2024 Illinois Association of Floodplain and Stormwater Managers

Knollwood Flood Mitigation Project

Raise the Road!

Fox Lake, IL

Michael Warner, PE, CFM, DECI

GEWALT HAMILTON ASSOCIATES, INC.

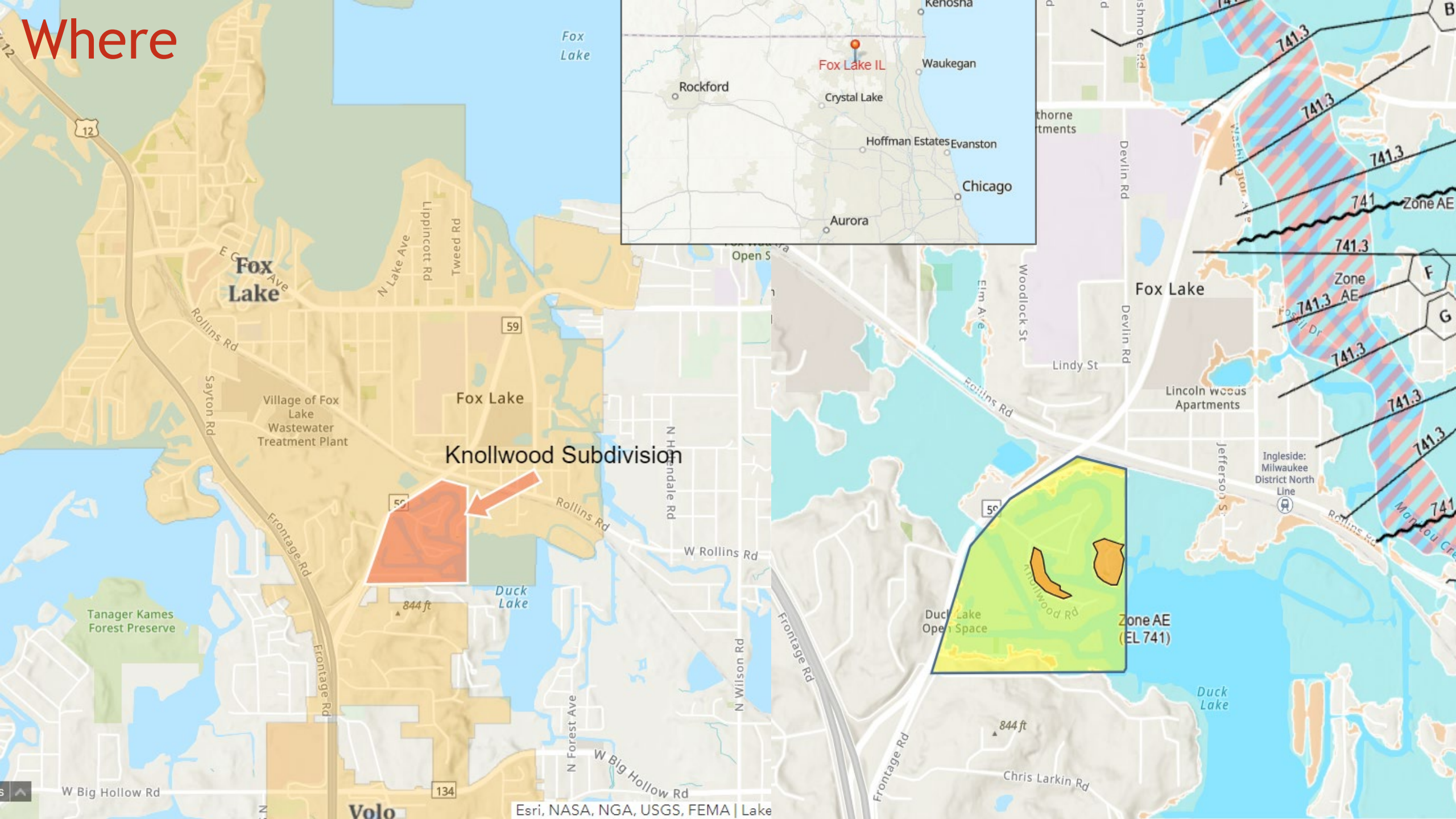
Susan Novak, PE
Director Of Public Works
Village of Fox Lake

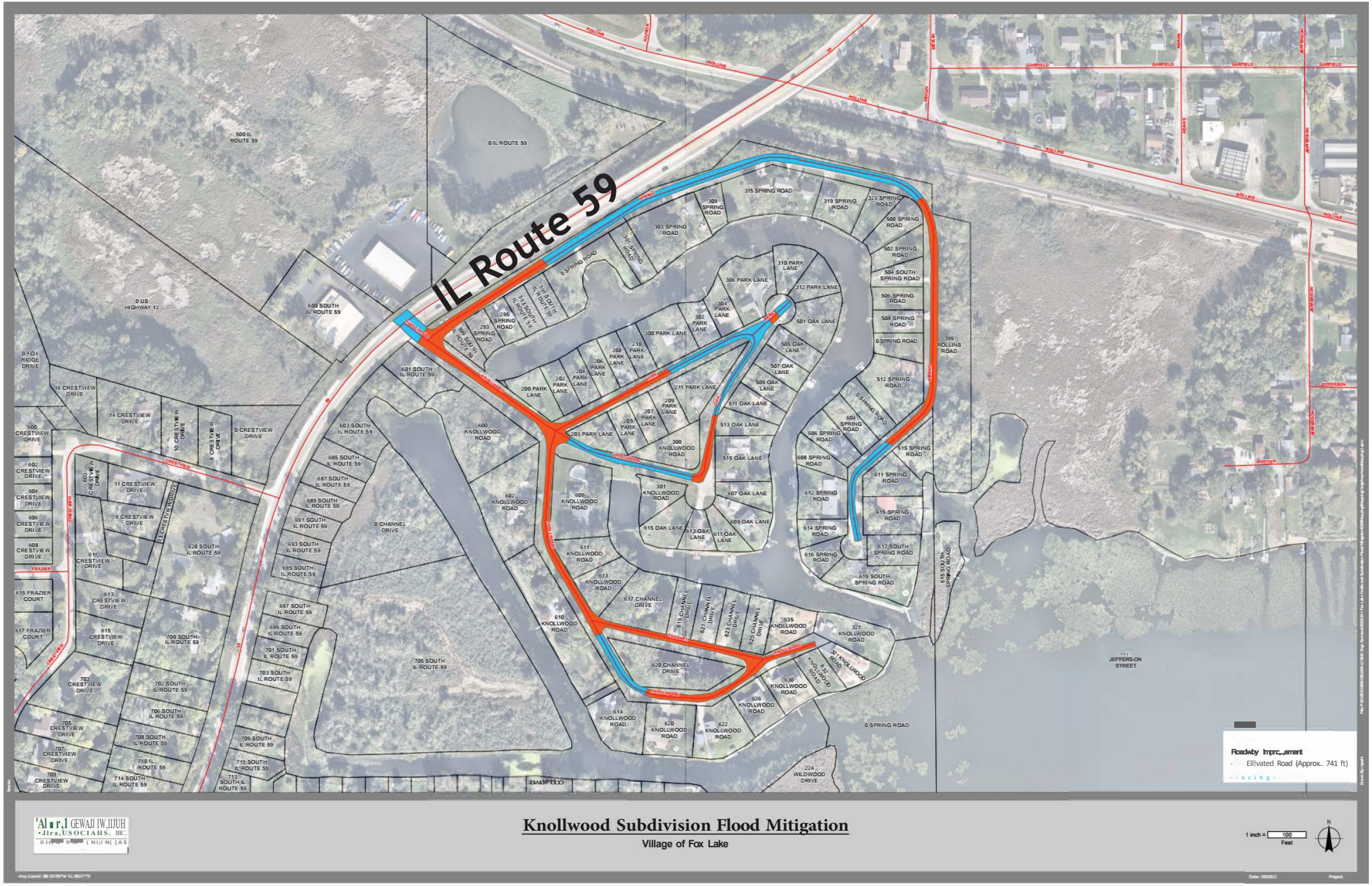
Wadee Rafati, PE

GEWALT HAMILTON ASSOCIATES, INC.


Raise The Roof | Uncle Luke | Choreography by Bethany Hall
Copy link

Where


Fox Lake IL
Kenosha
Waukegan
Rockford
Crystal Lake
Hoffman Estates
Evanston
Chicago
Aurora
Knollwood Subdivision
Fox Lake
Village of Fox Lake Wastewater Treatment Plant
Tanager Kames Forest Preserve
Duck Lake
844 ft
Rollins Rd
W Rollins Rd
Frontage Rd
Sayton Rd
N Lake Ave
Lippincott Rd
Tweed Rd
N Hendandale Rd
N Wilson Rd
N Forest Ave
W Big Hollow Rd
Volo
Lindy St
Woodlock St
Devlin Rd
Elm Ave
Lincoln Woods Apartments
Ingleside: Milwaukee District North Line
Jeffersonst
Duck Lake Open Space
Knollwood Rd
Zone AE (EL 741)
Chris Larkin Rd
Zone AE
741.3
741
Zone F
Zone G
Esri, NASA, NGA, USGS, FEMA | Lake


IL Route 59
Knollwood Subdivision Flood Mitigation
Village of Fox Lake
Roadway Improvement
Elevated Road (Approx. 741 ft)
1 inch = 100 Feet

Knollwood - what is happening to the roads?
Soils – loose organic silt/peat over 20’ deep in some spots
Roads compacting/subsiding over a long period of time

SOIL AND MATERIAL CONSULTANTS, INC.

8 W. COLLEGE DR. • SUITE C • ARLINGTON HEIGHTS, IL 60004

Client: Gewalt Hamilton Associates, Inc.

Reference: Knollwood Subdivision
Fox Lake, IL

Comments:

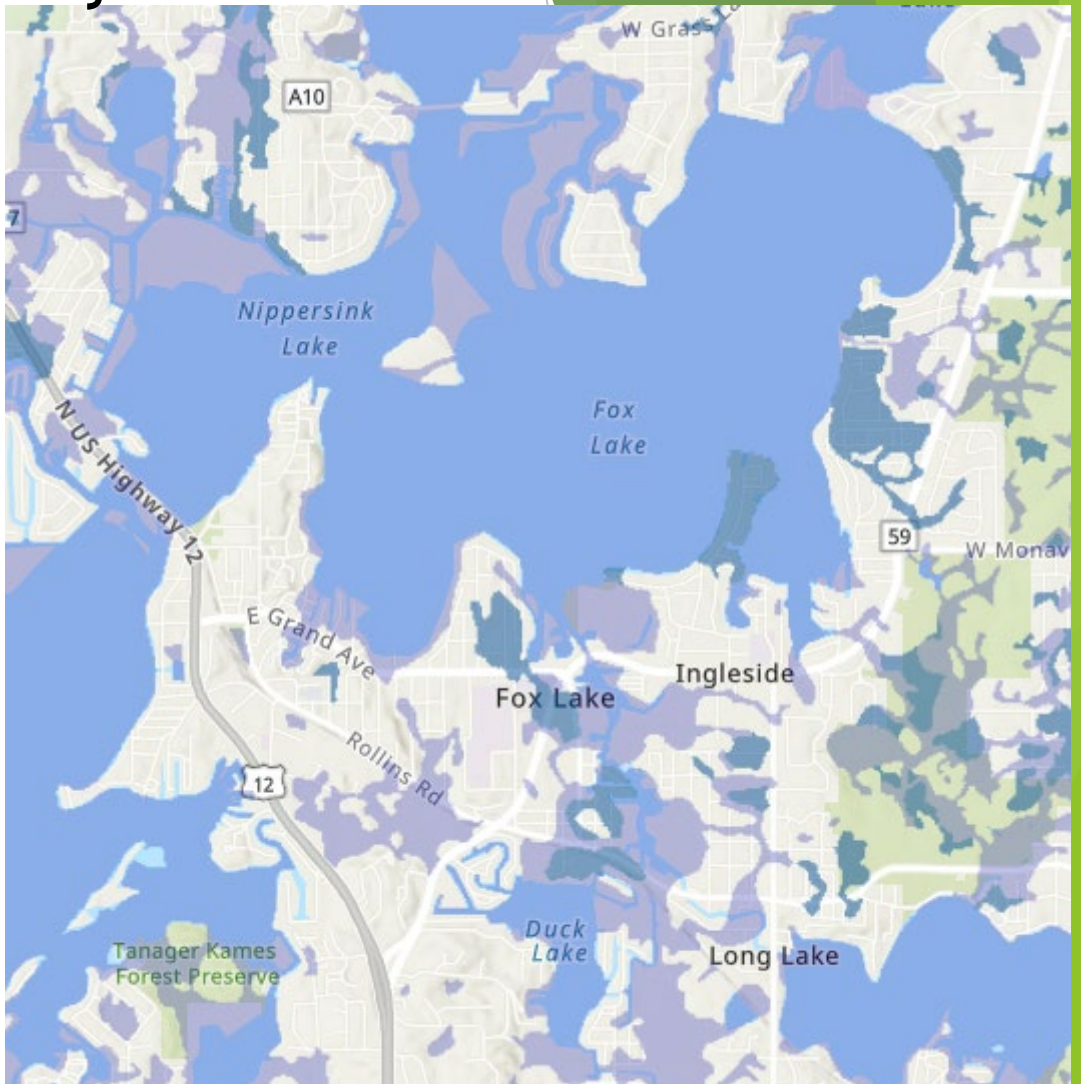
Equipment: ☐D-25 ☑D-50 ☐Hand Auger ☐Other

CLASSIFICATION

Elevation Existing Surface

depth, ft.	
	Black organic silt,some gravel,trace sand,damp-very damp,very loose - Fill
5	
	Dark brown-black organic peat,trace shells,very damp,very loose
10	
15	Brown-gray organic silt,trace shells, very damp,very loose
	Gray fine sand,trace medium-coarse sand, saturated,very loose to loose
20	
	Gray fine sand,some medium-coarse sand, trace gravel,saturated,medium dense
25	
30	End of Boring
35	
40	

Lake County and around Fox Lake have vast areas of hydric soils



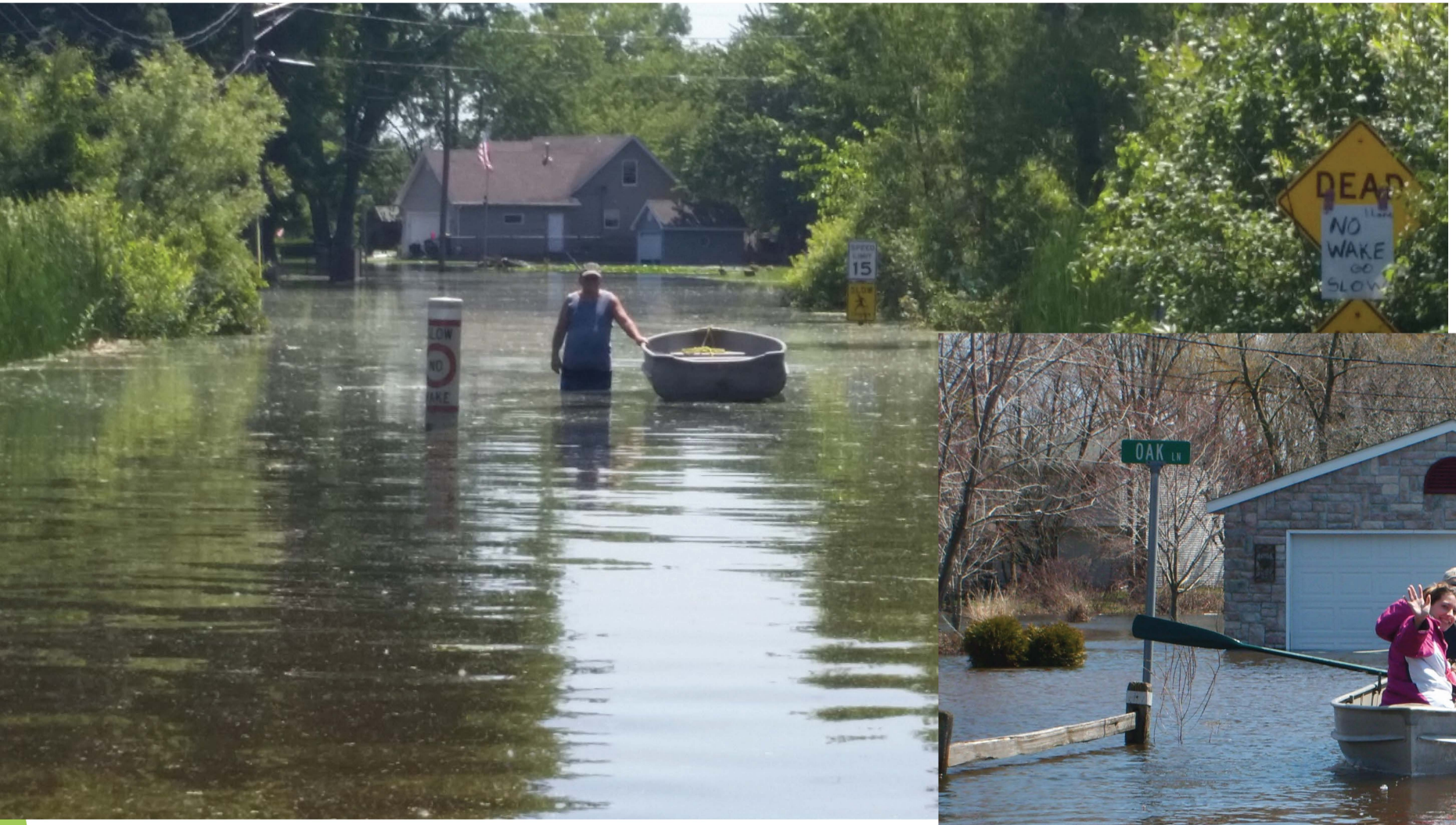
A. The restoration fill shall meet pre-subsidence elevations, and within riverine areas, the pre-subsidence effective *Regulatory Floodplain* and *Regulatory Floodway* conveyance shall be maintained.

What was the key elevation?

Flooding Source and Location	*Elevation (feet NAVD 88)*			
	10-Percent-Annual-Chance	*2-Percent-Annual-Chance*	*1-Percent-Annual-Chance*	*0.2-Percent-Annual-Chance*
Nippersink Lake (including Dunns Lake)	739.4	740.7	741.3	742.5

- 741.00 to provide 100-year protection
  - **Access to homes can be maintained during the 100-year event at elevation 741.00**
  - **0.3’ makes a difference in design and price**

Why
The Problem – It floods


15
NO
WAKE
GO
SLOW

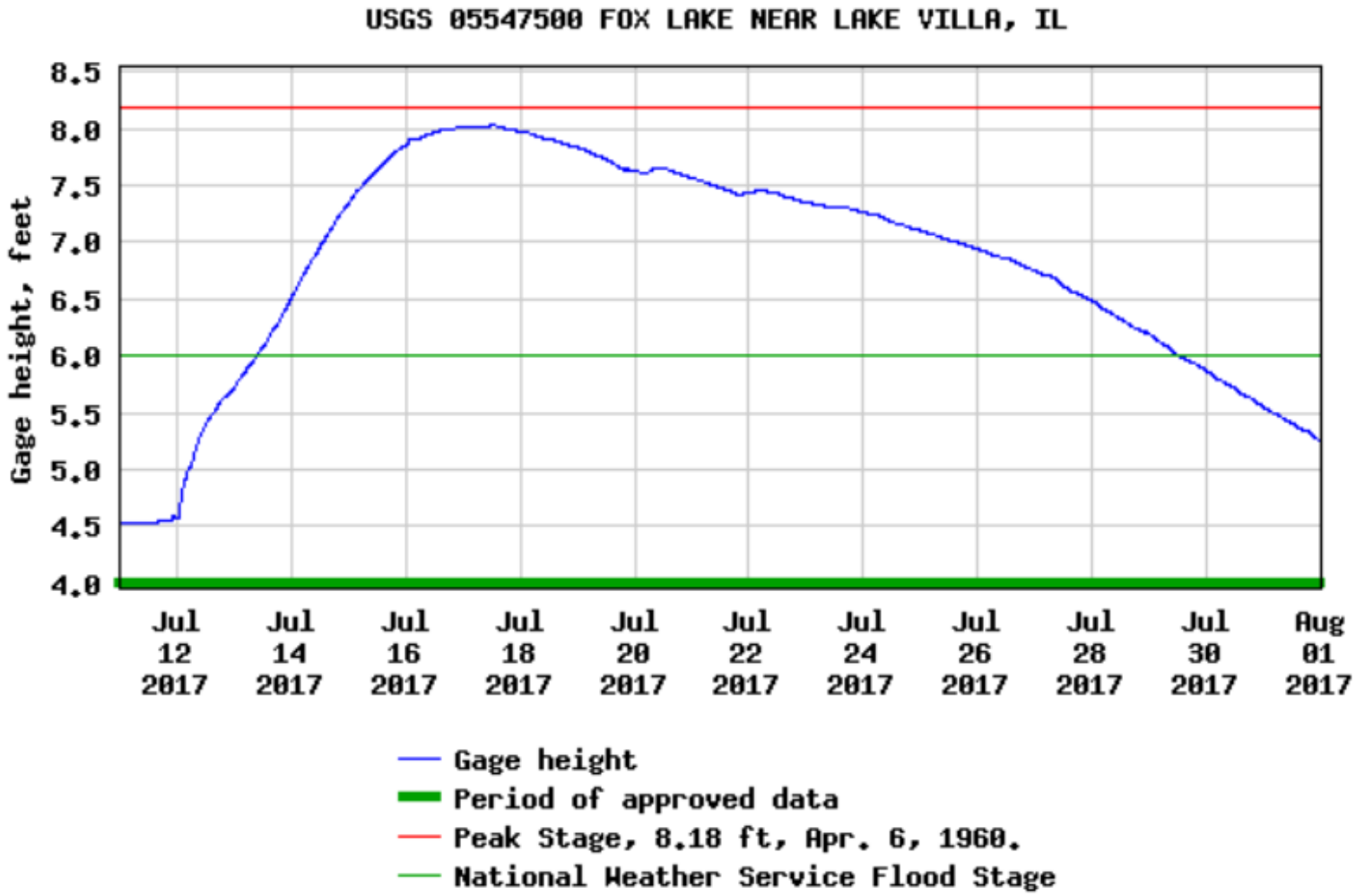

OAK LN

Knollwood Homes Raised above BFE

Additional flood mitigation - Knollwood Residential Buyouts
2 homes remediated by Lake County Stormwater Management Commission buyout program

When did – it flood?

- Flood events – how bad was it?
- Knollwood Road impassable = 6.5-7
- June 2008 – 7 days
- April 2013 – 10 days
- July 2017 – 14 days



Who was involved

- Knollwood Neighborhood Residents – rallied officials, assisted with easements
- Village of Fox Lake – elevated flooding concern, lobbied for project, easements
- Lake County Stormwater Management Commission – sought grants, worked with stakeholders
- Illinois State Representatives and Senators – appropriated funding, prioritized flood mitigation
- IL Department of Commerce and Economic Opportunity – grant funding and project management
- Governor J.B. Pritzker's Office – supported budgeting and prioritization
- Gewalt Hamilton Associates – project design, construction, SE/SC monitoring
- Maneval Paving Company – construction contractor, under contract time and under budget

Lake County Stormwater Management Commission, Lake County, IL

GHA Gewalt Hamilton Associates, Inc. Consulting Engineers

Maneval Paving

Since 1983 Woman Owned certified WBENC Women's Business Enterprise

DCEO and More Acronyms

- Department of Commerce and Economic Opportunities
- BEP MBE/WBE/DBE - Is it a goal or requirement?
- Monthly Reporting Requirements
  - PPR & PFR
  - Cancelled Checks
  - Payment Applications with Waivers

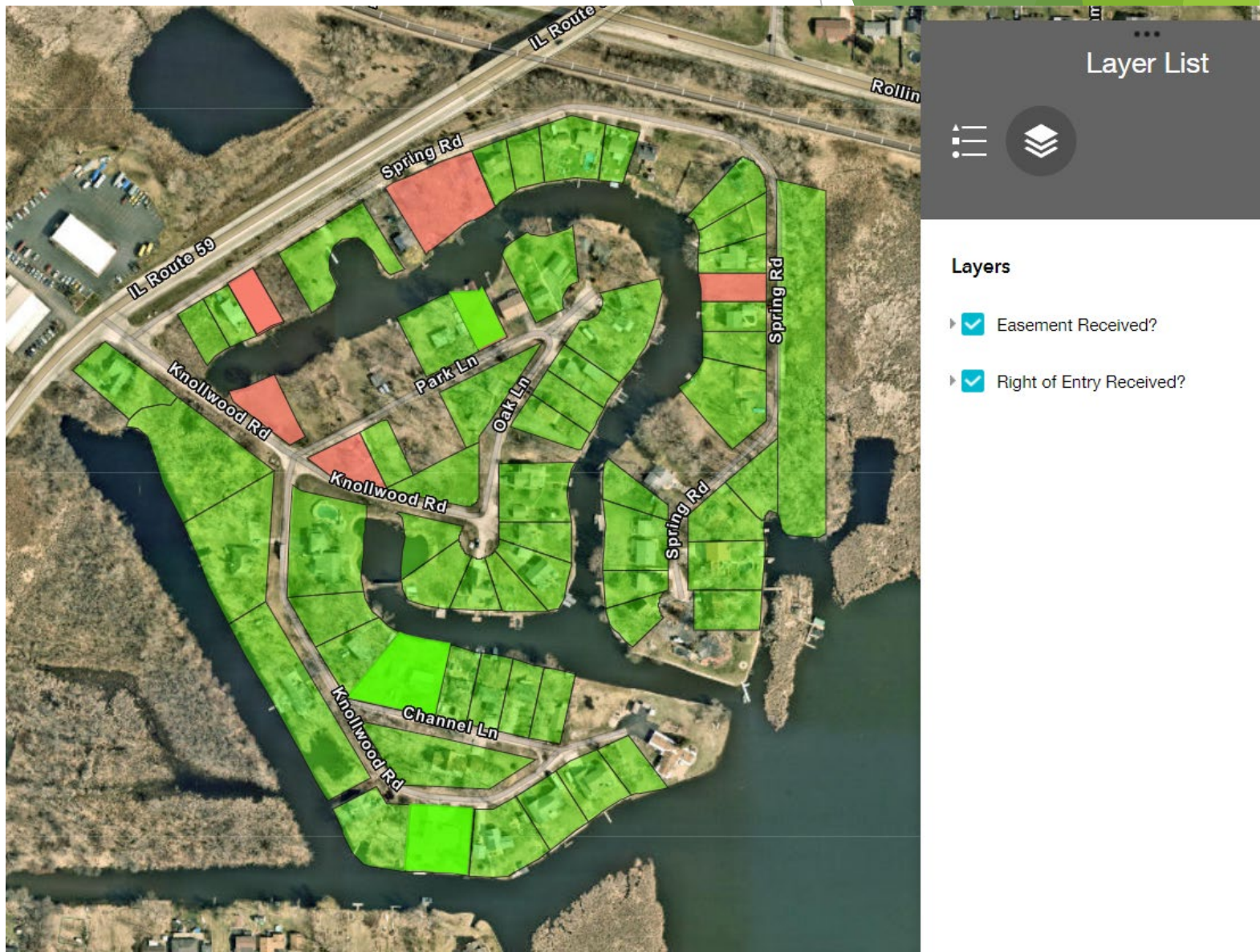
LAKE COUNTY Stormwater MANAGEMENT COMMISSION LAKE COUNTY, IL

When did -

- Funding - Announced November 2021
- GHA Design - Winter 2021
- Public Outreach/Neighborhood Meeting - January 2022
  - Begin easement outreach

When did -

- Easements ultimately finalized (during construction)
- Ongoing right of entry/easement webapp
- **Knollwood Easement App**



When were -

Permits issued

- USACE (June 2022)
- LCSMC (June 2022)
- IDNR-OWR (Delegated project to LCSMC)
- IDNR EcoCAT and Wetland Impact signoff “minimal alteration”
- IEPA SP3, NOI 5/2022, NOT 5/2023

The following special conditions are a requirement of your authorization:

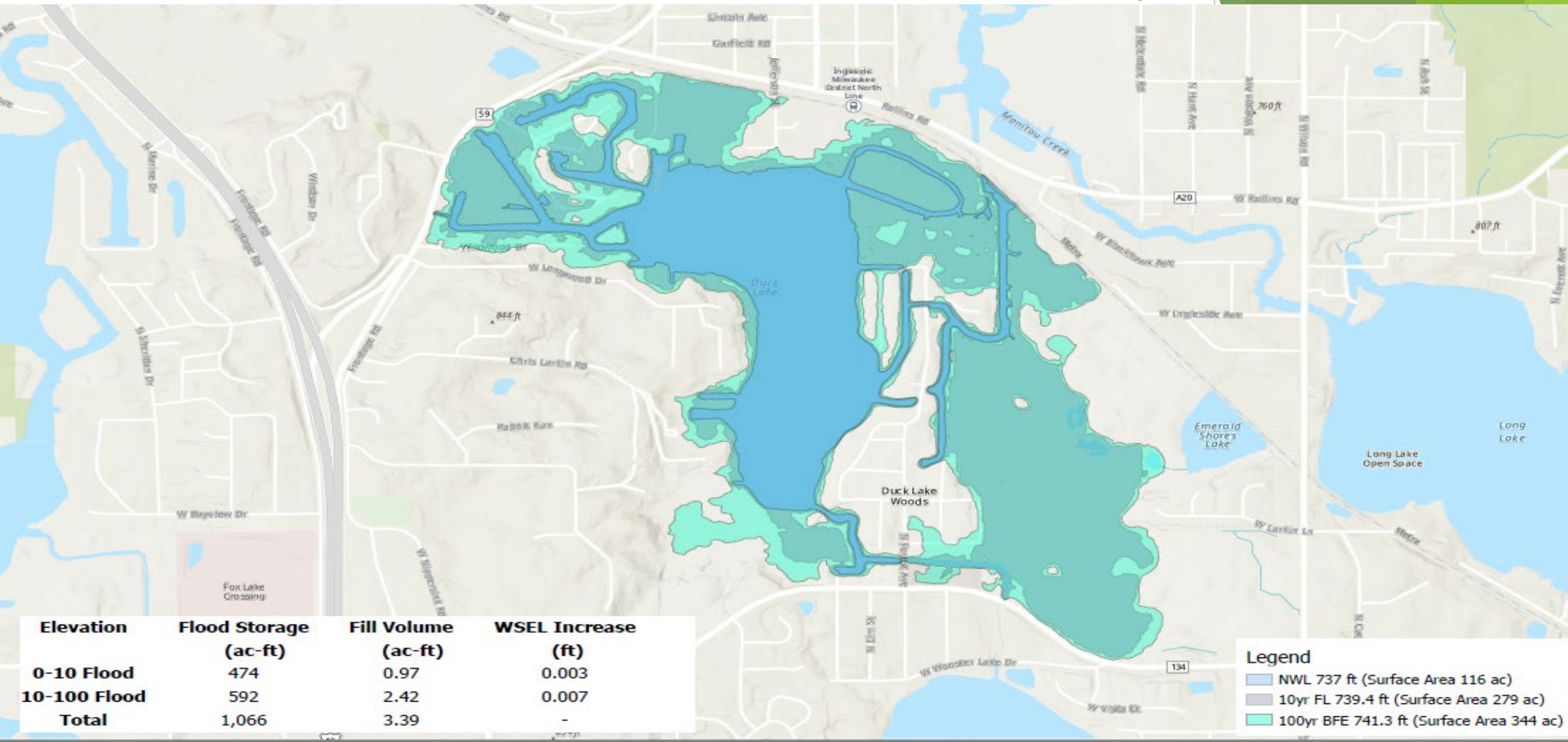
1. This authorization is contingent upon implementing and maintaining soil erosion and sediment controls in a serviceable condition throughout the duration of the project. You shall comply with the Lake County Stormwater Management Commission (LCSMC)'s written and verbal recommendations regarding the soil erosion and sediment control (SESC) plan and the installation and maintenance requirements of the SESC practices on-site.

   a. You shall schedule a preconstruction meeting with LCSMC to discuss the SESC plan and the installation and maintenance requirements of the SESC practices on the site. You shall contact the LCSMC at least 10 calendar days prior to the preconstruction meeting so that a representative may attend.

   b. You shall notify the LCSMC or the LCSMC’s designated agent of any changes or modifications to the approved plan set. Field conditions during project construction may require the implementation of additional SESC measures. If you fail to implement corrective measures, this office may require more frequent site inspections to ensure the installed SESC measures are acceptable.

   c. Prior to commencement of any in-stream work, you shall submit constructions plans and a detailed narrative disclosing the contractor's preferred method of cofferdam and dewatering method to the LCSMC or the LCSMC’s designated agent. Work in the waterway shall NOT commence until the LCSMC notifies you, in writing, that the plans have been approved.

Permits issued - LCSMC Determined as "Public Flood Control Project"



Elevation	Flood Storage (ac-ft)	Fill Volume (ac-ft)	WSEL Increase (ft)
0-10 Flood	474	0.97	0.003
10-100 Flood	592	2.42	0.007
Total	1,066	3.39	-

Exhibit 2 - Flood Height Analysis

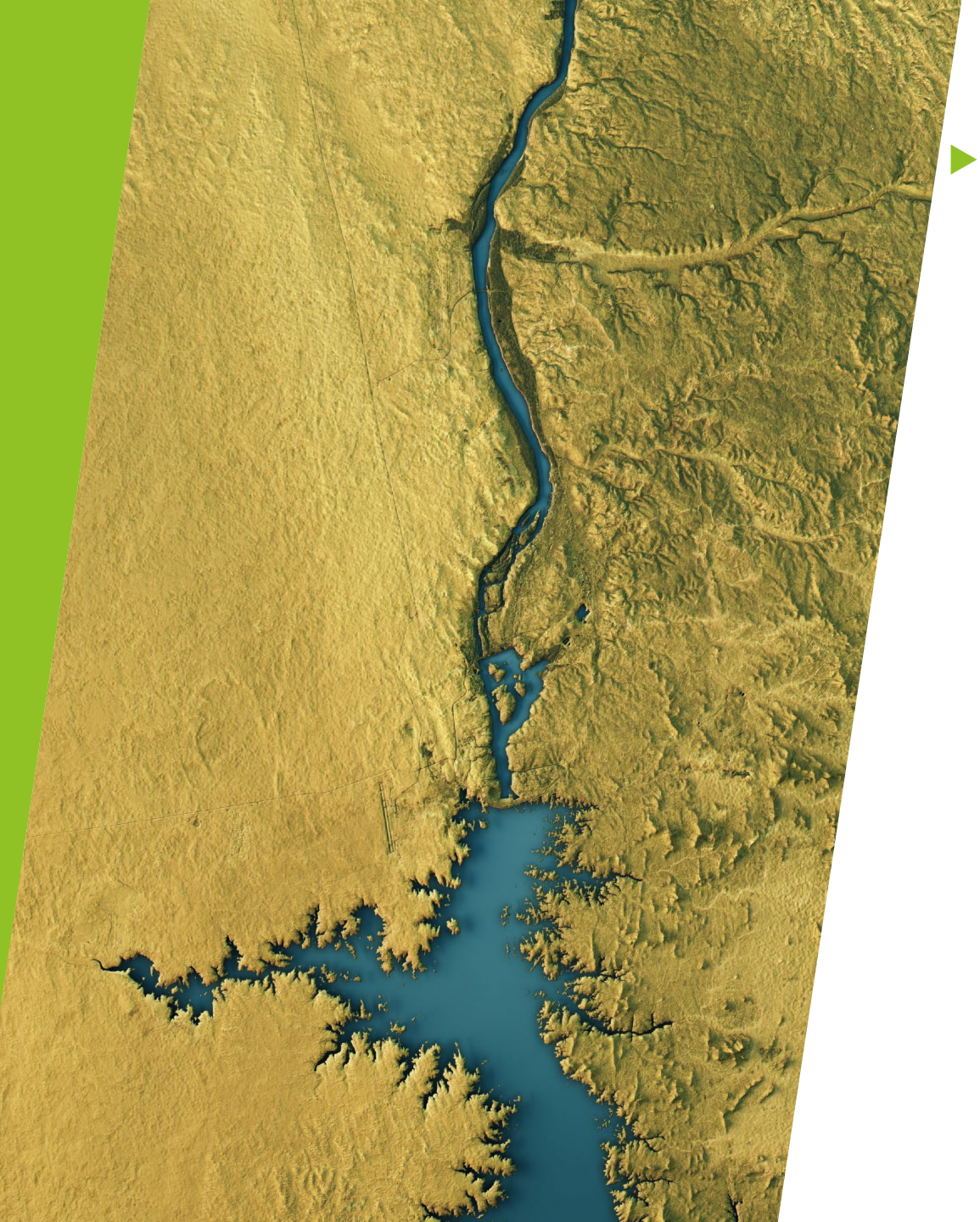
Knollwood Subdivision Flood Mitigation

GHA GEWALT HAMILTON ASSOCIATES, INC. CONSULTING ENGINEERS www.gha-engineers.com

1 inch = 800 Feet

Wetland Impacts

- Initial design > 0.1 acre impact = mitigation need
- Design refinements < 0.1 acres of permanent impact
- Both Corps (0.092 ac) and Isolated wetlands (0.008 ac)
- Maintain hydrology for Isolated wetland



- SE/SC Critical
  - Construction within wetlands (temporary and permanent impacts)
  - Entire site an arm's length away from Duck Lake
  - Several overland flow paths and culverts to install
  - Long construction timeline expected
  - Likelihood of another flood fairly high?

When was -

Designated Erosion Control Inspector (DECI) Duties

Lake County DECI mirrors the IEPA ILR10 requirement minimums

Pre-construction meeting – 8/8/22

Initial SE/SC installation to DECI closeout 8/15/22 – 5/23/23

40-week active DECI period

35 – GHA DECI Inspections (formal reports)

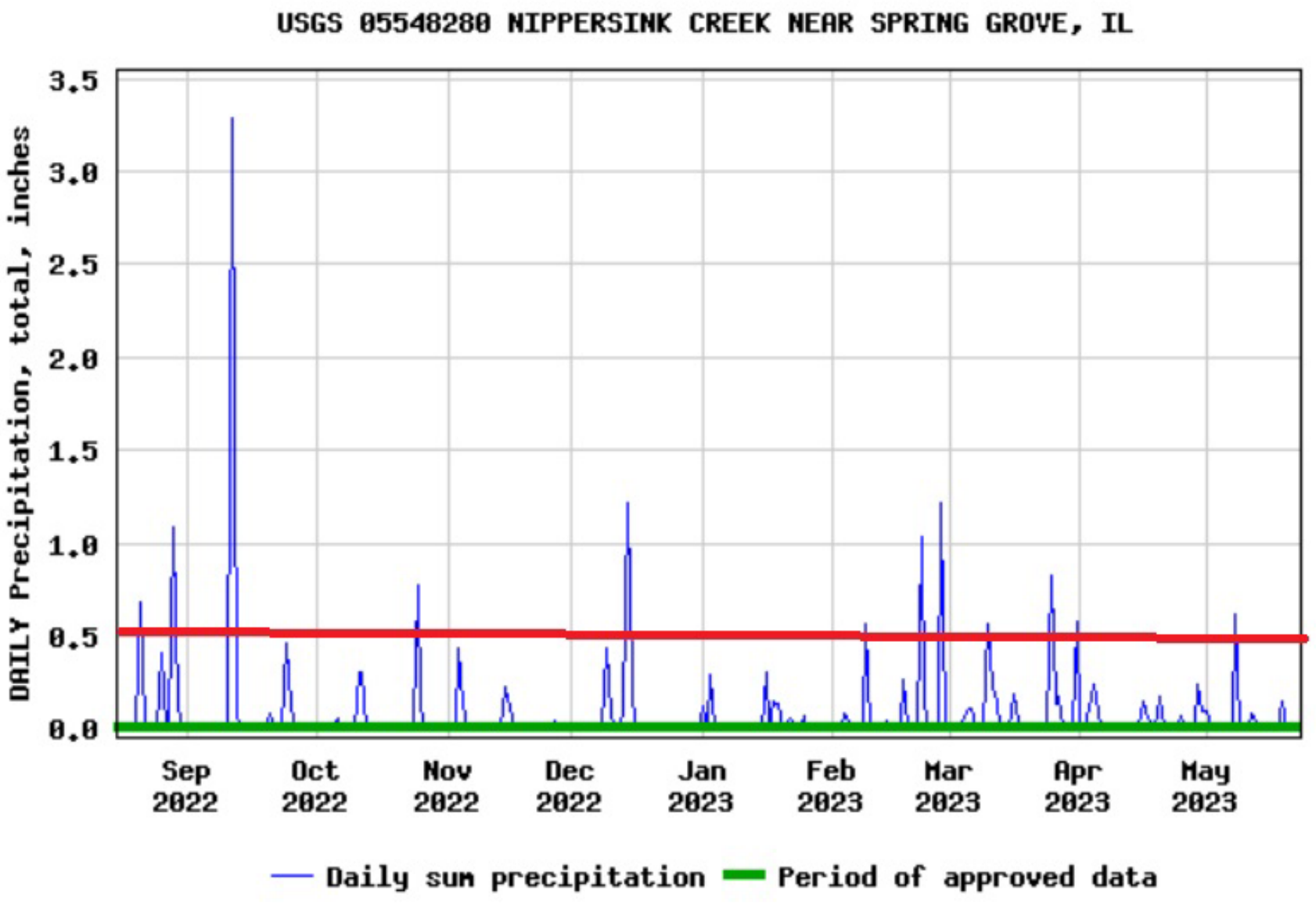
2 – McHenry-Lake Soil and Water Conservation District Inspections (IEPA-NPDES Based)

11 – Lake County SMC SE/SC Inspections

8 – additional LCSMC resident engineer coordination meetings

When was -

- 15 > 0.5” Precipitation Triggered Inspections
- USGS Nippersink+CoCoRhas Monitoring
- Typically LCSMC inspections followed precip events, or major project stages



Coir logs moved and replaced

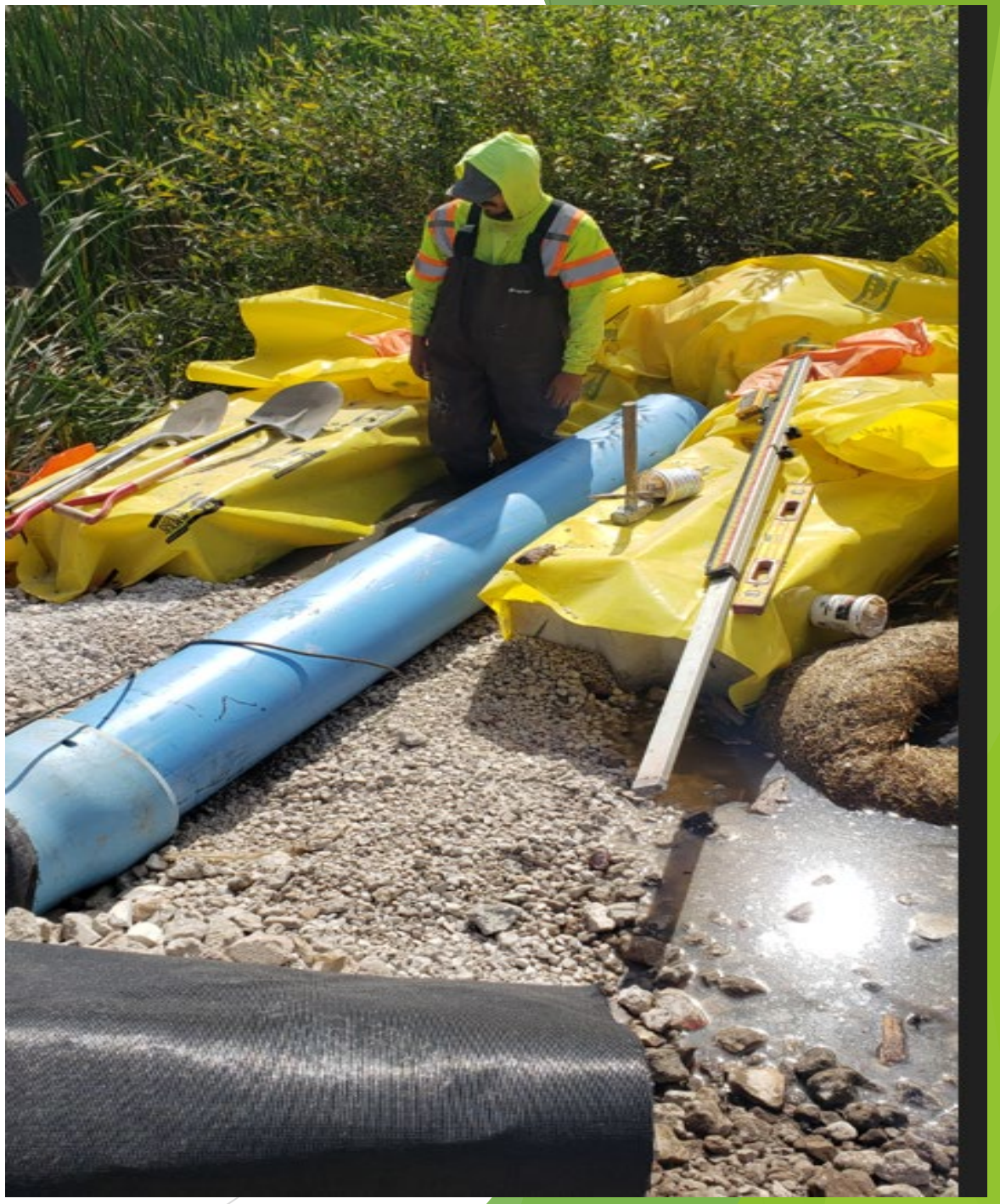
When was the use of coir fibers for construction purposes first **documented ?**

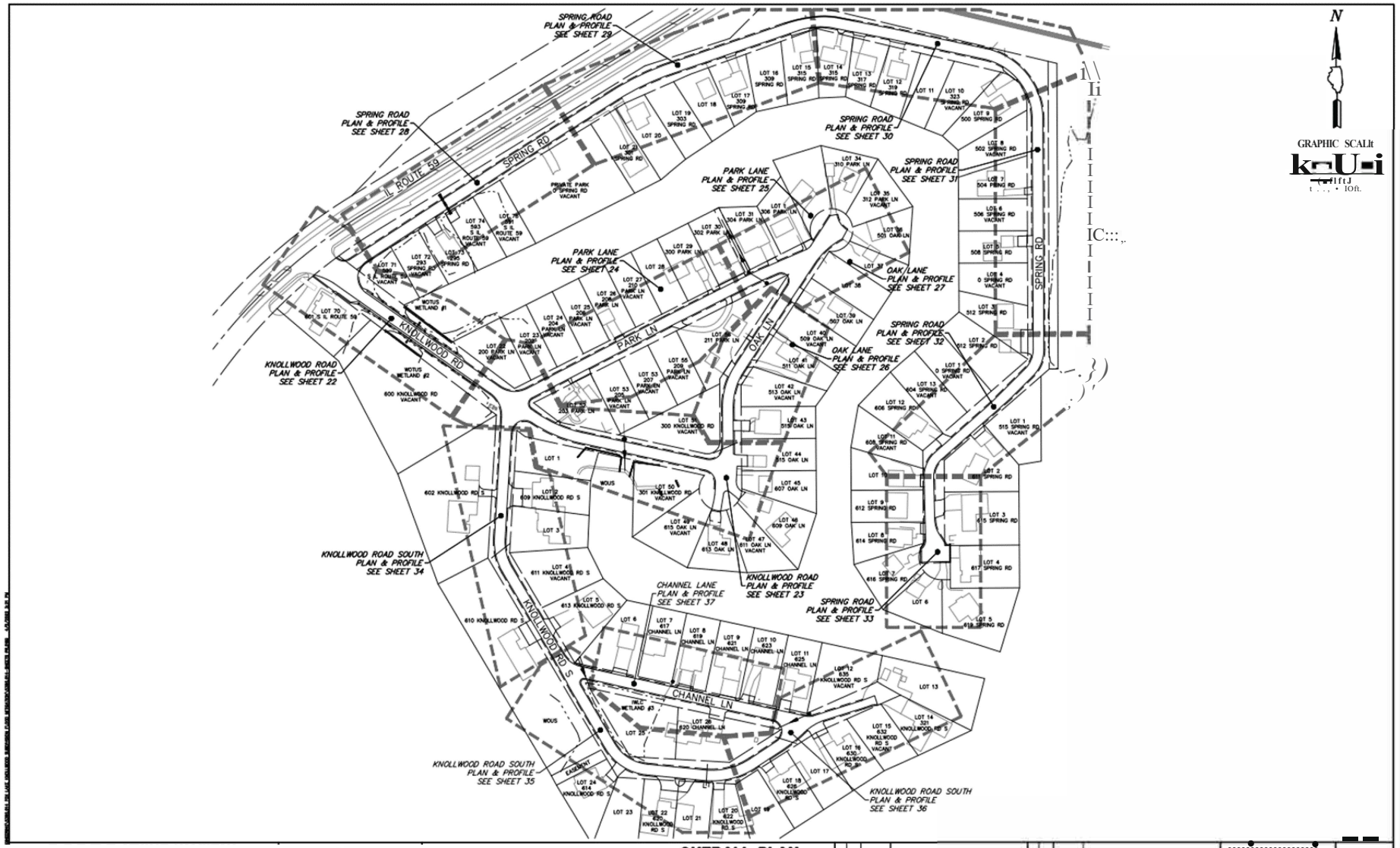
A. Third century B.C.
B. First century A.D
C. 11th century A.D.
D. In the movie Castaway with Tom Hanks

Entrance road cross culvert

Cofferdam method:

Used plastic-wrapped concrete block



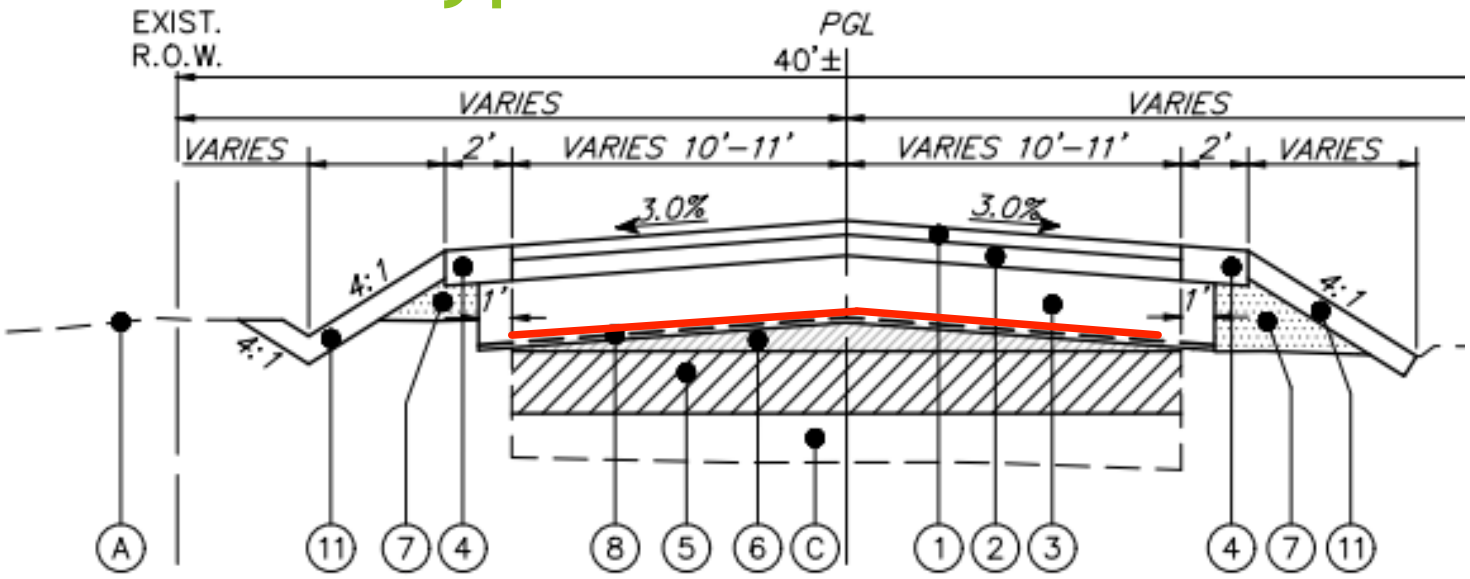


Flooding Source and Location	Elevation (feet NAVD 88) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Nippersink Lake (including Dunns Lake)	739.4	740.7	741.3	742.5

Design Challenges

- How are we going to raise the road 2+ feet?
- Existing Road Geometry
- The Entrance
  - Wetlands
  - Soil Conditions
- Heavy impact on private property
  - Driveways and connecting slopes
  - Grading off edge of new roadway
- Drainage
  - How to maintain existing drainage patterns when you're building a dam in the middle of a subdivision
- Utility Conflicts
  - Aerial Wires??
- Construction Sequencing

How are we going to raise the road? - Typical Section



KNOLLWOOD ROAD RECONSTRUCTION

PROPOSED TYPICAL SECTION

STA. 104+50 TO STA. 108+75

Core	HMA Surface (in.)	HMA Binder (in.)	Total HMA (in.)	Granular Base (in.)	Total Pavement (in.)
Spring Rd.					
1	1.5	1.5	3.0	19.0	22.0
2	**1.75**	1.5	3.25	7.75	11.0
3	1.75	1.75	3.5	11.25	14.75
4	**1.5**	---	1.5	28.5	30.0
5	**3.0**	---	3.0	12.75	15.75
Park Ln.					
6	3.5	---	3.52	38.5	42.0
7	3.0	2.75	5.75	18.25	24.0
Knollwood Rd.					
8	2.5	**3.0**	5.5	30.5	36.0
Channel Dr.					
9	1.25	2.25	3.5	11.5	15.0
S. Knollwood Rd.					
10	0.75	1.75	2.5	14.75	17.25
11	2.0	---	2.0	28.0	30.0
12	1.5	1.5	3.0	13.0	16.0

TYPICAL CROSS SECTION LEGEND

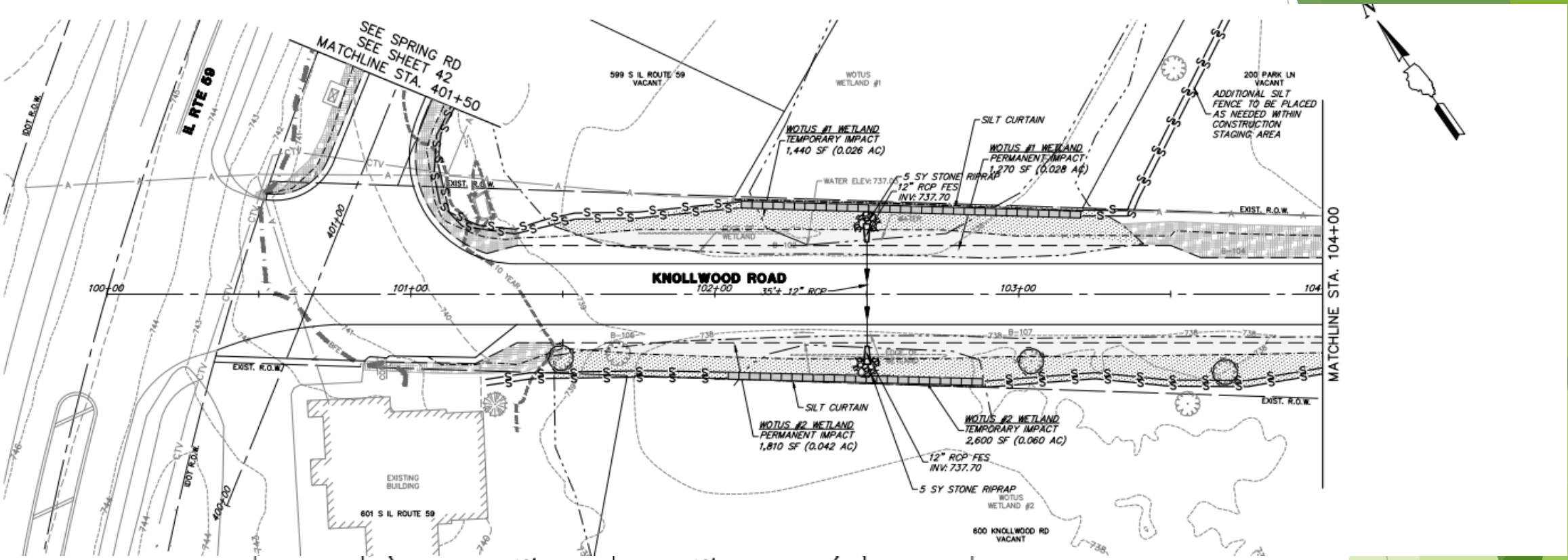
NO	DESCRIPTION
(A)	EXISTING GROUND
(B)	EXISTING HMA PAVEMENT, VARIES 2.0"–5.75"
(C)	EXISTING SUB BASE, VARIES 7.75"–38.5"
(D)	FULL DEPTH RECLAMATION 10"
(E)	EARTH EXCAVATION (FOR PAVEMENT WIDENING) (WIDTH VARIES)
(F)	HOT–MIX ASPHALT SURFACE REMOVAL, 2"
(1)	HOT–MIX ASPHALT SURFACE COURSE, IL–9.5, MIX "D", N50 (2")
(2)	HOT–MIX ASPHALT BINDER COURSE, IL–19.0, N50 (3")
(3)	AGGREGATE SUBGRADE IMPROVEMENT, 12" (& VARIES)
(4)	AGGREGATE SHOULDER TYPE B 5"
(5)	RECLAMATION (SPREAD EVENLY AND REGRADED)
(6)	PROPOSED FILL PGE, VARIABLE DEPTH
(7)	EMBANKMENT FILL
(8)	GEOTEXTILE FABRIC
(9)	GUARDRAIL
(10)	CA–1, VARIABLE DEPTH
(11)	TOPSOIL FURNISH AND PLACE, VARIES (4" MIN.) SEEDING, CLASS 2A NITROGEN FERTILIZER NUTRIENT POTASSIUM FERTILIZER NUTRIENT EROSION CONTROL BLANKET
(R)	ITEM TO BE REMOVED

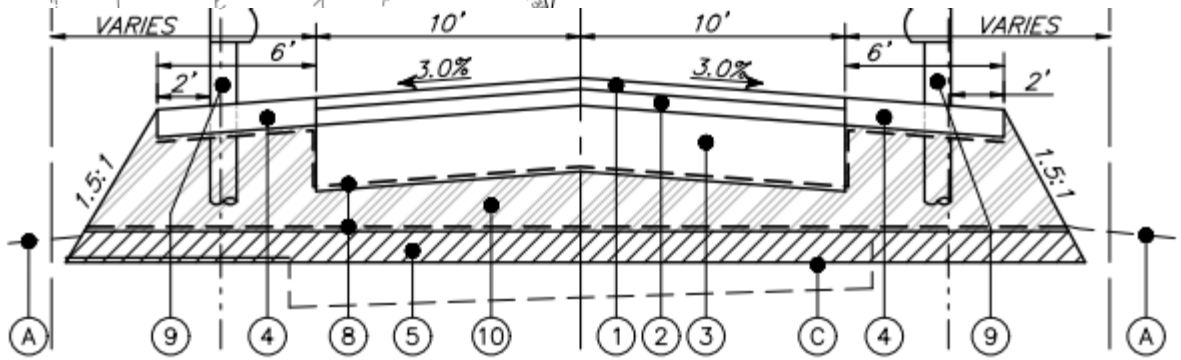
Reclamation of pavement in-place

Reclaimed pavement compacted for base

Geotextile installation – the Secret Ingredient for the SE/SC

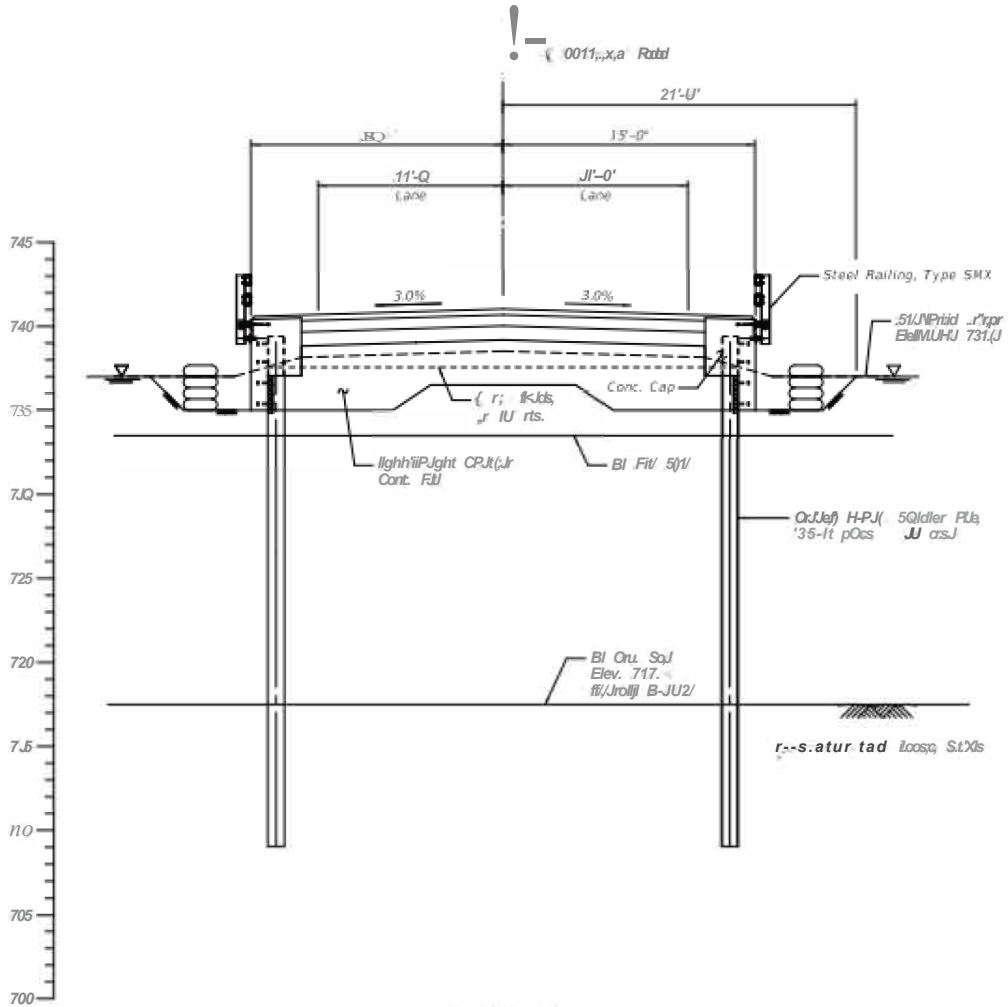
The Subdivision Entrance



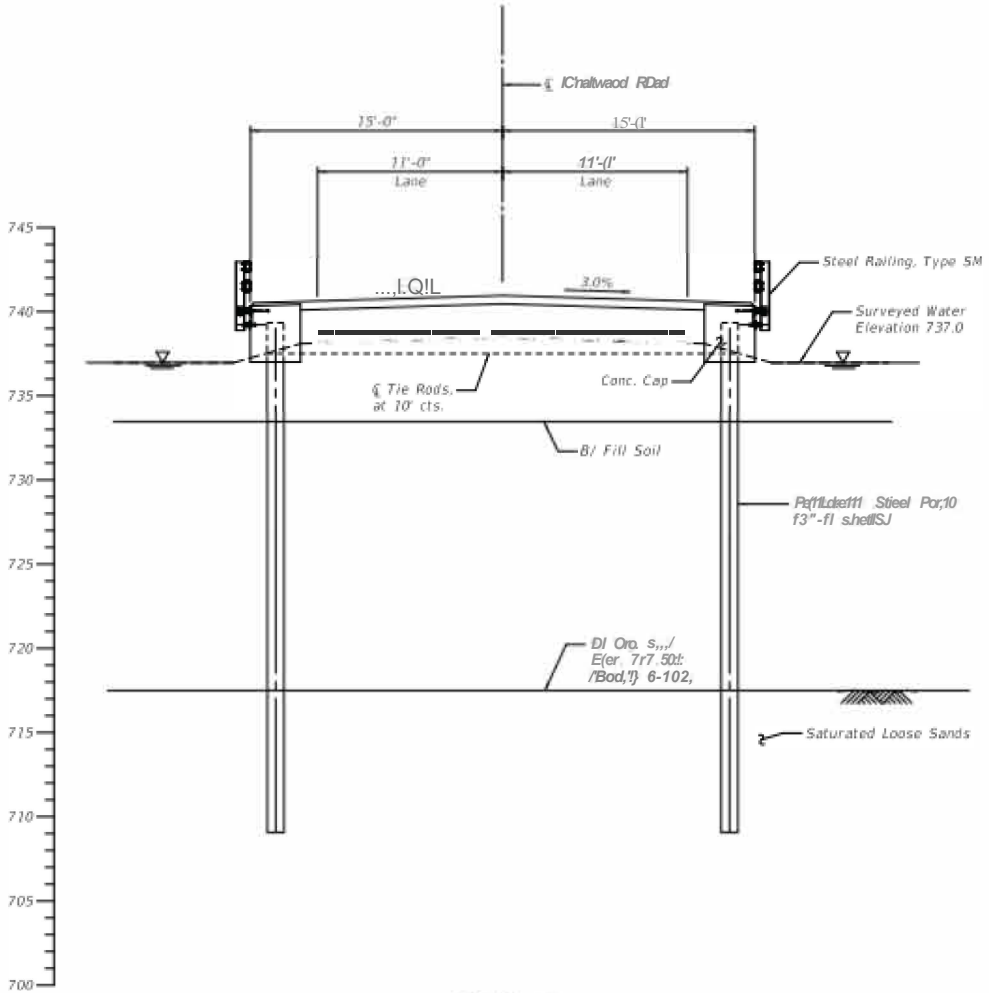


KNOLLWOOD ROAD RECONSTRUCTION
PROPOSED TYPICAL SECTION
STA. 101+35 TO STA. 104+50

Boring	Soil Type	Depth Below Existing Surface (feet)	Cohesion (psf)	Φ (deg)	Soil Unit Weight (Wet) (pcf)	Lateral Earth Pressure Coefficients	
						Active	Passive
Knollwood Road							
102	Fill	1.0 to 11.0	0	32	110	0.31	3.25
	Organic	11.0 to 27.0	50	10	80	0.70	1.42
	Granular	27.0 to 32.5	0	32	120	0.31	3.25
	Cohesive	32.5 to 36.0	1,250	20	115	0.5	2.0
	Granular	36.0 to 40.0	0	32	130	0.31	3.25



OPTION 1A
TIED 50WIER PfLE WALL



OPTION 1B
TIED SHEET PIL/(I/G

CJVJLTECH
Two Piette Place, Suite 1400
Ilasca, Illinois 60143
Tel: 630.773.3900
www.vciviltechinc.aom

EXHIBIT

KNOLLWOOD ROAD
STRUCTURE OPT10MS

Structural options too expensive

Used lightweight fill instead

Subsoil is peat > 20’ deep

May need to fill again in the distant future

KNOLLWOOD ROAD RETAINING WALL OPTIONS
CONSTRUCTION COST ESTIMATES

Option 1A - Tied Soldier Pile Wall with Light-Weight Fill

Code No.	Item	Unit	Quantity	Unit Price	Cost
50800205	Reinforcement Bars, Epoxy Coated	Pound	33,900	$2	$50,850
50901050	Steel Railing, Type SM	Foot	500	$225	$112,500
52200900	Concrete Structures (Retaining Wall)	Cu. Yd.	226.0	$850	$192,100
X0325318	Lightweight Cellular Concrete Fill	Cu. Yd.	805.6	$120	$96,672
X0325751	Driving Soldier Piles	Foot	1,820	$1	$1,820
Z0046304	Furnishing Soldier Piles (HP Section)	Foot	1,820	$85	$154,700
Z0075400	Tie Rods	Each	52	$365	$18,980
	Cofferdam / Dewater	Each	2	$20,000	$40,000
				Sum of Estimated Items =	$667,622
				20% Other Items =	$133,524
				Total =	**$801,100**

Option 1B - Tied Sheet Piling

Code No.	Item	Unit	Quantity	Unit Price	Cost
50800205	Reinforcement Bars, Epoxy Coated	Pound	28,340	$2	$42,510
50901050	Steel Railing, Type SM	Foot	500	$225	$112,500
52200900	Concrete Structures (Retaining Wall)	Cu. Yd.	188.9	$850	$160,565
52200015	Permanent Sheet Piling	Sq. Ft.	15,000	$50	$750,000
Z0075400	Tie Rods	Each	52	$365	$18,980
				Sum of Estimated Items =	$1,084,555
				20% Other Items =	$216,911
				Total =	**$1,301,500**

Option 2 - Land Bridge

Code No.	Item	Unit	Quantity	Unit Price	Cost
50300225	Concrete Structures	Cu. Yd.	84.3	$900	$75,870
50300255	Concrete Superstructure	Cu. Yd.	357.5	$1,200	$429,000
50800205	Reinforcement Bars, Epoxy Coated	Pound	91,050	$2	$136,575
50901050	Steel Railing, Type SM	Foot	500	$225	$112,500
51200957	Furnishing Metal Shell Piles 12" X 0.250"	Foot	3,000	$60	$180,000
52200900	Concrete Structures (Retaining Wall)	Cu. Yd.	74.1	$850	$62,985
	Cofferdam / Dewater	Each	2	$20,000	$40,000
				Sum of Estimated Items =	$1,036,930
				20% Other Items =	$207,386
				Total =	**$1,244,300**

Option 3 - MSE Wall with Conc. Column Ground Improvement

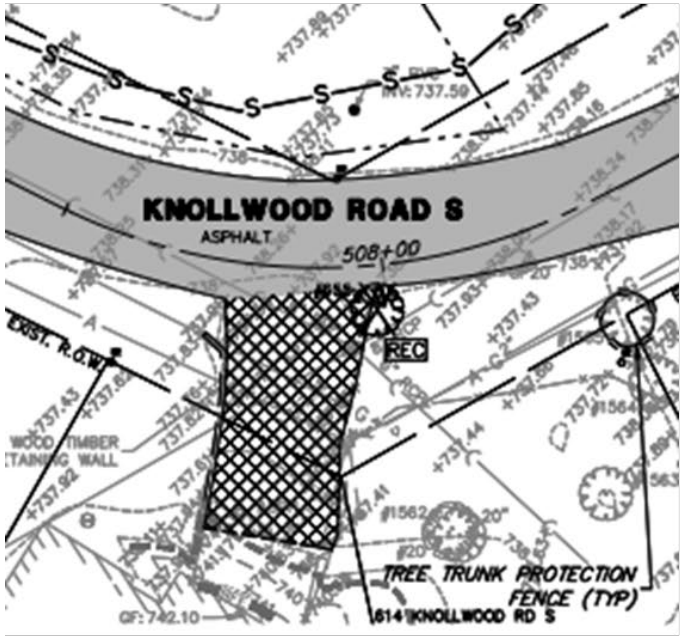
Code No.	Item	Unit	Quantity	Unit Price	Cost
50800205	Reinforcement Bars, Epoxy Coated	Pound	17,790	$2	$26,685
50901050	Steel Railing, Type SM	Foot	400	$225	$90,000
52200500	MSE Retaining Wall	Sq. Ft.	1,468	$100	$146,800
52200900	Concrete Structures (Retaining Wall)	Cu. Yd.	118.6	$850	$100,810
	Concrete Column Ground Improvement	Sq. Ft.	8,840	$30	$265,200
	Cofferdam / Dewater	Each	2	$20,000	$40,000
				Sum of Estimated Items =	$669,495
				20% Other Items =	$133,899
				Total =	**$803,400**

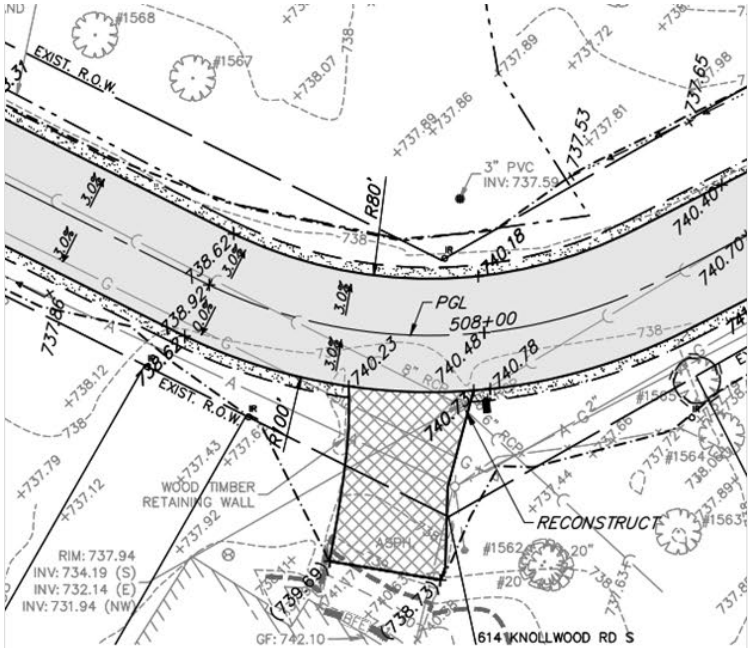
W Rollins Rd
Spring Rd
Spring Rd
Spring Rd
Spring Rd
Park Ln
Park Ln
Knollwood Rd
Knollwood Rd S
Channel Ln
DP01
DP02
DP03
DP04
DP05
DP06
DP07
DP08
DP09
Wetland 1
Wetland 2
Wetland 4
WOUS
WOUS
Wetland 3
(Detention)
Wetland 5

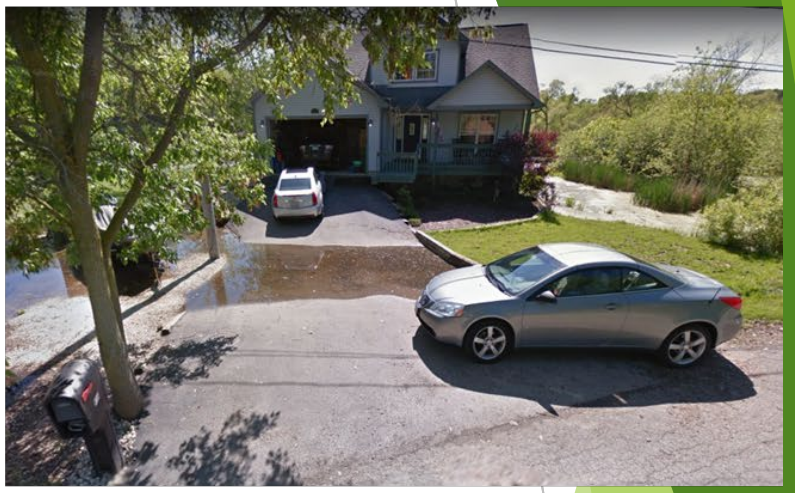
Things to consider for construction

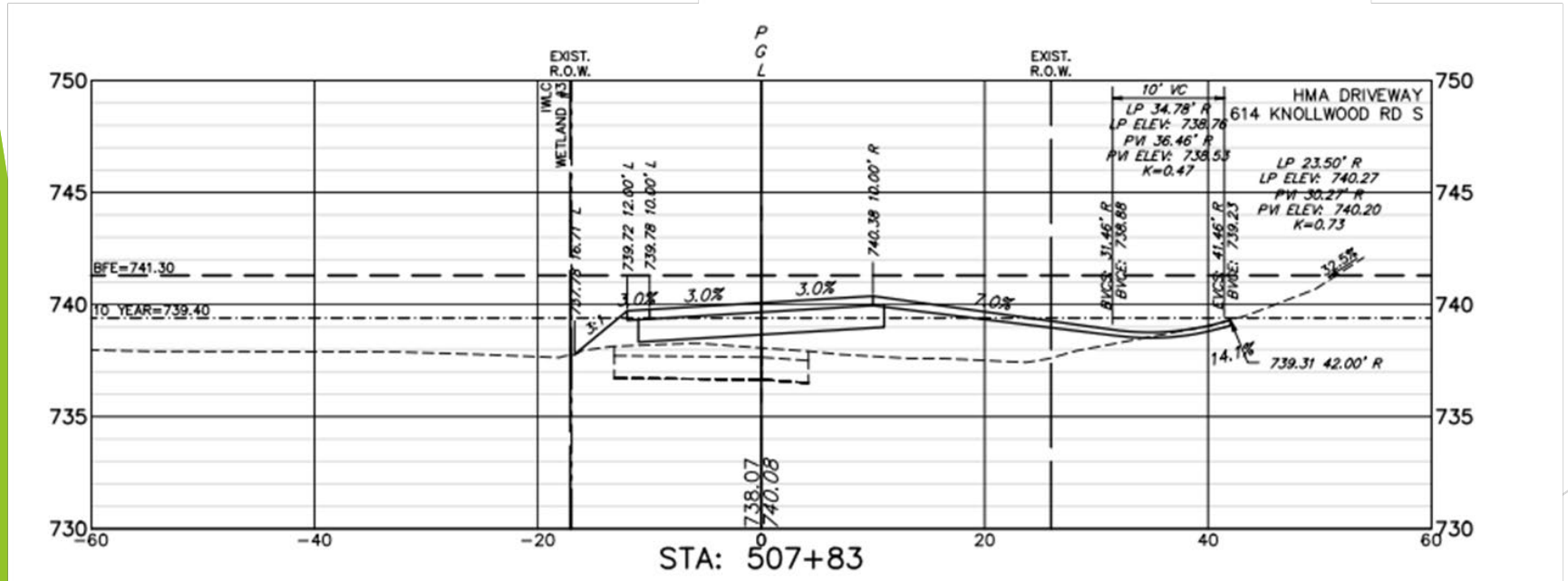
- Construction staging areas
- Construction Sequencing
- Road closures
- Material removal and material delivery
- Mail delivery, garbage pickup, etc…
- Emergency Vehicle Access
- Temporary Parking Areas

Private Property Impact

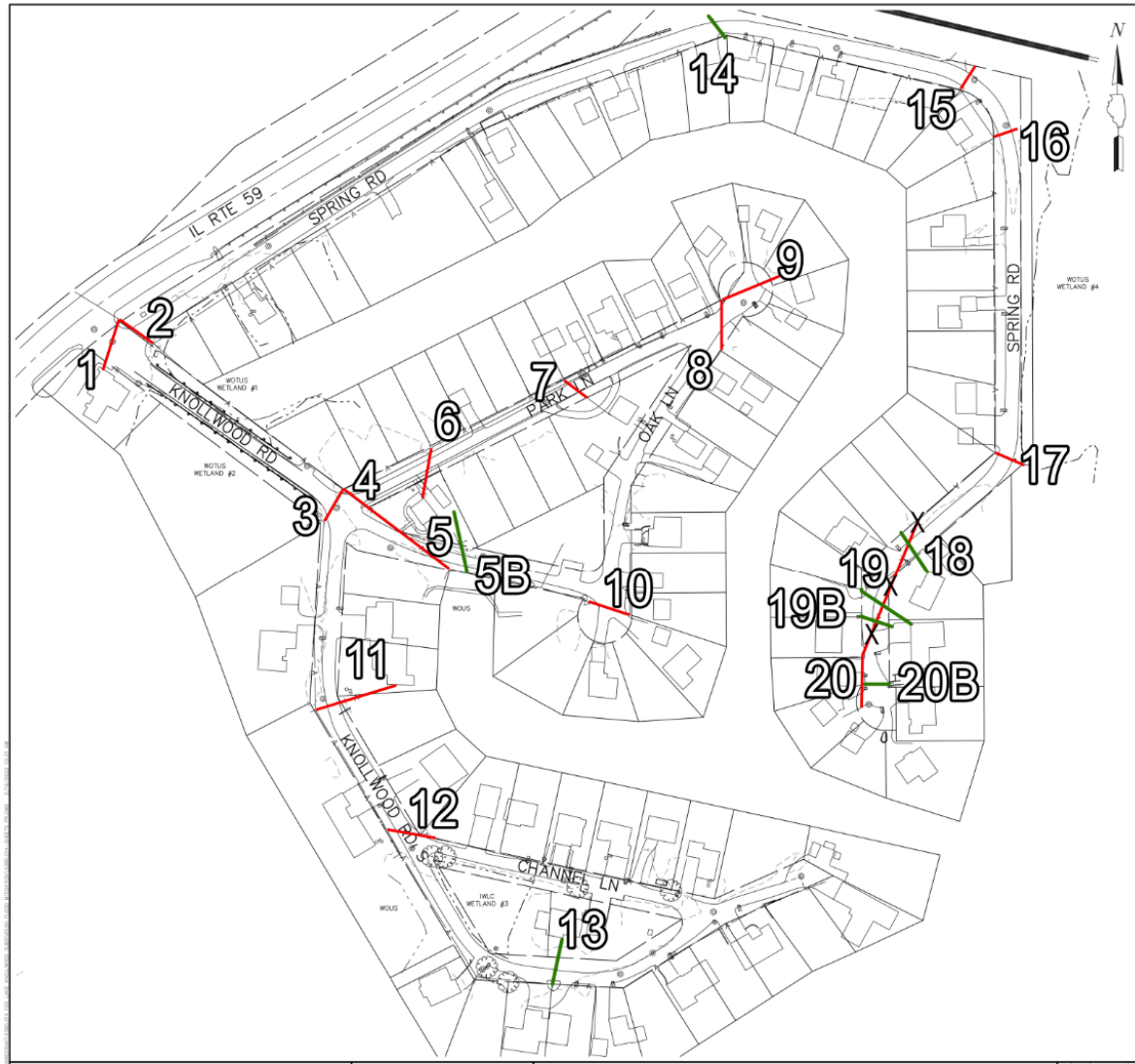








Utility Conflicts



N

GRAPHIC SCALE
80 0 40 80
(IN FEET)
1 inch = 80 ft.

	EXISTING CLEARANCE	PROPOSED CLEARANCE
1.	16.4'	16.0'
2.	18.8'	17.8'
3.	17.8'	16.0'
4.	14.3'	13.4'
5.	13.3'	12.9'
5B.	14.4'	14.1'
6.	12.6'	11.7'
7.	15'	14.7'
8.	12.6'	12.2'
9.	16.2'	15.9'
10.	13.4'	10.7'
11.	13.7'	12.4'
12.	13'	11.7'
13.	16.5'	14.0'
14.	21.7'	21.7'
15.	20.4'	20.4'
16.	19.2'	18.4'
17.	16.7'	14.6'
18.	16'	16.0'
19.	14.8'	14.8'
19B.	13.2'	13.2'
20.	10' (Side of the road over road)	10.0'
20B.	14.9'	14.9'

*Clearance requirements for aerial wires:
16'-6" Minimum over all roads
18' Minimum over IDOT Highway

GHA GEWALT HAMILTON ASSOCIATES, INC.
625 Forest Edge Drive ▪ Vernon Hills, IL. 60061
TEL 847.478.9700 ▪ FAX 847.478.9701

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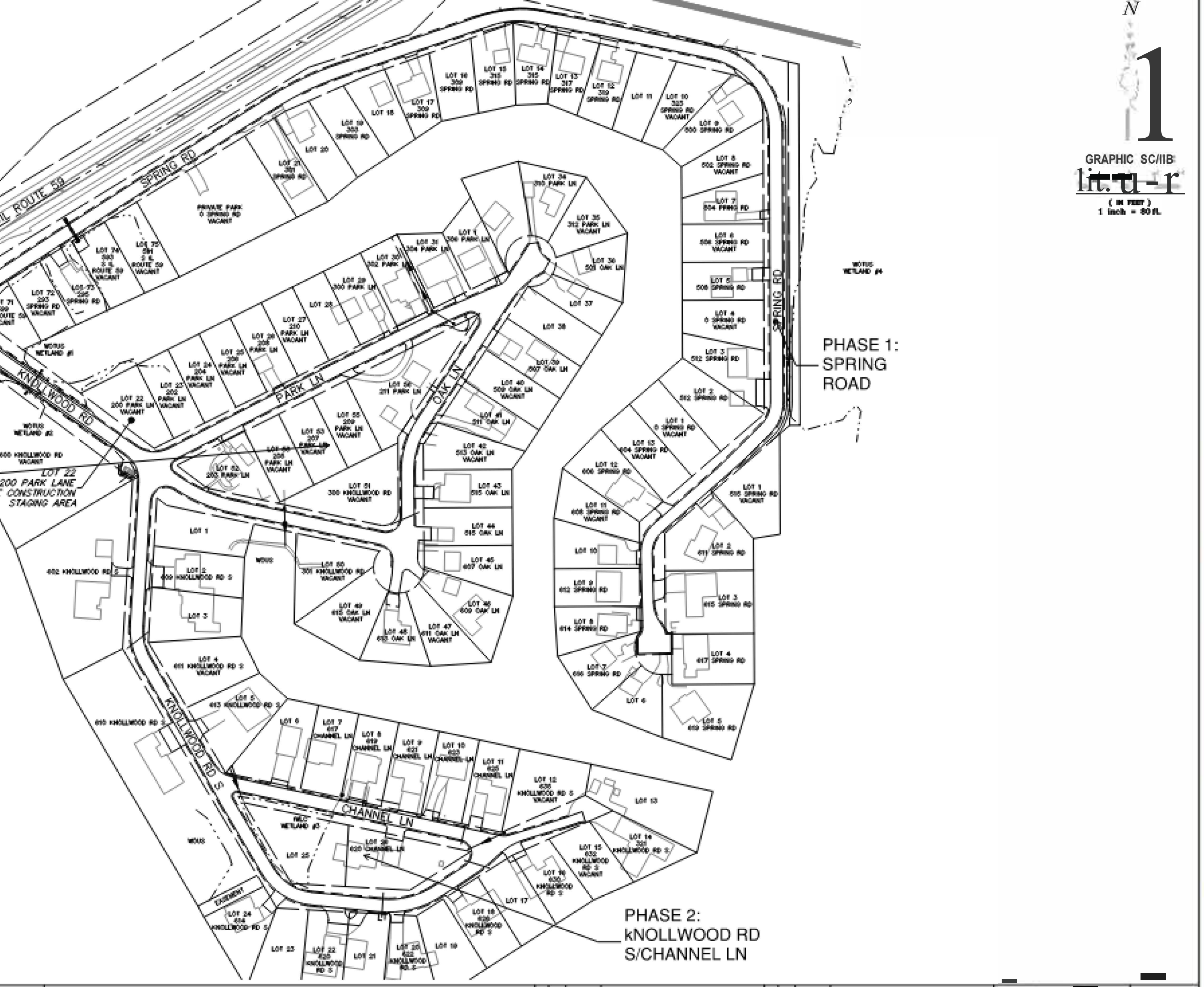
Low Wires

KNOLLWOOD SUBDIVISION FLOOD MITIGATION PROJECT
LAKE COUNTY STORMWATER MANAGEMENT COMMISSION
FOX LAKE, ILLINOIS

NO. BY DATE REVISION

NO. BY DATE REVISION

FILE: 5380.014-sheets PR.dwg
DRAWN BY: PJS DATE: 02-07-22
GHA PROJECT # 5380.014
CHECKED BY: MZ DATE: 02-07-22
SCALE 1"=80'
SHEET NUMBER: 1
OF — SHEETS



SEQUENCING OF MAJOR ACTIVITIES:

iflle following, recommendecl lke[!Uencing sh11 serve lhe purposes onl as a general outline for the conlJaolor to use lo, ,oomplete lheir deieiled oonstruc'lion sched'ule. Arli and all ch es or revisions shall ba approV9d lly lhe engineer before work is antioipateel to cooimence.

1. Place temt)O'llIY lnforma1lon sigms ,even (7) calendar days pdor to cons1ruo1ion commencement on e.i,-h respe,o1iS1e s1reet ;egmemt_
2. Furnish end imslell erosion and sedimenJ comUOl devices, including all rence and inlet liller basiltels. Erosion roralrol dewoo:s shall be islalled at each mspooii..., s1rea1 priOt 0 lde sta11 0f any construcio11 ac1ivi1i..s. n" contfactor sha11 ;tlSo CltIlYCr to the stte any dcWatcr;ng llag;s and pofyfflcrs required for 1lle wOlt.
3. Furnish and imslall t,ee prolecniOn or r,001 pruming as shQllm tD the plaBS or es mail<ed by the engineer.
4. Pleace temparmy traffic ro.ntrol and protectiarl meesu<es.
5. PMOflm ulilitywmk.
6. PMom, road co:strudiiOn as oumnM in Roael ConslrucliOn Seq,uencing, Notes.
7. Penlorm dralmage S\Vale work.
8. ifemporarily stabilize 1he coos-1ruction area and penomi restoralion.
9. Permanenlly stabilize lha cons1rudian BJea.
10. Remave temporal)' erosion canlrol measures and lres protection fencing once V9gatation has 'baen estahliShed.
11. Complete all general land=PC rostorntlon.
12. l'erform s)reet sweep,ng ope<allons wUhln lhe project llmlts and adjacent roadw...
13. Ramare te,mpora,y traflic con1rol and pralec1ion mee6urea.

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STAGES OF CONSTRUCTION PLAN

KNOLLWOOD SUBDIVISION FLOOD MITIGATION PROJECT
LAKE COUNTY STORMWATER MANAGEMENT COMMISSION
FOX LAKE, ILLINOIS

Issues - Lessons Learned

- Easements – Early and Often, connect/outreach with residents
- ROE Agreements – same as above
- Never (if possible) change the “current” natural drainage pattern
  - (wetland hydrology especially)
  - Resident expectations
- Dealing with Residents
  - Make sure to explain the purpose of the project, and what the final product will be
- Utility conflicts
  - Wow these can be cumbersome, wires, poles, pipes, vaults

How much $?

- Initial Estimate = $2.7M
- Grant Amount = $2.7M
  - $2.1M Construction EOPC
  - $300k Design Engineering
  - $300k Construction Engineering
- Low Bid = $2.3M
- Final Costs
  - $1.8M Construction
  - $270k Design Engineering
  - $180k Construction Engineering
- $450k savings!

Success! - Under budget and time!

Questions?