SECTION 6-4-7
WATER RESOURCES

This section documents the evaluation of potential effects of the Project to water resources, which include wetlands, surface waters (including mapped streams and waterbodies), groundwater, floodplains, drainage areas, and surface flow. **Appendix I-1** presents the legislation and regulatory programs that pertain to water resources.

Four study areas were identified for the Project: Central Study Area, I-481 South Study Area, I-481 East Study Area, and I-481 North Study Area (see **Figure 6-4-7-1**). Onondaga Lake, Onondaga Creek, Ley Creek, Mud Creek, Butternut Creek, and several unnamed streams are located within the Project Area. The study areas also include small, isolated areas where the only Project activity is the proposed noise barriers; these areas have also been evaluated for potential effects to water resources.

Existing conditions for water resources within the study areas were characterized using the following data sources:

- NYSDEC's Environmental Resource Mapper for data on streams, waterbodies, and freshwater wetlands;
- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) wetlands maps;
- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soils maps;
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for areas that may be located within flood hazard areas;
- The Final NYSDEC 2020 Section 303(d) List of Impaired Waters Requiring a TMDL or Other Restoration Strategy (June 2020);[1]
- Site reconnaissance of the study areas in July and September 2016, June through October 2017, June and August 2018, September 2019, June 2020, and May 2021;
- Wetland delineations[2] conducted within the study areas in July, August, and September 2017, and September and October 2019 (see I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary, **Appendix I-2**);

1 NYSDEC. 2018. Final New York State 2018 Section 303(d) List of Impaired/TMDL Waters. Accessed May 13th, 2021 at https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

2 Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss; U.S. Army Corps of Engineers. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (version 2.0), ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble, and J.F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

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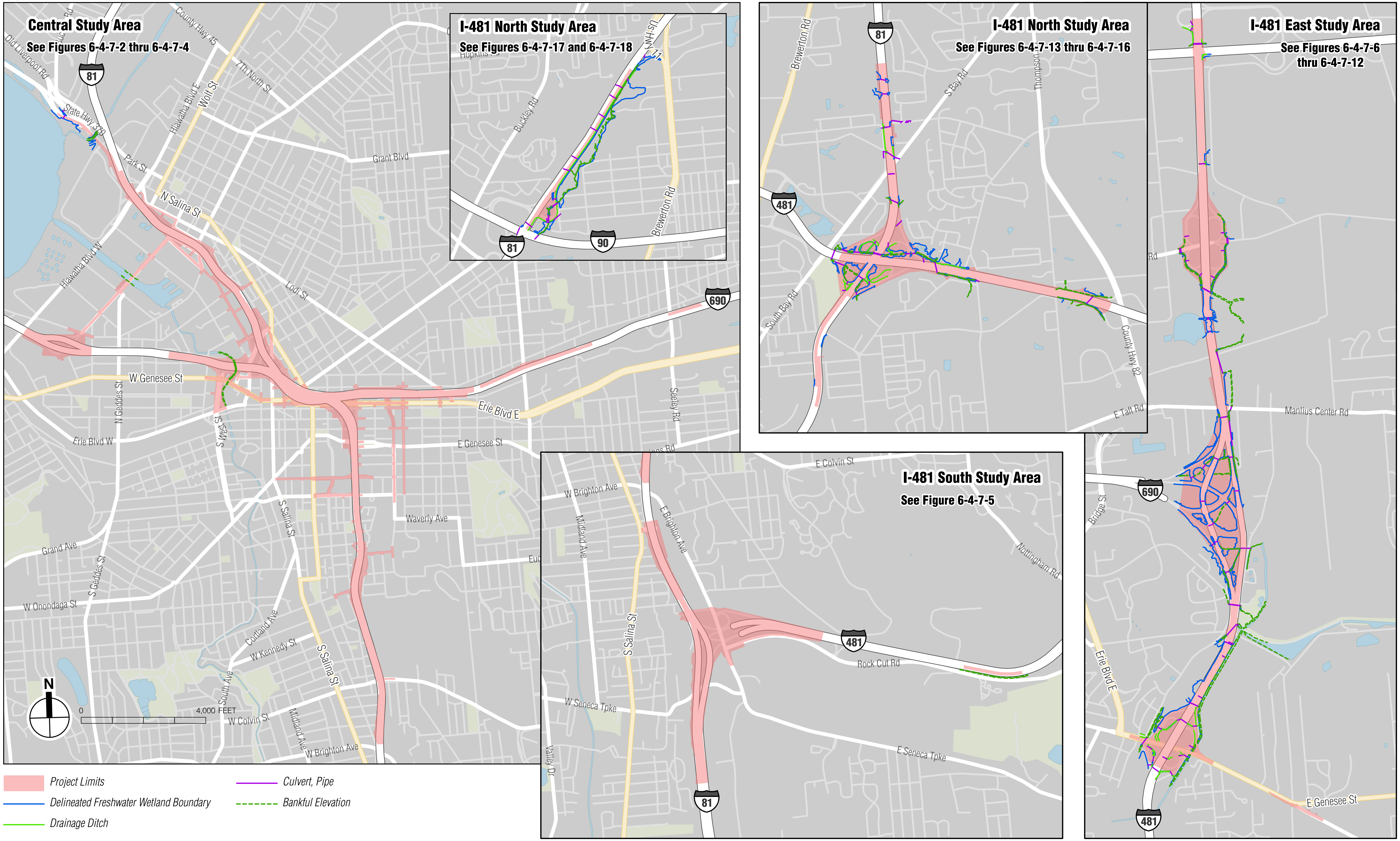


EO 11990 Wetlands and Jurisdictional Surface Waters Overview
Figure 6-4-7-1

- Wetland mapping[3] conducted within the study areas in June 2020 and May 2021 (see I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary, **Appendix I-2**);
- Stream and culvert surveys[4] conducted within the study areas in October 2017, June and August 2018, September and October 2019, June 2020, and May 2021 (**Appendix I-2**, **Appendix I-3**);
- U.S. Geological Survey's (USGS's) National Streamflow Information Program for watershed size data for streams; and
- USEPA's STOrage and RETrieval and Water Quality eXchange (STORET) for water quality data for streams.

The assessment of potential effects to the surface waters listed above included analyses conducted in accordance with the Toler Method[5] and FHWA's Pollutant Loadings and Impacts from Highway Stormwater Runoff, 1990 method.[6] **Appendix I-4** presents the results of the analyses. To conservatively estimate the potential change in water quality characteristics, the analyses were conducted without the inclusion of stormwater best management practices (BMPs).

6-4-7.1 AFFECTED ENVIRONMENT

6-4-7.1.1 FRESHWATER WETLANDS

For the purposes of identifying wetland resources, the assessment was conducted for each of the four study areas and up to an additional 164 feet (ft) around[7] the outside of these study areas[8] (see **Appendix I-2**). The wetland delineation and wetland mapping for the Project documented 132.79 acres of freshwater wetlands, which includes those mapped by NYSDEC and NWI (see **Appendix I-2**) within the Project Area. Most of the wetlands within the Project Area are in close proximity to transportation infrastructure and are disturbed. Several of these wetlands have associated creeks that have been diverted under roads, ramps, railroads, and parking lots via culverts (described below in **Section 6-4-7.1.2** and **Appendix I-3**). **Appendix I-2** provides a summary of the wetland delineation and mapping (I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary) conducted for the Project during the 2017, 2019, 2020, and 2021 growing seasons. Wetland acreage calculations were made on the basis of the wetland delineations and mapping as summarized in **Appendix I-2**.

[3] The wetland mapping was conducting following the Preliminary Wetland Mapping and Assessment Methodology (December 2015) that was developed as part of the preliminary DEIS (pDEIS) in 2016 for the Project.

[4] The stream and culvert survey was conducted as a rapid assessment of channel and culvert conditions. Methodology was adapted from the United States Department of Agriculture (USDA) Forest Service 1994 Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Stream surveys are described in **Appendix I-2** and culvert assessments are detailed in **Appendix I-3**.

[5] https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-a.pdf

[6] https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-b.pdf

[7] All unmapped wetlands/surface waters in the project vicinity that are located within 50 meters (164 feet) of a NYSDEC-mapped wetland where there is a NYSDEC-mapped wetland located 50 meters (164 feet) from the limits of disturbance

[8] For consistency with **Chapter 6-4-8**, Ecology, the existing conditions acreages presented herein are calculated on the basis of the 100-foot study area established for ecological communities.

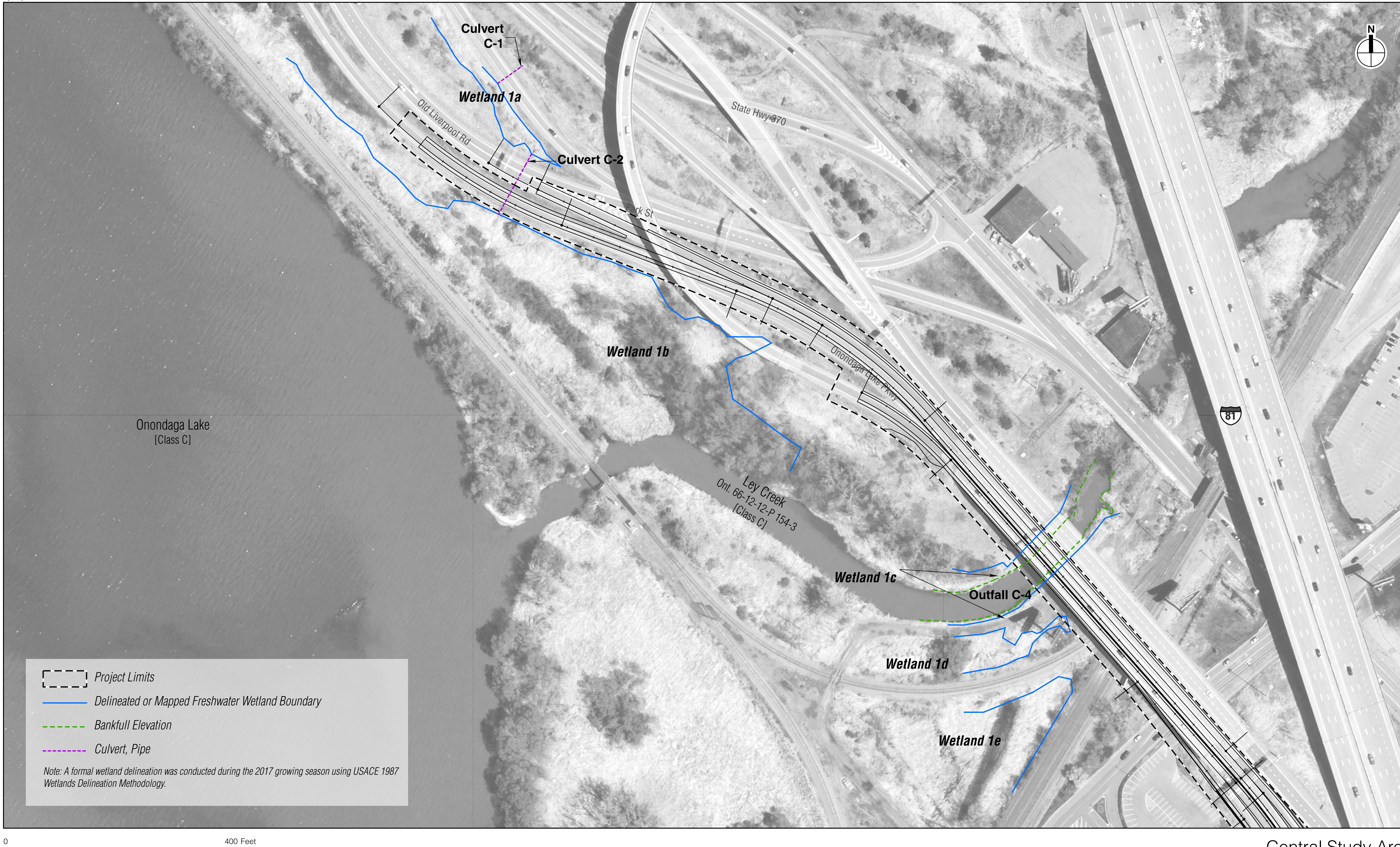
The Project was reviewed for compliance with Executive Order (EO) 11990, Protection of Wetlands (23 CFR 771.125(a)(1)). FHWA is required to comply with EO 11990 by achieving a no net loss of wetlands. FHWA must also seek to avoid, minimize, and mitigate wetlands that are subject to EO 11990. All wetlands that would be adversely affected by a federally funded project are subject to compensatory mitigation under EO 11990. All wetlands presented herein are subject to EO 11990 and are the focus of this assessment for the purposes of NEPA (see **Figure 6-4-7-1** to **Figure 6-4-7-18**). As part of this analysis, NYSDOT has made preliminary determinations regarding USACE and NYSDEC regulatory responsibilities pertaining to wetlands of the Project Area. These USACE and NYSDEC preliminary determinations are presented in **Figure 6-4-7-19** to **Figure 6-4-7-36** and **Figure 6-4-7-37** to **Figure 6-4-7-54**, respectively.

During final design, USACE and NYSDEC would confirm their respective regulatory responsibilities pertaining to wetlands through agency-specific jurisdictional determinations. Wetlands mapped during the 2020 and 2021 growing season (see **Appendix I-2**), were delineated following the USACE wetland delineation methodology. A wetland delineation report is under review by the USACE and NYSDEC along with a request for jurisdictional determination. USACE would determine which of the delineated wetlands meet the definition of Waters of the United States (WOTUS) and are within USACE's jurisdiction. Any wetlands that are determined to be non-jurisdictional by USACE would still be subject to EO 11990.

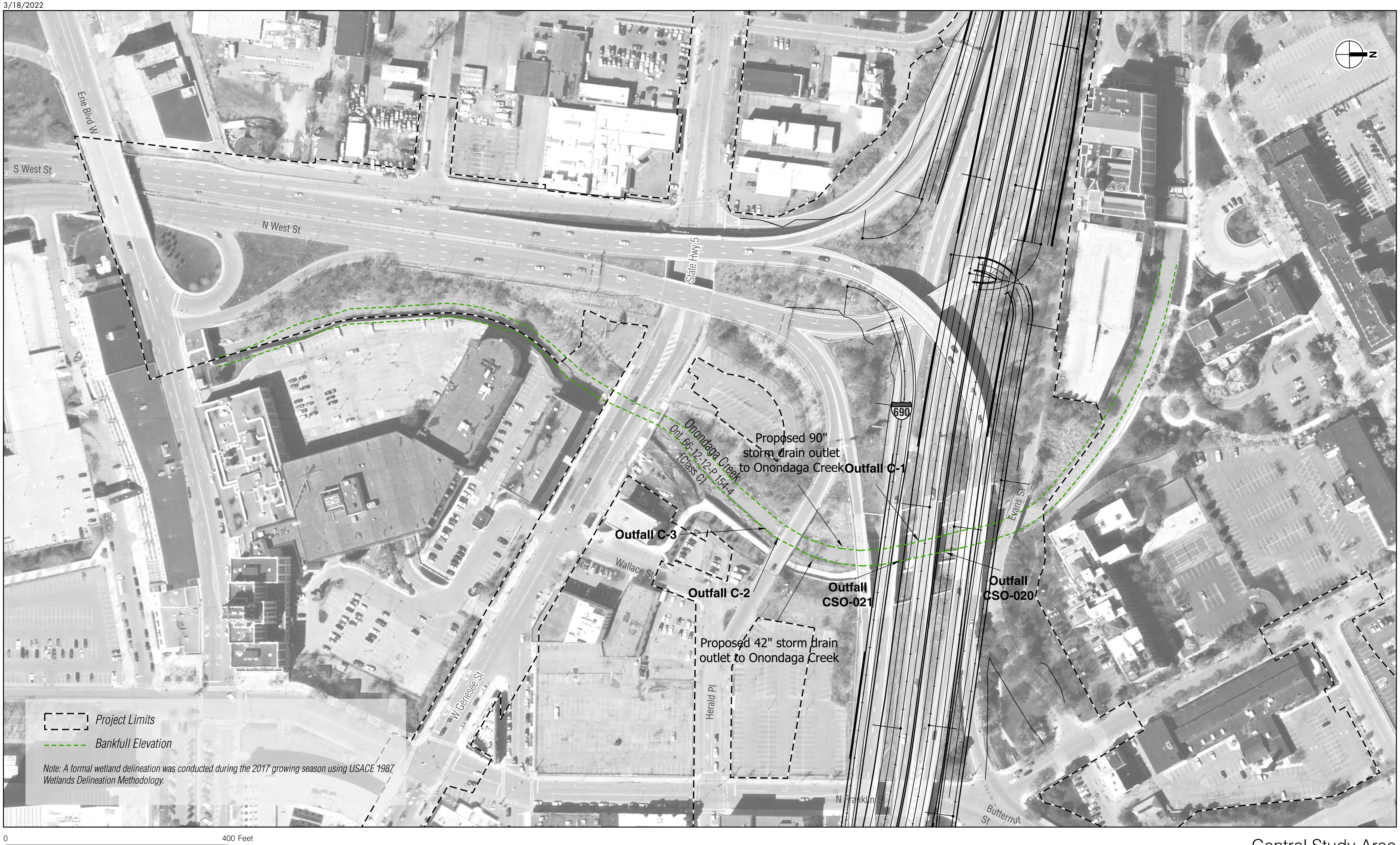
Table 6-4-7-1
Summary of EO 11990 Wetlands within the Project Study Areas

Project Study Area	EO 11990 Wetlands
Central Study Area	2.20
I-481 South Study Area	0.00
I-481 East Study Area	98.79
I-481 North Study Area	31.80
Total	**132.79**

Notes: All wetlands presented herein are EO 11990 freshwater wetlands. Wetlands were delineated/mapped within an area up to 164 feet of the boundaries of each study area as part of this Project (see **Appendix I-2** "I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary"). For consistency with **Chapter 6-4-8, Ecology**, the existing conditions acreages presented herein are calculated on the basis of the 100-ft study area established for ecological communities.
Sources: I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary (**Appendix I-2**).

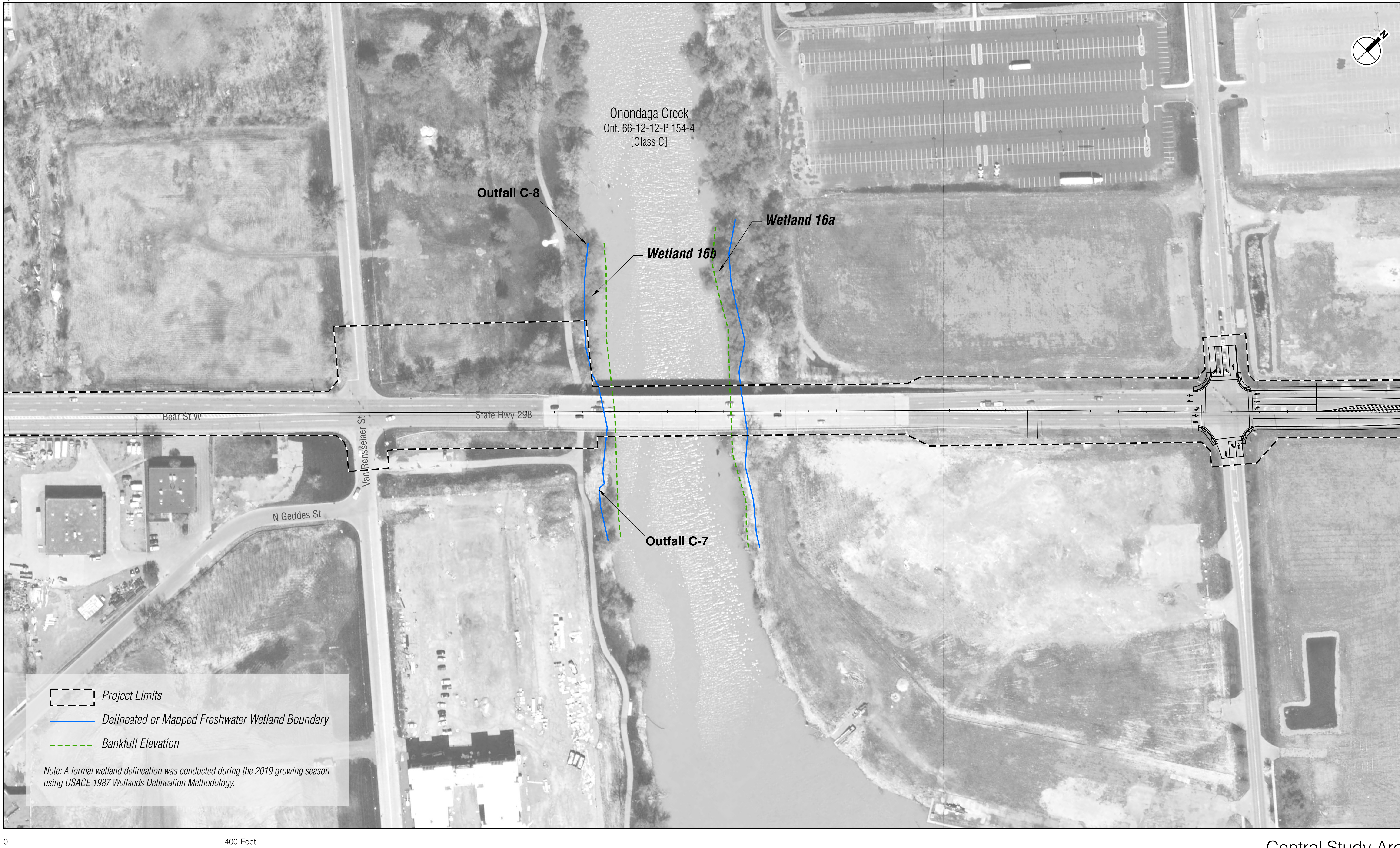


Central Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-2



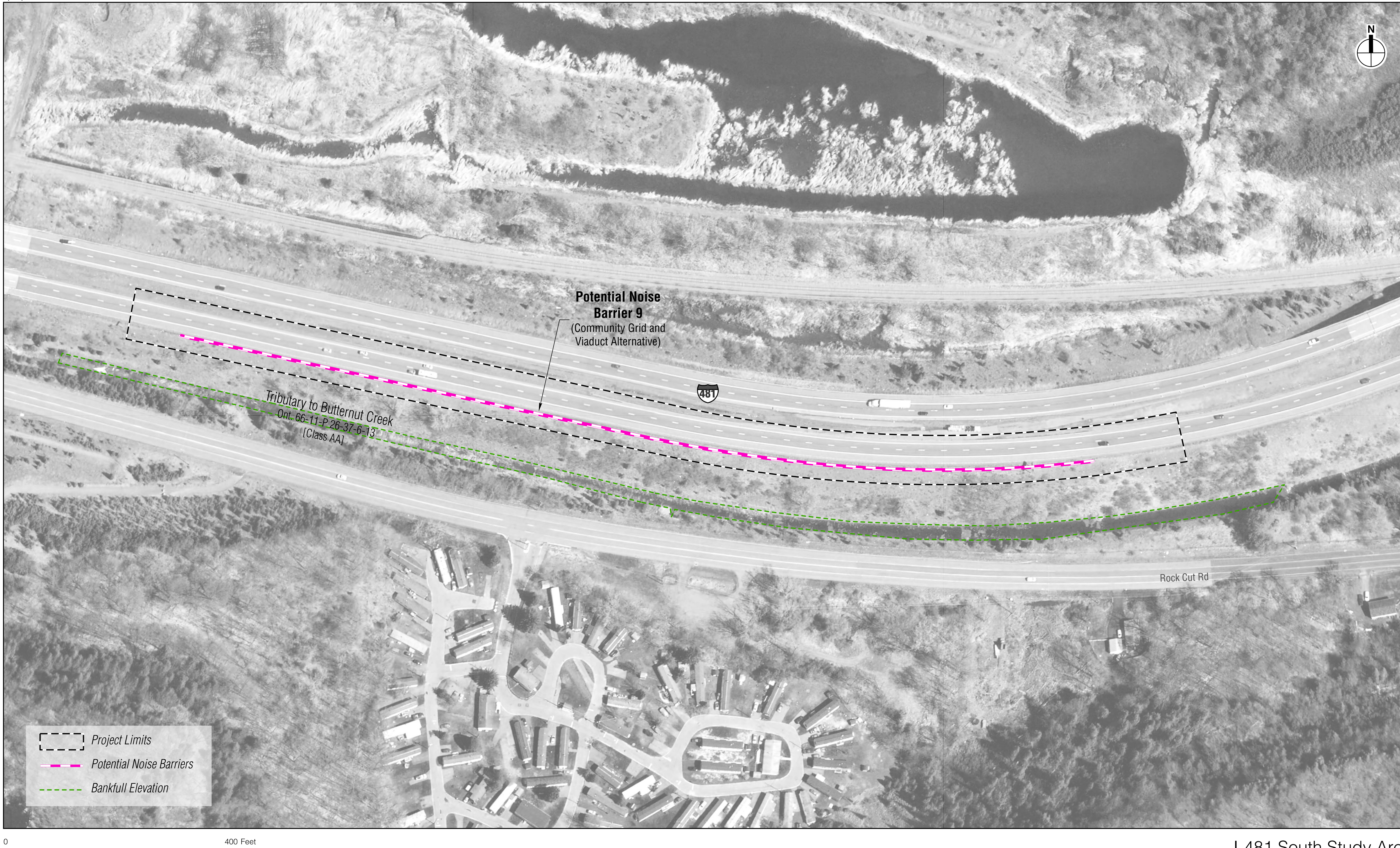
Central Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-3

3/18/2022



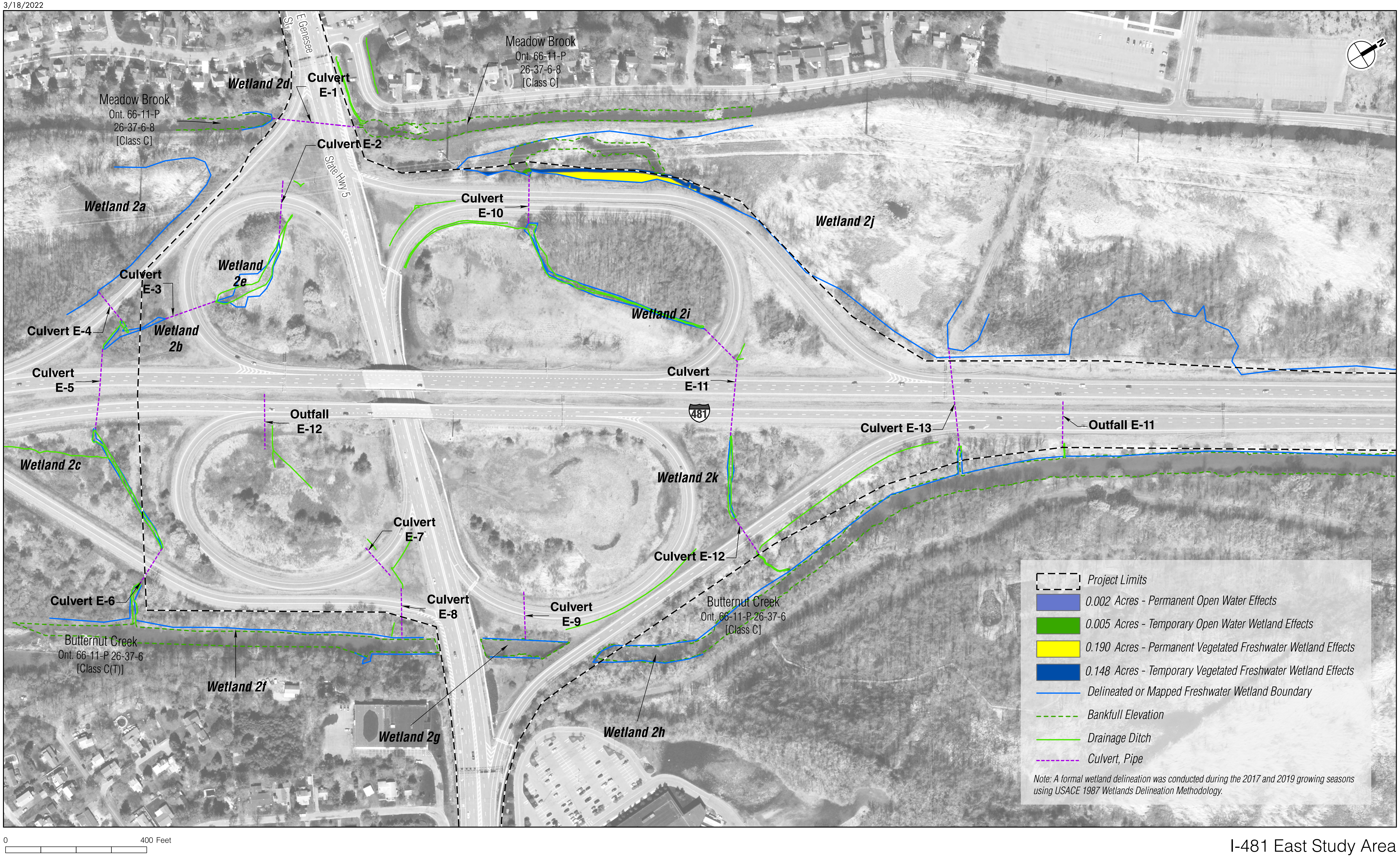
Central Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-4

3/18/2022



I-481 South Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-5

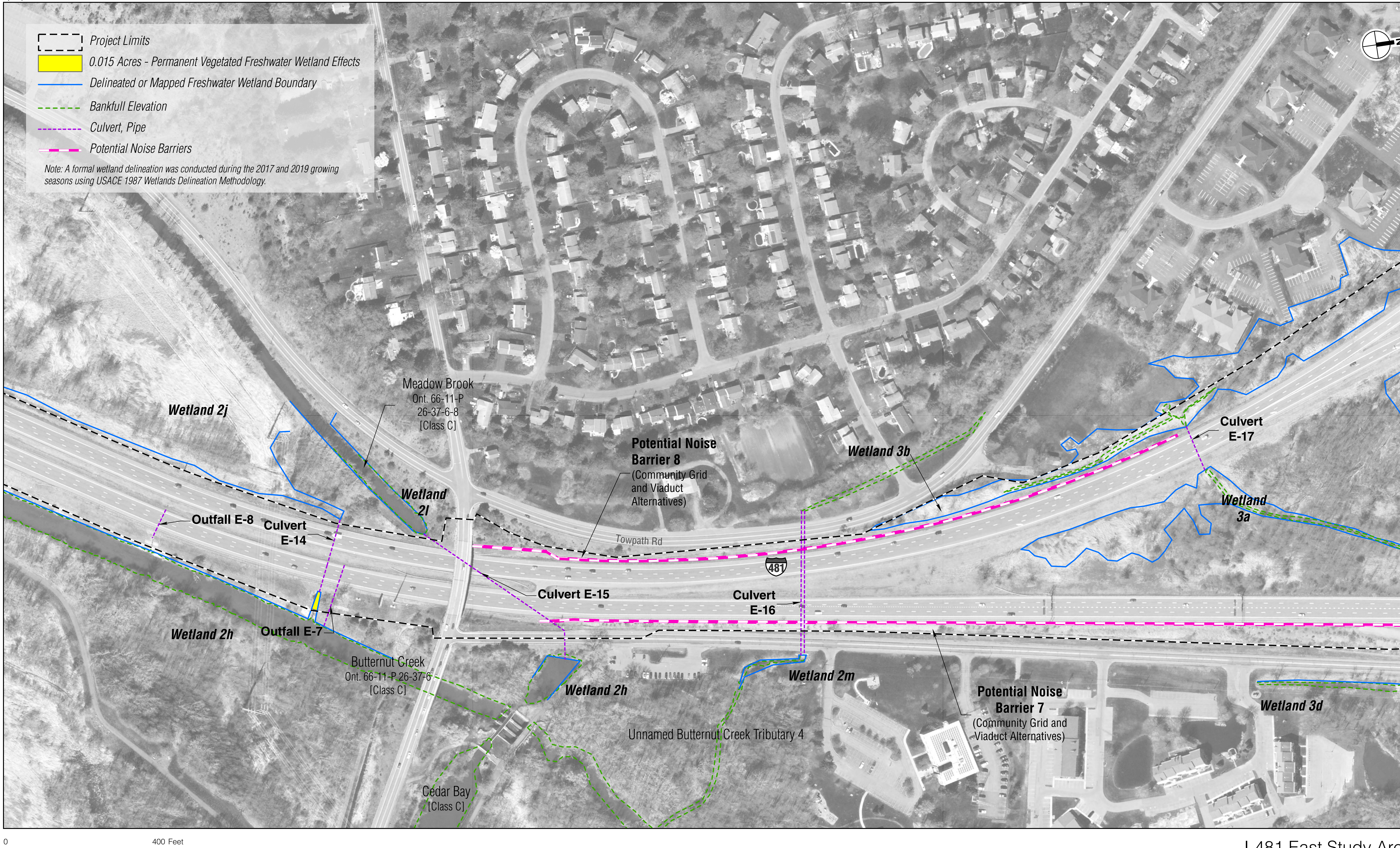
3/18/2022



I-481 East Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-6

I-81 Viaduct Project

3/18/2022

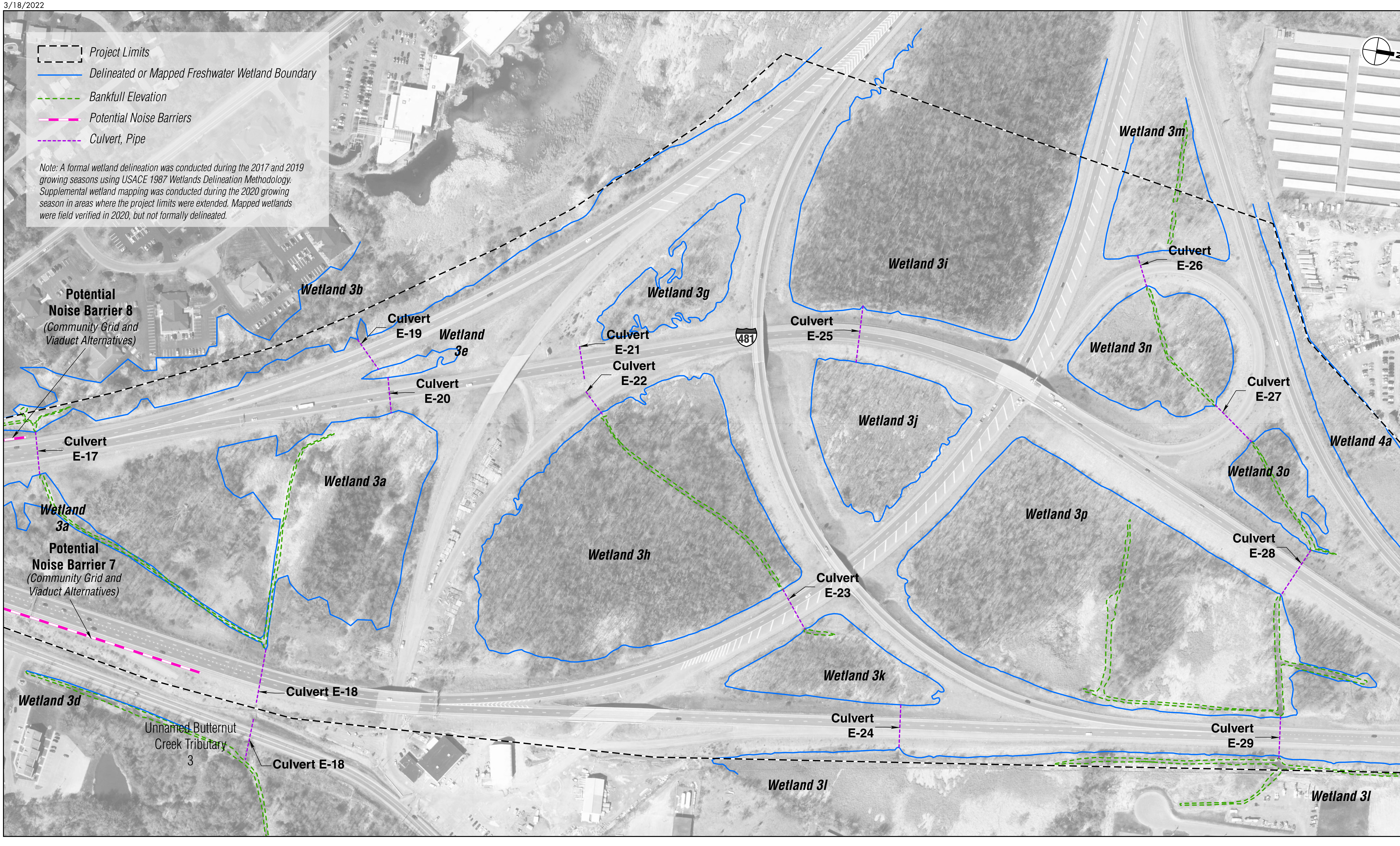


I-481 East Study Area

EO 11990 Wetlands and Jurisdictional Surface Waters

Figure 6-4-7-7

3/18/2022



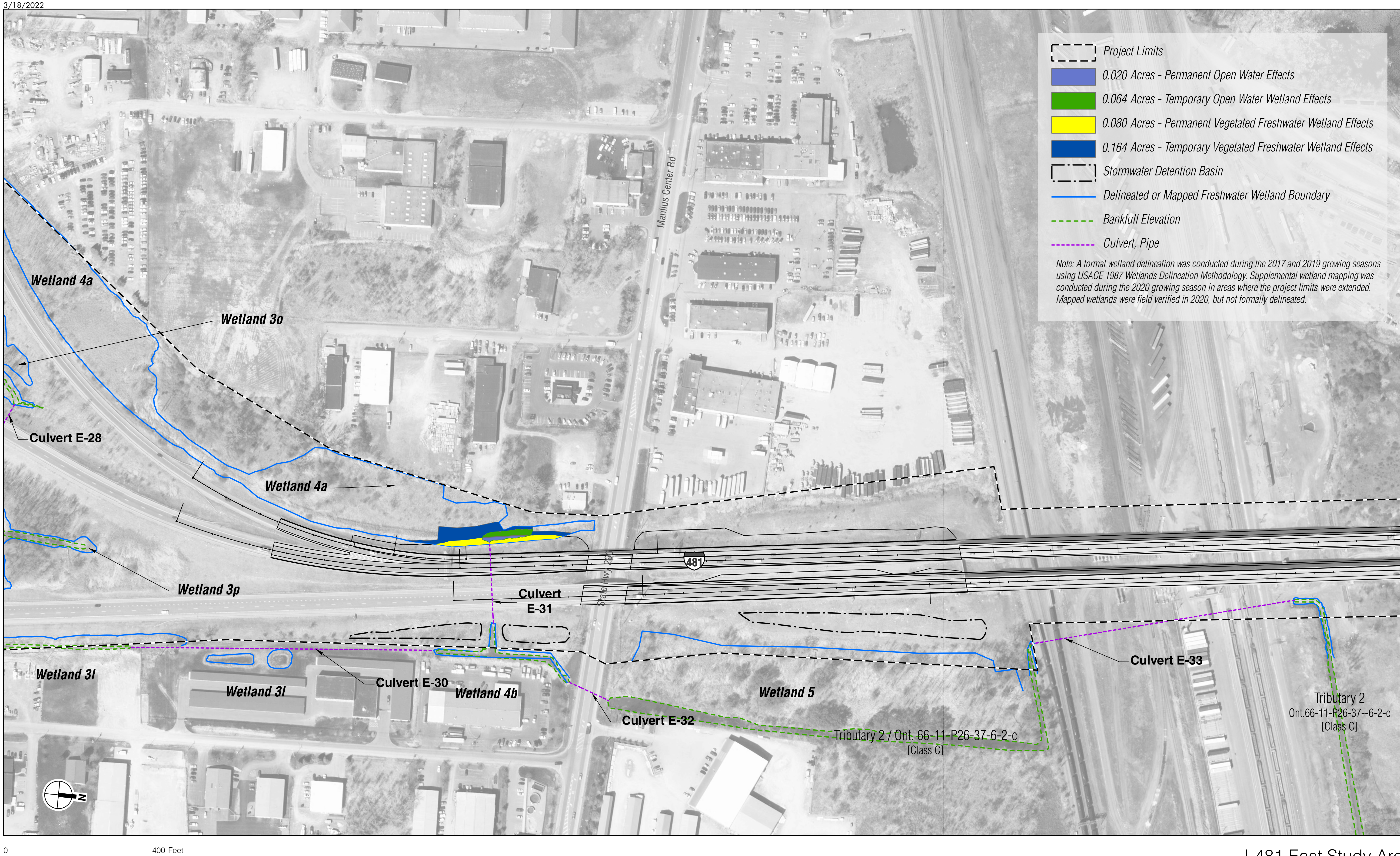
I-481 East Study Area

EO 11990 Wetlands and Jurisdictional Surface Waters

Figure 6-4-7-8

I-81 Viaduct Project

3/18/2022

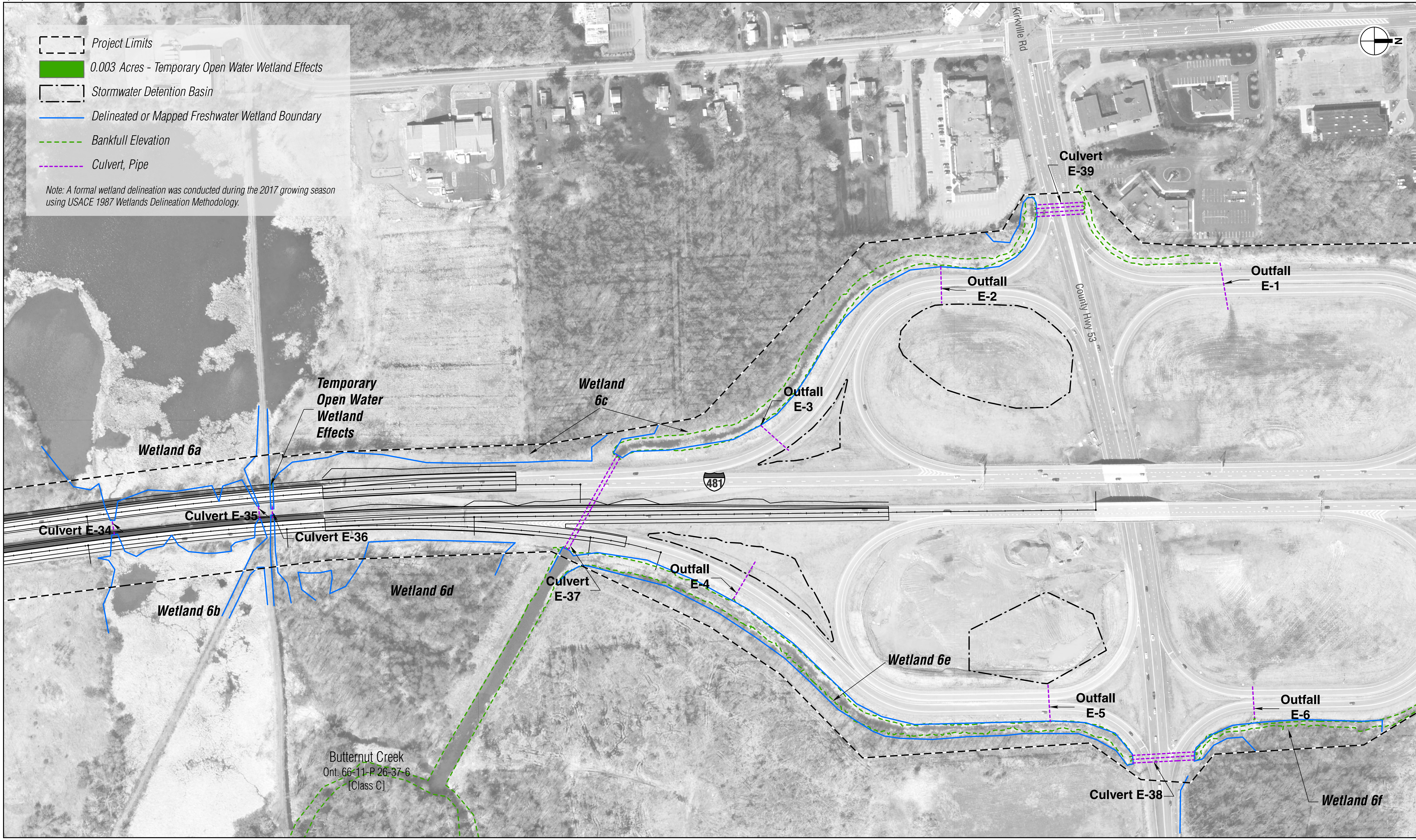


I-481 East Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters

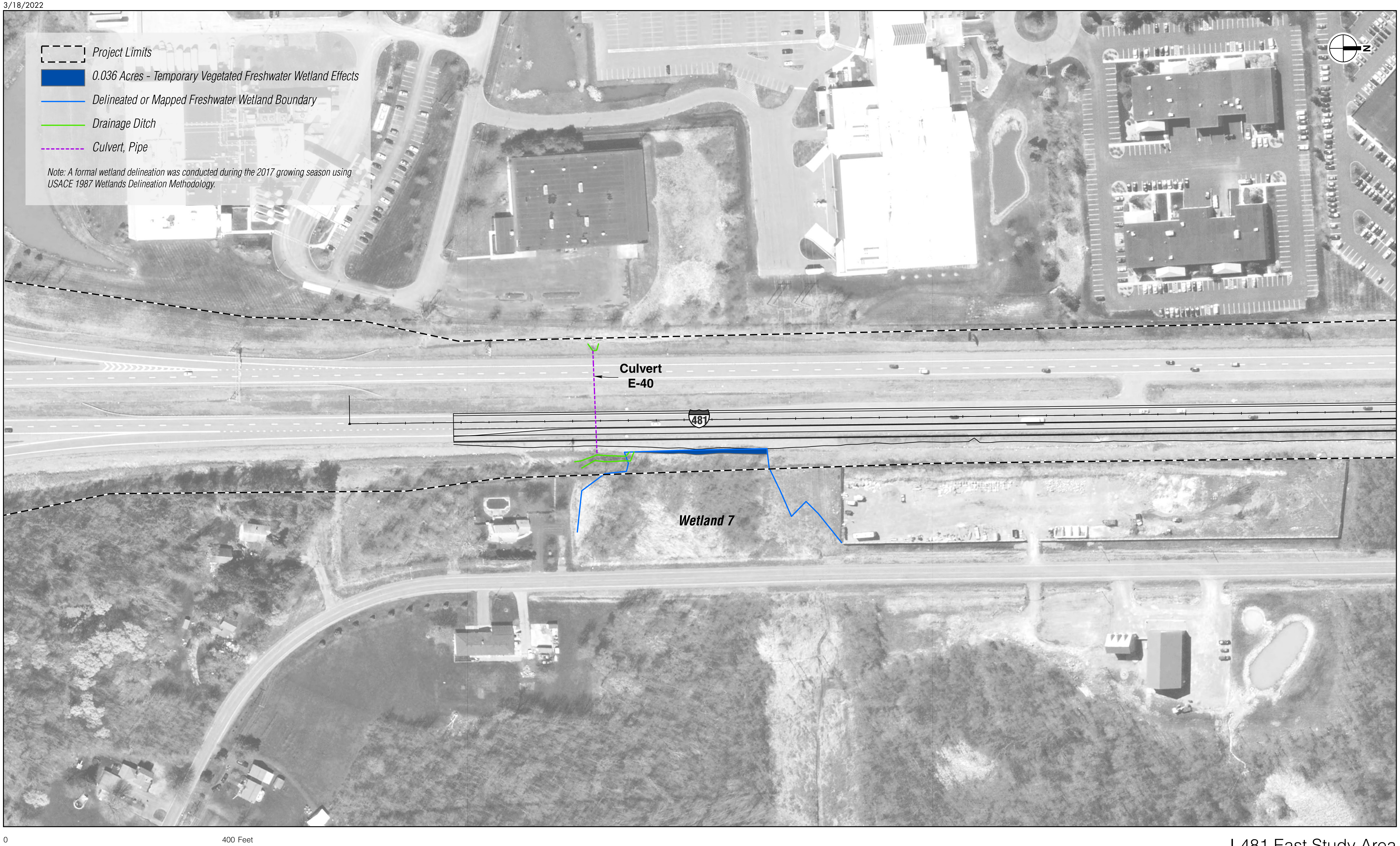
I-81 Viaduct Project

Figure 6-4-7-9

3/18/2022

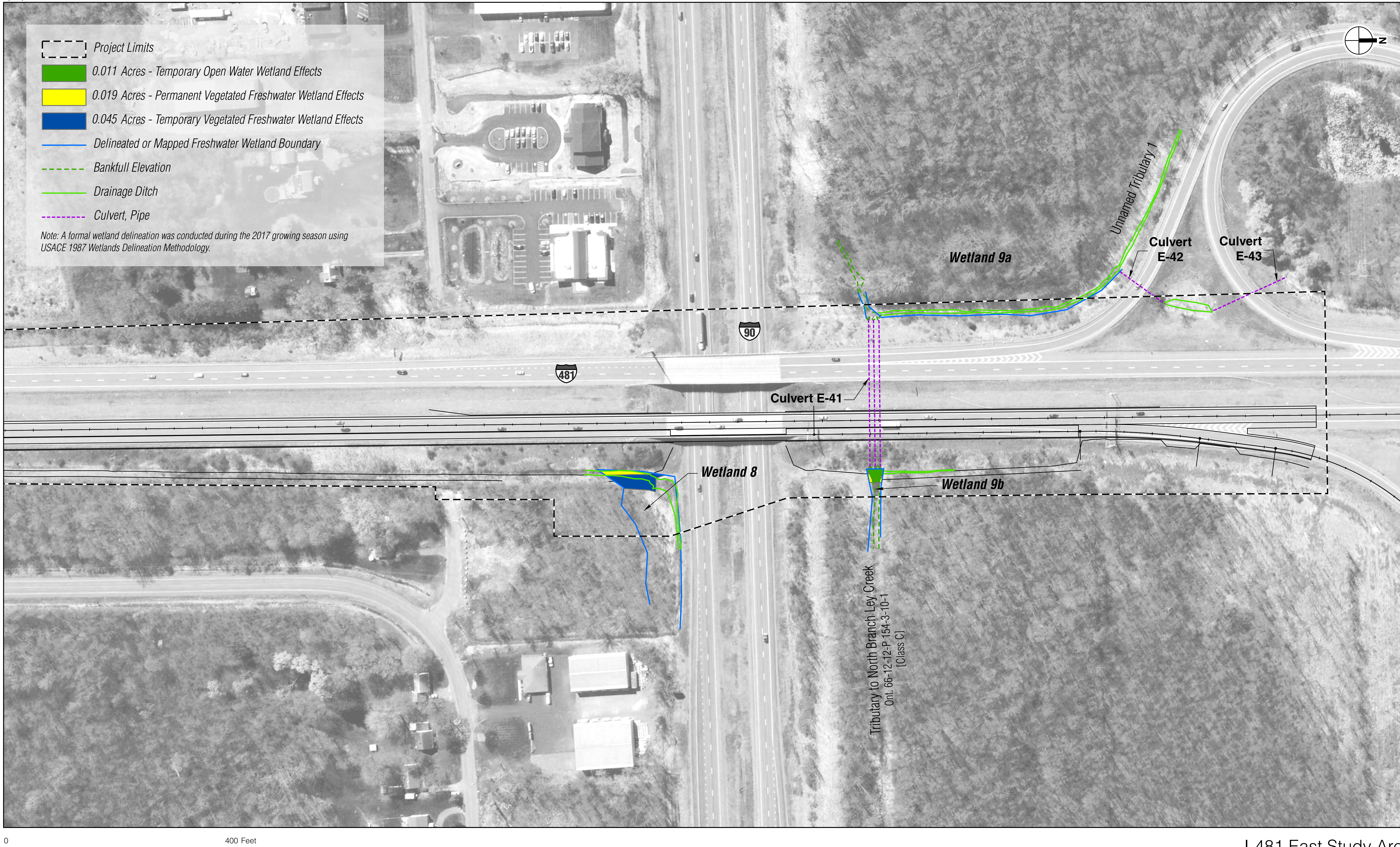


I-481 East Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-10



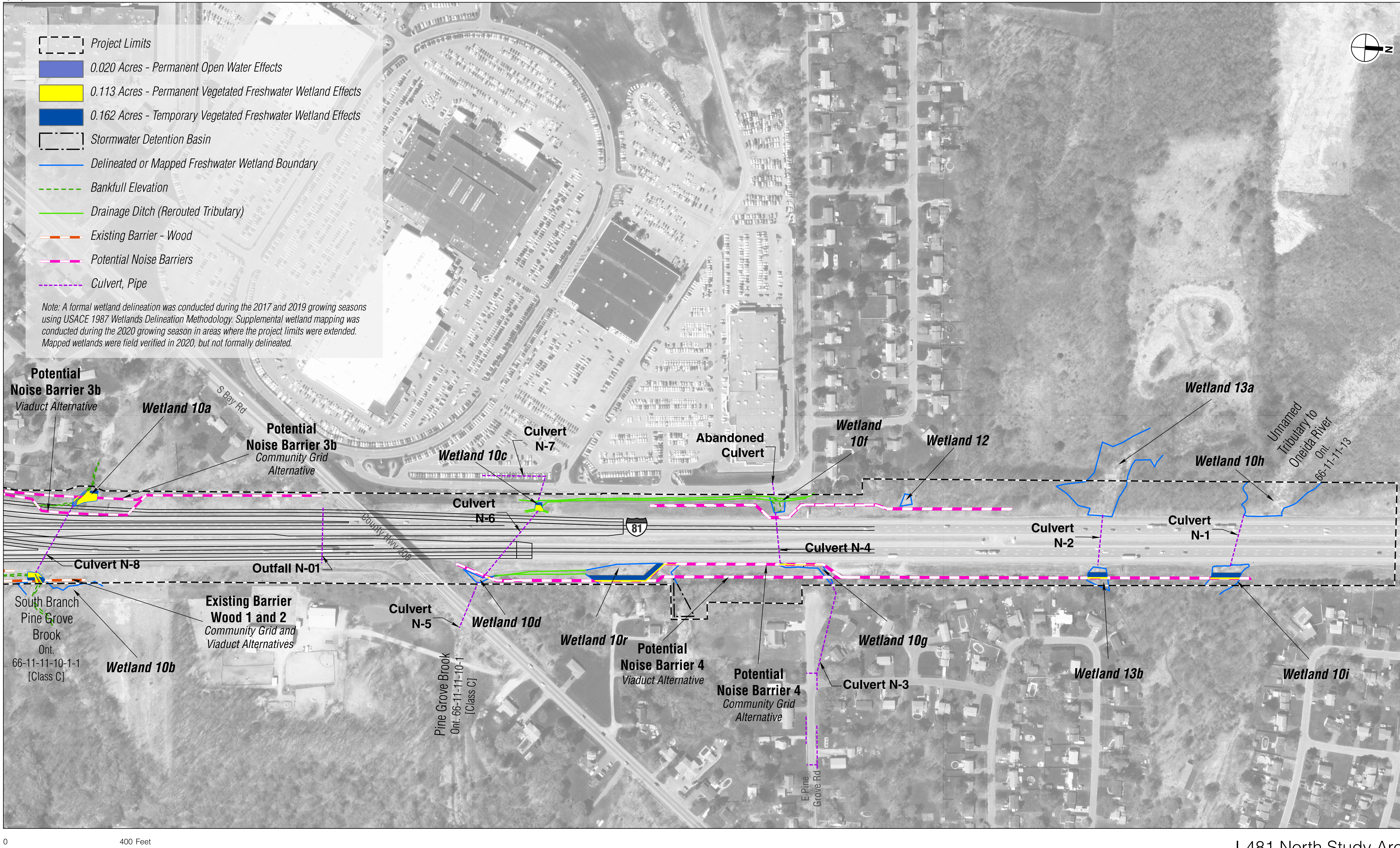
I-481 East Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-11

3/18/2022



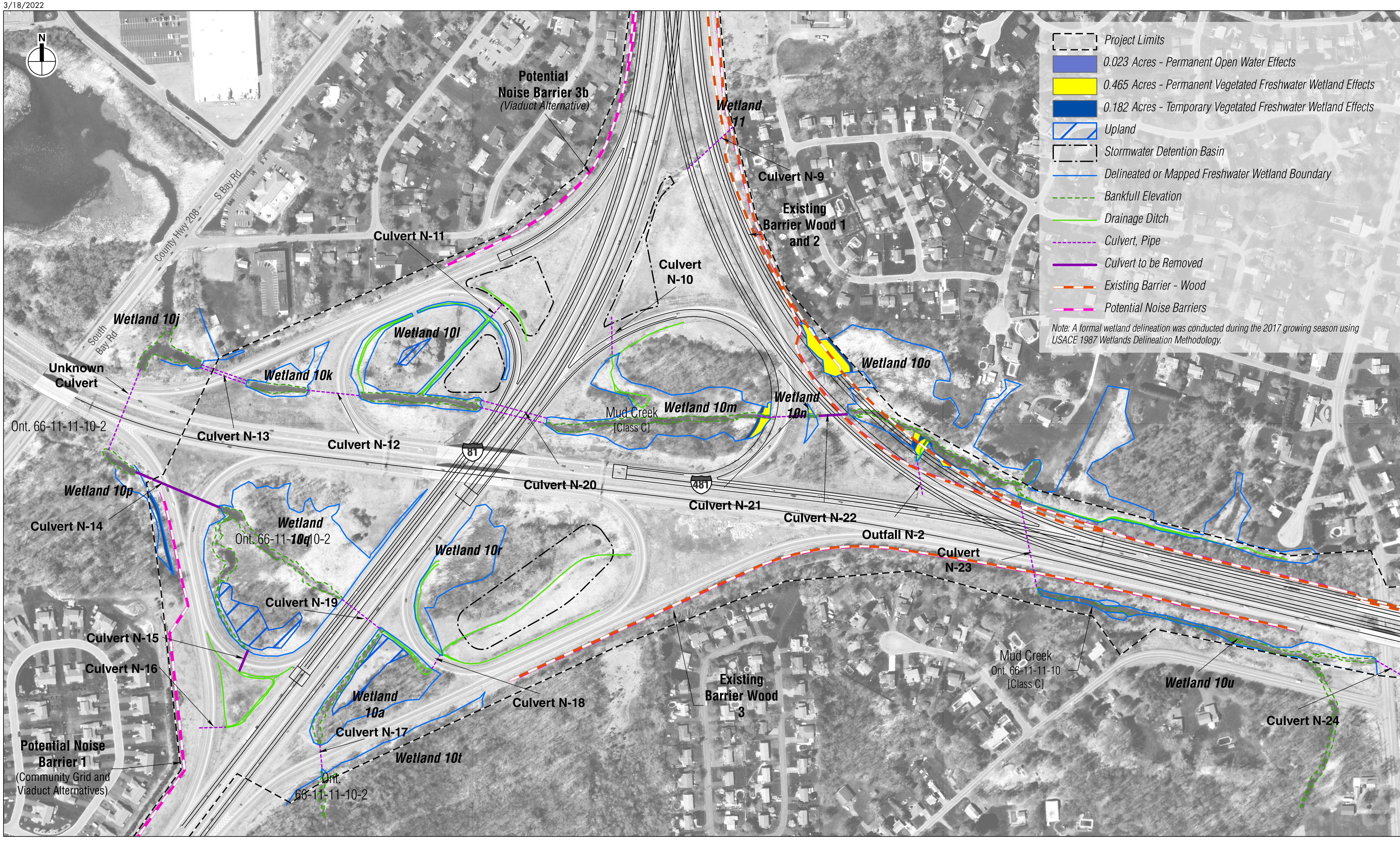
I-481 East Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-12

I-81 Viaduct Project



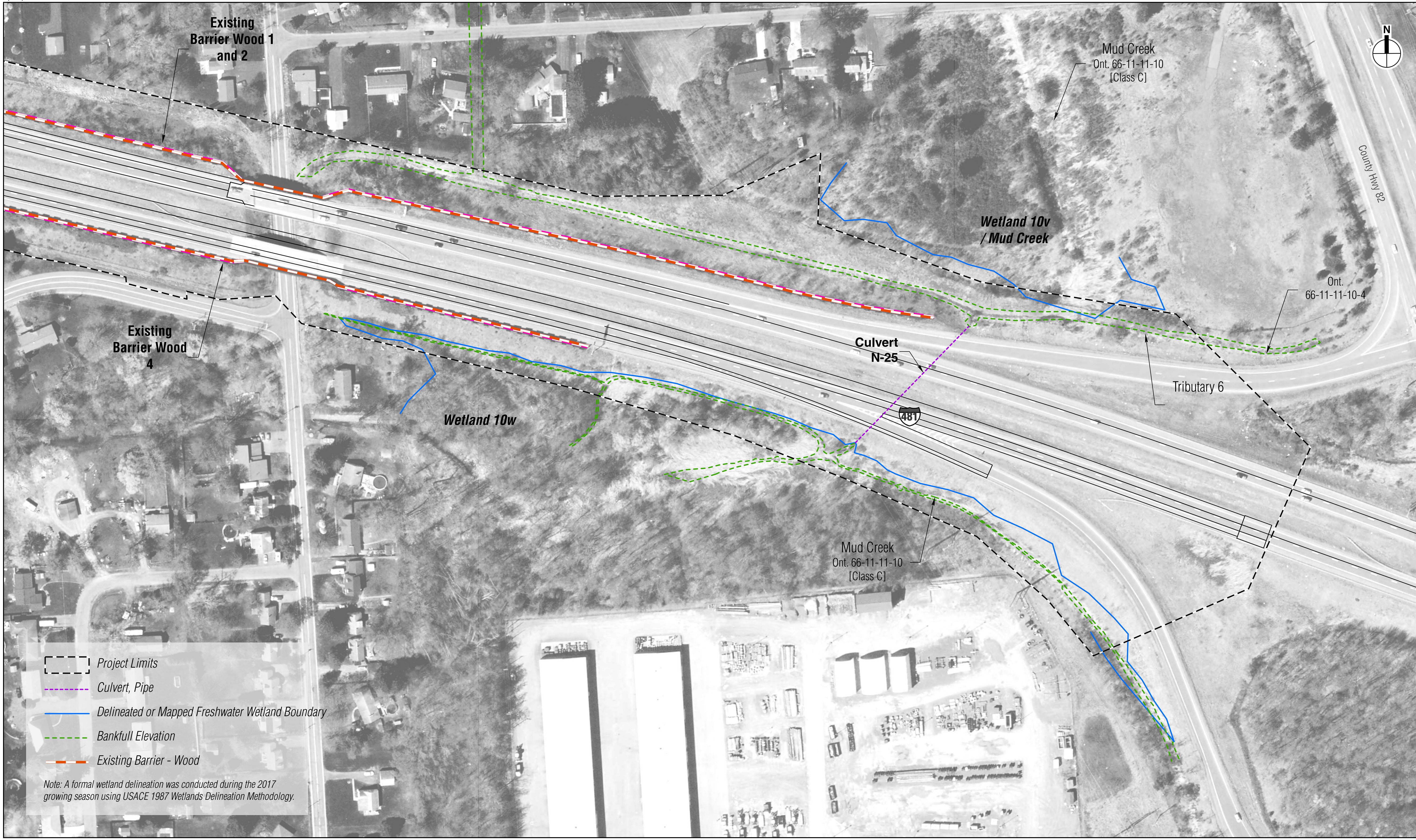
I-481 North Study Area

EO 11990 Wetlands and Jurisdictional Surface Waters



I-481 North Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-14

3/18/2022

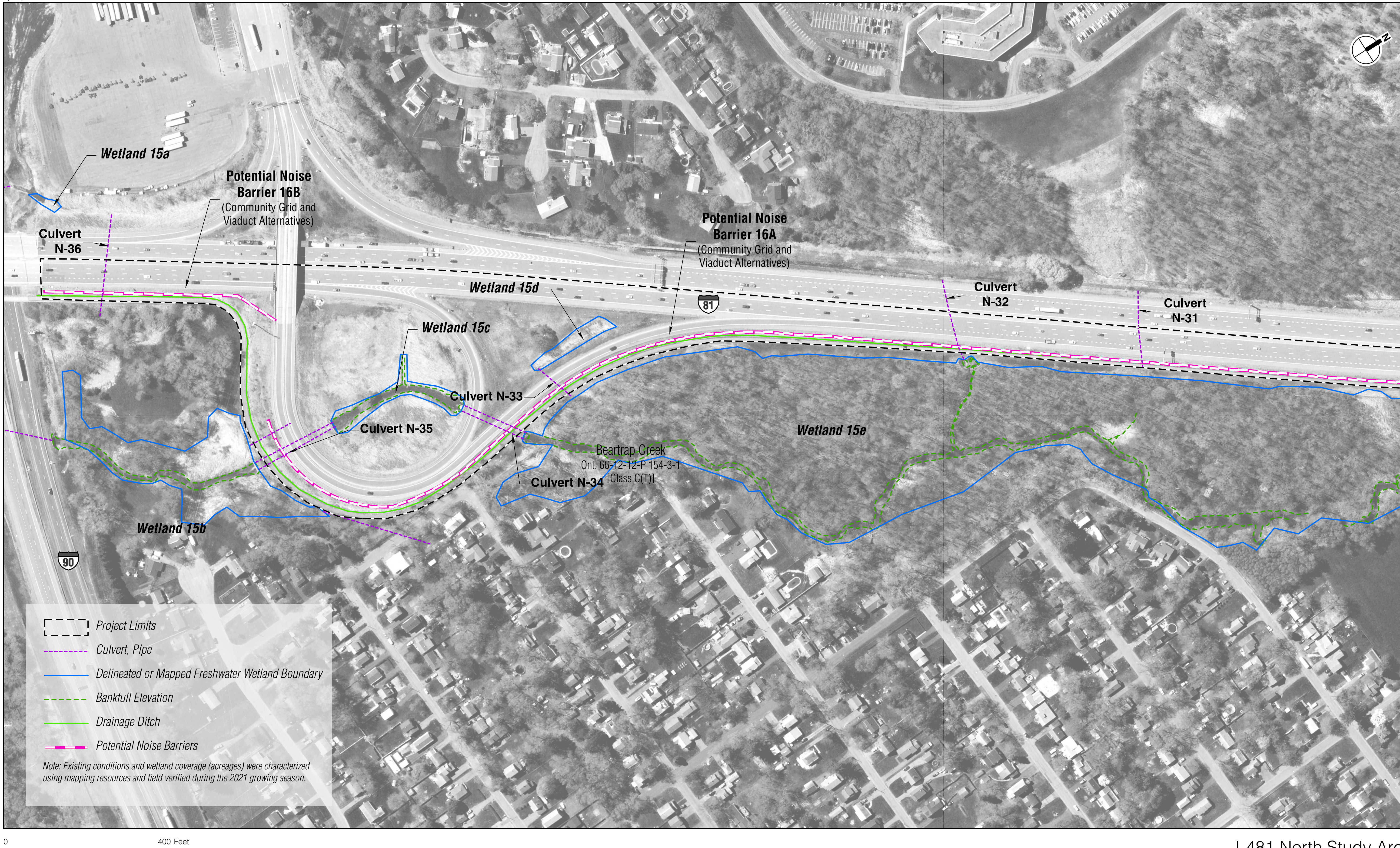


0 400 Feet

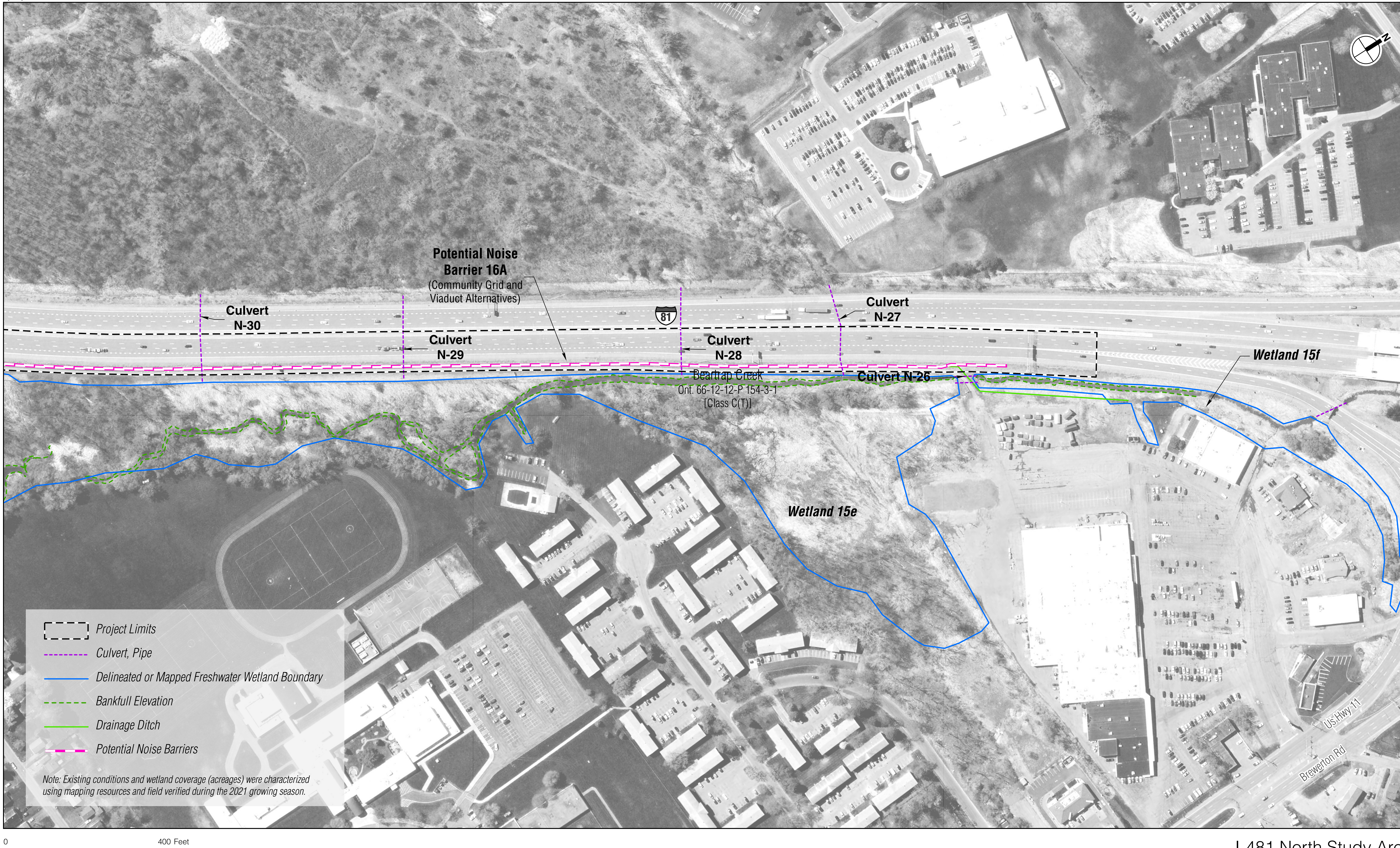
I-481 North Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-15

I-481 North Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-16

3/18/2022

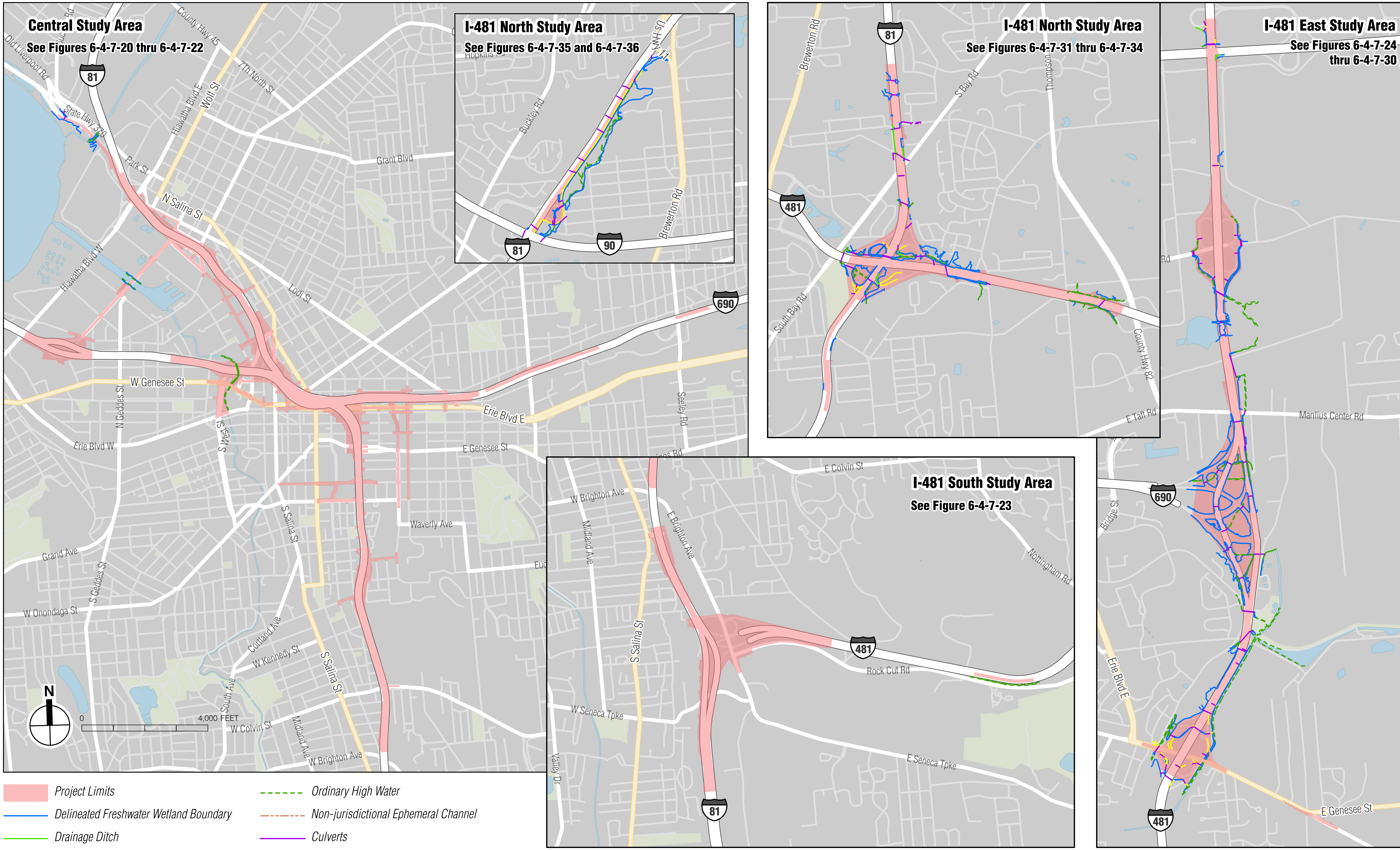


I-481 North Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-17



I-481 North Study Area
EO 11990 Wetlands and Jurisdictional Surface Waters
Figure 6-4-7-18

3/9/2022



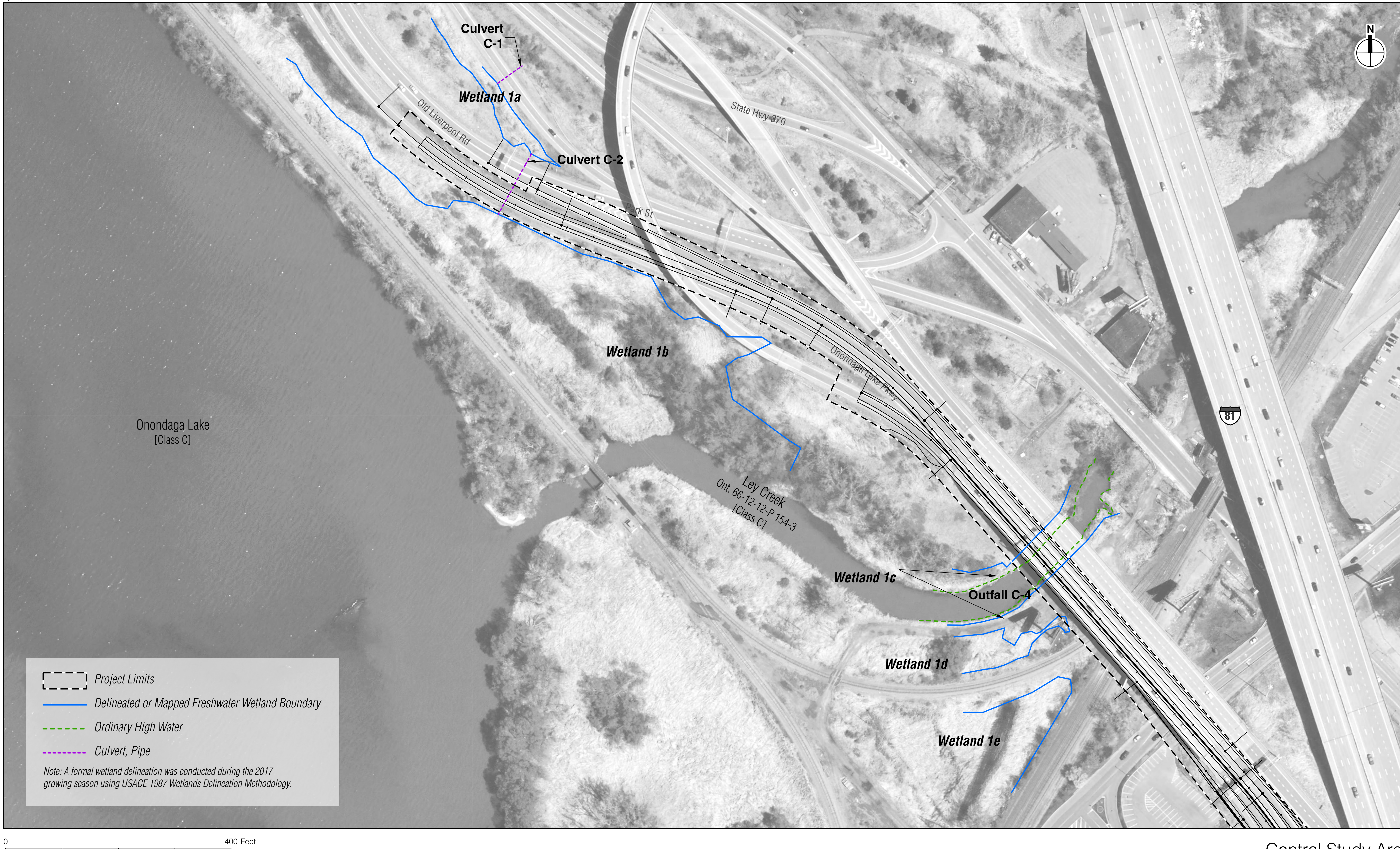
Project Limits
Delineated Freshwater Wetland Boundary
Drainage Ditch
Drainage Ditch (Non-jurisdictional)
Ordinary High Water
Non-jurisdictional Ephemeral Channel
Culverts

USACE Jurisdictional Wetlands and Surface Waters Overview

Figure 6-4-7-19

I-81 Viaduct Project

3/18/2022

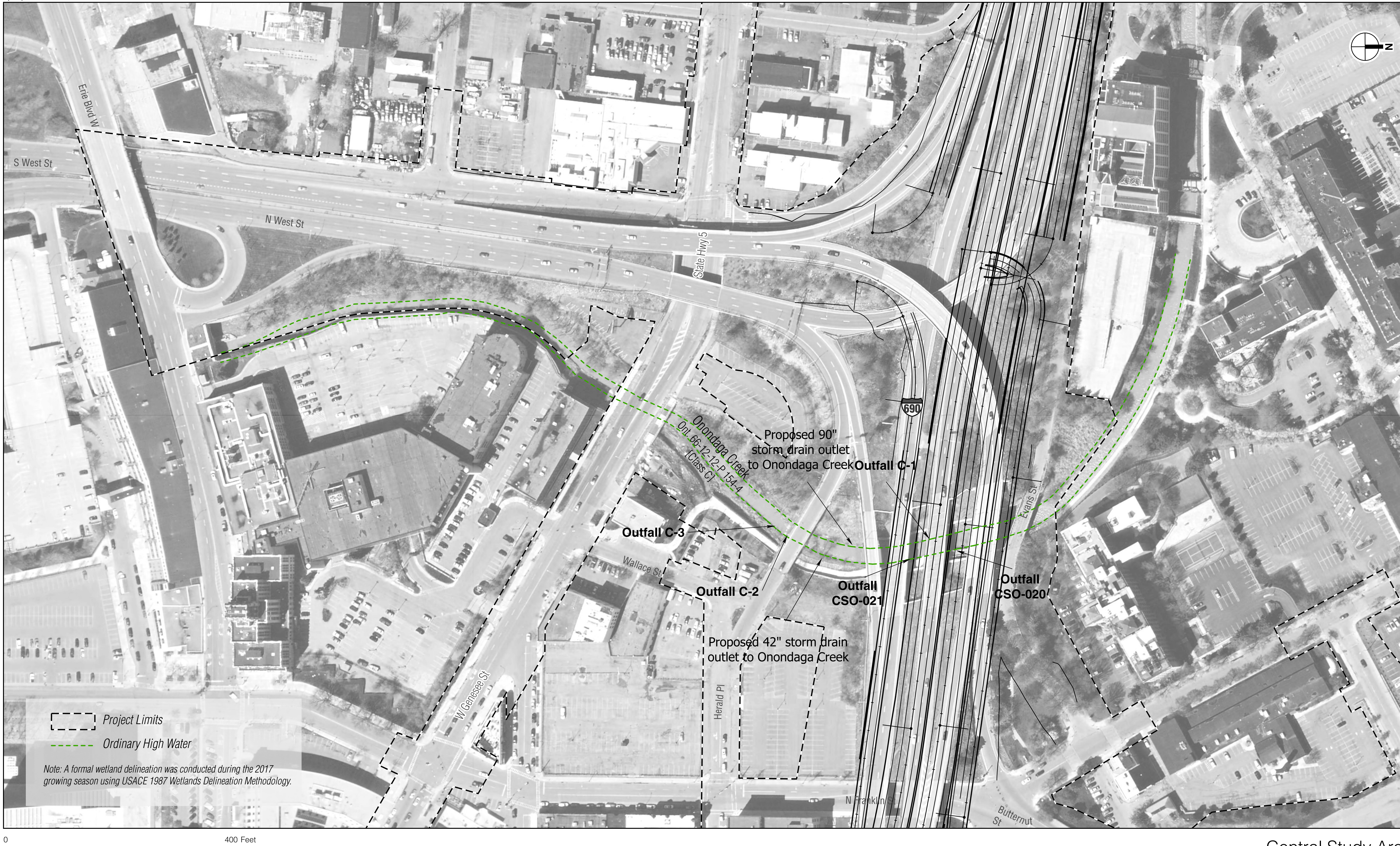


Central Study Area

USACE Jurisdictional Wetlands and Surface Waters

Figure 6-4-7-20

3/18/2022



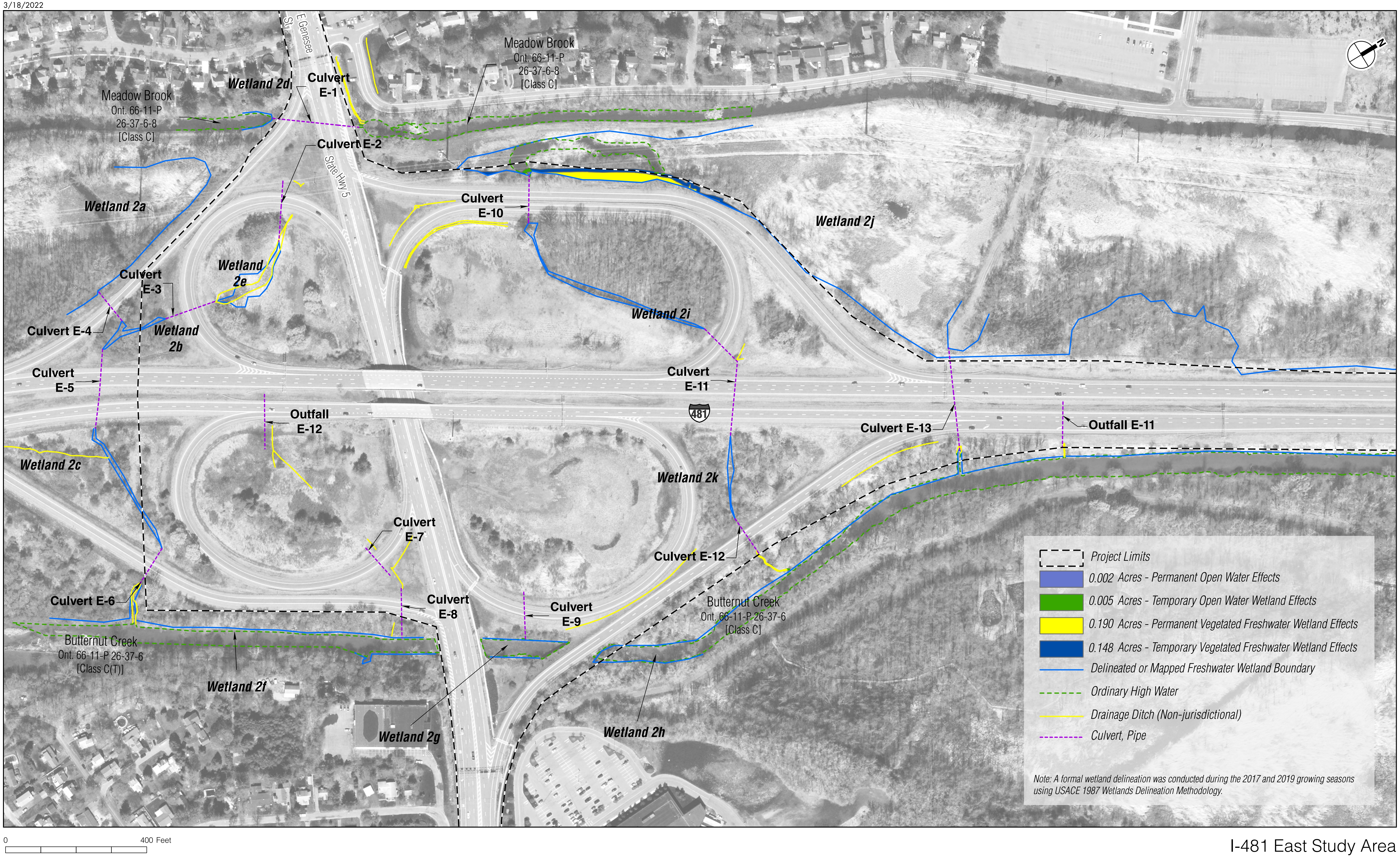
Central Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-21

I-81 Viaduct Project

0 400 Feet

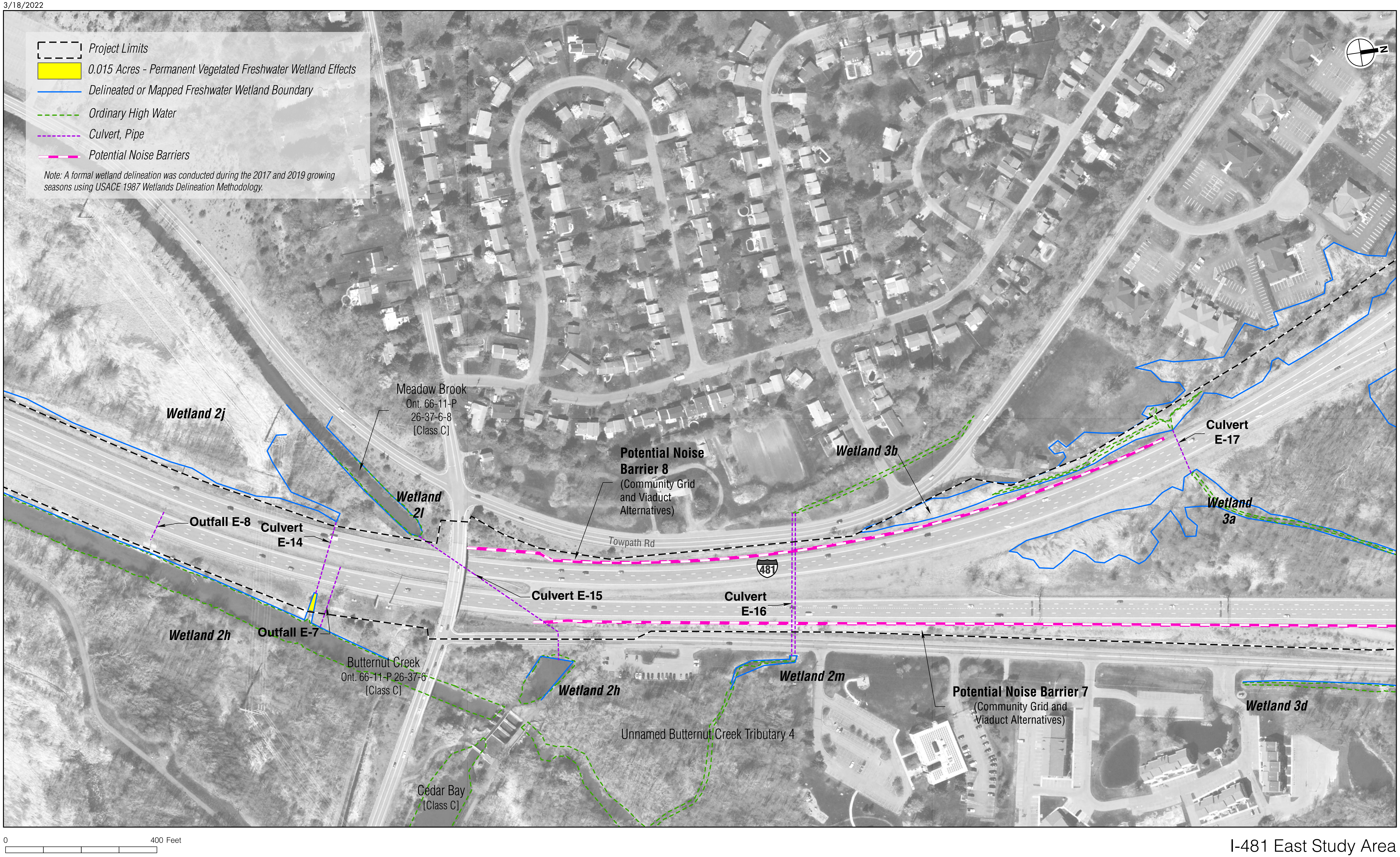
Central Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-22

I-481 South Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-23



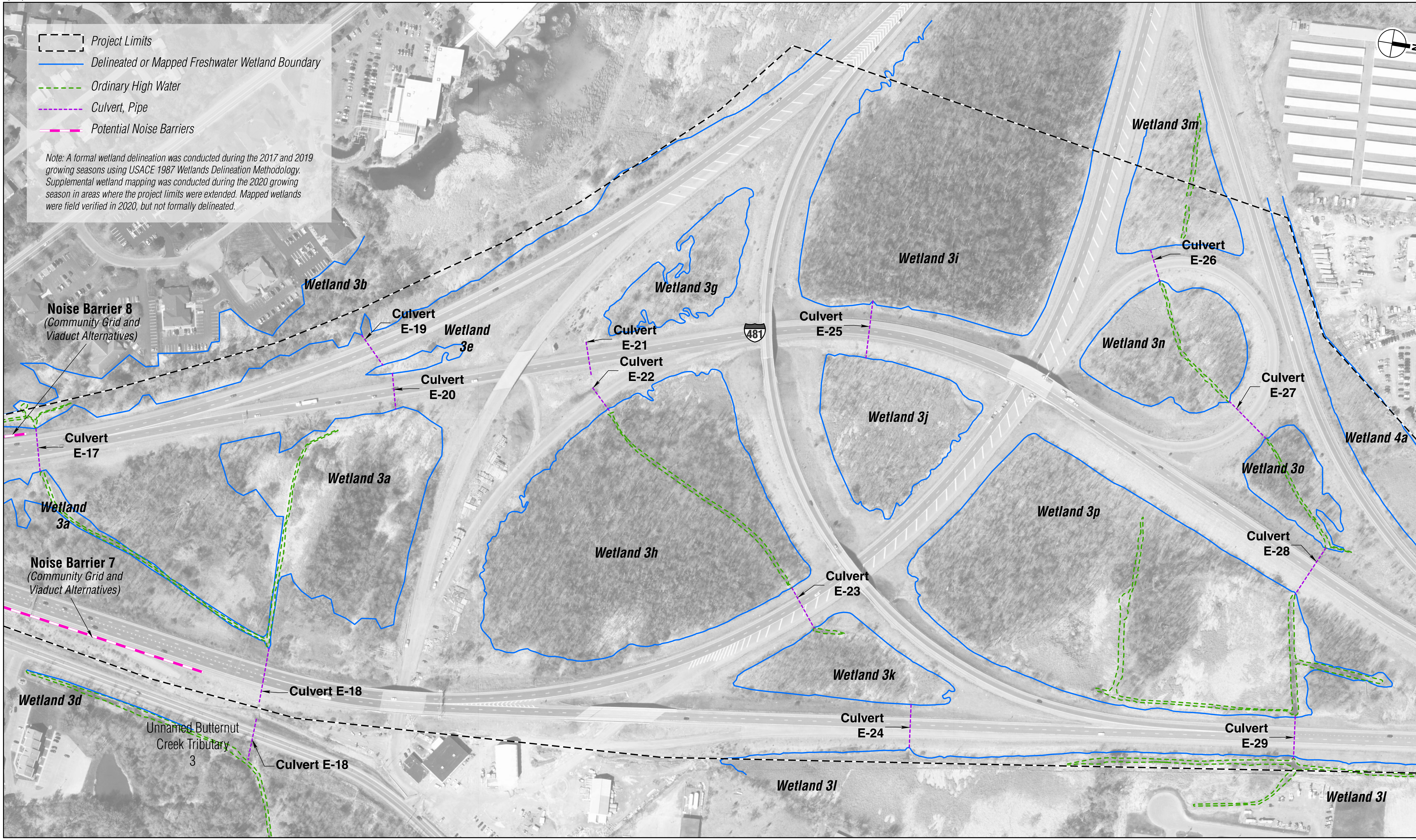
I-481 East Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-24

3/18/2022



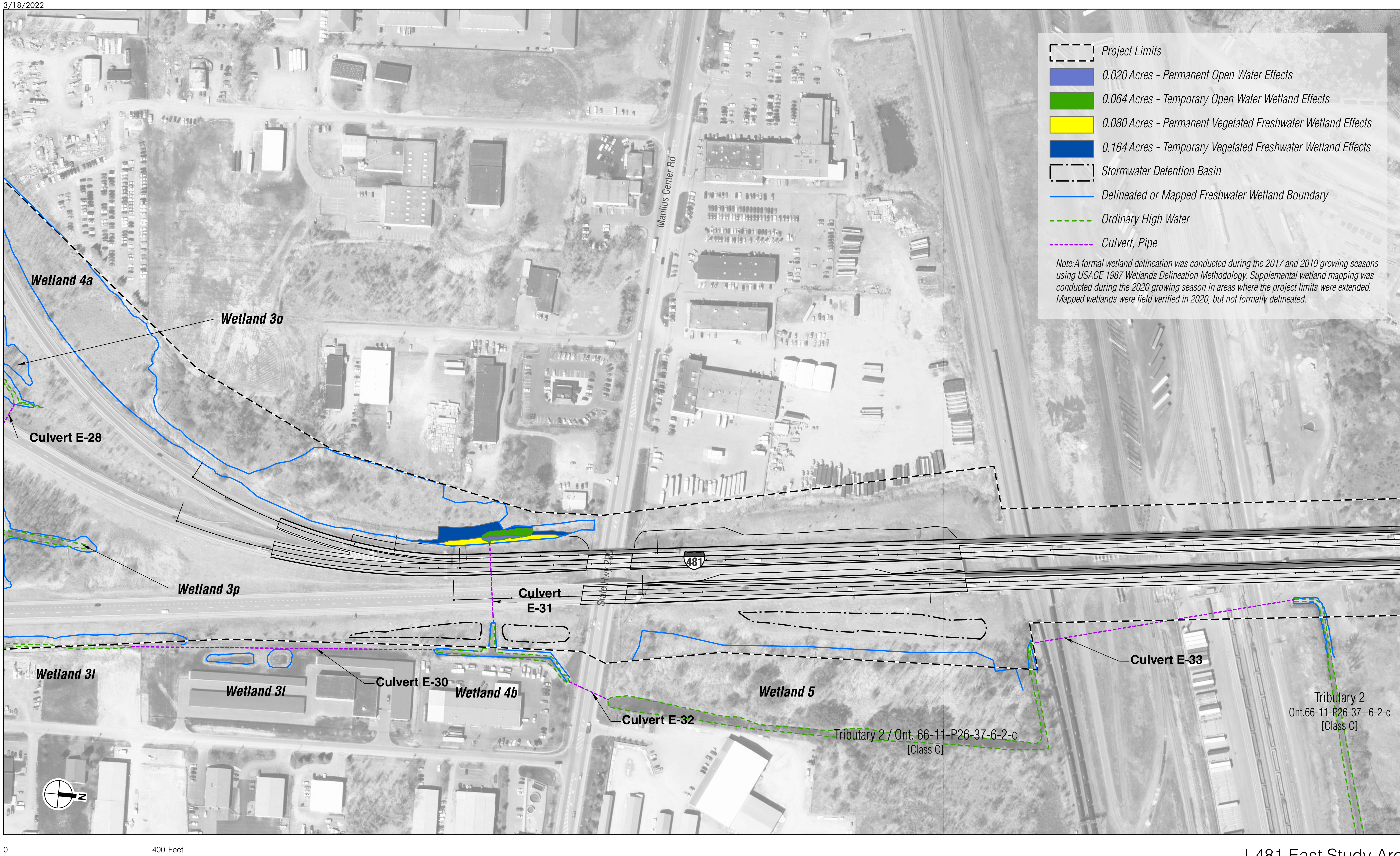
I-481 East Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-25

3/18/2022



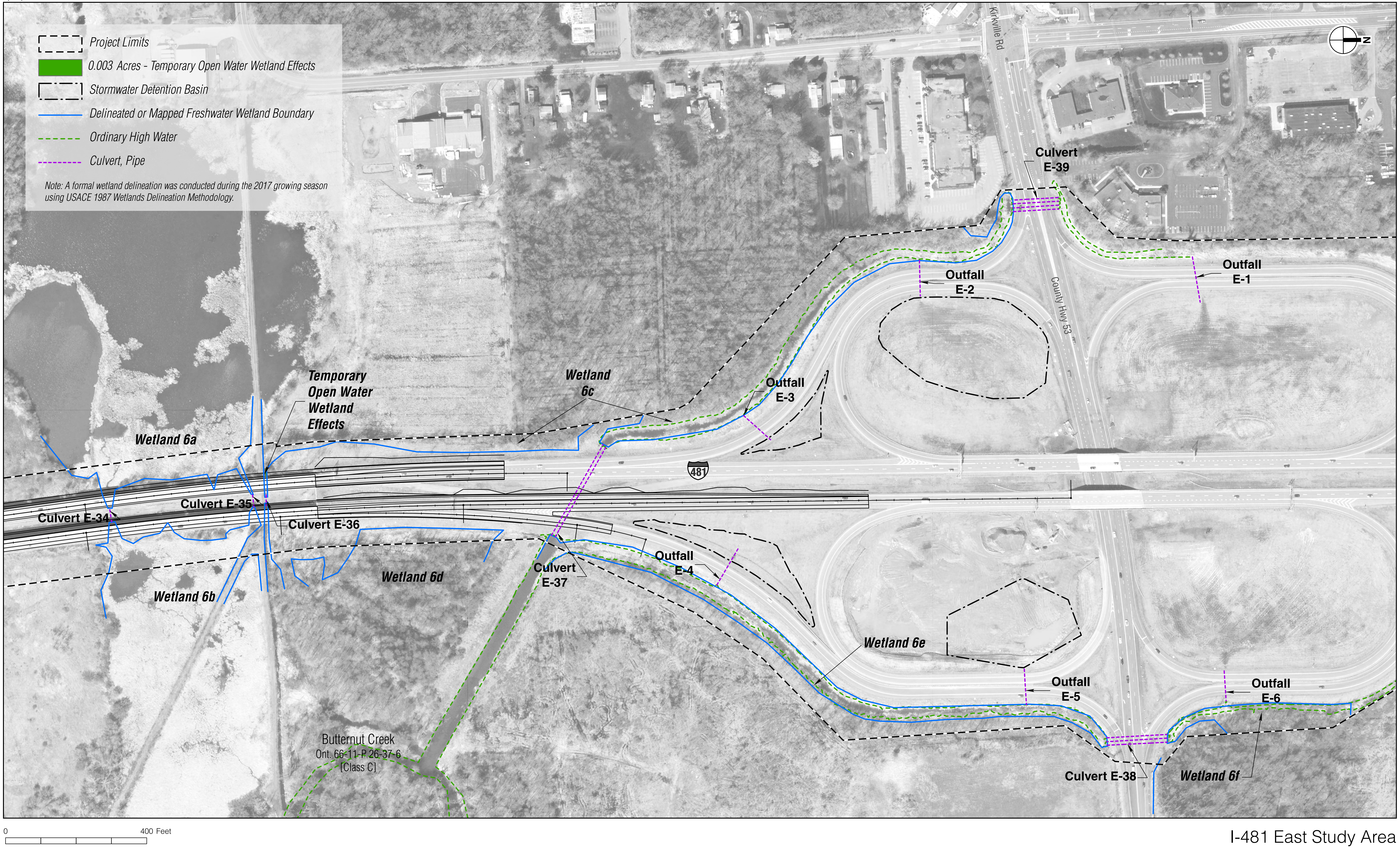
I-481 East Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-26

3/18/2022



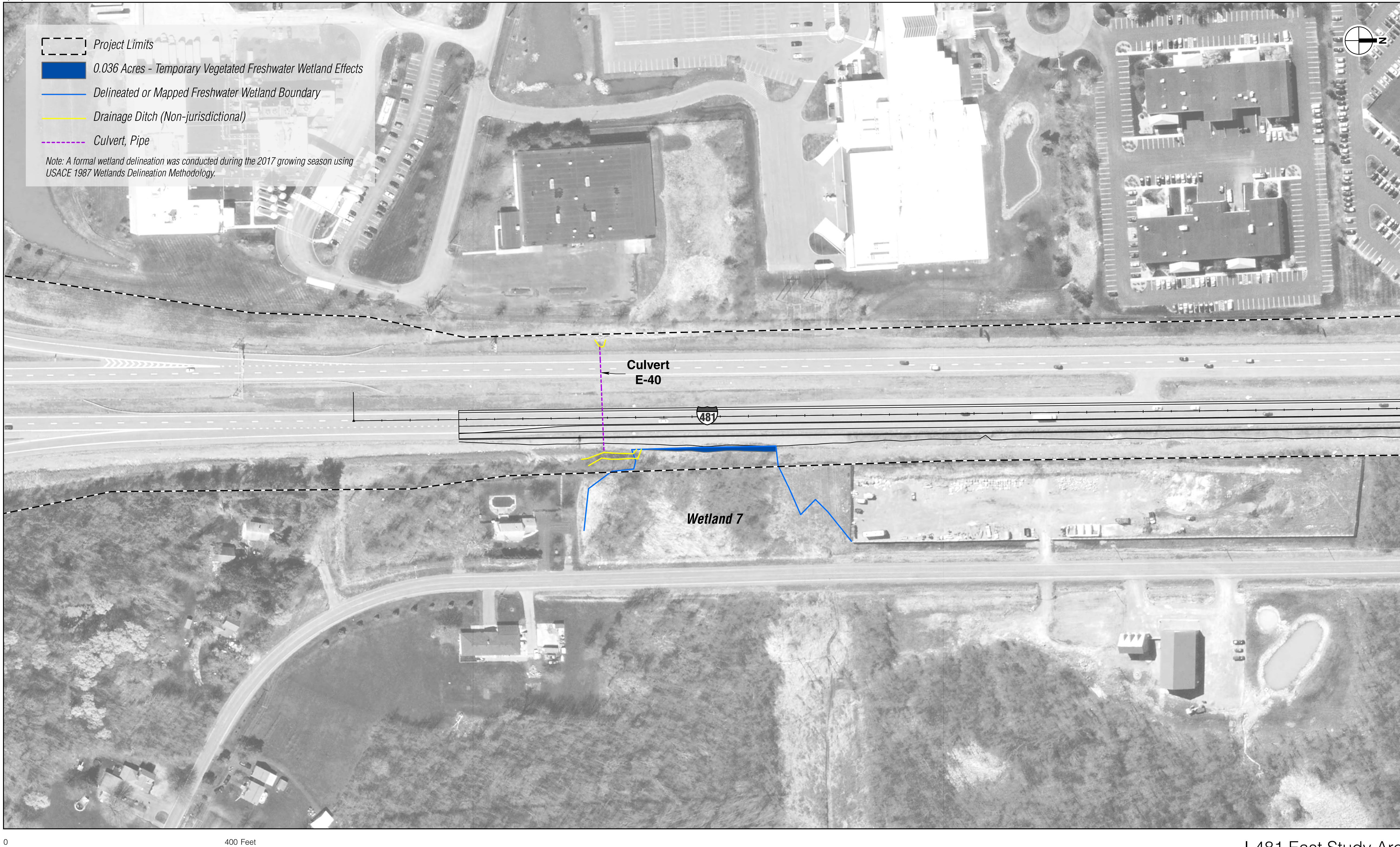
I-481 East Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-27

3/18/2022



I-481 East Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-28

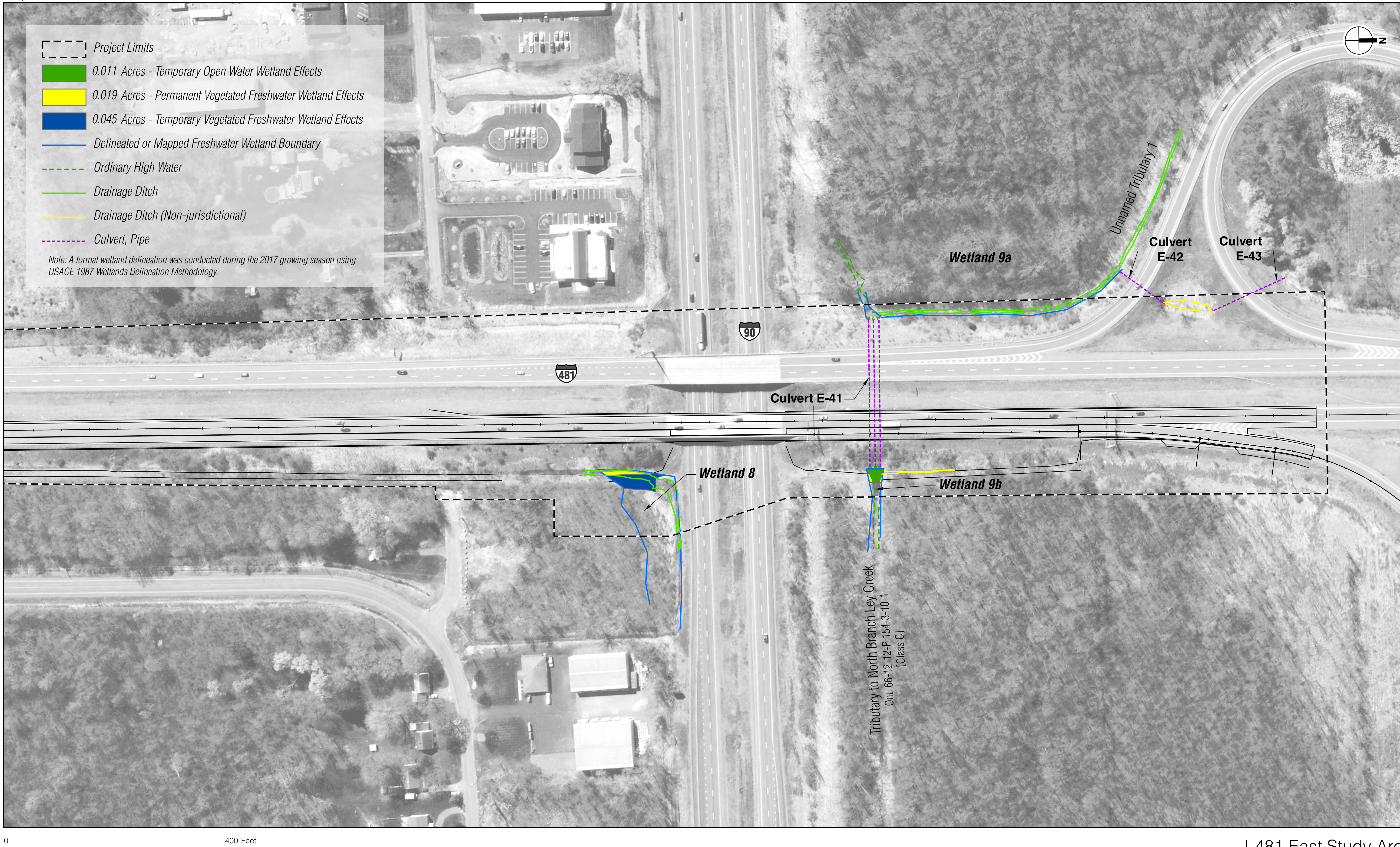
3/18/2022



I-481 East Study Area

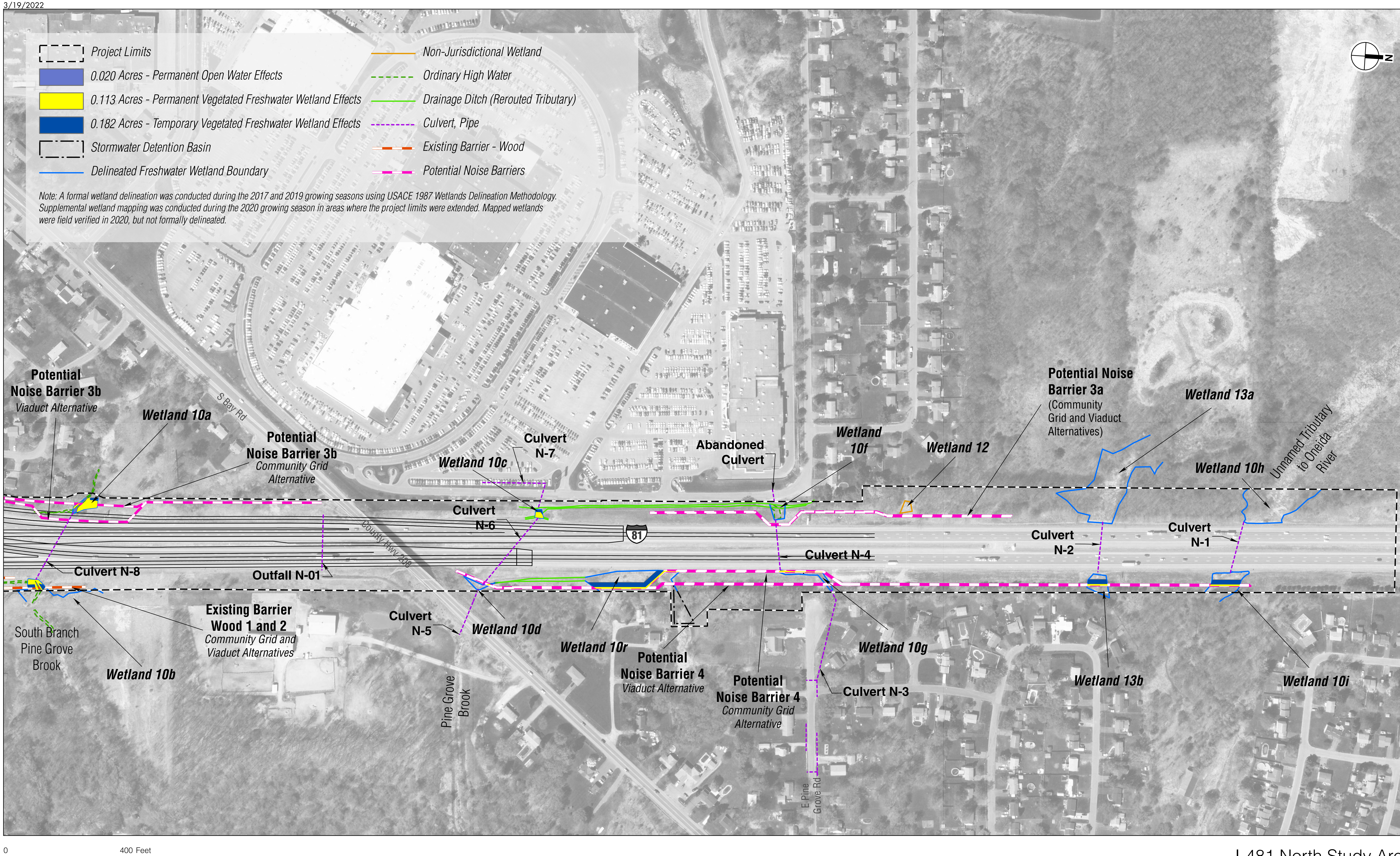
USACE Jurisdictional Wetlands and Surface Waters

Figure 6-4-7-29



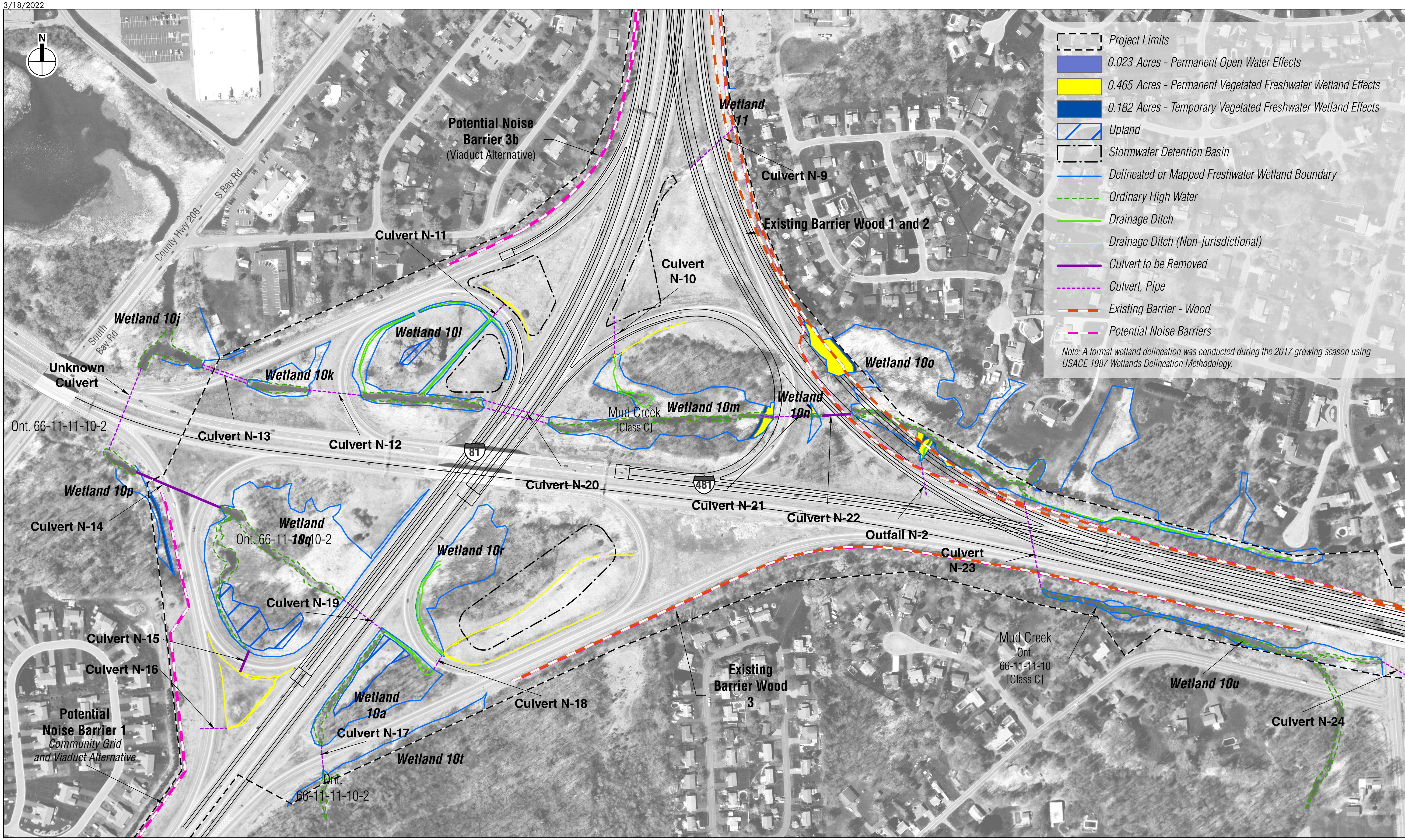
I-481 East Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-30

3/19/2022



I-481 North Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-31

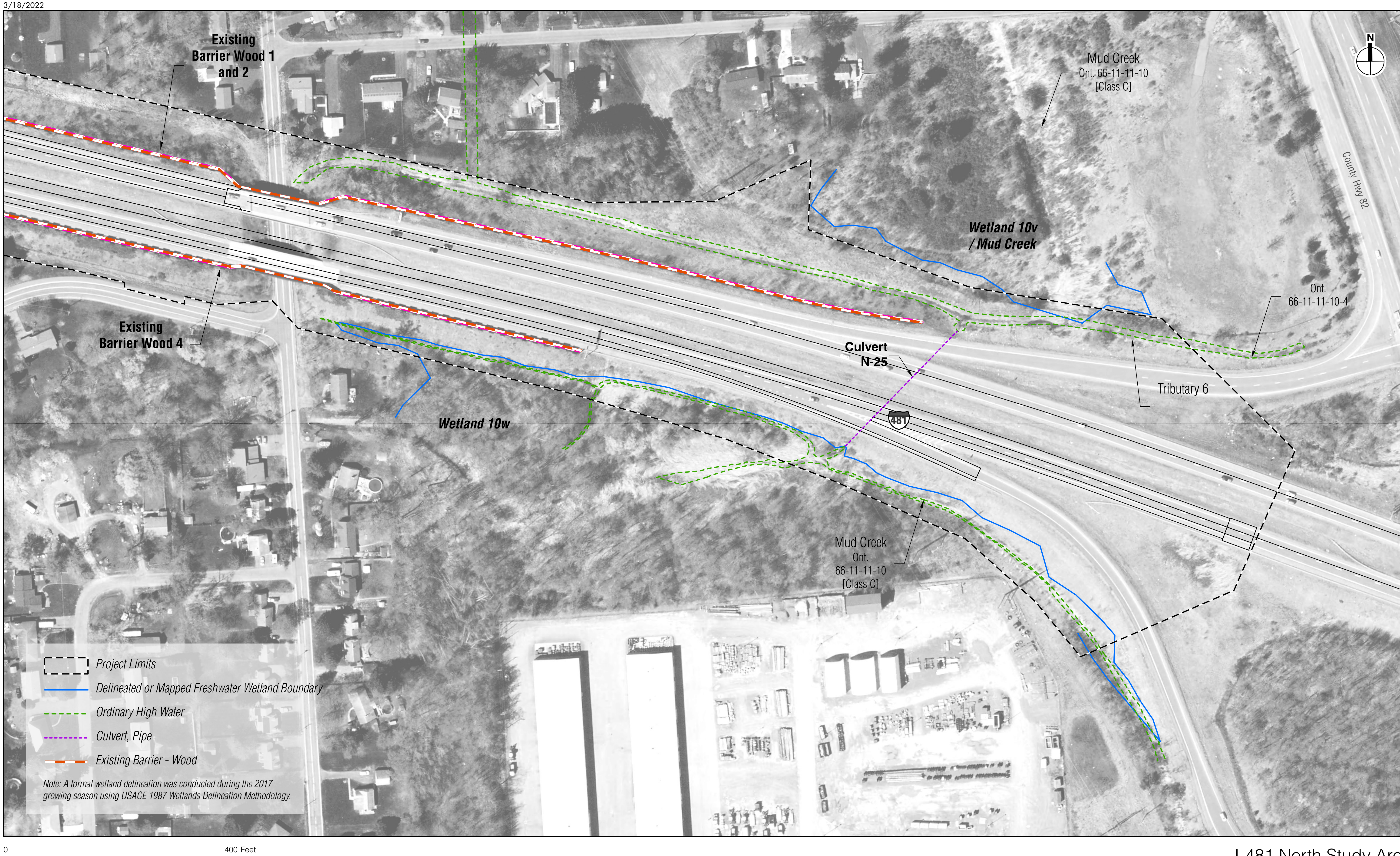
3/18/2022



0 400 Feet

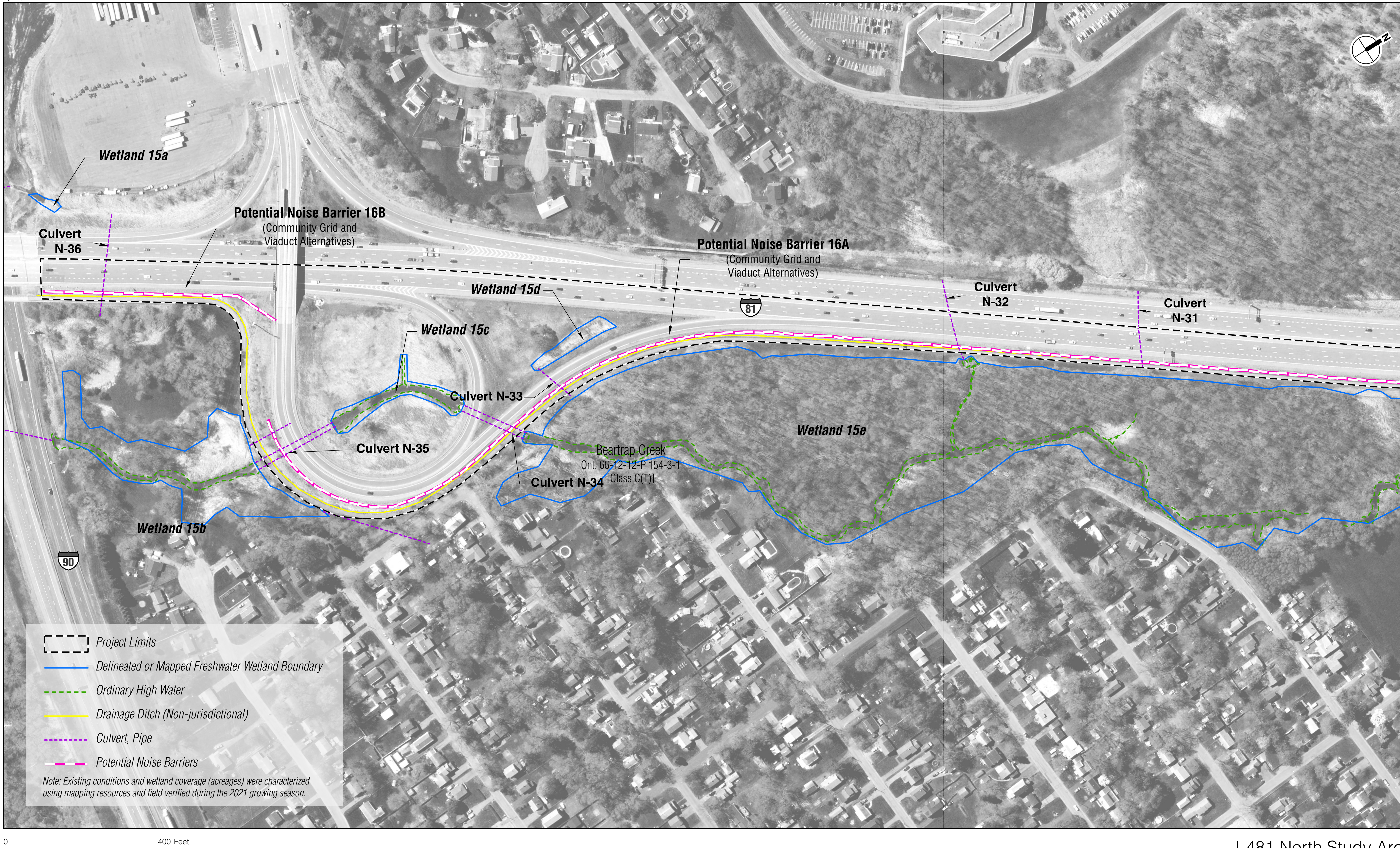
I-481 North Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-32

I-81 Viaduct Project



I-481 North Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-33

I-481 North Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-34

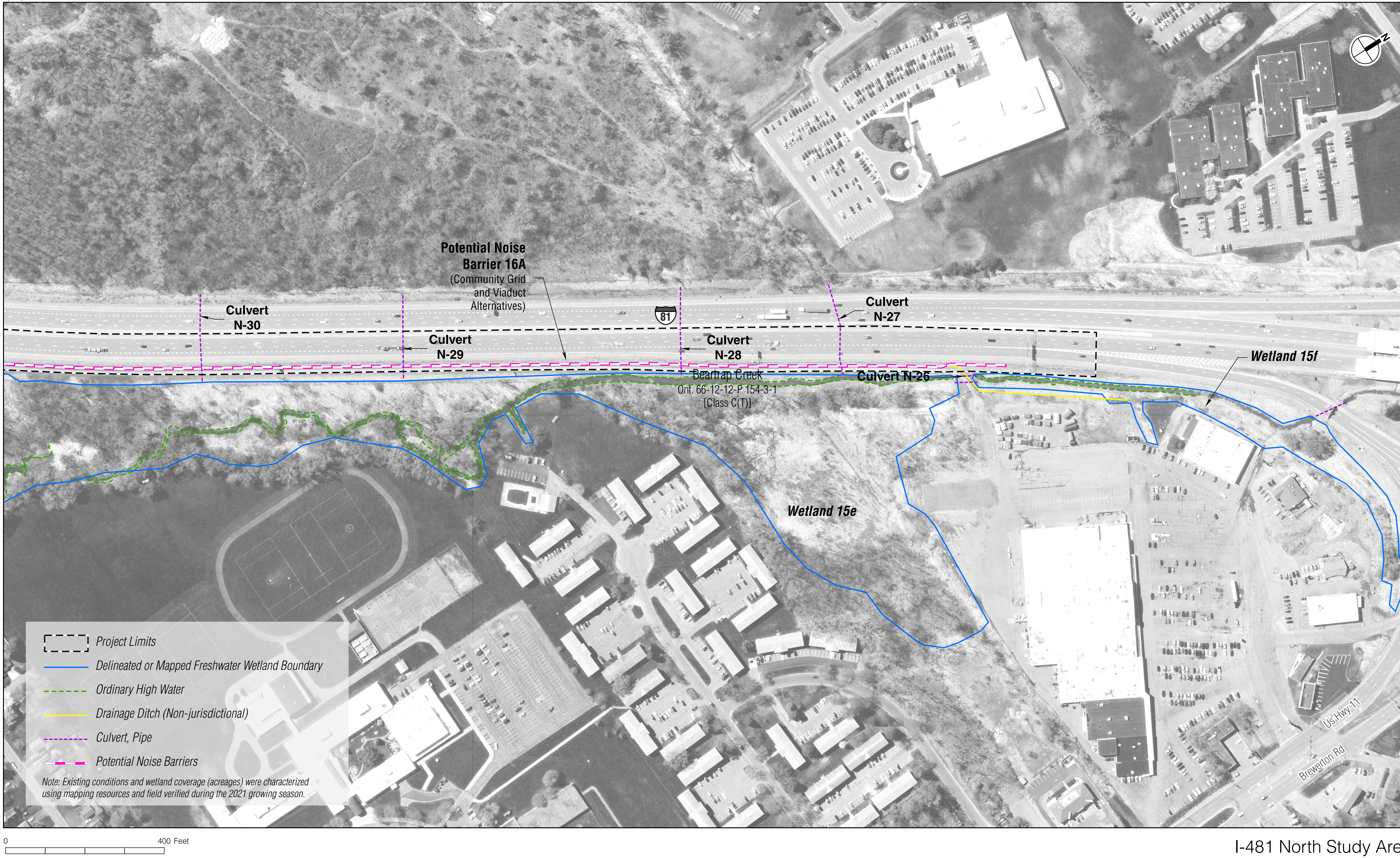


I-481 North Study Area

USACE Jurisdictional Wetlands and Surface Waters

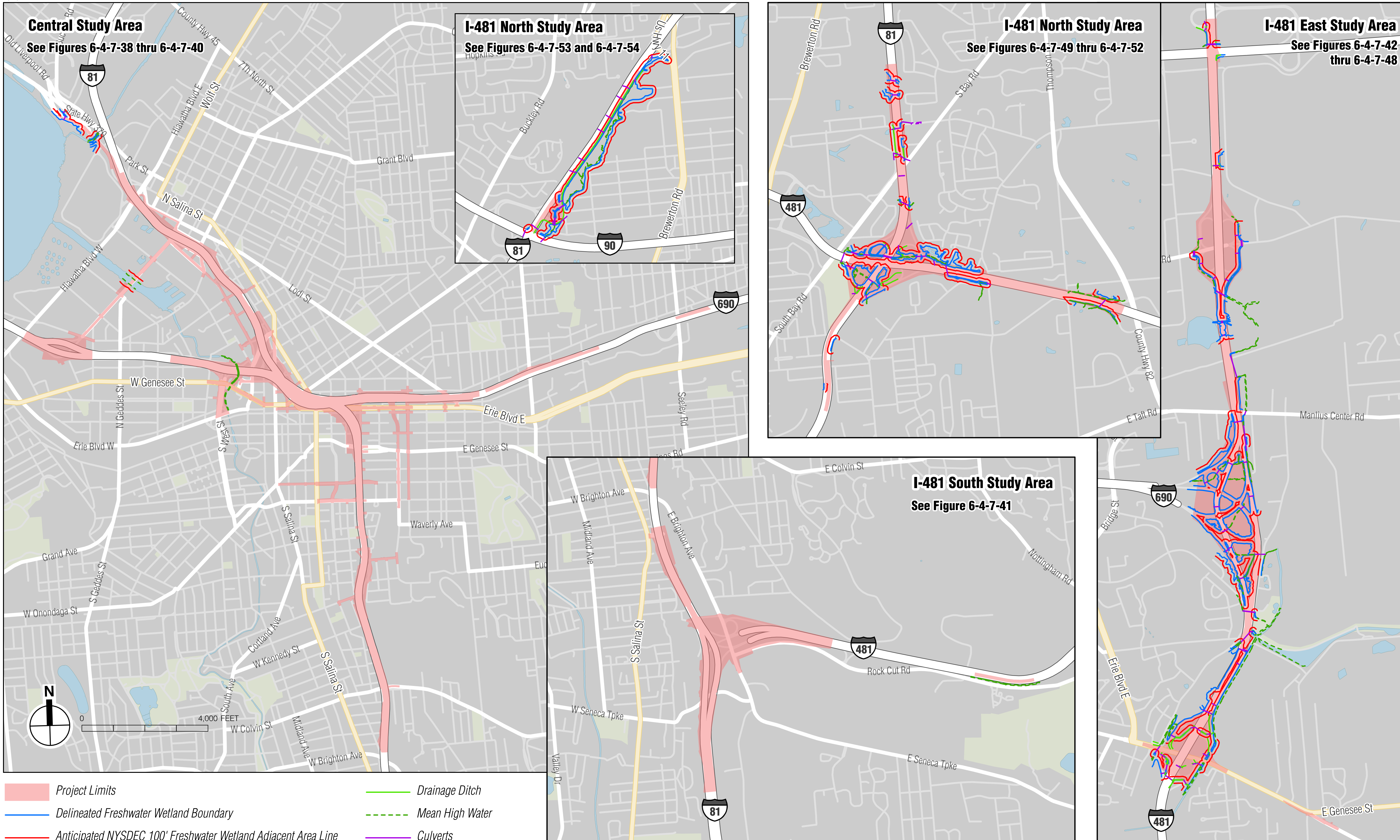
Figure 6-4-7-35

3/18/2022



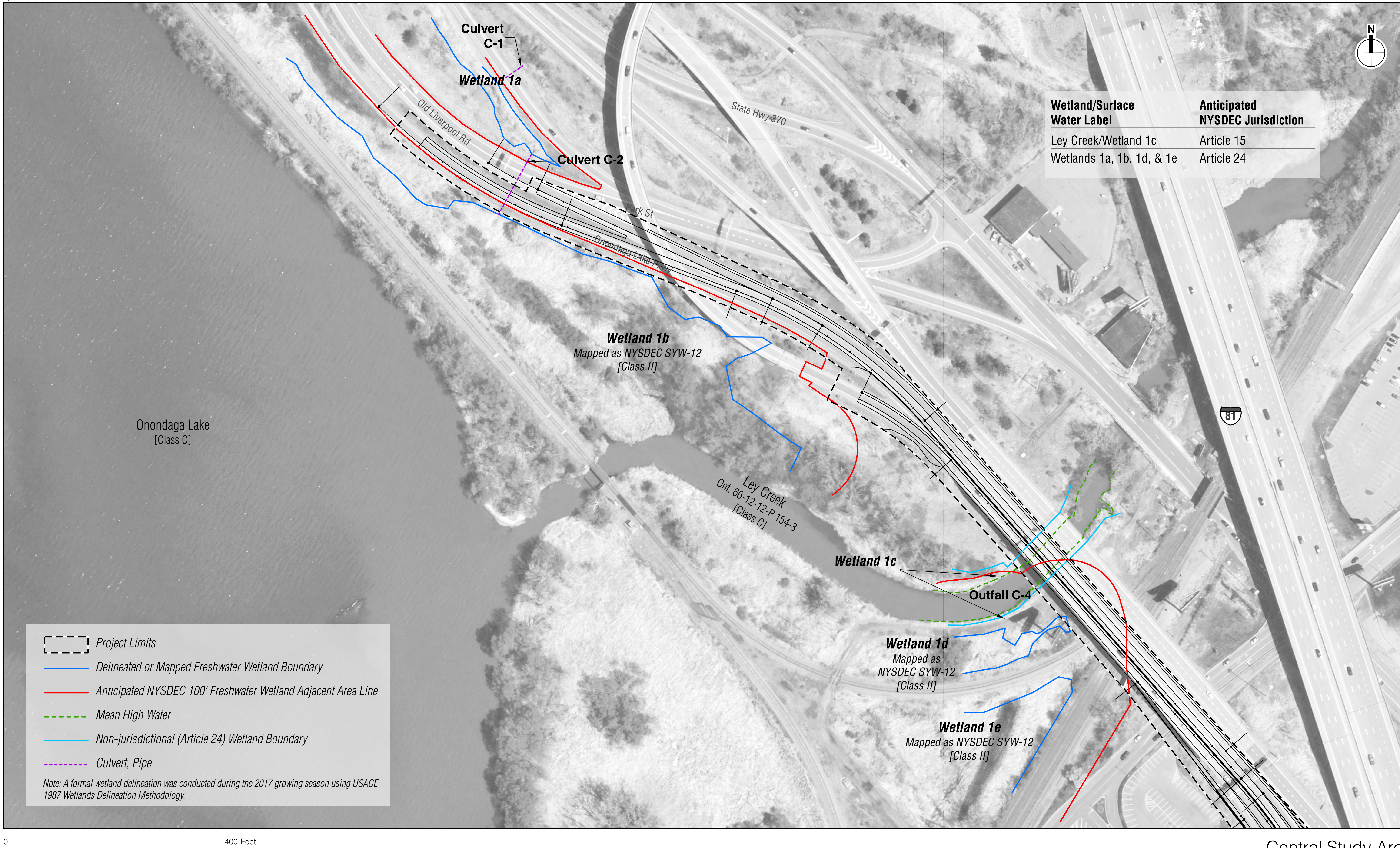
I-481 North Study Area
USACE Jurisdictional Wetlands and Surface Waters
Figure 6-4-7-36

3/9/2022



Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters Overview

Figure 6-4-7-37

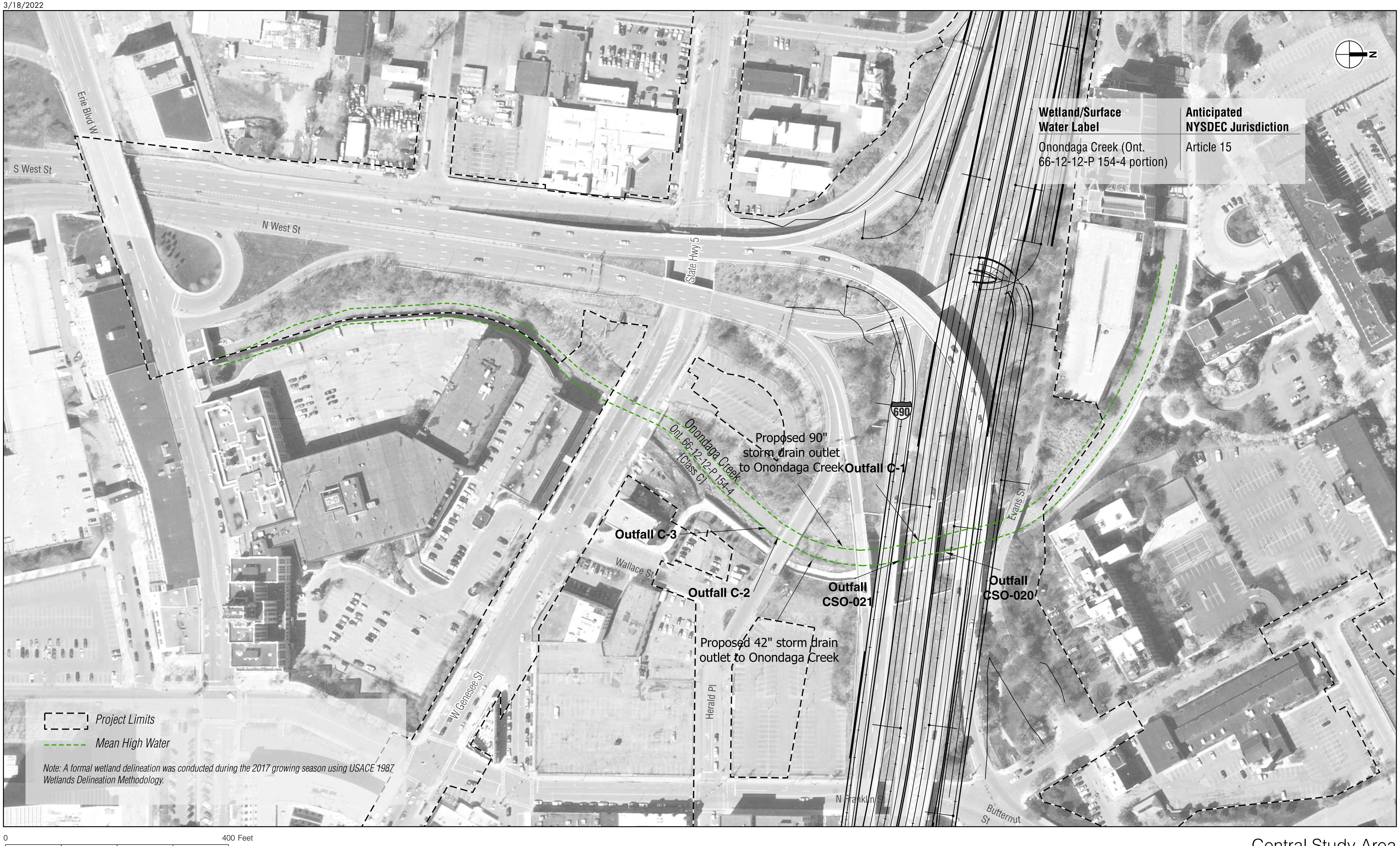


Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Ley Creek/Wetland 1c	Article 15
Wetlands 1a, 1b, 1d, & 1e	Article 24

Central Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-38

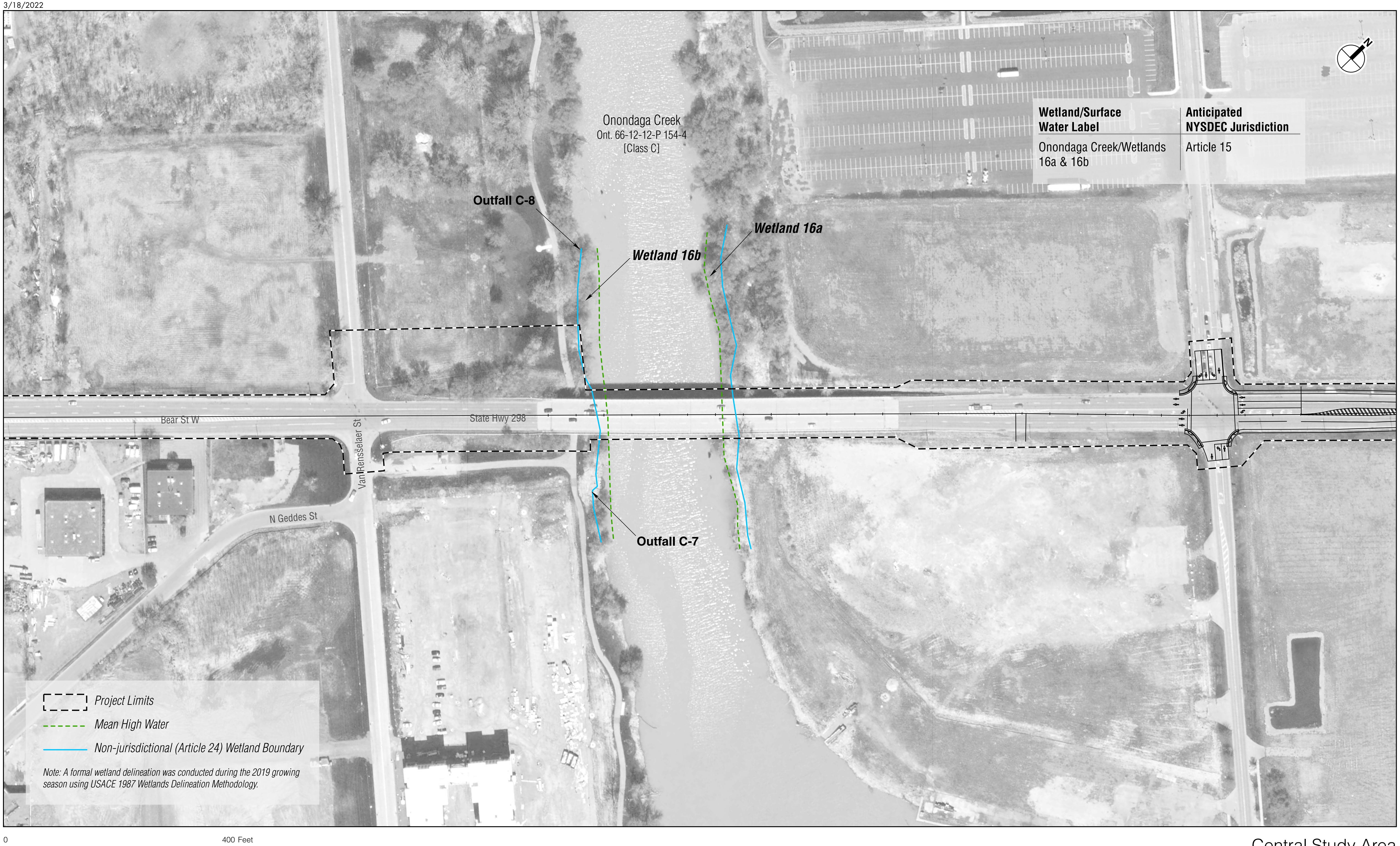


Central Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-39

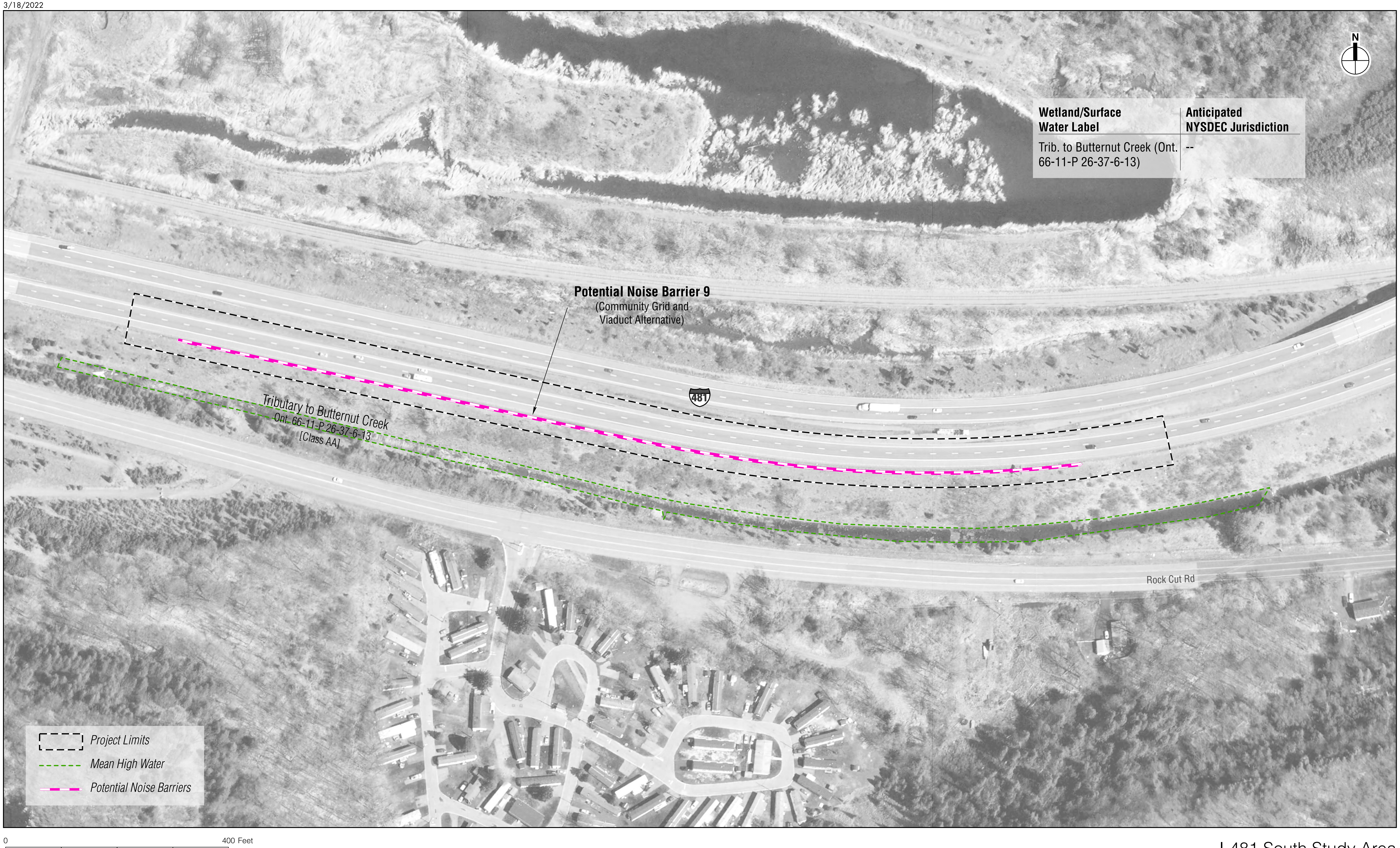
3/18/2022



Central Study Area
Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters
Figure 6-4-7-40

I-81 Viaduct Project

3/18/2022



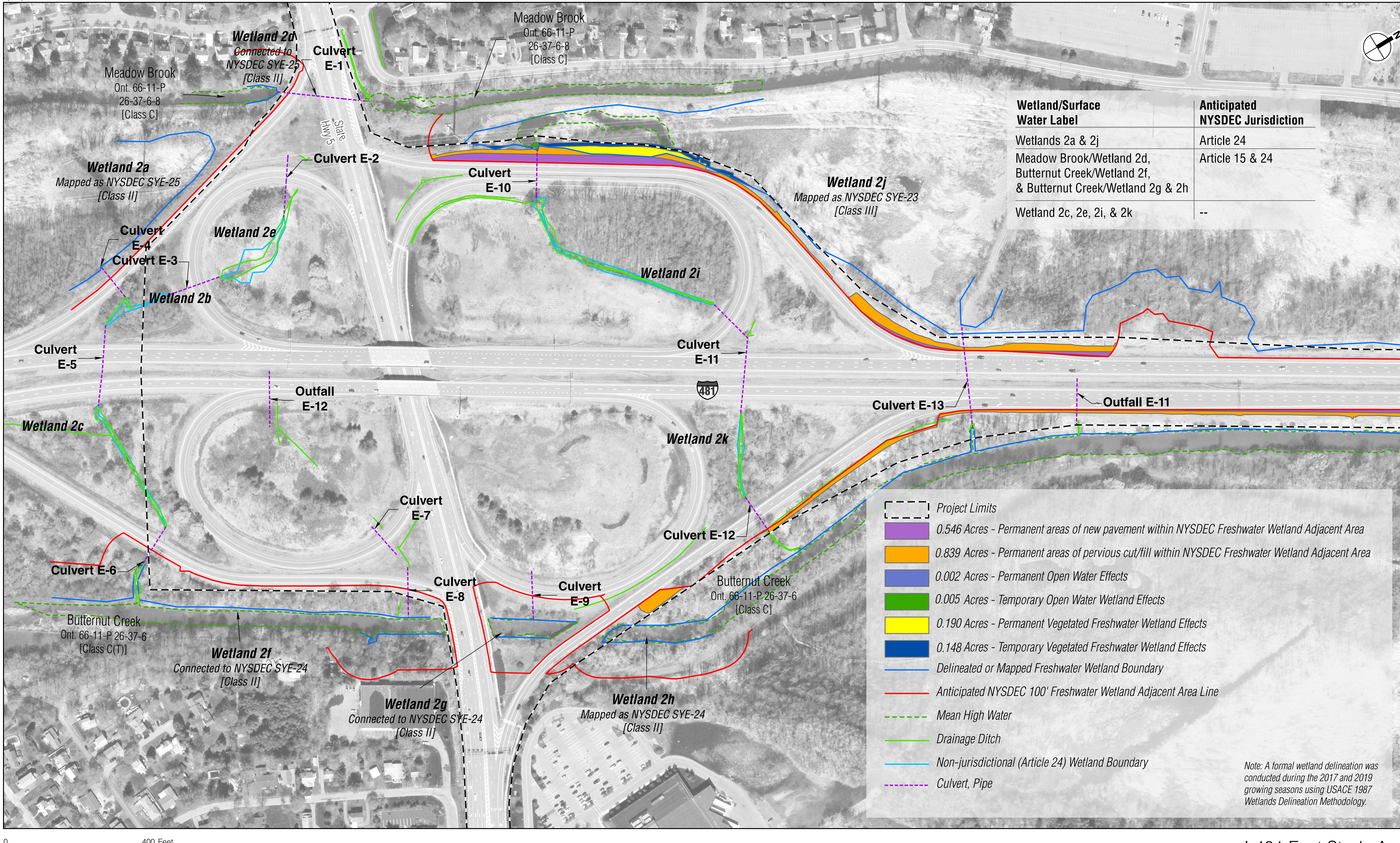
I-481 South Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

I-81 Viaduct Project

Figure 6-4-7-41

3/18/2022

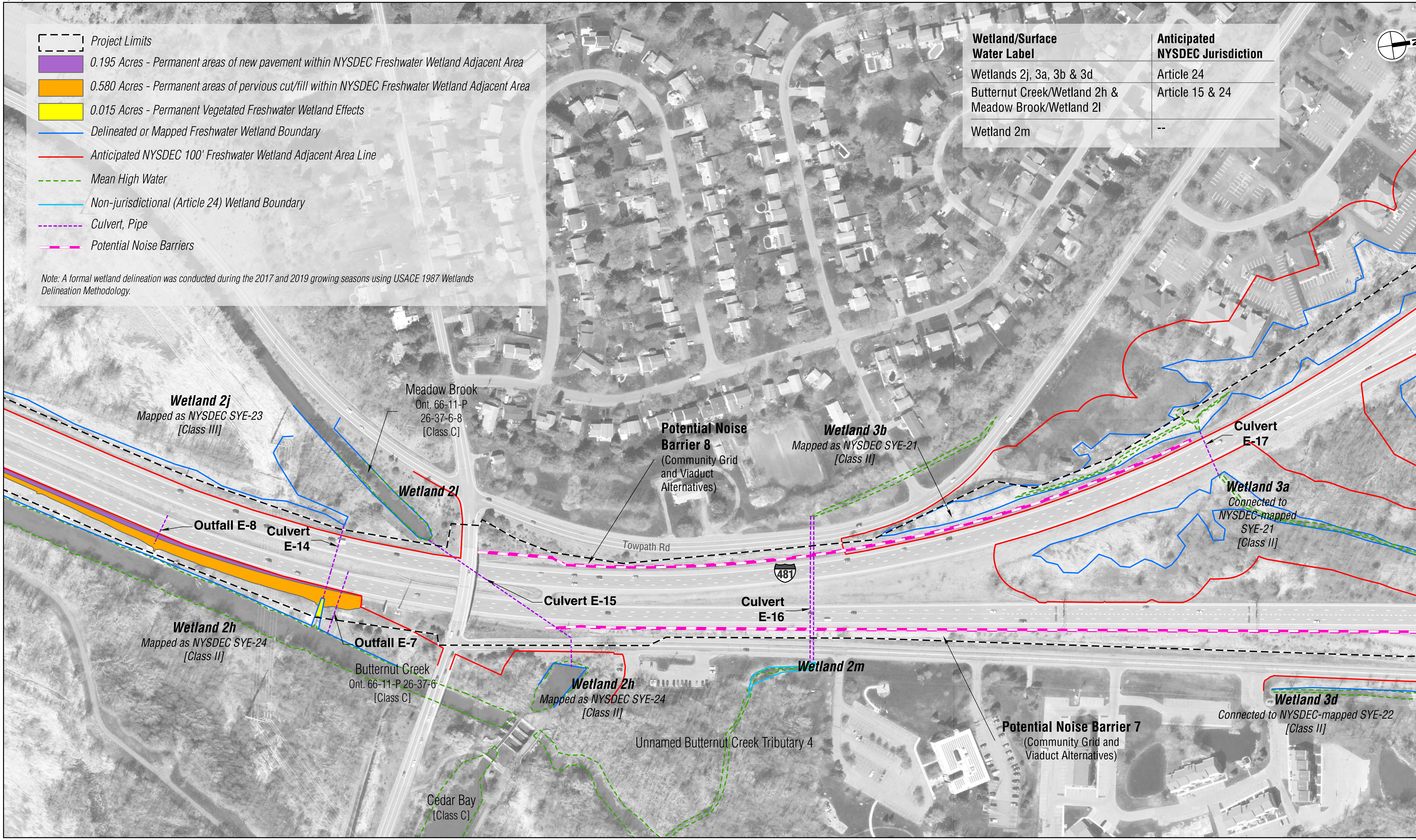


Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Wetlands 2a & 2j	Article 24
Meadow Brook/Wetland 2d, Butternut Creek/Wetland 2f, & Butternut Creek/Wetland 2g & 2h	Article 15 & 24
Wetland 2c, 2e, 2i, & 2k	--

I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-42

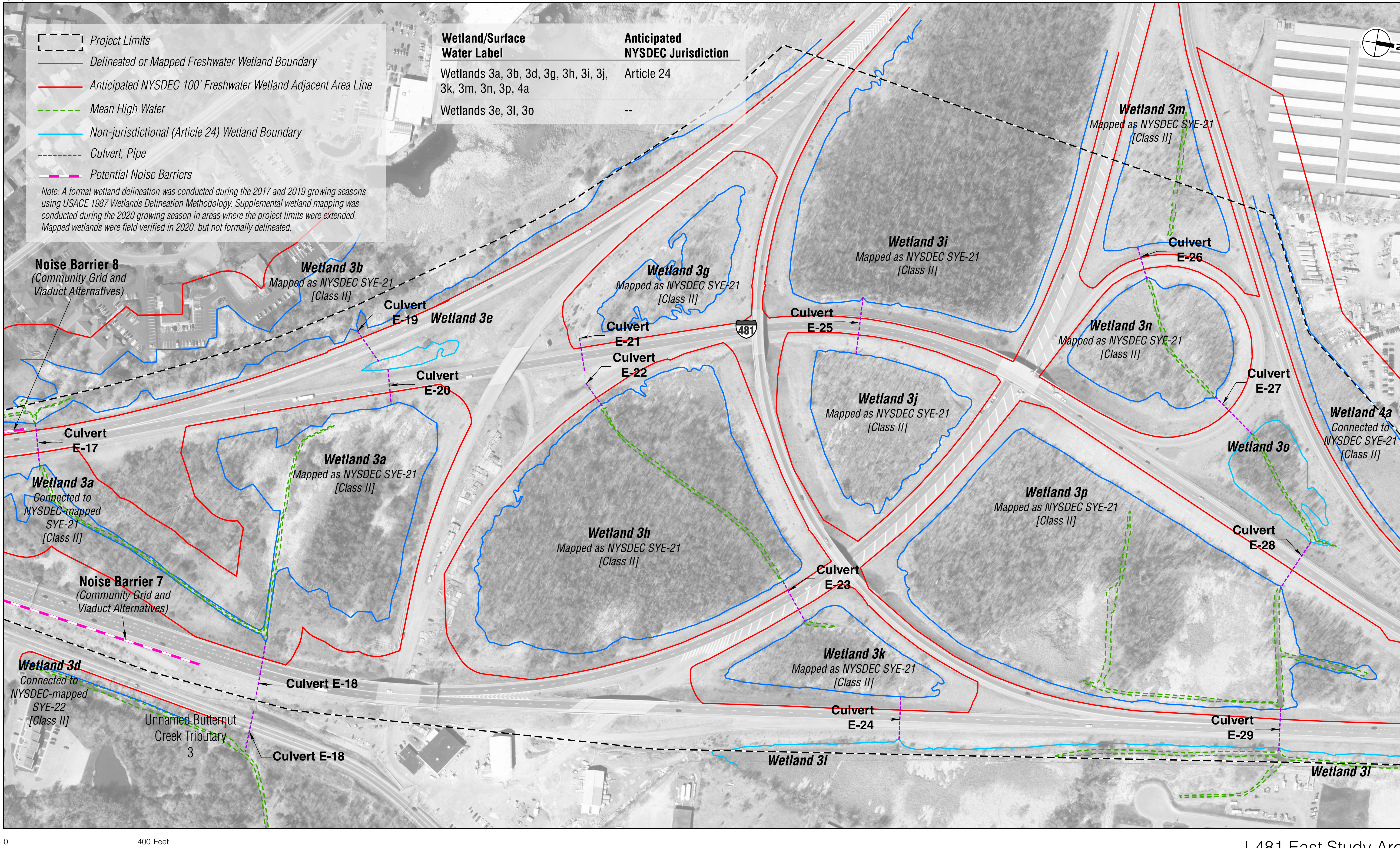


I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-43

3/18/2022



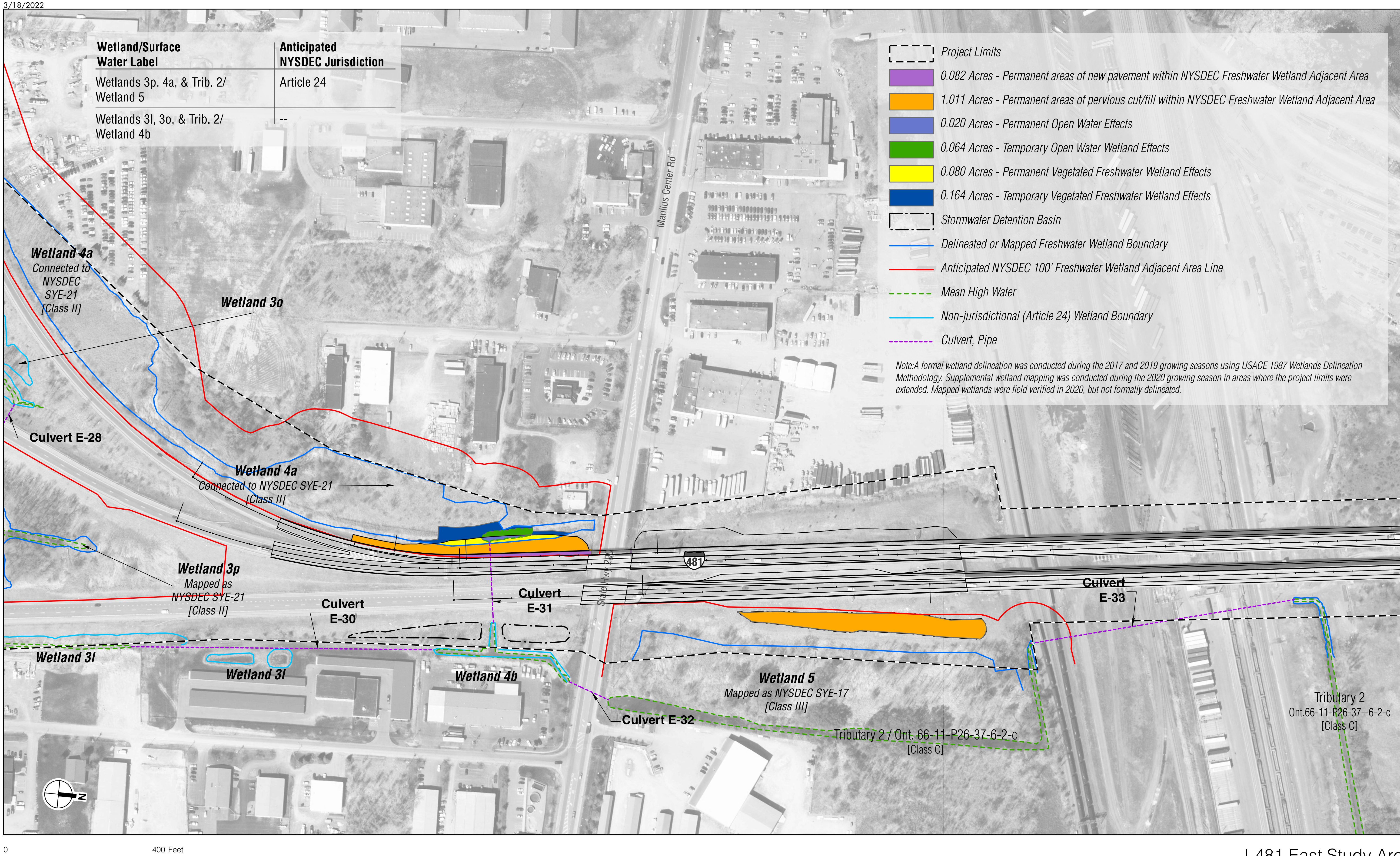
Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Wetlands 3a, 3b, 3d, 3g, 3h, 3i, 3j, 3k, 3m, 3n, 3p, 4a	Article 24
Wetlands 3e, 3l, 3o	--

I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-44

3/18/2022

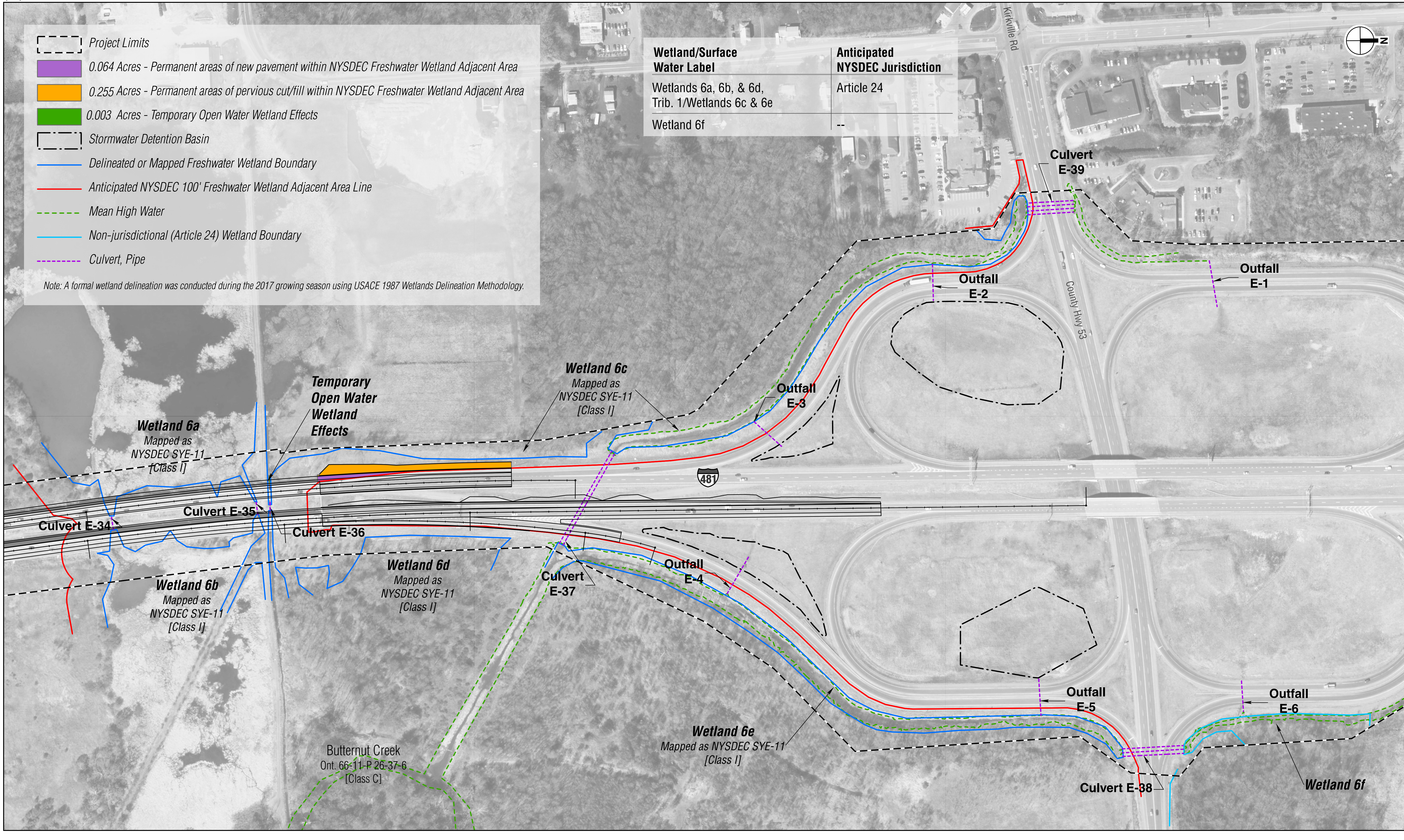


I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-45

3/18/2022



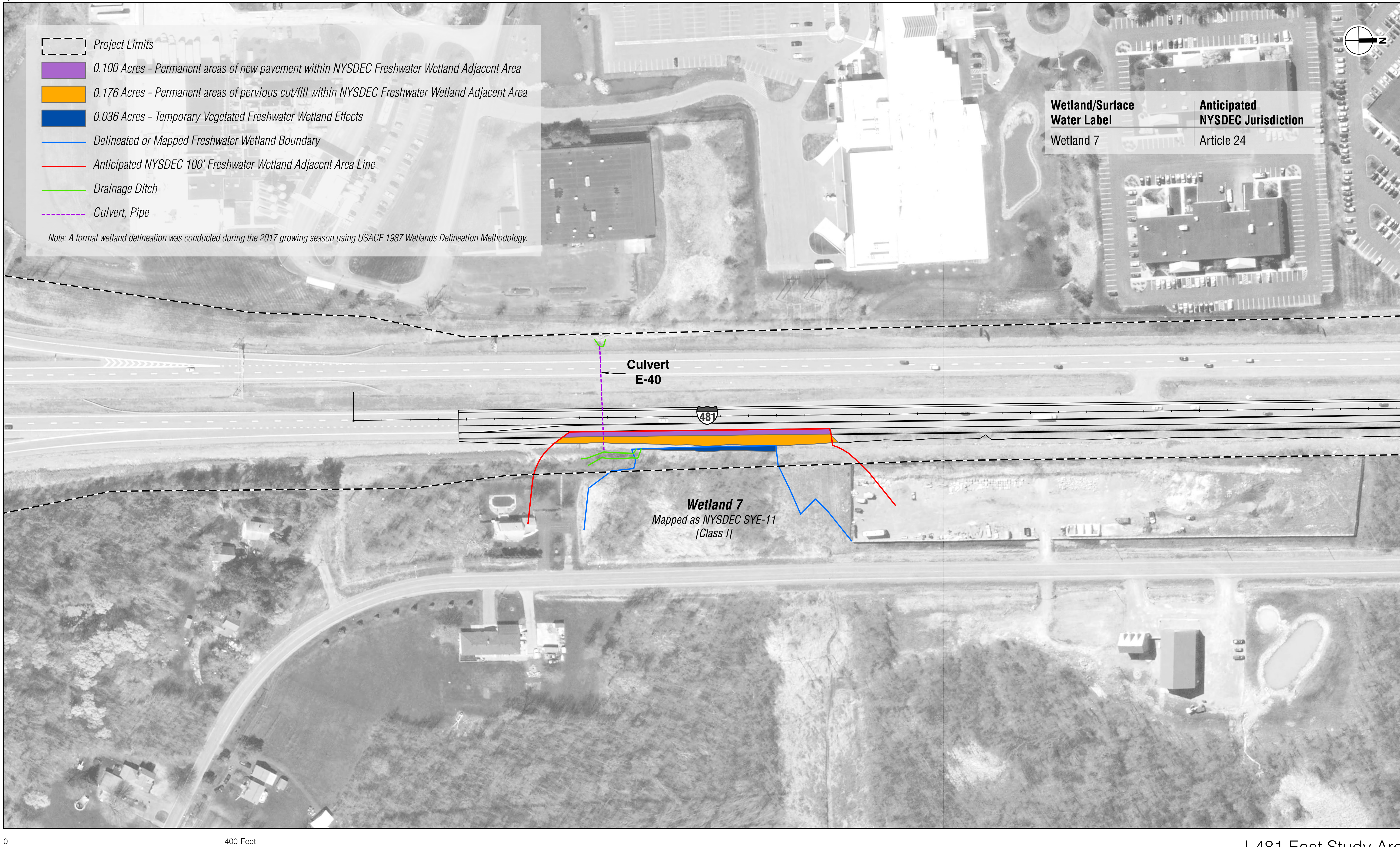
Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Wetlands 6a, 6b, & 6d, Trib. 1/Wetlands 6c & 6e	Article 24
Wetland 6f	--

I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-46

3/18/2022

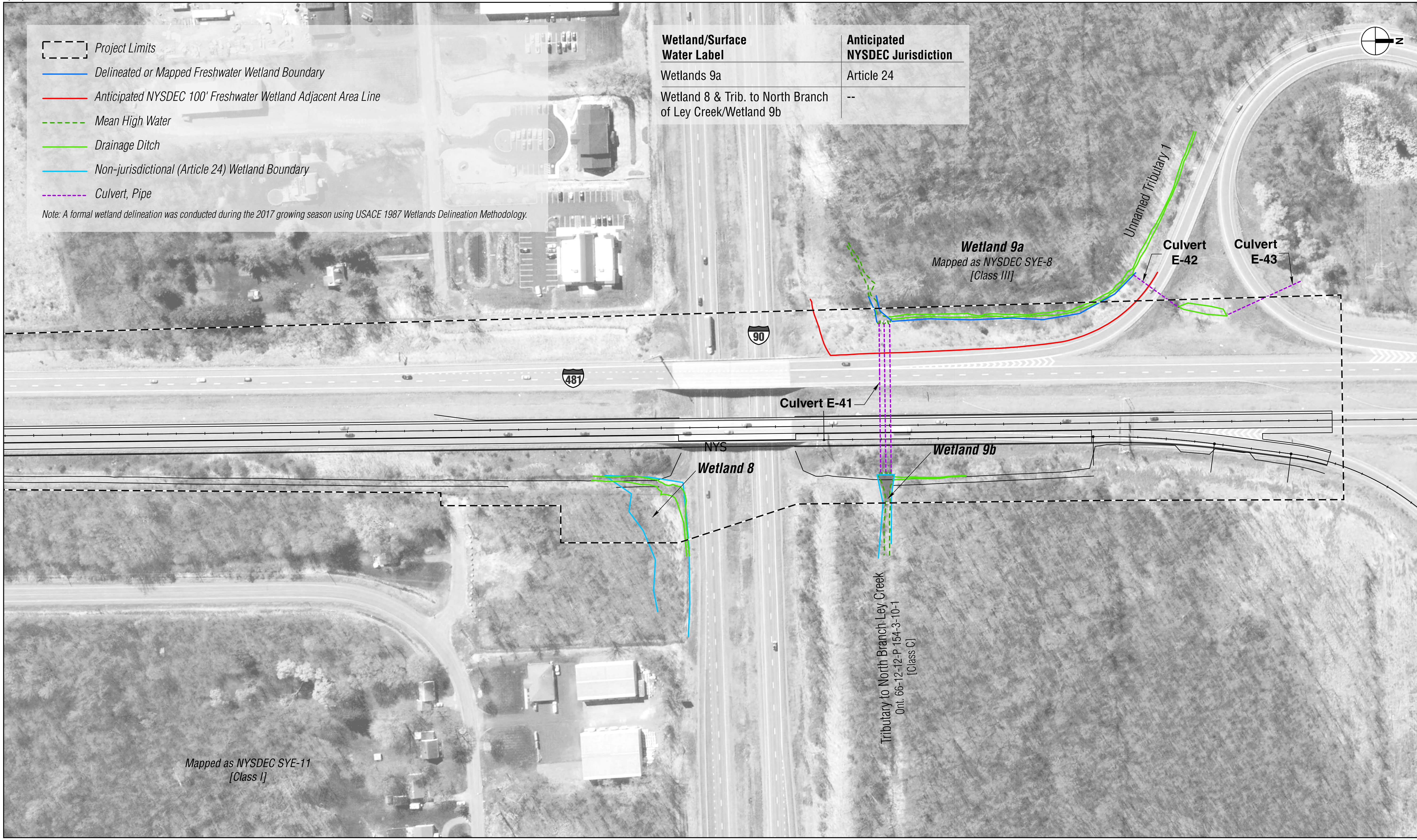


I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-47

I-81 Viaduct Project

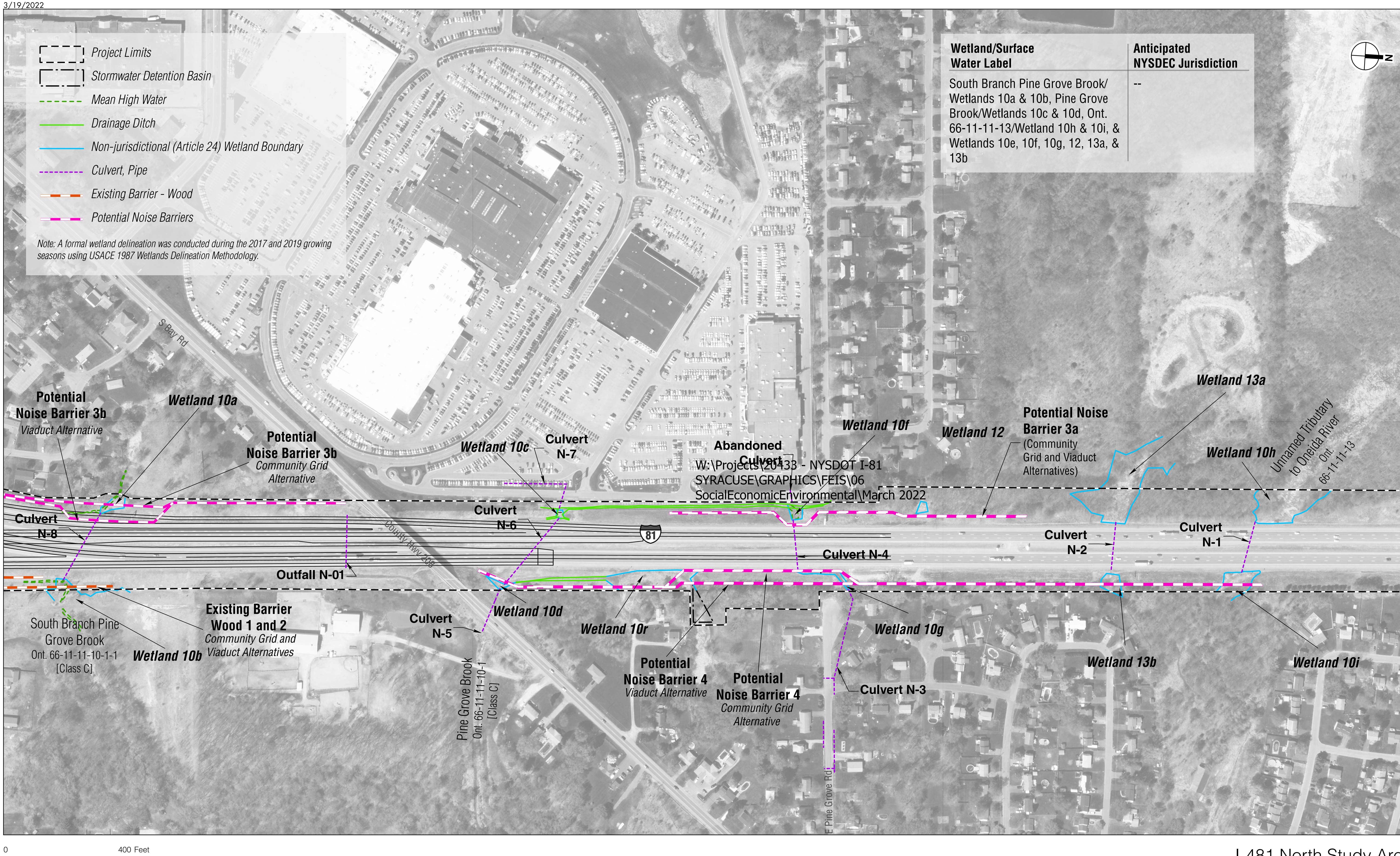


Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Wetlands 9a	Article 24
Wetland 8 & Trib. to North Branch of Ley Creek/Wetland 9b	--

I-481 East Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-48

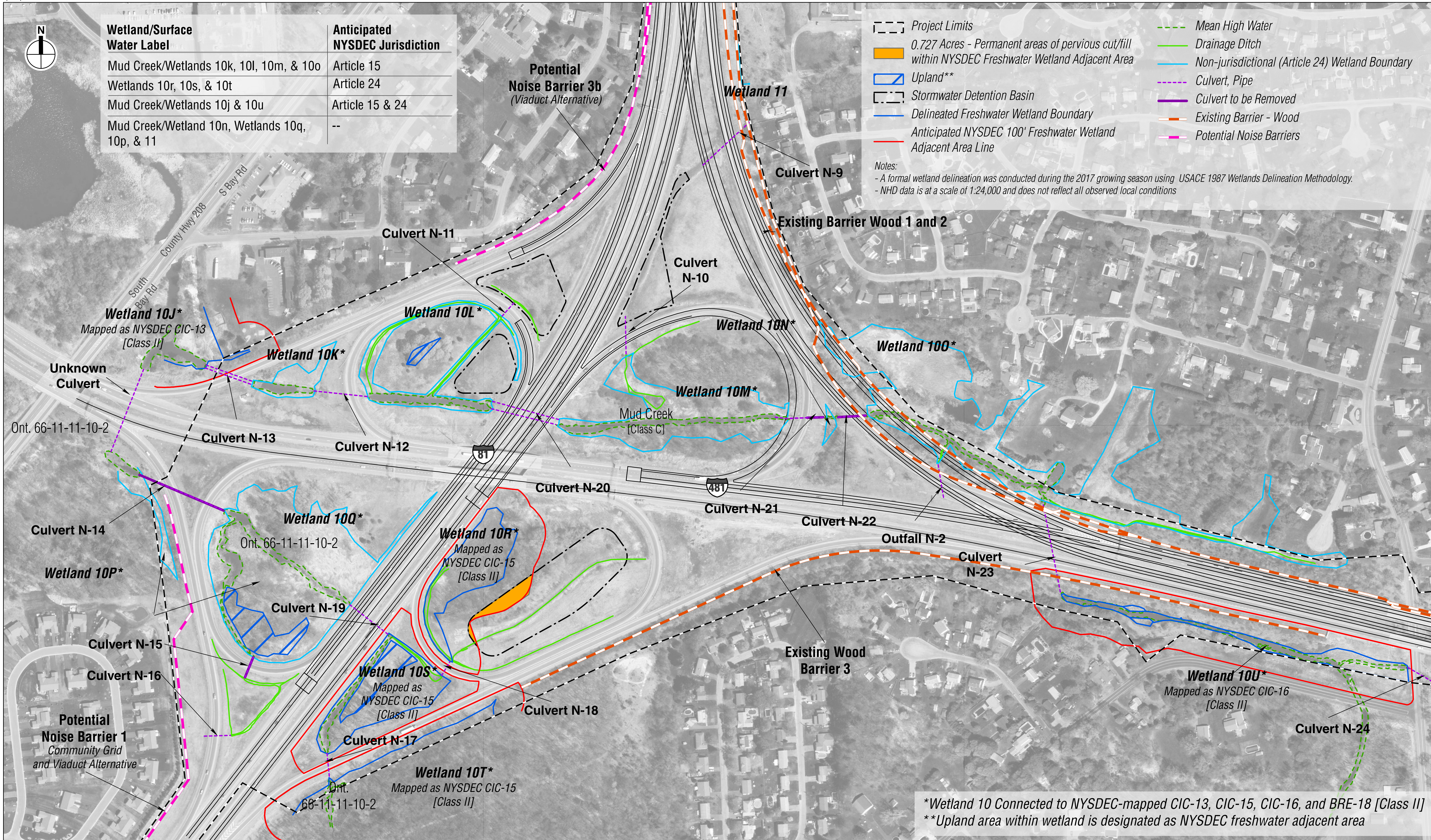


I-481 North Study Area
Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

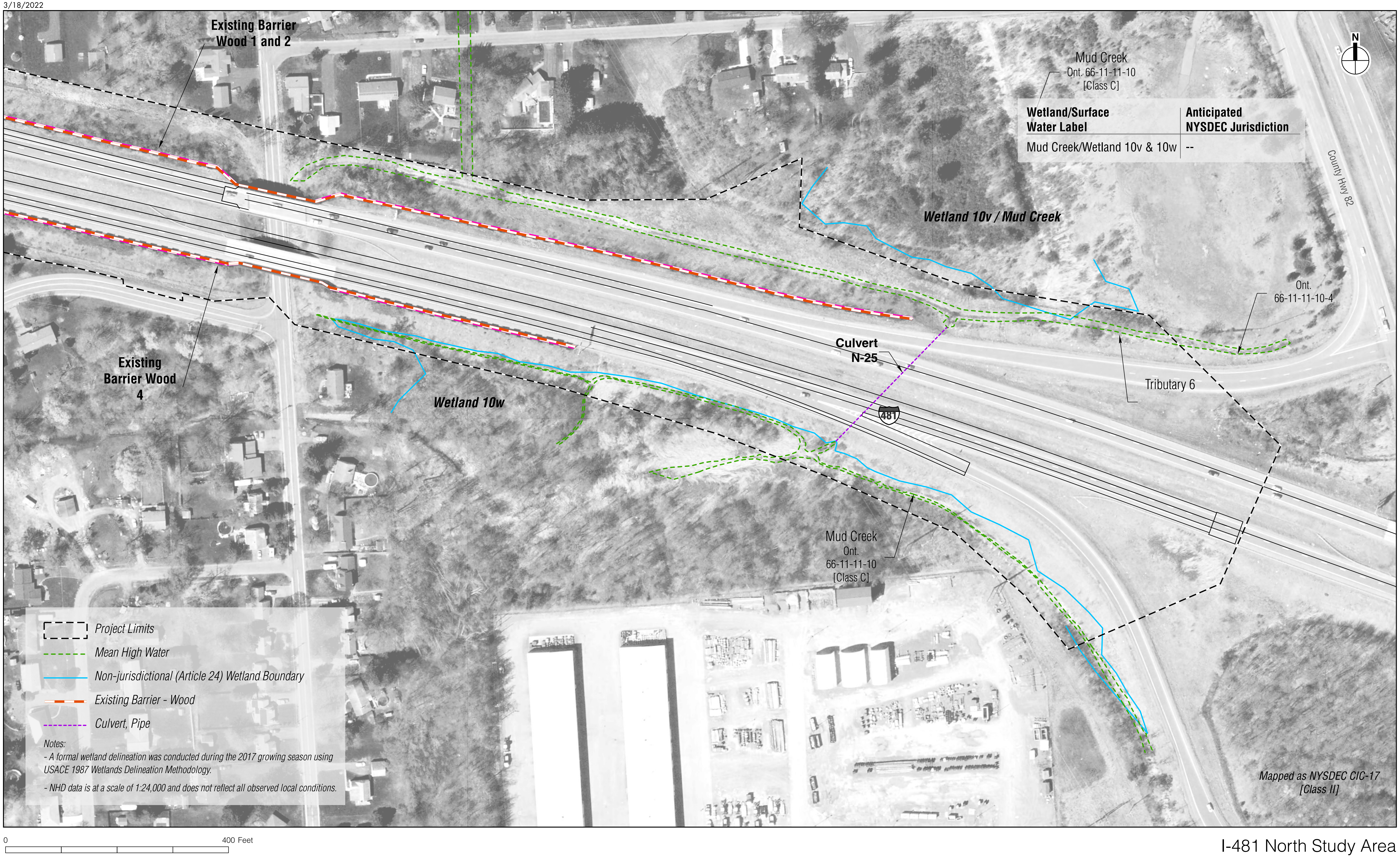
I-81 Viaduct Project

Figure 6-4-7-49

Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Mud Creek/Wetlands 10k, 10l, 10m, & 10o	Article 15
Wetlands 10r, 10s, & 10t	Article 24
Mud Creek/Wetlands 10j & 10u	Article 15 & 24
Mud Creek/Wetland 10n, Wetlands 10q, 10p, & 11	--



I-481 North Study Area
Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters



I-481 North Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

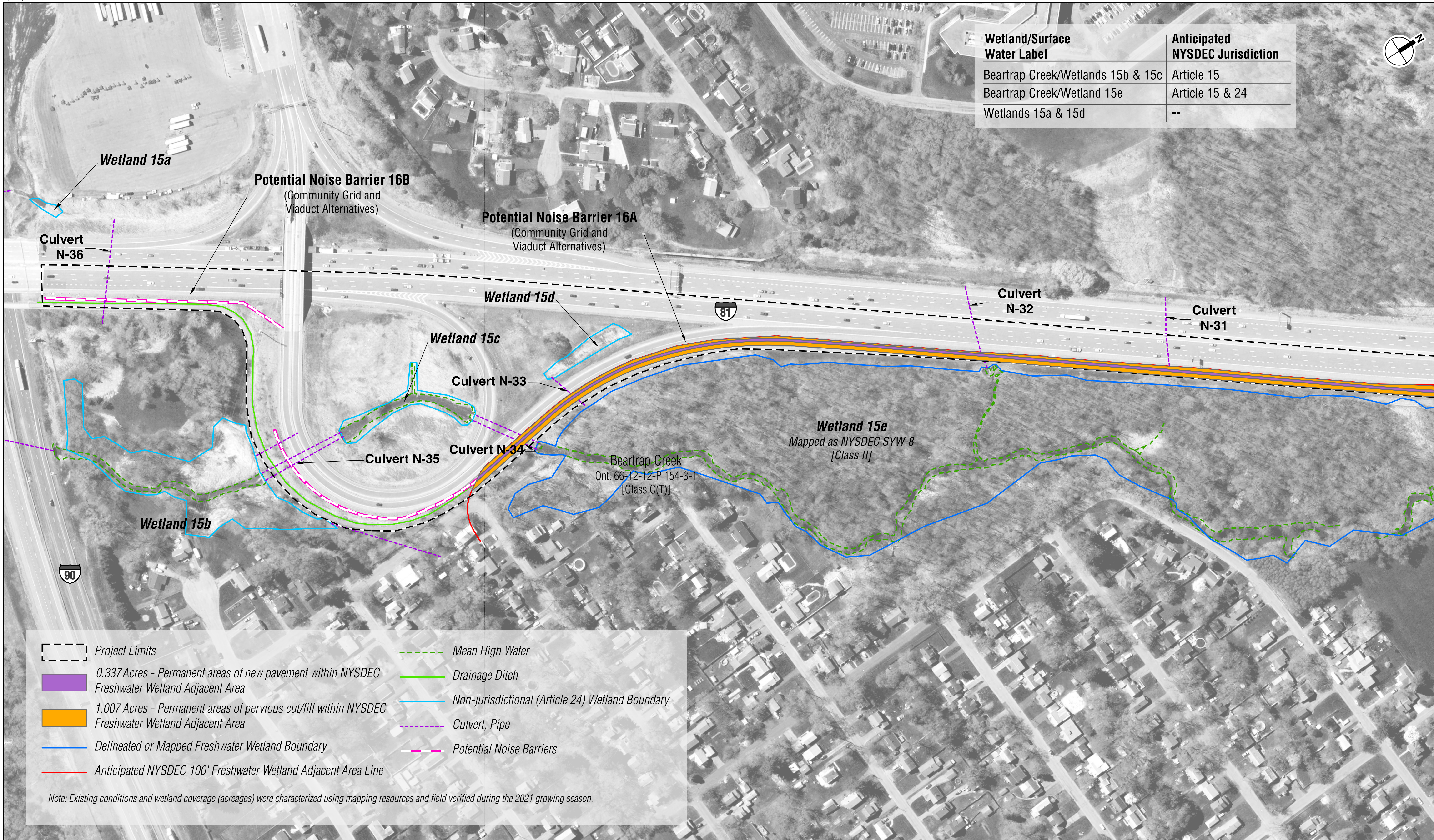
Figure 6-4-7-51

3/18/2022

Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Wetland 14	Article 24
Wetland 10x	--

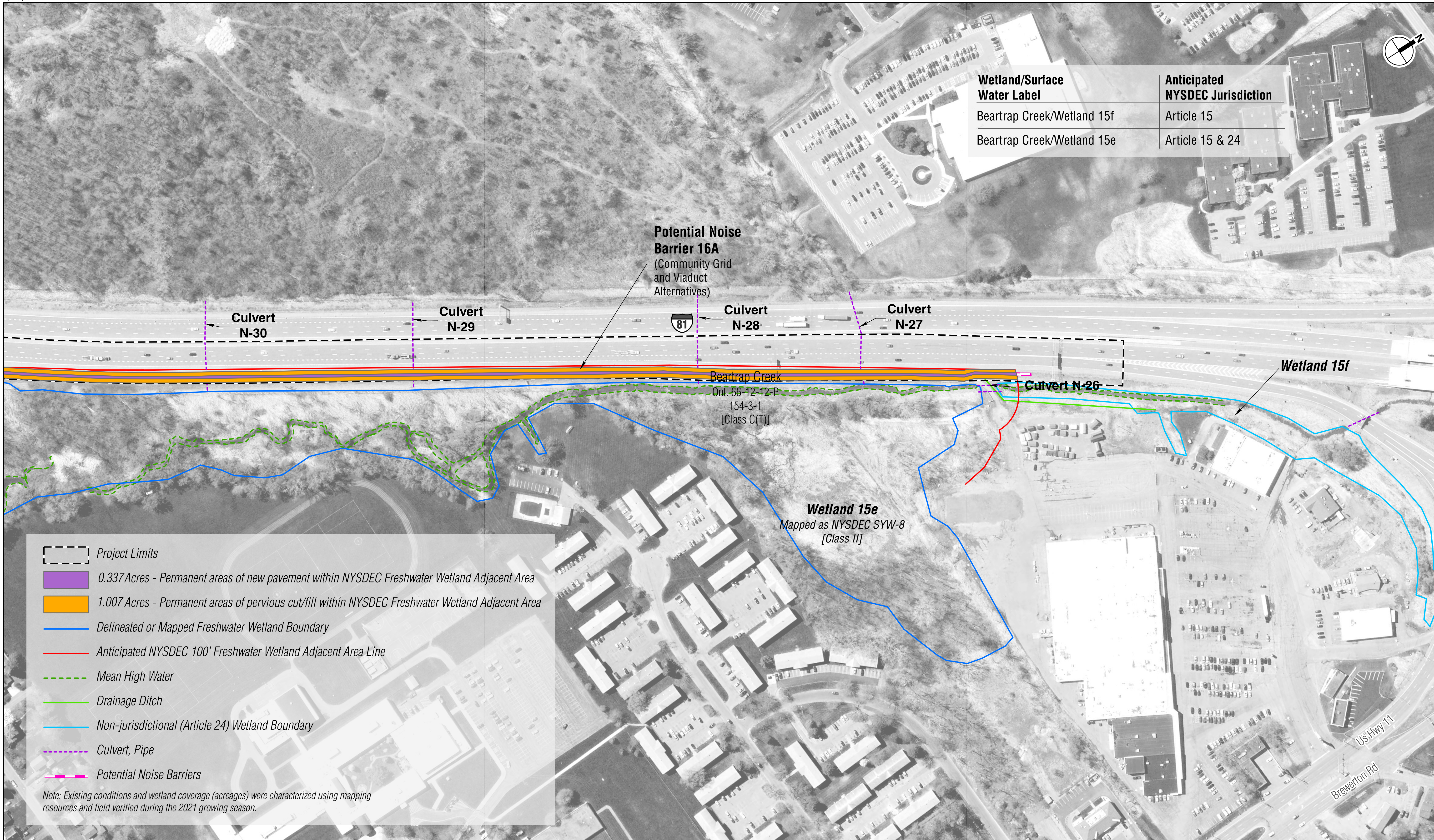
I-481 North Study Area
Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters
Figure 6-4-7-52

I-81 Viaduct Project



Wetland/Surface Water Label	Anticipated NYSDEC Jurisdiction
Beartrap Creek/Wetlands 15b & 15c	Article 15
Beartrap Creek/Wetland 15e	Article 15 & 24
Wetlands 15a & 15d	--

I-481 North Study Area
Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters
Figure 6-4-7-53



0 400 Feet

I-481 North Study Area

Anticipated NYSDEC Jurisdictional Wetlands, Adjacent Areas, and Surface Waters

Figure 6-4-7-54

Table 6-4-7-1 identifies the acreages for wetlands for each study area, which are characterized as follows:

- **Central Study Area.** The study area at Ley Creek contains a total of 2.20 acres of wetlands dominated by common reed (*Phragmites australis*) (see Wetland 1, parts 1a-1e,[10] in **Figure 6-4-7-2**). The majority of the study area at Onondaga Creek does not contain wetlands (see **Figure 6-4-7-3**) with the exception of a 0.03-acre common reed-dominated wetland located along the banks in the vicinity of the Bear Street bridge (see **Figure 6-4-7-4**).
- **I-481 South Study Area.** There are no wetlands within the I-481 South Study Area, including in the vicinity of a proposed noise barrier to the east where an unnamed tributary to Butternut Creek exists (see **Figure 6-4-7-5**).
- **I-481 East Study Area.** The study area contains a total of 98.79 acres of wetlands (see **Figure 6-4-7-6** through **Figure 6-4-7-12**). The majority is associated with two freshwater wetlands[11,12] (see **Appendix I-2** for additional wetland information) located south of the I-481/I-690 interchange in the vicinity of Exit 3 (see Wetland 2, parts 2a-2m, in **Figure 6-4-7-6**), within the I-481/I-690 interchange (see Wetlands 2, parts 2h-2j and 3, parts 3a-3d, in **Figure 6-4-7-7** and Wetland 3, parts 3c-3p in **Figure 6-4-7-8**) and one wetland[13] located north of the I-481 and I-690 interchange just north of the CSX railroad tracks (see Wetland 6, parts 6a-6f in **Figure 6-4-7-10**).

  Wetland 2 is located within and along both sides of Interchange 3 and is associated with Meadow Brook to the west and Butternut Creek to the east, which are described below (see **Figure 6-4-7-6**). The east and west sides of Wetland 2 are connected to each other via delineated channels located within Interchange 3. The wetlands consist of a mixture of emergent, scrub-shrub, and floodplain forest cover types. Emergent vegetation is dominated by common reed. Dominant species in the canopy include green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), and red maple (*Acer rubrum*) with a shrub layer dominated by common buckthorn (*Rhamnus cathartica*).

  Wetland 3 is located to the north of Wetland 2 and is in the vicinity of the I-481 and I-690 interchange. It contains similar cover types to Wetland 2, including emergent and floodplain forest wetlands, consisting of the same plant species assemblages as Wetland 2 (see **Appendix I-2** for additional wetland information).[14]

  Wetland 6 extends to the east and west beyond the I-481 East Study Area boundary. The emergent portion of this wetland contains a variety of micro-habitats including areas dominated by

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10 In many areas, a single wetland may span a large area as it is hydrologically connected by a network of streams, channels, tributaries, and/or culverts. To aid in the review process, individual wetland areas within these larger wetlands have been assigned sublabels (e.g., Wetland 1a through Wetland 1e) as a means to identify the specific areas of the wetland. However, the first number in the naming convention identifies the overall wetland number/name.

11 A palustrine scrub-shrub wetland with broad-leaved deciduous vegetation mixed with emergent vegetation dominated by common reed that is seasonally flooded-saturated (PSS1/PEM5E).

12 A freshwater forested/shrub wetland (PFO1A).

13 A semi-permanently flooded palustrine emergent wetland dominated by common reed (PEM5) with an unconsolidated bottom (UBF).

14 A palustrine forested broad-leaved deciduous wetland that is temporarily flooded (PFO1A), emergent wetlands that support persistent emergent vegetation that are seasonally flooded (PEM1C) and emergent wetlands dominated by common reed that are temporarily flooded (PEM5A)/partially drained/ditched (PEM5Ad).

narrowleaf cattail (*Typha angustifolia*), purple loosestrife (*Lythrum salicaria)*, reed canary grass (*Phalaris arundinacea*), and common reed, and includes areas of open water.[15] The forested portion of this wetland occurs along the eastern edges of the right-of-way and includes species assemblages that are typical of a floodplain forest (see **Appendix J-2, "Ecological Communities and Vegetation"**). Other wetlands include Wetland 4[16], Wetland 5,[17] an unnamed channel[18] (see **Figure 6-4-7-9**), Wetland 7 (see **Figure 6-4-7-11**),[19] Wetland 8 (see **Figure 6-4-7-12**), and Wetland 9 (tributary to North Branch of Ley Creek) (see **Figure 6-4-7-12** and **Appendix I-2** for additional information).[20] In general, these wetlands are characterized by disturbance (i.e., channelization, fill, prevalence of common reed/common buckthorn).

- **I-481 North Study Area.** This study area contains 31.80 acres of wetlands were identified during the wetland delineations (see **Figure 6-4-7-13** through **Figure 6-4-7-18** and **Appendix I-2** for additional information). These wetlands include common reed and floodplain forest wetlands associated with the Mud Creek wetland complex (see **Figure 6-4-7-13** through **Figure 6-4-7-15**) and common reed, scrub-shrub, and floodplain forest wetlands associated with Beartrap Creek (see **Figure 6-4-7-17** and **Figure 6-4-7-18**).

6-4-7.1.2 SURFACE WATERS

To identify surface waters, an assessment was conducted for each of the four study areas described above as well as for an additional 100 feet around the outside of these study areas (see **Appendix I-2**). The Central Study Area, most of the I-481 South Study Area, the northern portion of the I-481 East Study Area, and a small part of the I-481 North Study Area are located within the Onondaga watershed, a sub-watershed of the Seneca watershed. The majority of the I-481 East Study Area is within the Limestone Creek watershed and the majority of the I-481 North Study Area is within the Oneida River watershed, both of which are part of the Oneida watershed. The Seneca and Oneida watersheds drain northwards towards the confluence of the Seneca and Oneida Rivers. North of the confluence, the river continues as the Oswego River, and discharges into Lake Ontario, which discharges to the St. Lawrence River, and finally to the Atlantic Ocean. **Figure 6-4-7-55** shows the relationship between the study areas and the primary sub-watersheds and waterbodies in the region. The waterbodies were identified based on the New York Codes, Rules and Regulations (NYCRR) Oswego River Drainage Basin Series maps and tables.[21]

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15 The various wetland categories provide descriptive information on the cover types (e.g., emergent vegetation versus open water) associated with a wetland. However, the categories have no significance on the USACE and NYSDEC regulatory status of a wetland or its coverage under EO 11990.

16 Wetland 4 is not mapped by NWI.

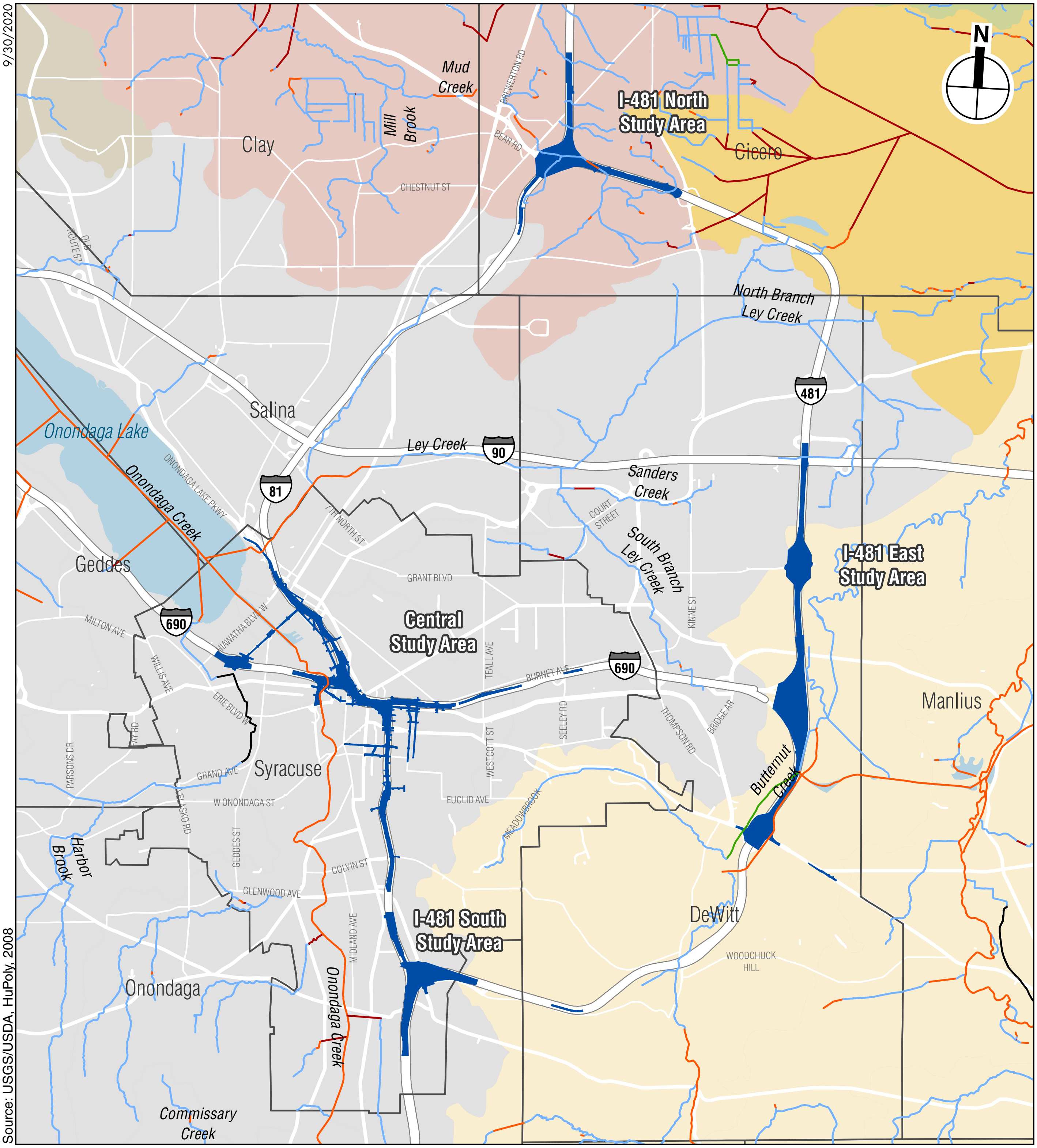
17 Temporarily flooded palustrine forested wetland that is dominated by deciduous broad-leaf vegetation (PFO1A).

18 The unnamed channel is not mapped by NWI.

19 Wetland 7 is not mapped by NWI.

20 Unknown perennial riverine system with an unconsolidated bottom that is permanently flooded (R5UBH).

21 Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1



9/30/2020

Source: USGS/USDA, HuPoly, 2008

Project Limits
City/Town Boundary
Chittenango Creek Watershed
Limestone Creek Watershed
Lower Seneca River Watershed
Oneida Lake-Oneida River Watershed
Oneida River Watershed
Onondaga Watershed

National Hydrology Dataset: Flow Lines
Artificial Path - Modified Stream/River
Canal/Ditch
Connector - Modified Stream/River
Pipeline
Stream/River

Watersheds
Figure 6-4-7-55

I-81 Viaduct Project

All surface waters in the study areas are presumed to be WOTUS under Federal jurisdiction. **Figure 6-4-7-1** through **Figure 6-4-7-18** show the approximate bankfull extents of the surface waters within the study areas, as identified during surface water surveys (see **Appendix I-2** for additional information). **Figure 6-4-7-19** through **Figure 6-4-7-36** show the Ordinary High Water (OHW) extent[22] of the surface waters within the study areas. Where mapped by NYSDEC, the majority of the surface waters within the study areas are NYSDEC Water Quality Classification B or C, with one AA(T) tributary and two C(T) creeks (see **Table 6-4-7-2**). **Figure 6-4-7-56** shows an overview of the streams and water bodies within the study areas, including their NYSDEC Water Quality Classification, and identifies segments that have been piped underground. **Figure 6-4-7-37** through **Figure 6-4-7-54** show the Mean High Water (MHW)[23] extents of the surface waters within the study areas and the NYSDEC water quality classifications. **Table 6-4-7-3** summarizes the impairment status and NYSDEC Water Quality Classification of the surface waters within the study areas, as well as observations on the condition of those streams made during field reconnaissance. NYSDEC assigns a Waters Index Number to each mapped waterbody. The primary waters are typically referred to by name or an abbreviation, while tributaries of primary waters are consecutively numbered progressing upstream from the mouth. Ponds and lakes are denoted by the letter "P" and numbered consecutively as they are encountered, with their tributaries numbered consecutively as they enter and progressing clockwise around the lake or pond from its outlet or mouth.

Most surface waters within the study areas are characterized by disturbance. They are in close proximity to highway and railroad infrastructure, and many are channelized or diverted underneath roads, ramps, and railroads via culvert inlets/outlets. Surface waters within the study areas were surveyed in October 2017, September and October 2019, June 2020, and May 2021 (see **Appendix I-2**). The survey describes the stream channel characteristics upstream and downstream of existing culverts (see **Tables 6-4-7-4a** and **6-4-7-4b**), identifies OHW and other channel features within these limits, and identifies potential opportunities for stream restoration or enhancement.

Culverts conveying surface waters were assessed in June and August 2018, September and October 2019, June 2020, May 2021, and July 2021 using the North Atlantic Aquatic Connectivity Collaborative (NAACC) 2015 rapid assessment protocol for evaluating Aquatic Organism Passage (AOP) at road-stream crossings.[24] The protocol includes two scoring methods, a numeric fine rating system for computing an AOP score ranging from 0 (severe barrier to AOP) to 1 (no barrier to AOP), and a coarse screening system with three categories: 1) Full AOP, 2) Reduced AOP, and 3) No AOP. **Appendix I-3** presents culvert assessment information.

During the surface water surveys and culvert assessments, the locations of stormwater drainage outfalls were noted when observed in the field and are described in **Table 6-4-7-4d**. Refer to **Chapter 5, Transportation and Engineering Considerations** for detailed information on stormwater drainage within the study areas.

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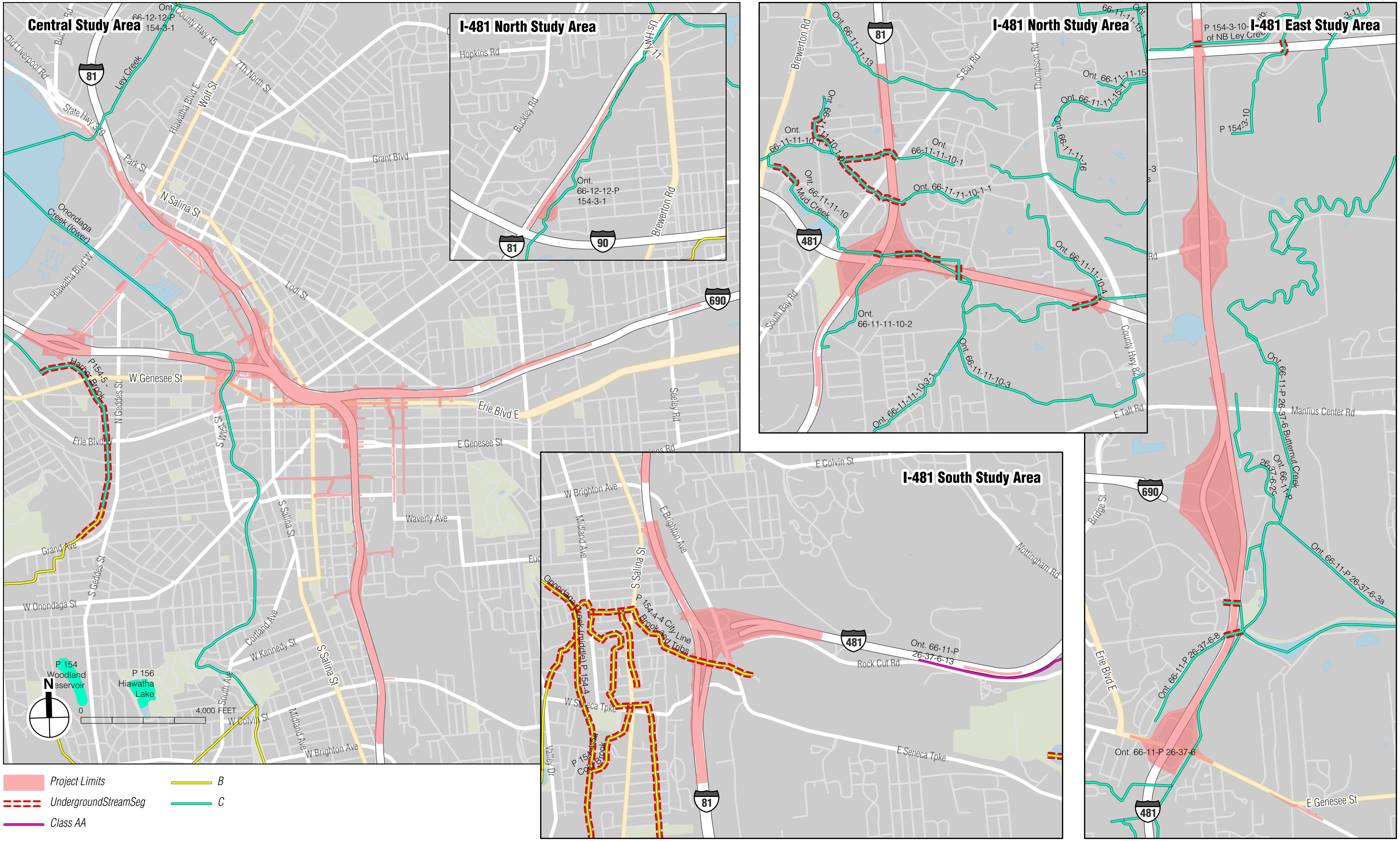
22 OHW was based conservatively on the edge of bank. The USACE regulations define the term "ordinary high water mark" for purposes of the CWA lateral jurisdiction in 33 CFR 328.3(e).

23 MHW is defined by Title 6 Department of Environmental Conservation Chapter V. Resource Management Services Subchapter E. Water Regulation Part 608. Use and Protection of Waters (6 CRR-NY 608.1).

24 NAACC 2015. Scoring Road Stream Crossings as Part of the NAACC.

Sources: NYS Dept. of Environmental Conservation, Division of Water, Bureau of Water Assessment and Monitoring. Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1
AKRF, Inc. 2016. New York State Department of Transportation Interstate 81 (I-81) Viaduct Project Wetland And Surface Water Assessment Report.

3/9/2022



Water Quality Classifications
Figure 6-4-7-56

I-81 Viaduct Project

Table 6-4-7-2
NYSDEC Surface Water Quality Standards[1]

Parameter	Class AA, Class B, and Class C Waters (2)
Taste, color, and odor-producing, toxic and other deleterious substances	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages
Turbidity	No increase that will cause a substantial visible contrast to natural conditions
Suspended, colloidal and settleable solids	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages
Oil and floating substances	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease
Phosphorus and nitrogen	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages
Flow	No alteration that will impair the waters for their best usages
pH	Normal range shall not be less than 6.5 nor more than 9.0
Dissolved oxygen (mg/L)	For non-trout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/ L For trout waters, Classes AA(T) and C(T), the minimum daily average shall not be less than 6.0 mg/L, and at no time shall the DO concentration be less than 5.0 mg/ L
Dissolved solids	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.
Fecal coliform (cfu/100 mL)	The monthly geometric mean, from a minimum of five examinations, shall not exceed 200.
Ammonia (µg/L) (3)	For non-trout waters, with pH ranging from 6.5 to 9.0, and temperature ranging from 0°C to 30°C, standard shall not exceed 0.7 at 0°C, and 50 at 30°C For trout waters, Classes AA(T) and C(T), with pH ranging from 6.5 to 9.0, and temperature ranging from 0°C to 30°C, standard shall not exceed 0.7 at 0°C, and 35 at 30°C
Cyanide (µg/L)	9000 for Fish Consumption Health, 5.2 for Aquatic Chronic, 22 for Aquatic Acute For trout waters, Class AA(T) and C(T): 200 for Water Source Health, 5.2 for aquatic chronic, 22 for aquatic acute
In-Stream Work Window	For Class C trout waters, work can occur between May 15 and October 1. For navigable, non-trout Class C streams, work may occur between July 15 and March 15

Notes:

1. In accordance with the Federal Clean Water Act, surface waters in New York State are classified for their best uses (fishing, source of drinking water, etc.) and standards (allowable levels of pollutants) are set to protect those uses. Letter classes and standards range from A to D in descending order of quality. Standards set forth the maximum allowable levels of chemical pollutants, which are used as the regulatory targets for permitting, compliance enforcement, and assessing the quality of the State's waters. These standards can be either narrative (e.g., "none in amounts that will impair ...") or numeric (e.g., "0.001 µg/L") and are found in NYS regulation 6 NYCRR Part 703. The letter classifications and their best uses are described in regulation 6 NYCRR Part 701.
2. On all parameters listed, Class B and C Waters have the same standards. Where more than one type of standard is listed for a water class, the most stringent applies. Where standards differ for trout waters, Classes AA(T) and C(T), standards for both trout and non-trout waters are listed.
3. The NYSDEC standard for ammonia applies to un-ionized ammonia as NH_3.

Sources:

6 NYCRR Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations;

https://govt.westlaw.com/nycrr/Document/I4ed90418cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

https://govt.westlaw.com/nycrr/Document/I4ed90412cd1711dda432a117e6e0f345?transitionType=Default&contextData=(sc.Default)#:~:text=For%20trout%20waters%20(T)%2C,less%20than%204.0%20mg%2F%20L.

Table 6-4-7-3
Surface Waters Within the Study Areas

Stream Name[1]	6 NYCRR Waters Index Number[1]	NYSDEC Stream Classification[1]	6 NYCRR[1] Standards	TMDL List[2]	Cause / Pollutant	Suspected Source[2]	Stream Condition[3]	Receiving Waterbody[1]
Central Study Area								
Onondaga Creek (lower)[4]	Ont. 66-12-12-P 154-4[5]	Class C	C	303(d) - Part 3a	Turbidity	Streambank erosion	Channelized. Lower perennial riverine system with an unconsolidated bottom that is permanently flooded.	Onondaga Lake
				303(d) - Part 3b	Fecal Coliform, Nutrients (P), Ammonia	CSOs[6], Municipal, Urban Runoff		
Onondaga Creek (middle)[4]	Ont. 66-12-12-P 154-4	Class B	B	303(d) - Part 3a	Turbidity	Streambank erosion	Lower perennial riverine system with an unconsolidated bottom that is permanently flooded.	Onondaga Lake
				303(d) - Part 3b	Fecal Coliform, Nutrients (P), Ammonia	CSOs, Municipal, Urban Runoff		
Ley Creek[4]	Ont. 66-12-12-P 154-3 portion	Class C	C	303(d) - Part 3b[4]	Fecal Coliform, Nutrients (P), Ammonia	CSOs, Municipal, Urban Runoff	Channelized. Lower perennial riverine system with an unconsolidated bottom that has been excavated and is permanently flooded.	Onondaga Lake
				303(d) - Part 2b	Dioxin, Mercury, PCBs, other toxins	Contaminated Sediment		
Onondaga Lake, southern end[4]	Ont. 66-12-12-P 154 (portion 2)	Class C	C	303(d) - Part 2b	Dioxin, Mercury, PCBs, other toxins	Contaminated Sediment	Onondaga Lake is a limnetic lacustrine system with an unconsolidated bottom that is permanently flooded. The downstream collector, Seneca River, is a lower perennial riverine system with an unconsolidated bottom that is permanently flooded.	-
				303(d) - Part 3a	Low D.O.	Natural Conditions		
				303(d) - Part 3b	Fecal Coliform	CSOs, Municipal, Urban Runoff		

Table 6-4-7-3 (cont'd)
Surface Waters Within the Study Areas

Stream Name[1]	6 NYCRR Waters Index Number[1]	NYSDEC Stream Classification[1]	6 NYCRR[1] Standards	TMDL List[2]	Cause /Pollutant	Suspected Source[2]	Stream Condition[3]	Receiving Waterbody[1]
I-481 South Study Area								
City Line Brook	Ont. 66-12-12-P 154-4-4 and all tributaries	Class B	B	303(d) - Part 3a	Turbidity	Streambank erosion	Diverted underground.	Onondaga Creek (Middle)
				303(d) - Part 3b	Fecal Coliform, Nutrients (P), Ammonia	CSOs, Municipal, Urban Runoff		
Tributary of Butternut Creek	Ont. 66-11-P 26-37-6-13	Class AA	AA(T)	-	-	-	Perennial riverine system with an unconsolidated bottom that is permanently flooded.	Butternut Creek
I-481 East Study Area								
Butternut Creek[4]	Ont. 66-11-P 26-37-6	Class C	C	303(d) - Part 3a	Fecal Coliform, Oxygen demand	Municipal	Perennial riverine system with an unconsolidated bottom that is permanently flooded. Parts of the channel have been excavated.	Chittenango Creek
Butternut Creek[4]	Ont. 66-11-P 26-37-6	Class C	C(T)	303(d) - Part 3a	Fecal Coliform, Oxygen demand	Municipal	Lower perennial riverine system with an unconsolidated bottom that is permanently flooded and has been excavated.	Chittenango Creek
Tribs. of Butternut Creek[4]	Ont. 66-11-P 26-37-6-2-c, Ont. 66-11-P 26-37-6-8	Class C	C	303(d) - Part 3a	Fecal Coliform, Oxygen demand	Municipal	Lower perennial riverine systems with unconsolidated bottoms that are permanently flooded.	Butternut Creek
Tribs. of North Branch Ley Creek	Ont. 66-12-12-P 154-3-10, Ont. 66-12-12-P 154-3-10-1, Ont. 66-12-12-P 154-3-11	Class C	C	303(d) - Part 3b	Fecal Coliform, Nutrients (P), Ammonia, Cyanide	CSOs, Municipal, Urban Runoff	Perennial riverine systems with unconsolidated bottoms that are permanently flooded. Pass under I-480 and I-90 via culverts.	North Branch Ley Creek

Table 6-4-7-3 (cont'd)
Surface Waters Within the Study Areas

Stream Name[1]	6 NYCRR Waters Index Number[1]	NYSDEC Stream Classification[1]	6 NYCRR[1] Standards	TMDL List[2]	Cause /Pollutant	Suspected Source[2]	Stream Condition[3]	Receiving Waterbody[1]
I-481 North Study Area								
Mud Creek and tributaries[4]	Ont. 66-11-11-10 west and tributaries	Class C	C	-			Flows underground via culvert inlet/outlets under the highway. Intermittent riverine system with a seasonally flooded streambed.	Oneida River
Mud Creek[4]	Ont. 66-11-11-10 east	Class C	C	-			Connects emergent and forested wetlands via culverts located underneath highway. Lower perennial riverine system with an unconsolidated bottom that has been excavated and is permanently flooded.	Oneida River
Tributaries of Oneida River	Ont. 66-11-11 and tributaries	Class C	C	-			Intermittent riverine system with a seasonally flooded streambed.	Oneida River
Beartrap Creek	Ont. 66-12-12-P 154-3-1 and all tribs.	Class C	C(T)	303(d) - Part 3b	Fecal Coliform, Nutrients (P), Ammonia, Cyanide	CSOs, Municipal, Urban Runoff	Intermittent riverine system with a seasonally flooded streambed.	Ley Creek

Notes:

1. Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1
2. NYSDEC. 2018. Final New York State 2018 Section 303(d) List of Impaired/TMDL Waters. Accessed May 13th, 2021 at https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf
   303(d) - Part 2b - fish consumption advisories
   303(d) - Part 3a - Waterbodies for which TMDL Development May be Deferred (Requiring Verification of Impairment)
   303(d) - Part 3b - Waterbodies for which TMDL Development May be Deferred (Requiring Verification of Cause/Pollutant/Source)
3. I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary (**Appendix I-2**).
4. Indicates that this is a navigable waterway under Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act, or Title 5 of Article 15 of the NYSDEC Environmental Conservation Law (ECL). Further details are included in the text below, as well as in **Appendix I-2**.
5. "Ont." stands for Ontario (waters with this identifier are part of Lake Ontario's watershed).
6. Combined Sewer Overflows (CSOs).

Table 6-4-7-4a
Existing Culverts Within the Study Areas – I-481 East Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
Central	C-1	24" concrete culvert with wing walls, apron, and headwall mitered to the slope. Conveys Wetland 1A west under highway right-of-way.	Reduced AOP	0.82 / Insignificant Barrier
Central	C-2	52" concrete culvert with wing walls, apron, and headwall mitered to the slope. Connects Wetland 1A to Wetland 1B under highway right-of-way.	Reduced AOP	0.73 / Minor Barrier

Table 6-4-7-4b
Existing Culverts Within the Study Areas – I-481 East Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
East	E-1	82" wide by 96" tall RCP[1] box culvert with wing walls. Conveys Meadow Brook under Route 5, west of the I-481 interchange.	Reduced AOP	0.88 / Insignificant Barrier
East	E-2	24" RCP culvert with wing walls, mitered to the slope. Conveys surface drainage and Wetland 2e to Butternut Creek through I-481 and Route 5 interchange.	Reduced AOP	0.76 / Minor Barrier
East	E-3	24" RCP culvert with wing walls, mitered to the slope, and submerged. Conveys surface drainage to Butternut Creek through I-481 and Route 5 interchange.	Reduced AOP	0.88 / Insignificant Barrier
East	E-4	32" RCP with wing walls mitered to the slope, a concrete apron, and a small drop to a cobble-lined scour pool/energy dissipator. Conveys surface drainage and Wetland 2a to Butternut Creek through I-481 and Route 5 interchange.	Reduced AOP	0.68 / Minor Barrier
East	E-5	42" RCP with wing walls, mitered to the slope, with a cobble-lined scour pool/energy dissipator. Conveys surface drainage and Wetland 2b to Butternut Creek through I-481 and Route 5 interchange.	Reduced AOP	0.82 / Insignificant Barrier
East	E-6	42" RCP culvert with wing walls, mitered to the slope, with a cobble-lined scour pool/energy dissipator. Conveys surface drainage and Wetland 2c to Butternut Creek through I-481 and Route 5 interchange.	No AOP	0.19 / Severe Barrier
East	E-7	24" RCP culvert with crumbling inlet, mitered to the slope. Conveys surface drainage to Butternut Creek through I-481 and Route 5 interchange.	Reduced AOP	0.89 / Insignificant Barrier
East	E-8	24" RCP culvert with wing walls, an apron, and an extensive cobble rip-rap energy dissipator. Outlets to slightly eroded preferential flow path on Butternut Creek embankment. Conveys surface drainage to Butternut Creek through I-481 and Route 5 interchange.	No AOP	0.00 / Severe Barrier
East	E-9	24" RCP culvert with wing walls, an apron, and a light cobble rip-rap energy dissipator. Outlets to slightly eroded preferential flow path on Butternut Creek embankment. Conveys surface drainage to Butternut Creek through I-481 and Route 5 interchange.	No AOP	0.00 / Severe Barrier
East	E-10	32" RCP culvert with wing walls and a projecting inlet. Conveys Wetland 2j to Butternut Creek through I-481 and Route 5 interchange.	No AOP	0.63 / Minor Barrier

Table 6-4-7-4b (cont'd)
Existing Culverts Within the Study Areas – I-481 East Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
East	E-11	24" RCP culvert with wing walls, a projecting inlet, and a bend along the pipe alignment. Conveys Wetland 2i to Butternut Creek through I-481 and Route 5 interchange.	No AOP	0.61 / Minor Barrier
East	E-12	32" RCP culvert with wing walls and a projecting inlet. Conveys Wetland 2k to Butternut Creek through I-481 and Route 5 interchange.	Reduced AOP	0.71 / Minor Barrier
East	E-13	30" RCP culvert with wing walls and outlet armoring. Conveys Wetlands 2j and 2h underneath I-481.	No AOP	0.50 / Moderate Barrier
East	E-14	Elliptical RCP culvert - 52" wide and 36" tall. Metal cover and concrete headwall at outlet, wing walls, and headwall at inlet. Conveys Wetlands 2j and 2h underneath I-481.	No AOP	0.00 / Severe Barrier
East	E-15	Elliptical RCP culvert, 84" wide by 66" tall with headwalls and wing walls. Conveys Meadow Brook to Cedar Bay.	Reduced AOP	0.84 / Insignificant Barrier
East	E-16	Double-barrel culvert under I-481. Elliptical CMPs,[2] 60" wide by 36" tall, with headwall and wing walls. Conveys an Unnamed Butternut Creek Tributary under I-481.	Reduced AOP	0.85 / Insignificant Barrier
East	E-17	Elliptical CMP culvert - 24" wide and 18" tall - with wing walls. Conveys Wetland 3a to an Unnamed Butternut Creek Tributary.	Reduced AOP	0.66 / Minor Barrier
East	E-18	36" CMP culvert with wing walls mitered to the slope and rusted apron. Conveys Wetland 3a to an Unnamed Butternut Creek Tributary.	Reduced AOP	0.57 / Moderate Barrier
East	E-19	24" RCP culvert with wing walls mitered to the slope. Conveys Wetlands 3b and 3e through I-481/I-690 Interchange.	Reduced AOP	0.73 / Minor Barrier
East	E-20	24" RCP culvert with wing walls mitered to the slope. Conveys Wetlands 3e and 3a through I-481/I-690 Interchange.	Reduced AOP	0.81 / Insignificant Barrier
East	E-21	24" CMP culvert with wing walls mitered to the slope. Conveys Wetland 3g through I-481/I-690 Interchange.	Reduced AOP	0.84 / Insignificant Barrier
East	E-22	24" deformed CMP culvert with broken wing walls. Conveys Wetlands 3f and 3h through I-481/I-690 Interchange.	Reduced AOP	0.73 / Minor Barrier
East	E-23	36" CMP culvert with wing walls mitered to the slope. Conveys Wetlands 3h and 3k through I-481/I-690 Interchange.	Reduced AOP	0.82 / Insignificant Barrier
East	E-24	36" CMP culvert with wing walls mitered to the slope. Conveys Wetlands 3k and 3l through I-481/I-690 Interchange.	Reduced AOP	0.78 / Minor Barrier
East	E-25	18" CMP culvert with buried or removed inlet. Hydrologic connection between I-481/I-690 Interchange ramps.	No AOP	0.64 / Minor Barrier
East	E-26	24" CMP culvert with wing walls mitered to the slope. Conveys Wetlands 3m and 3n through I-481/I-690 Interchange.	No AOP	0.75 / Minor Barrier

Table 6-4-7-4b (cont'd)
Existing Culverts Within the Study Areas–I-481 East Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
East	E-27	24" CMP culvert with broken wing walls and mitered to the slope. Conveys Wetlands 3n and 3o through I-481/I-690 Interchange.	No AOP	0.70 / Minor Barrier
East	E-28	24" CMP culvert with wing walls mitered to the slope. Conveys Wetlands 3o and 3p through I-481/I-690 Interchange.	No AOP	0.66 / Minor Barrier
East	E-29	42" RCP culvert with wing walls mitered to the slope. Conveys Wetlands 3p and 3l through I-481/I-690 Interchange.	Full AOP	0.81 / Insignificant Barrier
East	E-30	48" CMP culvert with wing walls. Conveys unnamed stream-wetland complex north towards Wetland 5 and an Unnamed Butternut Creek Tributary.	Full AOP	0.81 / Insignificant Barrier
East	E-31	24" CMP culvert with wing walls mitered to the slope. Connects Wetland 4a under I-481 to Wetland 4b and an Unnamed Butternut Creek Tributary.	Full AOP	0.84 / Insignificant Barrier
East	E-32	48" RCP culvert with wing walls. Conveys Unnamed Butternut Creek Tributary under Manlius Center Road.	Full AOP	0.90 / Insignificant Barrier
East	E-33	Circular 36" CMP inlet extended with elliptical 42" wide by 24" high HDPE pipe at outlet. Conveys Unnamed Butternut Creek Tributary under CSX railroad tracks.	Full AOP	0.89 / Insignificant Barrier
East	E-34	30" HDPE culvert with 60" metal apron on downstream side. Connects Wetlands 6a and 6b under highway maintenance road under highway bridge.	Reduced AOP	0.83 / Insignificant Barrier
East	E-35	32" HDPE culvert. Connects Wetlands 6a and 6b under highway maintenance road under highway bridge.	Reduced AOP	0.70 / Minor Barrier
East	E-36	24" HDPE culvert with 60" metal apron. Connects to Wetlands 6c and 6d under a highway maintenance road under a highway bridge. Standing, stagnant water in pipe during dry weather.	Reduced AOP	0.86 / Insignificant Barrier
East	E-37	Two 42" HDPE culverts with wing walls. Convey Wetland 6c and an Unnamed Butternut Creek Tributary under I-481 to confluence with Butternut Creek.	Reduced AOP	0.84 / Insignificant Barrier
East	E-38	Three elliptical CMPs - 60" wide by 36" tall, with wing walls. Conveys highway drainage ditch and Wetland 6f under Kirkville Road, east of I-481, to Butternut Creek.	Reduced AOP	0.90 / Insignificant Barrier
East	E-39	Four elliptical CMPs - 60" wide by 36" tall, with wing walls. Conveys highways drainage ditch under Kirkville Road, west of I-481, into Wetland 6c and an Unnamed Butternut Creek Tributary.	Reduced AOP	0.90 / Insignificant Barrier
East	E-40	54" CMP culvert with wing walls. Connects highway drainage ditch to Wetland 7 under I-481 – tributary of North Branch Ley Creek.	Reduced AOP	0.91 / Insignificant Barrier

Table 6-4-7-4b (cont'd)
Existing Culverts Within the Study Areas–I-481 East Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
East	E-41	One 65" CMP culvert and two 54" HDPE culverts set in a concrete headwall. Outlets into Wetland 9b – tributary of North Branch Ley Creek.	No AOP	0.52 / Moderate Barrier
East	E-42	32" CMP culvert with wing walls mitered to the slope. Conveys Wetland 9a through the I-90 and I-481 Interchange.	Full AOP	0.89 / Insignificant Barrier
East	E-43	32" CMP culvert with wing walls mitered to the slope. Conveys Wetland 9a through the I-90 and I-481 Interchange.	Reduced AOP	0.89 / Insignificant Barrier

Notes:
1. Reinforced Concrete Pipe (RCP)
2. Corrugated Metal Pipe (CMP)

Table 6-4-7-4c
Existing Culverts Within the Study Areas – I-481 North Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
North	N-1	24" RCP with wing walls. Conveys Wetlands 10h and 10i from east to west under I-481	Full AOP	0.84 / Insignificant Barrier
North	N-2	24" RCP with wing walls. Conveys Wetlands 13a and 13b from east to west under I-481.	Reduced AOP	0.81 / Insignificant Barrier
North	N-3	18" CMP, outlet protruding from bank. Conveys unnamed tributary to Pine Grove Brook from where it was piped under residential units towards I-481.	No AOP	0.56 / Moderate Barrier
North	N-4	24" RCP with wing walls, mitered to the slope. Conveys unnamed tributary to Pine Grove Brook from east to west under I-481.	Reduced AOP	0.65 / Minor Barrier
North	N-5	24" RCP with outlet protruding from embankment. Conveys Pine Grove Brook under South Bay Road.	Reduced AOP	0.60 / Moderate Barrier
North	N-6	32" RCP with wing walls mitered to slope. Conveys Pine Grove Brook under I-481.	Reduced AOP	0.60 / Moderate Barrier
North	N-7	32" RCP with wing walls detached from main pipe. Conveys Pine Grove Brook west under shopping center.	No AOP	0.72 / Minor Barrier
North	N-8	36" RCP. Outlets into dense common reed low area on edge of highway that becomes South Branch of Pine Grove Brook.	Reduced AOP	0.72 / Minor Barrier
North	N-9	24" RCP. Inlet and outlet are Mud Creek tributary wetland areas.	Reduced AOP	0.86 / Insignificant Barrier
North	N-10	24" RCP. Inlet and outlet are highway drainage swale tributary to Wetland 10m and Mud Creek. No dry weather flows.	Reduced AOP	0.66 / Minor Barrier
North	N-11	24" CMP. Inlet and outlet are highway drainage swale tributary to Wetland 10l and Mud Creek. No dry weather flows.	Reduced AOP	0.88 / Insignificant Barrier
North	N-12	84" CMP. Inlet and outlet are Mud Creek.	Reduced AOP	0.90 / Insignificant Barrier
North	N-13	60" HDPE double-barrel culvert. Inlet and outlet are Mud Creek.	Reduced AOP	0.86 / Insignificant Barrier

Table 6-4-7-4c (cont'd)
Existing Culverts Within the Study Areas – I-481 North Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
North	N-14	60" CMP. Inlet and outlet are Mud Creek tributary Ont. 66-11-10-2.	Reduced AOP	0.90 / Insignificant Barrier
North	N-15	24" CMP. Inlet is a drainage ditch area; outlet is Wetland 10q.	Reduced AOP	0.78 / Minor Barrier
North	N-16	24" RCP. Outlets to drainage ditch connected to Wetland 10q by culvert N-10.	Reduced AOP	0.82 / Insignificant Barrier
North	N-17	60" CMP. Inlet and outlet are Mud Creek tributary Ont. 66-11-10-2.	Reduced AOP	0.78 / Minor Barrier
North	N-18	36" CMP. Connects drainage ditches in Wetlands 10r and 10s under clover leaf ramp.	Reduced AOP	0.88 / Insignificant Barrier
North	N-19	Elliptical CMP - 60" wide by 40" high. Inlet and outlet are Mud Creek tributary Ont. 66-11-10-2.	Reduced AOP	0.93 / Insignificant Barrier
North	N-20	Double-barrel culvert. 60" CMP and 48" RCP set at a higher elevation. Inlet and outlet are Mud Creek.	Reduced AOP	0.68 / Minor Barrier
North	N-21	84" CMP. Inlet and outlet are Mud Creek.	Reduced AOP	0.70 / Minor Barrier
North	N-22	84" CMP. Inlet and outlet are Mud Creek.	Reduced AOP	0.76 / Minor Barrier
North	N-23	84" CMP. Inlet and outlet are Mud Creek.	Reduced AOP	0.68 / Minor Barrier
North	N-24	Double-barrel 24" RCP. Inlets and outlets are Mud Creek under Thompson Road.	Reduced AOP	0.86 / Insignificant Barrier
North	N-25	56" CMP, 20' long concrete headwall. Inlet is Wetland 10w; outlet is Mud Creek. No dry-weather flow through the culvert.	Reduced AOP	0.92 / Insignificant Barrier
North	N-26	Double-barrel culvert with two elliptical CMP - 144" wide by 78" high, with wingwalls mitered to the slope. Inlet and outlets are Beartrap Creek and adjacent Wetland 15f and 15e.	Full AOP	0.85 / Insignificant Barrier
North	N-27	24" RCP with concrete apron and wingwalls mitered to the slope. Conveys surface water and highway drainage west to east under I-81 ROW. Outlet is Beartrap Creek.	Reduced AOP	0.50 / Moderate Barrier
North	N-28	12" RCP with concrete apron and wingwalls mitered to the slope. Conveys surface water and highway drainage west to east under I-81 right-of-way. Outlets on the floodplain/embankment of Beartrap Creek.	Reduced AOP	0.74 / Minor Barrier
North	N-29	12" RCP. Conveys surface water and highway drainage west to east under I-81 right-of-way. Outlets in Wetland 15e, upstream of Beartrap Creek.	Reduced AOP	0.82 / Insignificant Barrier
North	N-30	12" RCP with concrete apron and wingwalls mitered to the slope. Conveys surface water and highway drainage west to east under I-81 right-of-way. Outlets in Wetland 15e, upstream of Beartrap Creek. Completely submerged at time of survey.	Reduced AOP	0.65 / Minor Barrier
North	N-31	24" RCP with concrete apron and wingwalls mitered to the slope. Conveys surface water and highway drainage under I-81 right-of-way. Outlet is a small, incised channel tributary to Beartrap Creek.	Reduced AOP	0.19 / Severe Barrier
North	N-32	24" RCP with concrete apron and wingwalls mitered to the slope. Conveys surface water and highway drainage west to east under I-81 right-of-way. Outlet is an incised tributary to Beartrap Creek and is heavily eroded around structure.	Reduced AOP	0.01 / Severe Barrier
North	N-33	30" RCP with concrete apron, wingwalls mitered to the slope, and headwall. Conveys Wetland 15d under I-81 interchange right-of-way. Outlets in an armored channel in Wetland 15e, upstream of Beartrap Creek.	Reduced AOP	0.45 / Moderate Barrier

Table 6-4-7-4c (cont'd)
Existing Culverts Within the Study Areas – I-481 North Study Area

Study Area	Culvert ID	Description	NAACC Coarse AOP Rating	NAACC Fine AOP Score/ Rating
North	N-34	Double-barrel culvert with two elliptical CMP - 114" wide by 78" high, with wingwalls mitered to the slope. Inlet and outlets are Beartrap Creek.	Reduced AOP	0.66 / Minor Barrier
North	N-35	Double-barrel culvert with two 87" CMP and concrete headwall. Inlet and outlets are Beartrap Creek.	Reduced AOP	0.88 / Insignificant Barrier
North	N-36	30" RCP with concrete apron and wingwalls mitered to the slope. Conveys surface water and highway drainage under I-81 right-of-way. Outlets in an armored scour pool upstream of Wetland 15b.	Reduced AOP	0.68 / Minor Barrier

Table 6-4-7-4d
Existing Outfalls Observed During Field Work Within the Study Areas[1]

Study Area	Outfall ID	Description
Central	CSO-020	68” concrete double-barrel culvert, one closed with 90” cast iron cap, 20.3' concrete apron. Combined Sewer Overflow (CSO) outfall, CSO-020. Outlets to Onondaga Creek, 1.5 feet above the creek bed.
Central	C-1	8” metal outfall. Stormwater runoff conveyance. Outlets to Onondaga Creek, 2.5 feet above the creek bed.
Central	CSO-021	30” HDPE outfall. Set flush with bridge pier, in the constructed “floodplain.” CSO outfall CSO-021. Outlets to Onondaga Creek, 5.5 feet above the creek bed.
Central	C-2	24” HDPE pipe, 59” metal apron. Set in the constructed “floodplain.” Stormwater runoff conveyance. Outlets to Onondaga Creek, 4.5 feet above the creek bed.
Central	C-3	Three 14” clay pipes with stone surround, half buried in water and sediment in the stream bank/bed. Stormwater runoff conveyance. Outlets to Onondaga Creek.
Central	C-4	42” CMP outfall, 90” metal apron. Stormwater runoff drainage. Outlets into Ley Creek, 2.6 feet above the creek bed.
Central	C-5	Elliptical RCP outfall pipe, 24" wide and 12" tall, with a concrete headwall protruding from the eroded embankment under the bridge. Stormwater outfall, outlets to Onondaga Creek.
Central	C-6	Elliptical RCP outfall pipe, 60" wide and 36" tall, with a concrete headwall protruding from the eroded embankment under the bridge. Stormwater outfall, outlets to Onondaga Creek.
Central	C-7	24" HDPE outfall pipe with wing walls, upstream of rip-rap cascade, and forebay enclosed by geotextile-covered concrete. Forebay overflows into Onondaga Creek.
Central	C-8	34" CMP outfall with concrete headwall. Stormwater runoff drainage. Creates a small scour pool where it outlets into Onondaga Creek.
East	E-1	24" RCP outfall pipe with wing walls. Conveys highway stormwater drainage from northwestern portion of I-481 and Kirkville interchange to unnamed tributary of Butternut Creek.
East	E-2	24" RCP outfall pipe with wing walls. Conveys highway stormwater drainage from southwestern portion of I-481 and Kirkville interchange to unnamed tributary of Butternut Creek.
East	E-3	24" RCP outfall pipe with wing walls. Conveys highway stormwater drainage under I-481 southbound on-ramp to unnamed tributary of Butternut Creek.
East	E-4	24" RCP outfall pipe with wing walls. Conveys highway stormwater drainage to unnamed tributary of Butternut Creek under I-481 northbound off ramp to Kirkville Road.
East	E-5	24" RCP outfall pipe with wing walls. Conveys highway stormwater drainage from southeastern portion of I-481 and Kirkville interchange to unnamed tributary of Butternut Creek.
East	E-6	24" RCP outfall pipe with wing walls. Conveys highway stormwater drainage from northeastern portion of I-481 and Kirkville interchange to unnamed tributary of Butternut Creek.
East	E-7	24" CMP outfall pipe with 4" drop from pipe to embankment. Conveys highway stormwater drainage to highway embankment upstream of Butternut Creek.
East	E-8	24" CMP outfall pipe with 2" drop from pipe to embankment. Conveys highway stormwater drainage to highway embankment upstream of Butternut Creek.
East	E-9	24" RCP outfall pipe with wing walls, a trash rack within the pipe, and 6" drop from the apron to the embankment. Conveys highway stormwater drainage to highway embankment upstream of Butternut Creek.
East	E-10	Elliptical CMP outfall pipe, 30" wide and 20" tall, with rusted metal wing walls and apron, and 6" drop from the apron to the embankment. Conveys highway stormwater drainage to highway embankment upstream of Butternut Creek.
East	E-11	24" CMP outfall pipe with rusted metal wing walls and apron, and 4" drop from pipe to embankment. Conveys highway stormwater drainage to highway embankment upstream of Butternut Creek.
East	E-12	12" RCP outfall, half buried in sediment and vegetation. Conveys highway stormwater drainage to I-481 & Route 5 quad.
North	N-1	24" RCP. Highway drainage. Outlets into dry swale densely populated with common reed.
North	N-2	36" CMP. Highway drainage. Outlets into a steep wet-weather flow drainage ditch to Mud Creek that appears to be eroding the culvert outlet.

Note 1: Additional outfalls are likely present within all study areas but were not observed or evaluated during field work.

Central Study Area

The Central Study Area is located within the Onondaga Lake watershed and the watersheds of two of the lake's tributaries, Onondaga Creek and Ley Creek (see **Figure 6-4-7-55, Figure 6-4-7-39, Figure 6-4-7-40,** and **Figure 6-4-7-38**). **Figure 6-4-7-2** through **Figure 6-4-7-4** show the approximate bankfull extents of the surface waters within the study areas, as identified during surface water surveys, and **Figure 6-4-7-20** through **Figure 6-4-7-22** show the OHW extents[25] of the surface waters within the study areas. In general, the watersheds of these two streams are characterized by disturbance associated with roadway, commercial, industrial, and residential development.

- **Onondaga Creek:** Onondaga Creek has a drainage area of approximately 110 square miles and is one of the largest tributaries to Onondaga Lake. The creek meanders in a northerly direction through the western part of the Central Study Area for 2,243 linear feet (lf), has a surface area of 2.67 acres, and is classified as a NYSDEC Class C stream. The southern portion of the study area, from East Brighton Avenue north to Garfield Place, is within the watershed, but not the stream segment for the middle section of Onondaga Creek, which is designated as Class B. The Final NYSDEC 2018 Section 303(d) List of Impaired Waters Requiring a TMDL or other restoration strategy[26] indicate that within the Central Study Area, Onondaga Creek is impaired due to turbidity, deriving from streambank erosion, and contamination, which includes fecal coliform, nutrients (phosphorus), and ammonia due to Combined Sewer Overflows (CSOs), municipal sources, and urban runoff. The NWI maps this portion of Onondaga Creek as a lower perennial riverine system with an unconsolidated bottom that is permanently flooded. The creek is channelized within the Central Study Area, with a trapezoidal cross section and heavily armored banks between Erie Boulevard and Evans Street; this section of Onondaga Creek is not considered a navigable waterway under Section 10 of the Rivers and Harbors Act[27] or under Section 404 of the Clean Water Act, but does meet the definition of navigable under Title 5 of Article 15 of the NYSDEC Environmental Conservation Law (ECL).[28] A water body qualifies as "navigable waters of the United States" under Federal laws if "the water body is (a) subject to the ebb and flow of the tide, and/or (b) the water body is presently used, or has been used in the past, or may be susceptible for use (with or without reasonable improvements) to transport interstate or foreign commerce." The Buffalo District of the USACE has a list of navigable waters of the United States within its district in New York State.[29] "Navigable waters" of the State under Article 15 of the ECL means all lakes, rivers, streams, and other bodies of water in the State that are navigable in fact or upon which vessels with a capacity of one or more persons can be operated notwithstanding interruptions to navigation by artificial structures, shallows, rapids, or other obstructions, or by seasonal variations in capacity to support navigation; it does not include waters that are surrounded by land held in single private ownership at every point in their total area. Downstream, adjacent to Bear Street, the creek has a more irregular cross section, with silty sediments forming the bed and banks. This

25 OHW was based conservatively on the edge of bank.

26 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

27 http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=2734&context=dlj

28 https://law.justia.com/codes/new-york/2015/env/article-15/title-5/

29 http://www.lrb.usace.army.mil/Portals/45/docs/regulatory/Section10NavigableWaterways/waterwayNY.pdf

portion of the creek is navigable under Section 10 of the Rivers and Harbors Act[30], Section 404 of the Clean Water Act,[31] and NYSDEC ECL Article 15.[32]

Within the Central Study Area, ten bridges cross Onondaga Creek (from downstream to upstream): the Bear Street bridge, the Evans Street bridge, a ramp from Franklin Street to North Water Street, a ramp from westbound I-690 to North West Street South, the westbound I-690 and the eastbound I-690 bridges, a ramp from West Street to eastbound I-690, a ramp from West Street to Herald Place, the West Genesee Street bridge, and the Erie Boulevard bridge. Onondaga Creek does not pass through any culverts within the Central Study Area.

Three stormwater outfalls ranging in size from 8 to 24 inches in diameter and two CSO outfalls, CSO-020, a 68-inch diameter double-barrel RCP, and CSO-021, a 30" HDPE pipe, are located along the portion of Onondaga Creek between Erie Boulevard and Evans Street (see **Figure 6-4-7-39** and **Table 6-4-7-4d**). Four additional stormwater outfalls, ranging in size from 12 to 30 inches in diameter (see **Figure 6-4-7-40** and **Table 6-4-7-4d**), are located further downstream within the Central Study Area, where Bear Street crosses over Onondaga Creek. The CSO outfalls discharge under high flow conditions onto concrete spillways positioned at the level of the floodplain, above bankfull elevation. These outfalls have the potential to discharge pollutants to the creek during high flow precipitation events.

- **Ley Creek:** Located north of Onondaga Creek, Ley Creek is another large tributary to Onondaga Lake, draining an area of about 30 square miles. Ley Creek is a NYSDEC Class C stream that flows from east to west through the Central Study Area for 282 lf, with a surface area of 0.31 acres. The NWI maps it as a lower perennial riverine system with an unconsolidated bottom that has been excavated and is permanently flooded. Within the Central Study Area, the creek has been channelized and has riprap along the upper edges of the banks and gravel along the lower edges with common reed dominant lower on the banks of the creek and along mudflats. In the Central Study Area, the creek is classified as a navigable waterway under Section 10 of the Rivers and Harbors Act and the NYSDEC ECL Article 15. Within the study area, Ley Creek passes under a bridge subject to Section 9 of the Rivers and Harbors Act[33] and the General Bridge Act of 1946.[34] This three-lane bridge connects northbound and southbound I-81 to local Syracuse streets. The channel has no aids to navigation as defined by 14 U.S.C. § 85[35] or 33 CFR Part 118.[36] The 303(d) List[37] indicates Ley Creek is impaired due to contamination, which includes fecal coliform, nutrients (phosphorus), and ammonia due to CSOs, municipal sources, and urban runoff. A 42-inch metal stormwater outfall protrudes from the stream bank at bankfull elevation and has the potential to be a pollutant discharge point (see **Figure 6-4-7-38** and **Table 6-4-7-4d**). The 303(d) List[38] also

30 http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=2734&context=dlj

31 http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/app_d_traditional_naviganav_waters.pdf

32 https://law.justia.com/codes/new-york/2015/env/article-15/title-5/

33 http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=2734&context=dlj

34 https://www.gpo.gov/fdsys/pkg/USCODE-2011-title33/pdf/USCODE-2011-title33-chap11-subchapIII-sec525.pdf

35 http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title14section85&num=0&edition=prelim

36 https://www.law.cornell.edu/cfr/text/33/part-118

37 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

38 Ibid, 2018.

indicates that Ley Creek has a fish advisory due to contaminated sediment, which contains toxins including dioxin, mercury, and PCBs. An additional bridge carrying the ramp from Old Liverpool Road and Onondaga Lake Parkway to southbound I-81 crosses over the creek. Ley Creek does not pass through any culverts within the study area.

- **Onondaga Lake:** Although only a portion is within the study area, Onondaga Lake is characterized for this discussion, since it receives discharge from Onondaga Creek and Ley Creek. Onondaga Lake (WOTUS under Federal jurisdiction and NYSDEC Class B and C) is located immediately northwest of the Central Study Area (see **Figure 6-4-7-38** and **Figure 6-4-7-55**). The lake is approximately one mile wide and 4.6 miles long and receives water from a drainage basin of approximately 285 square miles, almost entirely within Onondaga County. It is classified as a navigable waterway under Section 10 of the Rivers and Harbors Act, under Section 404 of the Clean Water Act, and under NYSDEC ECL Article 15.[39] It has 13 lights and beacons[40] as aids to navigation (covered by 14 U.S.C. § 85[41] or 33 CFR Part 118[42]), two of which are located along the southeast shore near the Central Study Area. For over 125 years, industrial and chemical operations disposed of a variety of pollutants into the lake. Under the National Water Resources Development Act of 1990, the lake was given priority cleanup status.[43] In 1994, Onondaga Lake and related upland sites were added to the Federal Superfund National Priorities List and the New York State Registry of Inactive Hazardous Waste Disposal Sites (State Superfund Program).[44] The NYSDEC 2018 Section 303(d) List of Impaired Waters requiring a TMDL lists Onondaga Lake and waters that "extend into and include tributary waters to the first impassable barrier"[45] as impaired by fish consumption advisories. The impairment is attributed to sediment contamination, which includes dioxins, mercury, PCBs, and other toxins resulting from industrial discharges, wastewater pollution, and polluted stormwater runoff in the Syracuse/Onondaga Lake area. Remediation has included the dredging and capping of contaminated lake bottom (in 2014), planting of emergent wetlands and other habitat improvements, wastewater treatment improvements, and projects (such as the Save the Rain program discussed in **Section 6-4-7.1.4**) aimed at reducing sediment, nutrients, and other polluted runoff.[46] Onondaga Lake is also listed as impaired on the 303(d) List due to low dissolved oxygen due to natural sources, though development of a TMDL may be deferred, requiring verification of the impairment.

  Within the Central Study Area, two culverts convey Wetlands 1a and 1b under highway right-of-way (refer to **Figure 6-4-7-18**). **Table 6-4-7-4b** lists the scores for each culvert within the study area. The culverts were both assessed to have "Reduced AOP" and were rated as "insignificant" and "minor" barriers to AOP, largely due to constriction of the stream, outlet armoring, and

39 I-81 Viaduct Project: Water Resources Regulatory Framework, **Appendix I-1**.

40 http://www.canals.ny.gov/wwwapps/navinfo/navinfo.aspx?waterway=onondagalake

41 http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title14-section85&num=0&edition=prelim

42 https://www.law.cornell.edu/cfr/text/33/part-118

43 http://ny.cf.er.usgs.gov/nyprojectsearch/projects/2457-A20-1.html

44 http://www.dec.ny.gov/chemical/8668.html

45 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

46 https://www.dec.ny.gov/lands/72771.html

sedimentation in the outlets. **Appendix I-3** provides a more detailed discussion of the culvert survey study and NAACC scoring system.

I-481 South Study Area

The majority of I-481 South Study Area is within the Onondaga Lake watershed. The easternmost portion of the I-481 South Study Area is within the Butternut Creek watershed. City Line Brook, a tributary of Onondaga Creek, is the only stream identified within the Onondaga Lake watershed that passes through the I-481 South Study Area. It is entirely piped underground within the I-481 South Study Area (see **Figure 6-4-7-55**). **Figure 6-4-7-5** shows the approximate bankfull extents of the surface waters within the study areas, as identified during surface water surveys; **Figure 6-4-7-23** shows the OHW extents[47] of the surface waters within the study areas; and **Figure 6-4-7-41** shows the MHW extents and NYSDEC water quality classification.

- **City Line Brook:** Towards the western edge of the I-481 South Study Area, City Line Brook and its tributaries flow north and west, until they reach Onondaga Creek. No definitive watershed has been established for City Line Brook and its tributaries due to the unknown extents of the karst topography in the area. However, local researchers have partially delineated the watershed based on historical mapping, aerial photos, and construction documents and have drafted a proposal to fund studies of the City Line Brook watershed to better understand the unique tufa (a type of limestone) formations.[49] The tributaries to City Line Brook do not enter the study area. The main stem of City Line Brook, referred to as Spring Brook locally, does not surface within the I-481 South Study Area but originates, at least in part, from surface flows from the local high points within the study area, which move west outside of the study area through fissures in the limestone karst topography. Additionally, the historic sinkhole under the southbound lanes of I-81 (filled during the construction of I-81 and now identified by NYSDOT as a gravel pit) creates a preferential flow path for surface water from within the I-481 South Study Area to enter the karst topography. The springs seep out of carbonate bedrock fractures at four identified locations along the slopes west of the Cunningham Building and the Loretto Health Care Facility, to the east of North Monticello Drive and outside of the I-481 South Study Area. South and to the west of the study area, in an unfilled portion of a glacial outwash ravine, emergent springs form a small creek that has historically been mapped as part of the southern tributary of City Line Brook. Downstream of the emergent springs and the resulting channels, tufa dam formations (unique formations created by mineral deposits within the stream) are present within both City Line Brook and its southern tributary.[50] Downstream of the tufa formations, City Line Brook and its tributary are conveyed through a residential neighborhood via a series of lined channels, channelized unlined channels, and pipes; City Line Brook is piped underground at Slayton Avenue and outfalls into Onondaga Creek (the middle portion) at Ballantyne Road. These creeks do not appear on NWI maps but are mapped by NYSDEC as Class B creeks.[51] There are no culverts conveying City

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47 OHW was based conservatively on the edge of bank.

49 Stribley, K. 2021. Letter to NYSDOT Staff/Consultants "Re: Errors/omissions regarding City Line Brook and associated Valley environments in the I-81 DDR/DEIS Water Resources section 6-4-7 and General Ecology 6-4-8 sections (as well as other sections) related to I-481 South Study Area". Dated August 16th, 2021. Received August 18, 2021.

50 Ibid, 2021.

51 I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary, **Appendix I-2**.

Line Brook within the study area. The creeks are not classified as navigable under Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act, or NYSDEC ECL Article 15.[52] City Line Brook and its tributaries are also on the 303(d) List[53] due to turbidity and fecal coliform, nutrient (phosphorus), and ammonia contamination from streambank erosion, CSOs, municipal sources, and urban runoff.

- **Unnamed tributary to Butternut Creek:** An unnamed tributary to Butternut Creek, Ont. 66-11-P 26-37-6-13,[54] is located along the southern edge of the eastern part of the I-481 South Study Area near a proposed noise barrier. The creek flows eastward parallel to I-481 for 2,068 lf within the study area and has a surface area of 1.02 acres. Outside of the study area, the creek is conveyed under Ram's Gulch Road and railroad tracks, into Ram's Gulch, a portion of which is used as a settlement basin for wash water from a large stone quarry operation. The portion of the tributary that is within the study area, to the west of Ram's Gulch Road, is not mapped by NYSDEC or NWI, but the NWI maps the downstream portion as a perennial riverine system with an unconsolidated bottom that is permanently flooded. NYSDEC classifies this same downstream portion as a Class AA stream, with AA(T) water quality standards.[55] The tributary is not on the 2018 303(d) List[56] and does not pass through any culverts within the study area. The tributary is not classified as navigable under Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act, or NYSDEC ECL Article 15.[57]

I-481 East Study Area

The I-481 East Study Area includes Butternut Creek, seven unnamed tributaries of Butternut Creek, and two unnamed tributaries of North Branch Ley Creek (see **Figure 6-4-7-55**). Within the study area limits, none of these surface waters are classified as navigable under Section 10 of the Rivers and Harbors Act or Section 404 of the Clean Water Act, though Butternut Creek and one its tributaries, Meadow Brook, meet the definition of navigable under NYSDEC ECL Article 15.[58] **Figure 6-4-7-6** through **Figure 6-4-7-12** show the approximate bankfull extents of the surface waters within the study areas, as identified during surface water surveys; **Figure 6-4-7-24** through **Figure 6-4-7-30** show the OHW extents[59] of the surface waters within the study areas; and **Figure 6-4-7-42** through **Figure 6-4-7-48** show the MHW extents and NYSDEC water quality classification. **Table 6-4-7-4b** lists the

52 I-81 Viaduct Project: Water Resources Regulatory Framework, **Appendix I-1**.

53 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

54 Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1.]

55 Thompson Reuters. 2020. New York Codes, Rules and Regulations. Title 6, Chapter X., Subchapter A, Article 2, Part 703.5 Water quality standards for taste-, color- and odor-producing, toxic and other deleterious substances. Accessed on September 30, 2020 at https://govt.westlaw.com/nycrr/Document/I4ed90418cd1711dda432a117e6e0f345?transitionType=Default&contextData=%28sc.Default%29

56 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

57 I-81 Viaduct Project: Water Resources Regulatory Framework, **Appendix I-1**.

58 Ibid.

59 OHW was based conservatively on the edge of bank.

scores for each culvert within the study area. **Appendix I-3** provides a more detailed discussion of the culvert survey study and NAACC scoring system.

- **Butternut Creek:** To the east of the I-481 East Study Area, Butternut Creek flows northeastward and discharges to Chittenango Creek, eventually discharging to Oneida Lake in Bridgeport, New York, which then drains to the Oneida River. Butternut Creek has a drainage area of 63 square miles. NWI maps the creek as a permanently flooded lower perennial riverine system with an unconsolidated bottom that has been excavated in places, including along the length of the creek that passes through the study area. Butternut Creek is a NYSDEC Class C stream, with Class C(T) water quality standards for the upstream portion of the creek, south of the East Genesee Street Bridge. It is listed as impaired on the 2018 303(d) List due to municipal sources contributing to fecal coliform contamination and the exceedance of the NYSDEC standard for dissolved oxygen.[60] Within the study area, the Class C(T) portion of the stream is 899 lf with a surface area of 0.79 acres, while the downstream, Class C portion of the stream is 3,861 lf with a surface area of 4.31 acres. Butternut Creek does not pass through any culverts within the study area, but it does pass under two bridges, the Route 5 bridge and the northbound I-481 on-ramp bridge (see **Figure 6-4-7-42**). Six culverts conveying the unnamed Butternut Creek tributaries described below outfall along the western bank of Butternut Creek within the study area. Additionally, five highway stormwater runoff outfalls drain water from I-481 to the embankment that forms the western floodplain of Butternut Creek (see **Figure 6-4-7-42** and **Figure 6-4-7-43**).

- **Unnamed tributaries to Butternut Creek:** The seven unnamed tributaries to Butternut Creek that pass through the I-481 East Study Area are described below, from north to south within the study area.

  Tributary 1—The northernmost tributary to Butternut Creek within the I-481 East Study Area is unnamed and unmapped by NWI or NYSDEC. The tributary flows southwards along the outside edges of the eastern I-481 Kirkville interchange ramps and under Kirkville Road via culvert E-38. To the east of the northbound I-481 Kirkville East ramp, the tributary is joined by a smaller tributary (identified herein as Tributary 1.1), then meanders southeast away from I-481 outside of the limits of the I-481 East Study Area, towards the confluence with Butternut Creek (see **Figure 6-4-7-46**). Within the study area, the tributary is 2,747 lf with a surface area of 1.63 acres.

  Tributary 1.1—Along the western I-481 Kirkville interchange ramps, the tributary to Tributary 1 flows southwards, parallel to the right-of-way, and is conveyed under Kirkville Road via culvert E-39 (see **Figure 6-4-7-46**). Tributary 1.1 turns southeast as it is conveyed under I-481 via culvert E-37, and the confluence with Tributary 1 is downstream of the study area. Within the study area, the tributary is 2,009 lf with a surface area of 1.31 acres.

  Tributary 2—Farther south and upstream within the watershed, an unnamed tributary to Butternut Creek, Ont. 66-11-P 26-37-6-2-c,[61] flows through the interchange (see **Figure 6-4-7-44**

60 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

61 Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1.]

and **Figure 6-4-7-45**). NWI maps this tributary as a perennial riverine system with an unconsolidated bottom that is permanently flooded. It is a NYSDEC Class C stream listed as impaired on the 2018 303(d) List due to municipal sources contributing to fecal coliform contamination and the exceedance of the standard for dissolved oxygen.[62] The tributary begins in the northwestern portion of the interchange and flows east and northeast through the northern half of the I-481/I-690 interchange, via a series of stream-wetland complexes connected under the right-of-way by four culverts (culvert E-26 through culvert E-29). Downstream of culvert E-28 and upstream of culvert E-29, in the wooded portion of the interchange between southbound I-481 and northbound I-481, two small tributaries (Tributaries 2.2 and 2.3, described below) converge with Tributary 2. The junction of Tributary 2 and Tributary 2.1 (also described below) is downstream of culvert E-29, on the eastern side of northbound I-481. Tributary 2 then flows north via surface ditches and culverts (E-30, E-32, and E-33), parallel along the east side of I-481 and under Manlius Center Road and the CSX railroad tracks via culverts, before flowing east to its confluence with Butternut Creek outside of the I-481 East Study Area. Wetland 4a is hydraulically connected to Wetland 4b and Tributary 2 via culvert E-31, which conveys the surface water under I-481. Within the study area, the tributary is 2,763 lf with a surface area of 0.81 acres.

Tributary 2.1—The farthest downstream tributary to Tributary 2 is unmapped by NWI or NYSDEC. It flows east and northeast through the I-481/I-690 interchange, beginning on the western side of the highway maintenance facility access road from the eastbound I-690 to southbound I-481 ramp (see **Figure 6-4-7-44**). It continues east under southbound I-481, then under a highway maintenance road, then northeast through a wooded area, and under the northbound I-481 to eastbound I-690 ramp via culvert E-21, culvert E-22, and culvert E-23. This tributary may be a fragmented segment of unnamed Butternut Creek tributary Ont. 66-11-P 26-37-6-2-c,[63] and it is also a stream-wetland complex system with an unconsolidated bottom. The channel is not well-defined in the triangular area between the northbound I-481, the northbound I-481 to westbound I-690 ramp, and the eastbound I-690 to northbound I-481 ramp; this area drains towards the northeast and is hydrologically connected to Tributary 2 via a culvert under northbound I-481 and a highway drainage ditch. Within the study area, the tributary is 984 lf with a surface area of 0.18 acres.

Tributaries 2.2 and 2.3—The farthest upstream tributaries to Tributary 2 are within a wooded wetland area confined by highway right-of-way: southbound I-481, northbound I-481, the eastbound I-690 to northbound I-481 ramp, and the northbound I-481] to westbound I-690 ramp (see **Figure 6-4-7-44**). Tributary 2.2, on the southern bank of Tributary 2, is an L-shaped channel, 1,089 lf with a surface area of 0.25 acres, and flows east and then north before the confluence with Tributary 2. Tributary 2.3 is on the right bank of the stream, approximately perpendicular to Tributary 2. Tributary 2.3 is 254 lf with a surface area of 0.08 acres.

62 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

63 Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1.]

Tributary 3—A third tributary to Butternut Creek, unmapped by NWI or NYSDEC, flows north and northeast through Wetland 3, the I-481/I-690 interchange, beginning near the southwestern edge of the ramp from eastbound I-690 to southbound I-481 (via culvert E-17), then flows northeast through the wooded wetland (Wetland 3a) in the space between the northbound and southbound I-481 (see **Figure 6-4-7-43** and **Figure 6-4-7-44**). Wetland 3a is connected to Wetland 3b and Wetland 3e via two culverts that pass under the southbound ramp from eastbound I-690 (culvert E-19) and under southbound I-481 (culvert E-20). Downstream of culvert E-19 and culvert E-20, culvert E-18 conveys Wetland 3a and Tributary 3 under the northbound I-481 lanes and the adjacent Butternut Drive, after which the tributary flows northeast to a confluence with Butternut Creek. Within the study area, the tributary is 2,606 lf with a surface area of 0.39 acres.

Tributary 4—A fourth Butternut Creek tributary within the study area is unmapped by NWI or NYSDEC and flows south along Towpath Road on the west side of the I-481/I-690 interchange. The tributary is culverted under the right-of-way to the east side of the highway via culvert E-16, then flows south and east into Butternut Creek, north of Cedar Bay (see **Figure 6-4-7-43**). Within the study area, the tributary is 247 lf with a surface area of 0.04 acres.

Tributary 5—Ont. 66-11-P 26-37-6-8,[64] locally known as Meadow Brook, flows northwards along to the west side of the I-481 East Study Area, approximately parallel to the right-of-way. The tributary enters the study area just south of Route 5, to the west of the I-481/Route-5 interchange and flows under Route 5 via culvert E-1 (see **Figure 6-4-7-42**). Downstream of culvert E-1, Meadow Brook continues to flow north, parallel to I-481, until just south of Kinne Road, underneath I-481 via culvert E-15. The culvert outlets at the confluence of Cedar Bay and Butternut Creek (located just to the east of the I-481 East Study Area), part of the old Erie Canal (see **Figure 6-4-7-43**). NWI maps Meadow Brook as a lower perennial riverine system with an unconsolidated bottom that has been excavated and is permanently flooded. The tributary is a NYSDEC Class C stream, listed as impaired on the 2018 303(d) List due to municipal sources contributing to fecal coliform contamination and exceedance of the standard for dissolved oxygen.[65] Meadow Brook is also navigable under NYSDEC ECL Article 15, though it is not classified as navigable under the Rivers and Harbors Act or the Clean Water Act. Within the study area, Meadow Brook, including the Cedar Bay portion, is 1,431 lf with a surface area of 0.33 acres.

Tributary 6—Farther upstream within the I-481 East Study Area, a sixth unnamed tributary, unmapped by NWI or NYSDEC, flows through Wetlands 2j and 2i in the northern half of the I-481 and NYS Route 5 interchange via a series of wooded wetland-stream channels and culvert E-10, culvert E-11, and culvert E-12 (see **Figure 6-4-7-42**). Within the study area, the tributary is 1,369 lf with a surface area of 0.21 acres.

Downstream along unnamed tributary 6, culvert E-11, a 24" RCP with wing walls, a projecting inlet, and a bend along the pipe alignment, conveys surface water northeast and east, from the northwestern portion of the interchange to the northeastern triangular open area within the

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64 Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20th, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1.]

65 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

interchange. Farther downstream along Tributary 6, culvert E-12 conveys the channel underneath of the ramp from westbound Route 5 West to northbound I-481.

Upstream along the Butternut Creek embankment, there are three surface drainage culvert outlets that impact the embankment and the channel. Upstream of Tributary 6, culvert E-9 conveys surface drainage to the Butternut Creek embankment from the northbound I-481 to westbound Route 5 interchange (**Figure 6-4-7-42**) and outlets onto an old cobble rip-rap cascade. Farther upstream, culverts E-7 and E-8 convey drainage eastwards from the southeastern cloverleaf of the interchange to the southeastern triangle. Culvert E-7 conveys surface drainage from within the cloverleaf, under the eastbound Route 5 to northbound I-481 interchange ramp. Downstream along this flow path, culvert E-8 continues conveyance and outlets to a rip-rap energy dissipator and a four-foot cascade down the bank of Butternut Creek, between the Butternut Creek confluences with Tributaries 6 and 7.

Tributary 7—On the south side of Route 5, highway drainage and a wetland-stream complex are conveyed through the upstream-most extent of the I-481 East Study Area via five culverts (culvert E-2 through culvert E-6; refer to **Figure 6-4-7-42**). Culvert E-2 and culvert E-3 convey surface water drainage underneath two section of the southwestern cloverleaf ramp, beginning in the triangle between the eastbound Route 5 to southbound I-481 ramp and eastbound Route 5. Culvert E-3 outlets to the triangle between the eastbound Route 5 to southbound I-481 ramp and southbound I-481. Culvert E-4 conveys surface water northeast from Wetland 2a into the interchange and outlets to the same triangle as culvert E-3. Culvert E-5 conveys Tributary 7 from the west of I-481 to the triangle on the eastern side of I-481 and to the west of the northbound I-481 to Route 5 ramp. Culvert E-4 and culvert E-5 are entirely outside of the study area, though still within the I-481/Route 5 interchange infrastructure. Downstream and further north, within the most southern extent of the study area, culvert E-6 outlets into a cobble-lined energy dissipator and scour pool that narrows into a short, silty, ephemeral channel in the highway embankment that confines Butternut Creek. Within the study area, Tributary 7 is 933 lf with a surface area of 0.27 acres.

Within the I-481 East Study Area, a total of 12 stormwater outfalls and 40 culverts convey highway drainage, wetlands, and the unnamed tributaries to Butternut Creek through multiple flow paths, as described above (refer to **Figure 6-4-7-42** through **Figure 6-4-7-46**, and **Table 6-4-7-4b,** for culvert descriptions and ratings, and to **Table 6-4-7-4d** for stormwater outfall descriptions). Of the 40 culverts, 26 have "reduced aquatic organism passage (AOP)" using the coarse NAACC screening system, with fine screening ratings of "insignificant barrier" (scores of 0.82 to 0.91) for 17 of the culverts, and nine rated as "minor barriers" (scores of 0.64 to 0.76). Eleven culverts in the Butternut Creek drainage area portion of the I-481 East Study Area have "No AOP" on the coarse NAACC rating scale; six of these culverts were categorized as "minor barriers" with scores between 0.61 and 0.73, culvert E-13 was categorized as a "moderate barrier" with a score of 0.50, and the remaining four culverts were rated as "severe barriers," three with scores of 0.00 and one score of 0.19 for culvert E-26. Only two of the 40 culverts, E-29 and E-30, had a NAACC coarse rating of "Full AOP"; both scored 0.81 on the fine rating scale and are classified as "insignificant barriers." The culverts were primarily rated as barriers to AOP due to low openness scores (which is the cross-sectional area divided by the structure length) and moderate constriction of the stream channel. Some of the culverts were partially blocked by plants and sediment, a couple of the metal pipes were damaged, and some of the culverts were observed to not convey flow during dry-weather conditions. Refer to **Appendix I-3** for additional information.

- **Unnamed tributaries to North Branch Ley Creek:** There are two unnamed tributaries of North Branch Ley Creek within the I-481 East Study Area. The headwaters of these tributaries are west of I-481 and flow east into the North Branch of Ley Creek, which eventually discharges into Onondaga Lake. Both are NYSDEC Class C streams that pass under I-481 and I-90 through culverts and are NWI-mapped perennial riverine systems with unconsolidated bottoms that are permanently flooded. These two tributaries are listed as impaired on the 303(d) List due to contamination, which includes fecal coliform, nutrients (phosphorus), and ammonia, from CSOs, municipal sources, and urban runoff.[66]

  An unnamed tributary to the North Branch Ley Creek within the study area, identified as Ont. 66-12-12-P 154-3-10-1, flows east parallel to I-90, crosses under I-481 via culvert E-41, and continues east outside of the study area (see **Figure 6-4-7-48**). Within the study area, the tributary is 280 lf with a surface area of 0.06 acres. This tributary has a small tributary of its own, which flows southeast from the I-90 and I-481 interchange through culvert E-42 and culvert E-43, then south along the edge of the highway right-of-way. Within the Study Area, this tributary is 793 lf with a surface area of 0.10 acres.

I-481 North Study Area

The I-481 North Study Area includes Beartrap Creek (a tributary of Ley Creek), an unnamed tributary to the Oneida River adjacent to Wetlands 10h and 10i, and Mud Creek and a number of its tributaries, which flow westwards through natural, channelized, and piped drainageways and wetlands into the Oneida River, which discharges to Oneida Lake. All of the surface waters associated with Mud Creek are designated as WOTUS (see **Figure 6-4-7-31** through **Figure 6-4-7-34**)[67] and NYSDEC Class C (see **Figure 6-4-7-49** through **Figure 6-4-7-52**) and none are listed on the 303(d) List of impaired waters. Beartrap Creek is designated as NYSDEC Class C(T) and is on the 303(d) List of impaired waters due to contamination, which includes fecal coliform, nutrients (phosphorus), and ammonia, from CSOs, municipal sources, and urban runoff.[68] Surface waters within the study area are not classified as navigable under Section 10 of the Rivers and Harbors Act or Section 404 of the Clean Water Act, but these streams meet the definition of navigable under NYSDEC ECL Article 15.[69] **Figure 6-4-7-13** through **Figure 6-4-7-16** show the approximate bankfull extents of the surface waters within the study areas, as identified during surface water surveys, and **Figure 6-4-7-31** through **Figure 6-4-7-34** show the OHW extents[70] of the surface waters within the study areas.

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66 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

67 OHW was based conservatively on the edge of bank.

68 https://www.dec.ny.gov/docs/water_pdf/section303d2018.pdf

69 I-81 Viaduct Project: Water Resources Regulatory Framework (**Appendix I-1)**.

70 OHW was based conservatively on the edge of bank.

- **Unnamed tributary to Oneida River**: An unnamed tributary to Oneida River, Waters Index Number Ont. 66-11-11-13,[71] flows through Wetlands 10h and 10i and is mapped by NWI as an intermittent, seasonally flooded streambed (R4SBC) upstream (to the east) of culvert N-1 and the I-81 right-of-way. Downstream of the I-81 right-of-way, the surface water is mapped by NWI as an emergent, palustrine, seasonally flooded *Phragmites australis* wetland (PEM5c). During the stream and culvert assessment survey, the tributary was observed to have a poorly defined channel upstream of the culvert and no defined channel downstream of the culvert. Within the study area, the tributary is 200 lf with a surface area of 0.08 acres. Culvert N-1 was assessed to be an insignificant barrier to AOP, although it was observed to be slightly submerged by water at the time of the survey (June 25, 2020).
- **Mud Creek:** The main stem of Mud Creek, Waters Index Number Ont. 66-11-10, originates to the east of the I-481 North Study Area and flows west underneath I-481 through a series of culverts (see **Figure 6-4-7-14** and **Figure 6-4-7-15**). It connects emergent and forested wetlands via culverts located underneath the highway and eventually drains to the Oneida River. The eastern part of Mud Creek is mapped by NWI as an intermittent riverine system with a seasonally flooded streambed. As the stream moves west, it becomes a lower perennial riverine system with an unconsolidated bottom that has been excavated and is permanently flooded. During the stream and culvert assessment survey, the creek was observed to be a low gradient, low energy stream system with sections of stream/wetland complex and sections with a more defined stream channel lined with woody and herbaceous vegetation. Within the study area, Mud Creek is 1,780 lf with a surface area of 0.59 acres.

  The culverts connecting the main stem of Mud Creek (N-13, N-12, and N-20 through N-25 – see **Figure 6-4-7-14** and **Figure 6-4-7-15**) were observed to be in moderate or good condition with little erosion or deposition and were assessed under the NAACC coarse screening system as having "Reduced AOP," with the exception of the culvert located farthest upstream (culvert N-25 – see **Figure 6-4-7-15**), which was determined to have "No AOP," as it does not convey water or sediment during dry-weather conditions. The NAACC fine rating system resulted in an assessment of the culverts N-20 through N-23 as minor barriers to AOP, with scores ranging from 0.68 to 0.76, while culverts N-12, N-13, N-23, and N-25 were assessed as insignificant barriers to AOP with scores of 0.86-0.92 (**Table 6-4-7-4c**). The fine rating system does not penalize culverts for having no flow when the stream channel is also not flowing, which is partially why N-25 was found to have a higher score than expected. The culverts that convey the main stem of Mud Creek moderately or severely constrict the stream channel. Those rated as "minor" barriers had shallower and faster water flowing in them than in the stream channel, making them less suitable for AOP (refer to **Appendix I-3**).

  - **Tributaries to Mud Creek:** Six tributaries to Mud Creek are in the vicinity of the I-481 North Study Area and converge into the main stem of Mud Creek (see **Figure 6-4-7-55**). Many of the tributaries are unnamed and are differentiated using their NYSDEC index stream segment

[71] Thompson Reuters. 2016. New York Codes, Rules and Regulations. Title 6, Chapter X, Subchapter B, Article 14. Oswego River Drainage Basin Series. Accessed October 20, 2016 at https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRegulations?guid=I3563adb0b5a111dda0a4e17826ebc834&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)&bhcp=1.]

numbers, where available. These tributaries all have drainage areas of less than one square mile upstream of their respective confluences with the main stem of Mud Creek (Ont. 66-11-11-10).

Tributary 1—Segment Ont. 66-11-11-10-1, Pine Grove Brook, is a Class C stream mapped by NYSDEC and a riverine intermittent streambed that is seasonally flooded as per NWI as shown on **Figure 6-4-7-49**. Pine Grove Brook runs northwest underneath South Bay Road through culvert N-5. To the west, it runs under the north and southbound lanes of I-81 via culvert N-6, then daylights in the vicinity of a ditch. It continues west into culvert N-7, running underneath a car dealership and shopping center. Pine Grove Brook daylights at NYSDEC-mapped wetland BRE-18, a Class II wetland, west of the car dealership. Within the study area, the Brook is 102 lf with a surface area of 0.02 acres.

Tributary 2—Upstream of the culvert N-6 inlet, an unnamed, unmapped tributary converges with Pine Grove Brook. This tributary is, in part, a channel that originates on private property located east of a right-of-way fence, continues west into the right-of-way, travels through Wetland 10, and connects to a drainage ditch (**Figure 6-4-7-49**). Within the study area, the tributary is 218 lf with a surface area of 0.05 acres.

Tributary 3—As shown on **Figure 6-4-7-49**, another tributary runs east to west through the I-481 North Study Area and is located to the north of the aforementioned unnamed tributary and to the north of culvert N-4. It is not mapped by NYSDEC, NWI, or USGS. This northern tributary enters the study area via culvert N-3, located to the east of the right-of-way fence, in the vicinity of East Pine Grove Road. The tributary continues west through the right-of-way and through culvert N-4, under the northbound and southbound lanes of I-81. It daylights on the west side of I-81 and connects to a north-south oriented ditch. As shown on **Figure 6-4-7-49**, this drainage ditch runs parallel to the southbound lanes of I-81 and is primarily located immediately west of the right-of-way fence in front of the car dealership. It crosses to the east side of the right-of-way fence just north of the culvert N-6 outlet and the culvert N-7 inlet. This ditch is very pronounced and maintained (i.e., by mowing) and is not mapped by NYSDEC, NWI, or USGS, as shown on **Figure 6-4-7-49**. Within the study area, Tributary 3 is 923 lf with a surface area of 0.15 acres.

Tributary 4—Stream segment Ont. 66-11-11-10-1-1,[73] the South Branch of Pine Grove Brook, is north of the I-81 on-ramp from I-481 and flows from east to west underneath I-81 via culvert N-8 inlet/outlets. South Branch Pine Grove Brook is a Class C stream mapped by NYSDEC and a riverine intermittent streambed that is seasonally flooded as per NWI, as shown on **Figure 6-4-7-49**. South Branch of Pine Grove Brook forms in the forested area east of I-81 and travels west through the I-481 North Study Area south of South Bay Road, towards the car dealership parking lot. Outside of the study area, South Branch Pine Grove Brook crosses under South Bay Road before being piped under the car dealership and daylighting at an NWI-mapped freshwater pond, which is the confluence of South Branch Pine Grove Brook and Pine Grove Brook. Within the study area, the tributary is 562 lf with a surface area of 0.06 acres.

[73] Ibid, 2016.

Tributary 5—Stream segment Ont. 66-11-11-10-2,[74] shown on **Figure 6-4-7-50**, is located along the east side of I-81 and flows north and west underneath I-81 and the ramps connecting to I-481 via culverts N-17, N-19, and N-14, before exiting the study area, flowing under I-481, and connecting with the main branch of Mud Creek downstream of culvert N-13. This tributary is a Class C stream mapped by NYSDEC and a riverine intermittent streambed that is seasonally flooded as per NWI. Within the study area, Tributary 5 is 1,484 lf with a surface area of 0.82 acres.

Tributary 6—Stream segment Ont. 66-11-11-10-4[75] is also a Class C stream mapped by NYSDEC and a riverine intermittent streambed that is seasonally flooded as per NWI as shown on **Figure 6-4-7-55**. This tributary flows southeast, then west, and connects with the main stem of Mud Creek, which then crosses underneath of I-481 via culvert N-25 (see **Figure 6-4-7-51**). Within the study area, the tributary is 1,429 lf with a surface area of 1.95 acres.

Using the coarse screening system, the culverts conveying the Mud Creek tributaries were nearly all assessed as having Reduced AOP under typical flow conditions; only culverts N-3 and N-7 were rated as having "No AOP." **Table 6-4-7-4c** and **Appendix I-3** describe the culverts in greater detail; refer to **Figure 6-4-7-49** through **Figure 6-4-7-51** for culvert locations.

Culvert N-2 conveys a wetland under I-481, and is rated an insignificant barrier to AOP, with a fine rating of 0.81 due to the moderate constriction and low openness (cross sectional area divided by culvert length). The culvert was about 25 percent blocked with sediment.

A little farther south within the study area, culverts N-3 and N-4 convey Tributary 2 westward, underneath I-481, from a residential area into drainage ditch 2. Culvert N-3 was rated as having "No AOP" and being a moderate barrier, with a score of 0.56. The low openness of the metal pipe, the 2.5" drop from the pipe to the stream bed, and the small tailwater scour pool were the primary reasons for the moderate and "No AOP" ratings.

Culverts N-5 and N-6 convey Pine Grove Brook and were designated as moderate barriers to AOP using the fine rating system, with scores of 0.60. Both culverts had moderate constriction and low openness. N-5 also had a small tailwater scour pool and N-6 had no dry-weather flow in culvert, while during wet weather flows, water is shallower and has a faster velocity. Farther downstream, culvert N-7 had No AOP due to the low openness from being piped under the car dealership and shopping center (**Figure 6-4-7-49**).

Culvert N-8, which conveys South Branch Pine Grove Brook, was designated as a minor barrier to AOP using the fine rating system and had a score of 0.72. Culvert N-8 had a minor amount of stream constriction, little to no substrate cover within the structures, and less water in the structures than in the channels.

As described above, culverts N-14, N-17, and N-19 convey tributary Ont. 66-11-11-10-2[76] through the highway interchange. These culverts are rated as insignificant and minor barriers to AOP, with

74 Ibid.

75 Ibid.

76 Ibid, 2016.

the farthest upstream culvert, N-17, having the lowest rating of 0.78 (a minor barrier) due to the presence of the metal debris rack at the outlet.

In addition to the culverts described above, there are culverts that connect wetlands (described in **Section 6-4-7.1.1**) to Mud Creek: culverts N-9, N-10, N-11, N-15, N-16, and N-18 (see **Figure 6-4-7-50**). Culverts N-9, N-11, N-16, and N-18 were rated to be insignificant barrier to AOP, with scores ranging from 0.82 to 0.88, while culverts N-10 and N-15 were described as minor barriers to AOP with scores of 0.66 and 0.78, respectively. All six culverts convey flow through the I-481 and I-81 interchange and connect highway drainage to wetland areas. Culvert N-10 scored lowest because of the vertical inlet, and the "minor barrier" rating for Culvert N-15 score was due to an inlet heavily clogged by debris that act as a barrier to aquatic organism passage.

- **Beartrap Creek:** Beartrap Creek, Waters Index Number Ont. 66-12-12-P 154-3-1, is located in the vicinity of the I-481 North Study Area and flows from north to south until its confluence with Ley Creek, outside of the study area (**Figure 6-4-7-53** and **Figure 6-4-7-54**). Beartrap Creek is a NYSDEC Class C(T) creek, mapped by NWI as riverine intermittent streambed that is seasonally flooded (R4SBC). Within the study area, the creek is 2,113 lf with a surface area of 0.74 acres, and is a low gradient, low sinuosity, meandering stream with a silty sand streambed and woody and herbaceous vegetation on the floodplain. Beartrap Creek and its floodplain are moderately confined by the highway right-of-way, a culvert (N-26), and a shared use path near the northern extent of the study area, as well as where it passes through two culvert structures (N-34 and N-35) underneath the northbound I-81/I-90 interchange within the southern extent of the I-481 North Study Area. Eight additional culverts (N-27 through N-33 and N-36) convey wetlands and stormwater underneath the I-81 right-of-way and were evaluated for AOP during the surface water and culvert surveys. Culverts N-26 and N-35, which are large double-barrel culverts conveying Beartrap Creek as described above, were determined to be "insignificant" barriers to AOP, with scores of 0.85 and 0.88, respectively. Culvert N-34, the other large culvert conveying Beartrap Creek through the highway right-of-way within the study area, was rated as a "minor barrier" to AOP and had a score of 0.66, due to the slightly perched inlet and low sediment coverage in the culvert. AOP ratings for culverts N-27 through N-33 and culvert N-36 ranged from insignificant barriers to severe barriers. Culvert N-29 was determined to be an "insignificant barrier" to AOP, with a score of 0.82. Culverts N-28, N-30, and N-36 were "minor" barriers, with AOP scores of 0.74, 0.65, and 0.68, respectively; culvert N-30 scored the lowest in this group because the outlet was observed to be entirely submerged under water and about 75 percent full of sediment. Culverts N-27 and N-33 scored 0.50 and 0.45, respectively, which categorized them as "moderate" barriers to AOP. These structures also had internal deformation or pipe misalignments and minimal sediment and water within the structures. Culverts N-31 and N-32 were both "severe" barriers to AOP, with scores of 0.19 and 0.01, respectively, due to erosion at the outlets that created one foot or larger vertical drops to the stream surface and stream bottom. Refer to **Appendix I-3** for a detailed discussion of the culvert conditions and AOP ratings.

  Two highway drainage pipes, Outfalls N-1 and N-2, are also located in the I-481 North Study Area. Neither pipe was assessed for AOP, as there is no dry-weather flow through the pipes and neither the inlets nor outlets are wetlands or stream habitat.

6-4-7.1.3 FLOODPLAINS

Portions of the Central, I-481 East, and I-481 North Study Areas are located within the 100-year floodplain, the area with a one percent chance of flooding each year (shown on FEMA Q3 Flood Data Map for Onondaga County, New York, November 2016). This is the floodplain as defined under the current 23 CFR §650 and is the Flood Hazard Area as defined under 6 NYCRR §502 (see **Figure 6-4-7-57**).

Central Study Area

Within the Central Study Area, mapped 100-year (base) floodplains occur along Onondaga Lake, Onondaga Creek, and Ley Creek (as shown on **Figure 6-4-7-57**). The floodplains of the creeks within the Central Study Area have been altered due to urban development. Onondaga Creek and Ley Creek have been channelized and lined with stone and rip-rap within most of the Central Study Area, which reduces the stream channels connection to their original floodplains, especially during normal flow conditions. The Onondaga Creek floodplain within the portion of the study area at Bear Street Bridge is wider, less modified with rip-rap, and in a more vegetated condition than the upstream part of the study area. Existing transportation infrastructure that intersects the 100-year floodplains of these waterbodies include: the I-81 bridge that passes over Carousel Center Drive, Ley Creek, and the CSX railroad tracks; the Park Street bridge over Ley Creek; the Evans Street bridge over Onondaga Creek; the westbound I-690 exit ramp over Onondaga Creek to North West Street, the westbound and eastbound I-690 bridges over Onondaga Creek; the ramp from North West Street to eastbound I-690 that passes over Onondaga Creek; the ramp over Onondaga Creek from North West Street to Herald Place; and the Bear Street bridge over Onondaga Creek. Portions of transportation infrastructure within the Central Study Area that are shown to be within the 100-year floodplains of Onondaga Lake, Onondaga Creek, and Ley Creek include Onondaga Lake Parkway, Old Liverpool Road, Buckley Road, Park Street, Evans Street, West Genesee Street, Erie Boulevard West, South West Street, and Bear Street.

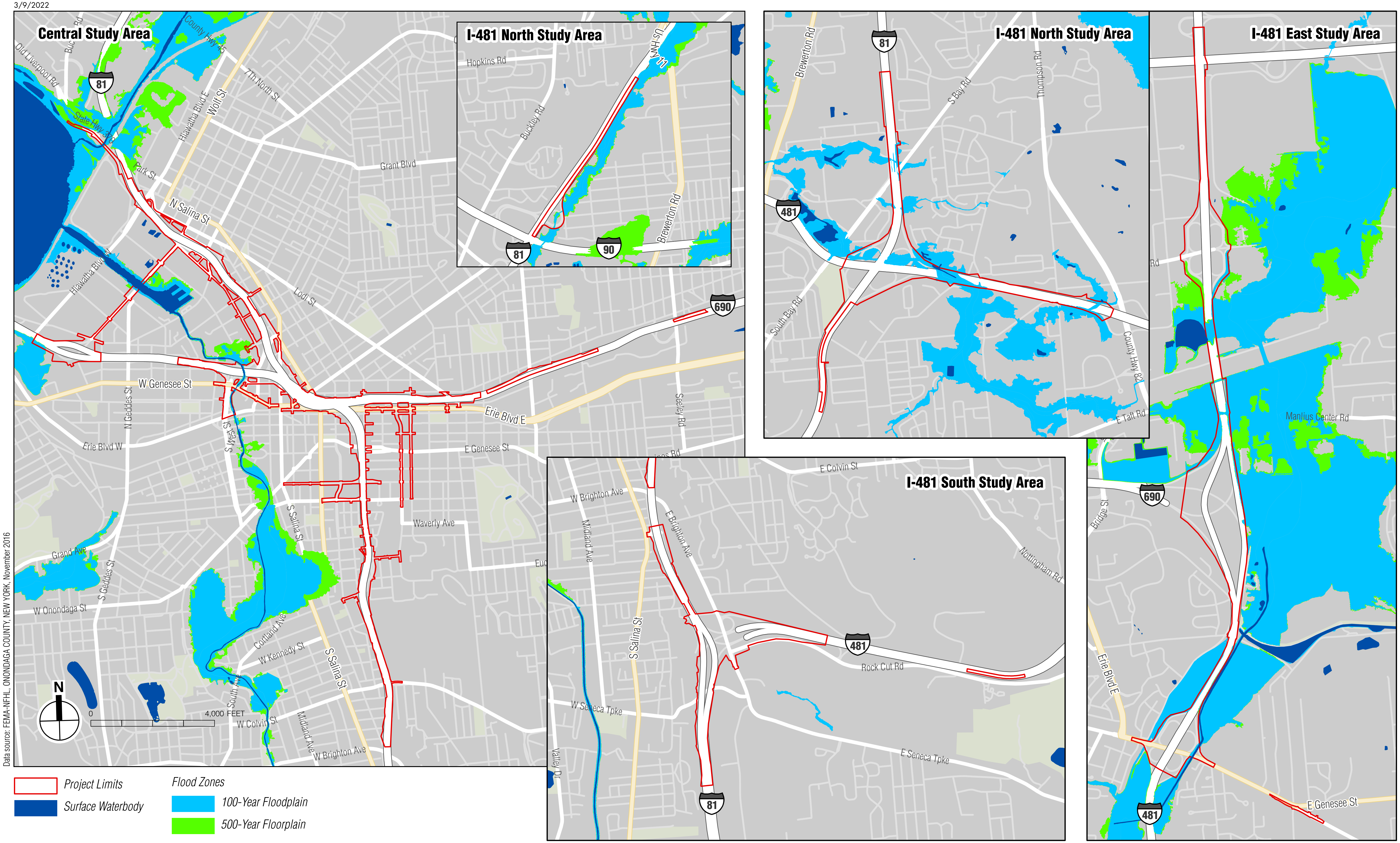
I-481 South Study Area

There are no mapped 100-year floodplains within the I-481 South Study Area (**Figure 6-4-7-57**). City Line Brook is located to the west of the I-481 South Study Area and there is no mapped floodplain for City Line Brook. There is no mapped floodplain for the unnamed tributary to Butternut Creek located in the vicinity of Noise Barrier 9. There is a mapped 100-year floodplain southeast of the I-81 and I-481 interchange, outside of the study area. The floodplain is isolated within a forested area and there are no mapped Flood Hazard Areas in the I-481 South Study Area.

I-481 East Study Area

The southern portion of the I-481 East Study Area, within the Butternut Creek Watershed, intersects the Butternut Creek 100-year (base) floodplain in multiple locations, as shown on **Figure 6-4-7-57**. The 100-year floodplain is mapped by FEMA along Butternut Creek and its floodplains, including Meadow Brook, Tributary 1, Wetland 6, and Tributary 2. Within the I-481 East Study Area, portions of both the northbound and southbound I-481 right-of-way, westbound I-690 right-of-way, East Genesee Street, the East Genesee Street/I-481 interchange ramps, Manlius Center Road, and East Ellis Street intersect the 100-year floodplain.

3/9/2022



Data source: FEMA-NFHL, ONONDAGA COUNTY, NEW YORK, November 2016

FEMA Flood Hazard Zones
Figure 6-4-7-57

I-481 North Study Area

The 100-year (base) floodplains of Beartrap Creek and Mud Creek and its tributaries, including Pine Grove Brook and South Branch Pine Grove Brook, are within the I-481 North Study Area (as shown on **Figure 6-4-7-57**). Within the study area, portions of I-81, I-481, South Bay Road, the on and off ramps connecting I-481 and Northern Boulevard, the northeastern portion of the I-81/I-481 interchange, and a portion of the I-81/I-90 interchange intersect the 100-year floodplain.

6-4-7.1.4 STORMWATER

Stormwater runoff can bring sediment, nutrients, and contaminants to surface waters. Pollutants contained in stormwater runoff are termed "non-point source pollution" to distinguish them from "point sources" of water pollution, such as those from sewage treatment plants or industrial processing wastes that discharge to a surface water through a pipe outlet or outfall. Land development that involves the replacement of pervious surfaces that allow runoff from precipitation events to infiltrate into the soil with impervious surfaces that do not allow runoff to infiltrate results in an increase in the rate and volume of runoff discharged to receiving waters. Stormwater runoff can adversely affect water quality of the receiving surface water body due to erosion of banks resulting from the increased flow and to the discharge of pollutants contained in the stormwater runoff (e.g., pesticides, nutrients, metals, hydrocarbons, and bacteria).[77] **Section 5-3, Transportation Conditions, Deficiencies and Engineering Considerations**, describes existing stormwater infrastructure in the study areas.

The Central Study Area stormwater infrastructure primarily consists of a combined sewer system, while the I-481 South, East, and North Study Areas are generally open drainage systems, which facilitate ground infiltration. These open drainage systems utilize open swales, dry ditches, and the culverts described in **Section 6-4-7.1.2** and **Tables 6-4-7-4a** and **6-4-7-4b**.

Central Study Area

Within the Central Study Area, the drainage system primarily consists of a closed sewer network owned by the City of Syracuse and Onondaga County. This system contains drainage inlets, bridge deck drains, manholes, and storm pipes that convey runoff to Onondaga Creek through a network of small diameter pipes that drain to larger diameter county interceptor sewers. Most of the City of Syracuse is serviced by a combined sewer system, in which sanitary waste, industrial waste, and stormwater runoff are discharged to the same sewer system and conveyed to the Metropolitan Syracuse Wastewater Treatment Plant (Metro) for treatment. During periods of heavy rain or snowmelt, the wastewater volume in the combined sewer system may exceed the capacity of the combined sewer system or Metro. During these periods, the combined sewer system is designed to overflow (i.e., combined sewer overflows [CSOs]) and discharge excess combined flow into nearby surface waters, including Ley Creek and Onondaga Creek. The Ley Creek CSO outfall (CSO-074) is

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[77] Sources of stormwater runoff pollutants include fertilizers and pesticides applied to lawns and crops, atmospheric deposition of airborne pollutants onto impervious surfaces (roads/buildings), improperly contained garbage or organic wastes, and petroleum/metals deposited by automobiles on roadways. Nutrient pollutants (nitrogen/phosphorus) can result in algal blooms in receiving waters causing hypoxia and damage to the aquatic ecosystem. Toxic pollutants (metals, petroleum) can damage aquatic life and spread to terrestrial components of the ecosystem. Sediment in runoff can cause turbidity and deposition, which can damage aquatic plant and animal life.

located upstream of the Central Study Area, and several active and inactive CSO outfalls are located on Onondaga Creek immediately upstream and downstream of the study area (CSO-080 and CSO-022 upstream; CSO-065 and CSO-066 downstream). Within the Central Study Area, a 60-inch RCP outfall, CSO-020, and a 30-inch HDPE outfall, CSO-021, discharge into Onondaga Creek, near Butternut Street (see **Figure 6-4-7-58** for CSO outfall locations and **Chapter 5, Transportation and Engineering Considerations** for additional descriptions of outfalls). The existing combined sewer connected to outfall CSO-020 has been identified as having insufficient capacity, resulting in a history of flooding at the existing I-81 underpass at Butternut Street, to the east of the outfall itself.

In 1989, litigation between New York State, the Atlantic States Legal Foundation, and Onondaga County regarding alleged violations of State and Federal water pollution control laws was settled through the development of a Consent Judgement requiring investigation into the pollution of Onondaga Lake and its tributaries[78]. The Amended Consent Judgement (ACJ) was signed in 1998, after a series of studies revealed the need for upgrades to Metro and to provide treatment of CSOs that occur in the Metro service area. Under the ACJ, Metro was obligated to achieve a phosphorus effluent limit of 0.02 mg/L. In 2009, the fourth amendment to the ACJ was adopted; in fulfillment of the requirements, Onondaga County developed the Save the Rain initiative, a comprehensive stormwater management plan focused on the design and implementation of gray and green infrastructure solutions to address the CSOs and surface water pollution issues. The Central, I-481 South, I-481 East, and I-481 North Study Areas are subject to the Save the Rain initiative; NYSDEC and USACE have stated that the Project should maximize the use of green infrastructure practices to the extent possible to improve water quality in Onondaga Lake.

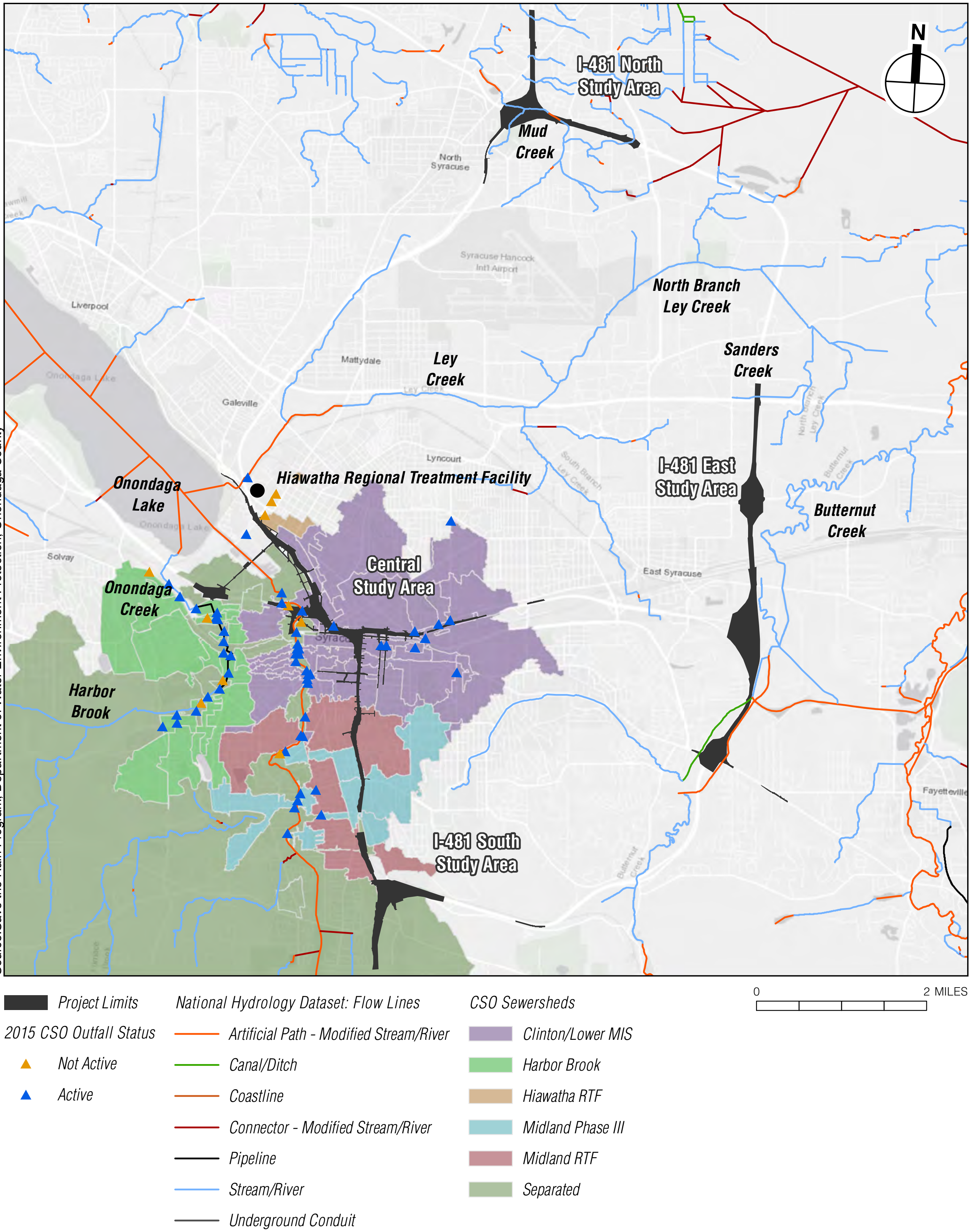
Since the 2010 implementation of Save the Rain, over 180 separate green infrastructure projects, capturing an average of over 122 million gallons of stormwater every year, have been created on public and private property throughout Onondaga County. Save the Rain green infrastructure technologies include rain gardens, bioswales, porous pavement, green roofs, cisterns, and underground infiltration trenches, all of which intercept stormwater before it enters the combined sewers, addressing both water quality and quantity issues. The ACJ required elimination or capture and treatment of 95 percent of the combined sewage generated in the City of Syracuse by 2018; this goal was achieved in 2014. Water quality monitoring conducted in compliance with the ACJ indicates improvements in Onondaga Lake since the implementation of Save the Rain and upgrades to Metro and green infrastructure projects.[79]

In the summer of 2014, water quality in the northern two thirds of Onondaga Lake was determined to be suitable for swimming use, according to the Onondaga County Department of Water Environment Protection[80], although USEPA has not yet concurred that Onondaga Lake is swimmable. The improved water quality has led to improvements in the fish community in Onondaga Lake; 26 adult species of fish were captured in 2014, as compared to 20 species in 2000, and largemouth bass capture rates were 50 per hour during the same year, as compared to just over 10 per

[78] Atlantic States Legal Foundation. 2021. https://onondagalake.org/combined-sewer-overflow-cso-abatement/ammended-consent-judgement-acj/

[79] http://www.oei2.org/olp/ppdf/olwpaas/OLWPAAS%20Suplmnt%20Final.pdf

[80] http://static.ongov.net/WEP/AMP/LAKE_PROGRESS_RPTS/OnondagaLakeProgressReport_August2015_UPDATE.pdf



Source: Save the Rain Program, Department of Water Environment Protection, Onondaga County

Combined Sewershed Basins

Figure 6-4-7-58

hour in 2000.[81] Improvements to water quality from the Save the Rain program are expected to continue to be seen in the Central Study Area surface waters as additional green infrastructure practices are built, improving the stormwater runoff water quality and decreasing the occurrence of CSOs.

I-481 South Study Area

Portions of the I-481 South Study Area contain ditches and swales that drain to an existing storm sewer network, the outlet of which is an existing 84-inch reinforced concrete pipe that drains northwest along West Ostrander Avenue towards Onondaga Creek. Additionally, portions of the I-481 South Study Area drain east along I-481 towards Butternut Creek. There are no known drainage issues or reports of pavement flooding in this study area.

I-481 East Study Area

The I-481 East Study Area consists of an open drainage system tributary to Butternut Creek and the North Branch of Ley Creek., as described in **Section 6-4-7.1.2**. There are no known drainage issues or reports of pavement flooding in the I-481 East Study Area.

I-481 North Study Area

As described in **Section 6-4-7.1.2**, the existing drainage pattern of the I-481 North Study Area is primarily to the west, while the drainage pattern along I-81 in the vicinity of the proposed noise barriers, in the southern portion of the I-481 North Study Area, is primarily to the south. Ditches and swales along I-481 and I-81 convey roadway runoff to Mud Creek and Beartrap Creek, respectively. There are no known drainage issues or reports of pavement flooding associated with the I-481 North Study Area.

6-4-7.1.5 GROUNDWATER

Groundwater is not used as a potable water supply within the Project Area. The primary water supply for the City of Syracuse is Skaneateles Lake, a Finger Lake approximately 20 miles southwest of the city. The closest USEPA-designated sole source aquifer (SSA)[82] to the Project Area is the Cortland-Homer-Preble SSA, located approximately 13 miles to the south of the I-481 South Study Area.

The Project Area contains shale and limestone bedrock, located at a depth of approximately 20 – 70 feet below the ground surface, and overlain by an unconsolidated basal aquifer. The layers contain slowly moving water that ranges from saline to briny and is enriched with minerals through the dissolution of halite, calcite, and gypsum. Overlying middle and upper glacial valley-fill deposits contain several aquifers with more rapidly moving and less mineral-rich freshwater. Groundwater flow-paths are present along the southeastern shore of Onondaga Lake, in the Central Study Area, and allow salty water to move upwards from the deep flow system to brine springs in and around the lake. From 1797 to 1917, commercial salt production utilized brine from the springs on the southeastern shore of Onondaga Lake, from former brine wells dug or drilled at the lake's edge, and from wells that tapped halite beds near Tully, 15 miles south of Syracuse. The extensive mining of the halite layers in the Tully Valley resulted in subsidence and fracturing of the bedrock layers and created

81 Ibid, 2015.

82 An aquifer that supplies at least 50 percent of the drinking water for its service area and where there are no reasonably available alternative drinking water sources should the aquifer become contaminated.

hydraulic connections between the bedrock, unconsolidated aquifer, and the aquifers within the valley-fill deposits. USGS (2000) noted that the hydraulic connection may be increasing the quantity and decreasing the quality of the water that flows through the rest of the Onondaga Creek valley aquifer system. This connection may have an effect on the existing groundwater quality in the I-481 South and Central Study Areas, as well as in Onondaga Lake.

The northern portion of the Central Study Area is within a principal aquifer (Baldwinsville, see **Figure 6-4-7-59**), defined by NYSDEC (Technical and Operational Guidance Series (TOGS) 2.1.3) as "aquifers known to be highly productive or whose geology suggests abundant potential water supply, but which are not intensively used as sources of water supply by major municipal systems at the present time." As described in **Chapter 5, Transportation and Engineering Considerations**, the subsurface ground conditions were evaluated using extensive historical soil borings performed in the 1960s by the New York State Department of Public Works. The boring log records primarily concentrated along the existing bridge footprints within the Central Study Area. In addition, NYSDOT conducted ten new soil borings in 2015 at selected locations north and south of the I-690/ I-81 interchange. The subsurface conditions consist of manmade fill of variable thickness underlain by natural soils and bedrock.

Within the principal aquifer, in the vicinity of Ley Creek geotechnical borings recorded groundwater within the surficial aquifer between 3 feet to 3.75 feet below ground surface. The reported elevation of the groundwater at the time of borings (1960s) ranged from 375 to 410 feet within the rest of the Central Study Area. Artesian water head up to seven feet above existing grade was reported at underlying bedrock about 0.75 to 1.0 miles east of the I-81 viaduct during subsurface explorations in 2015 (NYSDOT, 2016).

Within the I-481 South Study Area, sinkholes caused by karstic bedrock conditions occur at the southerly region of the I-81/I-481 South Interchange. Currently, NYSDOT is monitoring two sinkholes located to the north of the East Seneca Turnpike.

There are no known groundwater considerations in the I-481 North and I-481 East Study Areas.

6-4-7.2 NO BUILD ALTERNATIVE

The No Build Alternative would maintain the highway in its existing configuration with routine maintenance and minor repairs to ensure safety of the traveling public. The No Build Alternative would result in no improvements within the Project Area besides those planned by others or implemented as part of routine maintenance. As such, there would be no effects to wetlands, surface waters, and floodplains associated with the No Build Alternative.

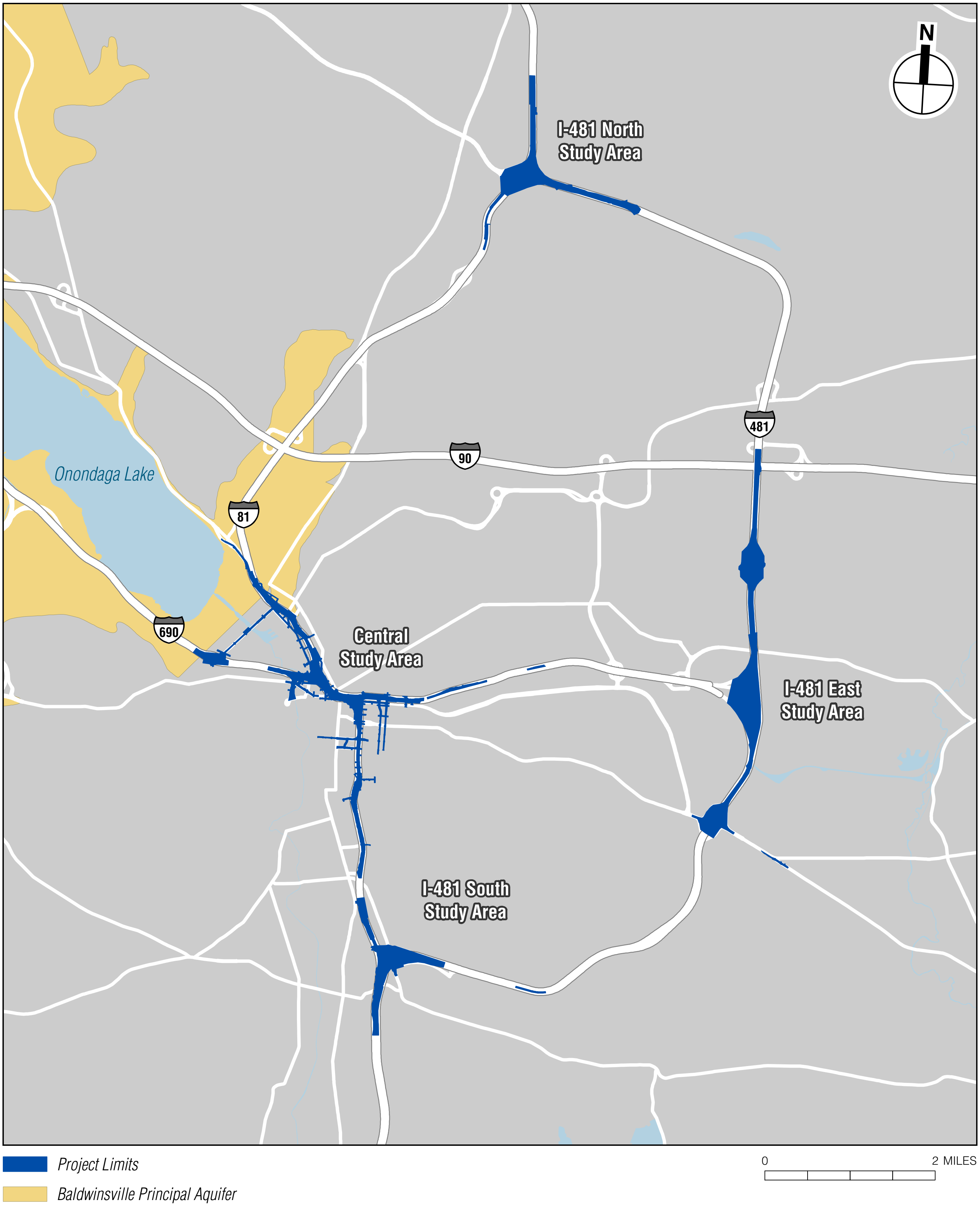
6-4-7.3 ENVIRONMENTAL CONSEQUENCES OF THE VIADUCT ALTERNATIVE

6-4-7.3.1 PERMANENT/OPERATIONAL EFFECTS

Wetlands and Jurisdictional Surface Waters

As indicated in **Table 6-4-7-5**, approximately 2.20 acres of wetlands are present within the Central Study Area associated with Ley Creek. However, none are located within the limits of disturbance for the Viaduct Alternative within the Central Study Area (see Wetland 1 in **Figure 6-4-7-2**). As design progresses, all practicable measures (i.e., avoidance, implementation of erosion and sediment control

10.15.20



Source: NYS Dept. of Environmental Conservation, Primary Aquifers, 2011

Baldwinsville Principal Aquifer

I-81 Viaduct Project

Figure 6-4-7-59

measures) would be implemented to continue to minimize effects to freshwater wetlands of the Central Study Area.

Table 6-4-7-5
Permanent Effects to EO 11990 Wetlands from the Viaduct Alternative

Study Area	Freshwater Wetlands (acres)	Freshwater Wetlands Effects (acres)	Remaining Freshwater Wetlands (acres)
Central Study Area	2.20	0.00	2.20
I-481 South Study Area	0.00	0.00	0.00
I-481 East Study Area	98.79	0.00	98.79
I-481 North Study Area	31.80	0.06	31.74
Total	**132.79**	**0.06**	**132.74**

Notes: Acreages represents the vegetated portion of the delineated wetland.
Sources: I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary.

As part of the noise abatement (see **Section 6-4-6**) for the Viaduct Alternative, noise barriers would be constructed in the Project Area. As indicated in **Table 6-4-7-5**, there are 31.80 acres of wetlands within the I-481 North Study Area. Due to the design of Noise Barriers 3 and 4 (see **Figure 6-4-7-13**), the Viaduct Alternative would permanently affect 0.06 acres of freshwater wetlands in the I-481 North Study Area. The effect would occur in the vicinity of Wetland 10 (0.05 acres in Wetland 10a) and Wetland 13 (0.01 acres in Wetland 13b),[83] which are part of a wetland complex located in the vicinity of the I-481 North Study Area.

No wetlands would be permanently affected in the I-481 East or South Study Areas under the Viaduct Alternative. No surface waters would be permanently affected by the Viaduct Alternative.

Compliance with Executive Order 11990

Under EO 11990, Federal actions (in which effects to wetlands are unavoidable) require a "finding" that there are no practicable alternatives to the proposed construction in wetlands and that the project includes all practical means to reduce harm to wetlands. The Viaduct Alternative has been carefully studied with respect to its effects on wetlands. Design refinements (i.e., alterations to ramp and noise barrier alignments to avoid wetlands where possible) have been made to avoid or minimize effects to wetlands. The Viaduct Alternative involves unavoidable permanent effects to 0.06 acres of freshwater wetlands due to the placement of noise barriers. This work is necessary to fulfill the purpose and need of the Project.

Coordination regarding wetland effects as a result of the Viaduct Alternative is ongoing with USACE and NYSDEC. Specific effects to USACE and NYSDEC wetlands are described in the following subsection. Based upon the above considerations, it is determined that this alternative includes all practicable measures to minimize harm to wetlands that may result from such use.

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84 Also in accordance with the proposed 2021 NWPs.

Regulatory Jurisdiction and Permitting

United States Army Corps of Engineers

Wetland 10 and Wetland 13 are connected to unmapped tributaries of Mud Creek and, for this reason, are regulated by USACE as WOTUS. Therefore, a Section 404 permit would be required for the 0.05 acres of permanent placement of fill in Wetland 10a and 0.01 acres of permanent placement of fill in Wetland 13b. According to the current (2017) nationwide permit (NWP) conditions[84] and based on the anticipated permanent wetland effects of less than 0.10 acres, no compensatory mitigation is expected to be required for this alternative. The 0.06 acres of permanent wetlands effects would not result in significant adverse effects to WOTUS.

New York State Department of Environmental Conservation

Portions of Wetland 10 are mapped by NYSDEC (CIC-13, CIC-15, and CIC-16) within the I-481 North Study Area. These wetlands are regulated as Class II[86] wetlands by NYSDEC. There would be no permanent effects to NYSDEC freshwater wetlands due to the roadway footprint or noise barriers under the Viaduct Alternative.

The NYSDEC also regulates an adjacent area associated with each NYSDEC-regulated freshwater wetland. This NYSDEC-regulated freshwater wetland adjacent area extends 100 feet upland from the wetland boundary or edge of existing pavement on paved roadways, whichever comes first.[87] The NYSDEC-regulated freshwater wetland adjacent area would be affected in the I-481 North Study Area during the operation of the Viaduct Alternative.

As described above, noise barriers are proposed in the vicinity of freshwater wetlands located in the I-481 North Study Area. Because of new or reconstructed noise barriers (see **Figures 6-4-7-52** and **6-4-7-53**), the Viaduct Alternative would permanently affect 0.71 acres that are currently pervious of the existing 19.87 acres of NYSDEC-regulated freshwater wetland adjacent area within the I-481 North Study Area. The effect would occur in the adjacent area of Wetland 14 (0.04 acres) and Wetland 15 (0.67 acres in Wetland 15e). In addition, there would be approximately 2.12acres of permanent areas of cut/fill within NYSDEC freshwater wetland adjacent areas of Wetland 14 (0.112 acres) and Wetland 15 (2.01 acres). Although this cut/fill would be permanent, it would be limited to pervious fill, thereby allowing for some infiltration within the NYSDEC freshwater wetland adjacent area. NYSDEC and NYSDOT have a Memorandum of Understanding (MOU) pursuant to Article 24 of the Environmental Conservation Law (ECL), and accordingly, the small amount of permanent NYSDEC freshwater adjacent area effects (0.71 acres) may qualify for a NYSDEC General Permit GP-0-11-002 under Activity #2 "Permanent and temporary placement of earth fills." Under the conditions of this General Permit, NYSDOT would submit a request for authorization to NYSDEC as design advances. Therefore, no adverse effects to NYSDEC-regulated freshwater wetland adjacent area would occur as a result of the Viaduct Alternative in the I-481 North Study Area.

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84 Also in accordance with the proposed 2021 NWPs.

86 Ranked as moderately valuable.

87 Letter from Tracy A. Elizabeth, Regional Permit Administrator (NSYDEC) to Angelo Trichilo, P.E. Deputy Chief Engineer, Acting Director, Office of Environmental, New York State Department of Transportation (NYSDOT) Response to the Draft Design Report / Draft Environmental Impact Statement for the I-81 Viaduct Project. September 13, 2021.

Surface Waters

Effects from Stormwater

An analysis of the existing and proposed drainage conditions was undertaken, with a focus on water quality and quantity. Additionally, the potential effects of the Viaduct Alternative on surface waters were analyzed using the FHWA's "Pollutant Loadings Analysis" (FHWA-RD-88-006) and "Toler Analysis" (USGS-MDPW-003) methodologies. **Appendix I-4** summarizes the results of these analyses. The analyses are conservative, in that they assume that the runoff enters the receiving waterbody directly, without any treatment or passing through water quality infrastructure. Under the Viaduct Alternative, two new stormwater trunk lines would collect stormwater runoff and discharge it to outfalls (one 96 inches, the other 42 inches in diameter) on opposite banks of Onondaga Creek near Wallace Street, between the Herald Place Bridge and the West Street to eastbound I-690 ramp (see **Figure 6-4-7-3**). This would reduce the volume of runoff flowing to the combined sewer system, decrease the frequency and magnitude of overflow events, and help Onondaga County meet the mandate in the ACJ. The new stormwater system would also include BMPs such as hydrodynamic stormwater treatment units and infiltration/detention basins, which would improve stormwater quality prior to it entering the stormwater trunk lines. As described in **Section 5.5.3**, the total storage volume of each infiltration/detention basin BMP would reflect the volume required for 24-hour extended detention of the post-developed 1-year, 24-hour storm event. The hydrodynamic units would be sized as needed to meet the water quality target volume, which was calculated using the post-developed 1-year, 24-hour storm event. The NYSDEC storage volume requirements for the 10-year storm and 100-year storm were used as the design volume for the infiltration/detention basin BMPs, indicating that they would be able to treat a large volume of the stormwater from the Project Area. Under the current drainage system, the stormwater enters the combined sewer system and is treated by Metro during low-flow conditions, but untreated stormwater and sanitary sewage overflows into Onondaga Creek during high flow conditions. The level of treatment provided to stormwater by Metro under low-flow conditions does not mitigate for the increased pollutant loading that occurs during CSO events. While stormwater would no longer be treated at Metro and only a portion of the stormwater runoff volume would be treated by stormwater management BMPs, the overall benefit of the separate storm drainage system would improve water quality by reducing CSO's.

The pollutant loading analyses were conservative in assuming the No Build Alternative would not provide any treatment of water quality. Thus, any improvements to water quality indicated by the FHWA Pollutant Loading Analysis or the Toler Analysis would represent improvements over the No Build Condition due to the Viaduct Alternative, through changes in land use, the separation of the stormwater and sanitary sewer systems, or the addition of BMPs.

Table 6-4-7-6 presents the results of the stream impact analysis portion of the FHWA's Pollutant Loading Analysis. FHWA's Pollutant Loading Analysis is a quantitative procedure for estimating the magnitude and frequency of occurrence, on a watershed scale, of in-stream concentrations of pollutants caused by stormwater runoff, namely copper, lead, zinc, total organic carbon, chemical oxygen demand, nitrate + nitrite nitrogen, total kjeldahl nitrogen, phosphorus, total suspended solids, and volatile suspended solids. Similarly, the Toler Analysis estimates the effects of chloride on surface waters, resulting from applications of highway deicing salts within the watershed. Highway right-of-way (area of pavement area [in acres]) is the primary variable in these methodologies that demonstrate differences in pollutant concentrations between the Project alternatives. These methodologies are applied on a watershed scale and focus on the entire right-of-way, rather than on the area of disturbance that was evaluated for the runoff discussion presented in **Chapter 5, Transportation and Engineering Considerations**. The Central Study Area would consist of 146.2 acres of impervious surface under the No Build Alternative. Under the Viaduct Alternative, the amount of impervious area in the Central Study Area (144.2 acres) would decrease by 2.0 acres, or 1.4 percent. The FHWA Pollutant Loading analyses, which were conducted without any reduction in loadings due to BMPs (which would occur under the Viaduct Alternative) or treatment by Metro (which would occur under the No Build Alternative), indicate that loadings of pollutants on an annual and mean event basis would be approximately 1.1 percent lower within the study area and 0.0024 percent lower scaled to the full watershed under the Viaduct Alternative than under the No Build Alternative. The reduced impervious surface would result in a smaller volume of storm runoff, leading to smaller pollutant loading. The Toler Analysis showed that chloride loadings to Lower Onondaga Creek would be higher by approximately 17.7 percent in the immediate study area and 0.04 percent higher when scaled to the full drainage area on an annual basis for the Viaduct Alternative, when compared with the No Build Alternative. This is due to the 17.9 percent increase in lane miles that would have to be deiced during the winter. Even though the total lane miles would increase under the Viaduct Alternative, the total acreage of impervious area in the study area would be reduced through changes in land use outside of the highway lanes but within the NYSDOT right-of-way. Restoration of open areas would be controlled so that no more than 35 percent of these areas would be constructed as impervious surfaces (see **Chapter 5, Transportation and Engineering Considerations**). The reduction in impervious area outside of the highway lanes but within the NYSDOT right-of-way could lead to a reduction in chloride applications and a benefit to water quality not indicated by the Toler Analysis. Additionally, while stormwater would no longer be treated at Metro and only a portion of the stormwater runoff volume would be treated by stormwater management BMPs, the overall benefit of the separate storm drainage system would further improve water quality in a way not indicated by the FHWA analysis, by reducing CSO events.

The most current data for copper, lead, and zinc concentrations in Onondaga Lake is from 2012 and 2013. Using the percent increase in pollutant loadings from the FHWA analysis and scaling those results by the drainage area, approximate concentrations were determined for these three metals.[89] These results indicated that without BMPs, projected copper, lead, and zinc loadings would not result in concentrations of these pollutants discharging to Onondaga Lake, which would pose a risk to aquatic organisms by exceeding the USEPA acute criteria or USEPA National Urban Runoff Program (NURP) suggested threshold level[90] (see **Table 6-4-7-6**). With implementation of stormwater BMPs expected to have a target removal rate of 80 percent of total suspended solids (TSS),[91] and thus the metals that attach to these particles, pollutant loadings of lead, zinc, and copper to Onondaga Lake

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89 Concentration in runoff entering the stream that has the probability of occurring once in three years. FHWA methodology: https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-b.pdf

90 United States Environmental Protection Agency Nationwide Urban Runoff Program. The threshold effect level indicates the concentration from a short storm surge that would result in the mortality of the most sensitive individual of the most sensitive species. https://www3.epa.gov/npdes/pubs/sw_nurp_vol_1_finalreport.pdf

91 New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf

would be lower than projected by the FHWA Pollutant Loading analysis, resulting in concentrations in Onondaga Lake that would also be below the USEPA acute criteria concentrations.

Table 6-4-7-6
Viaduct Alternative:
Summary Estimate Results of Stream Impact Assessment

SUMMARY ESTIMATE RESULTS OF STREAM IMPACT ANALYSIS, Once in 3 Year Stream Pollutant Concentration, mg/L[1]							
ALTERNATIVE: VIADUCT ALTERNATIVE STUDY AREA: CENTRAL STUDY AREA RECEIVING WATERBODY: ONONDAGA LAKE							
Pollutant	**Soluble Fraction[2]**	**Acute Criteria[3]**	**Threshold Effect Level[4]**	**No Build**	**Build Without BMPS**	**Assumed BMP Removal Efficiency Rate[5]**	**Build With BMP Treatment Using Assumed Removal Rate**
Total Organic Carbon (TOC)	-	0.000	0.000	52	52	-	52
Chemical Oxygen Demand (COD)	-	0.000	0.000	238	236	-	236
Nitrate + Nitrite Nitrogen (NO2+3)	-	0.000	0.000	1.59	1.57	-	1.57
Total Kjeldahl Nitrogen (TKN)	-	0.000	0.000	3.82	3.79	-	3.79
Phosphorus (PO4-P)	-	0.000	0.000	0.835	0.828	40	0.50
Total Suspended Solids (TSS)	-	0.000	0.000	297	294	80	58.81
Volatile Suspended Solids (VSS)	-	0.000	0.000	81	81	80	16.15
Copper (Cu)	0.4	0.021	0.045	0.045	0.045	80	0.01
Lead (Pb)	0.1	0.103	0.450	0.084	0.083	80	0.02
Zinc (Zn)	0.4	0.374	0.785	0.275	0.273	80	0.05

Notes:

1. The FHWA pollutant loading analysis was used to determine the percent change in concentrations between the no build and build alternatives. This percentage was then used with existing water quality data in order to estimate how the alternative will affect current conditions. FHWA methodology: https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-b.pdf
2. Soluble fraction taken from the FHWA methodology: https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-b.pdf
3. United States Environmental Protection Agency. The acute criteria indicate the highest concentration of specific pollutants or parameters in water that are not expected to pose a significant risk to the majority of species. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table
4. United States Environmental Protection Agency Nationwide Urban Runoff Program. The threshold effect level indicates the concentration from a short storm surge that would result in the mortality of the most sensitive individual of the most sensitive species. https://www3.epa.gov/npdes/pubs/sw_nurp_vol_1_finalreport.pdf
5. New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf

The Viaduct Alternative would result in a 0.0024 percent lower loading of nutrients such as phosphorus, and nitrite and nitrate nitrogen (as compared to the No Build Alternative), and proposed stormwater BMPs would have target removal rates for phosphorus of at least 40 percent, which would further reduce phosphorus loads to Onondaga Creek and Onondaga Lake. Similarly, stormwater BMPs would have target TSS removals of at least 80 percent, which would also further reduce the TSS loadings to Onondaga Creek. BMPs designed in accordance with the New York State Stormwater Management Design Manual (Design Manual) do remove nitrogen from stormwater, but target removal rates vary depending on the practice and are typically not quantified in the Design Manual. Therefore, the operation of the Viaduct Alternative with the proposed stormwater trunk lines and stormwater BMPs (i.e., hydrodynamic units and detention basins – discussed below) would provide sufficient treatment for the stormwater and would not result in the failure of the surface waters within the Central Study Area to meet the water quality criteria for its designated Class C Water Classification.

The higher chloride loadings would not result in significant adverse effects to water quality of Onondaga Lake, the receiving water body in the Toler Analysis, when compared with the No Build Alternative. The percent increase between the Viaduct Alternative and No Build Alternative is 0.04 percent. The chloride concentration in Onondaga Lake in 2013, as measured by Onondaga County Department of Water Environment Protection's Ambient Monitoring Program, ranged from 355 to 643 mg/L.[92] Thus, according to the Toler Analysis, the estimated chloride concentration in the Central Study Area under the Viaduct Alternative would range from 355.1 643.3 mg/L in Onondaga Lake. The USEPA chronic toxicity water quality criteria concentration of chloride, for the majority of aquatic species, is 230 mg/L, while the acute toxicity concentration is 860 mg/L.[93] Both high and low concentrations of chloride have effects on diversity and community structure of aquatic invertebrates and may influence reproduction of aquatic organisms.[94] Since stormwater BMPs do not remove chloride from stormwater, the Viaduct Alternative would result in higher chloride concentration within Onondaga Lake when compared with the No Build Alternative, in which chloride is already elevated above the chronic toxicity water quality criteria; under both alternatives, chloride concentration would be below the acute toxicity concentration.

A combination of hydrodynamic stormwater treatment units and infiltration/detention basins would be installed within the Central Study Area and would treat the 1-year, 24-hour rainfall event for watersheds where phosphorus pollution is a concern. The target water quality volume would be 7.6 acre-feet of stormwater runoff, and the runoff reduction minimum volume would be 0.4 acre-feet. The combination of stormwater treatment practices would meet the peak flow attenuation requirements as described in the Design Manual. The water quality treatment provided by the implementation of these BMPs would further reduce the pollutant loadings previously described. The final locations for the BMPs would be determined during final design and would be positioned within the landscape in accordance with the Design Manual, in such a way that would provide the required water quality treatment, runoff reduction, and peak flow attenuation. In addition to the water quality BMPs, green infrastructure practices are proposed for the study area, which would be further refined during the final design stage. Practices under consideration include vegetated swales, stormwater tree

92 http://www.ongov.net/wep/archive-amp-data-sets.html

93 https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

94 http://dx.doi.org/10.1016/j.scitotenv.2014.12.012

planting, tree pits, stormwater planters, rain gardens, and conservation of existing trees. In addition to providing the water quality improvements described above, some of the proposed BMPs and green infrastructure practices under consideration would increase infiltration, decrease stormwater runoff volume within the study area, and provide storage and delayed release of stormwater, which would reduce peak flows. Therefore, the Viaduct Alternative would result in an overall benefit to receiving wetlands, surface waters, floodplains, and groundwater.

Most of the Central Study Area is within or on the border of the Clinton/Lower Main Interceptor Sewer combined sewershed (see **Figure 6-4-7-58**). The exception is the northern portion of the Central Study Area, which is on the border of the Hiawatha Regional Treatment Facility combined sewershed, and a portion of the study area immediately adjacent to Onondaga Creek where the storm and sanitary sewers have been separated. As described in the Existing Conditions section, there are four active combined sewer outfalls (CSO-080, CSO-021, CSO-020, and CSO-066) and two inactive combined sewer outfalls (CSO-022 and CSO-065) along Onondaga Creek in the immediate vicinity of the study area. These outfalls would remain operational under the Viaduct Alternative but would deliver reduced loads of stormwater and pollutants to Onondaga Creek, as described below.

Stormwater runoff from the Central Study Area would not discharge to the City's combined sewer system; the new roadways' drainage system would prevent any contribution to the current combined sewer in accordance with the ACJ and the Save the Rain initiative. The total runoff to the existing combined sewer system and the county sanitary sewer treatment facility would be substantially reduced, decreasing combined sewer overflows. In addition, the proposed storm sewer system would update the City of Syracuse's drainage infrastructure to current design standards and improve the safety of flood prone areas, including the existing locations with known drainage issues, such as at the I-81 underpass at Butternut Street, West Street near I-690, and the northbound I-81 to eastbound I-690 ramp. In addition, the new storm sewer trunk line has been designed to accommodate the 50-year storm event as compared to the normal 10-year storm event standard. The higher storm event standard would provide for resiliency for increased storm events as well as provide for additional future capacity. The new conveyance system would discharge runoff directly to the receiving surface water of Onondaga Creek. This direct discharge of stormwater flows into Onondaga Creek would represent a change from the existing condition in which a CSO outfall discharges into the creek during high flow events. With the installation of the stormwater trunk lines, stormwater discharges into Onondaga Creek would occur during all stormflow events. However, these discharges would have improved water quality due to separation of stormwater and sanitary sewers and the implementation of BMPs in the watershed. CSO events would unlikely occur under the operation of the stormwater trunk lines, providing a substantial improvement to water quality downstream of the outfalls. Therefore, the operation of the stormwater trunk lines would have a beneficial effect on the water quality in Onondaga Creek and Onondaga Lake compared to the No Build Alternative. The potential effect of the stormwater trunk lines on the bed and banks of Onondaga Creek is discussed below.

With BMPs designed to treat stormwater quantity and quality in accordance with the Design Manual and the Stormwater Pollution Prevention Plan (SWPPP) prepared in accordance with SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001), stormwater runoff from the Viaduct Alternative would have beneficial effects to Onondaga Creek and Onondaga Lake when compared to the No Build Alternative, and would not result in the failure of these surface waters to meet water quality criteria for their designated water quality classification. The new stormwater trunk lines and BMPs would be the property of Onondaga County. NYSDOT and Onondaga County would continue to coordinate the associated ownership and maintenance roles.

Effects on Beds and Banks of the Surface Waters

Table 6-4-7-7 summarizes the temporary and permanent effects of the Viaduct Alternative on surface waters in the Central Study Area. While no permanent loss (fill) of waters is proposed under the Viaduct Alternative, the work to construct structures below the ordinary high water of the Onondaga Creek (a WOTUS), in addition to the wetland effects associated with the noise walls, is anticipated to meet the requirements for Section 404 of the Clean Water Act authorization under a NWP[95] and, based on final design details, may either meet the requirements for coverage under the NYSDEC Section 401 Water Quality Certification issued for the chosen NWP or require an individual certification. Based on the field survey of Ley Creek and a review of the Project plans for the Central Study Area, the Project would not result in direct effects to Ley Creek. Additionally, based on the field survey of Onondaga Creek at the Bear Street bridge and a review of the Project plans for the Central Study Area, the Project is not expected to result in direct effects to Onondaga Creek at Bear Street.

The new separated drainage system consisting of large diameter storm sewer trunk lines along I-81 and I-690 would be subject to NYSDEC and USACE permit requirements. To obtain the required permits, a detailed hydraulic analysis would be conducted during final design to demonstrate that project development would not result in adverse impacts to the downstream watercourses and any designated floodplains. The new 96-inch (8-foot) outfall for the stormwater trunk line servicing the area east of Onondaga Creek would be located in the existing bank of Onondaga Creek and would not have a permanent effect on the surface water area or stream length (see **Table 6-4-7-7)**. The invert of the outfall would be 1.6 feet above the Onondaga Creek stream bed at the outfall location. During low flow conditions, the top of the water surface is at 1.9 feet above the creek bed and therefore the pipe would contain some backwater for a short distance. The top of the outfall would be below the mean high-water line. Therefore, discharge from the outfall would not result in a head drop and would have minimal erosive impact on the stream bed and stone wall banks. The sewer trunk would be located on an outside meander bend of Onondaga Creek, at an angle that would direct the flow from the outfall towards the far bank, which would reduce the potential for erosion of the bed and banks.

The new 42-inch (3.5-foot) outfall for the stormwater trunk line servicing the area west of Onondaga Creek would be located in the existing embankment of the Onondaga Creek floodplain, on the opposite shore from the 96-inch outfall. There would be no permanent effect on the surface water area or stream length as a result of the new outfall, as described in **Table 6-4-7-7**. The invert of the outfall would be between 15 and 20 feet above the Onondaga Creek stream bed at the outfall location (exact location to be determined during final design). Protection from erosion would be provided by the construction of an energy-dissipating structure and bank stabilization measures. The energy dissipating structure would be designed during final design and would meet the requirements of NYSDOT's Geotechnical Design Procedure: Bank and Channel Protective Lining Design Procedures.

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95 http://www.nan.usace.army.mil/Portals/37/docs/regulatory/publicnotices/Regional%20Gen%20 Permit/PN-LRB%20NAN%20FinalRegionalConditionsWQC%20CZMforNYdated%2021-MAR-2017.pdf?ver=2017-03-22-111131-070. Specifically, NWP #7 (Outfall Structures and Associated Intake Structures), NWP#18 (Minor discharges) & NWP #14 (Linear Transportation) may be appropriate.

Table 6-4-7-7
Effects to Surface Waters from the Viaduct Alternative

Central Study Area – Onondaga Creek				
Existing				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (square feet (sf))**	**Stream Area (acres)**
	226	1,563	54,709	1.26
Design				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
	226	1,563	54,709	1.26

Summary of Effects	**Quantity**	**Description**
Length of Permanent Stream Impact (lf)	0	
Area of Permanent Stream Impact (sf)	0	
Area of Permanent Stream Impact (acres)	0	
Length of Temporary Stream Impact (lf)	65	Temporary impact from stormwater trunk line tie in.
Area of Temporary Stream Impact (sf)	2,387	
Area of Temporary Stream Impact (acres)	0.05	
Note:	***Used culvert section for Erie Blvd and W. Genesee St only, treated other bridge structures as open channel***	

Central Study Area – Ley Creek				
Existing				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
	0	-	3,296	0.08
Design				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
	0	-	3,296	0.08

Summary of Effects	**Quantity**	**Description**
Length of Permanent Stream Impact (lf)	0	
Area of Permanent Stream Impact (sf)	0	
Area of Permanent Stream Impact (acres)	0	
Length of Temporary Stream Impact (lf)	0	
Area of Temporary Stream Impact (sf)	0	
Area of Temporary Stream Impact (acres)	0	

Effects on Navigation

Within the Central Study Area, Onondaga Creek is not navigable under Federal law between Erie Boulevard and Evans Street, but is navigable downstream, adjacent to Bear Street. The Viaduct Alternative would not adversely affect navigability of the creek under Article 15 of the ECL.[96]

Ley Creek is the only navigable stream under Federal law within the Central Study Area and the I-81 and Park Street bridges would not be modified under the Viaduct Alternative. Therefore, this alternative has no impact to navigability under State and Federal laws.

Floodplains

The floodplains of the creeks within the Central Study Area were altered by urban development. Preliminary design of the Viaduct Alternative conforms to FHWA policies for the location and hydraulic design of highway encroachments on floodplains (23 CFR § 650) and the floodplain management criteria for State projects in flood hazard areas (6 NYCRR 502). By complying with these regulations, the Viaduct Alternative would not adversely affect floodplains and would be consistent with the intent of the Standards and Criteria of the National Flood Insurance Program.

Within the Central Study Area, as shown on **Figure 6-4-7-57**, the 100-year floodplain occurs along Onondaga Lake, Onondaga Creek, and Ley Creek. The Viaduct Alternative would not cause a substantial encroachment within any floodplains, although the bridge piers associated with the I-690 bridges and West Street interchange ramps may occur within the boundary of the 100-year floodplain.

The Viaduct Alternative is defined as a rehabilitation project because it does not include any reconstruction within the floodplains that raises existing embankment elevations, does not widen an existing roadway along a stream in the flood hazard area, and does not include any new construction (or new bridges) within the flood hazard area. Within this well-developed area, there is no practicable alternative that includes moving the highway outside of 100-year floodplain areas entirely. However, any replacement piers and retaining walls needed by the five sections of road surface that span Onondaga Creek in the Central Study Area would be placed farther back from the creek than the existing piers and retaining walls. In addition, due to the topography of the area and the elevation of the bridges over the creek, it is anticipated that the freeboard provided below all structures at the 100-year flood would be greater than the two-foot minimum required; therefore, a hydraulic study would not be required until final design, and a Coast Guard Checklist would not be required.

The stormwater trunk lines would be constructed beneath the existing ground surface and therefore would not impact the elevation of the floodplain. The 96-inch outfall for the stormwater trunk line servicing the area east of Onondaga Creek would be located in the existing bank of Onondaga Creek, below the MHW line and below the elevation of the floodplain. The new 42-inch outfall for the stormwater trunk line servicing the area west of Onondaga Creek would be located in the existing embankment of the Onondaga Creek floodplain. Downstream of the 42-inch outfall, protection of the floodplain from erosion would be provided by bank stabilization measures. Additionally, the velocity of stormwater discharge from both outfalls would be reduced by energy-dissipating structures

[96] "Navigable waters" of the State under Article 15 means all lakes, rivers, streams and other bodies of water in the State that are navigable in fact or upon which vessels with a capacity of one or more persons can be operated notwithstanding interruptions to navigation by artificial structures, shallows, rapids or other obstructions, or by seasonal variations in capacity to support navigation. It does not include waters that are surrounded by land held in single private ownership at every point in their total area.

at each outfall, which would protect the immediate and downstream floodplains from erosion. A detailed hydraulic analysis would be conducted during final design to demonstrate that the discharge from the Project's trunk lines would not result in adverse impacts to the Onondaga Creek floodplain.

The Viaduct Alternative would result in the removal of 9.4-acres of impervious area, as well as the removal of infrastructure in the vicinity of the Lower Onondaga Creek floodplain through the restoration of the open areas within the highway right of way, resulting in lower amounts of impervious surface and the associated surface runoff compared with the No Build Alternative. Since the Viaduct Alternative would not result in the construction of substantial structures within the base floodplain, it would not result in a change in the existing flood hazard area.

Executive Order 11988

The Viaduct Alternative was reviewed for compliance with EO 11988, Floodplain Management. Under EO 11988, Federal actions (in which effects to floodplains are unavoidable) require a "finding" that there are no practicable alternatives to the proposed construction in floodplains and that the proposed action includes all practical means to reduce harm to floodplains.

The Viaduct Alternative has been carefully studied with respect to its effects on floodplains. Design refinements (i.e., reducing impervious cover and locating bridge piers farther from the creek than the existing structures where possible) have been made to avoid and minimize effects to floodplains.

Additional design refinements and quantification of the total effects to floodplains shall be completed during final design and shall be in compliance with EO 11988. Based upon the above considerations, it is determined that this alternative includes all practicable measures to minimize harm to floodplains that may result from such use.

Groundwater

Under the Viaduct Alternative, the decrease in impervious area would have an overall beneficial effect on groundwater resources. Stormwater BMPs would be implemented to receive stormwater runoff from the new impervious surfaces constructed under the Viaduct Alternative. The BMPs would increase groundwater infiltration of stormwater and would result in a beneficial effect on groundwater quality as well, as the stormwater runoff would have reduced sediment, nutrient, and heavy metal concentrations. As indicated in the Toler analysis, the increased road mileage as compared to the No Build Alternative would result in an increased amount of winter road salting, and increased loadings of chloride in stormwater runoff from the highway. The increased chloride in stormwater runoff from the highway would result in increased concentration of chloride in the water that would infiltrate into the surficial aquifer. However, this increase would be offset to some extent by the reduction in impervious area outside of the highway lanes but within the right-of-way; the change in land use could lead to a reduction in chloride applications in this area, and thus a benefit to groundwater quality not indicated by the Toler Analysis. Therefore, the increased chloride concentration from the highway lanes would not result in a substantial adverse effect to groundwater quality.

Through the provision of stormwater management practices, the preservation of water quality and contribution to surface water base flows would be preserved. BMPs that increase groundwater infiltration would be used where possible and would contribute to groundwater recharge and improve water quality.

As discussed in **Chapter 4, Construction Means and Methods**, the new bridge construction along the portions of I-81, I-690, and ramps would require pile foundations, which could have the potential to intercept the groundwater table. Within the Baldwinsville Principal Aquifer, in the vicinity of the Ley Creek bridge construction area, groundwater was recorded in borings between 3 and 3.75 feet below ground surface. Construction of bridge foundations would involve driving approximately 470 piles approximately 12 inches in diameter and between 20 to 40 feet long. While intercepted by the piles, groundwater would be expected to flow around them. Therefore, the driving of the piles would not result in a significant adverse effect to groundwater resources within the surficial aquifer. Groundwater dewatering methods during construction would be coordinated with NYSDEC and Onondaga County before any dewatering activities commence.

The Viaduct Alternative would not result in any below ground structures that would significantly affect groundwater flow.

6-4-7.3.2 CONSTRUCTION EFFECTS

During construction, the implementation of erosion and sediment controls will be in accordance with the 2016 New York State Standards and Specifications for Erosion and Sediment Control ("Blue Book"). The SWPPP will be prepared for the Project to meet the requirements of SPDES General Permit GP-0-20-001, and NYSDOT Highway Design Manual, Chapter 8 Highway Drainage. The SWPPP would implement erosion and sediment control measures and minimize the potential for construction activities to result in adverse effects to wetlands and surface water quality within the Project Area. Erosion and sediment controls to be implemented during construction would be developed during final design and would include measures such as inlet protection at existing stormwater inlets, sediment controls to minimize erosion and transport of sediment from the site, dust control measures, spill prevention and containment measures, stabilized construction entrance/exits, and vegetative measures to stabilize any exposed soils. Any construction activities conducted in surface waters, including the installation of the stormwater trunk outfall, would be minimized to protect water quality. As much of the work would be completed from dry land as possible. Erosion and sediment control measures such as turbidity curtains, cofferdams, and temporary piping or diversion of Onondaga Creek would be implemented for any in-water construction activities, including the installation of the stormwater trunk line outfalls, to maintain stream flow and minimize suspended sediment. The construction of the stormwater trunk line outfalls would result in a temporary effect to Onondaga Creek of approximately 0.05 acres. There would not be any temporary effects to Ley Creek during construction, as all work would occur outside of the creek. Likewise, there would not be any temporary effects to the Butternut Creek tributaries in the I-481 South or I-481 East Study Areas due to the construction of the noise barriers, as all work would occur outside of the creek, and extra precautions for erosion and sediment controls would be set in place to protect the AA(T) water quality standard of Ont. 66-11-P 26-37-6-13.

Construction of this alternative would not result in any temporary effects to wetlands in the Central Study Area or I-481 East Study Area. Temporary effects to approximately 0.22 acres of wetlands would occur during construction of the noise barriers in the I-481 North Study Area. Construction that would permanently change portions of NYSDEC-regulated freshwater wetland adjacent area is discussed in permanent effects above. Work in freshwater wetlands and in vegetated areas within the NYSDEC-regulated freshwater wetland adjacent areas for construction access would be temporary in nature; erosion and sediment control BMPs would be employed, and the disturbed areas would be restored using soil restoration techniques and planting native plants, where possible, as per the landscape restoration plan that would be developed for this alternative. With these measures in place, no more than minimal adverse effects to wetlands and NYSDEC-regulated freshwater wetland adjacent area would occur during construction of the Viaduct Alternative.

For construction of the new bridge piles, pre-auguring equipment would be used to reduce the duration of impact or vibratory pile driving, which would reduce any potential effects of pile driving on groundwater resources.

Along with measures previously identified, and in **Section 6-4-7.3.5**, the Contractor would implement environmental protection practices for water quality. As described in **Chapter 4, Construction Means and Methods**, NYSDOT would incorporate the standard practices into the construction contracts for the Viaduct Alternative including:

- The Contractor shall schedule and conduct its work to minimize soil erosion, not cause or contribute to a violation of water quality standards and prevent sedimentation on lands adjacent to or affected by the work.
- Construction of temporary soil erosion and sedimentation control measures, temporary and permanent soil stabilization, construction of drainage facilities, and performance of other contract work, which will contribute to the control of erosion and sedimentation.

6-4-7.3.3 INDIRECT EFFECTS

The Viaduct Alternative would be constructed within the footprint of existing roadways and other developed areas with existing infrastructure and would therefore have limited potential for resulting in indirect effects to surface waters, groundwater, or floodplains outside the Central Study Area. Reductions in peak flow resulting from stormwater BMPs could contribute to decreased CSO events and reduce the volume of stormwater that reaches Metro as compared to the No Build Alternative.

The Viaduct Alternative would result in a decrease in impervious surface within the watershed of Onondaga Lake and, therefore, would not have the potential to result in indirect adverse effects to the base floodplain of the Class C creeks and lake within the Central Study Area. Additionally, with the implementation of BMPs, in accordance with the SWPPP prepared for the Project, such as infiltration and detention basins, dry swales, and hydrodynamic stormwater treatment units, the volume and rate of stormwater discharge would be lower than the No Build Alternative. Infiltration would be higher and peak flow would be lower compared with the No Build Alternative. Green infrastructure practices proposed for the Project Area such as vegetated swales, tree planting, tree pits, stormwater planters, rain gardens, and conservation of existing trees would result in additional infiltration and/or reduction in stormwater runoff volume within the Project Area, in addition to providing the water quality improvements.

Because the stormwater trunk lines would be constructed, any runoff not captured by the BMPs would be discharged into Onondaga Creek about 1,000 feet upstream of where it would be discharged during a CSO event under the No Build Alternative. The operation of the stormwater trunk lines would not have a substantial effect on the creek because of the channelized nature of the creek, the reduction in runoff volume provided by the BMPs, and the capacity of the creek to handle this volume of runoff, as the drainage area would not increase from the existing condition. As described in **Chapter 5, Transportation and Engineering Considerations**, the 96-inch stormwater trunk line outfall and energy dissipator would include work below the ordinary high water of the stream and, as such, be subject to permit requirements by NYSDEC and USACE associated with Sections 401 and 404 of the Clean Water Act. The 42-inch stormwater trunk line outfall would be located above ordinary high-water elevations and thus would not be subject to those specific permit requirements by NYSDEC or USACE. For both outfalls, a detailed hydraulic analysis would be conducted during final design to demonstrate that the systems would not result in adverse effects to the downstream watercourses and discharge through both outfalls would be subject to NYSDEC requirements under SPDES.

The Viaduct Alternative would not result in indirect adverse effects to wetlands, surface waters, groundwater, or floodplains.

6-4-7.3.4 CUMULATIVE EFFECTS

No adverse cumulative effects to wetlands, surface waters, groundwater, and floodplains are anticipated as a result of the Viaduct Alternative. Improvements attributable to the watershed modifications made by the Save the Rain program would be expected regardless of any alternative chosen. Water quality monitoring completed in conjunction with the Save the Rain program has shown improvements to Onondaga Lake since the implementation of the program and this improvement is expected to continue as additional green infrastructure practices are built and the lake adjusts to the decreased pollution load from CSOs.

Stormwater BMPs, such as infiltration and detention basins and hydrodynamic stormwater treatment units, would be incorporated into the Viaduct Alternative, and additional green infrastructure practices would be considered during final design. The BMPs and green infrastructure practices would result in water quality improvements and peak flow reductions, and thus, would offset discharges from new impervious surfaces. Similarly, the stormwater trunk lines would reduce the demand on the existing combined sewer system, which would result in a reduction in the number and magnitude of CSO events in the existing watershed. Chloride loadings could be reduced through changes in land use outside of the roadway, but in NYSDOT right-of-way, and through the implementation of operational BMPs such as street sweeping to remove excess roads salts and/or reduced application rates.

In combination with efforts associated with Save the Rain and stormwater management requirements for new development, it is anticipated that the overall cumulative effect of the Viaduct Alternative would be beneficial to wetlands, surface waters, groundwater, and floodplains.

6-4-7.3.5 MITIGATION

Wetlands and Surface Waters

Approximately 0.06 acres of permanent effects would occur in EO 11990 freshwater wetlands (e.g., due to fill placement as a result of noise barrier construction in Wetland 10 and Wetland 13) as a result of the Viaduct Alternative. No permanent effects to NYSDEC freshwater wetlands would occur as a result of the Viaduct Alternative. During construction, measures (i.e., design refinements, silt fencing, exclusion fencing) would be implemented to avoid effects to wetlands and surface waters. It is anticipated that any permanent and temporary work in NYSDEC-regulated freshwater wetland adjacent areas would be conducted as per the MOU pursuant to Article 24 "Freshwater Wetlands."

Accordingly, the small amount of NYSDEC freshwater wetland adjacent area effects may qualify for a NYSDEC General Permit GP-0-11-002 under Activity #2 "Permanent and temporary placement of earth fills." Given that the Viaduct Alternative would result in no permanent effects to NYSDEC freshwater wetlands, no NYSDEC wetland or stream mitigation is proposed.

As described above, EO 11990 wetlands are within FHWA's jurisdiction. A wetland delineation report is under review by the USACE and NYSDEC along with a request for jurisdictional determination. As design advances, all practicable measures would be employed to avoid and minimize harm to EO 11990 wetlands and waters including consideration of Section 404 NWP and Section 401 Water Quality Certification conditions regarding stream crossings. As currently proposed, permanent loss of EO 11990 wetlands is minimal (0.06 acres), and no loss of open waters would occur as a result of the Viaduct Alternative. Therefore, no EO 11990 wetland or stream mitigation is required.

Within Onondaga Creek, the effect of the 8-foot diameter stormwater trunk line and 3.5-foot diameter stormwater trunk line outfalls would be minimized by the creation of energy dissipators at the outfalls to reduce the potential for erosion. As currently proposed, no Section 404 stream mitigation is required. Additional restoration and enhancement activities could be achieved by stabilization of streambanks and habitat enhancements through strategic use of native plantings, erosion control matting, and riprap to reduce erosion and subsequent sedimentation and to improve water quality.

As currently proposed, no work would occur within Ley Creek for the Viaduct Alternative. As currently proposed, no Section 404 stream mitigation would be required; however, additional restoration and enhancement activities could be achieved by streambank stabilization at bridge piers and an existing stormwater outfall (C-4), which would improve Ley Creek water quality.

Stormwater

Based on the total amount of impervious area, water quality and water quantity treatment would be required for the Viaduct Alternative. **Chapter 5, Transportation and Engineering Considerations** provides calculations and a detailed discussion on stormwater BMPs, including proposed locations for treatment methods. Water quality treatment for the new bridges and roadway pavements would be accommodated through infiltration and detention basins, as space, soil conditions and geology permit, and in hydrodynamic units where space is limited, as discussed above. The locations and design of the BMPs will be finalized during final design and will meet all requirements of the NYSDEC Stormwater Management Design Manual. As a result of installing a new stormwater trunk lines as part of the Viaduct Alternative, the demand on the existing combined sewer system would be reduced, which would result in a reduction in the number and magnitude of CSO events within the existing watershed. The new stormwater trunk lines, in combination with peak flow mitigation for any increases in impervious area and water quality treatment for paved surfaces, would result in improvements to downstream receiving waters. Stormwater BMPs and green infrastructure that are not required under this alternative would be considered as design advances to provide added benefits to the watershed.

6-4-7.4 ENVIRONMENTAL CONSEQUENCES OF THE COMMUNITY GRID ALTERNATIVE

6-4-7.4.1 PERMANENT/OPERATIONAL EFFECTS

Freshwater Wetlands and Surface Waters

A total of 132.79 acres of wetlands are present within the Central, I-481 East, and I-481 North Study Areas. The I-481 South Study Area contains an unmapped tributary to Butternut Creek, but freshwater wetlands are not present. As indicated in **Table 6-4-7-8**, 0.89 acres of wetlands would be permanently incorporated into the proposed footprint of the Community Grid Alternative. These effects would occur in the I-481 East and I-481 North Study Areas. There would be no work within wetlands of the Central Study Area.

Table 6-4-7-8
Permanent Effects to Wetlands from the Community Grid Alternative

Study Area	Freshwater Wetlands (acres)	Freshwater Wetlands Effects (acres)	Remaining Freshwater Wetlands (acres)
Central Study Area	2.20	0.00	2.20
I-481 South Study Area	0.00	0.00	0.00
I-481 East Study Area	98.79	0.30	98.50
I-481 North Study Area	31.80	0.59	31.21
Total	**132.79**	**0.89**	**131.91**

Notes: Acreages represent the vegetated portion of the delineated wetland. Open water portions of delineated wetlands (surface waters) are presented in **Table 6-4-7-9**.
Sources: I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary.

A total of 19.30 acres of open surface waters are present within the Central, I-481 East, I-481 North, and I-481 South Study Areas. Within the I-481 South Study Area there is an unmapped tributary located within the vicinity of Rock Cut Road (outside the Project limits). As indicated in **Table 6-4-7-9**, approximately 0.07 acres of surface waters would be permanently incorporated into the footprint of the Community Grid Alternative. These effects would occur in the I-481 East and I-481 North Study Areas. There would be no work within the delineated surface waters in the Central Study Area.

Table 6-4-7-9
Permanent Effects to Surface Waters from the Community Grid Alternative

Study Area	Surface Waters Coverage (acres)	Approximate Surface Waters Effects (acres)	Remaining Surface Waters (acres)
Central Study Area	2.98	0.00	2.98
I-481 South Study Area	1.02	0.00	1.02
I-481 East Study Area	10.96	0.03	10.93
I-481 North Study Area	4.34	0.04	4.30
Total	**19.30**	**0.07**	**19.23**

Notes: City Line Brook is located to the west of I-481 South Study Area and therefore no acreage for City Line Brook is included in surface waters. Surface waters associated with the I-481 South Study Area are associated with the unnamed tributary located in the vicinity of Rock Cut Road.

As indicated in **Table 6-4-7-10**, within the I-481 East Study Area, 0.30 acres of permanent effects to wetlands would result from the reconfiguration of Interchange 3 (New York State Route 5). The existing southbound I-481 to westbound Route 5 ramp would be widened and improved to accommodate turns onto both westbound and eastbound Route 5. This would permanently affect approximately 0.205 acres of a common reed-dominated wetland (see Wetland 2j [in **Figure 6-4-7-6** and **Appendix I-2**]) located west of the exiting southbound lanes, as indicated in **Table 6-4-7-10**.

Table 6-4-7-10
Permanent Wetland Effects in the I-481 East Study Area under the Community Grid Alternative

Wetland Identification	Vegetated (acres)	Open Water (acres)	Total (acres)
2 (Consisting of 2a through 2m)	0.205	0.002	**0.207**
4 (Consisting of 4a and 4b)	0.08	0.02	**0.10**
8	0.015	0.00	**0.015**
9 (Consisting of 9a and 9b; tributary to North Branch Ley Creek)	0.004	0.01	**0.014**
Total	**0.304**	**0.032**	**0.34***

Note: *Number is rounded to the hundredth place.
Source: Parsons (October 2020).

As shown in **Figure 6-4-7-9**, to the north of the I-481/I-690 interchange, permanent effects would result from alterations to the road alignment and the addition of an auxiliary lane along southbound I-481, which would be re-designated as I-81 under this alternative. The construction of this lane would involve the placement of fill in 0.08 acres of a common reed-dominated wetland (see Wetland 4 in **Figure 6-4-7-9** and **Appendix I-2**) of low ecological value located near the I-481/I-690 interchange, as indicated in **Table 6-4-7-10**.

As shown in **Figure 6-4-7-12**, to the north of Wetland 6, 0.015 acres of permanent effects would occur to Wetland 8 as a result of widening a highway embankment in its vicinity. Wetland 8 is associated with common reed dominated channel and a ditch. As shown in **Figure 6-4-7-12**, north of Wetland 8, an existing culvert would be extended within Wetland 9 (tributary to North Branch of Ley Creek), resulting in a permanent wetland effect of 0.004 acres. In summary, permanent effects are estimated at 0.304 acres within wetlands of the I-481 East Study Area.

As indicated in **Table 6-4-7-11**, **Figure 6-4-7-13**, and **Figure 6-4-7-14**, within the I-481 North Study Area, a total of 0.63 acres of the Mud Creek wetland complex would be permanently affected by the Community Grid Alternative. Effects would occur to 0.58 acres of common reed wetlands associated with Wetland 10 due to the conversion of the northeastern quadrant interchange to the new travel lanes of I-81, construction of noise barriers in the vicinity of the interchange, and culvert extension work located in the northern portion of this study area (see Wetland 10m and 10o [in **Figure 6-4-7-14** and **Appendix I-2**]). As indicated in **Table 6-4-7-11**, a total of 0.04 acres of permanent effect would be within open water associated with Mud Creek.

Table 6-4-7-11
Permanent Wetland Effects in the I-481 North Study Area under the Community Grid Alternative

Wetland Identification	Vegetated (acres)	Open Water (acres)	Total (acres)
Mud Creek	0.00	0.04	0.04
10 (consisting of 10a through 10x)	0.58	0.00	0.58
13 (consisting of 13a and 13b)	0.01	0.00	0.01
Total	**0.59**	**0.04**	**0.63**

Notes: Mud Creek and Wetland 10 are part of the same wetland complex. They are presented separately to differentiate between vegetated wetlands versus open water of Mud Creek
Source: Parsons (October 2020).

As part of the preliminary design, efforts have been made to avoid wetlands where possible. These efforts have included adding a three-span, 385-foot-long bridge and several hundred feet of retaining wall along both southbound and northbound I-81 in the I-481 North Study Area. This design change minimizes the effects to water resources by limiting permanent effects to 0.59 acres of wetland and 0.04 acres of surface water. As part of efforts to avoid and minimize effects to wetlands, ramp alignments and proposed detention basins were moved to areas outside of wetlands where feasible.

The wetland effects indicated in **Table 6-4-7-10** and **6-4-7-11** include considerable efforts to minimize effects through an iterative process of design refinements. As design advances, refinements would continue to be implemented, as practicable, to avoid and reduce permanent effects on wetlands where reasonable. During construction, BMPs would be employed to reduce permanent effects to wetlands located in close proximity to the construction areas, as discussed below.

Compliance with Executive Order 11990

Under EO 11990, Federal actions (where effects to wetlands are unavoidable) require a "finding" that there are no practicable alternatives to the proposed construction in wetlands and that the proposed action includes all practical means to reduce harm to wetlands.

The Community Grid Alternative has been carefully studied with respect to its effects on wetlands. As described above, design refinements (i.e., addition of a bridge and changes in the locations of ramps and stormwater basins) have been made to avoid and minimize effects to wetlands. However, the Community Grid Alternative involves unavoidable permanent effects to 0.96 acres (0.89 acres vegetated and 0.07 acres of surface water) of freshwater wetlands due to lane extensions, interchange reconfigurations, and placement of noise walls. Unavoidable temporary effects to wetlands would occur to approximately 0.72 acres of vegetated wetlands and 0.08 acres of open water as described below in **Construction Effects**. This work is necessary to fulfill the purpose and need of the Project, which is to address major structural and operational deficiencies, and other non-standard features within the Project Area along I-81 and I-690.

As described above, the Community Grid Alternative was designed to minimize and avoid effects to wetlands. The measures to minimize harm to the wetlands include compensatory mitigation for the temporary and permanent disturbances during construction in accordance with the joint mitigation rule (*Federal Register* dated April 10, 2008, 73 FR 19594 through 19705). Coordination with the USACE and NYSDEC is ongoing (as identified in **Mitigation**, below) and effects to USACE and NYSDEC-regulated wetlands are described in the sections below. Based upon the above considerations, it is determined that the Community Grid Alternative includes all practicable measures to minimize harm to wetlands that may result from such use.

Regulatory Jurisdiction and Permitting

United States Army Corps of Engineers

Figure 6-4-7-19 through **Figure 6-4-7-36** show the WOTUS regulated by USACE within the Project Area. Of the 132.79 acres of wetlands delineated within the Project Area, 132.66 acres are anticipated to be under the jurisdiction of the USACE. Wetlands 11 (0.1 acres) and 12 (0.02 acres) are the only wetlands that are not expected to be under the jurisdiction of USACE because they are non-adjacent wetlands (i.e., not connected to WOTUS).

All of the permanent wetland effects under the Community Grid Alternative, 0.96 acres (vegetated wetlands 0.89 acres and open waters 0.07 acres) outlined above and in **Table 6-4-7-13,** are expected to be under the jurisdiction of USACE. As discussed below in **Construction Effects**, the 0.96 acres of permanent effects as a result of the Community Grid Alternative would require an individual Section 404 permit and Section 401 Water Quality Certification for the permanent placement of dredged or fill materials into WOTUS, including wetlands. As described above, these permanent effects would occur in the I-481 East and I-481 North Study Areas. There would be no permanent effects to WOTUS or surface waters in the Central Study Area (see **Figure 6-4-7-20** through **Figure 6-4-7-22**) or to surface waters of the I-481 South Study Area (see **Figure 6-4-7-23**).

As described in **Section 6-4-7.4.5**, NYSDOT is currently coordinating with USACE on the mitigation for these permanent effects to anticipated USACE wetlands.

New York State Department of Environmental Conservation

Figure 6-4-7-37 through **Figure 6-4-7-54** show the wetlands regulated by the NYSDEC within the Project Area. **Table 6-4-7-12** shows the anticipated NYSDEC jurisdiction of each wetland under Article 15 “Protection of Waters” and Article 24 “Freshwater Wetlands” regulations. Of the 132.79 acres of wetlands delineated within the Project Area, approximately 100.60 acres are expected to be under the jurisdiction of NYSDEC. The remaining 32.19 acres of wetland delineated within the Project Area are not expected to be under the jurisdiction of NYSDEC.

Table 6-4-7-12
Anticipated NYSDEC Jurisdiction

Study Area	Article 15 "Protection of Waters"	Article 24 "Freshwater Wetlands"	Article 15 & Article 24	No Anticipated Jurisdiction
Central	Ley Creek/Wetland 1c, & Onondaga Creek (includes Ont. 66-12-12-P 154-4 portion)/Wetlands 16a & 16b	Wetlands 1a, 1b, 1d, & 1e	--	--
I-481 South	--	--	--	Trib. to Butternut Creek (Ont. 66-11-P 26-37-6-13) & City Line Brook
I-481 East	--	Wetlands 2a, 2j, 3a, 3b, 3d, 3g, 3h, 3i, 3j, 3k, 3m, 3n, 3p, 4a, Wetland 5, Wetlands 6c & 6e, & Wetlands 6a, 6b, 6d, 7, & 9a	Meadow Brook/Wetland 2d & 2l, Butternut Creek/Wetland 2e, Wetland 2f, & Butternut Creek/Wetland 2g & 2h	Wetlands 2e, 3e, 3l, 3o, 6f, & 8, , Wetland 2i, Wetland 2m, Wetland 4b, Wetland 9b
I-481 North	Mud Creek/Wetlands 10k, 10l, 10m, 10o, & Beartrap Creek/Wetland 15b, 15c, & 15f	Wetlands 10r & 14, Wetland 10s & 10t	Mud Creek/Wetland 10j & 10u, & Beartrap Creek/Wetland 15e	Wetlands 10p, 10x, 11, 12, 13a, 13b, 15a, 15d, South Branch Pine Grove Brook/Wetland 10a & 10b, Pine Grove Brook/Wetland 10c & 10d, Mud Creek/Wetlands 10n, 10v, & 10w, Wetland 10e, Wetland 10f & 10g, Ont. 66-11-11-13/Wetland 10h & 10i, Wetland 10q

Notes: Wetlands mapped by NYSDEC are regulated under Article 24 of the ECL. Wetlands directly adjacent to mapped wetlands are also considered Article 24 wetlands, however wetlands connected to NYSDEC-mapped wetlands via culverts are not considered. Wetlands directly adjacent to mapped wetlands are also considered Article 24 wetlands, however wetlands connected to NYSDEC-mapped wetlands via culverts are not considered jurisdictional." Jurisdiction of each wetland will be confirmed during NYSDEC's review of the Wetland Delineation Report.

Table 6-4-7-13 indicates the NYSDEC-mapped wetlands and NYSDEC classifications associated with the wetlands delineated in the I-481 East and North Study Areas and the permanent effects to each wetland under the Community Grid Alternative. All of the permanent wetlands effects under the Community Grid Alternative, 0.35 acres (vegetated wetlands 0.29 acres and open waters 0.06 acres) are expected to be under the jurisdiction of NYSDEC. As discussed below in **Construction Effects**, the 0.35 acres of permanent effects as a result of the Community Grid Alternative would require Article 15 and/or Article 24 permits. A Section 401 Certification for these permanent effects would be required under federal regulations, as described above, issued by NYSDEC. These permanent effects would occur in the I-481 East and I-481 North Study Areas. There would be no permanent effects to NYSDEC-regulated wetlands or surface waters in the Central Study Area (see **Figure 6-4-7-38** through **Figure 6-4-7-40**) or to surface waters in the I-481 South Study Area (see **Figure 6-4-7-41**).

Table 6-4-7-13
Permanent Wetland Effects by NYSDEC Map Identification Number and Classification under the Community Grid Alternative

Wetland Identification	NYSDEC Wetland Identification	NYSDEC Wetland Class	Vegetated (acres)	Open Water (acres)	Total (acres)
2h, 2j	SYE-23	II	0.205	0.002	**0.207**
4a	SYE-21	II	0.08	0.02	**0.10**
Mud Creek	BRE-18†, CIC-16, CIC-17	II	0.00	0.04	**0.04**
Total	--	--	**0.29**	**0.06**	**0.35**

Notes: NYSDEC jurisdictional wetlands under Article 24 are those that are mapped or directly connected to a NYSDEC-mapped wetland.
Wetlands listed in this table are regulated under Article 24 of the ECL. Class I wetlands are considered to be of the highest quality/value and state Class IV wetlands are considered to be of the lowest quality/value.
Source: Parsons (October 2020).

As indicated in **Table 6-4-7-14,** approximately 110.11 acres of NYSDEC-regulated freshwater wetland adjacent area are present within the Project Area. Following construction, previous paved areas would be restored using soil restoration techniques and planting native plants, where possible, as per the landscape restoration plan that would be developed for this alternative.

Table 6-4-7-14
Approximate Effects to NYSDEC-Regulated Freshwater Wetland Adjacent Area under the Community Grid Alternative

Study Area	Existing Approximate Adjacent Area (acres)	New Impervious Pavement Effects (acres)	Pervious Cut/Fill (acres)
Central	2.77	0.00	0.00
I-481 South	0.00	0.00	0.00
I-481 East	87.46	1.51	4.59
I-481 North	19.87	0.71	2.12
Total	**110.10**	**2.22**	**6.71**

Notes: The NYSDEC-regulated freshwater wetlands adjacent area is a 100-foot area extending from the freshwater wetland boundary (including impervious and pervious surfaces) or to the edge of pavement, whichever comes first.[98] The acreages presented herein are calculated on the basis of the wetland boundaries that were mapped or delineated as part of this Project (see **Appendix I-2**, "I-81 Viaduct Project: Wetland Delineation and Surface Waters Assessment Summary") that are also NYSDEC-mapped wetlands. Note that the freshwater wetland adjacent area described above also includes the acreage calculations of the terrestrial ecological communities from **Section 6-4-8**.

In the I-481 East Study Area, as shown in **Figure 6-4-7-42** through **Figure 6-4-7-48**, NYSDEC-regulated freshwater wetland adjacent area that is currently pervious (primarily maintained lawn area) would be permanently affected by the addition of 1.51 acres of pavement. In addition, 4.59 acres of pervious cut/fill would be conducted for lane expansion, construction of the proposed detention

98 As directed in comments from Tracy A. Elizabeth, Regional Permit Administrator (NSYDEC) to Angelo Trichilo, P.E. Deputy Chief Engineer, Acting Director, Office of Environmental, New York State Department of Transportation (NYSDOT) on the DDR/DEIS dated March 4, 2021 and September 13, 2021.

basins (0.63 acres), and the construction of the noise barrier walls in the I-481 East Study Area. Of this 4.59 acres of cut/fill, the southbound off-ramp at Exit 3 would widen from one to two lanes and then transition to four lanes as it approaches Route 5, resulting in 3.15 acres of pervious cut/fill within the freshwater wetland adjacent area of Wetland 2.

Within the I-481 North Study Area, 0.71 acres of currently pervious (primarily maintained lawn area) would be permanently affected by the addition of pavement and noise barrier walls and 2.12 acres would be permanently affected by cut/fill (for lane expansion and 0.73 acres of detention basins) (see **Figure 6-4-7-50** through **Figure 6-4-7-54**).

In most instances, the NYSDEC-regulated freshwater wetland adjacent areas are associated with low value habitat in terrestrial cultural ecological communities (e.g., mowed areas), particularly maintained right-of-way, and pavement associated with transportation infrastructure. These areas provide limited buffer attributes (e.g., quality vegetation and soils for water absorption) to the NYSDEC-regulated wetlands.

The Community Grid Alternative would require an Article 24 "Freshwater Wetlands" permit from NYSDEC to conduct temporary or permanent activities on wetlands or adjacent areas that have not been specifically exempted from regulation (6 CRR-NY 663.3(e)).

As described in **Section 6-4-7.4.5**, NYSDOT is coordinating with NYSDEC in developing a preliminary mitigation plan.

Surface Waters

Effects from Stormwater

An analysis of the existing and proposed drainage conditions was undertaken, with a focus on water quality and quantity, and the effects of the Community Grid Alternative on surface waters were analyzed using the FHWA's "Pollutant Loadings Analysis" (FHWA-RD-88-006) and "Toler Analysis" (USGS-MDPW-003) methodologies. **Appendix I-4** presents the results of the Pollutant Loading Analysis. **Table 6-4-7-15** summarizes the results of the stream impact analysis portion of the FHWA's Pollutant Loading Analysis. The analyses are conservative, as they assume that the runoff enters the receiving waterbody directly, without any treatment or passing through infrastructure.

Under the Community Grid Alternative, two new stormwater trunk lines would collect stormwater runoff and discharge it to outfalls (one 96-inches, the other 42-inches in diameter) on opposite banks of Onondaga Creek near Wallace Street, between the Herald Place Bridge and the ramp connecting West Street to eastbound I-690 (see **Figure 6-4-7-3**). This would reduce the volume of runoff flowing to the combined sewer system, decrease the frequency and magnitude of overflow events, and help Onondaga County meet the mandate in the ACJ. The new stormwater system would also include BMPs such as hydrodynamic stormwater treatment units and infiltration/detention basins, which would improve stormwater quality prior to it entering the stormwater trunk lines. As described in **Section 5.5.3**, the total storage volume of each infiltration/detention basin BMP would reflect the volume required for 24-hour extended detention of the post-developed 1-year, 24-hour storm event. The hydrodynamic units would be sized to meet the water quality target volume, which was calculated using the post-developed 1-year, 24-hour storm event. The NYSDEC storage volume requirements for the 10-year storm and 100-year storm were used as the design volume for the infiltration/detention basin BMPs, indicating that they would be able to treat a large volume of the stormwater from the

Project Area. Under the current drainage system, the stormwater enters the combined sewer system and is treated by Metro during low-flow conditions, but untreated stormwater and sanitary sewage are discharged into Onondaga Creek during high flow conditions. The level of treatment provided to stormwater by Metro under low-flow conditions does not mitigate for the increased pollutant loading that occurs during CSO events. While stormwater would no longer be treated at Metro and only a portion of the stormwater runoff volume would be treated by stormwater management BMPs, the separate storm drainage system would improve water quality by reducing CSO events.

These pollutant loading analyses were conservative in assuming that neither the No Build Alternative nor the Community Grid Alternative would provide any treatment of runoff for water quality. Thus, any improvements to water quality indicated by the FHWA Pollutant Loading Analysis or the Toler Analysis would represent improvements over the No Build Alternative due to a reduction in transportation right-of-way under the Community Grid Alternative.

Table 6-4-7-15 indicates the results of the stream impact analysis portion of the FHWA's Pollutant Loading Analysis. FHWA's Pollutant Loading Analysis is a quantitative procedure for estimating the magnitude and frequency of occurrence of in-stream concentrations, on a watershed scale, of pollutants caused by stormwater runoff, namely copper, lead, zinc, total organic carbon, chemical oxygen demand, nitrate + nitrite nitrogen, total kjeldahl nitrogen, phosphorus, total suspended solids, and volatile suspended solids. Similarly, the Toler Analysis estimates the effects of chloride on surface waters, resulting from applications of highway deicing salts within the watershed. Paved right-of-way is the primary variable in these methodologies that demonstrate differences in pollutant concentrations between alternatives. These methodologies are applied on a watershed scale and focus on the entire right-of-way, rather than on the area of disturbance that was evaluated for the runoff discussion presented in **Chapter 5, Transportation and Engineering Considerations**.

Central Study Area:

The Central Study Area would consist of 152.7 acres of impervious surface under the No Build Alternative. Under the Community Grid Alternative, the amount of impervious highway ROW in the Central Study Area (144.3 acres) would decrease by 8.4 acres or 5.5 percent when compared with the No Build Alternative. Potential beneficial effects from this decrease are assessed below. The majority of the Central Study Area is within or on the border of the Clinton/Lower Main Interceptor Sewer combined sewershed (see **Figure 6-4-7-58**). The exception is the northern portion of the study area, which is on the border of the Hiawatha Regional Treatment Facility combined sewershed, and the portion of the study area immediately adjacent to Onondaga Creek where the storm and sanitary sewers have been separated. Within the Central Study Area, there are four active (CSO-080, CSO-021, CSO-020, and CSO-066) and two inactive combined sewer outfalls (CSO-022 and CSO-065) along Onondaga Creek in the immediate vicinity of the study area, and one active outfall along Ley Creek upstream of the study area (CSO-074). These outfalls would remain operational under the Community Grid Alternative, as described below.

The Project would be designed with entirely separate stormwater runoff conveyance and treatment systems and would not contribute to the combined sewer flows. Instead, a new stormwater runoff conveyance system would discharge runoff from the study areas directly to receiving surface waters. The total runoff to the existing combined sewer system and the county sanitary sewer treatment facility would be substantially reduced, decreasing the likelihood of combined sewer overflows. In addition, the proposed storm sewer system would update the City of Syracuse's drainage infrastructure to current design standards and improve the safety of flood prone areas, including the existing locations with known drainage issues, such as at the I-81 underpass at Butternut Street, West Street near I-690, and the northbound I-81 to eastbound I-690 ramp. In addition, the new storm sewer trunk line has been designed to accommodate the 50-year storm event as compared to the normal 10-year storm event standard. The higher storm event standard would provide for resiliency for increased storm events as well as provide for additional future capacity. The proposed BMPs would provide both runoff reduction and water quality improvement for the stormwater entering the stormwater trunk. As a result, the Community Grid Alternative would be consistent with the Save the Rain initiative and the ACJ's mandate to reduce stormwater entering the combined sewer system, and it would have an overall beneficial effect on water quality in Onondaga Creek when compared to the No Build Alternative.

The results of the Toler and FHWA Pollutant Loading analyses (see **Table 6-4-7-15**), conducted without treatment by BMPs (which would occur in the case of the Community Grid Alternative) or treatment by Metro (which would occur in the case of the No Build Alternative), indicate that the reduction in impervious road *surface* within the Central Study Area would result in pollutant loading approximately 4.5 percent lower than the No Build Alternative within the immediate study area and 0.01 percent lower when scaled to the full contributing drainage area. The reduction in road surface under the Community Grid Alternative would result in lower stormwater runoff volumes, and thus lower mass loading of pollutants. The Toler Analysis showed that chloride loading to Lower Onondaga Creek and Onondaga Lake on an annual basis would be approximately 9.4 percent higher within the study area because the Community Grid Alternative would introduce 3.6 more highway miles that would require deicing.

The chloride concentration in Onondaga Lake in 2013, as measured by Onondaga County Department of Water Environment Protection's Ambient Monitoring Program, ranged from 355 to 643 mg/L.[99] Thus, according to the Toler Analysis, the Central Study Area under the Community Grid Alternative would contribute a 9.4 percent increase in the immediate study area and a 0.022 percent increase when scaled to the full contributing drainage area. Based on 2013 data, this increase would result in concentrations ranging from 355.1 to 643.1 mg/L. The USEPA chronic toxicity water quality criteria concentration of chloride, for the majority of aquatic species, is 230 mg/L, while the acute toxicity concentration is 860 mg/L.[100] Both high and low concentrations of chloride have effects on diversity and community structure of aquatic invertebrates and may influence reproduction of aquatic organisms.[101] Since stormwater BMPs do not remove chloride from stormwater, the Community Grid Alternative would result in higher chloride concentration within Onondaga Lake when compared with the No Build Alternative, in which chloride is already elevated above the chronic toxicity water quality criteria; under both alternatives, chloride concentration would be below the acute toxicity concentration. Therefore, the increase in chloride concentration in Onondaga Lake as a result of the Community Grid Alternative is not expected to result in significant adverse effects to the Lake.

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99 http://www.ongov.net/wep/archive-amp-data-sets.html

100 https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

101 http://dx.doi.org/10.1016/j.scitotenv.2014.12.012

Table 6-4-7-15
Community Grid Alternative
Summary Estimate Results of Stream Impact Assessment

SUMMARY ESTIMATE RESULTS OF STREAM IMPACT ANALYSIS WITHOUT BMPs, Once in 3 Year Stream Pollutant Concentration mg/L[1]																			
Study Area					Central Study Area			I-481 South Study Area			I-481 East Study Area: Northern Region			I-481 East Study Area: Southern Region[2]			I-481 North Study Area[3]		
Receiving Waterbody					Onondaga Lake			Middle Onondaga Creek			North-Branch Ley Creek			Butternut Creek			Mud Creek		
Pollutant	**Soluble Fraction[4]**	**Acute Criteria[5]**	**Thresh-old Effect Level[6]**	**Assumed BMP Removal Efficiency Rate[7]**	**No Build[8]**	**Build No BMPs**	**Build With BMP Treatment Using Assumed Removal Rate**	**No Build**	**Build No BMPs**	**Build With BMP Treatment Using Assumed Removal Rate**	**No Build**	**Build No BMPs**	**Build With BMP Treatment Using Assumed Removal Rate**	**No Build**	**Build No BMPs**	**Build With BMP Treatment Using Assumed Removal Rate**	**No Build**	**Build No BMPs**	**Build With BMP Treatment Using Assumed Removal Rate**
Total Organic Carbon (TOC)	-	0.000	0.000	-	27	52	52	74	74	74	65	66	66	31	32	32	74	74	74
Chemical Oxygen Demand (COD)	-	0.000	0.000	-	123	238	238	336	336	336	295	299	299	142	145	145	336	339	339
Nitrate + Nitrite Nitrogen (NO2+3)	-	0.000	0.000	-	0.82	1.59	1.59	2.24	2.24	2.24	1.97	1.99	1.99	0.95	0.97	0.97	2.24	2.26	2.26
Total Kjeldahl Nitrogen (TKN)	-	0.000	0.000	-	1.98	3.83	3.83	5.40	5.40	5.40	4.73	4.80	4.80	2.28	2.32	2.32	5.40	5.45	5.45
Phosphorus (PO4-P)	-	0.000	0.000	40	0.433	0.84	0.50	1.180	1.180	0.71	1.034	1.049	0.63	0.498	0.508	0.30	1.180	1.191	0.71
Total Suspended Solids (TSS)	-	0.000	0.000	80	154	297	59.31	419	419	83.81	367	373	74.51	177	180	36.06	419	423	84.54

Table 6-4-7-15 (cont'd)
Community Grid Alternative
Summary Estimate Results of Stream Impact Assessment

Pollutant	Soluble Fraction[4]	Acute Criteria[5]	Thresh-old Effect Level[6]	Assumed BMP Removal Efficiency Rate[7]	No Build[8]	Build No BMPs	Build With BMP Treatment Using Assumed Removal Rate	No Build	Build No BMPs	Build With BMP Treatment Using Assumed Removal Rate	No Build	Build No BMPs	Build With BMP Treatment Using Assumed Removal Rate	No Build	Build No BMPs	Build With BMP Treatment Using Assumed Removal Rate	No Build	Build No BMPs	Build With BMP Treatment Using Assumed Removal Rate
Volatile Suspended Solids (VSS)	-	0.000	0.000	80	42	81	16.29	115	115	23.02	101	102	20.47	49	50	9.90	115	116	23.22
Copper (Cu)	0.4	0.021	0.045	80	0.023	0.045	0.01	0.064	0.064	0.01	0.056	0.057	0.01	0.027	0.027	0.01	0.064	0.064	0.01
Lead (Pb)	0.1	0.103	0.450	80	0.043	0.084	0.02	0.118	0.118	0.02	0.103	0.105	0.02	0.050	0.051	0.01	0.118	0.119	0.02
Zinc (Zn)	0.4	0.374	0.785	80	0.142	0.275	0.05	0.388	0.388	0.08	0.340	0.345	0.07	0.164	0.167	0.03	0.388	0.392	0.08

Notes:

1. Concentrations are estimated using the percent changed between the No Build Alternative and the Community Grid Alternative from FHWA. This percent change is then applied to water quality data from nearby monitoring locations collected by Onondaga County Department of Water Environment Protection. Onondaga County Department WEP data: http://www.ongov.net/wep/archive-amp-data-sets.html and FHWA methodology: https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-b.pdf
2. Copper, lead, and zinc water quality data was not available in the vicinity of this study area. Data from Ley Creek at Park Street was used as representative of the East Study Area, southern region due to similarity in stream characteristics and similarity in other water quality parameters.
3. Copper, lead, and zinc water quality data was not available in the vicinity of this study area. Data from Ley Creek at Park Street was used as representative of the North Study Area due to similarity in stream characteristics and similarity in other water quality parameters.
4. Soluble fraction taken from the FHWA methodology: https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/4-5-b.pdf
5. United States Environmental Protection Agency. The acute criteria indicate the highest concentration of specific pollutants or parameters in water that are not expected to pose a significant risk to the majority of species. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table
6. United States Environmental Protection Agency Nationwide Urban Runoff Program. The threshold effect level indicates the concentration from a short storm surge that would result in the mortality of the most sensitive individual of the most sensitive species. https://www3.epa.gov/npdes/pubs/sw_nurp_vol_1_finalreport.pdf
7. New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf
8. The Central Study Area for the Community Grid Alternative is smaller and contains less impervious area than that of the Viaduct Alternative, thus the differences between **Tables 6-4-7-6** and **6-4-7-14.**

Although the total lane miles would increase under the Community Grid Alternative, the total impervious area in the Central Study Area would be reduced; restoration of open areas within the NYSDOT ROW would be designed so that no more than 35 percent of these areas would be constructed as impervious surfaces. The reduction in impervious area outside of the highway lanes but within the NYSDOT ROW could lead to a reduction in chloride applications, a benefit to water quality not indicated by the Toler Analysis. Additionally, while stormwater would no longer be treated at Metro and only a portion of the stormwater runoff volume would be treated by stormwater management BMPs, the overall benefit of the separate storm drainage system would further improve water quality in a way not indicated by the FHWA analysis, by reducing CSO events.

The FHWA Pollutant Loading analyses indicated that even without BMPs, projected in-stream concentrations of copper, lead, and zinc would be lower under the Community Grid Alternative than under the No Build Alternative. Water quality data collected in Onondaga Lake by Onondaga County WEP in 2013 shows the following average concentrations: - 0.0035 mg/L for copper, 0.002 mg/L for lead, and 0.0053 mg/L for zinc. Under the Community Grid Alternative, estimated concentrations decrease by 0.01 percent resulting in similar concentrations. These concentrations would not exceed the USEPA acute criteria of 0.021 mg/L, 0.103 mg/L and 0.374 mg/L, respectively, and would be below the USEPA (NURP) suggested threshold level of 0.045 mg/L, 0.450 mg/L, and 0.785 mg/L, respectively, suggesting a low potential to pose a risk to aquatic organisms[102] (see **Table 6-4-7-15**).

Stormwater BMPs that would be utilized in the study area (which would be designed during final design) would have a target removal rate of 80 percent of TSS,[103] and thus the metals that attach to these particles would be removed from the stormwater as well. Therefore, pollutant loadings of lead, zinc, and copper to Onondaga Lake would be lower than projected by the FHWA Pollutant Loading analysis, resulting in concentrations in Onondaga Lake that would be below the USEPA acute criteria concentrations. Therefore, the Community Grid Alternative would result in beneficial effects to Onondaga Lake through the reduction in pollutant loading due to stormwater runoff and would not have significant adverse effects on the lake as a result of increased chloride concentration.

I-481 South Study Area:

In the No Build Alternative, the I-481 South Study Area would consist of 49.3 acres of impervious surface. The Community Grid Alternative would also result in an impervious area of 49.3 acres. The I-481 South Study Area is not within a CSO sewershed. All of the project elements that would occur within the I-481 South Study Area would be within the NYSDOT ROW.

The results of the FHWA Pollutant Loading analysis, conducted without BMPs, indicates that because the impervious area does not change between the No Build and the Community Grid Alternatives, there would be no change to the pollutant loadings from the I-481 South Study Area on an annual and mean event basis. Chloride loading to Middle Onondaga Creek on an annual basis would be approximately 4.2 percent higher compared with that under the No Build Alternative, due to an increase of 40.6 miles of highway that would need deicing. When scaled to the full drainage area, the Community Grid Alternative would only increase chloride loads by 0.26 percent compared to the No

102 https://www3.epa.gov/npdes/pubs/sw_nurp_vol_1_finalreport.pdf

103 New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf

Build Alternative. The chloride concentration in Onondaga Creek at Dorwin Avenue in 2012 and 2013, as measured by Onondaga County Department of Water Environment Protection's Ambient Monitoring Program, ranged from 69.3 to 338 mg/L.[104] Thus, according to the Toler Analysis, the I-481 South Study Area under the Community Grid Alternative would contribute a 4.2 percent increase in the immediate study area and a 0.26 percent increase when scaled to the full contributing drainage area. Based on 2012 and 2013 data, this increase would result in concentrations ranging from 69.5 to 339 mg/L. The USEPA chronic toxicity water quality criteria concentration of chloride, for the majority of aquatic species, is 230 mg/L, while the acute toxicity concentration is 860 mg/L.[105] Both high and low concentrations of chloride have effects on diversity and community structure of aquatic invertebrates and may influence reproduction of aquatic organisms.[106] Since stormwater BMPs do not remove chloride from stormwater, the Community Grid Alternative would result in higher chloride concentration within Onondaga Creek when compared with the No Build Alternative, in which chloride is already elevated above the chronic toxicity water quality criteria; under both alternatives, chloride concentration would be below the acute toxicity concentration. Therefore, the increase in chloride concentration in Onondaga Creek as a result of the Community Grid Alternative is not expected to result in significant adverse effects to Onondaga Creek.

The projected in-stream copper, lead, and zinc concentrations are the same between the Community Grid Alternative and the No Build Alternative, due to both alternatives having the same impervious area (see **Table 6-4-7-15**). Water quality data collected by Onondaga County WEP in 2012 and 2013 shows the following average concentrations for Onondaga Creek at Dorwin Avenue: - < 0.0025 mg/L for copper, < 0.002 mg/L for lead, and 0.0072 mg/L for zinc. Under the Community Grid Alternative, the percent of impervious area is unchanged so the estimated concentrations under this alternative remain the same as above. These concentrations would not exceed the USEPA acute criteria of 0.021 mg/L, 0.103 mg/L, and 0.374 mg/L, respectively, and would be below the USEPA NURP suggested threshold level of 0.045 mg/L, 0.450 mg/L and 0.785 mg/L, respectively, suggesting a low potential to pose a risk to aquatic organisms.[107]

Stormwater BMPs that would be utilized in the I-481 South Study Area (which would be designed during final design) would have a target removal rate of 80 percent of TSS,[108] and thus the metals that attach to these particles would be removed from the stormwater as well. Therefore, pollutant loadings of lead, zinc, and copper to Middle Onondaga Creek would be lower than projected by the FHWA Pollutant Loading analysis, resulting in concentrations in Middle Onondaga Creek that would likely be further below the USEPA acute criteria concentrations. Therefore, the Community Grid Alternative would result in beneficial effects to Middle Onondaga Creek through the reduction in pollutant loading due to stormwater runoff.

104 http://www.ongov.net/wep/archive-amp-data-sets.html

105 https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

106 http://dx.doi.org/10.1016/j.scitotenv.2014.12.012

107 Ibid

108 New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf

I-481 East Study Area:

Currently, the I-481 East Study Area consists of 5.7 acres of impervious surface in the northern section and 65.3 acres of impervious surface in the southern section. The Community Grid Alternative for the northern section would result in approximately 6.3 acres of impervious area, an increase of 0.6 acres, or 10.5 percent. For the southern section, the Community Grid Alternative would result in approximately 68 acres of impervious area, an increase of 2.7 acres, or 4.1 percent (see **Appendix I-4**). The I-481 East Study Area is not within a CSO sewershed. With the exception of the bridge over the CSX tracks, all of the Project elements in this study area would be within the NYSDOT ROW.

The results of the Toler and FHWA Pollutant Loading analyses, conducted without BMPs, indicate that the greater amount of impervious surface from the additional auxiliary lanes would result in an approximately 7.2 percent higher pollutant loadings in the immediate study area or 0.22 percent higher pollutant loadings when scaled by the full contributing drainage area and an approximately 40 percent higher chloride loading on an annual basis within the immediate study area or 1.2 percent higher chloride loading when scaled by the full contributing drainage area within the northern section of the I-481 East Study Area. The additional auxiliary lanes in the southern section of the East Study Area would result in an approximately 2.8 percent higher pollutant loadings in the immediate study area or 0.01 percent higher pollutant loadings when scaled by the full contributing drainage area and an approximately 22.6 percent higher chloride loading on an annual basis within the immediate study area or 0.11 percent higher chloride loading when scaled by the full contributing drainage area.

For the North Branch Ley Creek, the chloride concentration in 2012 and 2013, as measured by Onondaga County Department of Water Environment Protection's Ambient Monitoring Program at Park Avenue, ranged from 59.5 to 1,320 mg/L.[109] Thus, according to the Toler Analysis, the northern section of the East Study Area under the Community Grid Alternative would contribute a 40 percent increase in the immediate study area or a 1.2 percent increase when scaled to the full contributing drainage area. Based on 2012 and 2013 data, this increase would result in concentrations ranging from 60.2 to 1,336 mg/L. For the southern section of the East Study Area, the chloride concentrations in Butternut Creek in 1999 and 2000, as presented by Central New York Regional Planning and Development Board at Limestone Creek at North Manlius Road, ranged from 44.3 to 63 mg/L.[110] Thus, according to the Toler Analysis, the southern section of the East Study Area under the Community Grid Alternative would contribute a 22.6 percent increase in the immediate study area or a 0.11 percent increase when scaled to the full contributing drainage area. Based on the 1999 and 2000 data, this increase would result in concentrations ranging from 44.4 to 63.1 mg/L. The USEPA chronic toxicity water quality criteria concentration of chloride, for the majority of aquatic species, is 230 mg/L, while the acute toxicity concentration is 860 mg/L.[111] Both high and low concentrations of chloride have effects on diversity and community structure of aquatic invertebrates and may influence reproduction of aquatic organisms.[112] Since stormwater BMPs do not remove chloride from stormwater, the Community Grid Alternative would result in higher chloride concentration within Ley Creek or Butternut Creek when compared with the No Build Alternative, in which chloride is

109 http://www.ongov.net/wep/archive-amp-data-sets.html

110 http://www.cnyrpdb.org/oneidalake/pdf/SOLWFinal/SOLW_2003.pdf

111 https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

112 http://dx.doi.org/10.1016/j.scitotenv.2014.12.012

already elevated above the chronic toxicity water quality criteria for the northern section but would remain below the chronic toxicity water quality criteria for the southern section. Chloride concentrations would be below the acute toxicity concentration for southern section but would remain above for the northern section. Therefore, the increase in chloride concentrations in Ley Creek and Butternut Creek as a result of the Community Grid Alternatives is not expected to result in significant adverse effects to Ley Creek or Butternut Creek.

For the northern section, water quality data collected by Onondaga County WEP in 2012 and 2013 shows the following average concentrations for Ley Creek at Park Street: < 0.0036 mg/L for copper, < 0.002 mg/L for lead, and 0.0124 mg/L for zinc. Based on the percent change between the Community Grid Alternative and the No Build Alternative, the pollutant loadings for copper, lead, and zinc, without BMPs, would result in estimated in-stream concentrations of 0.0036 mg/L and 0.002 mg/L, and 0.012 mg/L, respectively, for the Community Grid Alternative, a slight increase from the concentrations under the No Build Alternative. These concentrations would not exceed the USEPA acute criteria of 0.021 mg/L, 0.103 mg/L, and 0.374 mg/L, respectively, and would also be below the USEPA NURP suggested threshold level of 0.045 mg/L, 0.450 mg/L and 0.785 mg/L, respectively, suggesting a low potential to pose a risk to aquatic organisms.[113] For the southern section, water quality data for these pollutants was not found for Butternut Creek. Ley Creek data was used instead. Both Ley Creek and Butternut Creek are Class C streams, and they both have similar pollutant data for nitrate and nitrite, total kjeldahl nitrogen, total phosphorus, and total suspended solids; therefore metals concentrations from Ley Creek are used for estimating in-stream concentrations for the southern section of the I-481 East Study Area. Water quality data collected by Onondaga County WEP in 2012 and 2013 shows the following average concentrations for Ley Creek at Park Street: < 0.0036 mg/L for copper, < 0.002 mg/L for lead, and 0.0124 mg/L for zinc. Based on the percent change between the Community Grid Alternative and the No Build Alternative, the pollutant loadings for copper, lead, and zinc, without BMPs, would result in estimated in-stream concentrations of 0.0036 mg/L and 0.002 mg/L, and 0.012 mg/L, respectively, for the Community Grid Alternative, a slight increase from the concentrations under the No Build Alternative. These concentrations would not exceed the USEPA acute criteria of 0.021 mg/L, 0.103 mg/L, and 0.374 mg/L, respectively, and would also be below the USEPA NURP suggested threshold level of 0.045 mg/L, 0.450 mg/L and 0.785 mg/L, respectively, and would not pose a risk to aquatic biota in the unnamed tributary of North Branch Ley Creek.

Stormwater BMPs that would be utilized in the study area (which would be designed during final design) would have a target removal rate of 80 percent of TSS,[114] and thus the metals that attach to these particles would be removed from the stormwater as well. Therefore, pollutant loadings of lead, zinc, and copper to Butternut Creek and the unnamed North Branch Ley Creek tributary would be lower than projected by the FHWA Pollutant Loading analysis. The Community Grid Alternative would result in beneficial effects to Butternut Creek and the North Branch Ley Creek tributary through the reduction in pollutant loading due to stormwater runoff.

113 Ibid.

114 New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf

I-481 North Study Area:

Under the No Build Alternative, the I-481 North Study Area consists of 54.6 acres of impervious surface. The Community Grid Alternative would result in 59.2 acres of impervious surfaces, an increase of 4.6 acres, or 8.4 percent. The I-481 North Study Area is not within a CSO sewershed. All of the project elements that would occur are within the NYSDOT ROW. The results of the Toler and FHWA Pollutant Loading analyses, conducted without BMPs, indicate that the increase in the amount of impervious surface from the reconstructed ramps would result in an approximately 5.2 percent higher pollutant loading and an approximately 27.2 percent higher chloride loading on an annual basis to Mud Creek in the immediate study area or a 0.36 percent higher pollutant loading and 1.9 percent higher chloride loading when scaled to the full drainage area, compared with the loadings under the No Build Alternative. The chloride concentration in Mud Creek in 2012 and 2013, as measured by Onondaga County Department of Water Environment Protection's Ambient Monitoring Program at River Buoy #212, ranged from 25.2 to 142 mg/L.[115] Thus, according to the Toler Analysis, the I-481 North Study Area under the Community Grid Alternative would contribute a 27.2 percent increase in the immediate study area and a 1.9 percent increase when scaled to the full contributing drainage area. Based on 2012 and 2013 data, this increase would result in concentrations ranging from 25.7 to 145 mg/L. The USEPA chronic toxicity water quality criteria concentration of chloride, for the majority of aquatic species, is 230 mg/L, while the acute toxicity concentration is 860 mg/L.[116] Both high and low concentrations of chloride have effects on diversity and community structure of aquatic invertebrates and may influence reproduction of aquatic organisms.[117] Since stormwater BMPs do not remove chloride from stormwater, the Community Grid Alternative would result in higher chloride concentration within Onondaga Creek compared with the No Build Alternative, but chloride concentration would be below the chronic toxicity water quality criteria as well as the acute toxicity concentration. Therefore, the increase in chloride concentration in Mud Creek as a result of the Community Grid Alternative is not expected to result in significant adverse effects to Mud Creek.

Water quality data collected by Onondaga County WEP in 2012 and 2013 shows the following average concentrations for Ley Creek at Park Street: < 0.0036 mg/L for copper, < 0.002 mg/L for lead, and 0.0124 mg/L for zinc. Water quality data for these pollutants was not found for Mud Creek. Ley Creek data was used instead. Both Ley Creek and Mud Creek are Class C streams. They both have similar pollutant data for total kjeldahl nitrogen, total phosphorus, and total suspended solids; therefore metals concentrations from Ley Creek are used for estimating in-stream concentrations of the North Study Area. Based on the percent change between the Community Grid Alternative and the No Build Alternative, the pollutant loadings for copper, lead, and zinc, without BMPs, would result in estimated in-stream concentrations of 0.0036 mg/L and 0.002 mg/L, and 0.012 mg/L, respectively, for the Community Grid Alternative, a very slight increase from the concentrations under the No Build Alternative. These concentrations would not exceed the USEPA acute criteria of 0.021 mg/L, 0.103 mg/L, and 0.374 mg/L, respectively, and would also be below the USEPA NURP suggested threshold level of 0.045 mg/L, 0.450 mg/L and 0.785 mg/L, respectively, suggesting a low potential to pose a

115 http://www.ongov.net/wep/archive-amp-data-sets.html

116 https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

117 http://dx.doi.org/10.1016/j.scitotenv.2014.12.012

risk to aquatic organisms.[118] The projected in-stream copper, lead, and zinc concentrations are similar under the Community Grid Alternative and the No Build Alternative, despite the differences in impervious areas (see **Table 6-4-7-15**). This is because the calculated concentration is based largely on the ratio of average annual streamflow to the runoff flow rate from the mean storm, a ratio that changes by less than one from the No Build Alternative to the Community Grid Alternative. Stormwater BMPs that would be utilized in the I-481 North Study Area (which would be designed during final design) would have a target removal rate of 80 percent of TSS,[119] and thus the metals that attach to these particles would be removed from the stormwater as well. Therefore, pollutant loadings of lead, zinc, and copper to Mud Creek would be lower than projected by the FHWA Pollutant Loading analysis. The Community Grid Alternative would result in beneficial effects to Mud Creek through the reduction in pollutant loading due to stormwater runoff.

With the implementation of BMPs, the Community Grid Alternative would not adversely affect aquatic organisms in any of the study areas when compared with the No Build Alternative. The increases in impervious area in all study areas would be similarly mitigated with the implementation of BMPs, and stormwater runoff volumes entering the receiving waters would not increase, as the BMPs would, at a minimum, treat the runoff reduction volumes of each study area (volumes and calculations provided in **Chapter 5, Transportation and Engineering Considerations**). In accordance with the NYS Stormwater Management Design Manual, BMPs would have target phosphorus removals of at least 40 percent, and TSS removals of at least 80 percent, which would result in improved quality of stormwater runoff. In the Central Study Area, stormwater would no longer be treated at Metro and only a portion of the stormwater runoff volume would be treated by stormwater management BMPs, but the overall benefit of the separate storm drainage system would improve water quality by reducing CSO events. Pollutant loadings of lead, zinc, and copper to all streams in the study areas would also be lower than projected by the FHWA Pollutant Loading analysis as a result of BMPs. Because these pollutants are typically filtered out with the sediment (TSS), BMPs designed in accordance with the 2015 New York State Stormwater Management Design Manual may remove nitrogen from stormwater, although target removal rates vary depending on the practice and are typically not quantified in the Design Manual. The water quality treatment provided by the implementation of these BMPs would result in reductions to the pollutant loadings described above. BMPs would be designed during final design, and the actual reductions in pollutant concentrations would be calculated.

A combination of hydrodynamic stormwater treatment units and infiltration/detention basins would be installed within the Central Study Area and would treat the 1-year rainfall event or 6.7 acre-feet of stormwater runoff (refer to **Chapter 5** for calculations and proposed locations). The final locations for the BMPs would be determined during final design and would be positioned within the landscape in accordance with the Design Manual, in such a way that would provide the required water quality treatment, runoff reduction, and peak flow attenuation. In addition to the water quality BMPs, green infrastructure practices are proposed for the Central Study Area and would be further refined during the final design stage. Practices under consideration include vegetated swales, tree planting, tree pits,

118 Ibid.

119 New York State Department of Environmental Conservation. New York State Stormwater Management Design Manual. http://www.dec.ny.gov/docs/water_pdf/swdm2015entire.pdf

stormwater planters, rain gardens, and conservation of existing trees. BMPs in the I-481 South Study Area would treat 3.1 acre-feet of runoff and would primarily include dry swales with check dams (refer to **Chapter 5** for calculations and proposed locations). Green infrastructure practices under consideration for the I-481 South Study Area include vegetated swales and infiltration practices such as bioretention basins. Stormwater treatment in the I-481 East Study Area would be achieved through the construction of detention and infiltration basins designed to treat 0.5 acre-feet of stormwater runoff (refer to **Chapter 5** for calculations and proposed locations). Green infrastructure practices constructed in the I-481 South Study Area could include vegetated swales and infiltration practices.

In the I-481 North Study Area, the Community Grid Alternative would include the treatment of 1.4 acre-feet of stormwater runoff using detention and infiltration basins, dry swales with check dams, and infiltration trenches (refer to **Chapter 5** for calculations and proposed locations). The final locations for the BMPs would be determined during final design and would be positioned within the landscape in accordance with the Design Manual, in such a way that would avoid existing stream channels (to prevent habitat degradation) and provide the required water quality treatment, runoff reduction, and peak flow attenuation. Additional treatment could be provided through additional infiltration practices and vegetated swales. These BMPs provide additional infiltration and water quality improvements not achieved under the No Build Alternative and not considered in the FHWA Pollutant Loading Analysis of the Community Grid Alternative. Most of the Central Study Area is within or on the border of the Clinton/Lower Main Interceptor Sewer combined sewershed (see **Figure 6-4-7-58**). The exception is the northern portion of the study area, which is on the border of the Hiawatha Regional Treatment Facility combined sewershed, and the portion of the study area immediately adjacent to Onondaga Creek where the storm and sanitary sewers have been separated. As described in the Existing Conditions section, within the Central Study Area, there are four active CSO outfalls (CSO-080, CSO-021, CSO-020, and CSO-066) and two inactive combined sewer outfalls (CSO-022 and CSO-065) along Onondaga Creek in the immediate vicinity of the study area, and one active outfall along Ley Creek upstream of the study area (CSO-074). These outfalls would likely remain operational under the Community Grid Alternative and would continue to contribute their current loads of stormwater and pollutants to Onondaga and Ley Creeks.

Stormwater runoff from the Central Study Area would not discharge to the City's combined sewer system; design of the new roadways' drainage system would prevent any contribution to the current combined sewer, in accordance with the ACJ and the Save the Rain initiative. A new stormwater runoff conveyance system would discharge runoff directly to the receiving surface water of Onondaga Creek (see **Chapter 5**). This direct discharge of stormwater flows into Onondaga Creek and would represent a change from the existing condition; currently, within the study area CSO-020 and CSO-021 discharge into the creek during high flow events. With the installation of the stormwater trunk lines, stormwater discharges into Onondaga Creek would occur during all stormflow events. However, these discharges would have improved water quality as compared to the CSO events due to the separation of the stormwater and sanitary sewers and the implementation of BMPs in the watershed. CSO events would be unlikely to occur under the operation of the stormwater trunk lines, providing a substantial improvement to water quality downstream of outfalls CSO-020 and CSO-021. Therefore, the stormwater trunk lines would have an overall beneficial effect on the water quality in Onondaga Creek and Onondaga Lake compared to the No Build Alternative. The potential effect of the stormwater trunk lines on the bed and banks of Onondaga Creek is discussed below.

With the implementation of BMPs designed to treat stormwater quantity and quality in accordance with the Design Manual and the SWPPP prepared in accordance with SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001), stormwater runoff from the Community Grid Alternative would be improved as compared to the No Build Alternative, would not result in adverse effects to Onondaga Creek or Onondaga Lake, and would not result in the failure of these surface waters to meet the water quality criteria for their designated water quality classification. The new stormwater trunk lines and BMPs would be the property of Onondaga County, and NYSDOT and Onondaga County would continue to coordinate the associated ownership and maintenance roles.

Effects on Beds and Banks of Surface Waters

Table 6-4-7-16 summarizes the temporary and permanent effects of the Community Grid Alternative on surface waters in the study areas.

Table 6-4-7-16
Effects to Surface Waters from the Community Grid Alternative

Central Study Area – Onondaga Creek				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
Existing	226	1,563	54,709	1.26
Design	226	1,563	54,709	1.26

Summary of Effects	**Quantity**	**Description**
Length of Permanent Stream Impact (lf)	0	
Area of Permanent Stream Impact (sf)	0	
Area of Permanent Stream Impact (acres)	0	
Length of Temporary Stream Impact (lf)	65	
Area of Temporary Stream Impact (sf)	2,387	Temporary effect from installation of stormwater trunk line
Area of Temporary Stream Impact (acres)	0.05	
Note: Used culvert section for Erie Blvd and W. Genesee St only, treated other bridge structures as open channel.		

Central Study Area – Ley Creek				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
Existing	0	-	3,296	0.08
Design	0	-	3,296	0.08
Summary of Effects			**Quantity**	**Description**
Length of Permanent Stream Impact (lf)			0	
Area of Permanent Stream Impact (sf)			0	
Area of Permanent Stream Impact (acres)			0	
Length of Temporary Stream Impact (lf)			0	
Area of Temporary Stream Impact (sf)			0	
Area of Temporary Stream Impact (acres)			0	

Table 6-4-7-16 (cont'd)
Effects to Surface Waters from the Community Grid Alternative

East Study Area – Unnamed North Branch Ley Creek Tributary				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
Existing	124	50	496	0.01
Design	134	40	400	0.01

Summary of Effects	**Quantity**	**Description**
Length of Permanent Stream Impact (lf)	10	Reduction in Channel Section due to culvert extension
Area of Permanent Stream Impact (sf)	96	Reduction in Channel Area due to culvert extension
Area of Permanent Stream Impact (acres)	0.01	Reduction in Channel Area due to culvert extension
Length of Temporary Stream Impact (lf)	15	Apron
Area of Temporary Stream Impact (sf)	150	Apron
Area of Temporary Stream Impact (acres)	0.003	Apron

North Study Area – Mud Creek				
Existing				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
Ont. 66-11-10	1,108	3,327	62,731	1.44
Ont. 66-11-10-2	493	1,740	43,665	1.00
Ont. 66-11-10-4	423	1,969	9,046	0.21
Ont. 66-11-10-1A (SB-PGB-1)	257	126	885	0.02
Ont. 66-11-10-1B (PGB-1)	316	57	572	0.01
Totals	**2,597**	**7,219**	**116,900**	**2.68**
Design				
	Culvert (lf)	**Stream Channel (lf)**	**Stream Area (sf)**	**Stream Area (acres)**
Ont. 66-11-11	1,039	3,396	63,723	1.46
Ont. 66-11-10-2	395	1,838	46,605	1.07
Ont. 66-11-10-4	423	1,969	9,046	0.21
Ont. 66-11-10-1A (SB-PGB-1)	321	95	662	0.02
Ont. 66-11-10-1B (PGB-1)	337	35	354	0.01
Totals	**2,516**	**7,333**	**120,390**	**2.76**

Summary of Effects	**Quantity**	**Description**
Length of Permanent Stream Impact (lf)	81	Increase in Channel Section
Area of Permanent Stream Impact (sf)	1,873	Increase in Channel Area
Area of Permanent Stream Impact (acres)	0.043	Increase in Channel Area
Length of Temporary Stream Impact (lf)	0	Erosion protection on west side of Culvert N-5 following lengthening, erosion protection on the north side of N-21 following lengthening, widening of Mud Creek to minimum 15'. Erosion protection on either end of culvert N-22. Erosion protection at western end of culvert in Pine Grove Brook.
Area of Temporary Stream Impact (sf)	0	
Area of Temporary Stream Impact (acres)	0.00	

Central Study Area:

While no permanent loss (fill) of waters is proposed within the Central Study Area (see **Table 6-4-7-15**), the work to construct replacement structures (including the removal of existing structures) below the ordinary high water of the Onondaga Creek (a WOTUS) would require a Section 404 Permit. The Community Grid Alternative would require an Individual Section 404 Permit and Section 401 Certification for its combined effects to WOTUS, including wetlands. Based on the field survey of Ley Creek and a review of the Project plans for the Central Study Area, the Project is not expected to result in direct effects to Ley Creek. Additionally, based on the field survey of Onondaga Creek at the Bear Street bridge and a review of the Project plans for the Central Study Area, the Project is not expected to result in direct effects to Onondaga Creek at Bear Street.

The new separated drainage system consisting of large diameter storm sewer trunk lines along I-81 and I-690 would be subject to permit requirements by the NYSDEC and USACE. To obtain the required permits, a detailed hydraulic analysis would be conducted during final design to demonstrate that the project development would not result in adverse impacts to the downstream watercourses and any designated floodplains. The new 96-inch (8-foot) outfall for the proposed stormwater trunk line servicing the area east of Onondaga Creek would be located in the existing bank of Onondaga Creek and would not have a permanent effect on the surface water area or stream length, as described in **Table 6-4-7-16**. The invert of the outfall would be approximately 1.6 feet above the Onondaga Creek stream bed at the outfall location. During low flow conditions, the top of the water surface is at 1.9 feet above the creek bed and therefore the pipe would always contain some backwater for a short distance. The top of the outfall would be below the mean high-water line. Therefore, discharge from the outfall would not result in a head drop and thus would have minimal erosive impact on the stream bed and the stone wall banks. The proposed outfall would be located on an outside meander bend of Onondaga Creek, at an angle that directs the flow from the outfall towards the far bank, which would reduce the potential for erosion of the bed and banks around the outfall structure. Additional protection from erosion would be provided by the construction of an energy-dissipating structure at the outfall. The energy dissipating structure would be designed during final design and would meet the requirements of the New York State Department of Transportation's Geotechnical Design Procedure: Bank and Channel Protective Lining Design Procedures.

Similarly, the new 42-inch (3.5-foot) outfall for the proposed stormwater trunk line servicing the area west of Onondaga Creek would be located in the existing embankment of the Onondaga Creek floodplain, on the opposite shore from the 96-inch outfall. There would be no permanent effect on the surface water area or stream length because of the new outfall, as described in **Table 6-4-7-7**. The invert of the outfall would be between 15 and 20 feet above the Onondaga Creek stream bed at the outfall location (exact location to be determined during final design). Protection from erosion would be provided by the construction of an energy-dissipating structure and bank stabilization measures. The energy dissipating structure would be designed during final design and would meet the requirements of the New York State Department of Transportation's Geotechnical Design Procedure: Bank and Channel Protective Lining Design Procedures.

The velocities and hydraulics of discharges from the stormwater trunk lines would be determined during final design, along with the details of protection measures needed to stabilize the creek bed, banks, and floodplain. The stormwater trunk lines would discharge stormwater runoff directly to Onondaga Creek, but the proposed stormwater BMPs located upstream of the creek would improve the quality of the stormwater and reduce peak flows as compared to the quality and quantity of stormwater that is discharged to Onondaga Creek during a CSO event under the No Build Alternative. The proposed stormwater BMPs would also meet the ACJ's water quality objectives. Therefore, the stormwater trunk lines would have beneficial effects to Onondaga Creek water quality and peak flows, as compared to the No Build Alternative.

There are six bridges over Onondaga Creek in the Central Study Area. There are no known hydraulic issues associated with the existing retaining walls or bridge piers, and changes to these bridges would require a hydraulic analysis. As part of this alternative, the existing retaining walls and piers would be retained or reconstructed as necessary, and any replacement piers and retaining walls would be placed farther back from the creek than the existing piers and retaining walls. As a result, no adverse effects on hydraulics are anticipated, as the existing conditions would be either maintained or improved.

I-481 South Study Area:

A NYSDEC jurisdictional creek, City Line Brook, is located just to the west of the I-81/I-481 interchange and is partially fed by surface waters within the I-481 South Study Area. A NYSDEC jurisdictional unnamed tributary to Butternut Creek is located adjacent to I-481 near proposed Noise Barrier 9. No work is proposed in the creek and effects would be limited to construction of the noise barrier up-gradient of the stream, on the existing highway embankment, and would be temporary in nature (see **Section 6-4-7.4.2 Construction Effects**). Therefore, no further review of effects on stream bed and banks in this study area is required.

I-481 East Study Area:

Currently, the existing triple barrel culvert in the I-481 East Study Area (E-11) is 124 linear feet, and the unnamed tributary to North Branch of Ley Creek within the I-481 East Study Area is 50 linear feet, or 496 square feet of surface water area (see **Table 6-4-7-17a**). During the site reconnaissance and stream surveys, up to one foot of water was observed in the North Branch of Ley Creek tributary to the east of the culvert, while to the west of the culvert the channel was poorly defined, heavily armored with gravel at the culvert inlet, and dominated by common reed. The existing culvert was rated as having "No AOP" according to the NAACC coarse screening protocol, and the NAACC fine rating system determined that the structure presents a moderate barrier to AOP. For the Community Grid Alternative, each pipe of the existing triple barrel culvert structure would be extended 10 feet downstream into the unnamed tributary to North Branch Ley Creek, creating 134 linear feet of additional culvert and reducing the creek length (within the study area) to 40 linear feet, which would reduce the surface water area to 400 square feet (see **Figure 6-4-7-12** and **Table 6-4-7-16**). The extension of the culvert would be a permanent effect to the North Branch Ley Creek tributary. The proposed culvert would have the same NAACC ratings as the existing culvert. Following the extension of the culvert, the new embankment would be stabilized with erosion control matting, to prevent sediment from entering the creek, and planted with native riparian and upland vegetation to prevent invasive species from colonizing and to further stabilize the embankment. The work to construct the replacement structures (including the removal of existing structures) below the ordinary high water of the North Branch Ley Creek tributary (a WOTUS) would require a Section 404 Permit.

Table 6-4-7-17a
Culvert Restoration Proposed under the Community Grid Alternative – I-481 East Study Area

Culvert ID	Description	Project Effect	Mitigation Opportunities
E-10	32" RCP with wing walls and a projecting inlet. Connects Wetland 2j to Butternut Creek through I-481 and Route 5 interchange. No AOP.	Extend culvert by 10 feet into the upstream wetland area.	• Repair damaged metal culvert during culvert extension work. • Plant disturbed areas with native species. • Replace culvert with open bottom culvert.
E-31	24" CMP culvert with wing walls mitered to the slope. Connects Wetland 4a under I-481 to Wetland 4b and an Unnamed Butternut Creek Tributary (Ont. 66-11-P 26-37-6-2-c). Reduced AOP.	Extend culvert by 20 feet into the upstream wetland area.	• Repair damaged metal culvert during culvert extension work. • Plant disturbed areas with native species. • Replace culvert with open bottom culvert.
E-41	One 65" CMP culvert, two 54" HDPE culverts, one concrete headwall. Outlets into Wetland 9b – unnamed North Branch Ley Creek tributary. No AOP.	Extend culvert by 10 feet into downstream wetland area.	• Repair damaged metal culvert during culvert extension work. • Plant disturbed areas with native species. • Replace culverts with open bottom culverts.

Farther south within the I-481 East Study Area, culvert E-20 would be extended westward, upstream into the wetland adjacent to Meadow Brook, to accommodate the expansion of the northwestern interchange ramps. Currently, the existing 32-inch RCP culvert structure is 140 linear feet; the proposed culvert would be 150 linear feet, with about 88 square feet of effect to the downstream wetland (included in the wetland effect calculations and not the stream effect calculations).

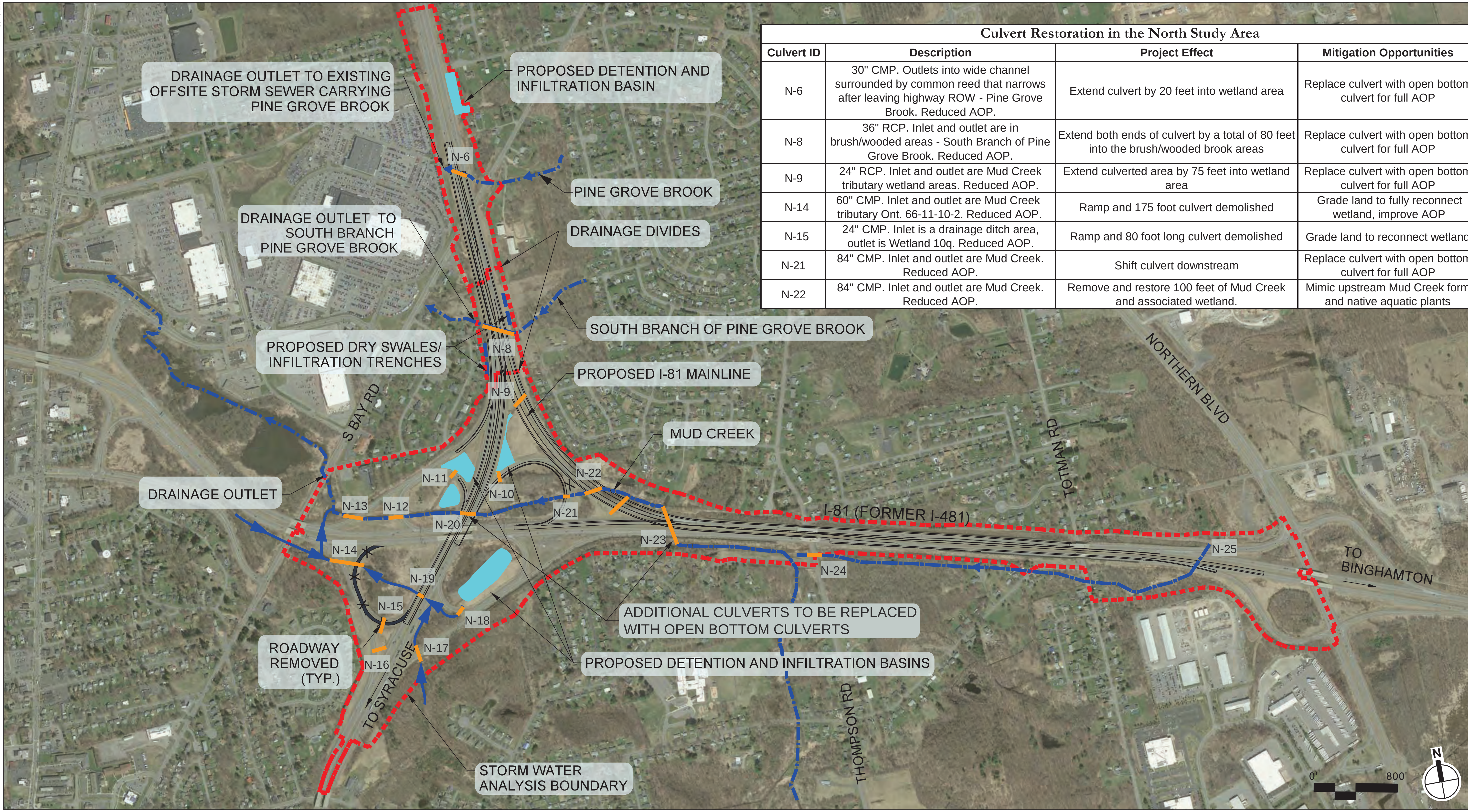
The Community Grid Alternative would require an Individual Section 404 Permit and Section 401 Certification for the combined effects to WOTUS (including wetlands).

I-481 North Study Area:

Within the I-481 North Study Area, the Community Grid Alternative would require construction of infrastructure in the vicinity of NYSDEC-regulated Mud Creek. Additionally, as described above, noise barriers are proposed in the vicinity of Beartrap Creek. To avoid and minimize effects to Mud Creek within the northeast portion of the I-481/I-81 interchange, the Project would include retaining walls and a bridge over a portion of the creek that is located in the design footprint. In addition, the Project would require numerous culvert replacements, extensions, and removals, as described in **Table 6-4-7-17b** and **Figure 6-4-7-60**, and below.

The Community Grid Alternative includes the removal of a 100-foot culvert, N-22, and restoration of part of Mud Creek between highway ramps. N-22 connects a 743 linear foot (0.26 acres) reach of Mud Creek (upstream) to a 53 linear foot (0.01 acres) reach (downstream). The proposed work also includes moving culvert N-21 (currently 119 linear feet, proposed to be 125 linear feet) downstream and the subsequent restoration of the previously culverted area. This work would result in the restoration of 113 linear feet of Mud Creek, connected to the upstream portion, and would form a contiguous 909 linear feet, or 0.31-acre, reach of Mud Creek. The shifting of culvert N-21 downstream and 6 linear foot increase in length would result in a decrease in length to the section of Mud Creek between N-21 and N-20, which is currently 839 linear feet (0.40 acres) and would be reduced to 795 linear feet (0.38 acres). This would result in a 44 linear foot decrease in length, or 0.02 acres of surface water.

3.16.22



Culvert Restoration in the North Study Area

Culvert ID	Description	Project Effect	Mitigation Opportunities
N-6	30" CMP. Outlets into wide channel surrounded by common reed that narrows after leaving highway ROW - Pine Grove Brook. Reduced AOP.	Extend culvert by 20 feet into wetland area	Replace culvert with open bottom culvert for full AOP
N-8	36" RCP. Inlet and outlet are in brush/wooded areas - South Branch of Pine Grove Brook. Reduced AOP.	Extend both ends of culvert by a total of 80 feet into the brush/wooded brook areas	Replace culvert with open bottom culvert for full AOP
N-9	24" RCP. Inlet and outlet are Mud Creek tributary wetland areas. Reduced AOP.	Extend culverted area by 75 feet into wetland area	Replace culvert with open bottom culvert for full AOP
N-14	60" CMP. Inlet and outlet are Mud Creek tributary Ont. 66-11-10-2. Reduced AOP.	Ramp and 175 foot culvert demolished	Grade land to fully reconnect wetland, improve AOP
N-15	24" CMP. Inlet is a drainage ditch area, outlet is Wetland 10q. Reduced AOP.	Ramp and 80 foot long culvert demolished	Grade land to reconnect wetlands
N-21	84" CMP. Inlet and outlet are Mud Creek. Reduced AOP.	Shift culvert downstream	Replace culvert with open bottom culvert for full AOP
N-22	84" CMP. Inlet and outlet are Mud Creek. Reduced AOP.	Remove and restore 100 feet of Mud Creek and associated wetland.	Mimic upstream Mud Creek form and native aquatic plants

Stormwater Analysis Boundary
Creek or Brook
Detention Pond
Culvert to be Removed or Modified

Community Grid Alternative:
Culvert Restoration
I-481 North Study Area

Table 6-4-7-17b
Culvert Restoration Proposed under the Community Grid Alternative – I-481 North Study Area

Culvert ID	Description	Project Effect	Mitigation Opportunities
N-6	30" RCP. Outlets into wide channel filled with common reed. Common reed density reduces outside of highway right of way (ROW) - Pine Grove Brook. Reduced AOP.	Extend culvert by 20 feet into wetland area.	• Plant disturbed areas with native species. • Replace culvert with open bottom culvert.
N-8	36" RCP. Inlet and outlet are in brush/wooded areas - South Branch of Pine Grove Brook. Reduced AOP.	Extend both ends of culvert by a total of 80 feet.	• Plant disturbed areas with native species.
N-9	24" RCP. Inlet and outlet are Mud Creek tributary wetland areas. Reduced AOP.	Extend culverted area by 75 feet into wetland area.	• Plant disturbed areas with native species. • Replace culvert with open bottom culvert for full AOP.
N-14	60" CMP. Inlet and outlet are Mud Creek tributary Ont. 66-11-10-2. Reduced AOP.	Ramp and 175-foot culvert demolished.	• Grade land to fully reconnect Wetlands 10p and 10q and improve AOP. • Plant disturbed areas with native species.
N-15	24" CMP. Inlet is a drainage ditch area; outlet is Wetland 10q. Reduced AOP.	Ramp and 80-foot-long culvert demolished.	• Grade land to reconnect Wetland 10q to unnamed wetland. • Plant disturbed areas with native species.
N-16	24" RCP. Outlets to drainage ditch connected to Wetland 10q by culvert N-15. Reduced AOP.	Remove and restore 100 feet of Mud Creek.	• Mimic upstream Mud Creek form and native riparian and aquatic plants.
N-21	84" CMP. Inlet and outlet are Mud Creek. Reduced AOP.	Shift culvert downstream	• Plant disturbed areas with native species. • Replace culvert with open bottom culvert. • Restored creek (about 26 feet) would mimic upstream Mud Creek form and native riparian and aquatic plants.
N-22	84" CMP. Inlet and outlet are Mud Creek. Reduced AOP.	Remove and restore 100 feet of Mud Creek and associated Wetland 10o.	• Restore creek to mimic upstream Mud Creek form and native riparian and aquatic plants.

A new bridge and retaining wall would be constructed between the existing N-23 and N-21 culverts and would avoid construction in any portions of Mud Creek; however, the embankments for the new structures would be close to the existing channel. To provide an adequate vegetated buffer between the embankment and Mud Creek, the stream channel would likely have to be redesigned with a gentle meander; geometry would be determined during final design. The current channel appears to be stable with little evidence of excess erosion or deposition. Thus, the geometry and sediment composition of the restored channel would mimic that of the upstream stream channel, where possible. The floodplain would be enhanced through the establishment of native plantings. This vegetated buffer would be created along the creek edges to protect it from highway runoff and to stabilize the toe of the retaining wall and the bridge footings. A minimum buffer width of 50 feet is recommended. The new alignment and final planting details will be determined during final design. Additional mitigation opportunities could include channel enhancements within the restored channel reach such as placement of small woody debris and emergent vegetation to provide microhabitats. Thus, the Community Grid Alternative would have a beneficial effect on the habitat connectivity of Mud Creek.

Although not required to be replaced under the Community Grid Alternative, the replacement of existing culvert N-23, farther upstream on Mud Creek, with open bottom culvert (of equal length) would allow for passage of aquatic organisms and small terrestrial species as an additional mitigation measure to unavoidable effects to surface waters and NYSDEC regulated wetlands. The culvert is currently in a stable condition and has a "Reduced AOP" score on the NAACC coarse rating protocol. It is classified as a minor barrier to AOP through the NAACC fine rating system, with a score of 0.68.

A highway drainage pipe, Outfall-N-2, that currently outlets to a steep wet-weather-flow tributary to Mud Creek would be relocated, requiring the construction of a new drainage pipe. The outlet from this new pipe would be stabilized to prevent erosion. Depending on the final location of the drainpipe, a regenerative stormwater conveyance or step-pool design form could be appropriate for the new drainage channel to Mud Creek, to provide energy dissipation, prevent erosion, and settle sediments before they reach the creek. The design details would be determined during final design.

Pine Grove Brook, a tributary to Mud Creek, would be affected under the Project by the extension of two culverts at two of its branches, N-6 and N-8 (see **Table 6-4-7-17b**). N-6 is currently 293 linear feet and connects two segments of Pine Grove Brook that are 36 linear feet (upstream) and 22 linear feet (downstream) within the I-481 North Study Area (total 0.01 acres of surface water). Under the proposed condition, the culvert would be increased by 21 linear feet to 314 linear feet, with a corresponding reduction of the upstream segment of Pine Grove brook to 14 linear feet within the study area and the downstream segment to 22 linear feet within the study area (total surface water area would decrease to 0.008 acres). N-8 is currently 257 linear feet and connects two segments of the South Branch of Pine Grove Brook that are 89 linear feet (upstream) and 37 linear feet (downstream) within the study area (total 0.02 acres of surface water). Under the proposed condition, the culvert would be increased by 64 linear feet to 321 linear feet, with a corresponding reduction of the upstream segment of Pine Grove brook to 69 linear feet within the study area and the downstream segment to 25 linear feet within the study area (total surface water area would decrease to 0.015 acres). A hydraulic analysis would be performed during final design to ensure that the design would have no adverse effects on the stream bed and banks and to establish additional protections for these areas if needed. All disturbed areas would be stabilized following construction and planted with appropriate native plantings.

The Community Grid Alternative would also require the extension of a drainpipe, Outfall-N-1, which connects a highway drainage feature to a dry swale. Additionally, existing culvert N-9, which connects two low-lying areas that drain to Mud Creek, would be extended by 75 feet, and would drain into one of the infiltration/detention basins that is proposed for the I-81/I-481 interchange. These disturbances would create an opportunity to strategically plant native species in and around the dry swale, infiltration/detention basin, and highway embankment. In all areas that would be disturbed by the Project, the landscape restoration plan would include planting of native species that would provide riparian habitat and bank stabilization.

The proposed demolition of one of the exit ramps in the I-481 North Study Area would also allow for the removal of two existing culverts that connect Wetland 10 to adjacent wetland areas. Culvert N-14 is currently 234 linear feet, 98 linear feet of which would be removed, while the entirety of the

80 linear foot culvert N-15 would be removed. This would also result in an opportunity to lower the existing grade and expand the floodplain area by about 1.2 acres (87,120.00 square feet). Where possible, the disturbed area would be replanted with native plants suitable for the new elevation that could compete with invasive species currently dominant in the area. Soil restoration would be provided for locations where impervious surfaces would be removed, and it would include physical restoration methods such as tilling to loosen the compacted soil.

All new culverts in Mud Creek would meet NYSDEC standards (e.g., embedded or open bottom). The culverts would be constructed to be passable by aquatic organisms. At minimum, they would have a width at bankfull (1.25 x Bankfull width) and would be embedded at least 20 percent at the inlet. Additional wetland and surface water mitigation would include replacing existing culverts (see **Figure 6-4-7-60**) that may be impeding fish passage with those that meet the NYSDEC standard. Where possible, these culverts would have open bottoms in an effort to maintain bottom habitat within the creek. The larger width would also provide opportunity for incorporating wildlife passage (small to medium) in the culvert design.

In total, there would be net increase in surface waters totaling 81 linear feet and 0.043 acres, with no temporary effects to the surface waters. The affected areas do not all have equal habitat value, and there are many mitigation opportunities to offset the proposed temporary and permanent effects described above. The net change in the culverted length of I-481 North Study Area streams would be a decrease of 81 linear feet, and the restoration of the Mud Creek area would have a greater habitat and water quality benefit than the loss of the short sections of Pine Grove Brook described above. The work to construct the new and replacement structures (including the removal of existing structures) below the ordinary high water on the tributaries to Mud Creek (all WOTUS) would require a Section 404 Permit. The Community Grid Alternative would require an Individual Section 404 Permit and Section 401 Certification for the combined effects to WOTUS, including wetlands.

Effects on Navigation

Within the Central Study Area, Onondaga Creek is not navigable under Federal law between Erie Boulevard and Evans Street, but is navigable adjacent to Bear Street. Placement of fill or structures within Onondaga Creek for the Community Grid Alternative is anticipated to meet the requirements for authorization for Section 404 of the Clean Water Act, and the new outfalls for the stormwater trunk lines would not adversely affect navigability of the creek under Article 15 of the ECL.[120]

Despite the changes to the culverts conveying Mud Creek and its tributaries through the I-481 North Study Area (described above), the Community Grid Alternative would not adversely affect navigability of the creeks under Article 15 of the ECL. Likewise, the modification of culvert E-11 would not adversely affect navigability of the unnamed tributary to the North Branch of Ley Creek under Article 15 of the ECL. The Community Grid Alternative would not modify the remainder of the culverts in the I-481 East Study Area.

120 "Navigable waters" of the State under Article 15 means all lakes, rivers, streams and other bodies of water in the State that are navigable in fact or upon which vessels with a capacity of one or more persons can be operated notwithstanding interruptions to navigation by artificial structures, shallows, rapids or other obstructions, or by seasonal variations in capacity to support navigation. It does not include waters that are surrounded by land held in single private ownership at every point in their total area.

Ley Creek is the only Federally navigable stream within the study areas, and the I-81 bridge is the only bridge over this Federally regulated navigable water that would be modified under the Community Grid Alternative. No work in Ley Creek is proposed, and as indicated in **Chapter 5, Transportation and Engineering Considerations**, a Coast Guard Checklist is not required for the bridge work. Therefore, this alternative would have no effect on navigability under State or Federal laws.

Floodplains

The floodplains of the creeks within the study areas have been altered due to urban development. The Community Grid Alternative has been designed to conform to FHWA policies for the location and hydraulic design of highway encroachments on floodplains (23 CFR § 650) and the floodplain management criteria for New York State projects in flood hazard areas (6 NYCRR 502). By complying with these regulations, the Project would be consistent with the intent of the Standards and Criteria of the National Flood Insurance Program.

The Community Grid Alternative would not cause a substantial encroachment within any floodplains. This alternative is defined as a rehabilitation project, because it does not include any reconstruction within the floodplains that raises existing embankment elevations, does not widen an existing roadway along a stream in the flood hazard area, and does not include any new construction (or new bridges) within the flood hazard area. There is no practicable alternative that includes moving the highway outside of 100-year floodplain areas, entirely. However, any replacement piers and retaining walls needed in the Community Grid Alternative would be placed farther back from the creeks than the existing piers and retaining walls. In addition, due to the topography of the area and the elevation of the bridges over the creeks, it is anticipated that the freeboard provided below all structures at the 100-year flood would be greater than the two-foot minimum required; therefore, a hydraulic study would not be required until final design, and a Coast Guard Checklist would not be required. Since the Community Grid Alternative would not result in the construction of substantial structures within the base floodplain, it would not result in a change in the existing flood hazard areas and, therefore, the alternative would have no adverse effects on floodplains.

Central Study Area

As shown on **Figure 6-4-7-57**, the 100-year (base) floodplain occurs along Onondaga Lake, Onondaga Creek, and Ley Creek. The Community Grid Alternative would not result in the construction of substantial structures within the base floodplain or a change in the existing flood hazard area.

The Community Grid Alternative would result in an 8.4-acre reduction in impervious area, as well as the removal of infrastructure in the vicinity of the Lower Onondaga Creek floodplain through the restoration of the open areas within the highway ROW, resulting in lower amounts of impervious surface and the associated surface runoff compared with the No Build Alternative. The stormwater trunk would be constructed beneath the existing ground surface and would not impact the elevation of the floodplain. The 96-inch outfall for the stormwater trunk line servicing the area east of Onondaga Creek would be located in the existing bank of Onondaga Creek, below the mean high-water line and below the elevation of the floodplain. The new 42-inch outfall for the stormwater trunk line servicing the area west of Onondaga Creek would be located in the existing embankment of the Onondaga Creek floodplain. Downstream of the 42-inch outfall, protection of the floodplain from erosion would be provided by bank stabilization measures. Additionally, the velocity of stormwater discharge from both outfalls would be reduced by energy-dissipating structures at each outfall, which would protect the immediate and downstream floodplains from erosion. A detailed hydraulic analysis would be conducted during final design to demonstrate that the discharge from the project trunk lines would not result in adverse impacts to the Onondaga Creek floodplain. Therefore, the Community Grid Alternative would not result in adverse effects to the floodplain of the Class C creeks and lake within the Central Study Area.

I-481 South Study Area

The I-481 South Study Area is not near the base floodplain for Middle Onondaga Creek, nor any other base floodplains. Additionally, the Project would not result in a change in impervious area within the study area and four new dry swales would be constructed to manage stormwater runoff from the highway. Therefore, the Project would not encroach upon or otherwise adversely affect floodplains within the I-481 South Study Area.

I-481 East Study Area

The northern portion of the I-481 East Study Area, within the North Branch Ley Creek watershed, is not within the mapped base floodplain. The southern portion of the I-481 East Study Area is within the Butternut Creek base floodplain, as described in **Section 6-4-7.1.3**. Within the Butternut Creek watershed portion of the I-481 East Study Area, the Community Grid Alternative would have 2.7 acres more impervious surface area than the No Build Alternative including two acres in the Butternut Creek base floodplain associated with new auxiliary lanes along I-481. However, with the installation of BMPs described previously, the stormwater runoff from the increased impervious area would be adequately treated in accordance with the NYS Stormwater Management Design Manual, and the Project would not adversely affect the floodplain within the I-481 East Study Area.

I-481 North Study Area

The base floodplains of Beartrap Creek, Mud Creek, and its tributaries are within the I-481 North Study Area. New pavement associated with modification of the I-81/I-481 interchange would increase impervious coverage by 4.6 acres in the I-481 North Study Area. The Project would result in removal of fill from the floodplain in conjunction with the removal of an existing culvert and its roadway embankment, the restoration of approximately 250 feet of Mud Creek and associated floodplain reconnection and restoration efforts, and the removal of a ramp and the associated embankment in the southeast portion of the study area. Some fill in the floodplain would be needed to create the new highway embankments and the new bridge over Mud Creek and would result in modification of the floodplain. All disturbed areas would be replanted with plants suitable for the area. A floodplain analysis would be performed to ensure that the Project would not result in adverse effects to the floodplain. Additionally, the implementation of BMPs, such as those described above, would adequately treat runoff from the increased impervious area in accordance with the NYS Stormwater Management Design Manual. Thus, the Community Grid Alternative would not adversely affect the floodplain within the I-481 North Study Area.

Executive Order 11988

The Community Grid Alternative was reviewed for compliance with EO 11988, Floodplain Management, as amended by Executive Order 13690. Under EO 11988, Federal actions (in which effects to floodplains are unavoidable) require a "finding" that there are no practicable alternatives to the proposed construction in floodplains and that the proposed action includes all practical means to reduce harm to floodplains.

The Community Grid Alternative has been carefully studied with respect to its effects on floodplains. Design refinements (i.e., locating bridge piers farther from the creek than the existing structures and reducing impervious cover where possible) have been made to avoid and minimize effects to floodplains.

Additional design refinements and quantification of the total effects to floodplains shall be completed during final design and shall be in compliance with EO 11988. Based upon the above considerations, it is determined that this alternative includes all practicable measures to minimize harm to floodplains that may result from such use.

Groundwater

The Community Grid Alternative would result in a 10.66-acre reduction in impervious area within the Central Study Area, which is within the Baldwinsville Aquifer, as compared to the No Build Alternative and 1.5 fewer acres of impervious area within the I-481 South Study Area, which is not within the drainage area of an aquifer. The proposed addition of the stormwater trunk lines in the Central Study Area would not result in adverse effects to groundwater or the Baldwinsville Aquifer. The proposed action would increase impervious area in the I-481 East and I-481 North Study Areas by 2.5 and 4.6 acres, respectively. However, neither the I-481 East nor the I-481 North Study Area is within the drainage area of an aquifer, so the increased impervious surfaces would not adversely affect drinking water resources in these areas.

BMPs that would be incorporated into the Community Grid Alternative would have the potential to benefit groundwater resources through increased infiltration. BMPs that would be considered include detention basins, dry swales, and hydrodynamic flow units. With these BMPs, surface runoff would be treated and allowed to infiltrate into the groundwater system where possible, which would be beneficial to the resource.

As discussed in **Chapter 4, Construction Means and Methods**, within the Central Study Area, the new bridge construction along the portions of I-81, I-690, and ramps would require pile foundations, which could have the potential to intercept the groundwater table. Within the Baldwinsville Principal Aquifer, in the vicinity of the Ley Creek bridge construction area, groundwater was reported in borings between 3.00 and 3.75 feet below ground surface. Construction of bridge foundations would involve driving approximately 470 piles approximately 12 inches in diameter and 20 to 40 feet long. These structures would intercept the groundwater table, but groundwater is expected to be able to move around these 12-inch diameter piles without a major change to the existing flow paths. Groundwater dewatering methods during construction would be coordinated with NYSDEC and Onondaga County before any dewatering activities commence.

Therefore, the Community Grid Alternative would not result in any below ground structures that would significantly affect groundwater flow.

6-4-7.4.2 CONSTRUCTION EFFECTS

During construction, adverse effects to wetlands and surface water quality within the study areas would be minimized by the implementation of erosion and sediment controls in accordance with the 2016 New York State Standards and Specifications for Erosion and Sediment Control ("Blue Book"), the project-specific SWPPP prepared to meet the requirements of SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001), and the requirements of the NYSDOT Highway Design Manual, Chapter 8 Highway Drainage. Erosion and sediment controls to be implemented during construction would include inlet protection measures at existing stormwater inlets, sediment controls to prevent erosion and sediment from leaving the construction sites, dust control measures, spill prevention and containment measures, stabilized construction entrance/exits, and vegetative measures to stabilize exposed soils. Construction activities conducted in surface waters, including the culvert replacements and the installation of the stormwater trunk outfall, would be completed from dry land, to the maximum extent practicable. Best management measures such as turbidity curtains, cofferdams, and temporary piping or diversion of Onondaga Creek, Mud Creek, and the North Branch Ley Creek tributary would be implemented for any in-water construction activities, as necessary, to maintain stream flow and minimize increases in suspended sediment. As described in **Table 6-4-7-16**, the construction of the stormwater trunk line outfalls would result in a temporary effect to Onondaga Creek of approximately 0.05 acres. There would not be any temporary effects to Ley Creek during construction, as all work would occur outside of the creek. Likewise, there would not be any temporary effects to the Butternut Creek tributaries in the I-481 South or I-481 East Study Area due to the construction of the noise barriers, as all work would occur outside of the creek, and extra precautions for erosion and sediment controls would be set in place to protect the AA(T) water quality standard of Ont. 66-11-P 26-37-6-13. Temporary effects to the North Branch of Ley Creek would be associated with the construction of the outfall apron and would total 0.003 acres. There would be no temporary effects to streams in the I-481 North Study Area as a result of the construction of the Project. Post-construction stabilization of the stream banks would occur in the vicinity of the culvert replacement and removal activities. All disturbed areas would be stabilized with erosion control matting, to prevent sediment from entering the creek, and planted with native riparian and upland vegetation to prevent invasive species from colonizing and to further stabilize the embankment.

As presented in **Table 6-4-7-18**, temporary vegetated wetlands effects resulting from the Community Grid Alternative in wetlands would be 0.72 acres. Within the I-481 East Study Area, these temporary construction effects would occur in Wetland 2 (0.15 acres), Wetland 4 (0.16 acres), Wetland 7 (0.036 acres), and Wetland 8 (0.045 acres) for a total of approximately 0.39 acres. Within the I-481 North Study Area, temporary construction effects would occur in Wetland 10 (0.31 acres) and Wetland 13 (0.02 acres). These effects would be a result of temporary disturbances that would be required to access work areas including noise barrier locations.

Temporary open water effects would occur in Wetland 2 (0.01 acres), Wetland 4 (0.06 acres), Wetland 6 (0.003 acres), and Wetland 9 (0.01 acres) in the I-481 East Study Area only for a total of 0.08 acres. As design advances, measures would be implemented to reduce and avoid temporary fill placement in wetlands as per EO 11990. However, should temporary fill placement be unavoidable, these effects would be coordinated with the USACE and NYSDEC as the applicable responsible regulating agencies for the 0.80 acres of temporary wetland and surface water effects. These temporary effects would be included within the Section 401 and 404 permits and an Article 24 "Freshwater Wetlands" permit would be obtained from the USACE and NYSDEC, respectively, for the Project as a whole (see Permanent/Operational Effects discussion above). During construction, BMPs, including the erosion and sediment control practices described above, would be implemented to protect wetlands within the Project Area.

Table 6-4-7-18
Temporary Wetland Effects of the Community Grid Alternative

Study Area	Vegetated (acres)	Open Water (acres)	Total (acres)
Central	0.00	0.00	**0.00**
I-481 South	0.00	0.00	**0.00**
I-481 East	0.39	0.08	**0.47**
I-481 North	0.33	0.00	**0.33**
Total	**0.72**	**0.08**	**0.80**

Notes: All wetlands listed in this table are anticipated to be under USACE and NYSDEC jurisdiction and would be subject to applicable permits.
Source: Parsons (October 2020).

Any wetlands that would be temporarily affected would be restored subsequent to construction following a soil and landscape restoration plan. Restoration measures would include restoration of the grade to pre-construction conditions (or better) and the seeding and/or planting of native species, where applicable. With these measures in place, the construction of the Community Grid Alternative would not result in an adverse effect on wetlands of the Project Area.

For the construction of the new bridge piles, pre-auguring equipment would be used to reduce the duration of vibratory pile driving, which would reduce any potential effects of pile driving on groundwater resources. Additionally, the Community Grid Alternative would require limited excavation; its construction would not have a significant adverse effect on groundwater resources.

Along with measures identified above and in **Section 6-4-7.4.5,** below, the Contractor would implement standard environmental protection practices for water quality. As described in **Chapter 4, Construction Means and Methods**, NYSDOT would incorporate these practices into the construction contracts for the Community Grid Alternative including:

- The Contractor shall schedule and conduct its work to minimize soil erosion, not cause or contribute to a violation of water quality standards and prevent sedimentation on lands adjacent to or affected by the work.
- Construction of temporary soil erosion and sedimentation control measures, temporary and permanent soil stabilization, construction of drainage facilities and performance of other contract work, which will contribute to the control of erosion and sedimentation control measures.

6-4-7.4.3 INDIRECT EFFECTS

The Community Grid Alternative would have lower impervious surface area in the Central and I-481 South Study Areas, as compared with the No Build Alternative, and would result in reduced amounts of runoff from road surfaces and reduced amounts of surface runoff conveyed to storm and combined sewers. In the Central Study Area, the stormwater trunk lines would reduce demand on the combined sewer system. The integration of green infrastructure and other storm water BMPs into the alternative would further reduce peak flows to the existing stormwater drainage system and combined sewers and result in additional water quality improvement within the Central Study Area. Similarly, the use of BMPs and the potential integration of green infrastructure in the I-481 South Study Area would further improve stormwater runoff quality through treatment and would benefit surface waters in the area by providing peak flow reduction.

The runoff in the Central Study Area that does not infiltrate into the soils through the stormwater BMPs would be discharged into Onondaga Creek about 1,000 linear feet upstream of where it would be discharged during CSO events under the No Build Alternative. The new stormwater outfalls would not have a substantial effect on the creek because of the channelized nature of the creek, the reduction in stormwater runoff provided by the BMPs, and the capacity of the stream to handle this volume of runoff, as the drainage area would not change from one alternative to another. As described in **Chapter 5, Transportation and Engineering Considerations**, the 96-inch stormwater trunk line outfall and energy dissipator would be subject to permit requirements by NYSDEC and USACE. The 42-inch stormwater trunk line outfall would be located above ordinary high-water elevations and thus would not be subject to permit requirements by NYSDEC or USACE. For both outfalls, a detailed hydraulic analysis would be conducted during final design to demonstrate that the systems would not result in adverse effects to the downstream watercourses.

The Community Grid Alternative would not result in indirect adverse effects to wetlands within the Project Area.

Under the Community Grid Alternative, there would be no indirect effects to surface waters and floodplains in the I-481 North and I-481 East Study Areas due to the construction, as the implementation of stormwater BMPs for water quality and quantity treatment would result in no net increase to stormwater runoff volume entering the surface waters.

The Community Grid Alternative would largely be constructed within the footprint of existing roadways and other developed areas with existing infrastructure, and it would therefore have limited potential for indirect effects to surface waters, groundwater, or floodplains. In the I-481 North and I-481 East Study Areas, where more surface water and wetland resources are present, indirect effects of the construction would be offset by the use of stormwater BMPs and green infrastructure practices, as described above, or through mitigation actions, described below.

6-4-7.4.4 CUMULATIVE EFFECTS

No adverse cumulative effects to wetlands, surface waters, groundwater, and floodplains are anticipated as a result of the Community Grid Alternative. Improvements attributable to the watershed modifications made by the Save the Rain program would be expected regardless of any alternative chosen. Water quality monitoring completed in conjunction with the Save the Rain program has shown improvements to Onondaga Lake since the implementation of the program and this improvement is expected to continue as additional green infrastructure practices are built and the lake adjusts to the decreased pollution load from CSOs.

As described above, stormwater BMPs such as infiltration and detention basins, dry swales, and hydrodynamic stormwater treatment units would be incorporated into the Community Grid

Alternative. These BMPs, along with additional green infrastructure practices that would be chosen during the final stage of design, would result in water quality and peak flow reductions, and thus, would offset discharges from the additional impervious surfaces that would be created in the I-481 East and I-481 North Study Areas. The stormwater trunk lines described above that would be constructed in the Central Study Area would reduce the demand on the existing combined sewer system, which would result in a reduction in the number and magnitude of CSO events within the existing watershed. In combination with efforts associated with Save the Rain and stormwater management requirements for new development, the overall cumulative effects are expected to be beneficial to surface waters.

Chloride, however, is not treated by any known BMPs, so even though the modeled chloride loadings to Butternut Creek, the North Branch Ley Creek tributary, and Mud Creek are not expected to result in exceedance of the chronic toxicity level, the increased loadings over the No Build Alterative, when combined with future loadings not due to the Project, may result in an adverse effect on aquatic community structure, function, and productivity over time. The chronic toxicity criteria for chloride were developed based on a four-day exposure period. Studies have demonstrated that exposure of aquatic organisms to chloride is not limited to the winter and spring months but continues over multiple seasons as groundwater with elevated chloride concentration is discharged to streams.[121] Chloride loadings could be reduced through changes in land use outside of the highway ROW (but within the NYSDOT ROW) and through the implementation of operational BMPs such as street sweeping to remove excess road salts and/or reduced salt application rates.

Despite the increased chloride loadings, it is anticipated that the overall cumulative effect of the Community Grid Alternative would be largely beneficial to wetlands, surface waters, groundwater, and floodplains.

6-4-7.4.5 MITIGATION

Wetlands and Surface Waters

Permanent effects would occur in approximately 0.96 acres freshwater wetlands and surface waters (e.g., due to fill placement as a result of roadway and noise barrier construction) under the Community Grid Alternative (including the loss of 0.89 acres of vegetated wetlands and 0.07 acres loss of open water) (see **Table 6-4-7-19**).

Table 6-4-7-19
Project Area Mitigation for the Community Grid Alternative

Category	Permanent Effects (acres)	Mitigation Ratio	Total Mitigation (acres)
Vegetated Wetlands	0.89	1.5:1.0	1.34
Open Water	0.07	1.5:1.0	0.08

Notes: It is assumed that the NYSDEC compensatory mitigation would occur onsite. A portion of the open water effects (0.04 acres) accounts for effects to an open water stream (Mud Creek) in the I-481 North Study Area.
Source: Parsons (October 2019).

121 http://dx.doi.org/10.1016/j.scitotenv.2014.12.012

33 CFR Part 332 (Compensatory Mitigation for Losses of Aquatic Resources) describes the compensatory mitigation requirements to offset environmental losses resulting from unavoidable effects to WOTUS (including wetlands). Mitigation at a minimum one-for-one is typically required for all wetland losses that exceed 1/10 acre. For losses of streams or other open waters, compensatory mitigation should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (also see 33 CFR 332.3(e)(3)).

Assuming a 1.5-acre (compensation) to 1.0-acre wetland mitigation ratio (effects ratio), the preliminary compensatory mitigation acreage would be 1.34 acres. Mitigation for these 1.34 acres would be in the form of an in-lieu fee arrangement with a mitigation service provider approved by USACE. Mitigation for the 0.35 acres of potential NYSDEC wetlands effects would be in the form of improvements to Mud Creek (including streambed restoration, habitat connectivity, floodplain enhancements, and riparian corridor enhancements).

NYSDOT has been coordinating with the USACE and NYSDEC on possible wetland and stream mitigation options. As a result of this coordination, a conceptual mitigation plan as described below has been accepted by USACE and NYSDEC. The conceptual mitigation for wetlands and stream mitigation for the Project would occur in the I-481 North Study Area ROW where there are a number of opportunities to enhance Mud Creek and its floodplain. The primary focus of the conceptual mitigation plan involves a combination of Mud Creek channel enhancements including:

- Replacement of closed bottom culverts with open bottom culverts for improved benthic habitat enhancement and aquatic organism connectivity, and reduced stream channel constriction,
- Removal of fill associated with the existing ramp in the southwest quadrant of the I-81 interchange, along with two existing culverts, for improved floodplain habitat,
- Addition of woody debris for in-stream habitat enhancement; and
- Channel restoration/floodplain enhancement where culverts would be removed.

In areas of channel restoration, a riparian corridor would be created. This would include a number of natural features such as shelves to allow for a wide range of hydrologic and soil saturation characteristics, thus allowing for a diversity of aquatic benthic habitats. The riparian corridor would be planted with native plant species, particularly with native shrubs that could quickly become established (to provide some resistance to the existing common reed infestation in the Project vicinity). A native planting could provide a possible food source to wildlife and shade over the newly established channel.

As part of the design refinement and the wetland permitting process, the final details of the mitigation would be determined, and a detailed mitigation plan would be developed in close collaboration with the agencies. This detailed mitigation plan would be implemented as part of the construction of the Project. In addition, BMPs (e.g., silt fence, exclusion fencing) would be employed to reduce effects to wetlands and streams located in close proximity to the construction zones. With these measures in place, Project Area wetlands would retain their functions and values in keeping with the objectives of 33 CFR Part 332 (Compensatory Mitigation for Losses of Aquatic Resources). Furthermore, as described above under Executive Order 11990, the Community Grid Alternative would minimize the destruction, loss, or degradation of wetlands and would preserve and enhance the natural and beneficial values of wetlands per the goals of EO 11990. Therefore, EO 11990 would be met.

Additional mitigation proposal for surface waters (i.e., Mud Creek, Ley Creek, and Onondaga Creek) as regulated by NYSDEC and USACE would be, to the extent practicable, to establish (or enhance) a buffer of native species between the creek channel and the ROW/edge of pavement as it would slow and absorb stormwater runoff, support bank stability, and create/enhance habitat. As discussed above, where new culverts are proposed or where existing culverts would be modified or replaced, open bottom culverts would be installed to improve habitat connectivity in these locations. The restored Mud Creek reach would mimic existing, stable, upstream stream reaches. Overall, there would be permanent beneficial effects in the I-481 North Study Area in the form of an 81 linear foot increase in stream channel length and 0.08-acre increase in channel area, approximately 300 linear feet of floodplain enhancement directly adjacent to the stream, and about 1.6 acres of floodplain enhancement along the main stem of Mud Creek. An additional 2 acres of floodplain restoration along the tributary to Mud Creek is proposed for habitat improvements to benefit the Project Area.

Within Onondaga Creek, in the Central Study Area, the effect of the two new stormwater trunk line outfalls would be minimized by the creation of energy dissipators at the outfalls to reduce the potential for erosion. While, as currently proposed, no Section 404 stream mitigation is required for this work, additional restoration and enhancement activities could include stabilization of streambanks and habitat enhancements through strategic use of native plantings, erosion control matting, and rip-rap to reduce erosion and subsequent sedimentation and to improve water quality.

Stormwater

Based on the total amount of impervious area, both water quality and water quantity treatment would be required for this alternative. Calculation details for stormwater BMPs are discussed in **Chapter 5, Transportation and Engineering Considerations**. Water quality treatment for the new bridges and roadway pavements would be accommodated in infiltration or detention basins, dry swales with check dams, or infiltration trenches as space, soil conditions, and geology permit, and hydrodynamic units where space is limited, as discussed above. The locations and design of the BMPs will be finalized during final design and will meet all requirements of the NYSDEC Stormwater Management Design Manual. As a result of installing stormwater trunk lines as part of this alternative, the demand on the existing combined sewer system would be reduced, which would result in a reduction in the number and magnitude of combined sewer overflows within the existing watershed. The new stormwater line, in combination with peak flow mitigation for the increases in impervious area and water quality treatment for new paved surfaces, would result in improvements to downstream receiving waters. Stormwater BMPs and green infrastructure that are not required under this alternative would be considered as design advances and provide added benefits to the watershed not required for the Project.