BAXTER & WOODMAN
Consulting Engineers

DESIGN MEMORANDUM

DATE: June 4, 2019

TO: Brigitte Berger, P.E., Director of Public Works and Engineering

FROM: Matthew J. Moffitt, P.E., CFM, CPESC, Project Manager

SUBJECT: Village of Wilmette – West Side Neighborhood Storage Project – Vault Alternatives

Introduction

Portions of the west side of the Village of Wilmette experience extensive surface flooding for large storm events. Underground stormwater storage has been proposed as part of the West Side Neighborhood Storage Project (WSNSP) at three public parks: Community Playfield, Hibbard Park, and Thornwood Park. The current recommendation and expectation is that StormTrap concrete vaults will be utilized to provide the underground storage. Initial configurations of the underground storage vaults were developed based on discussions with the Village of Wilmette Park District Staff and evaluation of site constraints.

The Village has requested that additional alternatives be developed at a conceptual level to minimize tree loss at each park. Baxter & Woodman, Inc. has analyzed depths, footprints, and configurations for alternative underground stormwater storage vaults that will meet the optimized WSNSP design criteria. Primary considerations when analyzing alternative layouts included: (a) minimizing impact to trees, (b) necessity of pumping systems, and (c) additional construction costs. All configurations provide the same storage volume required by the optimized analysis.

The estimated costs are for the complete underground vault construction and related items, including in-kind replacement of disturbed facilities and landscaping and a 20% contingency. Additional Park District facility improvements are not included. Pumping systems included in the costs for several of the alternatives assume 24-hour drawdown time, backup pumps, backup power generation, SCADA integration, and a structure around the pumping system that architecturally aligns with similar park district facilities. Only the volume of the vault below the gravity outlet will require pumping and is designed to be a similar duration to the drawdown time that would be designed for the gravity outlet. Operations and maintenance (O&M) costs for pumping systems are not included in the costs listed below. A high-level estimation for pumping system O&M are $20,000 per year (in 2019 dollars) for each pump station; this includes annual O&M costs, pump replacement every 20 years, and generator replacement every 25 years. Figure 1 shows examples of similar pumping systems for clarification on what may be visible at the completion of the project. These facilities would be located in the least conspicuous spot that would still allow their intended function.

Figure 1: Pump station examples

Community Playfield

The vault at Community Playfield (aerial shown in Figure 2) has a required storage volume of 18.6 acre-feet (ac-ft) based on the optimized project configuration. The initial (base) layout and two alternate layouts were analyzed for this site.

Proposed Base Configuration

This design utilizes a rectangular vault with dimensions of approximately 430' by 360' (3.56 ac). A single-level vault with 6'0" of vertical clearance yields the required storage volume.

The installation of this configuration would temporarily impact four soccer fields and require the removal of a cottonwood grove, consisting of thirty-two mature trees, varying in diameter from 16" to 60". The complete tree removal schedule can be seen in Appendix 1. This configuration would also remove the existing aboveground detention basin, permitted as 1.66 ac-ft of storage with a release rate of 0.78 cubic feet per second (cfs). This volume and release rate would need to be maintained through the construction of an additional storage vault adjacent to the proposed 18.6 ac-ft vault. The additional vault would have a 0.30-acre footprint and be situated southeast of the larger vault (see attached configuration exhibits).

This configuration is estimated to cost approximately $10,680,000. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Figure 2: Aerial view of Community Playfield

Alternative Configuration 1

An alternative configuration for Community Playfield employs a Z-shaped vault in order to avoid the cottonwood grove and permitted detention basin. The storage volume would be achieved with a single-level vault of 6'0", but would extend approximate 400' farther west than the base configuration, temporarily impacting two additional soccer fields. The total footprint size would be 3.56 acres. Two cottonwood trees (one 36"-diameter, one 60"-diameter) would also be removed with the alternative configuration.

This configuration is estimated to cost approximately $10,420,000, which is $260,000 less expensive than the base configuration. The relatively similar cost is due to the additional costs of storm sewer and structural backfill being offset by the relocation of the permitted detention volume. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Alternative Configuration 2

Increasing the depth to an 11'4" double-level gives the opportunity to shrink the footprint into an L-shaped vault, which avoids the cottonwood grove, detention basin, and the two large trees removed in the first alternative configuration. The total footprint size would be 1.90 acres. No sheet piling is anticipated for this alternative, though a 2,300 GPM pump would be needed to evacuate the water in the lower 5'4" of the vault to empty it. The pump size is a preliminary estimate; it would be sized to have the same performance as gravity draining in other configurations. The pump station would dewater the bottom portion of the vault within 24 hours after a storm event so that the volume would be available for a subsequent storm event. The pump station, as priced in this memo, will include backup pumps, a backup generator, and a structure around the pump station to improve aesthetics; the price for the pump station could be reduced up to $500,000 by excluding the emergency generator and/or structure. Due to anticipated groundwater, the deeper vault would likely also require an underdrain to dewater the area surrounding the vault.

This configuration is estimated to cost approximately $9,880,000, which is $800,000 less costly than the base configuration. The cost reduction can be primarily attributed to greater cost efficiency with the deeper storage vault. The smaller vault footprint allows for an overall reduction in vault construction costs. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Hibbard Park

The vault at Hibbard Park (aerial shown in Figure 3) needs to store 10.0 ac-ft of stormwater as part of the WSNSP. The initial (base) and three alternative configurations were studied at Hibbard Park, with varying depths and footprints.

Figure 3: Aerial view of Hibbard Park

Proposed Base Configuration

The base design utilizes the portion of Hibbard Park (2.00 acres) abutting the conceptual future building on the north, east, and south sides. The conceptual future building information was obtained through coordination with the Park District's architect and input from Park District staff. The single-level vault has an internal height of 5'2", and would provide 10.0 ac-ft (see attached configuration exhibits).

This configuration would temporarily impact both baseball outfield areas and require thirty-six trees to be removed. A full schedule of tree removal is included in Appendix 1. Because the topographic

survey for Hibbard Park has not yet been completed, the level of detail found within Appendix 1 for Hibbard Park is less that that found for the other parks.

This configuration is estimated to cost approximately $7,430,000. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Alternative Configuration 1

Increasing the depth to 11'4" (via a double-level vault), the required footprint shrinks to 1.02 acres. In this configuration, the footprint is concentrated in the north portion of the property, and requires the removal of eight trees, including six within the park site along Skokie Boulevard. Only the north baseball outfield would be temporarily impacted with this configuration. The increased depth would require sheet pile walls to facilitate construction. The depth would make a 1,200 GPM pump necessary for draining the bottom 6'2" of vault depth. The pump size is a preliminary estimate; it would be sized to have the same dewatering performance as gravity draining in the base configuration. The pump station would dewater the bottom portion of the vault within 24 hours after a storm event so that the volume would be available for a subsequent storm event. There is an initial capital cost to install the pump station/backup generator and yearly costs to operate, test and maintain the pump station. Due to anticipated groundwater, the deeper vault would also require an underdrain to dewater the area surrounding the vault.

This configuration is estimated to cost approximately $6,280,000, which is $1,150,000 less costly than the base configuration. The cost savings are mostly due to greater cost efficiency with the deeper vault and less sheet piling needed, though the savings are partially offset with the pump costs. The smaller vault footprint allows for an overall reduction in vault construction costs. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Alternative Configuration 2

This configuration is very similar to the previous alternative, though the 1.02-ac footprint is located farther west. Eight trees would need to be removed, including six along the west property line. The north baseball outfield would be the only one impacted for this configuration. Sheet piling and a 1,200 GPM pumping station would also be needed for this configuration with similar costs and performance to Alternate Configuration 1.

This configuration is estimated to cost approximately $6,340,000, which is $1,090,000 less costly than the base configuration. The cost reduction can be primarily attributed to greater cost efficiency with the deeper storage vault. The smaller vault footprint allows for an overall reduction in vault construction costs. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Alternative Configuration 3

To further avoid tree removal, a configuration with a smaller footprint (0.82 ac) and greater depth (15', double-level vault) was analyzed. This alternative removes only two trees and temporarily impacts only the north baseball outfield, but requires deeper sheet piling and a 1,500 GPM pumping station to dewater the bottom 9'10" of water stored in the vault with similar costs to Alternate Configurations 1 and 2. The pump size is a preliminary estimate and would be sized to have the same dewatering performance as the gravity draining in the base configuration. The pump station would dewater the bottom portion of the vault within 24 hours after a storm event so that the volume could be available for a subsequent event. An underdrain would be required for this configuration as well.

This configuration is estimated to cost approximately $7,180,000, which is $250,000 less expensive than the base configuration. For this configuration, the cost savings associated with the deeper vault are not realized as greatly as alternatives 1 and 2, due to a greater quantity of sheet piling needed for the increased depth. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Thornwood Park

The required stormwater storage at Thornwood Park is 13.9 ac-ft (aerial shown in Figure 4). The initial (base) configuration and two alternative configurations were explored at the site.

Figure 4: Aerial view of Thornwood Park

Proposed Base Configuration

This configuration consists of a rectangular vault with a footprint of 2.97 acres. The storage is provided by a 6'0" single-level vault.

Most of the trees on the east side of the park would need to be removed with this vault configuration (see attached configuration exhibits). In total, fifty-three existing trees would have to be removed. A complete schedule for tree removal is found in Appendix 1. The majority of both baseball diamonds would also need to be replaced, including the backstop for the north field.

This configuration is estimated to cost approximately $8,610,000. Appendix 2 details comparative costs.

Alternative Configuration 1

This configuration maintains the depth and area of the base configuration, but shifts the footprint west to save ten mature oak trees just south of the tennis courts. These trees range from 16" to 36" in diameter. This would require additional tree removal on the west side of the park. In total, sixty trees would need to removed. Additionally the entirety of both baseball diamonds and both backstops would need to be removed and replaced new.

This configuration is estimated to cost approximately $8,810,000, which is $200,000 more expensive than the base configuration. The similar cost can be attributed to similar footprints and method of construction. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Alternative Configuration 2

To minimize tree removal and to avoid backstop replacement, this configuration decreases the footprint to 1.35 acres while increasing the vault depth to 11'4" via a double-level chamber. Almost all the trees are saved in this scenario, and the impact to the baseball diamonds is minimized. If all trees were to be saved under this configuration, more of the baseball diamonds would have to be temporarily impacted. The increased depth requires deeper sheet piling and a 1,850 GPM pumping station would be necessary for draining the bottom 5'4" of water stored in the vault. The pump sizing is a preliminary estimate and would be sized to have the same dewatering performance as the gravity draining in the other configurations. The pump station would dewater the bottom portion of the vault after a storm event so that the volume would be available for a subsequent storm event. There is an initial capital cost to install the pump station/backup generator and yearly costs to operate, test and maintain the pump station. Due to anticipated groundwater, the deeper vault would also require an underdrain to dewater the area surrounding the vault.

This configuration is estimated to cost approximately $7,060,000, which is $1,550,000 less costly than the base configuration. The savings are found primarily from a smaller area of disturbance and increased efficiency in the storage due to the vault depth; these savings are somewhat offset by sheet piling and pump costs. The smaller vault footprint allows for an overall reduction in vault construction costs. A table containing *comparative costs* at a planning-level can be found in Appendix 2.

Conclusion

Each of the alternatives discussed provide the necessary underground stormwater storage to meet the optimized design of the WSNSP. When considering costs, the deeper vaults are generally more cost-effective per volume of storage, though some of their benefit is tempered due to higher construction costs associated with sheet piling needed in constrained areas. While the initial costs for the deeper vaults are generally less than the gravity drained vaults, the increased cost of maintenance and pumping operations are anticipated to be roughly $20,000 per year (in 2019 dollars) per facility.

The first underground storage facility planned to be installed is the facility located at Community Playfield (Phase 1). This project is recommended to be advertised to bid during November or December of 2019 in order to get the optimal prices for construction in 2020 and be ready to begin construction of the vault on June 12, 2020 (the first day of summer break). While Phase 1 is currently under design, finalizing the Inter-Governmental Agreement – or, at a minimum, reaching final concurrence on the vault configuration – between the Village and the Park District is a critical path item. In order to maintain the project schedule, the agreement should be in place by early-August 2019.

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Appendix 1 – Tree Removal Schedule

COMMUNITY PARK						
PROPOSED CONFIGURATION			ALTERNATIVE CONFIGURATION 1			ALTERNATIVE CONFIGURATION 2
SPECIES	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*	*No tree removal anticipated.*
COTTONWOOD	60"	3	COTTONWOOD	60"	4	
COTTONWOOD	40"	3	COTTONWOOD	36"	3	
COTTONWOOD	40"	3				
COTTONWOOD	40"	3				
COTTONWOOD	38"	3				
COTTONWOOD	38"	3				
COTTONWOOD	36"	3				
COTTONWOOD	36"	3				
COTTONWOOD	35"	3				
COTTONWOOD	34"	3				
COTTONWOOD	34"	3				
COTTONWOOD	31"	3				
COTTONWOOD	31"	3				
COTTONWOOD	27"	3				
COTTONWOOD	27"	3				
COTTONWOOD	27"	3				
COTTONWOOD	26"	3				
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COTTONWOOD	24"	3				
COTTONWOOD	24"	3				
COTTONWOOD	24"	3				
COTTONWOOD	23"	2				
COTTONWOOD	22"	3				
COTTONWOOD	20"	3				
COTTONWOOD	18"	3				
COTTONWOOD	18"	3				
COTTONWOOD	18"	3				
COTTONWOOD	18"	3				
COTTONWOOD	16"	3				
COTTONWOOD	16"	3				
COTTONWOOD	16"	3				

HIBBARD PARK									
PROPOSED CONFIGURATION				ALTERNATIVE CONFIGURATION 1		ALTERNATIVE CONFIGURATION 2		ALTERNATIVE CONFIGURATION 3	
SPECIES	*DIA*	*SPECIES*	*DIA*	*SPECIES*	*DIA*	*SPECIES*	*DIA*	*SPECIES*	*DIA*
OAK	UNK	COTTONWOOD	UNK	ELM	UNK	MAPLE	UNK	HICKORY	UNK
MUSCLE WOOD	UNK	PINE	UNK	ELM	UNK	OAK	UNK	MAPLE	UNK
WALNUT	UNK	PINE	UNK	ELM	UNK	OAK	UNK		
SHAG HICKORY	UNK	PINE	UNK	HICKORY	UNK	OAK	UNK		
BUR OAK	UNK	ELM	UNK	OAK	UNK	OAK	UNK		
OAK	UNK	ELM	UNK	MAPLE	UNK	HICKORY	UNK		
CRAB	UNK	ELM	UNK	MAPLE	UNK	OAK	UNK		
BALD CYPRESS	UNK	HICKORY	UNK	HICKORY	UNK	OAK	UNK		
BALD CYPRESS	UNK	OAK	UNK						
PINE	UNK	MAPLE	UNK						
PINE	UNK	MAPLE	UNK						
PINE	UNK	OAK	UNK						
HONEY LOCUST	UNK	OAK	UNK						
HONEY LOCUST	UNK	OAK	UNK						
HONEY LOCUST	UNK	OAK	UNK						
BLUE SPRUCE	UNK	HICKORY	UNK						
PINE	UNK	OAK	UNK						
PINE	UNK	OAK	UNK						
PINE	UNK	OAK	UNK						

Condition Legend
1 – Poor Condition
2 – Below Average Condition
3 – Average Condition
4 – Above Average Condition
5 – Excellent Condition

THORNWOOD PARK														
PROPOSED CONFIGURATION						ALTERNATIVE CONFIGURATION 1						ALTERNATIVE CONFIGURATION 2		
SPECIES	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*
BASSWOOD	22”	2	OAK	16”	3	BALD CYPRESS	12"	4	UNIDENTIFIED	10"		SYCAMORE	2-12"	3
BASSWOOD	8"	3	PEAR	12”	2	BASSWOOD	22"	3	UNIDENTIFIED	10"		UNIDENTIFIED	3"	
BEECH	20"	4	PEAR	8”	3	BASSWOOD	10” 4-8’ 5”	3	UNIDENTIFIED	8-3"		UNIDENTIFIED	2"	
CATALPA	6"	3	PEAR	8” 7” 5”	3	BASSWOOD	9	3	UNIDENTIFIED	8"	3			
CRABAPPLE	10”	3	PINE	16"	3	BASSWOOD	8"	3	UNIDENTIFIED	2-5" 3"				
CRABAPPLE	10”	3	PINE	16"	2	BEECH	20"	4	UNIDENTIFIED	5"				
CRABAPPLE	7”	3	SPRUCE	12"	3	CATALPA	6"	3	UNIDENTIFIED	4-4"				
ELM	8”	3	SWEETGUM	7”	3	CRABAPPLE	10”	3	UNIDENTIFIED	4"				
FLOWERING DOGWOOD	2-6”	4	SYCAMORE	12"	3	CRABAPPLE	10”	3	UNIDENTIFIED	4"				
MAPLE	12" 3-6" 6-4" 5-3"	3	UNIDENTIFIED	11"	3	CRABAPPLE	7”	3	UNIDENTIFIED	3-3" 7-2"				
MAPLE	12”	3	UNIDENTIFIED	10"		CYPRESS	12"	3	UNIDENTIFIED	3"				
MAPLE	10"	4	UNIDENTIFIED	10"		CYPRESS	12"	3	UNIDENTIFIED	3"				
MAPLE	10"	3	UNIDENTIFIED	8-3"		DOGWOOD	2-6”	4	UNIDENTIFIED	3"				
MAPLE	7"	3	UNIDENTIFIED	8"		HAWTHORN	3-12"	2	UNIDENTIFIED	3"				
MAPLE	6”	3	UNIDENTIFIED	5"		HAWTHORN	13”	3	UNIDENTIFIED	6-2"				
MAPLE	5"	2	UNIDENTIFIED	4-4"		HAWTHRON	12”	3	UNIDENTIFIED	4-2" 2-2"				
OAK	40"	1	UNIDENTIFIED	4"		HAWTHORN	2-10” 8”	3	UNIDENTIFIED	2"				
OAK	36"	3	UNIDENTIFIED	4"		HAWTHORN	3-10”	3	UNIDENTIFIED	2"				
OAK	30"	3	UNIDENTIFIED	4"		HAWTHRON	3-12”	3						
OAK	30"	3	UNIDENTIFIED	3"		HAWTHRON	2-12”	2						
OAK	30"	3	UNIDENTIFIED	3"		HAWTHRON	3-12”	3						
OAK	30"	3	UNIDENTIFIED	3"		HAWTHRON	2-12”	2						
OAK	26"	3	UNIDENTIFIED	3"		HONEY LOCUS	20”							
OAK	22"	3	UNIDENTIFIED	3"		MAPLE	12" 3-6" 6-4" 5-3"	3						
OAK	21"	3	UNIDENTIFIED	6-2"		MAPLE	11"	1						
OAK	21"	3	UNIDENTIFIED	2"		MAPLE	10"	4						
OAK	21"	3	UNIDENTIFIED	2"		MAPLE	10"	3						
OAK	21"	3	UNIDENTIFIED	2-7” 4-4”		MAPLE	7"	2						
OAK	20”	3				MAPLE	6"	3						
						MAPLE	5"	3						
						OAK	40"	1						
						OAK	13”	3						
						PINE	16"	3						
						PINE	16"	3						
						PEAR	12”	2						
						PEAR	8	3						
						PEAR	8” 7” 5”	3						
						SPRUCE	12"	3						
						SYCAMORE	11"	3						

Condition Legend
1 – Poor Condition
2 – Below Average Condition
3 – Average Condition
4 – Above Average Condition
5 – Excellent Condition

Appendix 2

Planning-Level Cost Estimate (COMPARATIVE COSTS)
West Side Neighborhood Storage - Underground Detention Configuration Alternatives
Village of Wilmette

BAXTER & WOODMAN Consulting Engineers

Community Park

			Proposed		Alternative 1		Alternative 2	
Pay Item	Type	Unit Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
VAULT	L SUM	VARIES	1	$ 4,747,800	1	$ 4,386,000	1	$ 3,316,300
PUMP	L SUM	$ 750,000					1	$ 750,000
STORM SEWER, RCP, 48"	LF	$ 400			300	$ 120,000	300	$ 120,000
UNDERDRAIN, 6" PVC	FOOT	$ 15					2,120	$ 31,800
TOPSOIL EXCAVATION AND PLACEMENT	SQ YD	$ 10	22,300	$ 223,000	22,600	$ 226,000	14,600	$ 146,000
SEEDING	SQ YD	$ 3	22,300	$ 66,900	22,600	$ 67,800	14,600	$ 43,800
EROSION CONTROL BLANKET	SQ YD	$ 3	22,300	$ 66,900	22,600	$ 67,800	14,600	$ 43,800
EARTH EXCAVATION	CU YD	$ 50	54,800	$ 2,740,000	53,900	$ 2,695,000	53,200	$ 2,660,000
EXCAVATION RE-SPREAD (STAY ON-SITE)	CU YD	$ 25	29,100	$ 727,500	29,300	$ 732,500	18,800	$ 470,000
STRUCTURAL BACKFILL	CU YD	$ 50	5,000	$ 250,000	7,100	$ 355,000	12,400	$ 620,000
TREE REMOVAL (OVER 15 UNITS DIAMETER)	IN-DIA	$ 50	906	$ 45,300	96	$ 4,800		
STRUCTURE REMOVAL, STORM	EACH	$ 250	5	$ 1,250	3	$ 750	2	$ 500
STORM SEWER REMOVAL, 4"	FOOT	$ 11	189	$ 2,079	93	$ 1,023	215	$ 2,365
STORM SEWER REMOVAL, 12"	FOOT	$ 11	806	$ 8,866	559	$ 6,149	466	$ 5,126
STABILIZED CONSTRUCTION ENTRANCE	L SUM	$ 15,000	1	$ 15,000	1	$ 15,000	1	$ 15,000
AGGREGATE FOR TEMPORARY ACCESS	TON	$ 40	33	$ 1,320	33	$ 1,320	33	$ 1,320
SUBTOTAL				$ 8,900,000		$ 8,680,000		$ 8,230,000
CONTINGENCY (20%)				$ 1,780,000		$ 1,740,000		$ 1,650,000
TOTAL				**$ 10,680,000**		**$ 10,420,000**		**$ 9,880,000**
						$ (260,000)		$ (800,000)

Hibbard Park

			Proposed		Alternative 1		Alternative 2		Alternative 3	
Pay Item	Type	Unit Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
VAULT	L SUM	VARIES	1	$ 2,680,900	1	$ 1,591,400	1	$ 1,558,300	1	$ 1,414,800
PUMP	L SUM	$ 750,000			1	$ 750,000	1	$ 750,000	1	$ 750,000
STORM SEWER, RCP, 48"	LF	$ 400			650	$ 260,000	650	$ 260,000	650	$ 260,000
SHEET PILING, 36'	SQ FT	$ 25	40,644	$ 1,016,100						
SHEET PILING, 54'	SQ FT	$ 30			21,276	$ 638,280	30,078	$ 902,340		
SHEET PILING, 66'	SQ FT	$ 35							47,058	$ 1,647,030
UNDERDRAIN, 6" PVC	FOOT	$ 15			1,350	$ 20,250	1,450	$ 21,750	1,305	$ 19,575
TOPSOIL EXCAVATION AND PLACEMENT	SQ YD	$ 10	13,600	$ 136,000	7,300	$ 73,000	6,700	$ 67,000	5,800	$ 58,000
SEEDING	SQ YD	$ 3	13,600	$ 40,800	7,300	$ 21,900	6,700	$ 20,100	5,800	$ 17,400
EROSION CONTROL BLANKET	SQ YD	$ 3	13,600	$ 40,800	7,300	$ 21,900	6,700	$ 20,100	5,800	$ 17,400
EARTH EXCAVATION	CU YD	$ 50	29,900	$ 1,495,000	26,300	$ 1,315,000	24,600	$ 1,230,000	26,000	$ 1,300,000
EXCAVATION RE-SPREAD (STAY ON-SITE)	CU YD	$ 25	17,300	$ 432,500	9,300	$ 232,500	8,600	$ 215,000	7,400	$ 185,000
STRUCTURAL BACKFILL	CU YD	$ 50	6,000	$ 300,000	5,700	$ 285,000	4,200	$ 210,000	5,700	$ 285,000
TREE REMOVAL (6 TO 15 UNITS DIAMETER)	IN-DIA	$ 35	495	$ 17,325	120	$ 4,200	120	$ 4,200	30	$ 1,050
TREE REMOVAL (OVER 15 UNITS DIAMETER)	IN-DIA	$ 50	90	$ 4,500						
STABILIZED CONSTRUCTION ENTRANCE	L SUM	$ 15,000	1	$ 15,000	1	$ 15,000	1	$ 15,000	1	$ 15,000
AGGREGATE FOR TEMPORARY ACCESS	TON	$ 40	33	$ 1,320	33	$ 1,320	33	$ 1,320	33	$ 1,320
SUBTOTAL				$ 6,190,000		$ 5,230,000		$ 5,280,000		$ 5,980,000
CONTINGENCY (20%)				$ 1,240,000		$ 1,050,000		$ 1,060,000		$ 1,200,000
TOTAL				**$ 7,430,000**		**$ 6,280,000**		**$ 6,340,000**		**$ 7,180,000**
						$ (1,150,000)		$ (1,090,000)		$ (250,000)

Thornwood Park

			Proposed		Alternative 1		Alternative 2	
Pay Item	Type	Unit Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
VAULT	L SUM	VARIES	1	$ 3,460,900	1	$ 3,437,200	1	$ 2,154,800
PUMP	L SUM	$ 750,000					1	$ 200,000
SHEET PILING, 54'	SQ FT	$ 30					24,300	$ 729,000
BASEBALL DIAMOND REMOVAL AND REPLACEMENT	EACH	$ 400,000	2	$ 800,000	2	$ 800,000	1	$ 400,000
UNDERDRAIN, 6" PVC	FOOT	$ 15					1,235	$ 18,525
TOPSOIL EXCAVATION AND PLACEMENT	SQ YD	$ 10	16,800	$ 168,000	17,800	$ 178,000	8,800	$ 88,000
SEEDING	SQ YD	$ 3	16,800	$ 50,400	17,800	$ 53,400	8,800	$ 26,400
EROSION CONTROL BLANKET	SQ YD	$ 3	16,800	$ 50,400	17,800	$ 53,400	8,800	$ 26,400
EARTH EXCAVATION	CU YD	$ 50	36,800	$ 1,840,000	38,900	$ 1,945,000	33,500	$ 1,675,000
EXCAVATION RE-SPREAD (STAY ON-SITE)	CU YD	$ 25	21,900	$ 547,500	23,300	$ 582,500	11,400	$ 285,000
STRUCTURAL BACKFILL	CU YD	$ 50	3,500	$ 175,000	4,000	$ 200,000	5,000	$ 250,000
TREE REMOVAL (6 TO 15 UNITS DIAMETER)	IN-DIA	$ 35	251	$ 8,785	331	$ 11,585	5	$ 175
TREE REMOVAL (OVER 15 UNITS DIAMETER)	IN-DIA	$ 50	897	$ 44,850	1,068	$ 53,400	36	$ 1,800
STRUCTURE REMOVAL, STORM	EACH	$ 250	2	$ 500	2	$ 500	1	$ 250
STORM SEWER REMOVAL, 8"	FOOT	$ 11	242	$ 2,662	242	$ 2,662	197	$ 2,167
STORM SEWER REMOVAL, 12"	FOOT	$ 11	125	$ 1,375	125	$ 1,375		
STABILIZED CONSTRUCTION ENTRANCE	L SUM	$ 15,000	1	$ 15,000	1	$ 15,000	1	$ 15,000
AGGREGATE FOR TEMPORARY ACCESS	TON	$ 40	33	$ 1,320	33	$ 1,320	33	$ 1,320
SUBTOTAL				**$ 7,170,000**		**$ 7,340,000**		**$ 5,880,000**
CONTINGENCY (20%)				$ 1,440,000		$ 1,470,000		$ 1,180,000
TOTAL				**$ 8,610,000**		**$ 8,810,000**		**$ 7,060,000**
						$ 200,000		$ (1,550,000)