



Riverwood Neighborhood Meeting

Project #FM-19-A

December 12, 2019

5:30 PM

An aerial photograph of a residential neighborhood in winter. The ground is covered in snow, and many trees are bare. A large pond is visible in the lower half of the image. Several houses of various colors (yellow, white, grey) are scattered throughout. A blue semi-transparent box is overlaid on the upper right portion of the image, containing the title and a list of topics.

Overview

- *Status of Last Meeting*
- *Recommended Plan*
- *Project Timeline*
- *Questions*

An aerial photograph of a residential neighborhood in winter. The ground is covered in snow, and many trees are bare. A large, light-colored house with a dark roof is prominent in the foreground. To the left, a road runs parallel to a body of water. The word "Riverwood" is overlaid in a large, black, serif font on a semi-transparent blue rectangular background.

Riverwood

STATUS OF LAST MEETING

- Public Informational Meeting (8/27)
 - Public Comment Period (Until 9/6)
- Revised Preliminary Project Design
 - Public Comments
 - Soil Borings
 - Geotechnical Analysis
 - Hydraulic Analysis
- 2ND Neighborhood Meeting (12/12)



Project Alignment

ORIGINAL PROJECT ALIGNMENT




 Proj. No. 6059-0161
Houston
Engineering Inc.
 Ph: 701.237.5065

ALL ELEVATIONS ARE BASED ON
 THE U.S.G.S. VERTICAL DATUM OF 1988.
 (UNLESS NOTED OTHERWISE)

REVISIONS
 ①
 ②
 ③
 SEAL
 PRELIMINARY

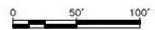
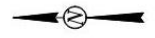
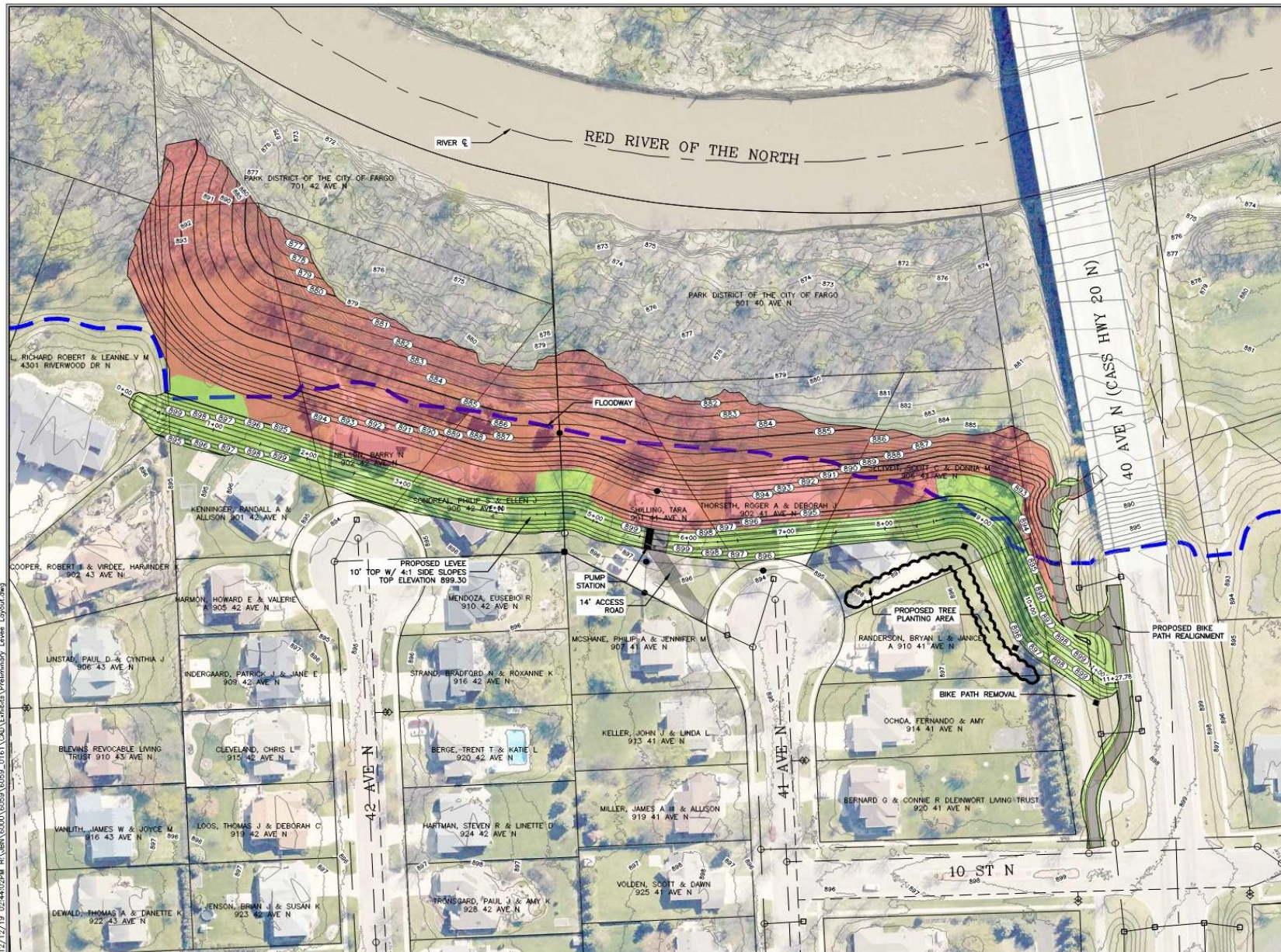
Riverwood

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THE CITY OF
Fargo
 FAR MORE

05/05/19 02:12:22PM H:\JAN 6000\6059-0161\001\Enr Alignments and Corridors.dwg

REVISED PROJECT ALIGNMENT



Proj. No. 6059-0161
Houston
Engineering Inc.
Ph: 701.237.5065

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THE U.S.G.S. VERTICAL DATUM OF 1988.
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REVISIONS		
③	②	①
SEAL		

PRELIMINARY

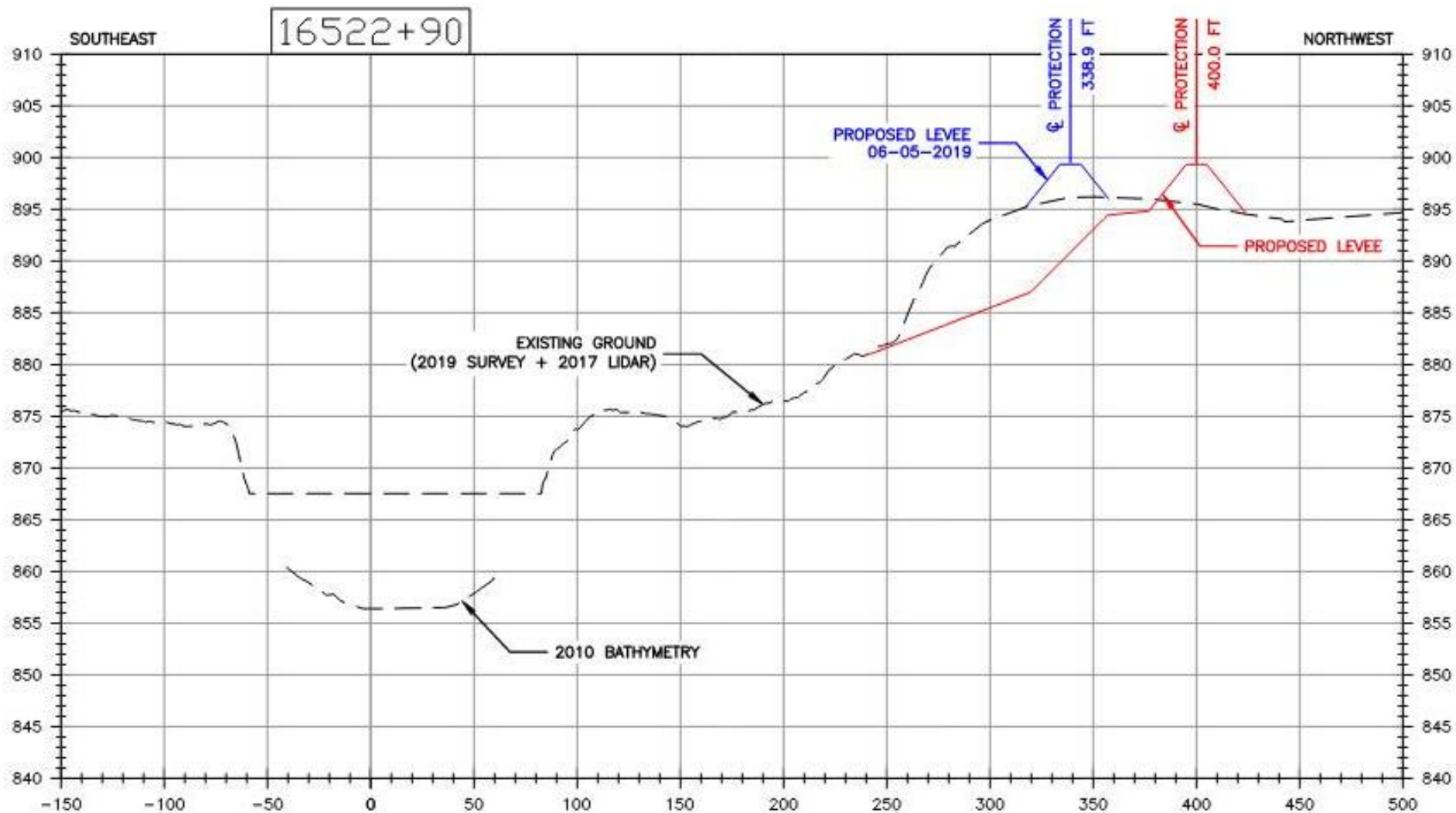
Riverwood FMP

Preliminary Layout

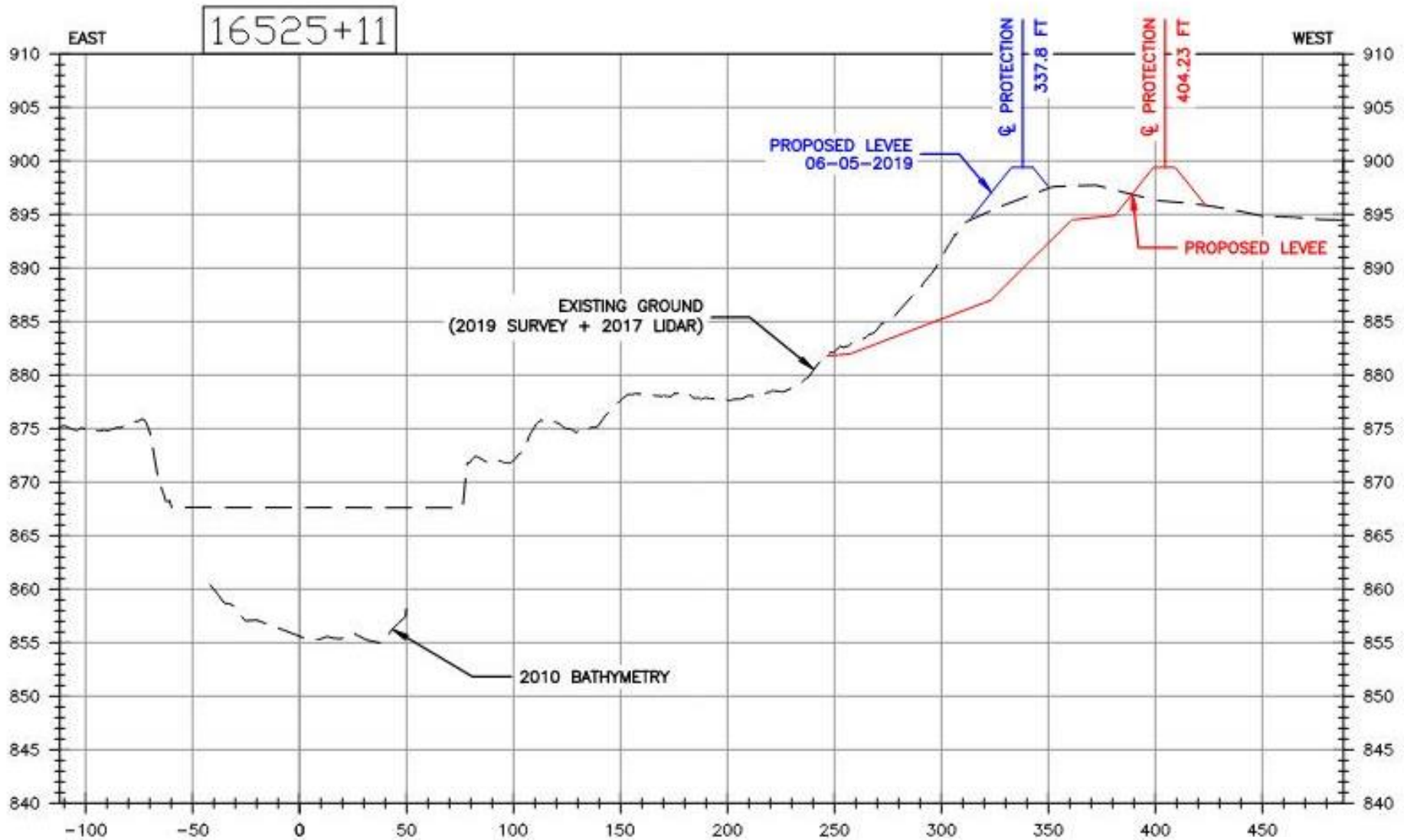
Project FM-10-40

THE CITY OF
Fargo
FAR MORE

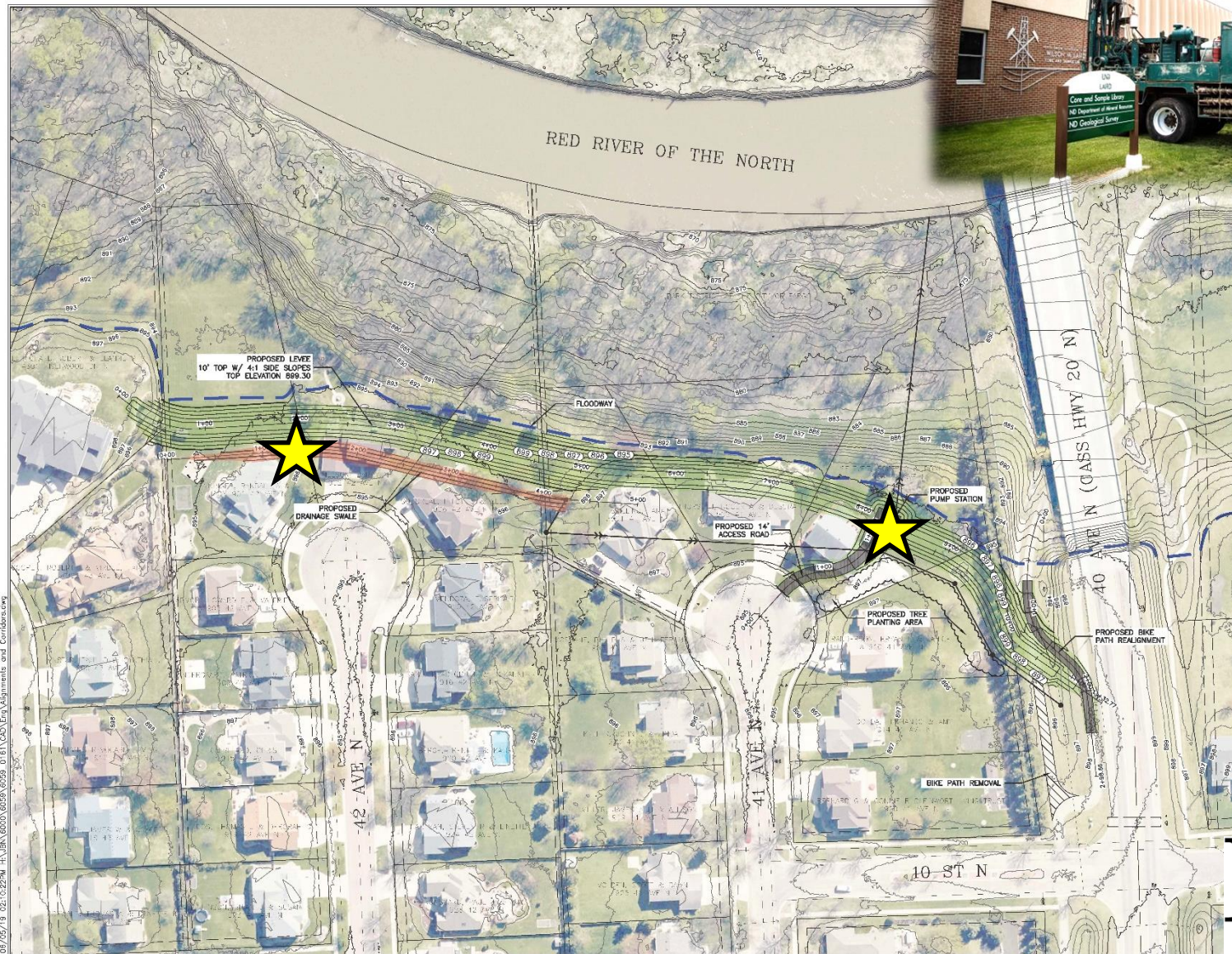
X-SECTION COMPARISON – 42ND AVE N AREA



X-SECTION COMPARISON – 41ST AVE N AREA



SOIL BORINGS



Proj. No. G059-0161
Houston
Engineering Inc.
Ph: 701.237.5065

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REVISIONS

① ② ③

SEAL

PRELIMINARY

Riverwood
CITY OF
Fargo

NORTH SOIL BORING – 42nd AVE N



LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1905387 Geotechnical Evaluation FM-19-A0 - Riverwood Addition Fargo, North Dakota				BORING: ST-02 LOCATION: See attached sketch LATITUDE: 46.93603 LONGITUDE: -96.79287			
DRILLER: D. Nash		LOGGED BY: C. Lindeman		START DATE: 09/24/19 END DATE: 09/24/19			
SURFACE ELEVATION: 895.5 ft		RIG: 7520		METHOD: 3 1/4" HSA			
SURFACING: Grass		WEATHER: Sunny					

Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
		FILL: FAT CLAY (CH), black to brown, moist		0-1-2 (3) 3"		40	
889.5			5	0-1-1 (2) 4"			
6.0		FAT CLAY (CH), silt lenses, brown and gray, moist, medium to soft (GLACIAL LAKE)		1-2-3 (5) 10"	2.25	37	
			10	TW 21"			
				1-1-2 (3) 12"	1.75	39	
			15	1-1-1 (2) 16"	0.75	45	DD=77 pcf WD=111 pcf
			20	1-2-3 (5) 18"	<0.5	32	
			25	1-1-2 (3) 18"	1.5	32	
867.5		FAT CLAY (CH), gray, moist, soft to very soft (GLACIAL LAKE)		0-1-2 (3) 18"	2.25	44	DD=76 pcf WD=110 pcf

Continued on next page



LOG OF BORING

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SURFACING: Grass		WEATHER: Sunny					

Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
		FAT CLAY (CH), gray, moist, soft to very soft (GLACIAL LAKE)		0-1-2 (3) 18"	<0.5	67	
				TW 24"			
			45	0-1-1 (2) 18"	0.5	63	
			50	0-0-1 (1) 18"	0.5	67	
			55	0-0-1 (1) 18"	0.5	64	DD=62 pcf WD=108 pcf
			60	WOH/ 18"	0.5	65	

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NORTH SOIL BORING – 42nd AVE N (CONTINUED)



LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1905387				BORING: ST-02			
Geotechnical Evaluation				LOCATION: See attached sketch			
FM-19-A0 - Riverwood Addition				LATITUDE: 46.93603 LONGITUDE: -96.79287			
Fargo, North Dakota				START DATE: 09/24/19 END DATE: 09/24/19			
DRILLER: D. Nash		LOGGED BY: C. Lindeman		SURFACING: Grass		WEATHER: Sunny	
SURFACE ELEVATION: 895.5 ft		RIG: 7520		METHOD: 3 1/4" HSA			
Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
		FAT CLAY (CH), gray, moist, soft to very soft (GLACIAL LAKE)	65	WOH/ 18"	0.5	71	
			70	WOH/ 18"	0.5	54	DD=71 pcf WD=108 pcf
			75	0-0-1 (1) 18"	0.5	52	
			80	WOH/ 18"	0.5	47	
			85	WOH/ 18"	<0.5	48	DD=72 pcf WD=106 pcf
			90	WOH/ 18"	<0.5	52	LL=70, PL=22, PI=48
			95	0-0-1 (1)	<0.5	49	DD=76 pcf WD=112 pcf

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1905387				BORING: ST-02			
Geotechnical Evaluation				LOCATION: See attached sketch			
FM-19-A0 - Riverwood Addition				LATITUDE: 46.93603 LONGITUDE: -96.79287			
Fargo, North Dakota				START DATE: 09/24/19 END DATE: 09/24/19			
DRILLER: D. Nash		LOGGED BY: C. Lindeman		SURFACING: Grass		WEATHER: Sunny	
SURFACE ELEVATION: 895.5 ft		RIG: 7520		METHOD: 3 1/4" HSA			
Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
		FAT CLAY (CH), gray, moist, soft to very soft (GLACIAL LAKE)	18"				
			100	0-0-2 (2) 18"	0.5	49	
793.5 102.0		SANDY FAT CLAY (CH), trace Gravel, gray, moist, stiff (GLACIAL TILL)	105	16-9-6 (15) 18"	1.5	19	
789.5 106.0		END OF BORING					
		Boring immediately backfilled with bentonite grout					
			110				
			115				
			120				
			125				

Water not observed while drilling.

SOUTH SOIL BORING – 41st AVE N



LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1905387 Geotechnical Evaluation FM-19-A0 - Riverwood Addition Fargo, North Dakota				BORING: ST-01 LOCATION: See attached sketch LATITUDE: 46.93290 LONGITUDE: -96.79311			
DRILLER: D. Nash		LOGGED BY: C. Lindeman		START DATE: 10/16/19		END DATE: 10/16/19	
SURFACE ELEVATION: 896.5 ft		RIG: 7520		METHOD: 3 1/4" HSA		SURFACING: Grass WEATHER: Sunny	
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
895.7 0.8		FILL: ORGANIC CLAY (OL), dark gray, moist		1-2-3 (5) 10"			
		FILL: FAT CLAY (CH), gray, moist		2-2-5 (7) 13"		33	
				1-3-4 (7) 15"		32	
890.0 6.5		FAT CLAY (CH), with Silt lenses, brown and gray, moist, medium to very soft (ALLUVIUM)		1-2-4 (6) 18"	2	40	DD=80 pcf WD=112 pcf
				1-1-3 (4) 18"	2	43	LL=71, PL=20, PI=51
				1-2-3 (5) 18"	2	44	DD=76 pcf WD=109 pcf
				0-0-1 (1) 18"	0.5	43	
880.0 16.5		LEAN CLAY (CL), with Silt lenses, brown and gray, moist, soft (ALLUVIUM)		TW 24"	0.5		LL=47, PL=21, PI=26
				1-1-2 (3) 18"	<0.5	43	
874.5 22.0		SILT (ML), with Clay lenses, gray and dark gray, moist, very loose, laminated, iron oxide staining (ALLUVIUM)		0-0-2 (2) 18"		33	
				0-2-2 (4) 17"		43	
				WOH/ 18"		47	DD=76 pcf WD=111 pcf
867.5 29.0		CLAYEY SAND (SC), fine-grained Sand, gray, wet, loose (ALLUVIUM)		0-0-2 (2) 17"		35	P200=37%
864.5 32.0							

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

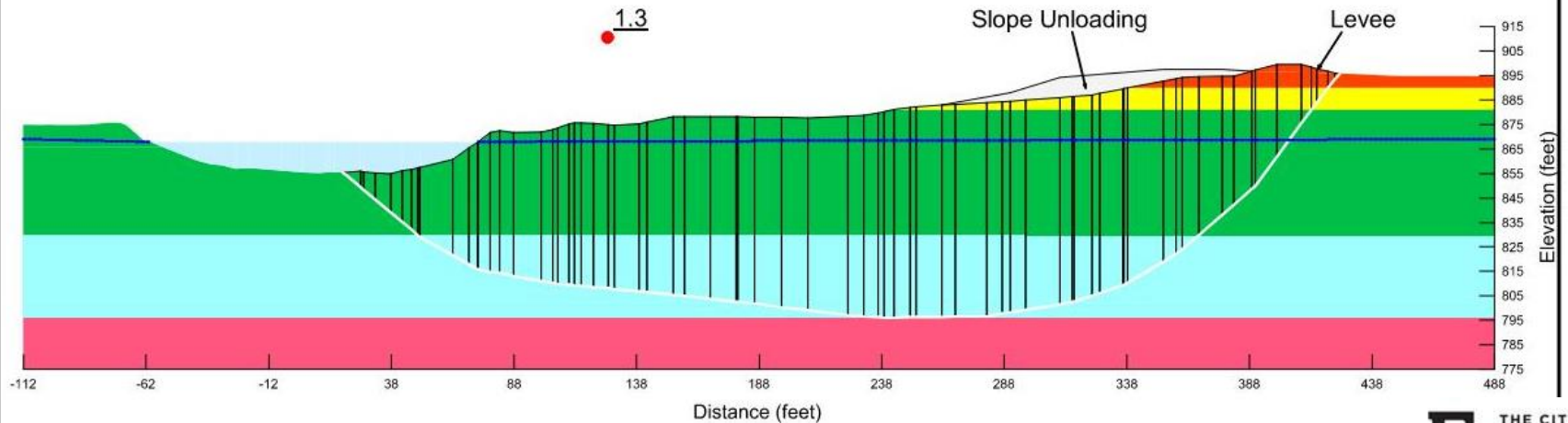
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DRILLER: D. Nash		LOGGED BY: C. Lindeman		START DATE: 10/16/19		END DATE: 10/16/19	
SURFACE ELEVATION: 896.5 ft		RIG: 7520		METHOD: 3 1/4" HSA		SURFACING: Grass WEATHER: Sunny	
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
		LEAN CLAY with SAND (CL), occasional Silt lenses, gray, wet, very soft (ALLUVIUM) <i>Plant matter/wood lenses from 32 to 35 feet</i>		0-0-1 (1) 10"	<0.5	51	LL=49, PL=26, PI=23
				0-0-1 (1) 12"		55	
859.5 37.0		SANDY LEAN CLAY (CL), fine-grained Sand, gray, moist, very soft to soft (ALLUVIUM)		WOH/ 11"			
				WOH/ 13"		38	P200=61%
				0-2-2 (4) 10"			
				0-1-2 (3) 13"			Water observed at 29.0 feet while drilling.
845.5 51.0		END OF BORING Boring immediately backfilled with bentonite grout					

SLOPE STABILITY ANALYSIS

FM-19-A0 Riverwood (41 Ave N Cross Section)
Braun Project No. B1905387
Fargo, North Dakota

End of Construction (Short-Term Analysis)

Color	Name	Unit Weight (pcf)	Cohesion (psf)
	Argusville TS	106	600
	Clay Fill TS	121	800
	Glacial Till TS	130	2,000
	Lower Alluvium TS	105	525
	Upper Alluvium TS	110	750



SLOPE STABILITY ANALYSIS

BRAUN
INTERTEC

Factor of Safety Results Table
FM-19-AO - Riverwood

	41 Ave N Original Alignment	42 Ave N Original Alignment	41 Ave N Current Alignment	42 Ave N Current Alignment	DHS-FEMA Minimum Requirement
End of Construction	1.3	1.1	1.3	1.3	1.3
Long Term, Steady-State, No Flood*	1.0	1.1	1.3	1.4	1.2

*Back Analysis conducted, residual parameters used



Path Forward

PROJECT TIMELINE

- Public Informational Meeting (8/27)
 - Public Comment Period (Until 9/6)
- September – Soil Borings
- Revised Preliminary Project Design – Public Comments
- 2ND Neighborhood Meeting – Tonight
 - Public Comment Period (Until 1/7)
- Present to City Commission for Alignment Approval (January, 27 2020)
- Easement / Acquisition (2020)
- ND State Water Commission Review (Spring/Summer 2020)
- Bidding of Construction Project (TBD)
- Anticipated Construction Begins (TBD)
- Substantial Construction Completion (TBD)
- Final Construction Completion (TBD)

Comment Form



Riverwood Area Flood Risk Management Project

December 12, 2019 Informational Meeting

Landowner Project Opinion:

☐ Yes ☐ No - I support the preliminary plan for providing improved flood risk management for the Riverwood Area.

Additional Comments:

Please Return by January 7, 2020 to:

Randy Engelstad
Houston Engineering, Inc.
1401 21st Avenue North
Fargo, ND 58102
Phone: (701) 499-2087
Fax: (701) 237-5101
Rengelstad@Houstoneng.com

Name: _____

Address: _____

Date: _____

PROJECT TIMELINE

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Questions

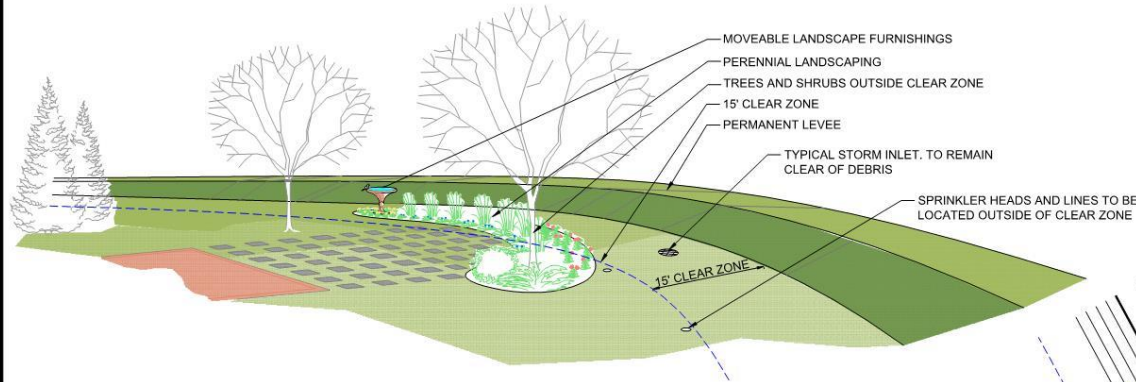


STANDARD LEVEE EXAMPLE



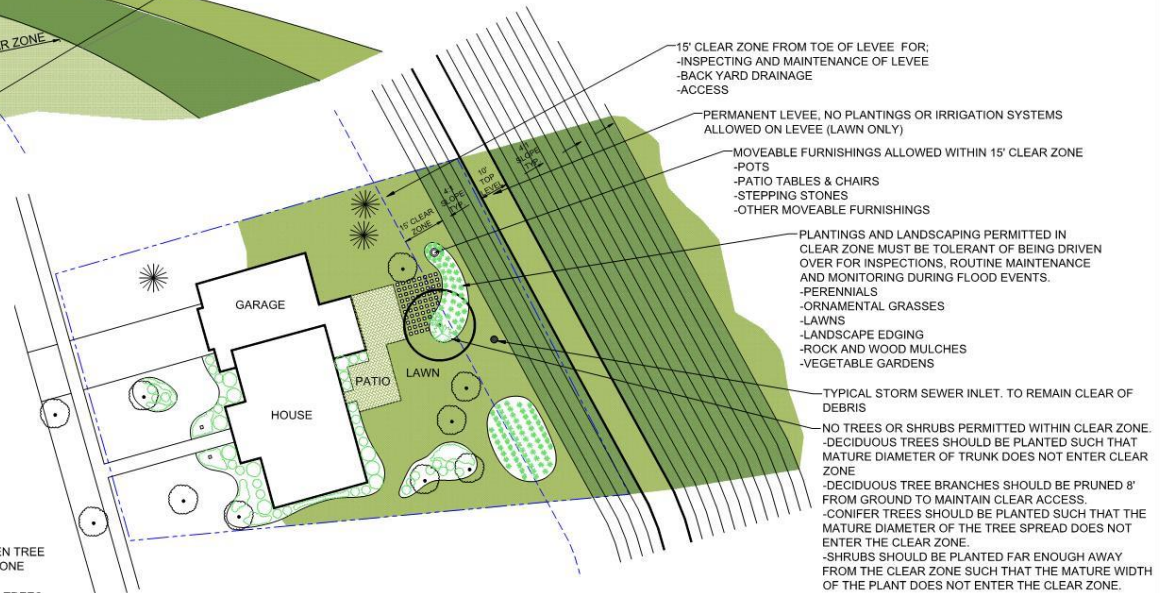
STANDARD LEVEE ALLOWABLE USE

CITY OF FARGO STANDARD LEVEE ALLOWABLE USE EXAMPLE

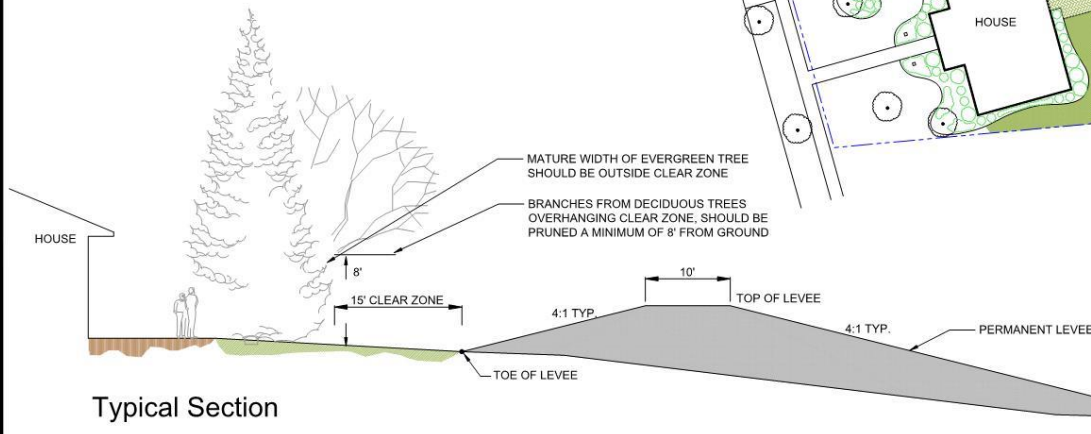


Typical Perspective

DRAINAGE NOTE:
DRAINAGE OF RUNOFF ADJACENT TO FLOODWALLS AND LEVEES IS IMPORTANT IN MAINTAINING THE INTEGRITY OF THE STRUCTURES. AS A RESULT, LANDSCAPING OR OTHER ADDED FEATURES SHOULD NOT CHANGE OR BLOCK THE DESIGN DRAINAGE GRADES AND FLOW PATHS.



Typical Plan View



Typical Section

Warning:
The primary purpose of the identified Clear Zone is to provide a reliable corridor of access along the levees and floodwalls. As a result, this corridor must be free of obstructions to assure adequate access by personnel and equipment for inspection, routine maintenance, monitoring, and flood-fighting. The property owner will be solely responsible for the repair and/or replacement of any feature placed within the identified clear zone area. The City of Fargo will not be responsible for costs associated with any damage to features within this area resulting from the required access.

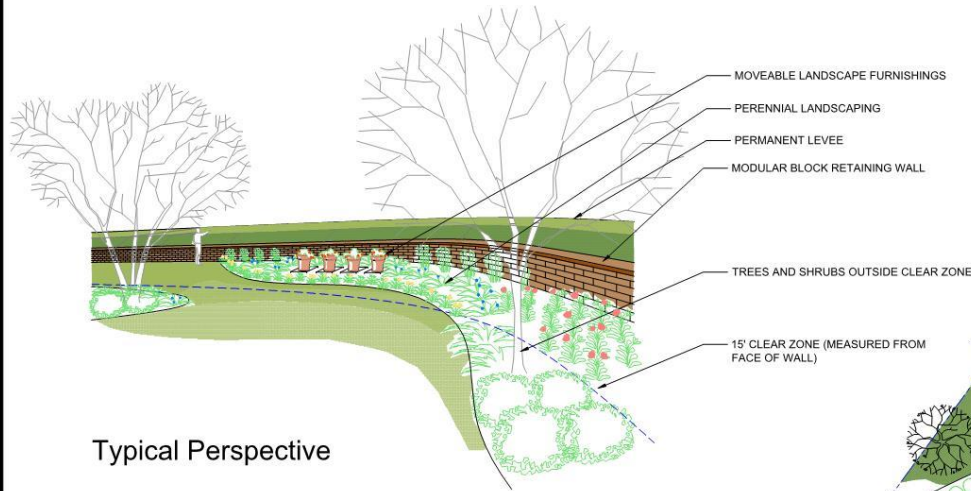
MODULAR BLOCK WALL LEVEE EXAMPLE



Maintenance Process

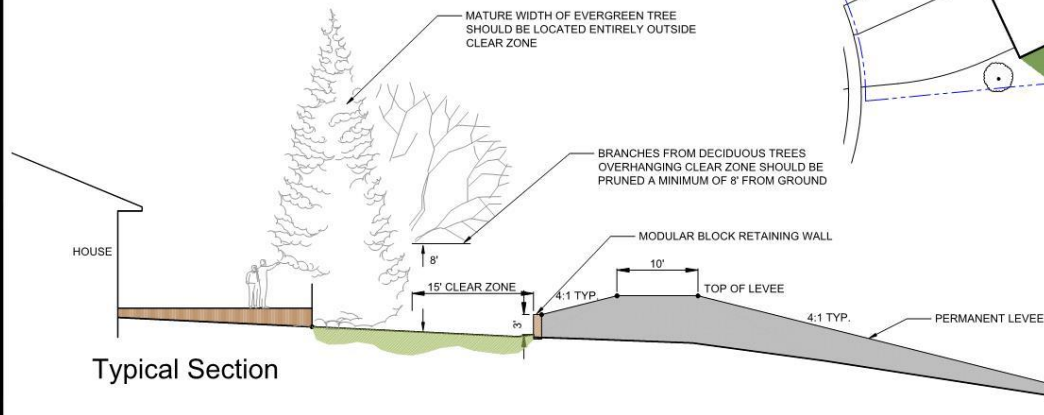
- City responsible to any significant structural integrity related issues...
- Landowner responsible to mow, regular maintenance, cosmetic repairs,...

MODULAR BLOCK WALL LEVEE ALLOWABLE USE



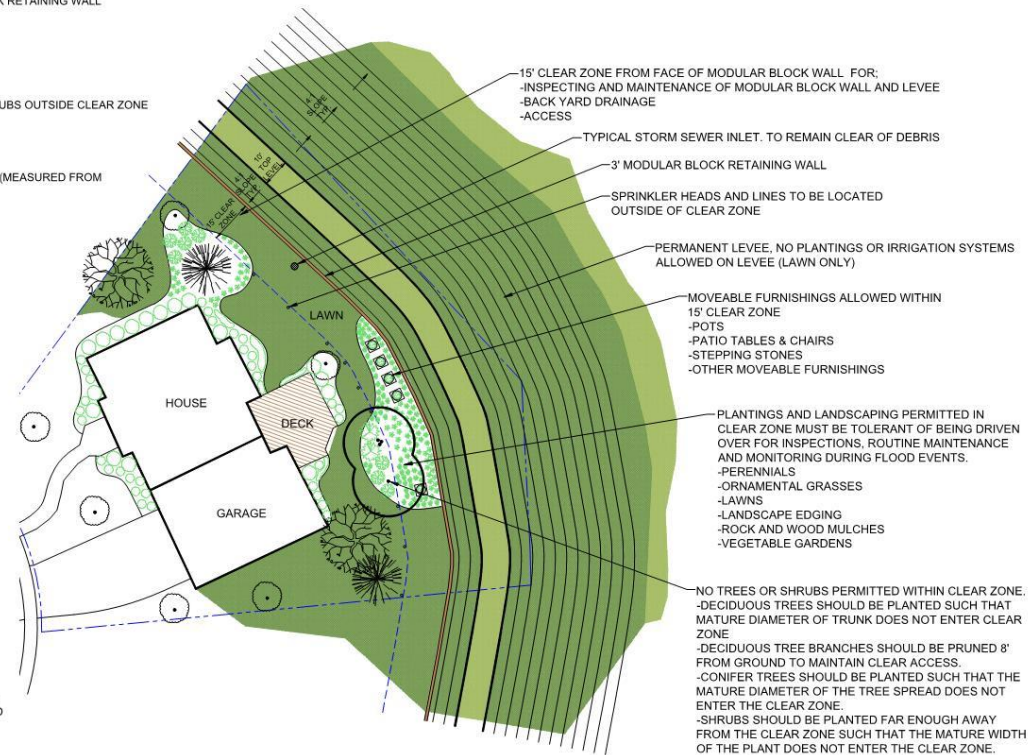
Typical Perspective

DRAINAGE NOTE:
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Typical Section

CITY OF FARGO STANDARD COMBINATION LEVEE WITH MODULAR BLOCK WALL ALLOWABLE USE EXAMPLE



Typical Plan View

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MODULAR BLOCK WALL LEVEE MAINTENANCE



MODULAR BLOCK WALL LEVEE EXAMPLE



MODULAR BLOCK WALL LEVEE EXAMPLE



PROJECT OVERVIEW







FM Diversion

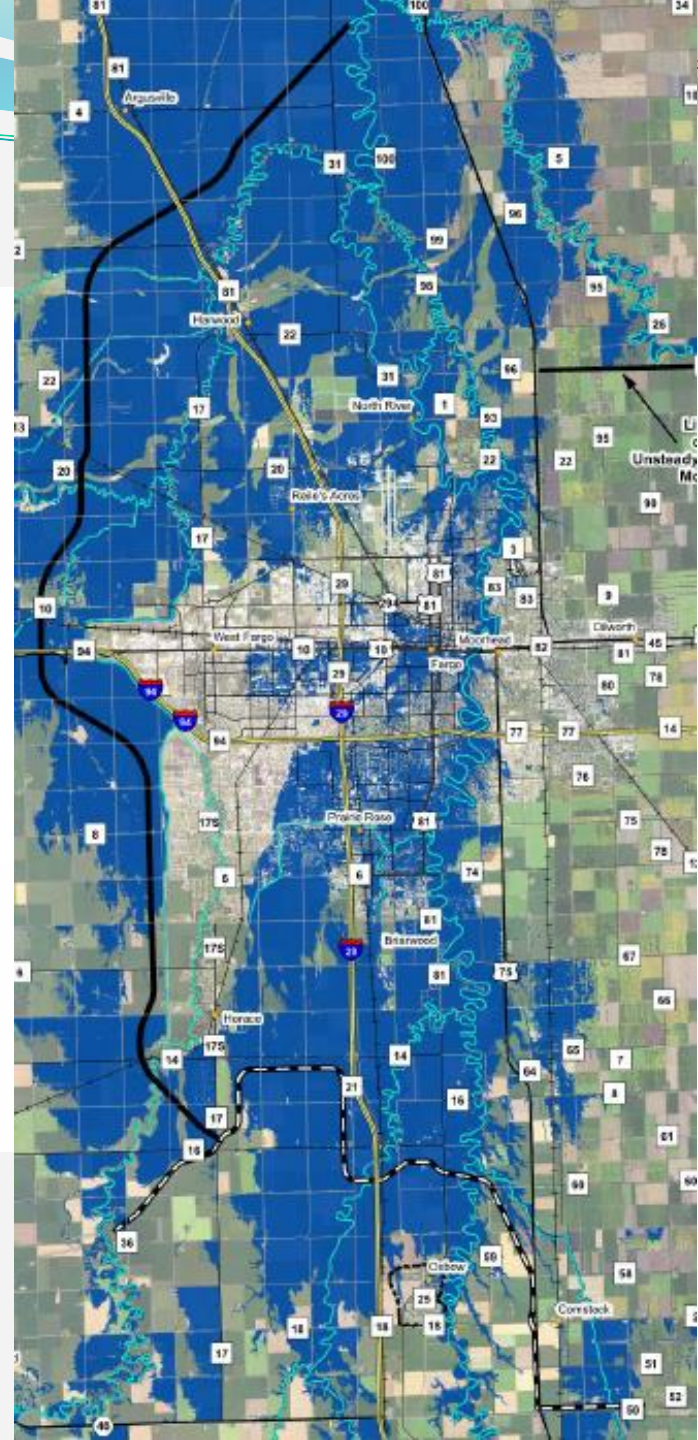
Diversion Project “Plan B”

- 100-year Flood Protection Minimum
 - Some features designed to PMF (Probable Maximum Flood) as required by State and Federal Dam Safety Requirements
- Diversion Channel
- Southern Embankment and Control Structures
- Temporary Staging of Flood Waters Upstream to Prevent Downstream Impacts
- In-town Levees
 - Additional levees needed to safely pass RS 37-feet during 100yr flood.



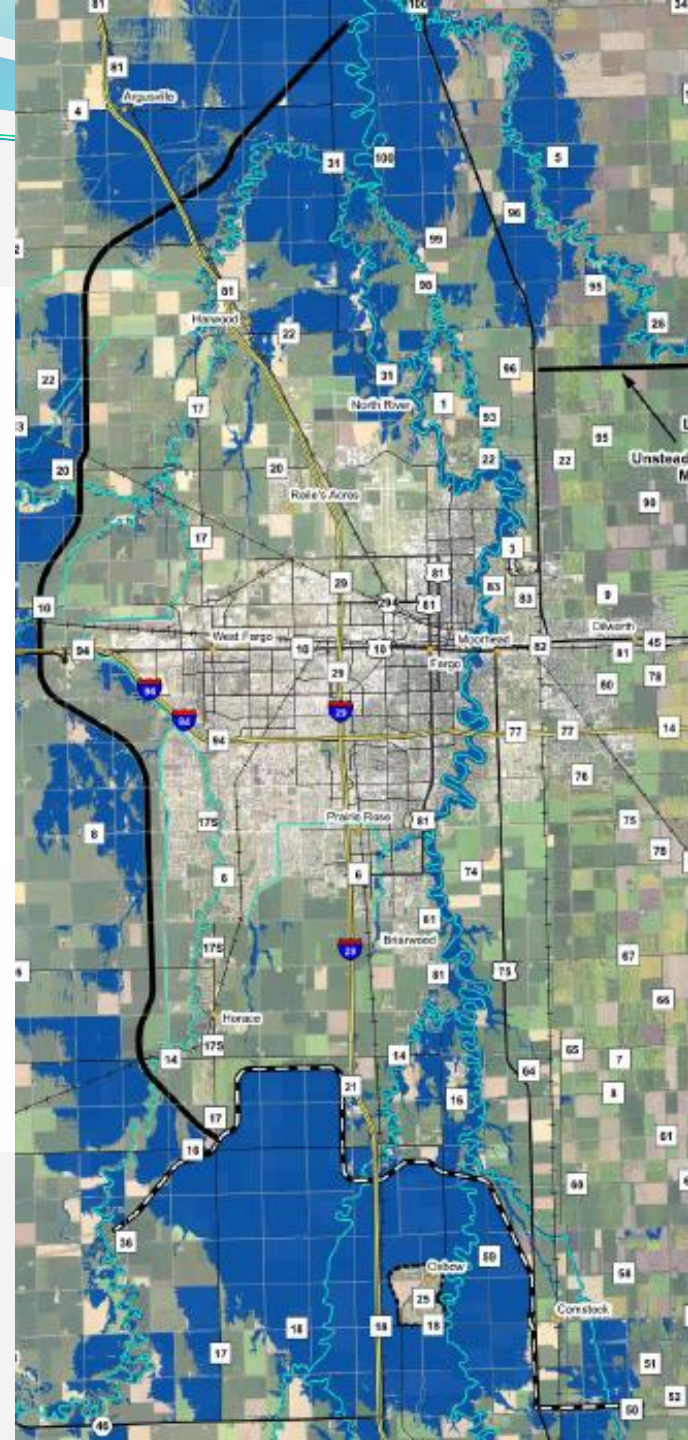
Existing Conditions

- 100-year floodplain shown in blue



With Project

- 100-year floodplain with project shown in blue
- Project also gives the ability to defend against a 500-year flood
 - Would require 18-20 miles of temporary clay and sandbag levees



Diversion Project “Plan B”

- 100-year Flood Protection Minimum
 - Some features designed to PMF (Probable Maximum Flood) as required by State and Federal Dam Safety Requirements
- Diversion Channel
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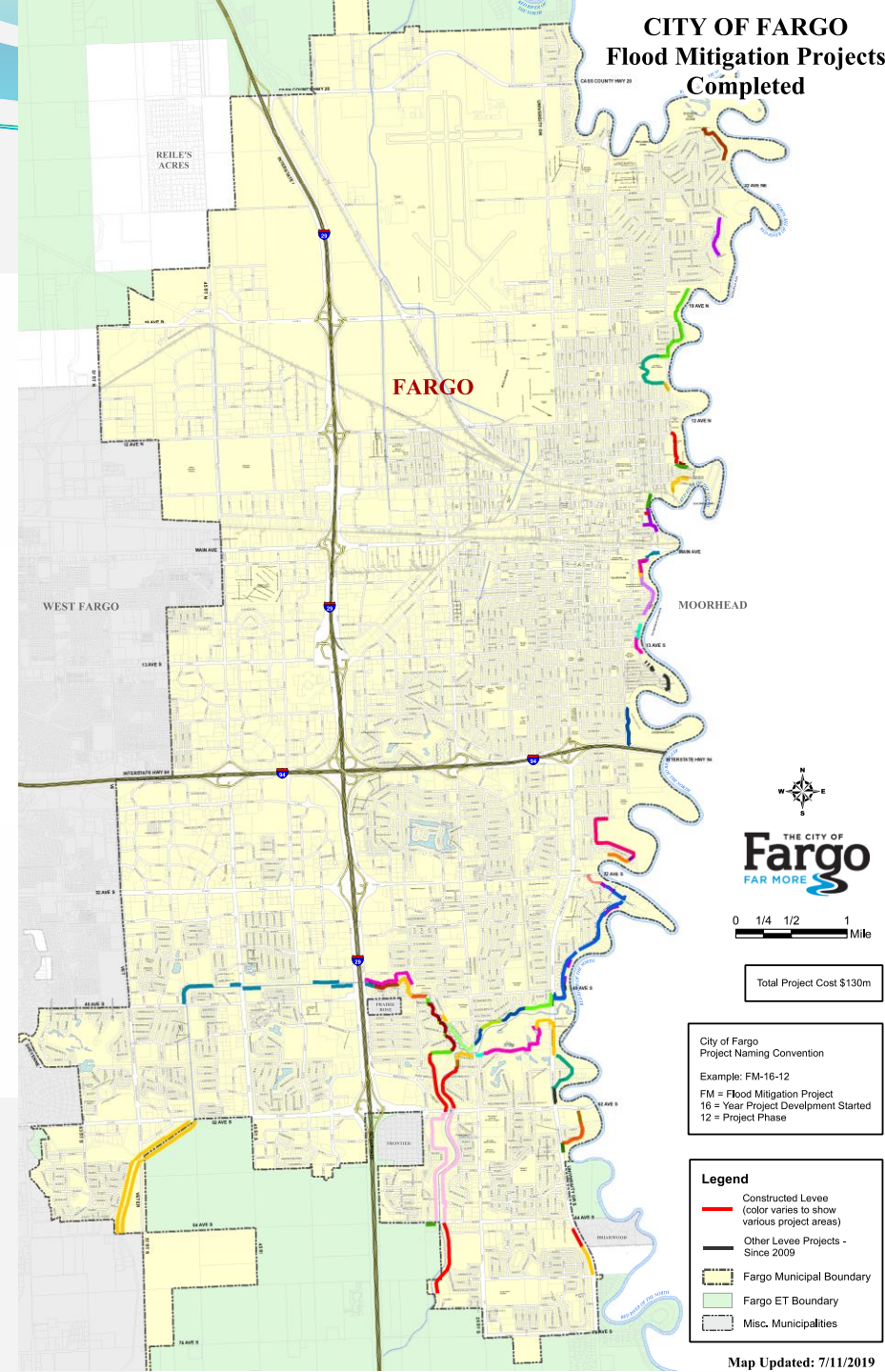




In-Town Projects

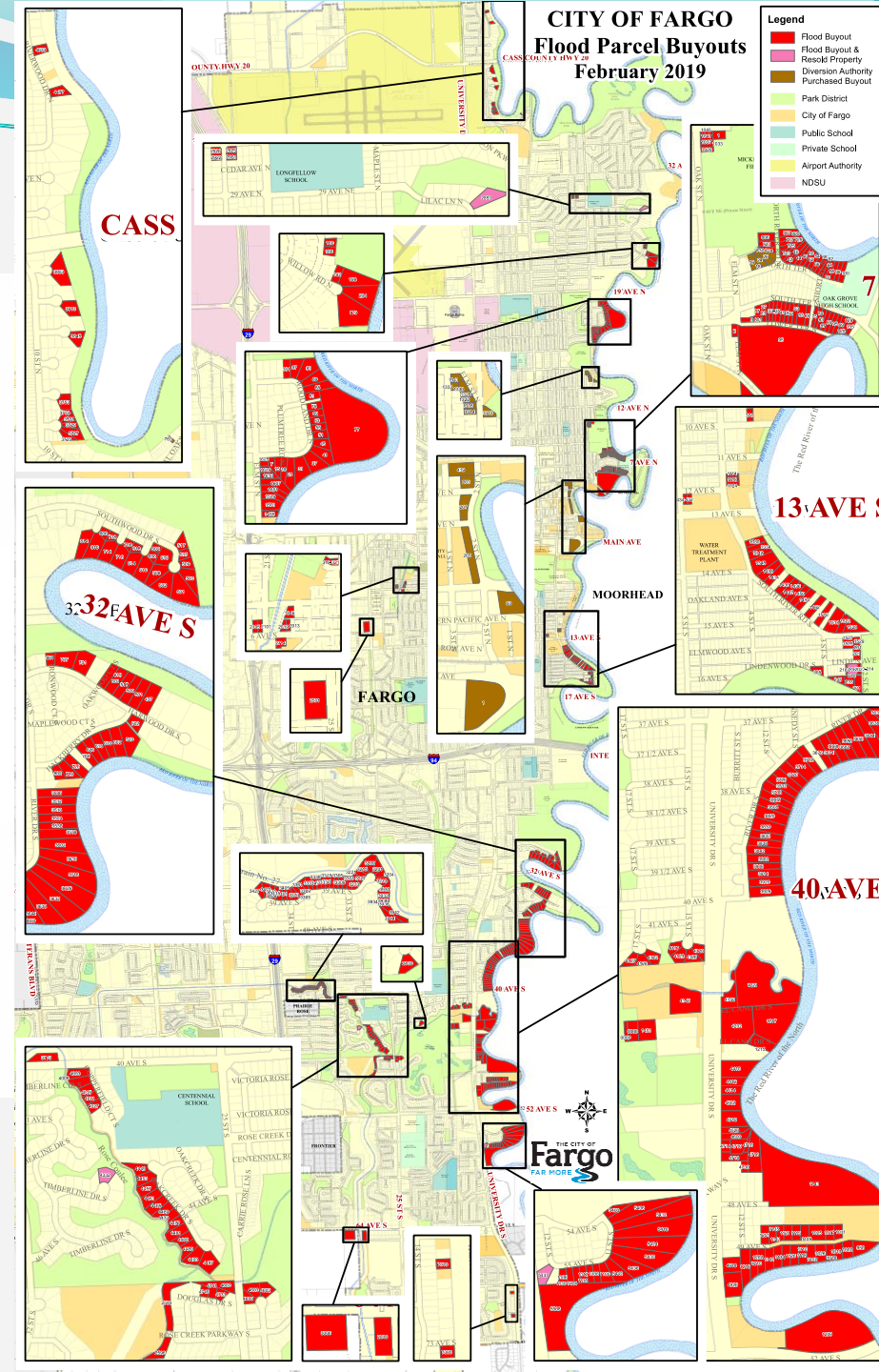
PROJECTS COMPLETED SINCE 2009

- Constructed over 21 miles
 - *47 miles of emergency levees constructed by the City in 2009
- Project Cost ≈ \$280 million
- Reduces required sandbags by approximately 5 million
 - Needed over 6 million in 2009
- All completed projects are built to proper elevations to accommodate Plan B's proposed 37' flow thru town



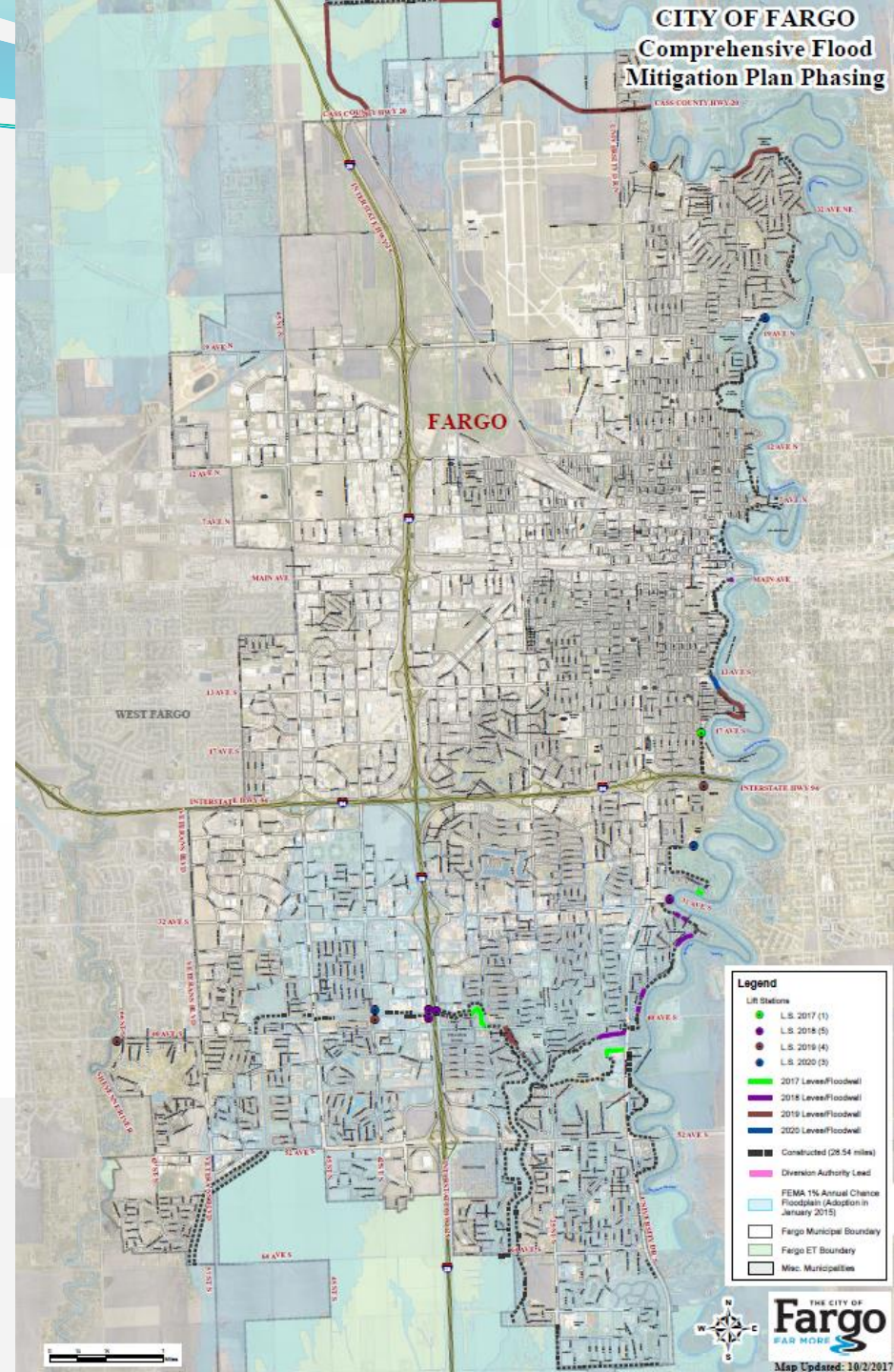
PROJECT ACQUISITIONS SINCE 2009

- 245 Properties Purchased
 - Over 380 since 1990
- At cost of over \$100 million
- Approximately 90 private property easement purchased



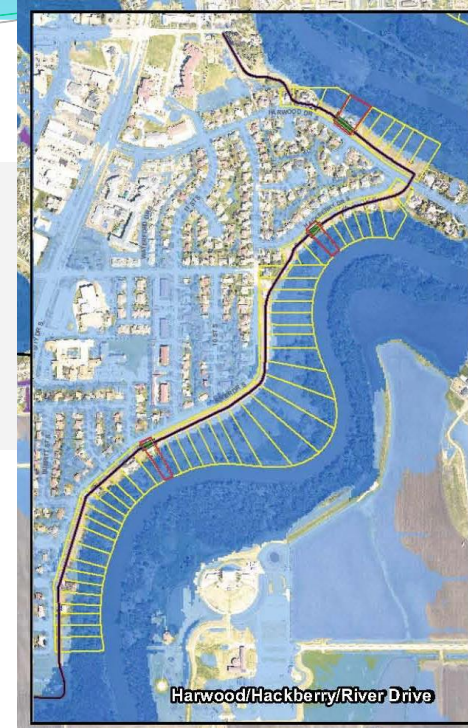
2019 PROJECTS UNDER CONSTRUCTION

- Four Projects
 - Rosewood Addition – Final Phase
 - Oakcreek & Copperfield Ct – Final Phase
 - Belmont Park – 2nd Phase
 - 2nd Street S & Main Ave – Final Phase
- Total Length \approx 0.75 mile
- Total Construction Cost \approx \$15.7M



REMAINING PROJECTS

- 2016 Revised Comprehensive Plan Projects
 - Harwood, Hackberry & River Drives
 - 3 Acquisitions Remain
 - Levee Construction
 - Belmont Park
 - 3 Acquisitions Remain
 - Levee & Floodwall Construction
 - Water Intake Building Modifications
 - Drain 10/Airport Area
 - Levee Construction
 - Storm Sewer Lift Station Replacement
 - Storm Sewer Lift Stations Improvements



REMAINING PROJECTS

- Plan B Additional In-Town Projects

- Riverwood Addition
 - Potential Acquisitions
 - Levee Construction
 - Storm Sewer Lift Station Replacement
- Royal Oaks
 - Potential Acquisitions
 - Levee Construction
- Woodcrest
 - Potential Acquisitions
 - Levee Construction
 - Storm Sewer Lift Station Replacement
- Elm Circle
 - Potential Acquisitions
 - Levee Construction
- Oak Grove
 - Potential Acquisitions
 - Levee Construction
- Storm Sewer Lift Stations Improvements

