Memo

TO: Public Works Committee

FROM: Ed Andrews, Public Works Director

DATE: October 12, 2018

SUBJECT: Water Treatment Plant #1 – Flood Protection Study
adoption of target Flood Compliance Q(100) or Q(500)

The City of Washington engaged CMT under Work Order 16-2 to assist in a detailed review of flood protection options (design requirements & funding) at Water Treatment Plant #1 (WTP#1). WTP#1 was built in 1959 and in 1986, FEMA first released Flood Insurance Rate Maps (FIRMs) for Washington which mapped WTP#1 in the 100-year flood plain. CMT's study is attached herewith, but a key discussion component for Council is decide on the degree of flood protection which we would target for this facility in forthcoming.

While there is a Federal Program (CAP-205) for a 50/50 cost share, this program would require a more aggressive 500-year flood protection. CMT has also reviewed the IEPA's minimum 100-year flood protection, which unfortunately does not have a cost share component, but is at a much lesser cost. The options costs are summarized below:

Flood	Est	Funds	
Protection	Cost	Federal	Local
Q(500)	$ 900,000	$ 450,000	$ 450,000
Q(100)	$ 158,000	$ -	$ 158,000

From a cost standpoint, "going it alone" for Q(100) protection is 1/3 of the City's 50% match for Q(500) protection under CAP-205. While we have had discussions about this project with staff at the Rock Island Corps, CAP-205 is a competitive program such that there is no guarantee of funding. Additionally, WTP#1 is the older of the City's two water plants. Expansion at this location is limited, such that the likely future scenario is a new WTP#3 at a different location.

Discussion with the Public Works Committee was to target Q(100) protection, but would also be presented Council. It is recommended that the City formally adopt at target compliance to help establish.

This matter has been placed on the City Council meeting agenda of Monday, October 15th, 2018 for review and adoption.

cc: File

WATER TREATMENT No. 1

Flood Protection Investigation

Planning Report

FINAL REPORT

September 2018

1.0 Introduction and Background

1.1 Purpose & Impacts of Flooding

Crawford, Murphy & Tilly, Inc. was retained by the City of Washington to investigate flood protection for Water Treatment Plant No. 1 (WTP #1) from Farm Creek. The purpose of the study is to evaluate flood protection options the for water treatment plant.

Determining the level of flood protection is a risk-based decision. With this in mind, the report provides differing levels of flood protection for the City to review and determine which level best fits their tolerance for the flooding risks.

The primary impacts of flooding WTP #1 are included below:

- Loss of potable water production from WTP #1
- Damage to electrical gear within WTP #1
- Loss of records/reports stored at WTP #1

It is anticipated that WTP #1 would remain out-of-service for a minimum of 2 months (depending on the extent of the electrical gear damage), possibly longer. Under 2016 average daily demands, Water Treatment Plant #2 (WTP #2) can support the City's water needs, but water restrictions to limit any peak flow demands may be necessary.

The relatively small Farm Creek watershed allows the flood peak to occur quickly after a rainfall event. This allows for very limited to no response time to set up any flood protection methods. Thus, response-time based methods (such as sand bags) were not considered as a part of this report. The report focused on permanent structural methods to limit flood impacts within the area of WTP #1.

1.2 Previous Reports

Christopher B. Burke Engineering LTD. (CBBEL) completed a study of Farm Creek east of the pedestrian path structure which is located northeast of Jefferson Street. The study was used to develop a FEMA Letter of Map Revision Concurrence. This report was used to determine the limits and depths of potential flooding on the WTP #1 site.

A Report of Soil Exploration was completed by Ramsey Geotechnical Engineering on March 15, 2017. This report was used to review the soil conditions within the area around WTP #1.

1.3 Regulatory Agencies and Requirements

Illinois Department of Natural Resources (IDNR) are responsible for permitting construction in floodways of rivers, lakes and streams. IDNR has issued draft updates to Part 3700 of the Illinois Administrative Code. The draft updates were used when evaluating the permitting requirements. A summary of the primary permit requirements that will impact a proposed improvement within a regulated floodplain is included below:

- A floodway determination would need to be completed. This is required to ensure that any proposed improvements are located outside of the floodway. A floodway determination was not included in the CBBEL report.
- Flood storage would need to be reviewed to ensure at least 90% of the existing floodplain storage volume is preserved (compensatory storage)
- Velocities would need to be determined to verify that any increases are limited to 10% to avoid increased erosion and sedimentation potential.

Federal Emergency Management Agency (FEMA) is responsible for maintaining the floodplain/floodway mapping and administering the flood insurance program. FEMA approval of the proposed improvements would be required to remove a portion of the property from the mapped floodplain.

US Army Corp of Engineers (USACE) are responsible for permitting/regulating improvements within the waters of the US. USACE permitting is not anticipated, since the potential improvements are not anticipated to occur within the natural water level of Farm Creek or a wetland.

City of Washington Zoning Code (Special Flood Hazard Area Regulations) regulate development within a flood hazard area. The primary function of the code is to prevent development/improvements from increasing flood heights and ensuring that the proper permits are received from IDNR.

2.0 Discussion of Protection Options

2.1 500-Year Level Protection

Industry standards for a new water treatment plant would be to provide 500-year level flood protection. The two primary options to provide this level of protection are discussed below.

2.1.1 Sheet Pile Levee

A sheet pile levee would allow for 500-year protection (with 1-foot freeboard) while maintaining deliveries to the water treatment plant (chemicals and salt) and the internal circulation of 911 Drive. See Exhibit A1 and A2 for the alignment and details of the proposed sheet pile levee. This alignment would provide the following benefits:

- Provides 500-year protection for the Water Treatment Plant, Well #7, and the Public Works Facilities
- Maintains access to WTP #1 and Public Works Facilities
- Limited impacts on day to day operations and storage

The alignment does have some negative impacts:

- Large impact to the floodplain. The alignment removes a significant amount of storage that will need to be replaced with compensatory storage within the floodplain
- Major visual impacts to the area. The levee could raise concerns with residential buildings within the floodplain on the north side of Farm Creek. If flooding of these structure were to occur after the installation of the levee, it is likely the residents will fault the levee for the flooding.

A permit from IDNR will be required to construct the sheet pile levee. IDNR will require a floodway determination be completed to confirm that the proposed levee alignment is outside of the floodway boundary. This determination and the proposed project would need to be submitted to IDNR for review and approval.

An opinion of probable construction costs was completed for the proposed sheet pile levee. A summary of these costs is included below:

Construction Item	Cost ($)
Sheet Pile Wall	$515,000
Earthwork (Detention / Compensatory Storage)	$180,000
Misc. Items (Levee Penetrations)	$50,000
20% Planning Contingency	$155,000
TOTAL	**$900,000**

*Construction costs do not include engineering, permitting or legal costs.
**Opinion of Probable Construction Costs based on 2018 project costs.

2.1.2 Earthen Levee

An earthen levee was eliminated from consideration due to the impacts of the overall footprint of the levee. The average width of the earthen levee (with 3:1 side-slopes and an average height of 11 feet) would be 71 feet. This width created too large of an impact on the area and did not allow for detention and compensatory storage areas. The earthen levee is not a preferred option to provide 500-year protection for WTP #1.

2.2 Limited 100-Year Level Protection

Since the City can maintain potable water service with WTP #2 in the event of flooding at WTP #1, the City could consider providing less than the 500-year level protection. A limited 100-year level protection improvements are discussed below.

2.2.1 WTP #1 Protection

The City could consider a combination of an earthen levee and a retaining wall to provide 100-year limited level protection (with 1-foot of freeboard) for the WTP #1 only. See Exhibit B1 and B2 for the details and location of the proposed improvement. This improvement would have the following benefits:

- Provides 100-year level protection for the WTP #1
- Limited impacts on the watershed. Minimal amount of compensatory storage would be required because it will only protect the WTP #1
- Minimal visual impact on the watershed because it is considerable shorter and will only remove the WTP #1 building from the 100-year floodplain.
- Limited impacts on day to day operations and storage

The alignment does have some negative impacts:

- Does not provide 500-year protection for the WTP #1
- Does not provide any flood protection of the public works facilities or Well #7

A preliminary discussion with IDNR was conducted to determine potential permitting requirements. IDNR indicated (based on the preliminary information they were provided) that the project would need an IDNR permit. However, they would not need a floodway determination if compensatory storage was provided for any lost storage volume within the floodplain. This determination was based on the improvement being located within an area that does not contribute to the conveyance of the flow and the lost storage volume being replaced with compensatory storage.

An opinion of probable construction costs was completed for the proposed 100-year limited levee. A summary of these costs is included below:

Construction Item	Cost ($)
Earthwork (Detention / Compensatory Storage)	$18,000
Retaining Wall	$30,000
Concrete Sidewalk (ADA Accessibility)	$7,000
Loading Dock Revision	$15,000
Interior Drainage	$20,000
Misc. (Pavement removal, seeding, fertilization, etc.)	$10,000
20% Planning Contingency	$20,000
TOTAL	**$120,000**

*Construction costs do not include engineering, permitting or legal costs.
** Opinion of Probable Construction Costs based on 2018 project costs.

2.2.2 Well #7 Protection

The City has three (3) wells which can currently serve WTP #1. Well #6 and Well #8 are located outside of the 100-year floodplain. During a flood event, the City could turn off Well #7 and continue to operate WTP #1 using Well #6 or Well #8. Thus, under the 100-year limited levee option, no protection was proposed for Well #7.

Minor improvements to Well #7 should be completed to eliminate the potential of floodwaters entering the well during a flood event. These improvements include raising the well casing vent pipe above the 100-year flood elevation.

More significant improvements would be required to protect Well #7 from being damaged during the 100-year flood event. If additional protection for Well #7 is desired, the City should consider raising the electrical gear above the 100-year flood elevation. An opinion of probable construction costs was completed for the Well #7 protection options. A summary of these costs is included below:

Construction Item	Cost ($)
Well casing vent piping	$2,000
Raise existing electrical gear above the 100-year flood elevation	$30,000
20% Planning Contingency	$6,000
TOTAL	**$38,000**

*Construction costs do not include engineering, permitting or legal costs.
** Opinion of Probable Construction Costs based on 2018 project costs.

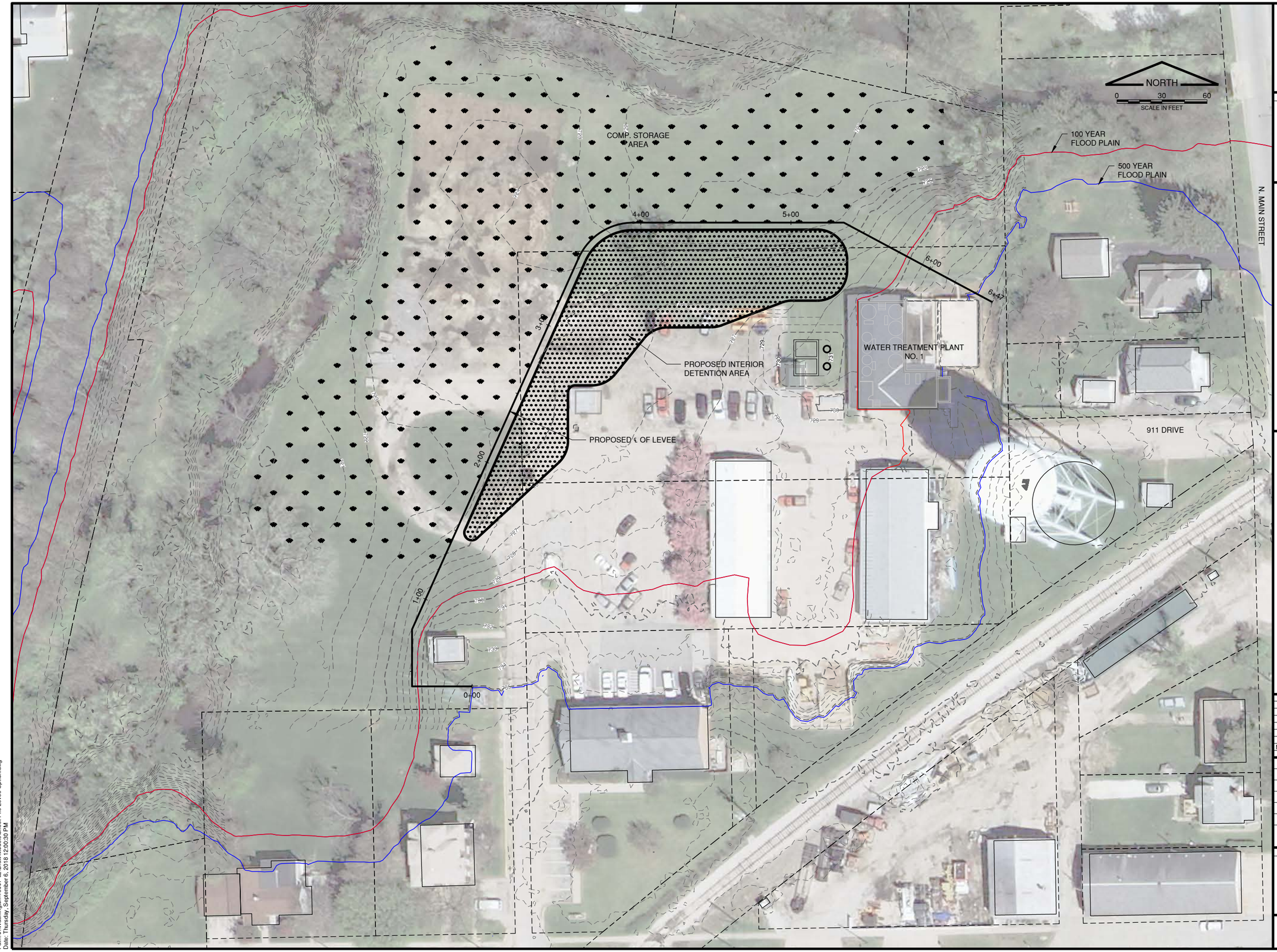
At a minimum, of any of the existing electrical gear for Well #7 is replaced (or improved) it should be installed at an elevation above the 100-year floodplain.

3.0 Recommendations

The City should careful review the potential impacts of flooding prior to determining how to proceed with flood protection within the watershed. If the City elects to proceed with the 500-year level protection, we would recommend contacting USACE to review potential funding alternates under the CAP – 205 Small Flood Risk Management Projects. The program could provide up to 50% of the funding and allow the USACE to complete the engineering, floodway modeling and permitting as a part of the project. A project funded through this program is anticipated to take 3-5 years to go from acceptance through completion.

It is anticipated that the limited 100-year level protection would be completed with local funding. This project could be completed within 1-2 years, depending on the final IDNR permitting requirements.

The final decision on the level of protection to provide for WTP #1 is a risk-based decision based on the City ability to accept the loss of service and financial impacts of the repairs. Only the City can fully weigh the risks and determine how to proceed with flood protection for WTP #1.



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CMT

License No. OFFICE NUMBER

CONSULTANTS

SHEET PILE LEVEE OPTION

PRELIMINARY LEVEE ALIGNMENT

OWNER

WASHINGTON

ILLINOIS

MARK	DATE	DESCRIPTION

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CAD DWG FILE:	SHEET PILE LEVEE OPTION.DWG
DESIGNED BY:	--
DRAWN BY:	--
CHECKED BY:	---
APPROVED BY:	--
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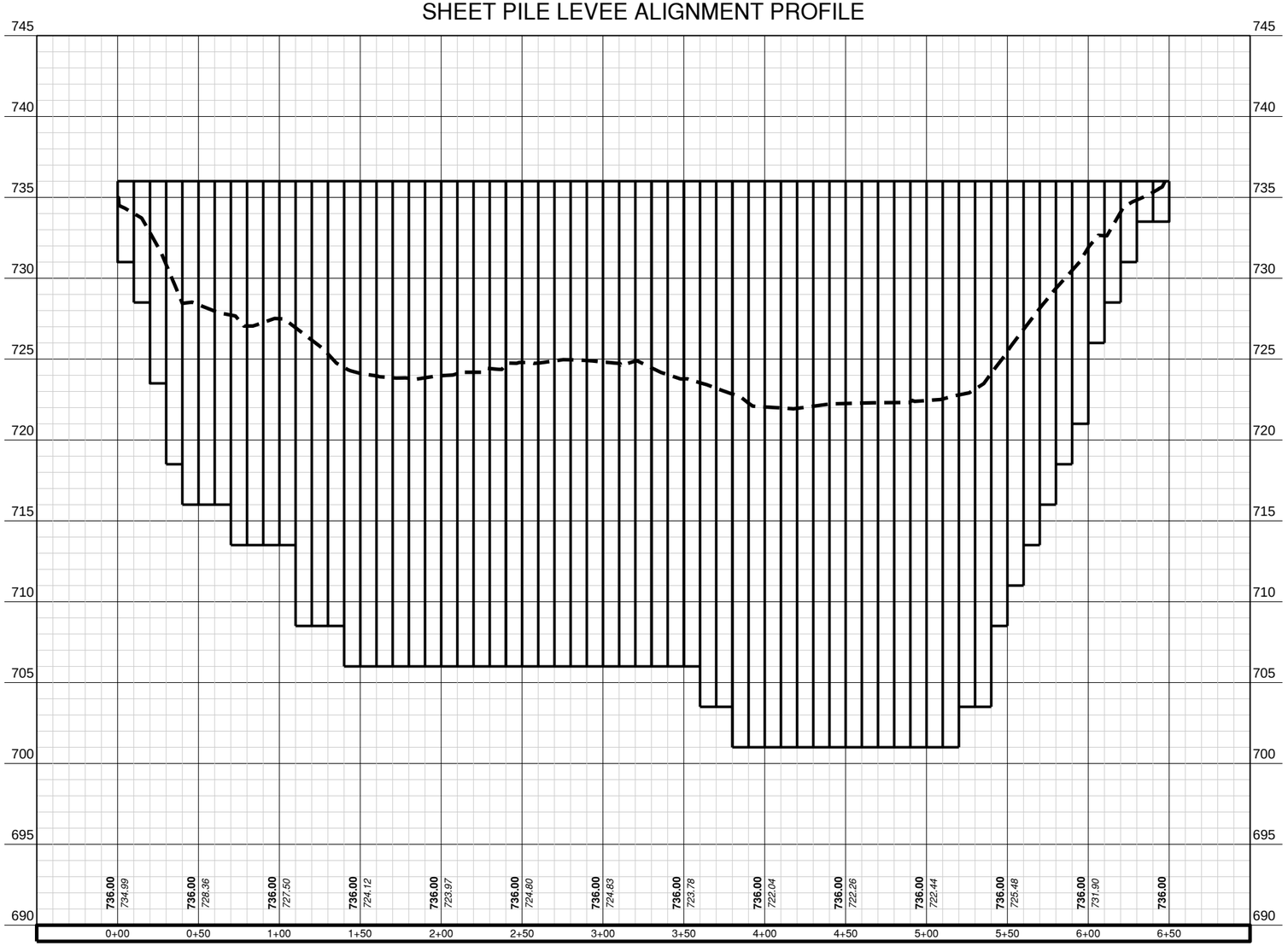
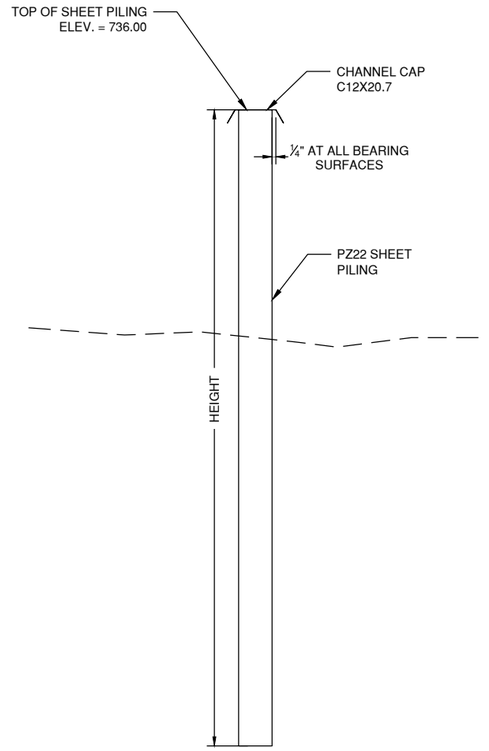
SHEET TITLE

EXHIBIT A1

SHEET OF

SHEET PILE LEVEE ALIGNMENT PROFILE





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STA. 0+30 TO STA. 0+40	10	17.5	175
STA. 0+40 TO STA. 0+70	30	20	600
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STA. 2+40 TO STA. 3+30	90	30	2700
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SHEET PILING WALL TYPICAL SECTION

NOTE: DESIGN VALUE OF CLAY COHESION = XXX PSF MIN.

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SHEET PILE LEVEE OPTION

PRELIMINARY LEVEE ALIGNMENT

OWNER

WASHINGTON

ILLINOIS

MARK	DATE	DESCRIPTION

PROJECT NO:	16007-02-00
CAD DWG FILE:	SHEET PILE LEVEE OPTION.DWG
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APPROVED BY:	--

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EXHIBIT A2

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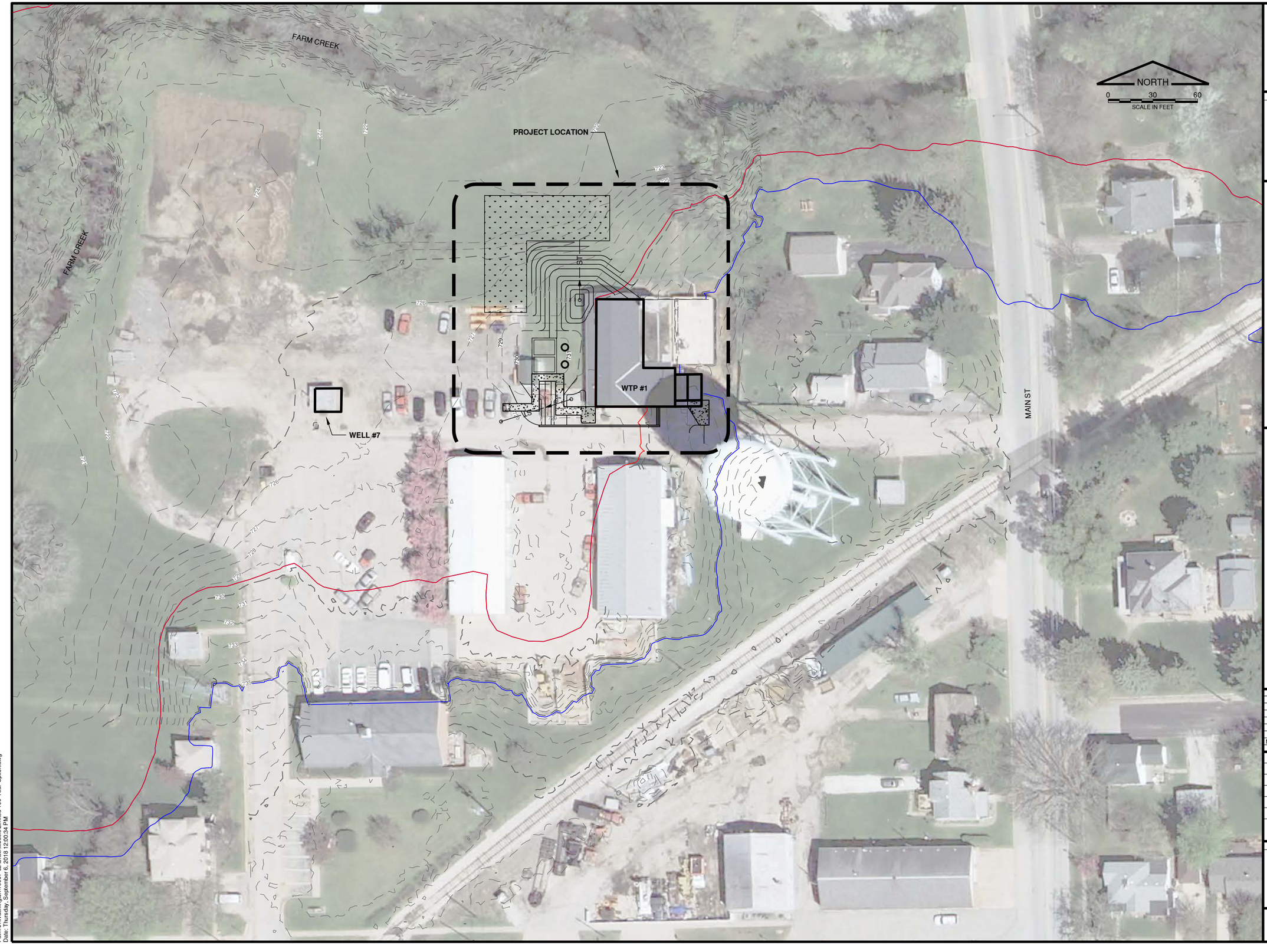

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LIMITED 100-YEAR OPTION

PRELIMINARY LEVEE ALIGNMENT

OWNER

WASHINGTON

ILLINOIS

MARK	DATE	DESCRIPTION

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EXHIBIT B1

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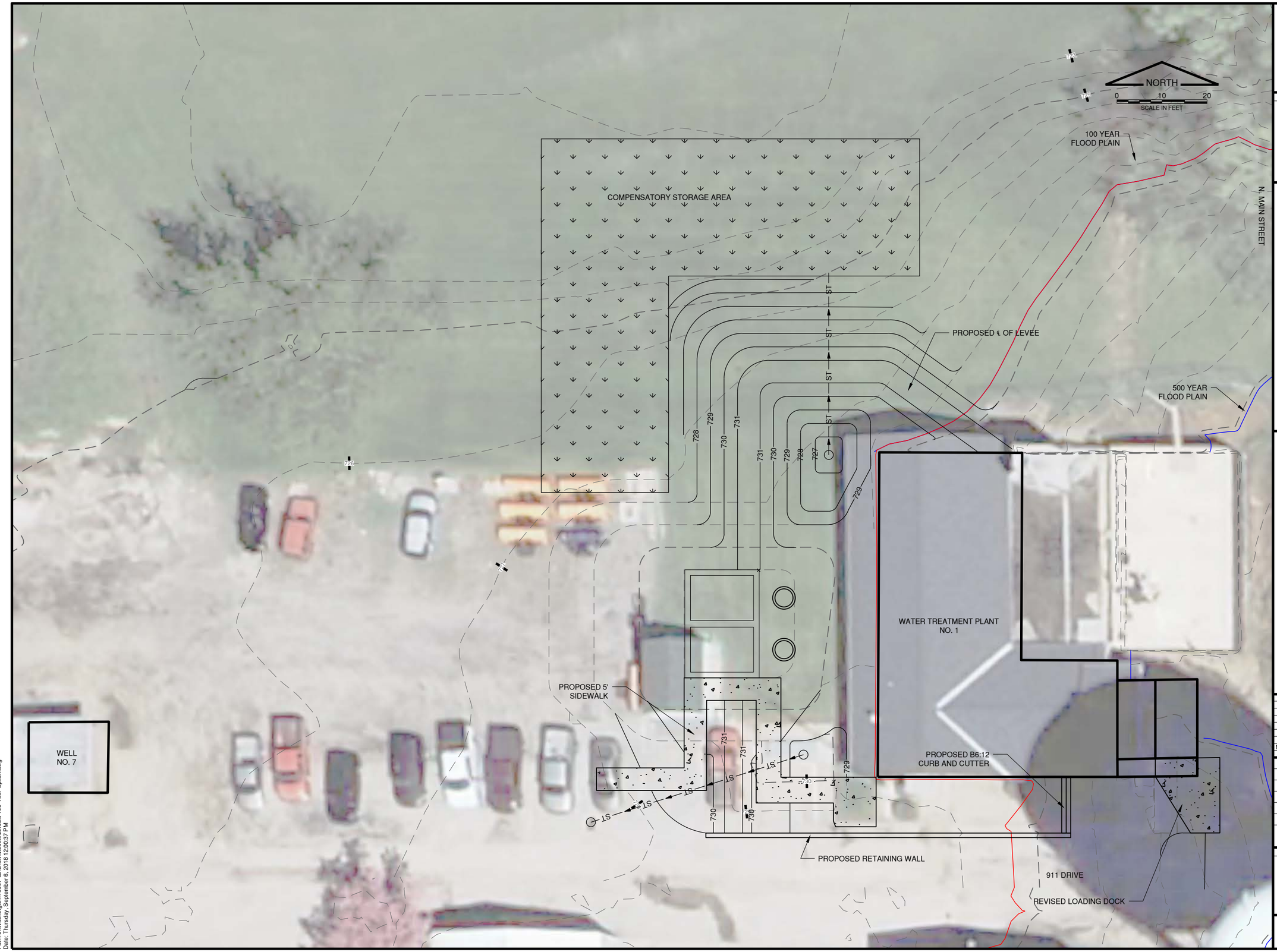

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CONSULTANTS

LIMITED 100-YEAR OPTION

PRELIMINARY LEVEE ALIGNMENT

OWNER

WASHINGTON

ILLINOIS

MARK	DATE	DESCRIPTION

PROJECT NO:	16007-02-00
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SHEET TITLE

EXHIBIT B2

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