Date: June 26, 2019

To: Steve Wilson, Executive Director, Wilmette Park District

From: Brigitte Ann Berger-Raish, P.E., Director of Engineering and Public Works

Subject: Neighborhood Storage Project—Responses to Questions

The purpose of this memorandum is to provide responses to the Park Board and resident questions that arose at and following the June 10 meeting. Village staff and the consulting team will be available on July 8 for the next Park Board meeting to answer any additional questions.

1. Is a backup generator required or can an offsite mobile generator solution be employed?

   The Village believes a permanent generator is the best solution because of the immediate ability to run the pumps in the event of a power outage. There are various installation options that could reduce the size of a structure, or eliminate it altogether, with the permanent generator screened by landscaping. The Village of Kenilworth water pumping station located at the corner of Ashland Lane and Kenilworth Avenue is an example of a well-screened generator. A mobile generator can also provide the power needed to run the pump station in the event of a power outage. A conservative estimate would require a generator capable of producing 100 Kilowatts of power to operate each pump station. The same generator could be used at all three sites if pump stations are required. These are commonly found as self-contained trailer units (see attachment 1).

2. Please provide further detail on weekly, monthly, periodic and annual maintenance requirements for both a gravity fed vault and a vault with a pump and generator.

   Vault: Annual inspection and cleaning

   Pump stations:

   - Weekly – Visually inspect pump station and buildings
   - Monthly/Post-Storm – Check wet well, discharge chamber, and backflow preventers for debris; Open pump hatches to visually

inspect pumps, casing, cable connections, and impellers; verify pump operation

- Annually – Clean wet well, discharge chamber, and backflow preventers; full pump maintenance including calibration of sensors/floats and oil change
- Approximately every 20 years – pump replacement

Generator:

- Weekly – Exercise for 30-60 minutes
- Monthly/Post-Storm – Check engine oil and coolant levels; check air filters
- Annually – Check belts and hoses; clean cooling system; Inspect/replace spark plugs, oxygen sensor, and AC generator system
- Approximately every 25 years – generator replacement

3. What are the anticipated costs for the ongoing maintenance for both vault concepts?

   A planning level cost for pump system operation and maintenance is $20,000 per year for each pump station. This cost includes annual operation and maintenance, pump replacement every 20 years, and generator replacement every 25 years.

4. Please explain why there are varied cost estimates for pumps across different designs.

   The varied cost estimate was an error in the spreadsheet. All pumps are conservatively estimated at $750,000, which includes the pump station, electrical controls, an emergency backup generator, and a structure enclosing the pump station. An updated Appendix 2 with the cost estimates is attached. (Attachment 2).

5. Is there an anticipated negative impact to the trees and grasses in the parks due to the tanks taking water too efficiently?

   The trees in the park thrive in both dry and wet conditions and should not be impacted by the vault – according to the Village's Foresters. Depending on the final design and the thickness of cover over the vault, it is possible that the areas above the tanks may not hold moisture sufficient for healthy grass. In this case more frequent watering, generally via an irrigation system, may be required. Maintaining healthy grass cover is possible and has been done successfully at other locations. Final engineering efforts will include assessment of the site drainage and ensuring the ability for the proposed vegetation to thrive.

6. Can the Village forester provide an estimate of the age of the cottonwood trees at Community Playfields as well as an average life for the particular species of tree?

   The foresters reviewed the 33 cottonwood trees and determined their ages range from as young as 35 years old to upwards of 120 years old. With a basic level inspection, most trees are at least in fair to good condition, although there are 1 to 2 trees within the grove that could be considered for removal or at minimum extensive pruning. The species is native to the area and are some of the fastest growing, larger diameter trees to be found in Wilmette. They can withstand and thrive in dry to wet soils. The Forestry Division does not plant eastern cottonwoods on its parkways as they are more susceptible to branch failure in storms as cottonwood wood is brittle and weak.

   In addition to the cottonwood grove, there are two large diameter trees that would be impacted with the "Z" gravity configuration. The foresters reviewed the conditions of these trees and determined they are in good health and structure. One of the trees is 57" in diameter breast height (DBH) and the other is 44" DBH.

   The foresters indicate that cottonwoods are a relatively short-lived species that on average can live up to 60 years of age, and in rare cases 100 years in a parkway setting.

7. If the new vault configurations at Thornwood Park is moved further west, would that add more money to the project or make the tank operate less efficiently?

   The vault could be moved further west with nominal change to the project cost. The current westerly limits are set to both avoid having to completely replace the backstops (as able) and also to avoid removing the trees between the two baseball fields (near the eastern limits of the northern baseball field backstop). Therefore, moving the vault limits further west would likely result in the removal of additional trees.

8. Can the inlet for the alternative designs at Thornwood be moved north towards the existing playground?

   The inlet is recommended to remain in the southeast corner of the park. Moving the inlet to the north would greatly increase the cost by increasing the length of large diameter storm sewer.

9. Is there a solution that has a pumped tank under the southern baseball field at Hibbard Park and what the tree impact would be.

   There are options to utilize more of the southern baseball field for underground stormwater storage. This area was not originally considered as it impedes into the area identified by the Park District's architect as potential area for future building expansion. The attached conceptual exhibit shows how a pumped (15' deep) detention vault could fit under the south baseball field. (Attachment 3)

10. The memo from Baxter & Woodman states that if the original proposed configuration is utilized (the rectangular vault under the cottonwood trees), this

would remove the existing detention basin. The removal of this basin would require an additional storage vault to be built adjacent to the proposed rectangular vault. Why is this additional vault necessary? Wouldn't the rectangular vault be sufficient to handle the water that settles in the detention basin?

The existing detention basin is designed specifically for the school district to mitigate the increase in runoff from past school construction projects in accordance with MWRD permitting requirements. The design of the existing detention basin includes a control structure to accommodate a specific release rate (the maximum flow rate allowed) defined in the MWRD permit. The existing MWRD permit will not allow the flow rate to be increased. The possibility of combining flood storage with the existing detention storage in a new facility was discussed during a team meeting with MWRD staff. MWRD staff indicated that to be compliant with the existing permit for the school, the detention facility would need to operate separately from the flood storage component of the system to maintain the allowable release rate from the school. In order to combine the existing detention facility with our proposed stormwater storage vault, we would have to maintain the required release rate for that portion of the detention storage volume in the overall basin. This release rate would not allow the much larger proposed stormwater storage volume to drain down within an acceptable duration; and is therefore not considered an option.

11. If the additional vault is needed to handle the amount of water generated during a storm, why wouldn't the rectangular vault be increased to include that additional storage space? Is this a separate vault or is it a build out of the rectangular vault? How will water be directed into this additional storage vault?

    The rectangular vault configuration could be expanded to accommodate the runoff from the school property separately. However, as stated above, a separate chamber within the overall vault would be required to meet the MWRD permit requirements. If the two storage areas were combined into one and separated by chambers, runoff from the school property would be directed to the associated chamber separately from the flood storage component of the vault.

12. According to the Baxter & Woodman memo, Alternative Configuration 1, the “Z” shaped vault will not require the construction of an additional vault and will leave the existing detention basin in place. Does that mean that the area around the cottonwoods will continue to pond water as it currently does? If it will continue to pond water will that affect the field conditions in the rest of the park? (I assume that ponding in the existing detention basin will not affect the rest of the park and that the standing water in the southerly portions of the park will drain into the Z shaped vault -- but I would like to confirm that).

    The existing detention basin within the cottonwood grove will remain intact and continue to function as it currently does. The proposed vault will be hydraulically separate from the existing detention basin. It is expected that drainage

improvements in the park will be included, to some extent, with the construction of the vault.

13. What is the expected life-span of the concrete vault?

The vendor states that the concrete vaults have a minimum design life of 100 years.

14. Efficacy of utilizing Avoca as a storage site for Kenilworth Gardens.

An additional 5,600 linear feet of large diameter storm sewer would be required to convey the excess stormwater that floods the low streets in Kenilworth Gardens into an underground stormwater storage vault at Avoca Park and then back into the existing trunk line storm sewer system. Given the unit prices in the current engineer's estimate of probable cost, this would add approximately $9M-$10M to the project cost.

15. Efficacy of utilizing Centennial Park as a storage site for Kenilworth Gardens.

Centennial Park drains to the Wilmette Avenue trunk line storm sewer system and Kenilworth Gardens drains to the Lake Avenue trunk line storm sewer system. The excess stormwater that floods the low streets in Kenilworth Gardens would have to be conveyed in a large diameter storm sewer to an underground storage vault in Centennial Park. This water would also have to be conveyed back to the Lake Avenue storm sewer system to avoid negative impacts to the Wilmette Avenue storm sewer system. This would require an additional 4,200 linear feet of large diameter storm sewer. Additionally, Centennial Park is much higher than Thornwood Park, resulting in excess overburden that would have to be managed as referenced in previous discussions with the Park District regarding the Centennial Park versus Community Playfields decision. Given the unit prices in the current engineer's estimate of probable cost, this would add approximately $8M-$9M to the project cost. This configuration has not been analyzed hydraulically and additional infrastructure (pump station, etc.) may be required that would further increase the project costs.

16. How loud would the pump station and generator be?

The pumps in a pump station are located in a concrete structure underground. The noise level above ground near the pump station would be in the range of 20-30 dB, or just above a whisper. The generator, whether permanent or portable, is a large combustion engine which would produce 60-90 decibels, or similar to a diesel truck or lawn mower. The generator would only function when the lower half of the vault is full and the power is out. It would also need to be exercised per the maintenance schedule provided above.

17. Will the roads around Thornwood Park be rebuilt/repaved after the wear and tear of construction vehicles?

All roads with new storm sewer will be fully rehabilitated. The condition of the roads used for truck access will be evaluated and considered for improvements in conjunction with the annual road program.

Attachments

1. Portable generator specification sheet
2. Appendix 2: Planning Level Cost Estimate
3. Hibbard Park Concept with Reservoir Under South Field

Image shown may not reflect actual configuration

Standby 110 kW
Prime 100 kW
60 Hz 1800 rpm 480V
60 Hz 1800 rpm 600V

Specifications

Frequency	Voltage	Standby kW (kVA)	Prime kW (kVA)	Speed rpm
480V 60 Hz Rating				
60 Hz	480/277V	110 (137)	100 (125)	1800
60 Hz	208/120V	110 (137)	100 (125)	1800
60 Hz	240/120V	65 (65)	65 (65)	1800
600V 60 Hz Rating (Optional)				
60 Hz	600V/347V	110 (137)	100 (125)	1800
60 Hz	480V/277V	110 (137)	100 (125)	1800
60 Hz	208/120V	110 (137)	100 (125)	1800
60 Hz	240/120V	64 (64)	64 (64)	1800

Cat® C4.4 ACERT™ Diesel Engine	Metric	Imperial (English)
Configuration	I-4, 4-Stroke - Water Cooled Diesel	
Bore	105 mm	4.13 in
Stroke	127 mm	5 in
Displacement	4.4 L	268.5 in^3
Aspiration	Turbocharged-Aftercooled	
Compression Ratio	16.5:1	
Engine rpm	1800	
Governor Type	ADEM™ A4	

Features & Benefits

Fuel/Emissions Strategy

- Meets U.S. EPA Tier 4 Final emission standards and CARB certified for non-road mobile applications at all 60 Hz ratings

Design Criteria

- Meets ISO 8528 transient response and linear vibration
- Canadian Standards Association (CSA) Certified

Single-source Supplier

- Package is factory designed and production tested
- Manufactured in ISO 9001:2000 certified Caterpillar facility

Cat C4.4 ACERT Diesel Engine

- Four-stroke diesel engine with ACERT technology combined with electronic engine controller offers consistent performance and excellent fuel economy
- Series turbocharged with smart wastegate
- Low ownership costs enabled by a 3,000 hrs service interval for multi-vee belts and service free tappets
- Oil and fuel filter change intervals: 500 hrs

Cat Clean Emissions Module (CEM)

- Engine mounted Aftertreatment module contains of Diesel Oxidation Catalyst (DOC) and Selective Catalytic Reduction (SCR)
- Aftertreatment remains invisible to the equipment operator when in use
- No requirement for ash servicing
- Service free for life of the engine

Diesel Exhaust Fluid (DEF) System

- DEF tank provides more than 24 hrs run time@ 75% load.
- Electrically heated DEF lines

Cat Generator

- Matched to the performance and output characteristics of Cat engines
- Integrated voltage selector switch
- UL 1446 Recognized Class H insulation

Cat Integrated Voltage Regulator (Cat IVR)

- Three-phase sensing
- Adjustable volts-per-hertz regulation
- Provides precise control, excellent block loading, and constant voltage in the normal operating range

Cat EMCP 4.2B Control Panel

- Electronic control panel provides power metering, protective relaying, engine and generator parameter viewing, and expanded AC metering
- Graphical display (3.8 in.) denotes text alarm/ event descriptions, set points, engine and generator monitoring, and is visible in all lighting conditions
- Simple, user-friendly interface and navigation
- Automatic set-point adjustment integrated with voltage selection

Sound-attenuated Enclosure

- Provides excellent weather protection and allows for a quiet package operation with less than 66 dBA sound levels at full load, while offering excellent service access with multiple doors and access panels
- Galvanealed sheet steel body panels for improved corrosion resistance.
- Coolant and oil drains along with auxiliary fuel connections are all conveniently located at one location on the exterior of the enclosure for easy access.

Fuel System

- Provides 24-hour runtime @ 75% prime
- Meets UL 142, ULC 601
- OPTIONAL: Meets Transport Canada (UN31A) requirements with factory-installed, optional vent kit

Reduced Environmental Impact

- 110% spill containment of onboard engine fluids

Cooling System

- Provides 50°C ambient capability @ full rating
- Coolant low-level shutdown switch
- Coolant recovery system for easy top off

Charging System

- Charging alternator; 12V-100A, heavy duty with integral regulator and belt guards
- 10-Watt Solar maintainer for batteries

Asset Monitoring and Management

- Product Link™ Generation (PLG) hardware provides two-way communication for remote control and equipment monitoring via cellular network
- Customer-defined, equipment-based, real-time status updates and alerts
- Flexible and customer-configurable user interface
- GPS provides asset location and geo-fencing

Factory-installed Standard Equipment

Engine
- Cat C4.4 ACERT heavy-duty diesel engine meets Tier 4 Final emission standards

Engine Air Inlet
- Heavy-duty air cleaner with dust cup and service indicator
- Turbocharger and air-to-air after cooler

Cat CEM
- Engine mounted CEM
- Robust operation in cold weather and low loads
- Includes DOC and SCR

DEF System
- 8 gal (30 L) plastic DEF tank provides capacity to meet or exceed fuel tank runtime at any given load.
- DEF tank is equipped with integrated level sensor and heating element to aid in cold weather operation.
- Electrically heated DEF lines
- DEF level gauge located on the control panel
- Equipped with low and critically-low level alarms and a critically-low shutdown

Fuel System
- 150 gal (568 L) double-wall fuel tank
- Fuel fill located in an isolated enclosed space away from the engine compartment with a lockable door
- Designed to meet UL 142, ULC 601
- Provides 24-hour runtime @ 75% prime
- Engine mounted electric priming pump
- Auxiliary connections for customer-supplied fuel transfer system with 3-way fuel transfer valve
- Engine mounted primary fuel filter with integral water separator
- Engine-mounted secondary fuel filter

Cooling System
- Provides 50°C ambient capability @ full rating
- Vertically mounted radiator with engine mounted cooling fan
- 50/50 Extended Life Coolant
- Coolant low-level shutdown switch
- Coolant recovery system
- Coolant drain line with valve

Mounting System
- Engine, generator and radiator soft mounted to the heavy duty, fabricated steel base frame

Sound-attenuated Enclosure
- Provides excellent weather protection
- Offers a quiet package with 66 dBA sound levels
- Rugged, corrosion-resistant construction:
  - Galvanealed, sheet steel body panels with zinc phosphate pre-treatment prior to polyester powder coating
- Excellent access for service and maintenance:
  - Two doors on each side of the enclosure provides clear access to routine service and maintenance needs.
  - Two rear doors provide access to power distribution and control panel access
  - Separate door for DEF and Diesel fill access
  - Access panel on the front provides access to clean radiator cores and to service DEF tank.
  - Lube oil drain, coolant drain, external fuel supply and return lines are all piped to exterior of the enclosure and located on one panel for easy access.
- Security and safety features:
  - Pad lockable latches on all access doors
  - Exterior emergency stop (E-stop) button

Lube System
- Open crankcase breather with filter
- Oil drain line with internal valve routed to connection point accessible from exterior
- 500-hour engine oil change interval

Starting System
- Single electric starting motor, 12VDC
- Single 12V (850 CCA) maintenance-free battery with disconnect switch, battery rack, and cables
- 120V single-phase block heater

Quality
- Factory testing of standard generator set and complete power module
- UL, NEMA, ISO, and IEEE standards
- O&M manuals
- CSA Certified
- Full manufacturer's warranty

Shore Power
- One 110V shore power connection for powering engine block heater and generator space heater (optional), battery charger (optional), and single duplex service receptacle
- Includes controls to de-energize block and generator space heaters when the engine is running

Factory-installed Optional Equipment

Vent Kit

- Provides necessary vents and films to upgrade the standard UL142 certified tank to meet Transport Canada (UN31A) certification

Trailer Electric

- Two-axle trailer with Electric brakes

Trailer Hydraulic

- Two-axle trailer with Hydraulic brakes

Battery Charger

- 10A, 12 VDC output
- UL & CSA listed

Hitches

- 3" Pintle OR 2-5/16" Ball

Generator Space Heater

- 110 VAC Anti-condensation heater

Permanent Magnet Generator (PMG)

- Adds independent source of excitation to generator

NEMA Receptacles

- 208 Volt locking NEMA receptacles, quantity 2

600V Generator

- Includes 600V generator and 4-position rotary switch for easy selection of desired output
- Available voltages include:
    - 3-phase (600/347 Volt, 480/277 Volt, 208/120 Volt)
    - 1-phase (240/120 Volt)

Technical Data

Cat Generator	
Frame size	LC3114F
Pitch	2/3
No. of poles	4
No. of leads	12
Excitation	Self Excited
Number of bearings	Single bearing, close coupled
Insulation	Class H
Enclosure	Drip proof IP23
Alignment	Pilot shaft
Overspeed capability – % of rated	125% of rated
Voltage regulator	3-phase sensing with volts-per-hertz
Voltage regulation (adjustable to compensate for engine speed droop and line loss)	Less than ± 1⁄2% voltage gain
Wave form deviation	3%
Telephone Influence Factor (TIF)	Less than 50
Harmonic Distortion (THD)	Less than 5%

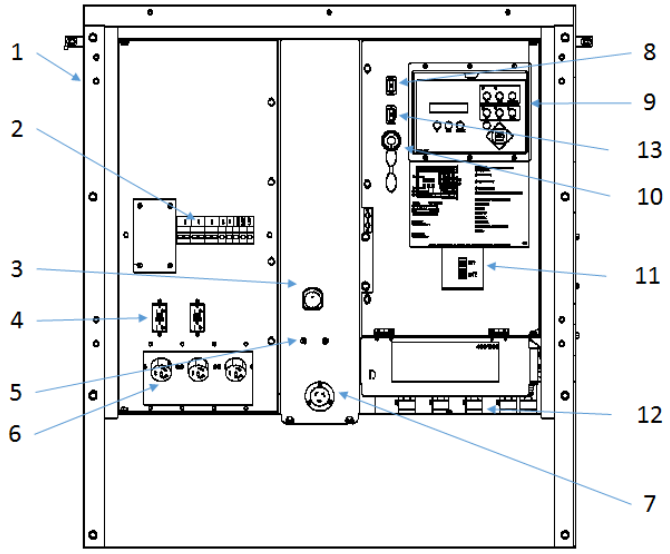
Cat Generator Set			
	Units	**60 Hz — Standby**	**60 Hz — Prime**
Power Rating	**kW (kVA)**	**110 (137)**	**100 (125)**
Performance Specification			
Lubricating System			
Oil pan capacity	L (gal)	9.4 (2.5)	9.4 (2.5)
Fuel System			
Fuel consumption — 100% Load	L/hr (gal/hr)	31.3 (8.27)	28.4 (7.49)
75% Load	L/hr (gal/hr)	-	20.9 (5.51)
50% Load	L/hr (gal/hr)	-	14.4 (3.80)
25% Load	L/hr (gal/hr)	-	7.5 (1.97)
Fuel tank capacity	L (gal)	568 (150)	568 (150)
Run time @ 75% rating	Hr		28
DEF System			
DEF consumption — 100% Load	L/hr (gal/hr)	1.2 (0.31)	0.47 (0.12)
75% Load	L/hr (gal/hr)	-	0.72 (0.19)
50% Load	L/hr (gal/hr)	-	0.39 (0.10)
25% Load	L/hr (gal/hr)	-	0.45 (0.12)
DEF tank capacity	L (gal)	30 (7.92)	30 (7.92)
Run time @ 75% rating	Hr		42
Cooling System			
Ambient capability	°C (°F)	55 (131)	55 (131)
Engine & radiator coolant capacity	L (gal)	18.3 (4.8)	18.3 (4.8)
Noise Rating (with enclosure)			
@ 7 meters (23 feet) @ 75% rating	dB(A)	66	65

Technical Data (continued)

Dimensions and Weights					
Model	**Length mm (in)**	**Width mm (in)**	**Height mm (in)**	**With Lube Oil & Coolant Kg (lb)**	**With all fluids Kg (lb)**
XQ125	3,222 (127)	1,244 (49)	1,858 (73)	2,372 (5,230)	2,876 (6,341)
XQ125 with trailer (electric brakes)	4,475 (176)	1,981 (78)	2,179 (86)	2,812 (6,200)	3,316 (7,311)
XQ125 with trailer (hydraulic brakes)	4,495 (177)	1,981 (78)	2,179 (86)	2,821 (6,220)	3,325 (7,331)

Control Panel and Power Distribution Layout

Item	Description
1	Steel enclosure with hinged, lockable doors (not shown)
2	Circuit breakers for receptacles
3	Emergency stop
4	2X Single-phase GFCI duplex receptacles (20A @ 120V)
5	Two-wire remote start terminals
6	3X Single-phase, California-style, twist-lock receptacles, 50A @ 208V phase-to-phase, 120V phase to neutral, or 240/120 single-phase when in that voltage position
7	Single-phase, NEMA locking input receptacle, (30A @ 120V) to power block heater, battery charger and generator space heater
8	Glow plug lamp
9	EMCP 4.2B digital generator set controller
10	Cat ET service tool connector
11	Generator main circuit breaker
12	Main bus connection (bus bars with 13 mm holes) behind hinged cover with safety switch
13	HEST/DPF Regen Lamp



Ratings Definitions and Conditions

Meets or Exceeds International Specifications: AS1359, CSA, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-33.

Prime — Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year. Prime power in accordance with ISO3046. Prime ambients shown indicate ambient temperature at 100% load which results in a coolant top tank temperature below the alarm temperature.

Standby — Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

Fuel rates are based on fuel oil of 35º API [16ºC (60ºF)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29ºC (85ºF) and weighing 838.9 g/liter (7.001 lbs/U.S. gal).

Additional ratings may be available for specific customer requirements, contact your Caterpillar representative for details. For information regarding low sulfur fuel and biodiesel capability, please consult your Cat dealer.

www.Cat.com/rentalpower

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	$ 750,000
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**		**$ 6,430,000**
CONTINGENCY (20%)				$ 1,440,000		$ 1,470,000		$ 1,290,000
TOTAL				**$ 8,610,000**		**$ 8,810,000**		**$ 7,720,000**
						$ 200,000		$ (890,000)

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HIBBARD PARK – UNDERGROUND DETENTION CONFIGURATION ALTERNATIVES
VILLAGE OF WILMETTE, ILLINOIS

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

Village of Wilmette West Side Neighborhood Storage

Stormwater Detention Vault Configuration Alternatives

Matthew J. Moffitt P.E., CFM, CPESC

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Detention Vault Configuration Alternatives

West Side Neighborhood Storage

- Configuration Criteria
- Pumping Stations
- Community Playfield Alternatives
- Hibbard Park Alternatives
- Thornwood Park Alternatives

Detention Vault Configuration Alternatives

- Precast Concrete Detention Vault (not visible from the surface)
- All configurations have equivalent volume and performance
- Alternatives designed to minimize impact to trees
- Deeper vault configurations will require pump stations

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

Underground Detention

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

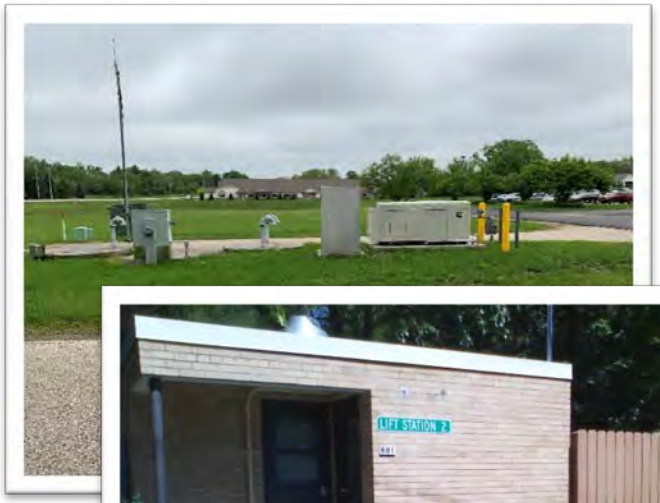
Underground Detention

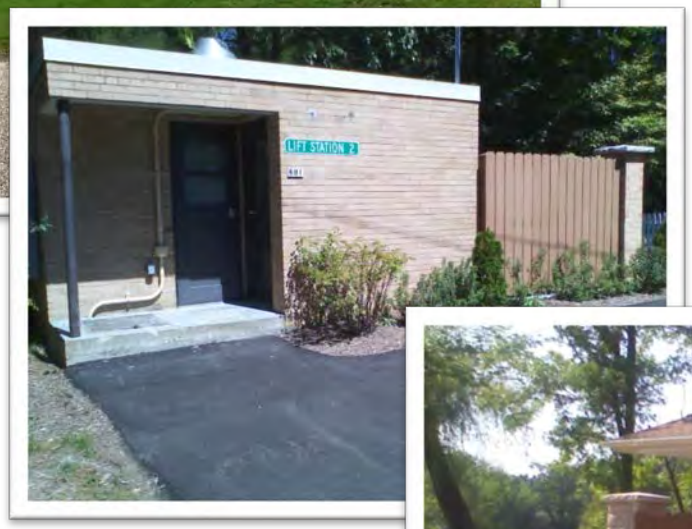
VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

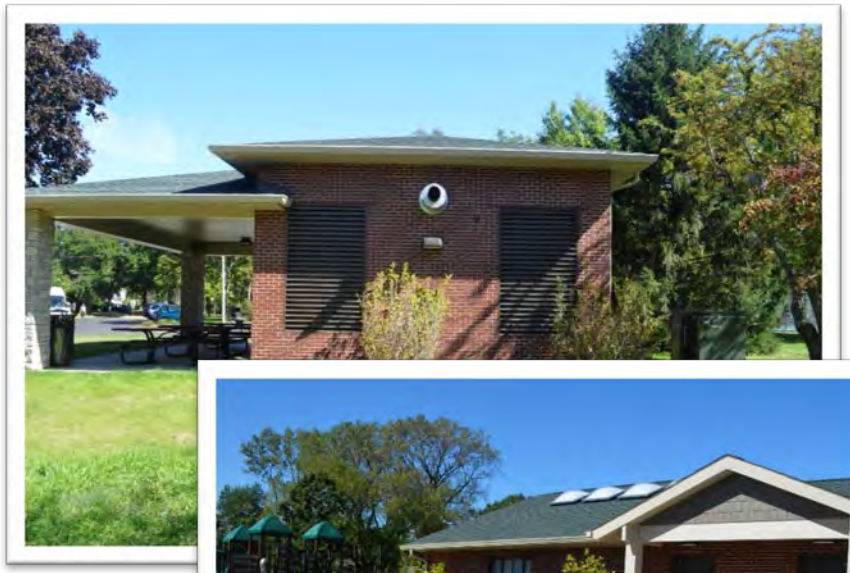
Pump Stations

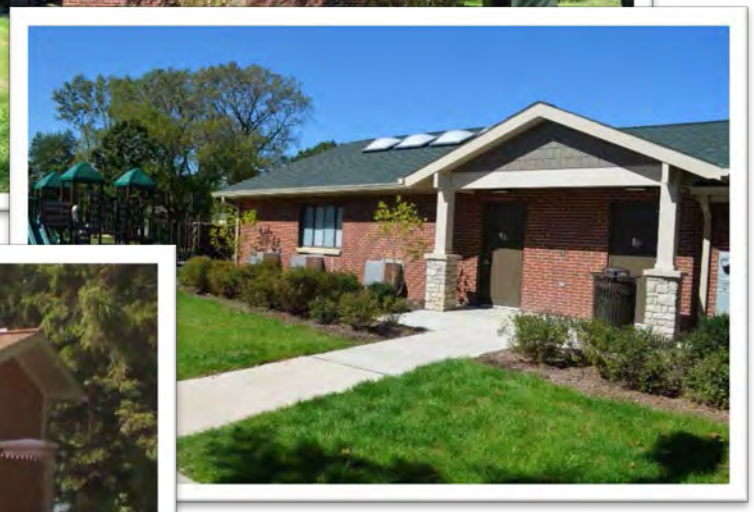
- Pump only volume below the gravity outlet
- Pump rate designed to provide similar performance to gravity outlet (24-hr drawdown)
- Backup pump and power included
- Will require more annual maintenance

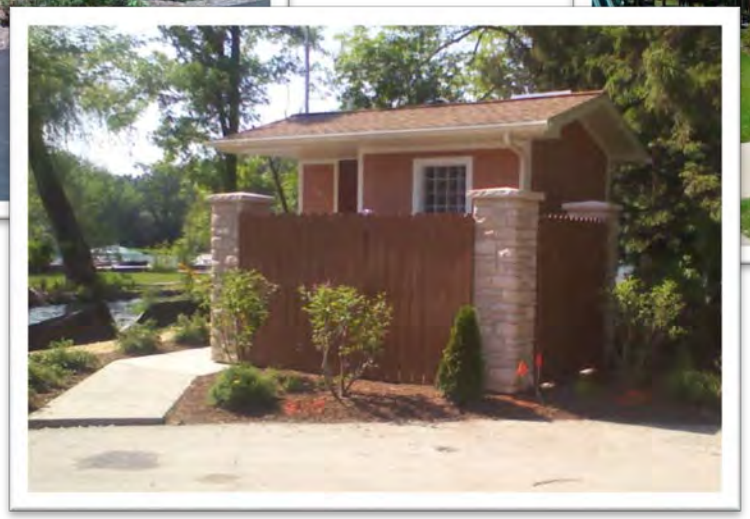
Pump Stations











VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$10,680,000

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$10,420,000 ($260,000↓)

2 Trees Removed

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

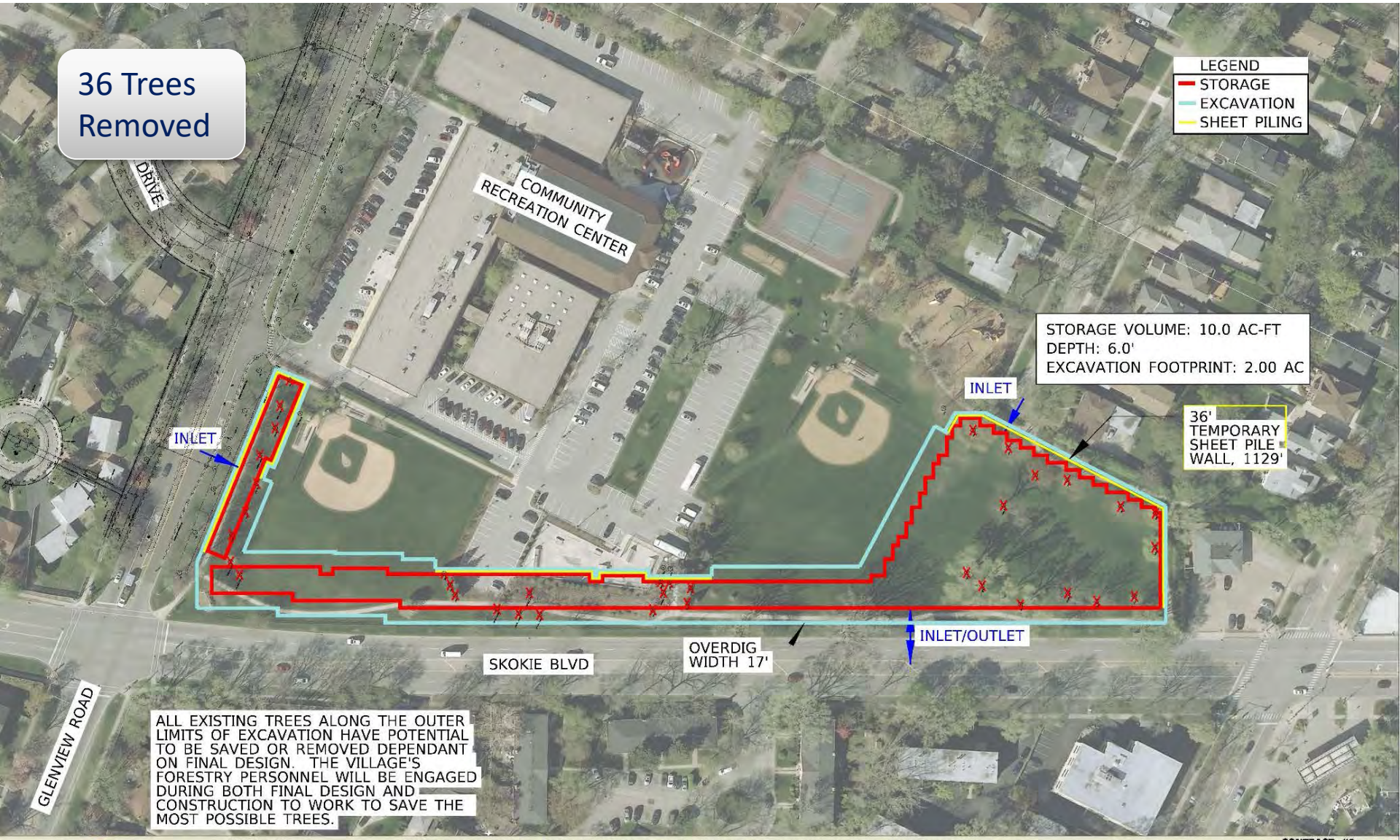
$9,880,000 ($800,000↓)

Community Playfield Comparison

Original Configuration	Alt. Configuration 1	Alt. Configuration 2
$10,680,000	$10,420,000 ($260,000↓)	$9,880,000 ($800,000↓)
Gravity Outlet	Gravity Outlet	Gravity & Pumped Outlet
Relocation of EX Detention	Preserves EX Detention	Preserves EX Detention
3.86 Acre footprint	3.56 Acre footprint	1.9 Acre footprint
6 feet Tall (underground)	6 feet Tall (underground)	11’-4” Tall (underground)
Removal of 32 trees	Removal of 2 trees	Protects all trees
Temp impact of 1 soccer field	Temp impact of 3 soccer fields	Temp impact of 1 soccer field

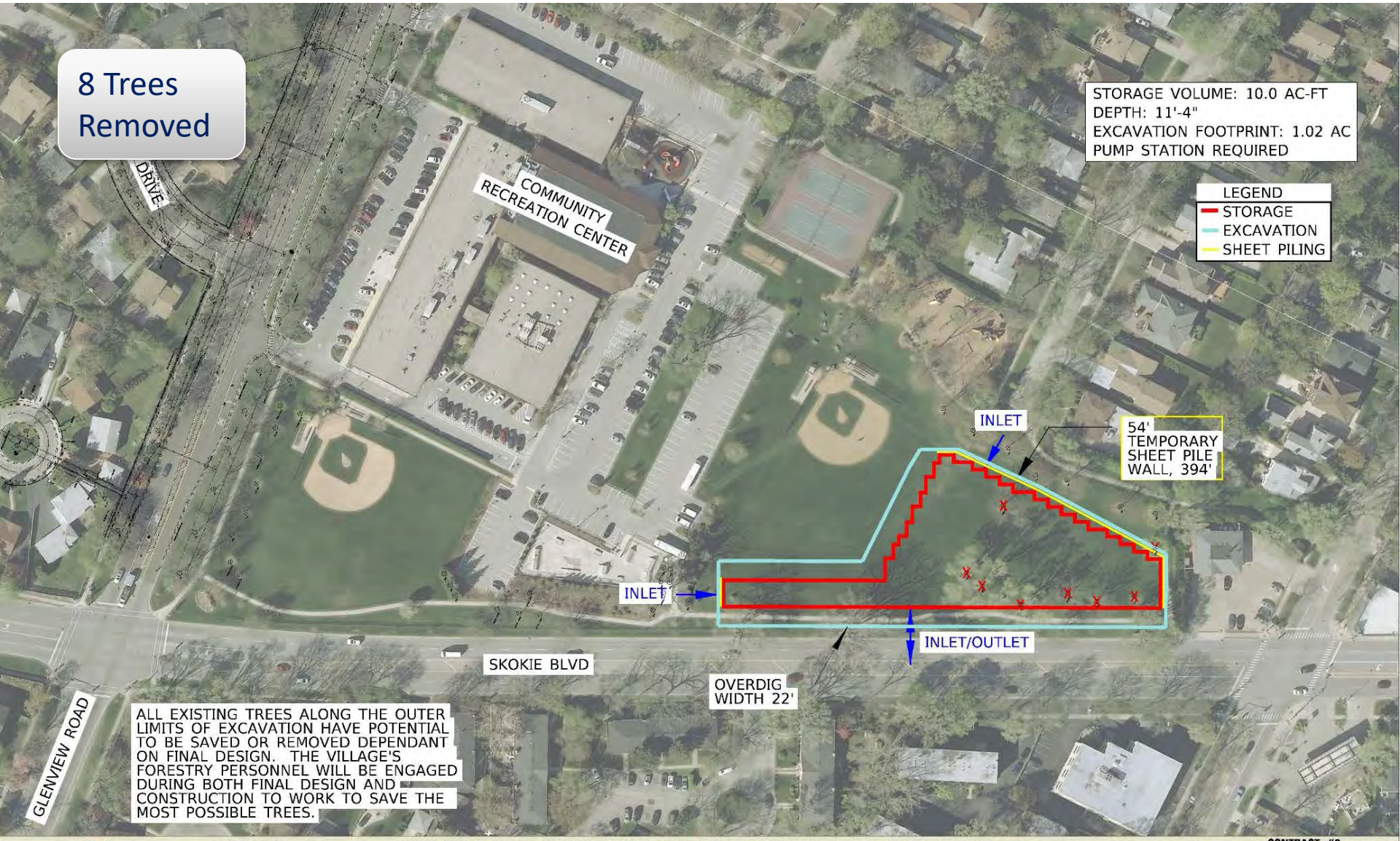
VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$7,430,000



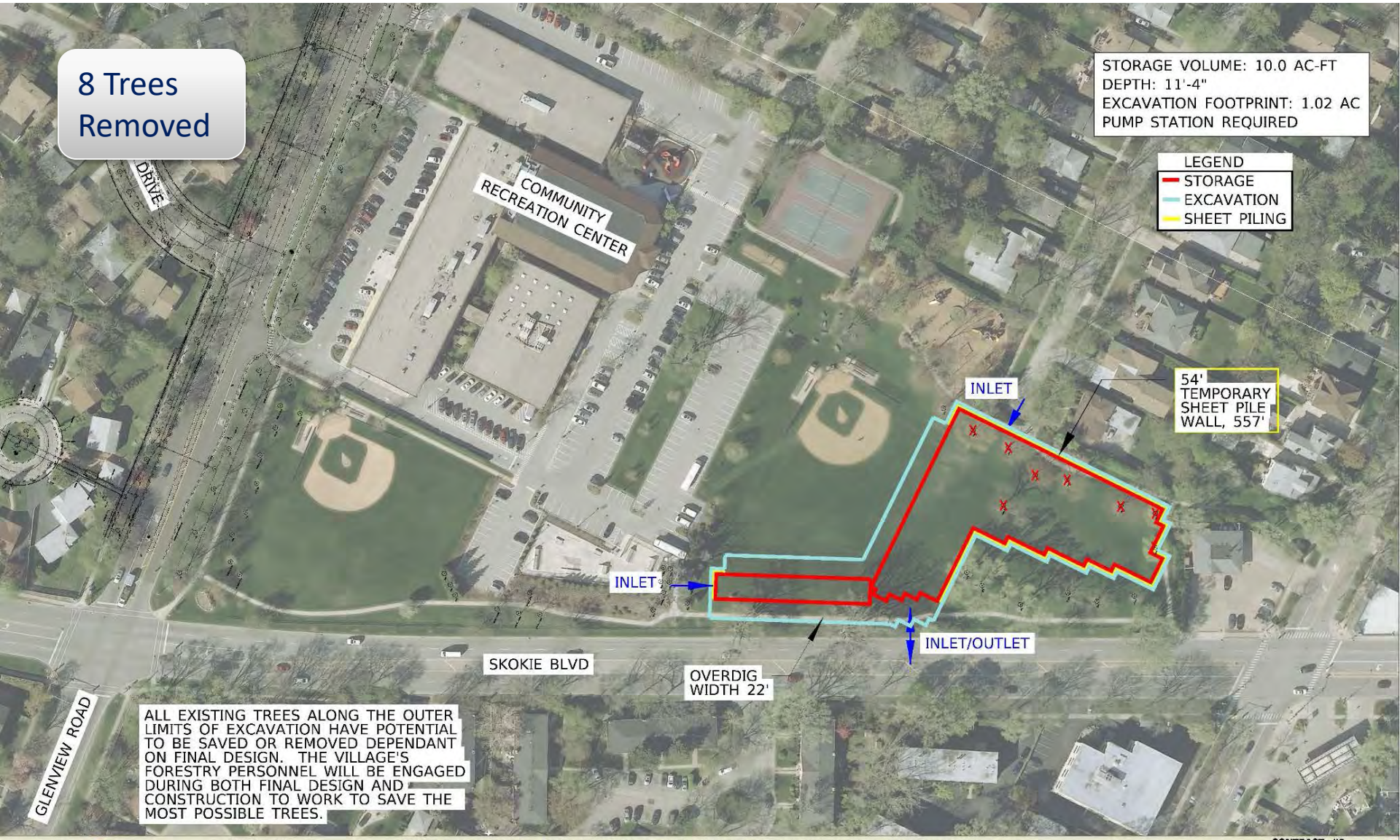
VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$6,280,000 ($1,150,000↓)



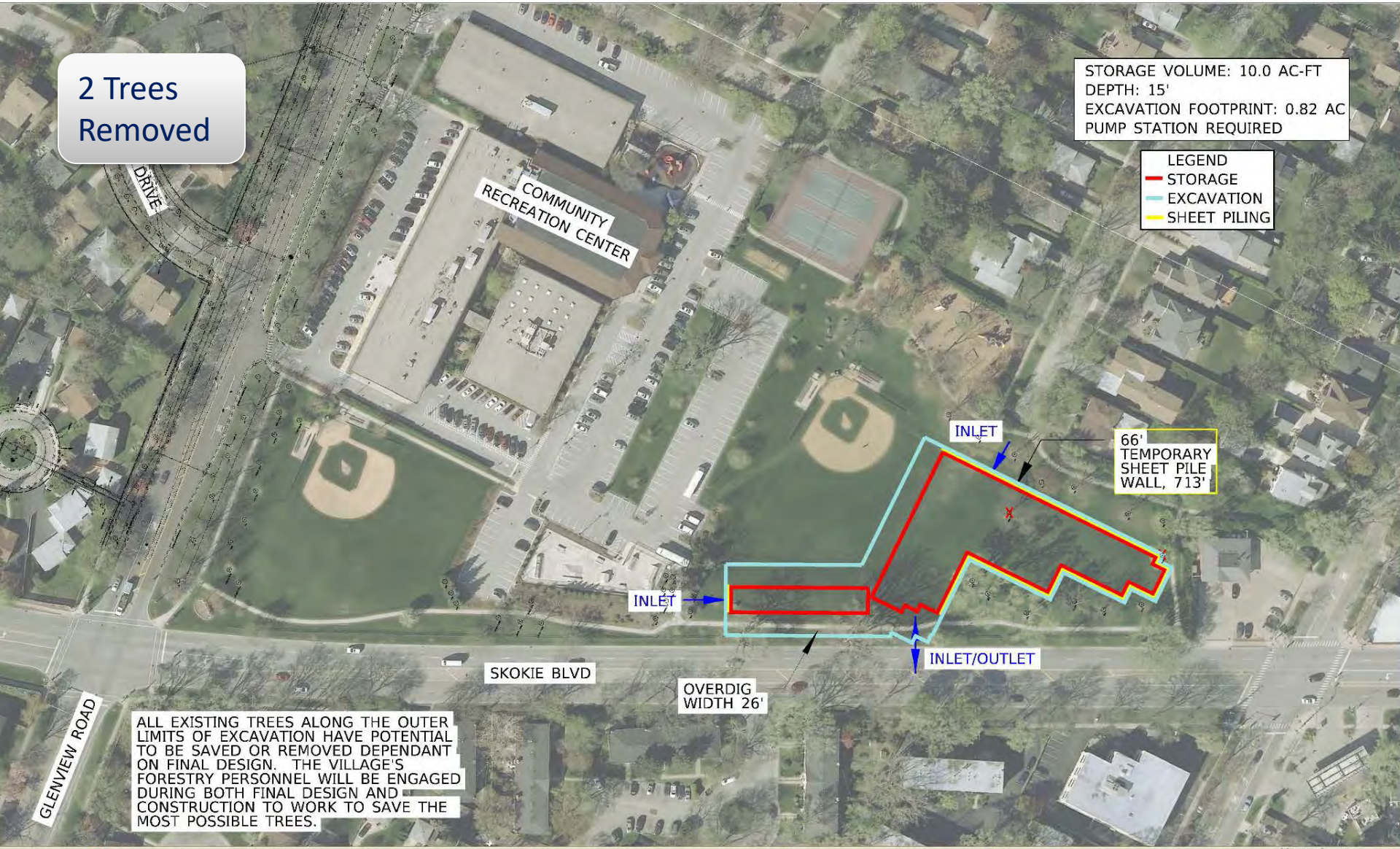
VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$6,340,000 ($1,090,000↓)



VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$7,180,000 ($250,000↓)



Hibbard ParkComparison

Original Configuration	Alt. Configuration 1	Alt. Configuration 2	Alt. Configuration 3
$7,430,000	$6,280,000 ($1,150,000↓)	$6,340,000 ($1,090,000↓)	$7,180,000 ($250,000↓)
Gravity Outlet	Gravity & Pumped Outlet	Gravity & Pumped Outlet	Gravity & Pumped Outlet
2.0 Acre footprint	1.0 Acre footprint	1.0 Acre footprint	0.8 Acre footprint
6 feet Tall (underground)	11’-4” Tall (underground)	11’-4” Tall (underground)	15 feet Tall (underground)
Removal of 36 trees	Removal of 8 trees on east side	Removal of 8 trees on west side	Removal of 2 trees on west side
Temp. disrupts 2 baseball fields	Temp. disrupts 1 baseball field	Temp. disrupts 1 baseball field	Temp. disrupts 1 baseball field

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$8,610,000

53 Trees Removed

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$8,810,000 ($200,000↑)

60 Trees Removed Preserves Oak Grove

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

$7,060,000 ($1,550,000↓)

3 Trees Removed

Thornwood Park Comparison

Original Configuration	Alt. Configuration 1	Alt. Configuration 2
$8,610,000	$8,810,000 ($200,000)	$7,060,000 ($1,550,000↓)
Gravity Outlet	Gravity Outlet	Gravity & Pumped Outlet
3.0 Acre footprint	3.0 Acre footprint	1.4 Acre footprint
6 feet Tall (underground)	6 feet Tall (underground)	11’-4” Tall (underground)
Removal of 53 trees	Removal of 60 trees	Removal of 3 trees
Impacts Oak grove	Preserves Oak grove	Preserves Oak grove
Temp impact of 2 baseball fields	Temp impact of 2 baseball fields	Temp impact of 2 baseball fields

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

Village of Wilmette West Side Neighborhood Storage

Stormwater Detention Vault Configuration Alternatives

Matthew J. Moffitt P.E., CFM, CPESC

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Consulting Engineers

Tree Impacts

[redacted]

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

Tree Impacts

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				
COTTONWOOD	25"	3				
COTTONWOOD	24"	3				
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						

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

VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

B&W

Tree Impacts

THORNWOOD PARK

PROPOSED CONFIGURATION					
SPECIES	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*
BASSWOOD	22"	2	OAK	16"	3
BASSWOOD	8"	3	PEAR	12"	2
BEECH	20"	4	PEAR	8"	3
CATALPA	6"	3	PEAR	8" 7" 5"	3
CRABAPPLE	10"	3	PINE	16"	3
CRABAPPLE	10"	3	PINE	16"	2
CRABAPPLE	7"	3	SPRUCE	12"	3
ELM	8"	3	SWEETGUM	7"	3
FLOWERING DOGWOOD	2-6"	4	SYCAMORE	12"	3
MAPLE	12" 3-6" 6-4" 5-3"	3	UNIDENTIFIED	11"	3
MAPLE	12"	3	UNIDENTIFIED	10"	
MAPLE	10"	4	UNIDENTIFIED	10"	
MAPLE	10"	3	UNIDENTIFIED	8-3"	
MAPLE	7"	3	UNIDENTIFIED	8"	
MAPLE	6"	3	UNIDENTIFIED	5"	
MAPLE	5"	2	UNIDENTIFIED	4-4"	
OAK	40"	1	UNIDENTIFIED	4"	
OAK	36"	3	UNIDENTIFIED	4"	
OAK	30"	3	UNIDENTIFIED	4"	
OAK	30"	3	UNIDENTIFIED	3"	
OAK	26"	3	UNIDENTIFIED	3"	
OAK	22"	3	UNIDENTIFIED	3"	
OAK	21"	3	UNIDENTIFIED	6-2"	
OAK	21"	3	UNIDENTIFIED	2"	
OAK	21"	3	UNIDENTIFIED	2"	
OAK	21"	3	UNIDENTIFIED	2-7" 4-4"	
OAK	20"	3			

ALTERNATIVE CONFIGURATION 1					
SPECIES	*DIA*	*CONDITION*	*SPECIES*	*DIA*	*CONDITION*
BALD CYPRESS	12"	4	UNIDENTIFIED	10"	
BASSWOOD	22"	3	UNIDENTIFIED	10"	
BASSWOOD	10" 4-8' 5"	3	UNIDENTIFIED	8-3"	
BASSWOOD	9	3	UNIDENTIFIED	8"	3
BASSWOOD	8"	3	UNIDENTIFIED	2-5" 3"	
BEECH	20"	4	UNIDENTIFIED	5"	
CATALPA	6"	3	UNIDENTIFIED	4-4"	
CRABAPPLE	10"	3	UNIDENTIFIED	4"	
CRABAPPLE	10"	3	UNIDENTIFIED	4"	
CRABAPPLE	7"	3	UNIDENTIFIED	3-3" 7-2"	
CYPRESS	12"	3	UNIDENTIFIED	3"	
CYPRESS	12"	3	UNIDENTIFIED	3"	
DOGWOOD	2-6"	4	UNIDENTIFIED	3"	
HAWTHORN	3-12"	2	UNIDENTIFIED	3"	
HAWTHORN	13"	3	UNIDENTIFIED	6-2"	
HAWTHRON	12"	3	UNIDENTIFIED	4-2" 2-2"	
HAWTHORN	2-10" 8"	3	UNIDENTIFIED	2"	
HAWTHORN	3-10"	3	UNIDENTIFIED	2"	
HAWTHRON	3-12"	3			
HAWTHRON	2-12"	2			
HONEY LOCUS	20"				
MAPLE	12" 3-6" 6-4" 5-3"	3			
MAPLE	11"	1			
MAPLE	10"	4			
MAPLE	10"	3			
MAPLE	7"	2			
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			

ALTERNATIVE CONFIGURATION 2		
SPECIES	*DIA*	*CONDITION*
SYCAMORE	2-12"	3
UNIDENTIFIED	3"	
UNIDENTIFIED	2"	

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

VILLAGE OF WILMETTE
STORMWATER ACTION PLAN

B&W