FAIRFAX COUNTY PARK AUTHORITY

M E M O R A N D U M

TO: Chairman and Members
Park Authority Board

VIA: Kirk W. Kincannon, Executive Director

FROM: Cindy Walsh, Director
Resource Management Division

DATE: January 18, 2018

Agenda

Committee of the Whole
Wednesday, January 24, 2018 – 6:45 p.m.
Boardroom – Herrity Building
Chairman: William G. Bouie
Vice Chair: [vacant]

1. Lake Accotink Master Plan Update – Information*

*Enclosures

Committee Agenda Item
January 24, 2018

INFORMATION

Lake Accotink Master Plan Update (Braddock, Lee, and Springfield Districts)

The Park Authority kicked off the public process of updating the master plan for Lake Accotink Park in March 2016. Considerable effort has gone into public outreach and assessment of the site that, combined, will inform the master plan team's recommendation for Lake Accotink Park located in Springfield.

The Lake Accotink Park Master Plan was last updated in 1992. The makeup of Springfield and the county as a whole has changed notably over the intervening time span, indicating the value of re-evaluating the plan for this well-loved park to assure it will continue to meet the needs of a diverse community. Additionally, the Board of Supervisors approved the allocation of $179,000 in carryover funds in September 2014 to allow staff to investigate options for the management of the lake which would influence the direction of the master plan design for Lake Accotink Park.

The need to address the ongoing issue of sediment accumulation within the lake is a complex matter. Park Authority staff has worked in close coordination with the Fairfax County Department of Public Works and Environmental Services (DPWES) Stormwater Planning Division and the environmental consulting firm of Wetland Studies & Solutions, Incorporated (WSSI) to help to determine the best approach for managing the lake.

During this same time period, the Virginia Department of Environmental Quality (DEQ) has worked to establish a standard for the total maximum daily load (TMDL) for sediment within Accotink Creek Watershed. As this standard, could potentially impact decisions for management of the lake, the master plan team participated with DEQ as part of their Technical Advisory Committee in the development of the new standard. A final recommendation from DEQ was published in August 2017 and is anticipated to be adopted in the spring of 2018.

Whereas Lake Accotink functions as a sediment trap, it was not designed specifically for that purpose. Based on state guidelines, therefore, the county would not be able to receive credit towards addressing MS4 permit requirements by managing sediment within Lake Accotink. DPWES staff evaluated each of the lake management options to determine if there might be any benefit to partnering with the Park Authority in the management of Lake Accotink. Assisting with the management of Lake Accotink may have benefits to the county's stormwater quality – but not in a way that impacts the standards that DPWES is specifically directed to address. As a result, there is no direct benefit to the County in achieving Chesapeake Bay Ordinance or DEQ TMDL reduction

goals through the lake management alternatives considered. In addition, DEQ's release of TMDL standards for sediment reduction for the Accotink Creek Watershed does not provide any additional direction for management of the lake.

DPWES staff developed a detailed cost analysis for each of the lake management options considered which considers capital costs for dredging and anticipated yearly maintenance cost associated with each alternative. This information was shared with Supervisors Cook, McKay, Herrity, and Chairman Bulova in October 2017. Although the costs are widely divergent, it was requested by the Supervisors that this information be shared with the community and their opinion sought for a preferred course of action.

A meeting is currently scheduled for January 22, 2018, with February 5, 2018, reserved as a "snow date", to present the various management options to the community once again, to include the cost analysis, with the intent of gauging community support for the various options. The same information will also be made available through the project webpage for a minimum of 30 days to encourage the input of those unable to attend the scheduled meeting.

In addition to gaining community input regarding the preferred lake management option the staff team will finalize recommendations for park features to be included in the Lake Accotink Park Master Plan with the intent of presenting the draft master plan to the Park Authority Board in the summer of 2018.

ENCLOSED DOCUMENTS:
Attachment 1: Lake Accotink Sustainability Plan, Appendix C, Cost Estimates

STAFF:
Kirk W. Kincannon, Executive Director
Sara Baldwin, Deputy Director/COO
Aimee L. Vosper, Deputy Director/CBD
David Bowden, Director, Planning and Development Division
Cindy Walsh, Director, Resource Management Division
Todd Brown, Director, Park Operations Division
Barbara Nugent, Director, Park Services Division
Andi Dorlester, Manager, Park Planning Branch, Planning and Development Division
Gayle Hooper, Landscape Architect, Park Planning Branch

Appendix C

Lake Accotink Sustainability Plan
Cost Estimates

As part of the review of the potential long term management options for Lake Accotink, Wetland Studies and Solutions, Inc. (WSSI) has developed ballpark cost estimates for each of the six potential management options under consideration:

A) The "do nothing" option.
B) The current plan of dredging on approximately a 15-year interval.
C) Construction of a sediment forebay (either just upstream or within the existing footprint of the lake).
D) Installation of "beaver dam" structures in line with Accotink Creek upstream of the lake.
E) Removing the existing dam and returning Accotink Creek to a single thread channel within the current lake footprint.
F) Removal of a portion of the existing dam to create a smaller lake along with a single thread channel.

Note that no design work has been performed, thus the estimated costs include a 30% contingency. While some of the tasks are more easily estimated than others, major unknowns (e.g. available disposal sites, sediment analyses, potential archeological/permitting issues, etc.) warrant inclusion of a significant contingency. In addition, it is assumed that dredging will be performed hydraulically and that a suitable disposal/dewatering area will be located in sufficient proximity to the lake. Costs associated with the dredging options also assume the material will be removed from the dewatering site and disposed of at a suitable location once they have sufficiently dewatered. The conservative assumption (higher cost) is that it may be easier to find a temporary, nearby location for dewatering only. If a beneficial use for the material can be found, or if the dewatering area also serves as the final disposal area, significant savings could potentially be realized. This was not considered in this analysis.

A brief discussion of the assumptions and total costs for each of the management options is provided in the following sections, followed by a summary that provides annualized costs to enable a direct comparison between the options. Note that more detail on the estimated costs for each option is provided in this Appendix.

Option A – "Do Nothing"

As the name suggests, this option is the least expensive as costs would be limited to annual maintenance of the existing dam. However, this option would also require upgrade and/or more significant maintenance of the dam at some point in order to keep it in compliance with dam safety regulations. Based on discussions with our sub-consultant AECOM, it is reasonable to assume that a similar type of repair that was performed in 2010 would be required on an estimated 30-year cycle.

Estimated Annual Maintenance Cost: ***$13,000***

Estimated Repair Cost (30 yr Cycle): ***$4,700,000***

Option B – Continue with Current Dredging Method

As mentioned above, this option assumes hydraulic dredging to an as yet undetermined disposal/dewatering area, followed by removal for final disposal once the sediments have dewatered. This is viewed as the most practical method of removal given the significant quantities. Removal of the sediments from the dewatering area would require approximately 35,000 truck-trips (assuming 10 cy/truck). Previous studies have identified several possible locations that would have to be explored further. This option would also require dam repairs and annual maintenance, as discussed for Option A.

Total Estimated Dredge Cost: ***$29,275,459*** *(removal of 350,000 cy @ approximately* ***$84/cy)***

Estimated Annual Maintenance Cost: ***$13,000***

Estimated Repair Cost (30 Yr Cycle): ***$4,700,000***

Option C – Install In-lake Forebay

This option is similar to the Option B, with the addition of the sediment forebay to be used for an annual sediment removal program. The initial volume of material to be dredged for this option is 500,000 cy (150,000 cy of which is attributable to the installation of a sediment forebay). As with the previous option, hydraulic dredging is assumed with the initial volume deposited at an offsite area for ultimate removal after dewatering (for this case, 50,000 truck trips would be required for final disposal).

This option also includes costs associated with establishing an on-site disposal area to accommodate the annual removal of sediment from the sediment forebay (12,000 cy). As with the initial dredging operation of the entire lake, the plan is to allow the material from the forebay to dewater (on-site), then truck it off for final disposal. This would require approximately 1,200 truck-trips, which would impact the park and/or immediately adjacent neighborhoods. Costs for establishing an on-site disposal area are considered (either previously used basin 4 located south of the lake or a newly a newly established basin north of the lake). The cost to fortify the existing trail to Rolling Road (assuming the previously utilized basin is selected as the on-site disposal area) is also included in this analysis. Annual dam maintenance and periodic repair costs are also necessary for this Option (same as Options A and B).

This is the only option that also represents the possibility of obtaining credit for the significant sediment (and associated nutrient) removal represented by the lake. This potential benefit is quantified in more detail in the Summary section.

Total Estimated Dredge Cost: ***$45,043,460*** *(removal of 500,000 cy @ approximately* ***$90/cy****)*

Estimated Annual Dredging Cost: ***$776,472*** *(removal of 12,000 cy @ approximately* ***$65/cy****)*

Estimated Annual Maintenance Cost: ***$13,000***
Estimated Repair Cost (30 yr Cycle): ***$4,700,000***

Option D – Install of "Beaver Dam" Structures

The installation of the beaver dams provides limited overall relief from the sedimentation of Lake Accotink, as discussed in the *Water Quality Analysis*. For the purposes of this costing exercise, the installation of four structures was assumed. This option would involve wetland impacts, which have been included. Maintenance includes nominal costs to inspect and perform minor repairs if necessary, which would diminish over time.

Total Cost: ***$932,874***

Estimated Annual Maintenance Cost: ***$19,500***

Option E – Single Channel With Reclaimed Land (Remove Dam)

Creation of a single thread channel with removal of the dam assumes all material will be utilized on site, eliminating the major expense of offsite disposal. However, there is an uncertainty in the manipulation of the "wet" sediments to create the single thread channel at this conceptual stage of the project. As such, a premium for handling the wet material was added to the cost. There is also additional investigative work necessary for determining the best dam removal option. This analysis considered several options and includes the cost for the currently suggested option, based on the limited information available at this time. Details on the estimated dam removal costs and options are attached (developed by AECOM). It is assumed any wetland impacts would be self-mitigating.

Also provided are the annual maintenance costs that might be expected for the first five years after the completion of construction, primarily to ensure the vegetation has been adequately established. This short term cost was assumed as part of the initial construction for the purpose of computing the annualized cost (presented in the Summary section). While the intent is for the new channel to be stable and self-maintaining after this initial establishment period, costs for

routine annual maintenance have also been included. As the channel becomes more established, this cost should diminish over time.

While there is no pollutant removal credit that can be realized with this option, there is the considerable long-term cost benefit of the one-time construction cost with no further dredging.

Total Cost: ***$11,176,815***

Estimated Annual Maintenance Cost: ***$26,000***

Option F – Single Channel with Smaller Lake (Modification of Existing Dam)

The cost for this option is very similar to that for the previous option. The primary difference is for the excavation of the smaller lake. Sediments for this option would also remain within the current lake footprint. This Option also assumes any wetland impacts would be self-mitigating.

Total Cost: ***$12,932,706***

Estimated Annual Maintenance Cost: ***$26,000***

Summary

To provide a means of comparison between each of the options, above costs are summarized below in Table 1. Estimated annualized costs are also provided.

Table 1 – Cost Summary

Option	Construction	30% Contingency	Total Estimated Cost[2]	$/cy		Estimated Annual Maintenance[2]	Assumed Lifespan (yrs)	Estimated Annualized Cost[3]
				w/o Contingency	with Contingency			
A[1]	$7,346,000	$2,204,000	$9,550,000	-	-	$13,000	30	$237,000
B[1]	$22,520,000	$6,756,000	$29,276,000	$64	$84	$13,000	15	$2,691,000
C[1]	$34,649,000	$10,395,000	$45,044,000	$69	$90	$776,000	30	$4,695,000
D	$718,000	$215,000	$933,000	-	-	$19,500	60	$291,000
E	$8,818,000	$2,645,000	$11,463,000	-	-	$26,000	60	$440,000
F	$10,168,000	$3,050,000	$13,218,000	-	-	$26,000	60	$503,000

[1] Assumes resurfacing/repair in 30 years and again in 60 years. Cost for last repair/resurfacing used as the basis ($4.7M, obtained from DCR report ("Costs, Funding, and Prioritization of Virginia Dams to Meet Minimum Public Safety Stanfards", 12/12/11)

[2] Assumes 30% contingency

[3] Assumes 3% interst rate

From the above, it is clear that the options that include continued dredging operations are significantly more expensive than the other, non-dredging options. Should further study locate a more cost effective means of disposal than assumed in this analysis, these costs could be reduced. Regardless, the dredging options will likely remain the more expensive of the potential management options under consideration.

Another factor to be considered for the option that proposes to enhance the current function of the lake through installation of a sediment forebay and adoption of a regular maintenance dredging operation (Option C) is the pollutant removal credit that could potentially be achieved. To assess this credit in terms of $/lb of phosphorus removal, it is necessary to compute the "net present value" (NPV) of implementing Option C (note that costs were included for two dredging cycles, at 30 and 60 yrs):

P	Intial Cost	$45,043,460	Forebay (150,000 cy) + Main Lake 350,000 cy)
A	Annual Dredging	$776,472	12,000 cy
F1	Dredge Main Lake	$45,759,891	350,000 cy, 30 yrs
F2	Main Lake	$71,526,381	350,000 cy, 60 yrs
F3	Repair/Resurface	$7,346,477	30 yrs
F4	Repair/Resurface	$11,483,133	60 yrs

NPV = P + A(P/A,3%,30) + F1(P/F,3%,30) +F2(P/F,3%,60)+F3(P/F,3%,30)+F4(P/F,3%,60)
= **$100,048,310**

Note the "Repair/Resurface" cost was derived using the most recent repair cost of $4,700,000, scaled up assuming a 1.5% inflation rate for the specified durations (30 or 60 years). The next step is to compute the average total phosphorus (TP) removal (lbs) during the approximate 30-yr dredge cycle. Using the methodology presented in the *Water Quality Analysis* and extrapolating the TP removal presented in Table 8 for 30 years results in an average removal of approximately 900 lbs/yr (ranging from approximately 2,200 lbs/yr right after the dredging operation takes place to effectively zero after approximately 20 years).

Dividing the computed NPV by the average TP removal results in a cost of approximately $111,000/lb of TP removed. While this average unit cost for TP removal over the 30-yr dredge cycle is not cost effective compared to other BMP's, obtaining credit for the removal of 900 lbs of TP/yr can help offset a portion of the dredging costs should the decision be made to continue the dredging program for other reasons.

ALTERNATIVE B: CONTINUE WITH CURRENT DREDGING METHOD

PHASE	ITEM	UNIT	COST	QUANTITY	TOTAL
ENVIRONMENTAL STUDIES	WETLAND DELINEATION	LS	$12,500	1	$12,500
	JURISDICTIONAL DETERMINATION	LS	$1,000	1	$1,000
	EXISTING VEGETATION MAP	LS	$2,000	1	$2,000
ENGINEERING STUDIES	VOLUME ANALYSIS	LS	$15,000	1	$15,000
	DISPOSAL SITE STUDY/ASSESSMENT	LS	$25,000	1	$25,000
CULTURAL STUDIES	PHASE I	LS	$8,500	1	$8,500
SURVEY	DELINEATION SURVEY	LS	$11,000	1	$11,000
	BATHYMETRIC SURVEY	AC	$2,194	50	$109,707
	AS-BUILT/BATHYMETRIC SURVEY	AC	$2,194	50	$109,707
	CONTRACTED UTILITY DESIGNATION	LS	$15,000	1	$15,000
	UTILITY SURVEY (VISIBLE, EX. SEWER)	LS	$10,000	1	$10,000
	CONSTRUCTION STAKE-OUT	EA	$10,000	1	$10,000
CONCEPT DESIGN PHASE	CONCEPTUAL DESIGN PLANS	LS	$35,000	1	$35,000
	PUBLIC MEETINGS	EA	$5,000	1	$5,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$2,500	1	$2,500
DESIGN DEVELOPMENT PHASE	DESIGN PLANS	LS	$20,000	1	$20,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
	COST ESTIMATE	LS	$2,500	1	$2,500
CONSTRUCTION DOCUMENTS PHASE	FINAL DESIGN PLANS	LS	$25,000	1	$25,000
	COST ESTIMATE	LS	$5,000	1	$5,000
	VALUE ENGINEERING STUDY	LS	$32,000	1	$32,000
PERMITTING	CORPS PERMIT (INCLUDES VMRC)	LS	$20,000	1	$20,000
	DEQ PERMIT	LS	$5,000	1	$5,000
	VSMP/SWPPP	LS	$5,000	1	$5,000
	USACE PERMIT MONITORING	LS	$5,000	1	$5,000
	MEETINGS	LS	$10,000	1	$10,000
BIDDING	BID PACKAGE	LS	$10,000	1	$10,000
	BIDDING ADMINISTRATION	LS	$7,500	1	$7,500
	PRE-BID MEETINGS	EA	$10,000	1	$10,000
CONSTRUCTION	MOBILIZATION	LS	10%	1	$351,686
	PRE-CONSTRUCTION MEETINGS	LS	$5,000	1	$5,000
	CONSTRUCTION ADMINISTRATION	WK	$1,000	52	$52,000
	DREDGING/PUMPING TO DEWATERING AREA	CY	$7.00	350000	$2,450,000
	DISPOSAL SITE DELINEATION	LS	$12,500	1	$12,500
	DISPOSAL SITE JD	LS	$1,000	1	$1,000
	DISPOSAL SITE DELINEATION SURVEY	LS	$8,500	1	$8,500
	DISPOSAL SITE USM	LS	$2,000	1	$2,000
	DISPOSAL SITE GRADING - ROUGH	SY	$1	242000	$200,860
	DISPOSAL SITE SURVEY	AC	$2,800	50	$140,000
	CONSTRUCTION INSPECTION	WK	$5,000	52	$260,000
	RESTORATION SEEDING	SY	$1.50	250000	$375,000
	3 YEAR PERFORMANCE WARRANTY	LS	$10,000	1	$10,000
				SUBTOTAL:	$4,414,959

OPTION	ITEMS	UNIT	COST	QUANTITY	TOTAL
TRUCKING	LOAD & HAUL (from offsite disposal area)	CY	$25	262500	$6,583,500
	DUMP CHARGE	CY	$44	262500	$11,521,125
				SUBTOTAL:	$18,104,625
				TOTAL:	$22,519,584

$64 /cy

CONTINGENCY	30% Conceptual Level	LS	$6,755,875	1	$6,755,875
				TOTAL w CONTINGENCY:	$29,275,459

$84 /CY

ANNUAL MAINTENANCE	DAM INSPECTION/MAINTENANCE	LS	$10,000	1	$10,000

CONTINGENCY	30% Conceptual Level	LS	$3,000	1	$3,000
				TOTAL w CONTINGENCY:	$13,000

ALTERNATIVE C: INSTALL IN-LAKE FOREBAY					
PHASE	**ITEM**	**UNIT**	**COST**	**QUANTITY**	**TOTAL**
ENVIRONMENTAL STUDIES	WETLAND DELINEATION	LS	$12,500	1	$12,500
	JURISDICTIONAL DETERMINATION	LS	$1,000	1	$1,000
	ENDANGERED SPECIES SURVEY	LS	$5,000	1	$5,000
	WETLAND IMPACT ASSESSMENT	LS	$1,000	1	$1,000
	MITIGATION ANALYSIS	LS	$1,000	1	$1,000
	EXISTING VEGETATION MAP	LS	$2,000	1	$2,000
ENGINEERING STUDIES	VOLUME ANALYSIS	LS	$15,000	1	$15,000
	DISPOSAL SITE STUDY/ASSESSMENT	LS	$25,000	1	$25,000
	HYDROLOGY AND HYDRAULICS	LS	$15,000	1	$15,000
	FLOODPLAIN MODELING/ANALYSIS	LS	$15,000	1	$15,000
	SEDIMENT TRANSPORT STUDY	LS	$20,000	1	$20,000
CULTURAL STUDIES	PHASE I AND II	LS	$67,000	1	$67,000
SURVEY	DELINEATION SURVEY	LS	$11,000	1	$11,000
	BATHYMETRIC SURVEY	AC	$2,194	50	$109,707
	DEWATERING AREA/ACCESS ROAD SURVEY/STAKEOUT	LF	$2.50	8700	$21,750
	AS-BUILT/BATHYMETRIC SURVEY	AC	$2,194	50	$109,707
	TREE SURVEY (12" OR GREATER)	AC	$800	10	$8,000
	CONTRACTED UTILITY DESIGNATION	LS	$15,000	1	$15,000
	UTILITY SURVEY (VISIBLE, EX. SEWER)	LS	$10,000	1	$10,000
	CONSTRUCTION STAKE-OUT	AC	$2,500	5	$12,500
	AS-BUILT (FOREBAY)	AC	$2,800	10	$28,000
CONCEPT DESIGN PHASE	CONCEPTUAL DESIGN PLANS	LS	$50,000	1	$50,000
	PUBLIC MEETINGS	EA	$5,000	3	$15,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$7,500	1	$7,500
DESIGN DEVELOPMENT PHASE	DESIGN PLANS	LS	$35,000	1	$35,000
	PUBLIC MEETINGS	EA	$5,000	1	$5,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$5,000	1	$5,000
CONSTRUCTION DOCUMENTS PHASE	FINAL DESIGN PLANS	LS	$25,000	1	$25,000
	PUBLIC MEETINGS	EA	$5,000	1	$5,000
	COST ESTIMATE	LS	$5,000	1	$5,000
	VALUE ENGINEERING STUDY	LS	$32,000	1	$32,000
PERMITTING	CORP PERMIT	LS	$30,000	1	$30,000
	DEQ PERMIT	LS	$5,000	1	$5,000
	VSMP/SWPPP	LS	$10,000	1	$10,000
	USACE PERMIT MONITORING	LS	$10,000	1	$10,000
	MEETINGS	LS	$20,000	1	$20,000
BIDDING	BID PACKAGE	LS	$10,000	1	$10,000
	BIDDING ADMINISTRATION	LS	$7,500	1	$7,500
	PRE-BID MEETING	EA	$10,000	1	$10,000
CONSTRUCTION	MOBILIZATION	LS	10%	1	$625,782
	PRE-CONSTRUCTION MEETINGS	LS	$10,000	1	$10,000
	ACCESS ROAD (DECK MATS)	LF	$22	4000	$88,000
	FILTER FABRIC (BENEATH DECK MATS)	SY	$5	8000	$40,000
	CONSTRUCTION ADMINISTRATION	WK	$1,000	52	$52,000
	FOREBAY DREDGING	CY	$10	150000	$1,500,000
	DREDGING/PUMPING TO DEWATERING AREA	CY	$10	350000	$3,500,000
	DISPOSAL SITE DELINEATION	LS	$12,500	1	$12,500
	DISPOSAL SITE JD	LS	$1,000	1	$1,000
	DISPOSAL SITE DELINEATION SURVEY	LS	$8,500	1	$8,500
	DISPOSAL SITE USM	LS	$2,000	1	$2,000
	DISPOSAL SITE GRADING - ROUGH	SY	$1	242000	$200,860
	DISPOSAL SITE SURVEY	AC	$2,800	50	$140,000
	TRAIL REPAIR	SY	$58	500	$28,835
	CONSTRUCTION INSPECTION	WK	$5,000	52	$260,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
	RESTORATION PLANTING	EA	$10	750	$7,125
	RESTORATION SEEDING	SY	$1.50	258000	$387,000
	3 YEAR PERFORMANCE WARRANTY	LS	$10,000	1	$10,000
MITIGATION	CREDITS	AC	$85,000	10	$850,000
				SUBTOTAL:	$7,690,765

OPTION	ITEMS	UNIT	COST	QUANTITY	TOTAL
TRUCKING	LOAD & HAUL (from offsite disposal area)	CY	$25	375000	$9,405,000
	DUMP CHARGE	CY	$44	375000	$16,458,750
				SUBTOTAL:	$25,863,750
ONSITE DISPOSAL AREA	ADDITIONAL DELINEATION	LS	$9,500	1	$9,500
	ADDITIONAL JD	LS	$1,000	1	$1,000
	ADDITIONAL DELINEATION SURVEY	LS	$8,500	1	$8,500
	USM	LS	$2,000	1	$2,000
	SITE GRADING - ROUGH	SY	$1	17000	$14,110
	SEDIMENT HAUL/LOADING	CY	$25	12000	$300,960
	DUMP CHARGE	CY	$44	12000	$526,680
	SURVEY DEWATERING BASIN	AC	$2,800	3.5	$9,800
	HAUL ROAD/BASIN DESIGN PLANS (LDS SUBMISSION)	LS	$25,000	1	$25,000
	STABILIZE HAUL ROAD	LS	$130,000	1	$130,000
HAUL TO ROLLING ROAD	SURVEY RAILROAD BED	LF	$2.50	8700	$21,750
	GEOTECH (BORING, STABILITY, CULVERT)	LS	$15,000	1	$15,000
HAUL THROUGH COMMUNITY	SURVEY ACCESS AND STAGING	LS	$20,000	1	$20,000
	ENTRANCE PLANS (LDS AND VDOT)	LS	$10,000	1	$10,000
				SUBTOTAL:	$1,094,300
				TOTAL:	$34,648,815	$69 /cy
CONTINGENCY	30% Conceptual Level	LS	$10,394,645	1	$10,394,645
				TOTAL w CONTINGENCY:	$45,043,460	$90 /cy
ANNUAL MAINTENANCE	MOBILIZATION	LS	5%	1	$27,966
	ANNUAL SEDIMENT REMOVAL/DREDGING	CY	$10	12000	$120,000
	SEDIMENT HAUL/LOADING	CY	$25	6000	$150,480
	DUMP CHARGE	CY	$44	6000	$263,340
	SEEDING	SY	$1.50	17000	$25,500
	DAM INSPECTION/MAINTENANCE	LS	$10,000	1	$10,000
				SUBTOTAL:	$597,286

ALTERNATIVE D: INSTALL BEAVER DAM STRUCTURES					
PHASE	**ITEM**	**UNIT**	**COST**	**QUANTITY**	**TOTAL**
ENVIRONMENTAL STUDIES	WETLAND DELINEATION	LS	$12,500	1	$12,500
	JURISDICTIONAL DETERMINATION	LS	$1,000	1	$1,000
	ENDANGERED SPECIES SURVEY	LS	$5,000	1	$5,000
	WETLAND IMPACT ASSESSMENT	LS	$1,000	1	$1,000
	MITIGATION ANALYSIS	LS	$500	1	$500
	EXISTING VEGETATION MAP	LS	$2,500	1	$2,500
ENGINEERING STUDIES	HYDROLOGY AND HYDRAULICS	LS	$7,500	1	$7,500
	FLOODPLAIN MODELING/ANALYSIS	LS	$15,000	1	$15,000
	SEDIMENT TRANSPORT STUDY	LS	$20,000	1	$20,000
CULTURAL STUDIES	PHASE I AND II	LS	$67,000	1	$67,000
SURVEY	DELINEATION SURVEY	LS	$16,000	1	$16,000
	TREE SURVEY (12" OR GREATER)	AC	$800	25	$20,000
	CONTRACTED UTILITY DESIGNATION	LS	$15,000	1	$15,000
	UTILITY SURVEY (VISIBLE, EX. SEWER)	LS	$10,000	1	$10,000
	CONSTRUCTION STAKE-OUT	AC	$2,500	25	$62,500
	AS-BUILT	AC	$2,800	25	$70,000
CONCEPT DESIGN PHASE	CONCEPTUAL DESIGN PLANS	LS	$15,000	1	$15,000
	PUBLIC MEETINGS	EA	$5,000	3	$15,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$5,000	1	$5,000
DESIGN DEVELOPMENT PHASE	DESIGN PLANS	LS	$20,000	1	$20,000
	PUBLIC MEETINGS	EA	$5,000	1	$5,000
	COST ESTIMATE	LS	$5,000	1	$5,000
CONSTRUCTION DOCUMENTS PHASE	FINAL DESIGN PLANS	LS	$15,000	1	$15,000
	PUBLIC MEETINGS	EA	$5,000	1	$5,000
	COST ESTIMATE	LS	$5,000	1	$5,000
PERMITTING	CORPS PERMIT (INCLUDES VMRC)	LS	$20,000	1	$20,000
	DEQ PERMIT	LS	$5,000	1	$5,000
	VSMP/SWPPP	LS	$5,000	1	$5,000
	USACE PERMIT MONITORING	LS	$10,000	1	$10,000
	MEETINGS	LS	$20,000	1	$20,000
BIDDING	BID PACKAGE	LS	$10,000	1	$10,000
	BIDDING ADMINISTRATION	LS	$7,500	1	$7,500
	PRE-BID MEETINGS	LS	$10,000	1	$10,000
CONSTRUCTION	MOBILIZATION	LS	5%	1	$35,880
	PRE-CONSTRUCTION MEETINGS	LS	$20,000	1	$20,000
	ACCESS ROAD (DECK MATS)	LF	$22	3000	$66,000
	FILTER FABRIC (BENEATH DECK MATS)	SY	$5.00	6000	$30,000
	CONSTRUCTION ADMINISTRATION	LS	$1,000	12	$12,000
	EXCAVATION (USED AS FILL ON SITE)	CY	$25	2000	$50,160
	SITE GRADING - ROUGH	SY	$0.83	2000	$1,660
	SITE GRADING - FINE	SY	$0.62	2000	$1,240
	VINYL PILING INSTALLATION	VLF	$13	20000	$250,000
	SHEET PILE CAP INSTALLATION	20 LF	$710	100	$71,000
	REINFORCED BED MIX (BOTH SIDES OF PILE)	CY	$95	1000	$95,000
	TRAIL REPAIR	SY	$58	500	$28,835
	CONSTRUCTION INSPECTION	WK	$5,000	12	$60,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
	RESTORATION PLANTING	EA	$10	600	$5,700
	RESTORATION SEEDING	SY	$1.50	4000	$6,000
	3 YEAR PERFORMANCE WARRANTY	LS	$10,000	1	$10,000
MITIGATION	CREDITS	AC	$85,000	5	$425,000
				TOTAL:	$717,595

CONTINGENCY	30% Conceptual Level	LS	$215,279	1	$215,279
				TOTAL w CONTINGENCY:	$932,874

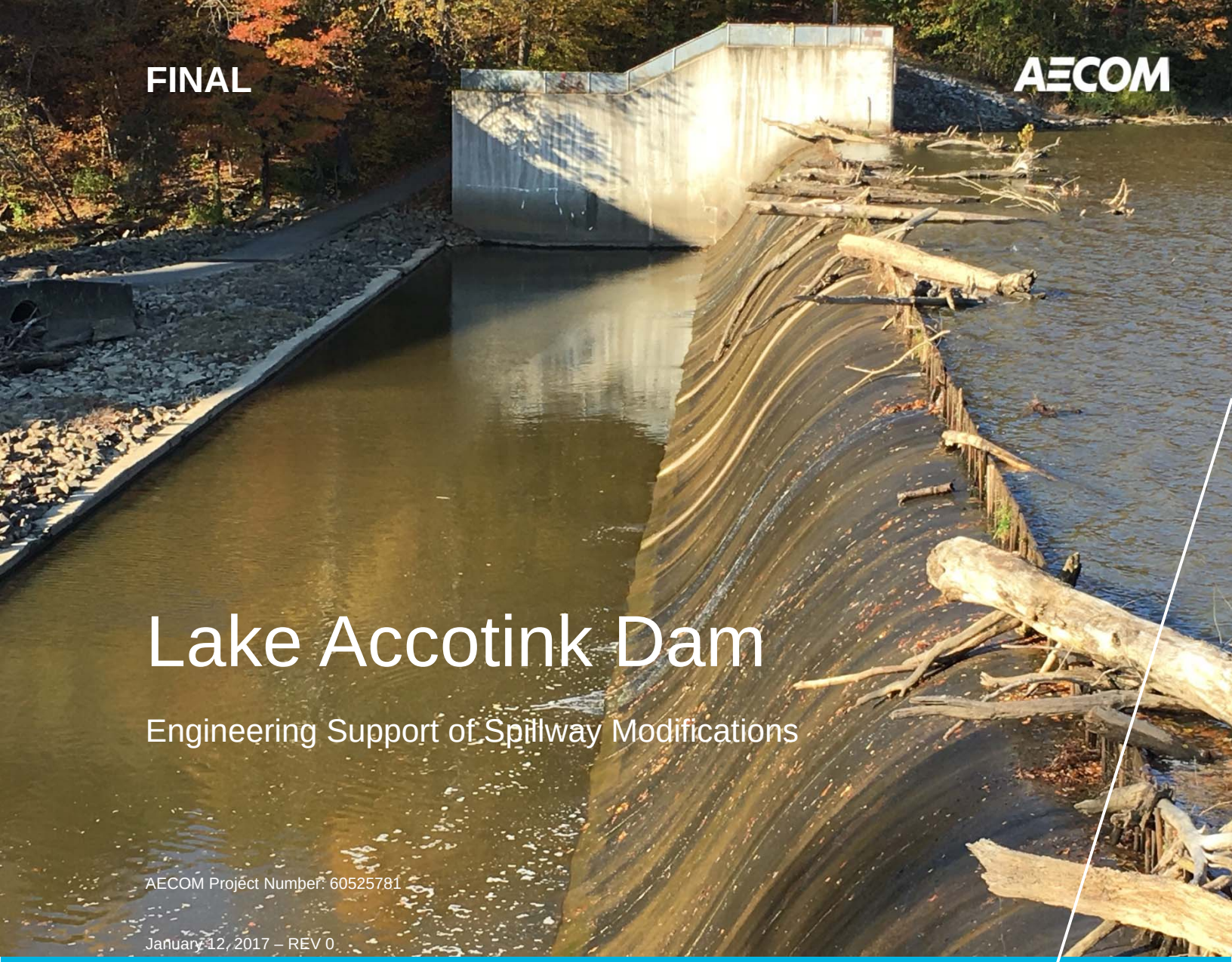
ANNUAL MAINTENANCE	STABILIZATION (MISC. REPAIRS)	LS	$5,000	1	$5,000
	DAM INSPECTION/MAINTENANCE	LS	$10,000	1	$10,000
				SUBTOTAL:	$15,000

CONTINGENCY	30% Conceptual Level	LS	$4,500	1	$4,500
				TOTAL w CONTINGENCY:	$19,500

ALTERNATIVE E: SINGLE CHANNEL WITH RECLAIMED LAND (REMOVE DAM)					
PHASE	**ITEM**	**UNIT**	**COST**	**QUANTITY**	**TOTAL**
ENVIRONMENTAL STUDIES	WETLAND DELINEATION	LS	$32,500	1	$32,500
	JURISDICTIONAL DETERMINATION	LS	$1,500	1	$1,500
	ENDANGERED SPECIES SURVEY	LS	$10,000	1	$10,000
	WETLAND IMPACT ASSESSMENT	LS	$1,000	1	$1,000
	MITIGATION ANALYSIS	LS	$5,000	1	$5,000
	EXISTING VEGETATION MAP	LS	$3,500	1	$3,500
	USM	LS	$2,500	1	$2,500
ENGINEERING STUDIES	SEDIMENT ANALYSIS	LS	$30,000	1	$30,000
	HYDROLOGY AND HYDRAULICS	LS	$20,000	1	$20,000
	FLOODPLAIN MODELING/ANALYSIS	LS	$15,000	1	$15,000
	DAM/STRUCTURAL ANALYSIS	LS	$25,000	1	$25,000
	SEDIMENT TRANSPORT STUDY (UPSTREAM & DOWN)	LS	$30,000	1	$30,000
CULTURAL STUDIES	PHASE I, II, AND III ARCH INVESTIGATIONS (DAM)	LS	$117,000	1	$117,000
SURVEY	DELINEATION SURVEY	LS	$30,000	1	$30,000
	DAM SURVEY	LS	$15,000	1	$15,000
	ASBESTOS TESTING IN OGEE SPILLWAY	LS	$10,000	1	$10,000
	CONTRACTED UTILITY DESIGNATION	LS	$15,000	1	$15,000
	UTILITY SURVEY (VISIBLE, EX. SEWER)	LS	$10,000	1	$10,000
	CONSTRUCTION STAKE-OUT (STREAM)	LF	$20	3300	$66,000
	CONSTRUCTION STAKE-OUT (UPLAND, WETLAND)	AC	$2,500	40	$100,000
	AS-BUILT (STREAM)	LF	$20	3300	$66,000
	AS-BUILT (UPLAND, WETLAND)	AC	$2,800	40	$112,000
CONCEPT DESIGN PHASE	CONCEPTUAL DESIGN PLANS	LS	$75,000	1	$75,000
	PUBLIC MEETINGS	EA	$5,000	3	$15,000
	PROJECT TEAM MEETINGS	EA	$2,500	10	$25,000
	COST ESTIMATE	LS	$10,000	1	$10,000
DESIGN DEVELOPMENT PHASE	DESIGN PLANS	LS	$50,000	1	$50,000
	PUBLIC MEETINGS	EA	$10,000	2	$20,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$5,000	1	$5,000
CONSTRUCTION DOCUMENTS PHASE	FINAL DESIGN PLANS	LS	$30,000	1	$30,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$5,000	1	$5,000
	VALUE ENGINEERING STUDY	LS	$32,000	1	$32,000
PERMITTING	CORP PERMIT (INCLUDES VMRC)	LS	$20,000	1	$20,000
	DEQ PERMIT	LS	$5,000	1	$5,000
	DCR DAM DECOMISSION/STRUCTURAL PERMITS	LS	$15,000	1	$15,000
	VSMP/SWPPP	LS	$10,000	1	$10,000
	USACE PERMIT MONITORING	LS	$10,000	1	$10,000
	MEETINGS	EA	$20,000	1	$20,000
BIDDING	BID PACKAGE	LS	$10,000	1	$10,000
	BIDDING ADMINISTRATION	LS	$7,500	1	$7,500
	PRE-BID MEETING	LS	$10,000	1	$10,000
CONSTRUCTION	MOBILIZATION	LS	5%	1	$355,050
	PRE-CONSTRUCTION MEETINGS	EA	$10,000	1	$10,000
	ACCESS ROAD (DECK MATS)	LF	$22	3000	$66,000
	FILTER FABRIC (BENEATH DECK MATS)	SY	$5.00	6000	$30,000
	CONSTRUCTION ADMINISTRATION	WK	$3,000	52	$156,000
	DAM DECOMMISSION/REMOVAL	LS	$556,000	1	$556,000
	EXCAVATION (USED AS FILL ON SITE)	CY	$25	100000	$2,508,000
	WET MATERIAL PREMIUM	CY	$5	100000	$500,000
	SITE GRADING - ROUGH	SY	$0.83	300000	$249,000
	SITE GRADING - FINE	SY	$0.62	300000	$186,000
	REINFORCED BED MIX (18")	CY	$95	16000	$1,520,000
	STREAM STRUCTURES	EA	$20,000	10	$200,000
	RESTORATION PLANTING	EA	$10	45000	$427,500
	RESTORATION SEEDING	SY	$1.50	275000	$412,500
	3 YEAR PERFORMANCE WARRANTY	LS	$10,000	1	$10,000
	CONSTRUCTION INSPECTION	WK	$5,000	52	$260,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
MITIGATION	MITIGATION MONITORING	LS	$25,000	1	$25,000
				TOTAL:	$8,597,550
CONTINGENCY	30% Conceptual Level	LS	$2,579,265	1	$2,579,265
				TOTAL w CONTINGENCY:	$11,176,815
MAINTENANCE	STREAM CHANNEL STABILIZATION (5 yrs)	EA	$25,000	5	$125,000
	VEGETATION ESTABLISHMENT (5 yrs)	EA	$10,000	5	$50,000
	MONITORING (5 yrs)	EA	$5,000	5	$25,000
	LONG TERM ANNUAL	LS	$20,000	1	$20,000
				SUBTOTAL:	$220,000
CONTINGENCY	30% Conceptual Level	LS	$66,000	1	$66,000
				TOTAL w CONTINGENCY:	$286,000

ALTERNATIVE F: SINGLE CHANNEL WITH SMALLER LAKE (MODIFICATION OF EXISTING DAM)					
PHASE	**ITEM**	**UNIT**	**COST**	**QUANTITY**	**TOTAL**
ENVIRONMENTAL STUDIES	WETLAND DELINEATION	LS	$32,500	1	$32,500
	JURISDICTIONAL DETERMINATION	LS	$1,500	1	$1,500
	ENDANGERED SPECIES SURVEY	LS	$10,000	1	$10,000
	WETLAND IMPACT ASSESSMENT	LS	$1,000	1	$1,000
	MITIGATION ANALYSIS	LS	$5,000	1	$5,000
	EXISTING VEGETATION MAP	LS	$3,500	1	$3,500
	USM	LS	$2,500	1	$2,500
ENGINEERING STUDIES	SEDIMENT ANALYSIS	LS	$30,000	1	$30,000
	HYDROLOGY AND HYDRAULICS	LS	$25,000	1	$25,000
	FLOODPLAIN MODELING/ANALYSIS	LS	$30,000	1	$30,000
	DAM/STRUCTURAL ANALYSIS	LS	$25,000	1	$25,000
	SEDIMENT TRANSPORT STUDY (UPSTREAM & DOWN)	LS	$50,000	1	$50,000
CULTURAL STUDIES	PHASE I, II, AND III ARCH INVESTIGATIONS (DAM)	LS	$117,000	1	$117,000
SURVEY	DELINEATION SURVEY	LS	$30,000	1	$30,000
	DAM SURVEY	LS	$15,000	1	$15,000
	ASBESTOS TESTING IN OGEE SPILLWAY	LS	$10,000	1	$10,000
	CONTRACTED UTILITY DESIGNATION	LS	$15,000	1	$15,000
	UTILITY SURVEY (VISIBLE, EX. SEWER)	LS	$10,000	1	$10,000
	CONSTRUCTION STAKE-OUT (STREAM)	LF	$20	2500	$50,000
	CONSTRUCTION STAKE-OUT (UPLAND, WETLAND)	AC	$2,500	40	$100,000
	AS-BUILT (STREAM)	LF	$20	2500	$50,000
	AS-BUILT (UPLAND, WETLAND)	AC	$2,800	40	$112,000
	AS-BUILT (SMALLER POND)	AC	$2,800	18	$50,400
CONCEPT DESIGN PHASE	CONCEPTUAL DESIGN PLANS	LS	$75,000	1	$75,000
	PUBLIC MEETINGS	EA	$10,000	3	$30,000
	PROJECT TEAM MEETINGS	EA	$2,500	10	$25,000
	COST ESTIMATE	LS	$10,000	1	$10,000
DESIGN DEVELOPMENT PHASE	DESIGN PLANS	LS	$50,000	1	$50,000
	PUBLIC MEETINGS	EA	$10,000	2	$20,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$5,000	1	$5,000
CONSTRUCTION DOCUMENTS PHASE	FINAL DESIGN PLANS	LS	$30,000	1	$30,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
	PROJECT TEAM MEETINGS	EA	$2,500	3	$7,500
	COST ESTIMATE	LS	$10,000	1	$10,000
	VALUE ENGINEERING STUDY	LS	$32,000	1	$32,000
PERMITTING	CORP PERMIT (INCLUDES VMRC)	LS	$20,000	1	$20,000
	DEQ PERMIT	LS	$5,000	1	$5,000
	DCR DAM DECOMISSION/STRUCTURAL PERMITS	LS	$15,000	1	$15,000
	VSMP/SWPPP	LS	$10,000	1	$10,000
	USACE PERMIT MONITORING	LS	$10,000	1	$10,000
	MEETINGS	EA	$10,000	2	$20,000
BIDDING	BID PACKAGE	LS	$10,000	1	$10,000
	BIDDING ADMINISTRATION	LS	$7,500	1	$7,500
	PRE-BID MEETINGS	LS	$10,000	1	$10,000
CONSTRUCTION	MOBILIZATION	LS	5%	1	$415,635
	PRE-CONSTRUCTION MEETINGS	LS	$10,000	1	$10,000
	ACCESS ROAD (DECK MATS)	LF	$22	3000	$66,000
	FILTER FABRIC (BENEATH DECK MATS)	SY	$5.00	6000	$30,000
	CONSTRUCTION ADMINISTRATION	WK	$3,000	52	$156,000
	DAM DECOMMISSION/REMOVAL	LS	$556,000	1	$556,000
	EXCAVATION (USED AS FILL ON SITE)	CY	$25	165000	$4,138,200
	WET MATERIAL PREMIUM	CY	$5	165000	$825,000
	SITE GRADING - ROUGH	SY	$1	300000	$249,000
	SITE GRADING - FINE	SY	$1	300000	$186,000
	REINFORCED BED MIX (18")	CY	$95	11000	$1,045,000
	STREAM STRUCTURES	EA	$20,000	12	$240,000
	RESTORATION PLANTING	EA	$10	25000	$237,500
	RESTORATION SEEDING	SY	$1.50	196000	$294,000
	3 YEAR PERFORMANCE WARRANTY	LS	$10,000	1	$10,000
	CONSTRUCTION INSPECTION	WK	$5,000	52	$260,000
	PUBLIC MEETINGS	EA	$10,000	1	$10,000
MITIGATION	MITIGATION MONITORING	LS	$25,000	1	$25,000
				TOTAL:	$9,948,235
CONTINGENCY	30% Conceptual Level	LS	$2,984,471	1	$2,984,471
				TOTAL w CONTINGENCY:	$12,932,706
MAINTENANCE	STREAM CHANNEL STABILIZATION	EA	$25,000	5	$125,000
	VEGETATION ESTABLISHMENT	EA	$10,000	5	$50,000
	MONITORING	EA	$5,000	5	$25,000
	LONG TERM ANNUAL	LS	$20,000	1	$20,000
				SUBTOTAL:	$220,000
CONTINGENCY	30% Conceptual Level	LS	$66,000	1	$66,000
				TOTAL w CONTINGENCY:	$286,000

FINAL



Lake Accotink Dam

Engineering Support of Spillway Modifications

AECOM Project Number: 60525781

January 12, 2017 – REV 0

Quality information

Prepared by	Checked by	Approved by
REPORT Ryan P. Gee, P.E.	Robert Pinciotti, P.E.	Robert Pinciotti, P.E.
COST ESTIMATE Robert Pinciotti, P.E.	Ryan P. Gee, P.E.	Robert Pinciotti, P.E.

Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Wetland Studies and Solutions, Inc. (WSSI)
5300 Wellington Branch Drive, Suite 100
Gainesville, Virginia 20155
USA

T: +1 (703) 679 5600
F: +1 (703) 679 5601
wetlandstudies.com

Prepared by:

AECOM
12420 Milestone Center Drive
Suite 150
Germantown
MD, 20876
USA

T: +1 (301) 820 3000
F: +1 (301) 820 3009
aecom.com

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Attachments

Attachment 1 – Drawings of Conceptual Spillway Removal Options

Attachment 2 – Engineers Opinion of Construction Cost for Lake Accotink Spillway Removal

Attachment 3 – Photolog of AECOM Site Visit on 11/04/2016

1. Introduction

1.1 Background

Lake Accotink Dam is located in Fairfax County, Virginia on Accotink Creek. The 55 acre lake is currently operated by the Fairfax County Park Authority (FCPA) and used solely for recreation. The dam is approximately 100 years old and is classified as a high hazard dam per Virginia Department of Conservation and Recreation (DCR) dam safety regulations.

The dam is a composite structure, consisting of an earthen embankment section and concrete spillway section. The embankment section has maximum height of 28 feet with a crest length of approximately 700 feet. The concrete ogee spillway is located along the right abutment (looking downstream) and is aligned with Accotink Creek. It has a crest length of approximately 360 feet with a height of approximately 15 feet from the downstream channel invert (approximately elevation (El.) 170 ft) at the toe of the dam to the crest of the spillway. The spillway crest is at El. 185 ft and wooden flashboards are used to raise the normal pool to El. 186.5 ft. A 4 foot by 4 foot cast iron sluice gate at El. 168.5 ft is located adjacent to the east abutment and, according to the July 2013 annual Inspection Report, is “fully operational and operated on a weekly basis by the Park Authority staff”.

The concrete spillway section is comprised of inclined concrete slabs with buttress walls (Ambursen dam) and an 8 foot wide and 10 foot high gallery that spans the entire length of the spillway. The gallery or interior of the spillway is divided into 30 chambers formed by two buttress walls, an upstream inclined concrete slab, a downstream inclined concrete spillway slab and a spillway based slab (or bedrock). The spillway discharges into a stilling basin that extends along the entire length of the spillway which is believed to have a concrete bottom at El. 165.4. Topography of the ground surface immediately downstream of the stilling basin is considerably higher than the stilling basin bottom. The stilling basin discharges into the stream channel which is aligned with the right side of the spillway. There is a paved access road which crosses the creek that has a notched channel from the stilling basin that carries low flows to the downstream channel via a culvert beneath the access road. There is also a low area just downstream of the stilling basin to the left of the stream channel where three pipes with concrete headwalls and endwalls can pass additional flows under the access road. The elevations of the three pipes are unknown but are higher than the elevation of the channel leading to the stream. For higher spillway discharges, water from the stilling basin will exceed the capacity of the notched channel between the stilling basin and stream channel and will overtop the access road. There is also a sewer manhole exposed along the access road in the area of the stream channel.

The original design information for Lake Accotink Dam is not available, however, there are historical project documents dated between 1986 and 2016 that have been found in the Fairfax County and DCR files, which are listed in Section 4 of this report. Repairs were made to the dam and spillway with record drawings from this work dated 2008. Annual dam inspections have been performed and documented that the dam is in “good condition”.

Lake Accotink has a drainage area of approximately 30 square miles. Currently Accotink Dam has a conditional Virginia Dam Safety Operation and Maintenance (O&M) Certificate since the spillway can only pass 0.6 times the Probable Maximum Flood (PMF), well below the 0.9 PMF spillway design flood (SDF) requirement for a high hazard dam. We understand that Fairfax County is updating the hydrologic and hydraulic modeling and dam breach mapping in order to evaluate if the hazard potential classification can be reduced in order to require a lower SDF that would be sufficient for the issuance of a standard (non-conditional) O&M Certificate.

Accotink Creek is subject to significant sediment loads and Lake Accotink to sedimentation. Since constructed in circa 1918, the lake water surface area is reduced to approximately 50% of the initial area and the depth of water in the reservoir is greatly reduced, to approximately 4 feet of open water at the dam face. The sediment trap rate since prior dredging has been estimated at 15,000 cubic feet per year or greater. The Total Daily Maximum Load (TMDL) for Accotink Creek is for benthic impairment with Lake Accotink providing sediment storage capacity.

The FCPA with the assistance of Wetland Studies & Solutions (WSSI) is performing a master planning study for Lake Accotink and evaluating various alternatives to the current lake. We understand that one of the primary objectives of this study is to eliminate the need for future dredging. One alternative under consideration, and the reason for this study, is the removal of a portion of the ogee spillway to prevent impounding water (and sediment) during normal

flows and either eliminate or greatly reduce the size of the lake. Another potential benefit of this concept would be the potential for declassifying the structure as an "impounding structure" and eliminate the need for an O&M Permit.

1.2 Scope of Work

The objective of AECOM's task order is to provide support to WSSI to further evaluate the feasibility of a removal of a portion of the Lake Accotink ogee spillway. Specifically, the following work items were established for this task:

- Based on existing available reports and data provided by Fairfax County, AECOM is to identify the steps and associated costs for designing and constructing a partial removal of the ogee spillway removal. AECOM is to identify data needs for designing the ogee spillway removal.
- AECOM is to perform an engineer's opinion of construction cost for the ogee spillway removal including assumptions and uncertainties.

1.3 Site Reconnaissance

AECOM visited the project site on Friday, November 4, 2016 and were met by representatives of WSSI. WSSI explained the Master Plan concepts which involve several options of site grading upstream of the dam and the primary concept (AECOM Option 1) for creating a notch in the dam.

No spill was occurring over the spillway during the site visit and we were able to observe that the overall condition of the spillway was good, free of significant spalling, delamination or cracking. Similarly, the earthen embankment was well maintained and did not contain noticeable sloughing, depressions or seepage.

Of particular interest during the site reconnaissance:

- We noted that water ponds within the stilling basin during a non-spill condition, which will need to be considered both for demolition activities and long-term post-demolition conditions. It is possible that by demolishing the primary spillway, the downstream wall of the stilling basin could then be considered a dam if it creates a significant backwater restriction during a flood event. Consideration will also need to be made whether the Stilling Basin should remain after spillway demolition to prevent downstream shoreline erosion and whether the basin is needed to slow the velocity of water.
- We observed that the vehicular roadway is lower in some areas than the crest of the embankment dam at the eastern end of the dam. This indicates that prior to overtopping, it is possible that water will flow down the roadway and act as an unintentional "emergency spillway".
- The downstream access path will be beneficial for construction activities, as it provides easy access to the full length of the spillway. We noticed the accessway is used by recreational hikers to connect to trails on either side of the dam. Further consideration will need to be made on how to safely keep the public away from demolition activities,

It is important to note that AECOM conducted a brief site reconnaissance in order to become familiar with the facility and site but did not perform a complete dam safety inspection or access the interior of the spillway. Photographs of AECOM's site reconnaissance are provided in Attachment No. 3.

2. Partial Spillway Removal Options

AECOM investigated three alternatives for removing a portion of the spillway, which are described in the subsections below. Option 1 is derived from the WSSI concept in the Master Plan. Options 2 and 3 were developed as alternatives that provide larger and deeper notches. Dredging of the sediment in the vicinity of the spillway will be required as part of each of the options. For all of the alternatives, we have assumed that the sediment would be removed adjacent to the upstream face of the spillway to the bottom of the notch. The overall evaluation of the need for removal of sediment from within the limits of the lake and the environmental and permitting uses related to the sediment is beyond the scope of this task.

Each of the options in this draft report shows the removal or demolition of the central portion of the spillway, as is shown in the 2016 Sustainability Study. However, we recommend that consideration also be given to shifting the breach to the right (west) so as to better align the new opening with the existing downstream channel.

We have assumed for each alternative that the existing sluice gate will be used to dewater the upstream side of the dam prior to demolition, and during concrete demolition diesel powered pumps would be used to control the water near the demolition area. The concrete slabs and buttresses would be demolished via hoe-ram, and then wire saw cut to the final elevation to create a clean demolition line.

It is important to note that no hydraulic analysis for the alternatives have been conducted at this point to understand how much water would be impounded behind the remaining section of the spillway/dam and what the downstream impacts would be. Therefore, it is unknown if the alternatives would restrict impounding water behind the remaining portions of the spillway/dam to the extent that the structure could be "de-classified" as an impounding structure (dam) and therefore, not subject the DCR impounding structure regulations. Given that the dam currently has a conditional certificate, it is our opinion that the de-classification of the structure should be an important criteria for selecting the desired concept.

2.1 Option 1 – WSSI Concept

The concept presented by WSSI in their April 26, 2016 presentation to Fairfax County titled "Lake Accotink Sustainability Plan Summary of Potential Alternatives", shows the spillway being demolished at two elevations. In the center of the spillway, the bays between Buttresses No. 12 and 17 would be demolished to El. 170.0 ft and the remaining spillway bays would be demolished to EL. 176.5 ft. Based on the assumed cross-section of the concrete spillway section, this option would leave a concrete section about 5.4 feet high above the bottom of the stilling basin (El 165.4) and unless modifications were made downstream, water would still stand in the stilling basin. A hydraulic analysis would need to be conducted along with discussions with the DCR Dam Safety officials to determine if this option would still be considered a dam and subject to the DCR Impounding Structures regulations.

To accomplish the demolition and long-term stability, it is anticipated that the interior of the slab and buttress dam would need to be in-filled with concrete.

AECOM considered an Option 1A which places concrete inside the dam before demolition of the existing slabs and buttresses. The infill prior to demolition significantly reduces the risk of a dam breach should a significant flood event occur during demolition, but would require the demolished concrete be disposed away from the dam (off-site). We also considered an Option 1B which calls for the demolition of the slabs and buttresses and places the concrete spoils of demolition within the buttress bays, and then the concrete rubble is backfilled with concrete. Option 1B significantly reduces the amount of concrete required, and allows for the demolished material to remain on-site. Specifications would need to be provided for limiting the size and shape of the debris so as to limit the number and size of voids, although some voids would be inevitable. Further, the concrete mix design would need to be carefully considered to ensure the voids are grouted to the most reasonable extent possible. Option 1B could be appropriate if the structure no longer acts as a dam, but in our opinion is not appropriate otherwise.

To place the concrete on the interior of the spillway in Option 1A, a series of core drilled holes would need to be placed along the crest of the dam and along the downstream face of the dam. The holes in the crest of the dam would be used for concrete placement via concrete pump truck, and the holes in the downstream face would allow the standing water within the chambers to displace to the exterior during concrete placement operations.

2.2 Option 2 – Deep Notch at Center of Spillway

This option investigates widening the deep notch presented in Option No 1B, and omits the shallow notch across the remainder of the spillway crest. We believe that this concept will be much more efficient in passing flood flows, limiting the impounding water behind the remaining spillway/dam sections, and present a higher likelihood that the structure can be de-classified as a dam. The deep notch under this option was anticipated as being approximately 120 feet wide and located between Buttresses No. 10 through 20. We have maintained the crest elevation of El. 170 ft. to be consistent with the deep notch in Option No. 1.

Similar to Option 1B, we assumed that the demolition debris is placed between the remaining portions of the spillway buttresses walls, and is then backfilled with concrete. Again, encapsulation of the demolition debris in the backfill concrete would be applicable if the structure can be de-classified as a dam.

2.3 Option 3 – Full Height Spillway Removal at Center of Spillway

Similar to Option 2, this option would investigate the full height demolition of the spillway for a width of 120ft between Buttresses No. 10 and 20. Rather than maintain a crest elevation of 170 ft, the spillway would be entirely demolished down to the existing concrete foundation at approximately El 165. Under this option, the concrete in-fill would no longer be required and the amount of wire-saw cutting would be significantly reduced. All of the demolished concrete will need to be disposed off site.

This alternative would present the highest likelihood of de-classifying the structure as a dam, but consideration would need to be given to treatment of the stilling basin and higher riprap berm that carries the access road across the stream channel. In high flow situations, the berm would likely act as a dam and impound some water. Treatment of the downstream area would need to be considered for the hydraulic analysis.

3. Preferred Option & Cost Estimate

It is AECOM's opinion that Option No. 3 is the preferred concept due to the complete removal of the spillway down to the foundation, which is the option most likely to satisfy regulators that the facility will not function as a dam. Further, the full height removal does not involve creating a new sill elevation (at the bottom of the notch), and does not involve in-filling the remaining slab and buttresses with concrete at the bottom of the notch. The elimination of the need to create a new sill makes Option No. 3 the lowest cost option. It is possible that the VA DCR Regulators will require that a soft bottom channel be constructed in the existing concrete slab.

In our preparation of the Engineer's Opinion of Construction Cost (EOCC) for Option No. 3 included in Attachment No. 2, AECOM considered the unit rates provided by six contractor bids for recent local dam modification projects, as well as unit rates provided in RS Means Heavy Construction. Each line item in our EOCC provides the source of the unit rate. We believe that the EOCC accurately reflects what we would expect the cost to be for this work given our experience with similar types of concrete dam demolition work.

The EOCC is intended to capture the scope of work specific to the removal of the concrete spillway structure. The costs associated with construction water management, sediment removal and erosion controls are costs to be identified and captured by WSSI as part of the overall silt removal and re-grading work upstream of the dam, which is an integral part of the overall dam removal concept.

We have assumed that the concrete demolition debris from the spillway removal will be permanently disposed of on-site, upstream of the dam in a location within the footprint of the sediment re-grading earthwork.

4. Recommendations

AECOM has identified several additional studies that should be conducted to further refine and confirm the feasibility of the options presented in this report.

4.1 Hydrologic and Hydraulic Analysis

A hydrologic and hydraulic (H&H) analysis will need to be conducted in order to evaluate various notch elevations and dimensions, impounding water elevations behind the remaining portions of the spillway/dam for various storm frequencies and to evaluate downstream tailwater effects The exact point in which a structure is no longer considered a dam is not clearly defined in VA regulations, and this study will need to be performed in conjunction with consultation with the Dam Safety regulators of the VA DCR. We recommend that storm frequencies of 10-year, 100-

year, and 90 percent PMF be evaluated at a minimum. We anticipate that this analysis will also need to consider the notch location on the spillway as it relates to stream calming and preventing downstream erosion.

4.2 Concrete Abutment Stability, Spillway Stability & As-Built Configuration Investigation

The as-built configuration and stability of the spillway and the left and right concrete spillway abutments will need to be investigated before finalizing the demolition concepts. The investigation must confirm that the remaining portions of spillway, including the left and right concrete abutments are stable after the spillway is partially removed. It is not currently known whether the slabs of the buttress dam are providing lateral stability for the abutment walls. Further, we do not currently know the foundation profile and in order to provide an accurate set of demolition drawings with accurate quantities, we will need to know the top of foundation elevation in every chamber of the spillway.

To investigate the as-built configuration, we recommend that a concrete core be taken at the bottom of the access shaft to determine the thickness of the concrete and top of rock elevation at each abutment, and a core/boring be taken just beyond the edge of concrete of the manways to determine whether the abutment foundation projects beyond the manway below grade. Within the chambers, a weighted tape will need to be used to measure the depth of each chamber. An exterior survey will also need to be conducted downstream of the dam to determine the stilling basin depths, invert elevation of the outlet pipes, invert elevation of discharge channel and the profile of the existing sewer line that crosses downstream of the dam. In our conceptual sketches we show the foundation and stilling basin at a consistent elevation, however, based upon experience with Ambursen dams we know that this type of construction can accommodate abrupt transition in foundation elevations.

5. References

In preparation of this report, AECOM had the documents listed below available. A major data gap in our preparation of this report is accurate as-built drawings of the concrete spillway. The best available information on the geometry of the spillway was from Sheet 7 of the 2003 Spillway Repairs prepared by Dewberry & Davis, LLC.

- Re-Inspection Report For Class I and Class II Impoundments and Impounding Structures by the Commonwealth of Virginia State Water Control Board. (1986)
- Condition Survey of Lake Accotink (Bathymetry) by Burgess & Niple, Inc. and Waterway Surveys & Engineering, Ltd. (2015)
- “Lake Accotink Sustainability Plan Summary of Potential Alternatives” by Wetland Studies and Solutions. (April 27, 2016)
- Operation and Maintenance Certificate Application For Virginia Regulated Impounding Structures by Chris Kuhn, MS. (March 25, 2013)
- Lake Accotink Dam Operation and Maintenance Manual by Michael Baker Jr., Inc. [Baker] (July 2013)
- Geotechnical Exploration Report by Burgess & Niple, Inc. (February 2003)
- Record Drawings of the Lake Accotink Dam/Spillway Repairs prepared in 2002 by Dewberry & Davis LLC (2008)
- Concrete and Corrosion Condition Survey by SCHNABEL Engineering Associates (July 11, 1997)
- Annual Inspection Report by Michael Baker Jr, Inc. [Baker] (July 2013)
- Lake Accotink Dam Re-Certification Study, Hydrology and Hydraulics Report by Williamsburg Environmental Group, Inc. (March 2013)
- Lake Accotink Dam Phase II Report, Inspection and Repair Recommendations, Dewberry, Nealon & Davis (1976)
- Accotink Dam – Spillway Stability during Renovations by Dewberry (2008)

- Lake Accotink Dam Emergency Action Plan by Williamsburg Environmental Group, Inc. (July 2013)

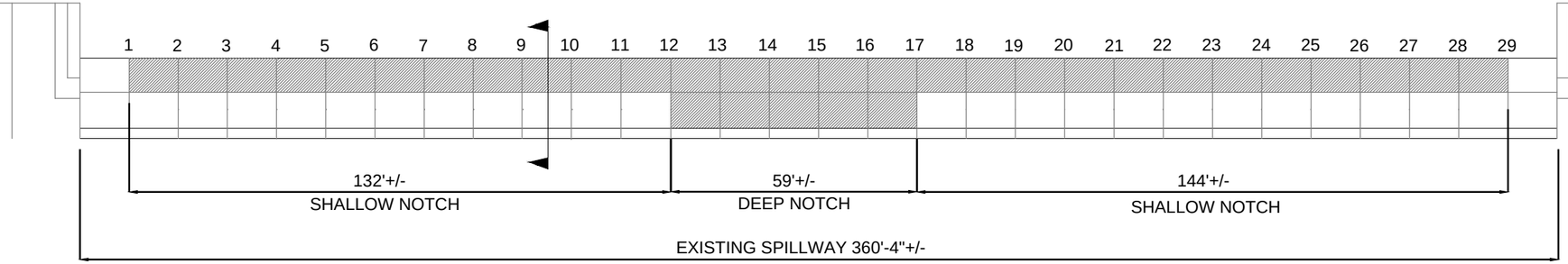
6. Limitations

This study is intended to provide a preliminary investigation into spillway removal options and costs, and is based upon limited available information. No engineering calculations were performed to verify hydraulic capacity or structural stability of the spillway/abutments. No coordination or discussion has occurred with the Virginia Department of Conservation and Recreation in preparation of this report. For this scope of work it is our understanding that WSSI will be responsible for all aspects regarding sediment management throughout the dam demolition. .

Attachment No. 1

Drawings of Conceptual Spillway Removal Options

OPTION NO. 1A - WSSI ORIGINAL CONCEPT - DEBRIS TAKEN OFFSITE



EXISTING CONDITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

GENERAL NOTES:

1. PROFILE OF SPILLWAY IS BASED UPON GEOMETRY SHOWN ON SHEET 7 OF THE JANUARY 2003 SPILLWAY REPAIRS PREPARED BY DEWBERRY & DAVIS LLC.
2. THE ELEVATIONS AND CONFIGURATION OF THE EXISTING SPILLWAY FOUNDATION IS UNKNOWN.

CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)			
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT			
VA INVENTORY DAM #05609	ENGINEER		
	RPG		

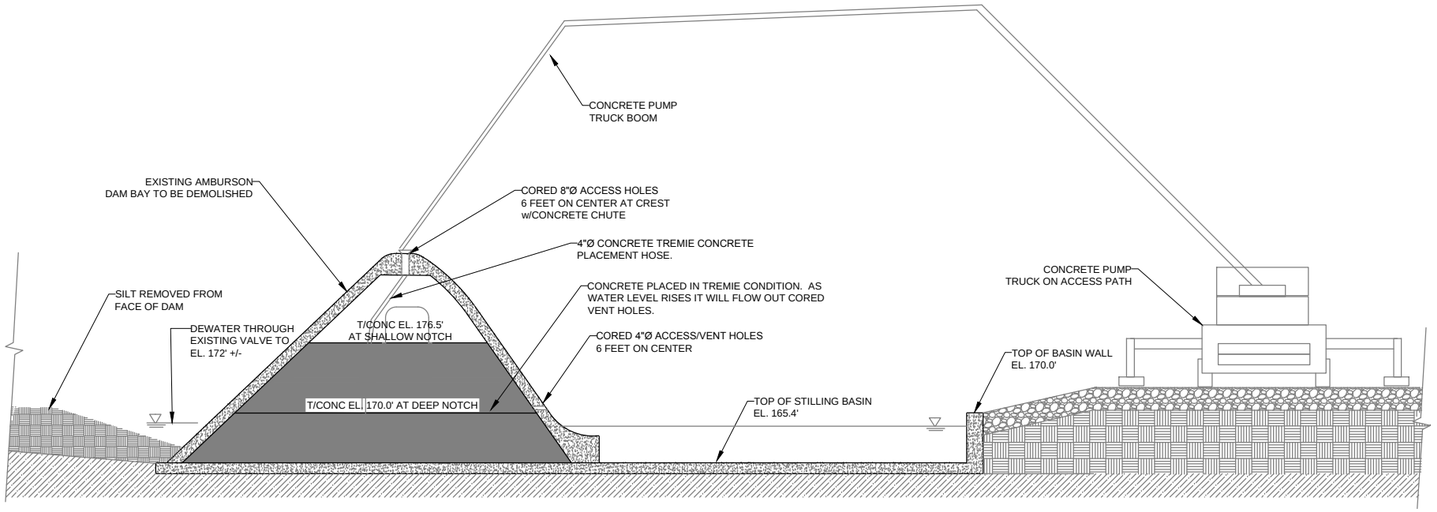
TITLE LAKE ACCOTINK DAM DEMOLITION CONCEPT

AECOM

PROJ NO 60525781

FIGURE 1

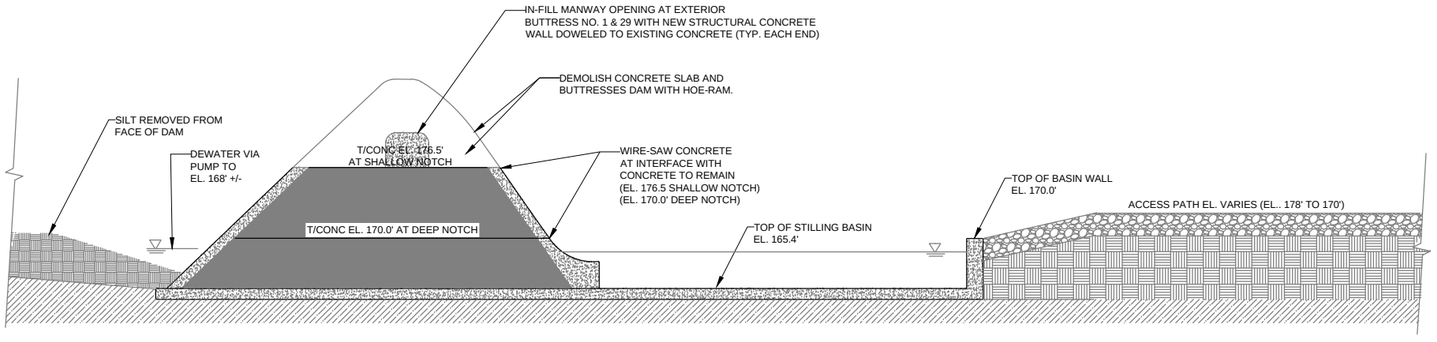
OPTION NO. 1A - WSSI ORIGINAL CONCEPT - DEBRIS TAKEN OFFSITE



PRE-DEMOLITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)



DEMOLITION - TYPICAL SPILLWAY CROSS SECTION

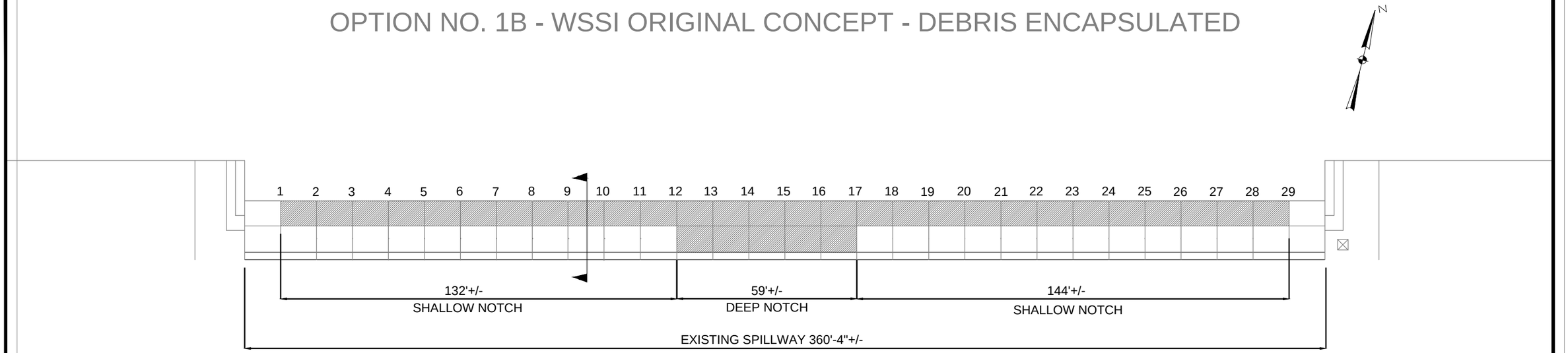
0' 10' 25' 50'

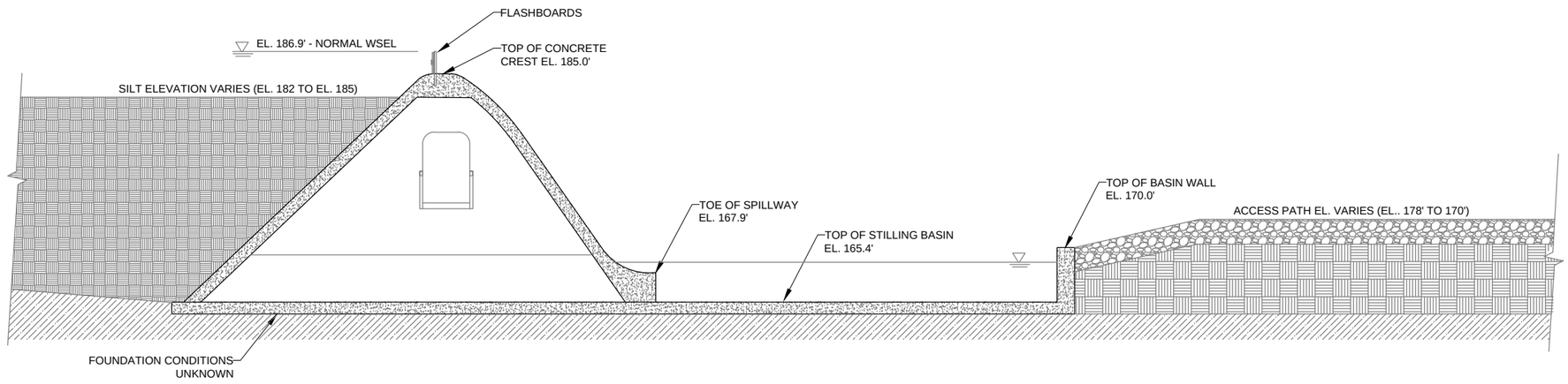
GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)				TITLE: LAKE ACCOTINK DAM DEMOLITION CONCEPT
PROJ: LAKE ACCOTINK – DAM REMOVAL CONCEPT				
VA INVENTORY DAM #05609	ENGINEER			AECOM
	RPG			PROJ NO 60525781
				FIGURE 2

OPTION NO. 1B - WSSI ORIGINAL CONCEPT - DEBRIS ENCAPSULATED





EXISTING CONDITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

GENERAL NOTES:

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2. THE ELEVATIONS AND CONFIGURATION OF THE EXISTING SPILLWAY FOUNDATION IS UNKNOWN.

CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)			
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT			
VA INVENTORY DAM #05609	ENGINEER		
	RPG		

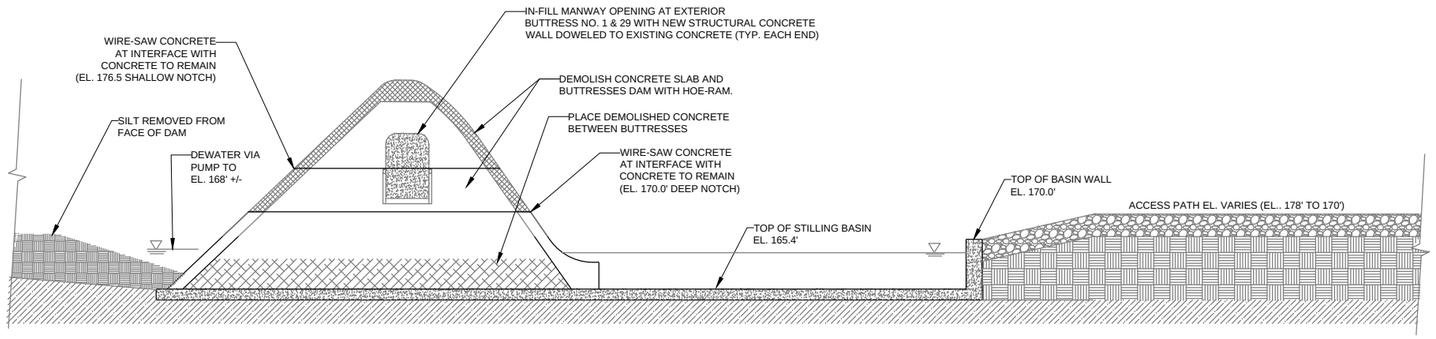
TITLE LAKE ACCOTINK DAM DEMOLITION CONCEPT

AECOM

PROJ NO 60525781

FIGURE 3

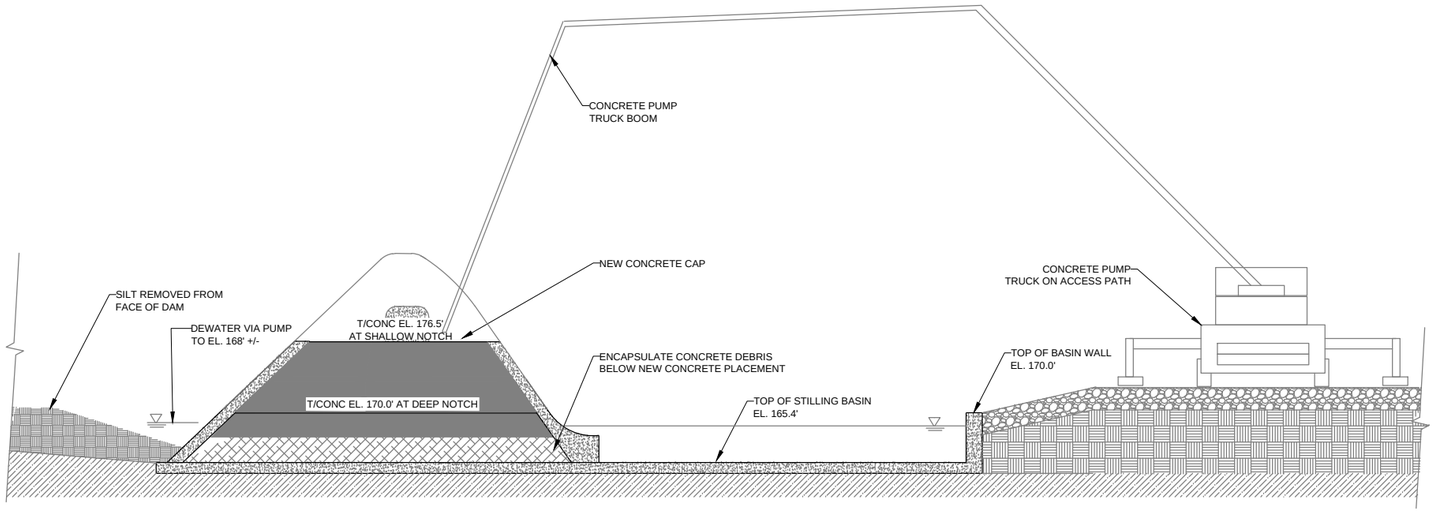
OPTION NO. 1B - WSSI ORIGINAL CONCEPT - DEBRIS ENCAPSULATED



DEMOLITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)



DEBRIS ENCAPSULATION - TYPICAL SPILLWAY CROSS SECTION

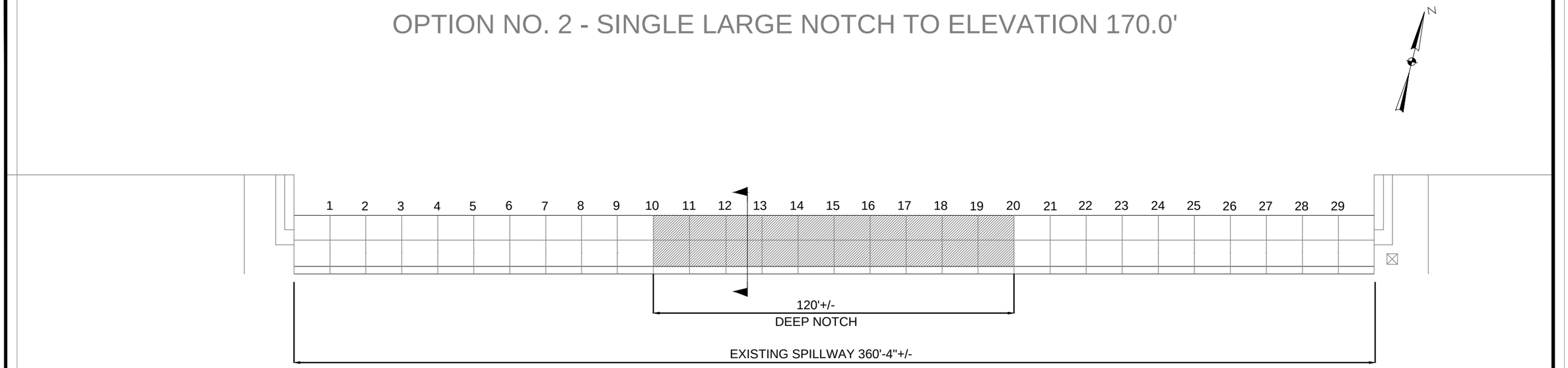
0' 10' 25' 50'

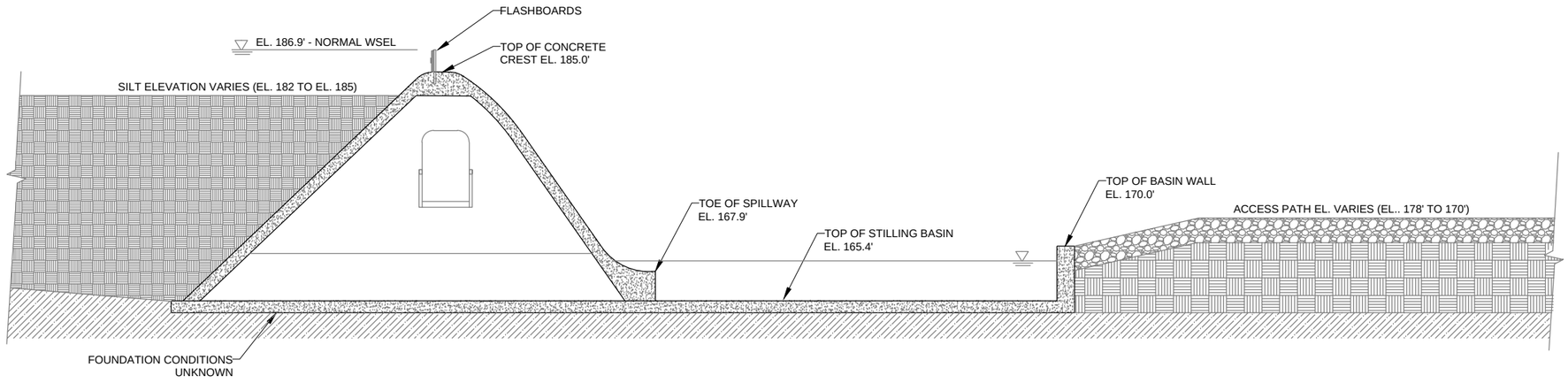
GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)				TITLE: LAKE ACCOTINK DAM DEMOLITION CONCEPT
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT				
VA INVENTORY DAM #05609	ENGINEER			AECOM
	RPG			PROJ NO 60525781
				FIGURE 4

OPTION NO. 2 - SINGLE LARGE NOTCH TO ELEVATION 170.0'





EXISTING CONDITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

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CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)			
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT			
VA INVENTORY DAM #05609	ENGINEER		
	RPG		

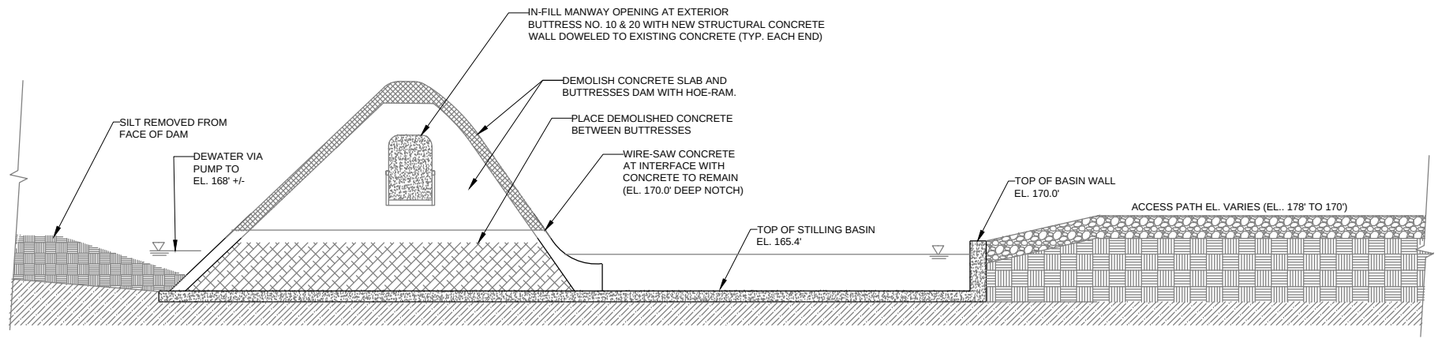
TITLE: LAKE ACCOTINK DAM DEMOLITION CONCEPT

AECOM

PROJ NO 60525781

FIGURE 5

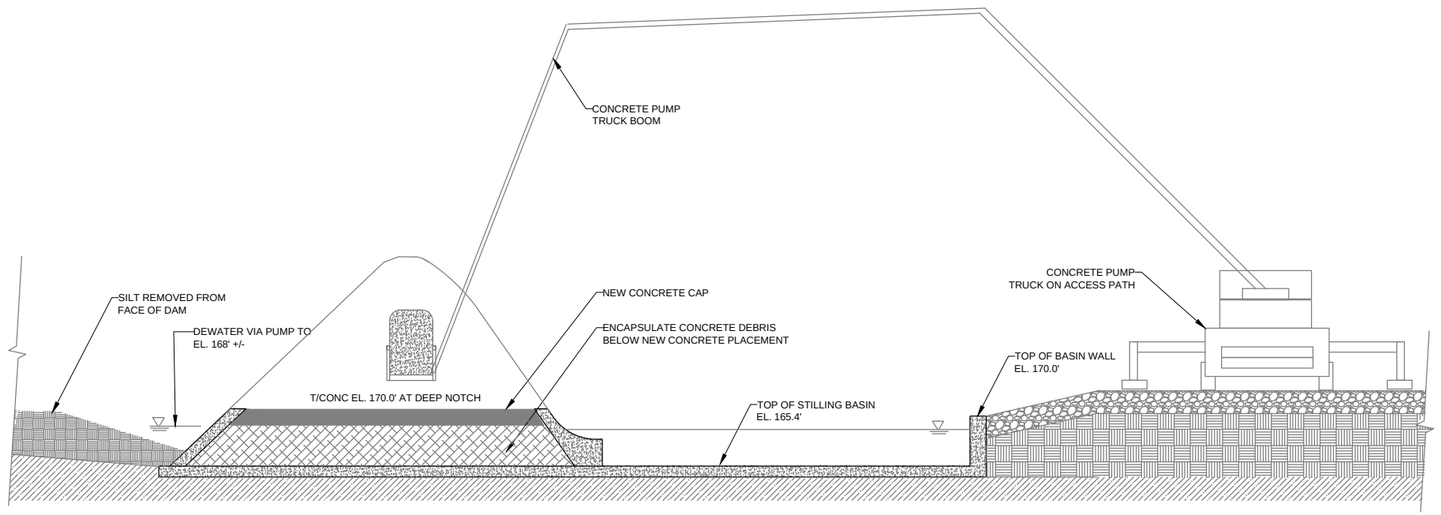
OPTION NO. 2 - SINGLE LARGE NOTCH TO ELEVATION 170.0'



DEMOLITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)



DEBRIS ENCAPSULATION - TYPICAL SPILLWAY CROSS SECTION

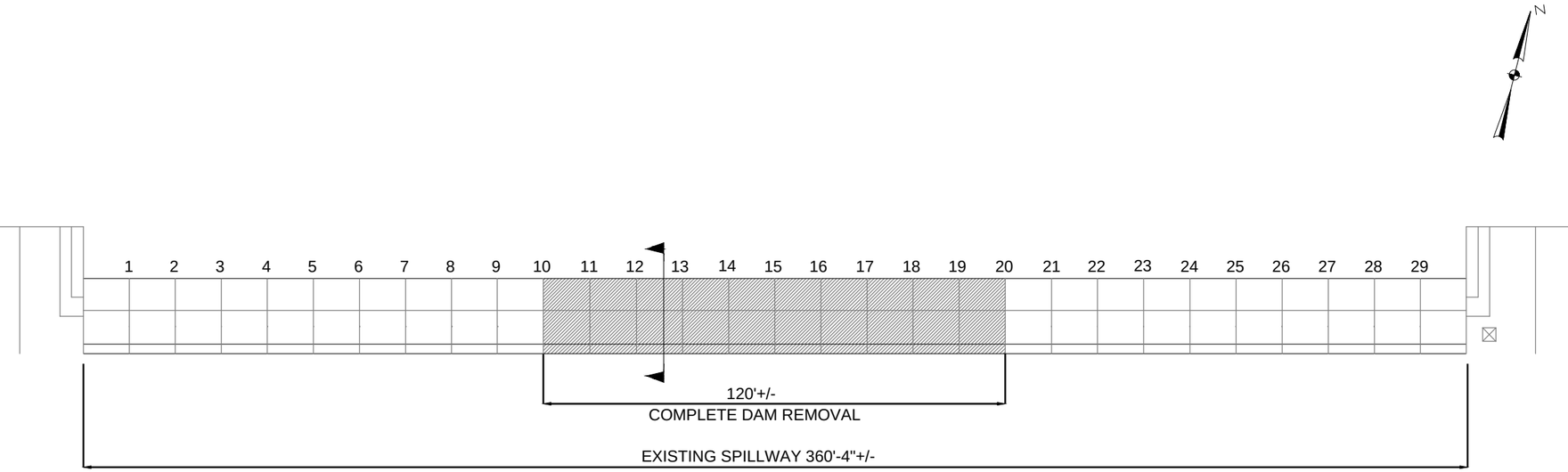
0' 10' 25' 50'

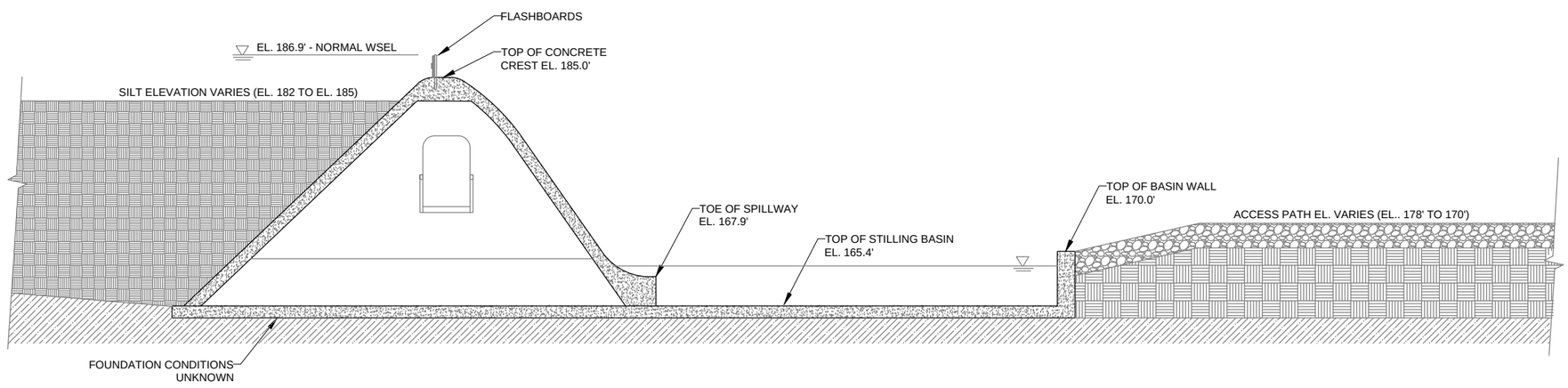
GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)				TITLE: LAKE ACCOTINK DAM DEMOLITION CONCEPT
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT				
VA INVENTORY DAM #05609	ENGINEER			AECOM
	RPG			PROJ NO 60525781
				FIGURE 6

OPTION NO. 3 - FULL HEIGHT SPILLWAY DEMOLITION





EXISTING CONDITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

GENERAL NOTES:

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CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)			
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT			
VA INVENTORY DAM #05609	ENGINEER		
	RPG		

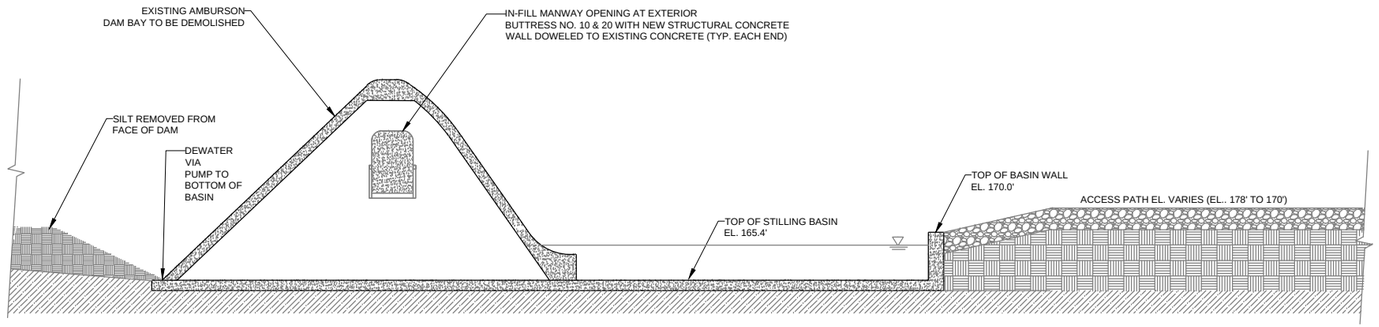
TITLE LAKE ACCOTINK DAM DEMOLITION CONCEPT

AECOM

PROJ NO 60525781

FIGURE 7

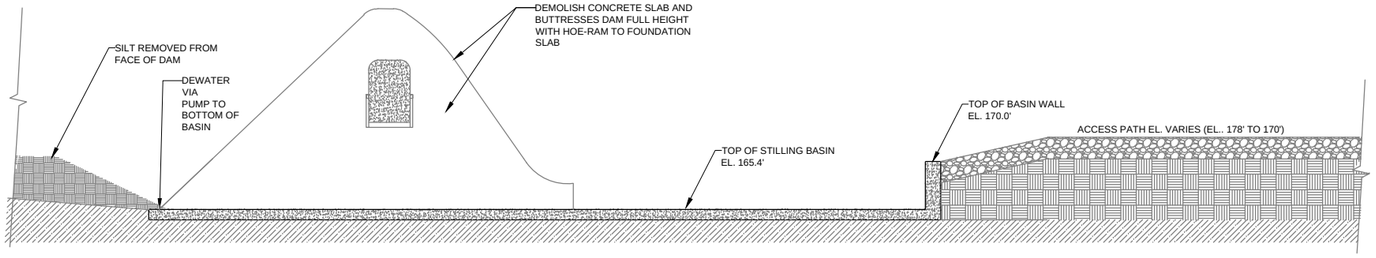
OPTION NO. 3 - FULL HEIGHT SPILLWAY DEMOLITION



PRE-DEMOLITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)



DEMOLITION - TYPICAL SPILLWAY CROSS SECTION

0' 10' 25' 50'

GRAPHICAL SCALE (1 HORIZONTAL: 1 VERTICAL)

-CONCEPTUAL DRAWING-
NOT FOR CONSTRUCTION

CLIENT: WETLAND STUDIES & SOLUTIONS, INC. (WSSI)				TITLE: LAKE ACCOTINK DAM DEMOLITION CONCEPT
PROJ LAKE ACCOTINK – DAM REMOVAL CONCEPT				
VA INVENTORY DAM #05609	ENGINEER			AECOM
	RPG			PROJ NO 60525781
				FIGURE 8

Attachment No. 2

Engineers Opinion of Construct Cost for Lake Accotink Spillway Removal

ENGINEERS OPINION CONSTRUCTION COST
LAKE ACCOTINK SPILLWAY REMOVAL

DIRECT AND INDIRECT COST
Design: Conceptual - not for construction

Effective Date: 9 Jan 2017

ID	Description	Unit	Quantity	Price ($)	Amount ($)	Assumptions \ Notes
1	Demolition of concrete slabs	ton	596	358.00	213,368.00	slab assumed to be an average of 1-foot thick. Unit cost from six contractor bids, 2011 (escalated at 1% per year)
2	Demolition of concrete buttresses	ton	360	358.00	128,880.00	buttresses assumed to be an average of 1.5-feet thick. Unit cost from six contractor bids, 2011 (escalated at 1% per year)
3	Disposal of concrete in on-site disposal area	cubic yard	651	4.70	3,059.70	RS Means Heavy Construction item: 312316462020 & 312323170020
4	Trucking of concrete to on-site disposal area	cubic yard	472.5	1.06	500.85	RS Means Heavy Construction item: 024119195000
5	Riprap bedding for stabilization upstream of concrete slab	ton	200	65.00	13,000.00	160-ft by 50-ft by 0.5-ft. Unit weight 100 pcf. Unit cost from six contractor bids, 2011 (escalated at 1% per year)
6	Riprap bedding for stabilization upstream of concrete slab	ton	400	85.00	34,000.00	160-ft by 50-ft by 1.0-ft. Unit weight 100 pcf. Unit cost from six contractor bids, 2011 (escalated at 1% per year)
7	Concrete infill of walkways in end buttresses	cubic yard	6	333.00	1,998.00	RS Means Heavy Construction item: 033053404300
8	Concrete infill of walkways in end buttresses (forms)	square foot	200	7.74	1,548.00	RS Means Heavy Construction item: 031113852000
9	Site Reclaimation below dam site	lumpsum	1	10,000.00	10,000.00	
10	Subtotal:				406,354.55	
11	Indirects and General Requirements 20%				81,270.91	
12	Subtotal:				487,625.46	
13	Mobilization & Demobiization 14%				68,267.56	Percentage is average of six contractor bids, 2011
14	Conceptual Contingency 30%				166,767.91	
15	**Total:**				**722,660.93**	

Notes: Costs do not include sediment removal, water management (pumps), erosion measures and other items not specifically listed.

Attachment No. 3

Photolog of AECOM Site Visit on 11/04/2016

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Wetland Studies and Solutions, Inc.	Lake Accotink Dam (VA INV #05906)	60525781

Photo No. 1	Date: 11/04/2016

Description:

Downstream face of spillway looking towards the left concrete abutment.

No spill was occurring during the visit and standing water was observed within the stilling basin.

Photo No. 2	Date: 11/04/2016

Description:

Downstream face of spillway looking towards the right concrete abutment.

No spill was occurring during the visit and standing water was observed within the stilling basin.

AECOM

PHOTOGRAPHIC LOG

Client Name: Wetland Studies and Solutions, Inc.	**Site Location:** Lake Accotink Dam (VA INV #05906)	**Project No.** 60525781

Photo No. 3	**Date:** 11/04/2016

Description:

Right concrete spillway abutment.

Photo No. 4	**Date:** 11/04/2016

Description:

Manway access to the gallery at the right concrete spillway abutment.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
Wetland Studies and Solutions, Inc.	Lake Accotink Dam (VA INV #05906)	60525781

Photo No. 5	Date: 11/04/2016

Description:

Left concrete spillway abutment.

The discharge point of the low level outlet is visible and partially submerged.

No spill was occurring during the visit and standing water observed within the stilling basin.

Photo No. 6	Date: 11/04/2016

Description:

Left concrete spillway abutment.

Remote monitoring station, manway access, low level gate actuator and trashrack/stoplog gate slot are visible.

AECOM

PHOTOGRAPHIC LOG

Client Name: Wetland Studies and Solutions, Inc.	**Site Location:** Lake Accotink Dam (VA INV #05906)	**Project No.** 60525781

Photo No. 7	**Date:** 11/04/2016

Description:

Left concrete spillway abutment.

Low level outlet sluice gate actuator. The trashrack/stoplog slot is located directly upstream.

Photo No. 8	**Date:** 11/04/2016

Description:

Left concrete spillway abutment.

Trashrack/Stoplog slot.

AECOM

PHOTOGRAPHIC LOG

Client Name: Wetland Studies and Solutions, Inc.	**Site Location:** Lake Accotink Dam (VA INV #05906)	**Project No.** 60525781

Photo No. 9	**Date:** 11/04/2016

Description:

Left concrete spillway abutment.

Manway access to the gallery.

Photo No. 10	**Date:** 11/04/2016

Description:

Downstream channel.

PHOTOGRAPHIC LOG

Client Name: Wetland Studies and Solutions, Inc.	**Site Location:** Lake Accotink Dam (VA INV #05906)	**Project No.** 60525781

Photo No. 11	**Date:** 11/04/2016

Description:

Overview of downstream face of spillway. Three outlet pipes under the access path provide the hydraulic pathway downstream during normal spill conditions.

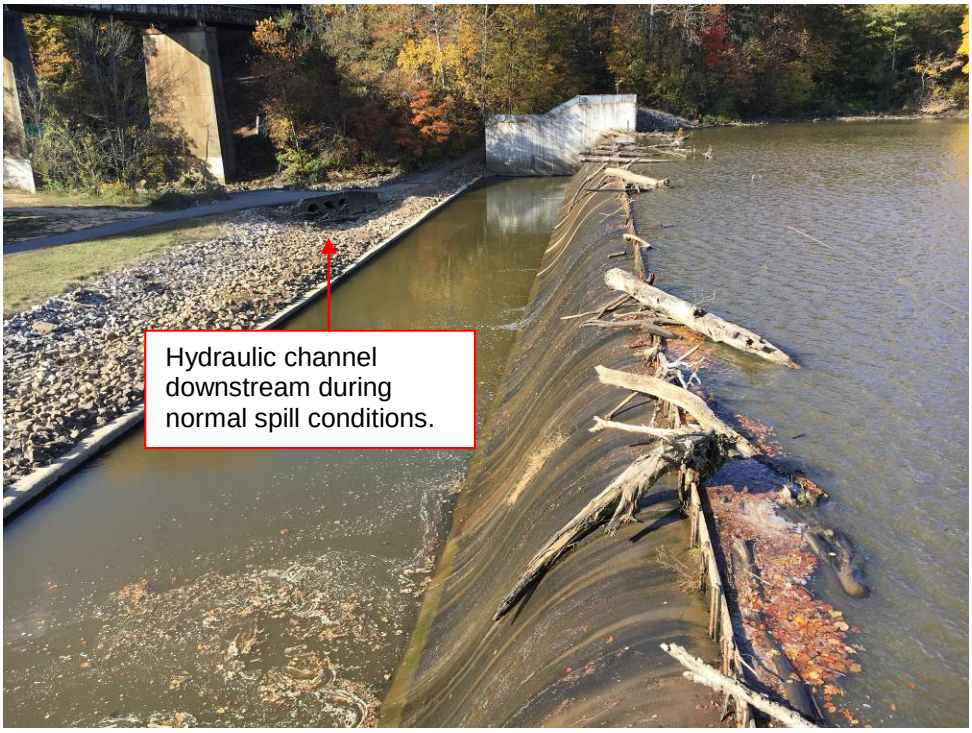


Photo No. 12	**Date:** 11/04/2016

Description:

Overview of earthen embankment section located to the left of the spillway.

LAKE ACCOTINK PARK MASTER PLAN REVISION

PROJECT UPDATE

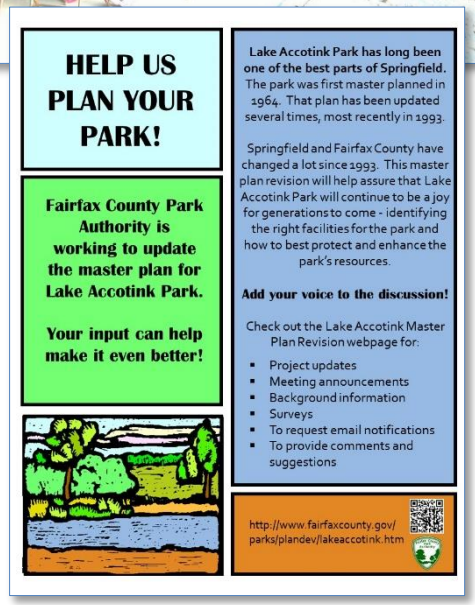
COMMITTEE OF THE WHOLE

January 24, 2018

LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH

OUTREACH IN THE PARK

- WATERSHED CLEAN-UP DAY
- SUMMER CONCERT SERIES
- SPRINGFIELD BRIDGE WALK
- CONTINUOUS SIGNAGE



LAKE ACCOTINK MASTER PLAN

COMMUNITY OUTREACH

OUTREACH THROUGH SCHOOLS

- Crestwood Elementary
- Ravensworth Elementary
- Kings Glen Elementary
- Kings Park Elementary
- Lynbrook Elementary
- Cardinal Forest Elementary
- North Springfield Elementary
- Braddock Elementary
- Rolling Valley Elementary
- West Springfield Elementary
- Forestdale Elementary
- Garfield Elementary
- Keene Mill Elementary
- Springfield Estates Elementary
- Canterbury Woods Elementary
- Key Middle
- Irving Middle
- Lake Braddock Secondary
- Lee High
- West Springfield High
- Thomas Jefferson High
- Annandale High

- INTERVIEWED SEVERAL ELEMENTARY SCHOOL PRINCIPAL AS THEY ARE INTIMATELY CONNECTED TO THE COMMUNITY AND ITS NEEDS
- OUTREACH TO THE COMMUNITY THROUGH SCHOOL ANNOUNCEMENTS, OFTEN TRANSLATED INTO MULTIPLE LANGUAGES
- PARK USAGE AND PREFERENCE SHARED WITH 5TH AND 6TH GRADERS TO GAIN INPUT FROM A YOUNGER PARK USER DEMOGRAPHIC
- TARGETED OUTREACH TO SCHOOLS TO ENCOURAGE PARTICIPATION BY YOUTH

LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH

OUTREACH THROUGH PLACES OF WORSHIP

- Adat Reyim
- Darul Huda Masjid
- Fellowship Baptist Church
- First Baptist Church of Springfield
- Grace Presbyterian Church
- Holy Spirit Catholic Church
- Immanuel Bible Church
- Kirkwood Presbyterian Church
- Madina Masjid
- Messiah United Methodist Church
- Mustafa Center
- Ohev Yisrael
- Parkwood Baptist Church
- Prince of Peace Lutheran Church
- Springfield United Methodist Church
- St. Bernadette's Catholic Church
- St. John's Lutheran Church
- St. John's United Methodist Church
- St. Mark's Lutheran Church
- St. Michael Catholic Church
- Westwood Baptist Church

- TARGETED OUTREACH TO LOCAL PLACES OF WORSHIP
- CONGREGANTS LIKELY AWARE OF AND USERS OF THE PARK
- MANY PLACES OF WORSHIP OFFER PROGRAMS AND SERVICES TO THOSE FOR WHOM ENGLISH IN NOT THEIR PRIMARY LANGUAGE

LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH

- TARGETED OUTREACH TO

OUTREACH TO PROGRAM ATTENDEES

1922 POINTS OF CONTACT

- TARGETED OUTREACH TO

OUTREACH TO FACILITY RENTERS

797 POINTS OF CONTACT

LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH

- TARGETED OUTREACH TO

ENVIRONMENTAL QUALITY ADVISORY COUNCIL

SPRINGFIELD CHAMBER OF COMMERCE

FRIENDS OF LAKE ACCOTINK PARK

CARDINAL FOREST ELEMENTARY 50TH ANNIVERSARY

LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH

230+ REQUESTS THROUGH THE PROJECT WEBSITE TO BE NOTIFIED FOR PROJECT ANNOUNCEMENTS AND MILESTONES

ONLINE OUTREACH THROUGH A VARIETY OF QUESTIONNAIRES:

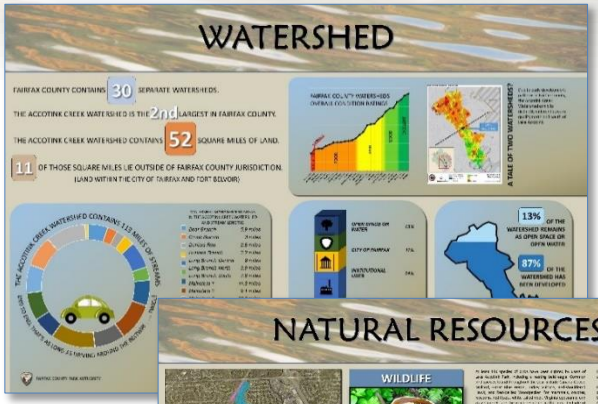
- Park Usage and Preferences (983 responses)
- Park Trails (50 responses)
- Facilities, Programming, and Usage (58 responses)
- Lake Sustainability (2 responses)

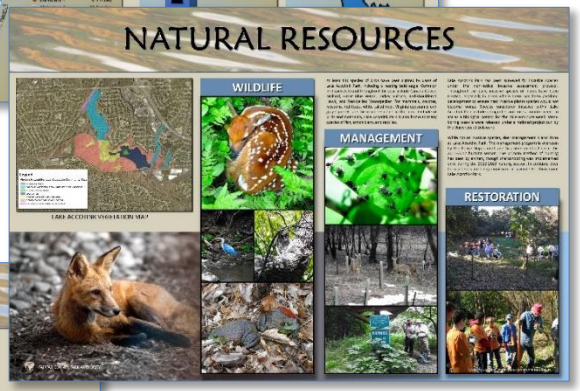
LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH

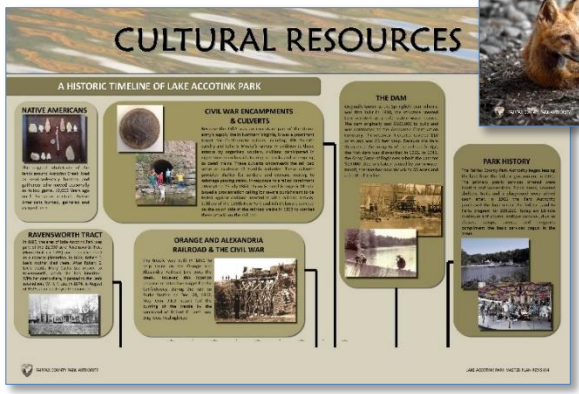
PUBLIC INFORMATION MEETING/ OPEN HOUSE

MARCH 14, 2016

- KICK OFF OF PUBLIC PARTICIPATION
- SHARED BACKGROUND ON PARK, EXPLAINED PLANNING PROCESS, AND HAD OPEN DISCUSSION
- MORE THAN 100 PEOPLE ATTENDED







FAIRFAX COUNTY PARK AUTHORITY

LAKE ACCOTINK MASTER PLAN

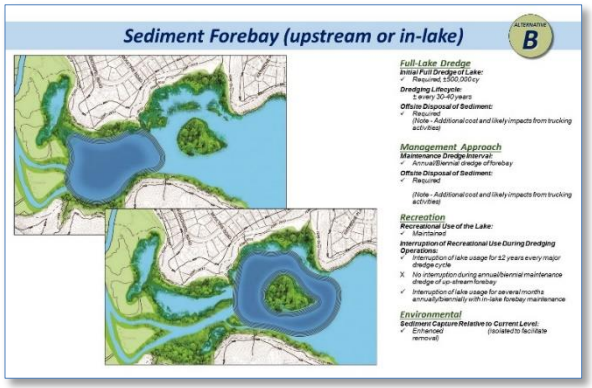
COMMUNITY OUTREACH

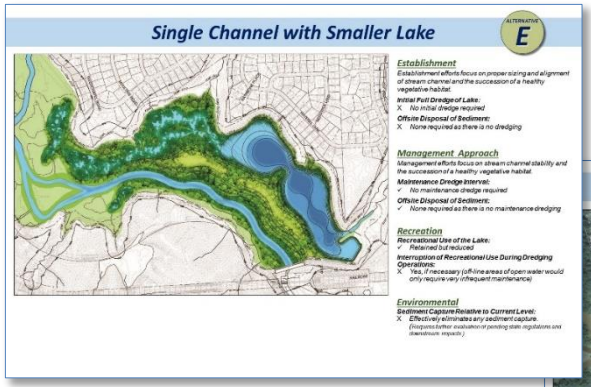
LAKE SUSTAINABILITY WORKSHOP

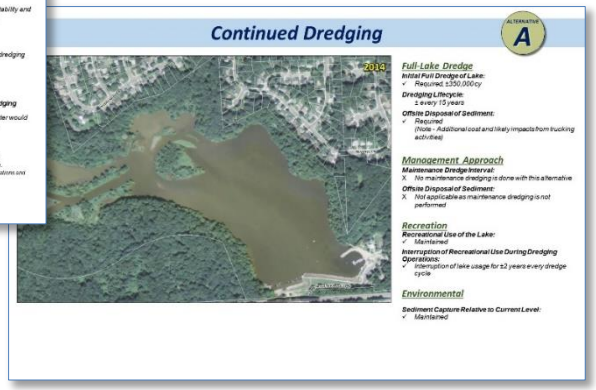
MAY 16, 2016

Wetland Studies and Solutions, Inc. a DAVEY company

- SHARED ISSUES CONCERNING MAINTENANCE OF LAKE
- PRESENTED RANGE OF ALTERNATIVES
- GROUP DISCUSSION OF ALTERNATIVES AND OTHER POSSIBLE SOLUTIONS
- MORE THAN 100 PEOPLE ATTENDED







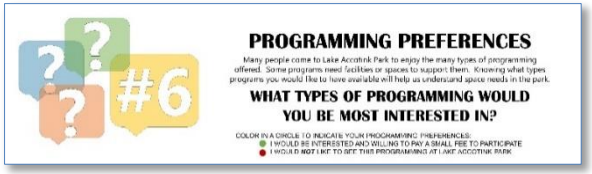
LAKE ACCOTINK MASTER PLAN

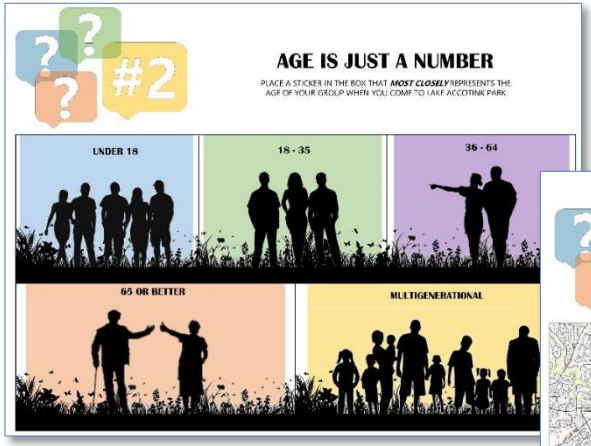
COMMUNITY OUTREACH

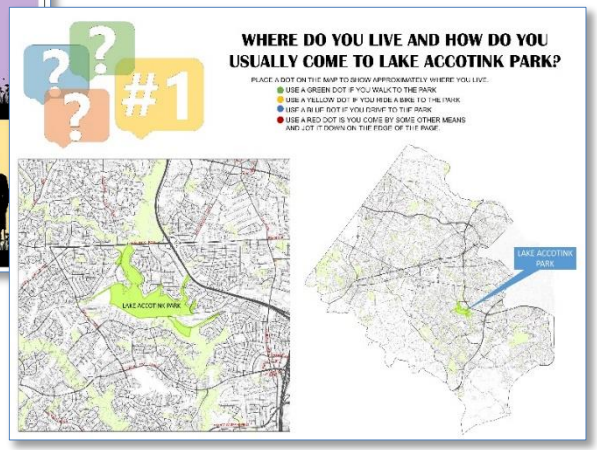
FACILITIES AND PROGRAMMING WORKSHOP

OCTOBER 27, 2016

- TO BETTER UNDERSTAND HOW PEOPLE USE THE PARK AND WHAT FACILITIES AND PROGRAMMING THEY WOULD LIKE TO SEE
- ABOUT 50 PEOPLE ATTENDED







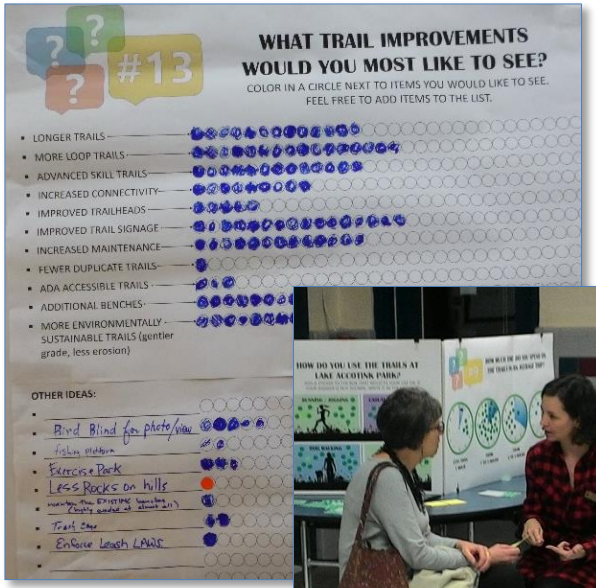
LAKE ACCOTINK MASTER PLAN

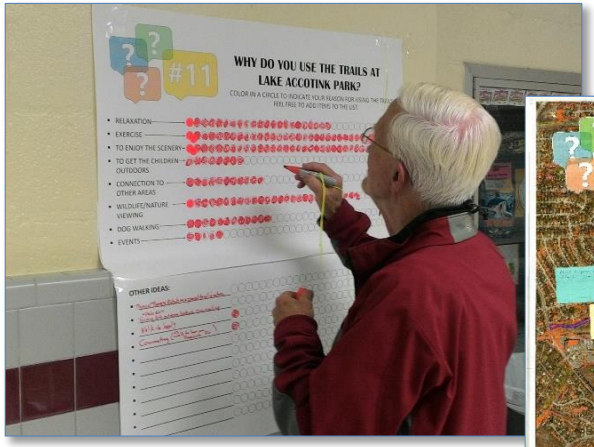
COMMUNITY OUTREACH

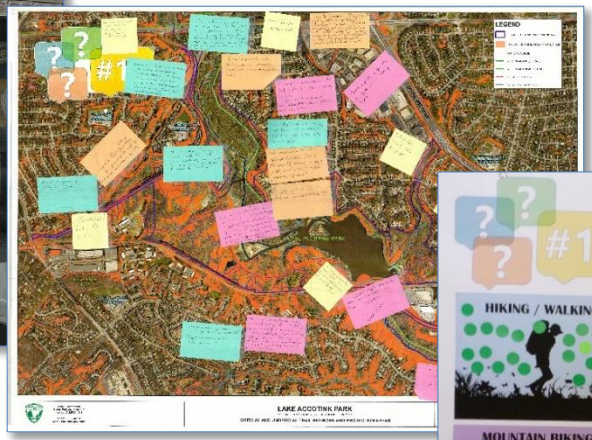
TRAILS WORKSHOP

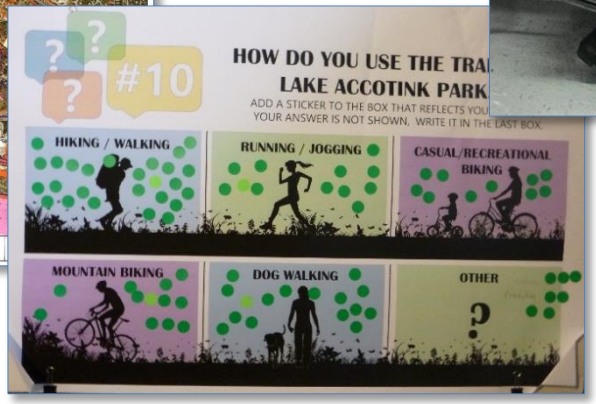
DECEMBER 5, 2016

- AS THE MOST USED PARK FACILITY, WORKSHOP TO BETTER UNDERSTAND HOW PEOPLE USE THE PARK TRAILS AND WHAT WOULD MOST IMPROVE THEIR EXPERIENCE
- NEARLY 100 PEOPLE ATTENDED









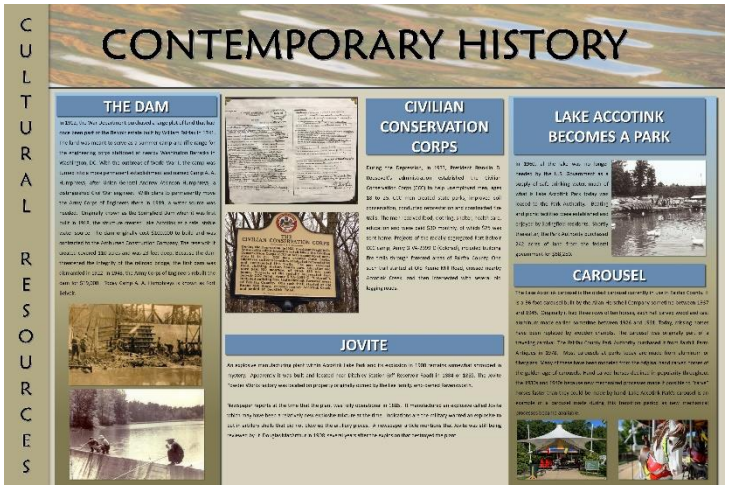
LAKE ACCOTINK MASTER PLAN

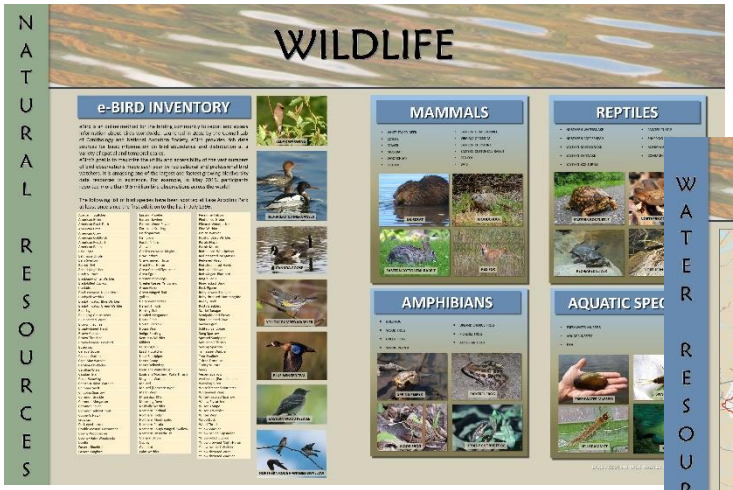
COMMUNITY OUTREACH

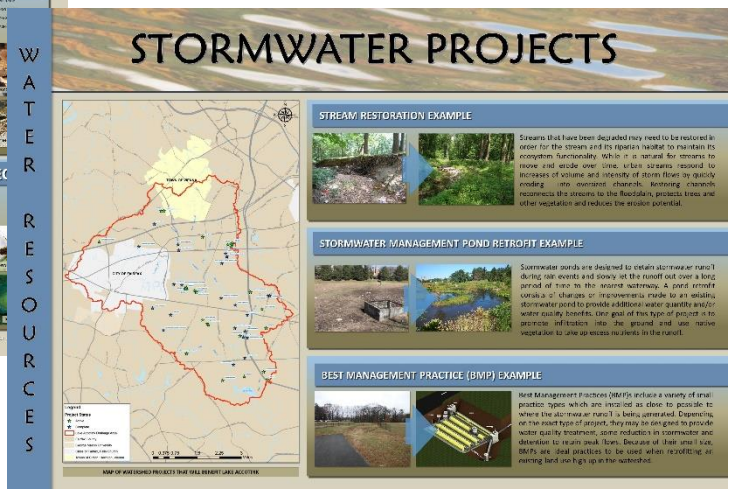
RESOURCES WORKSHOP

APRIL 24, 2017

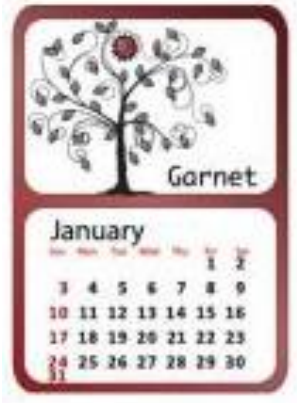
- MEETING PROVIDED AN OPPORTUNITY TO SHARE IN GREATER DETAIL SOME OF THE BACKGROUND INFORMATION ABOUT THE PARK
- ATTENDED BY APPROXIMATLEY 50 PEOPLE







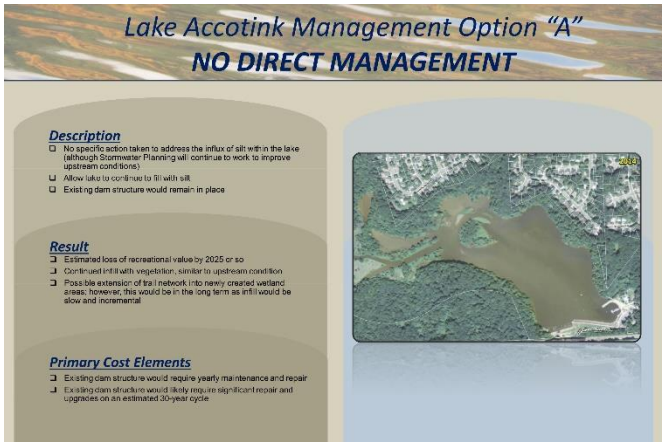
LAKE ACCOTINK MASTER PLAN
COMMUNITY OUTREACH



LAKE MANAGEMENT OPTIONS

JANUARY 22, 2018

- MEETING PROVIDED AN OPPORTUNITY TO CONTINUE THE CONVERSATION WITH THE COMMUNITY REGARDING OPTIONS FOR THE LAKE
- ATTENDED BY APPROX. 100 PEOPLE



LAKE ACCOTINK MASTER PLAN
COORDINATION WITH SUPERVISORS

In October 2017, we met with:

- Supervisor Cook
- Supervisor McKay
- Supervisor Herrity
- Chairman Bulova

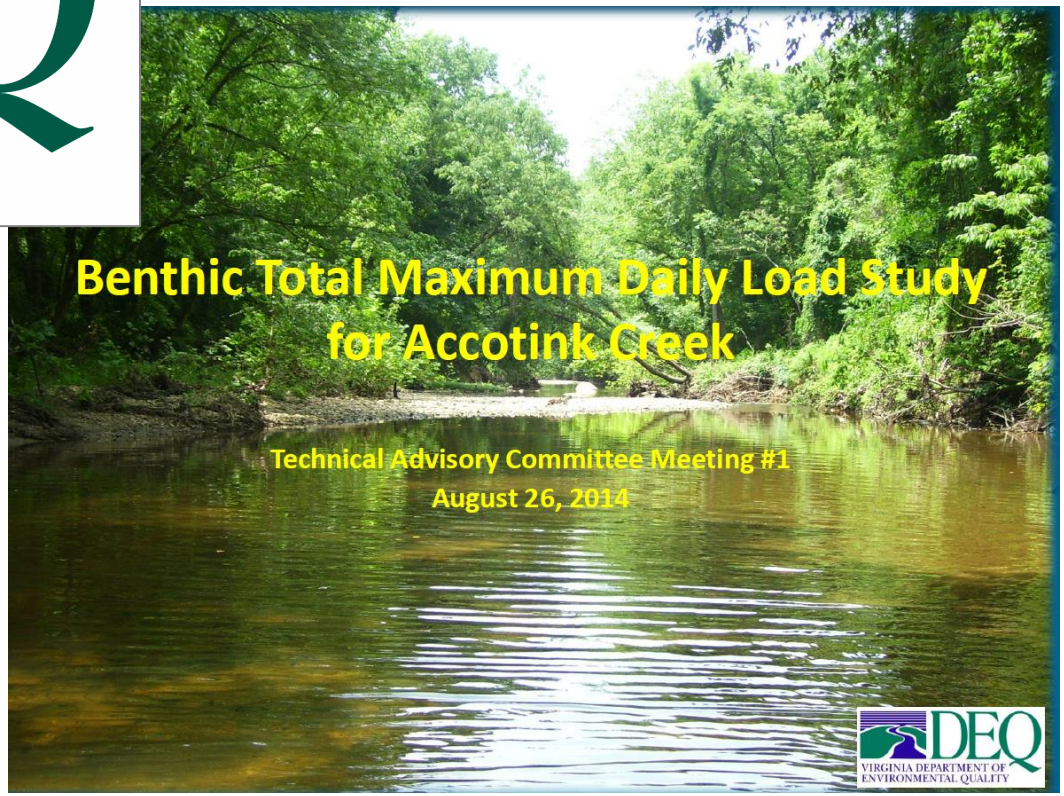
- Discussed overarching goals
- Primary point of interest was the management of the lake

Virginia Department of Environmental Quality

SEDIMENT TOTAL MAXIMUM DAILY LOAD

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

- Recommendations are anticipated to be approved by the EPA this spring
- Chloride and sediment are the most impactful stressors to aquatic life in the Accotink Creek Watershed



FAIRFAX COUNTY PARK AUTHORITY

Virginia Department of Environmental Quality

SEDIMENT TOTAL MAXIMUM DAILY LOAD

Where is the sediment coming from?

- ❑ Stream bank erosion is biggest contributor to sediment load

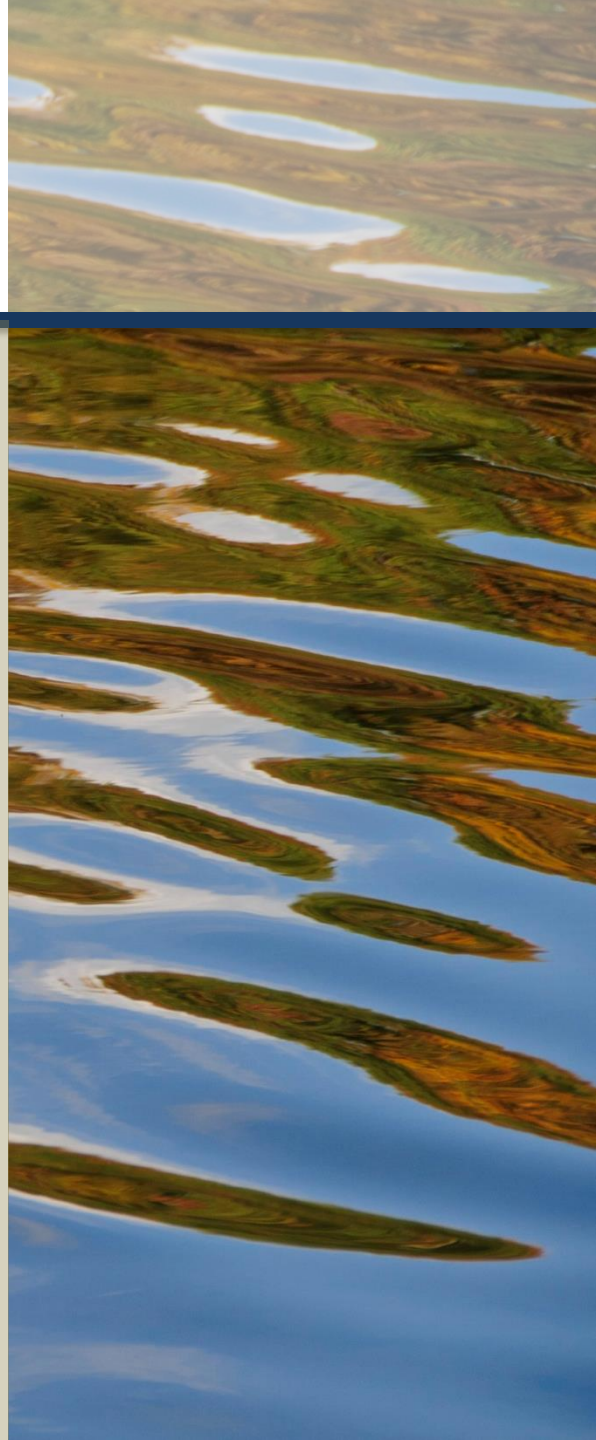
How can we stop the sediment?

- ❑ Restore all upstream water ways
- ❑ This is a long process, exceedingly expensive, and complicated by multiple land ownerships

Are there regulatory implications?

- ❑ Improvements/adjustments made to Lake Accotink would not be attributed towards meeting our regulatory requirements

LAKE MANAGEMENT OPTIONS



FAIRFAX COUNTY PARK AUTHORITY

COST COMPARISON

MANAGEMENT ALTERNATIVES COST COMPARISON

ALTERNATIVE			IMPLEMENTATION	ON-GOING MANAGEMENT				$
ALTERNATIVE	DESCRIPTION OF ALTERNATIVE	ASSUMED LIFESPAN	COST OF INITIAL IMPLEMENTATION OF MANAGEMENT PLAN	ANNUAL DREDGING	ANNUAL DAM MAINTENANCE	LONG-TERM DAM MAINTENANCE AND REPAIR	ANNUAL STABILIZATION	ESTIMATED ANNUALIZED COST
A	NO MANAGEMENT	30	N/A	N/A	$13,000	$4,700,000	N/A	***$237,000***
B	CONTINUE WITH CURRENT DREDGING MODEL	15	$29,276,000	N/A	$13,000	$4,700,000	N/A	***$2,691,000***
C	DREDGING WITH FOREBAY	30	$45,044,000	$776,472	$13,000	$4,700,000	N/A	***$4,695,000***
D	INSTALL "BEAVER DAM" STRUCTURES	60	$933,000	N/A	$13,000	$4,700,000	$19,500	***$291,000***
E	SINGLE CHANNEL WITH RECLAIMED LAND	60	$11,463,000	N/A	N/A	N/A	$26,000	***$440,000***
F	SINGLE CHANNEL WITH SMALLER LAKE	60	$13,218,000	N/A	N/A	N/A	$26,000	***$503,000***

Lake Accotink Management Option "A"

NO DIRECT MANAGEMENT

Description

- No specific action taken to address the influx of silt within the lake (although Stormwater Planning will continue to work to improve upstream conditions)
- Allow lake to continue to fill with silt
- Anticipated loss of recreational value of the lake by 2025

Primary Cost Elements

- Existing dam structure would require yearly maintenance and repair
- Existing dam structure would likely require significant repair and upgrades on an estimated 30-year cycle

Yearly Dam Maintenance
$13,000 annually

Major Dam Repairs
$4,700,000 every 30 years

60 YEAR ANNUALIZED COST

$237,000

Lake Accotink Management Option "B"

CONTINUE CURRENT DREDGING METHOD

Description

- This approach would continue to provide major dredging of the main body of the lake at roughly 15-year intervals
- Sediment removed from the lake would need to be hauled from the park, requiring approx. 35,000 truck trips routed through adjacent neighborhoods
- Retains recreational value of the lake

Primary Cost Elements

- Removal of approx. 350,000 cubic yards of sediment with each dredge
- Trucking of dredge material offsite for disposal
- Existing dam structure would require yearly maintenance and repair
- Existing dam structure would likely require significant repair and upgrades on an estimated 30-year cycle

Initial Dredge
$ 29,275,000

Repeated Dredging
$ 29,275,000+
Every 15 years

Dam Maintenance
$13,000 annually
$4,700,000 / 30 years

60 YEAR
ANNUALIZED COST

$2,691,000

FAIRFAX COUNTY PARK AUTHORITY

Lake Accotink Management Option "C"
ANNUAL DREDGING WITH FOREBAY

Description

- This approach would initially provide a major dredge of the lake, removing 350,000 cubic yards of sediment, plus an additional 150,000 cubic yards of sediment to create a forebay at the upper end of the lake
- All 500,000 cubic yards of sediment removed from the lake would need to be hauled from the park, requiring approx. 50,000 truck trips routed through adjacent neighborhoods
- After the initial dredge and forebay construction, smaller dredges would remove approx. 12,000 cubic yards of sediment from the forebay every year or two, routing an additional 1,200 truck trips through the community
- The existing dam structure would remain in place

Lake Accotink Management Option "C"

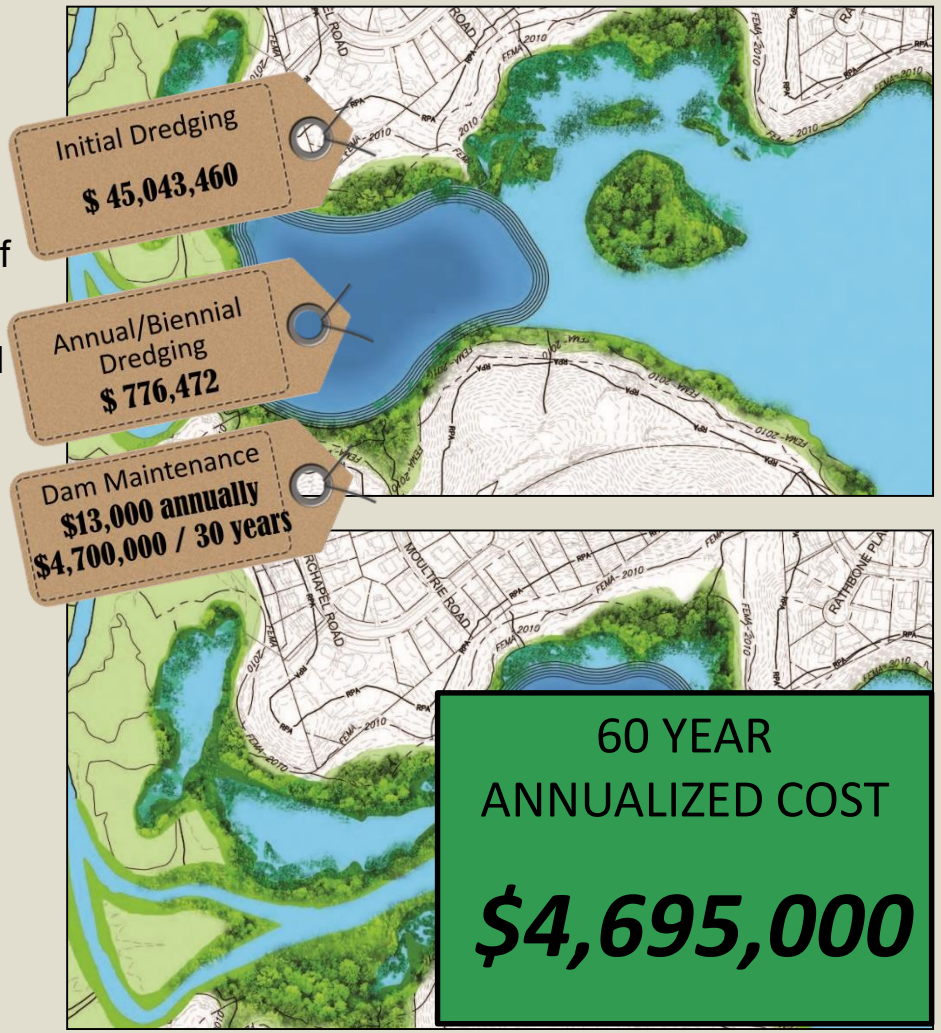
ANNUAL DREDGING WITH FOREBAY

Primary Cost Elements

- Removal of approx. 500,000 cubic yards of sediment with the initial dredging operation
- Biennial removal of approx. 12,000 cubic yards of sediment material
- Trucking of all dredge material offsite for disposal
- Existing dam structure would require yearly maintenance and repair
- Existing dam structure would likely require significant repair and upgrades on an estimated 30-year cycle

SMALL DREDGE EVERY YEAR OR TWO

REPEAT FULL DREDGE EVERY ±35 YEARS

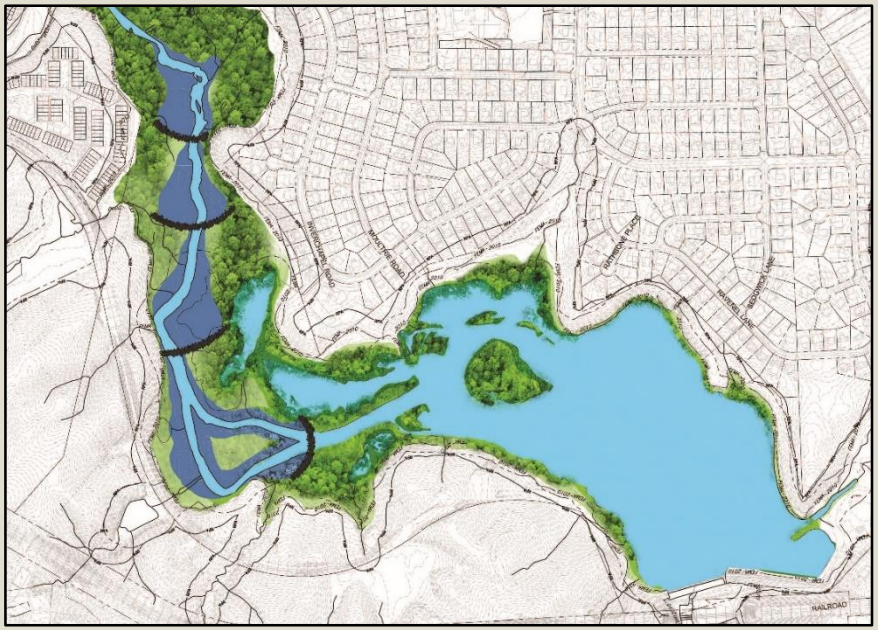


FAIRFAX COUNTY PARK AUTHORITY

Lake Accotink Management Option "D"
INSTALLATION OF UPSTREAM "BEAVER DAMS"

Description

- Installation of sheet pile "walls" within the channel to encourage sediment deposition.
- Will convert the existing forested wetland areas to "beaver swamps" over time
- This features are not accessible for maintenance
- This approach provides only short term benefit to sediment reduction and, ultimately does not serve to resolve the overall condition of Lake Accotink
- This approach would entail significant disturbance of relatively stable upstream areas.



Although included in the study, this option has been removed from consideration due to the extent of impacts with only limited benefit.

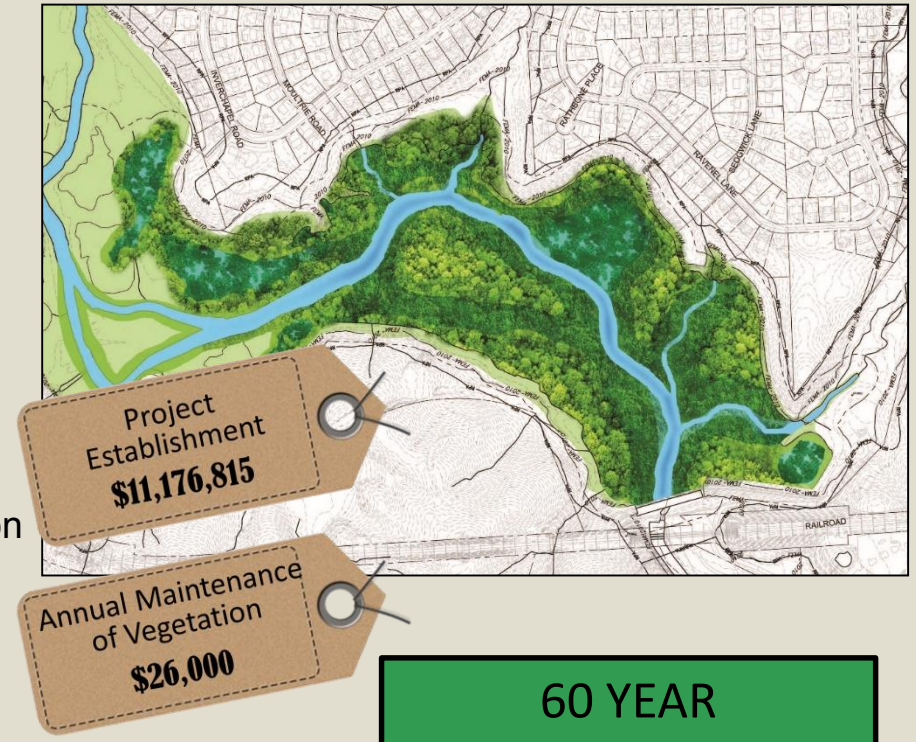
Lake Accotink Management Option "E"

SINGLE CHANNEL WITH RECLAIMED LAND

(Elimination of Existing Dam)

Description

- This management approach would seek to restore Accotink Creek to a condition reflective of the original stream that existed prior to the steam being dammed.
- The recreated stream channel would be sized to accommodate future storm flows
- Surrounding land area would be reforested to create wetland habitat to support area wildlife and increase biodiversity
- Recreational value of the lake would be eliminated; however, opportunities for trails and nature observation areas would be increased
- Eliminates concern for dam safety and potential downstream impacts if the dam were to be breached.



60 YEAR ANNUALIZED COST

$440,000

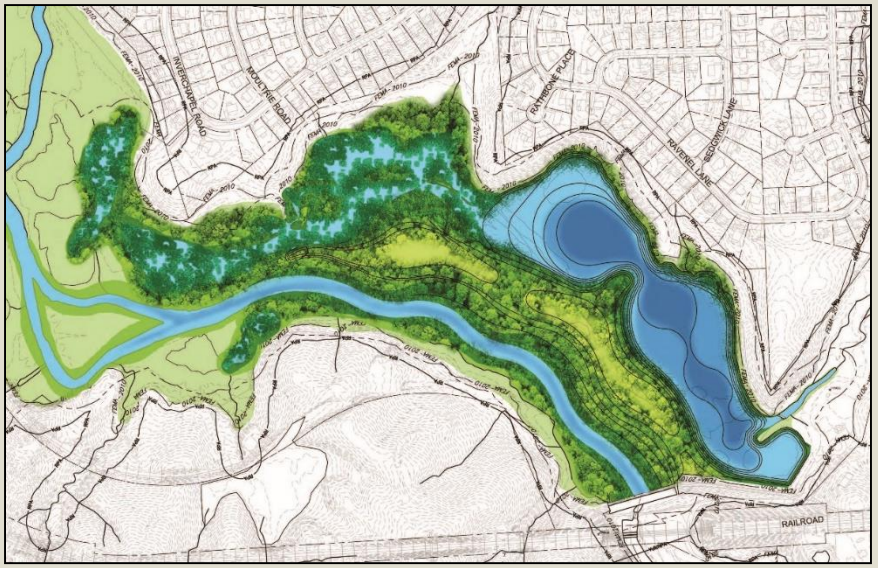
FAIRFAX COUNTY PARK AUTHORITY

Lake Accotink Management Option "F"

SINGLE CHANNEL WITH SMALLER LAKE

(Modification of Existing Dam)

Description



- Similar to Option E, this management approach would modify the existing dam to allow creation of a single thread stream channel through "sculpting" of the existing sediment.
- Sediment would be sculpted to create a rise on the north side of the stream channel, creating a space to retain a smaller lake for recreational purposes.
- Reclaimed land area would be revegetated, creating new habitat areas
- Trails might be expanded into the vegetated area for nature observation
- Recreational value of the lake would be retained but within a reduced footprint (Approximately 20 acres, about 8 feet deep)
- Smaller lake will be off-line from the main flow of water. Flag Run, the primary tributary of the smaller lake, is being restored, minimizing the influx of sediment to the new, smaller lake

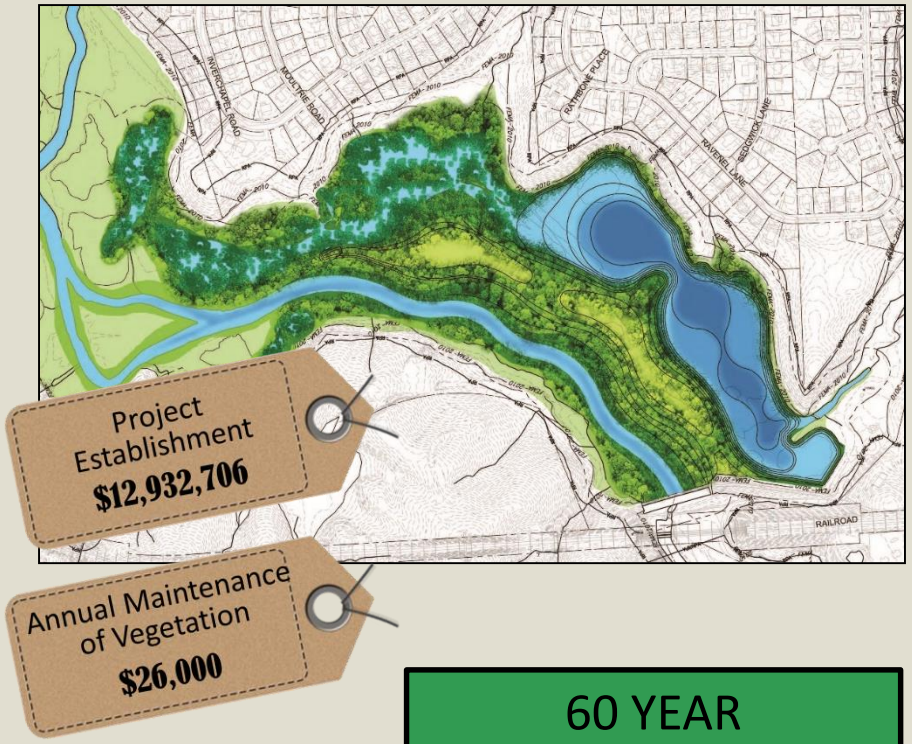
Lake Accotink Management Option "F"

SINGLE CHANNEL WITH SMALLER LAKE

(Modification of Existing Dam)

Primary Cost Elements

- The primary cost factor is the initial establishment of the management plan (revision to the dam structure, "sculpting" of sediment to establish the stream channel, reforestation)
- Annual maintenance would focus on insuring the vegetation is established well and addressing any invasive species that seek to infill. This cost would reduce some over the years as the vegetation becomes better established.



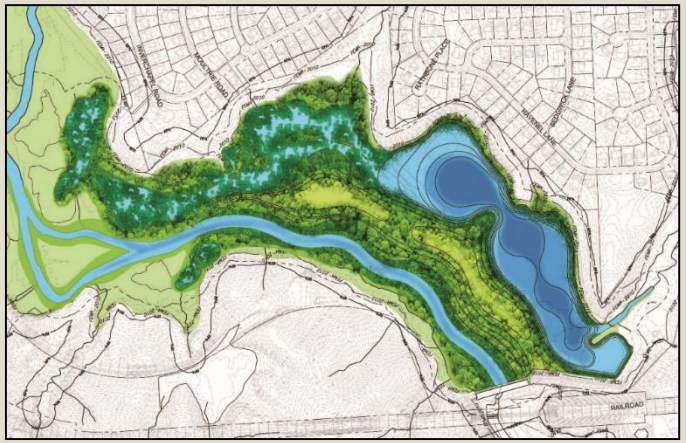
60 YEAR
ANNUALIZED COST

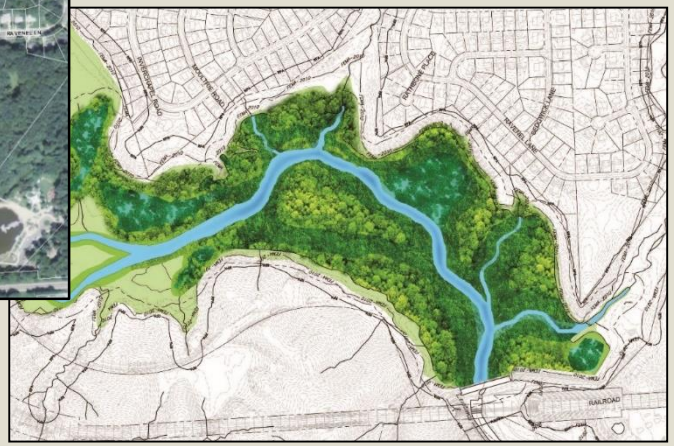
$503,000

LAKE ACCOTINK MASTER PLAN

Implications to the Master Plan

- As the approaches are so widely divergent, some direction is necessary prior to formalizing the approach for the master plan
- Should the direction be to continue dredging, funding would likely need to come through approval of a bond. If so, the master plan would likely need to address some sort of "alternative" should the funding not be approved





LAKE ACCOTINK MASTER PLAN

Voting Results from Monday

	0	Option A (No Direct Management)
52	20	Option B (Current Dredging Method)
	32	Option C (Dredging with Forebay)
	-	Option D (Beaver Dams)
31	5	Option E (Single Stream)
	26	Option F (Stream with Smaller Lake)

LAKE ACCOTINK MASTER PLAN
Next Steps

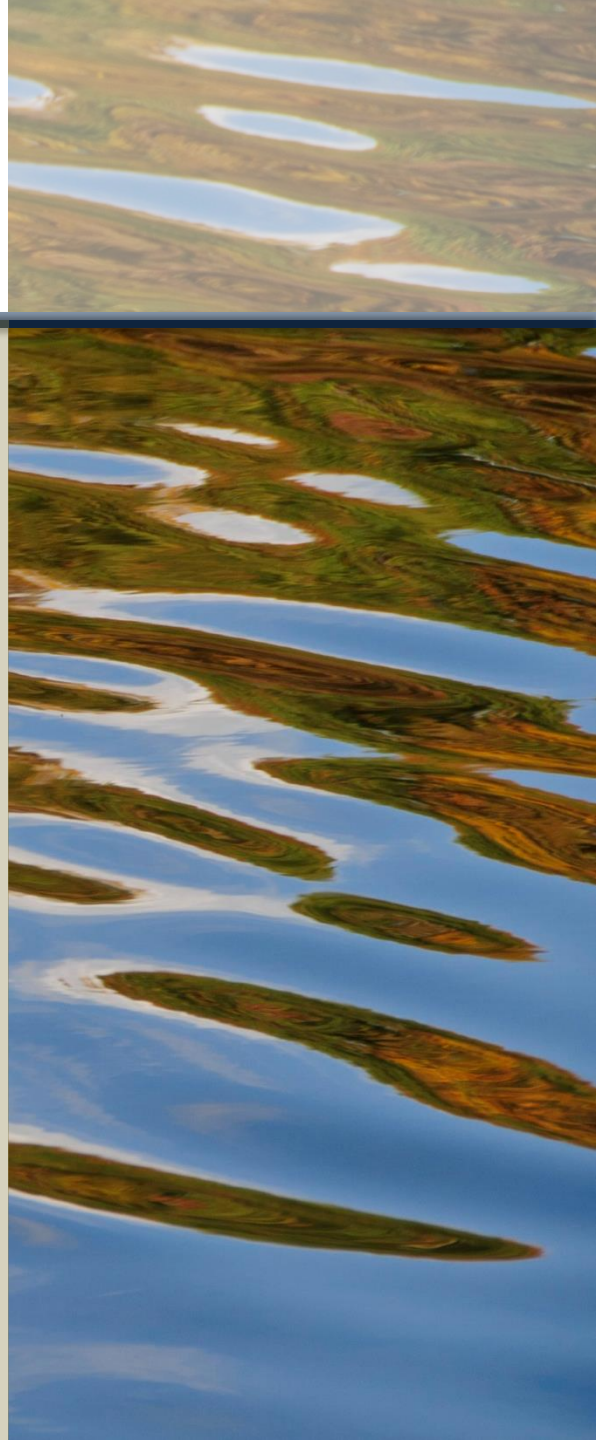
- ❑ 30-day (+) Comment period on the lake management options
- ❑ Master Plan team to finalize recommendation
- ❑ Draft Plan to the Park Authority Board in July
- ❑ Draft Plan for public comment in September

- ❑ HOWEVER! Supervisor Cook has requested to meet

LAKE ACCOTINK PARK MASTER PLAN

(whew!)

QUESTIONS?



FAIRFAX COUNTY PARK AUTHORITY