



TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT

ONSITE WETLAND AND RIPARIAN REFORESTATION PLAN

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT

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1.0 PROJECT OVERVIEW

On behalf of Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams), WHM Consulting, Inc. has prepared an onsite restoration and planting plan for the pipeline facilities associated with the Leidy South Project (Project) located in Clinton and Lycoming Counties. This plan addresses the replanting of trees and shrubs associated with temporarily impacted forested riparian buffers and to Palustrine Forested (PFO) and Palustrine Scrub-Shrub (PSS) wetlands along the pipeline Right-of-Way (ROW). Tree and shrub plantings will take place outside of the permanent maintained ROW.

2.0 FORESTED AND SCRUB-SHRUB WETLANDS

Restoration of temporarily impacted wetlands associated with PFO and PSS wetlands will involve onsite replanting. After the completion of construction, wetland areas within the ROW will be restored to pre-construction contours and seeded with Ernst FACW Meadow Mix (ERNMX-122), as outlined in Attachment A, or an alternative wetland seed mix that contains similar species. After seeding, impacted PSS and PFO wetlands outside the permanent maintained ROW will be replanted with native live stakes, bare root or container tree and shrub species up to 5 feet from the pipeline centerline. In PFO impacted wetlands, only shrub species shall be planted from 5 to 15 feet of the pipeline centerline. Outside 15 feet, tree species may be planted. A summary table outlining proposed PFO and PSS impacted wetlands, their location, and proposed restoration is outlined in Attachment C – Onsite Wetland and Riparian Buffer Replanting Table. In addition, replanting areas for each pipeline facility are outlined on the provided figures.

The vegetative design of the PFO and PSS impacted wetlands outlines a combination of specific native tree and shrub species selected for different hydrologic regimes and different vegetative cover types throughout the Project. Trees and shrubs selected for the replanting were based on species identified during wetland delineations and area outlined in Table 2-1.

TABLE 2-1 - WETLAND REPLANTING SPECIES LIST			
COMMON NAME	LATIN NAME	WETLAND INDICATOR	STRATUM
Black Willow	<i>Salix nigra</i>	OBL	Tree
Silver Maple	<i>Acer saccharinum</i>	FACW	Tree
River Birch	<i>Betula nigra</i>	FACW	Tree
Red Maple	<i>Acer rubrum</i>	FAC	Tree
Black Gum	<i>Nyssa sylvatica</i>	FAC	Tree
American sycamore	<i>Platanus occidentalis</i>	FACW	Tree
Quaking Aspen	<i>Populus tremuloides</i>	FAC (EMP)	Tree
Smooth Alder	<i>Alnus serrulata</i>	OBL	Shrub
Silky Dogwood	<i>Cornus amomum</i>	FACW	Shrub
Common Ninebark	<i>Physocarpus opulifolius</i>	FACW	Shrub

Highbush Blueberry	<i>Vaccinium corymbosum</i>	FACW	Shrub
Winterberry	<i>Ilex verticillata</i>	FACW	Shrub
Red Chokeberry	<i>Aronia arbutifolia</i>	FACW	Shrub
Northern Spicebush	<i>Lindera benzoin</i>	FAC (EMP)	Shrub
Pussy Willow	<i>Salix discolor</i>	FACW	Shrub

3.0 FORESTED RIPARIAN BUFFERS

Temporarily impacted riparian buffers (150' from each watercourse) will involve onsite replanting. After the completion of construction, riparian buffers within the ROW will be restored to pre-construction contours and revegetated with Ernst Riparian Buffer Mix (ERNMX-178), as outlined in Attachment B, or an alternative riparian seed mix that contains similar species. Impacted forested riparian buffers outside the permanent maintained ROW will be replanted with native live stakes, bare root or container tree and shrub species up to 5 feet from the pipeline centerline. Only shrub species shall be planted from 5 to 15 feet of the pipeline centerline. Outside 15 feet, both tree and shrub species may be planted. A summary table outlining proposed forested riparian buffer impact areas, their location, and proposed restoration is outlined in Attachment C – Onsite Wetland and Riparian Buffer Replanting Table. In addition, replanting areas for each pipeline facility are outlined on the provided figures.

The vegetative design of the forested riparian buffers outlines a combination of specific native tree and shrub species selected for different hydrologic regimes and different vegetative cover types throughout the Project. Trees and shrubs selected for the project were selected based on the Department of Environmental Protection's Riparian Forest Buffer Guidance, document number 394-5600-001 and observations of woody vegetation within riparian buffers during field surveys. The trees and shrubs selected for forested riparian buffer replanting are in Table 3-1 below:

TABLE 3-1 - RIPARIAN BUFFER REPLANTING SPECIES LIST			
COMMON NAME	LATIN NAME	WETLAND INDICATOR	STRATUM
Black Willow	<i>Salix nigra</i>	OBL	Tree
Silver Maple	<i>Acer saccharinum</i>	FACW	Tree
American Sycamore	<i>Platanus occidentalis</i>	FACW	Tree
River Birch	<i>Betula nigra</i>	FACW	Tree
Red Maple	<i>Acer rubrum</i>	FAC	Tree
Black Gum	<i>Nyssa sylvatica</i>	FAC	Tree
Tuliptree	<i>Liriodendron tulipifera</i>	FACU	Tree
Bigtooth Aspen	<i>Populus grandidentata</i>	FACU	Tree
White Pine	<i>Pinus strobus</i>	FACU	Tree
Eastern Hemlock	<i>Tsuga canadensis</i>	FACU	Tree
Smooth Alder	<i>Alnus serrulata</i>	OBL	Shrub/Small Tree
Speckled Alder	<i>Alnus incana</i>	FACU	Shrub/Small Tree
American Hornbeam	<i>Carpinus caroliniana</i>	FAC	Shrub/Small Tree
Silky Dogwood	<i>Cornus amomum</i>	FACW	Shrub
Common Ninebark	<i>Physocarpus opulifolius</i>	FACW	Shrub

Highbush Blueberry	<i>Vaccinium corymbosum</i>	FACW	Shrub
Rosebay Rhododendron	<i>Rhododendron maximum</i>	FAC	Shrub
American Hazelnut	<i>Corylus americana</i>	FACU	Shrub
Mountain Laurel	<i>Kalmia latifolia</i>	FACU	Shrub
Southern Arrowwood	<i>Viburnum recognitum</i>	FAC	Shrub

4.0 METHOD OF PLANTING

All plants shall be installed according to acceptable standards of the trade under the supervision of a landscape professional with suitable practical field experience in pipeline replanting projects. A qualified professional with documented experience shall oversee the replanting effort. Minor changes to the plan that will not adversely affect the overall success of the site or changes which enhance the success of the site may be implemented during the project without consultation. Any plan deviations will be documented in the as-built reporting.

All plant materials shall be nursery grown and shall be guaranteed to be true to name and healthy upon delivery. During planting operations, the contractor shall keep the trees and shrubs out of direct sunlight and maintain moisture on the roots to ensure that the roots don't dry out prior to planting. Trees and shrubs shall be planted by digging a hole twice the size of the width of the rootball down into the substrate at the point of installation. If the plant is in a plastic container, this shall be carefully removed to keep the rootball intact. After planting, the area will be backfilled and watered. Trees may be provided with support stakes or tree or shrub shelters. Shelters will only be placed on those plants suitable for shelters. Care shall be taken when installing support stakes or tree shelters to ensure that the root ball is not disturbed when driving the support stake into the soil. Fertilizer tablets may be placed in the backfilled soil to help the growth of the planted trees and shrubs.

5.0 PLANT DENSITY AND PLACEMENT

All plants will be planted in clumps of monocultures consisting of three to six plants of the species. All plants will be planted in a clumped distribution of monoculture blocks of individual species. Monocultures will be planted randomly with spacing of approximately 8.0 feet on center for shrubs and small trees species and 12.0 feet on center for tree species. Trees and shrubs will be planted at a density of 435 stems per acre. No tree plantings are to take place within 15' of the pipeline or between existing utilities. Typical planting details are included within Attachment D.

6.0 WILDLIFE DAMAGE CONTROL

After planting of the site has been completed, tree and shrub shelters shall be installed for those plants suitable for shelters. If deemed necessary, other methods of wildlife damage control may include the application of rodenticide to each tree/shrub or installing bait boxes for meadow vole control.

7.0 AS-BUILT DOCUMENTATION AND MONITORING PLAN

As-built documentation for the planting shall occur as the planting is completed. Thereafter, monitoring of the onsite wetland and riparian buffers replanting areas shall take

place annually for three years after planting to determine the success of the replanting areas. During the monitoring, the survival of trees and shrubs will be counted and documented. Any threats to the riparian buffers will be documented and remedial measures will be recommended. Photographs will be taken at representative crossings to document the success of the replanting areas. The as built documentation and monitoring reports will include, at a minimum, the following information:

- a) Dates of inspection and names of inspectors;
- b) Photographic Documentation;
- c) Vegetation data shall summarize plant survival, the growth of planted trees and shrubs (monitoring plan only);
- d) Identification of any problems that need required remedial measures.

8.0 PERFORMANCE STANDARDS

Performance standards have been established for the onsite replanting areas. These standards will be used to determine the success of the replanting effort. By monitoring the site as proposed in the monitoring plan and comparing results to the performance standards, a determination of success can be evaluated. The performance standards are as follows:

- Planted trees and shrubs shall meet 85% survival throughout the 3-year monitoring period.

If the performance standards have not been achieved, appropriate remedial actions, as outlined in the adaptive management plan must take place to ensure the success of the site. A vegetative analysis must continue on a yearly basis until the performance standards or goals have been met. In the situations where the buffer planting is not successful, the monitoring report must include a discussion of remedial measures to correct the deficiencies.

REFERENCES

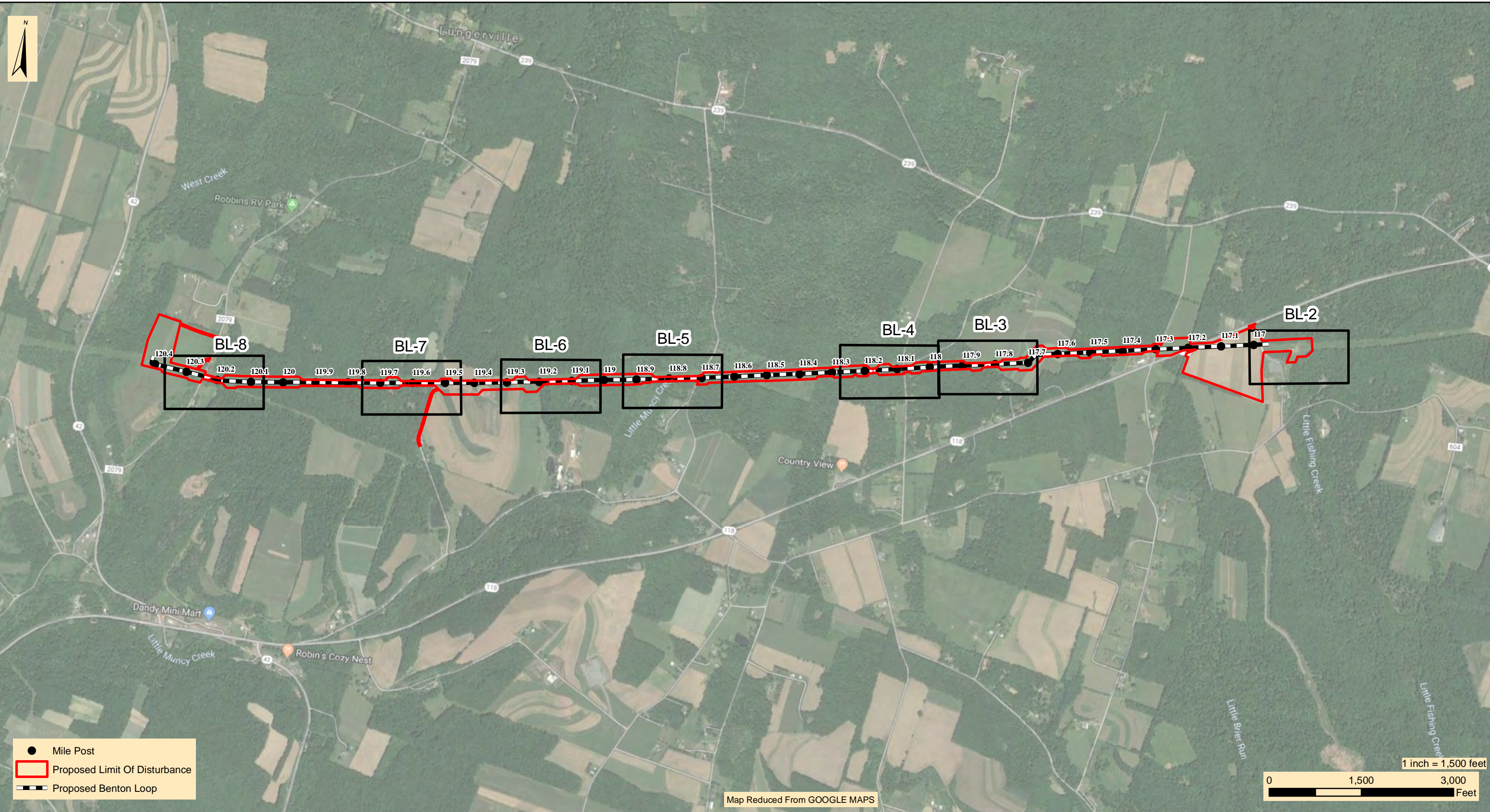
Pennsylvania Department of Environmental Protection Bureau of Watershed Management. 2010. Riparian Forest Buffer Guidance. Document number 394-5600-001. Pennsylvania Department of Environmental Protection. Harrisburg, PA.

U.S. Army Corps of Engineers. 2016. National Wetland Plant List, version 3.3. http://wetland_plants.usace.army.mil/ US Army Corps of Engineers Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH.

WHM Consulting, Inc. 2019. *Leidy South Project - Wetland and Watercourse Delineation Report*. State College, PA. August, 2019.

FIGURES

BENTON LOOP



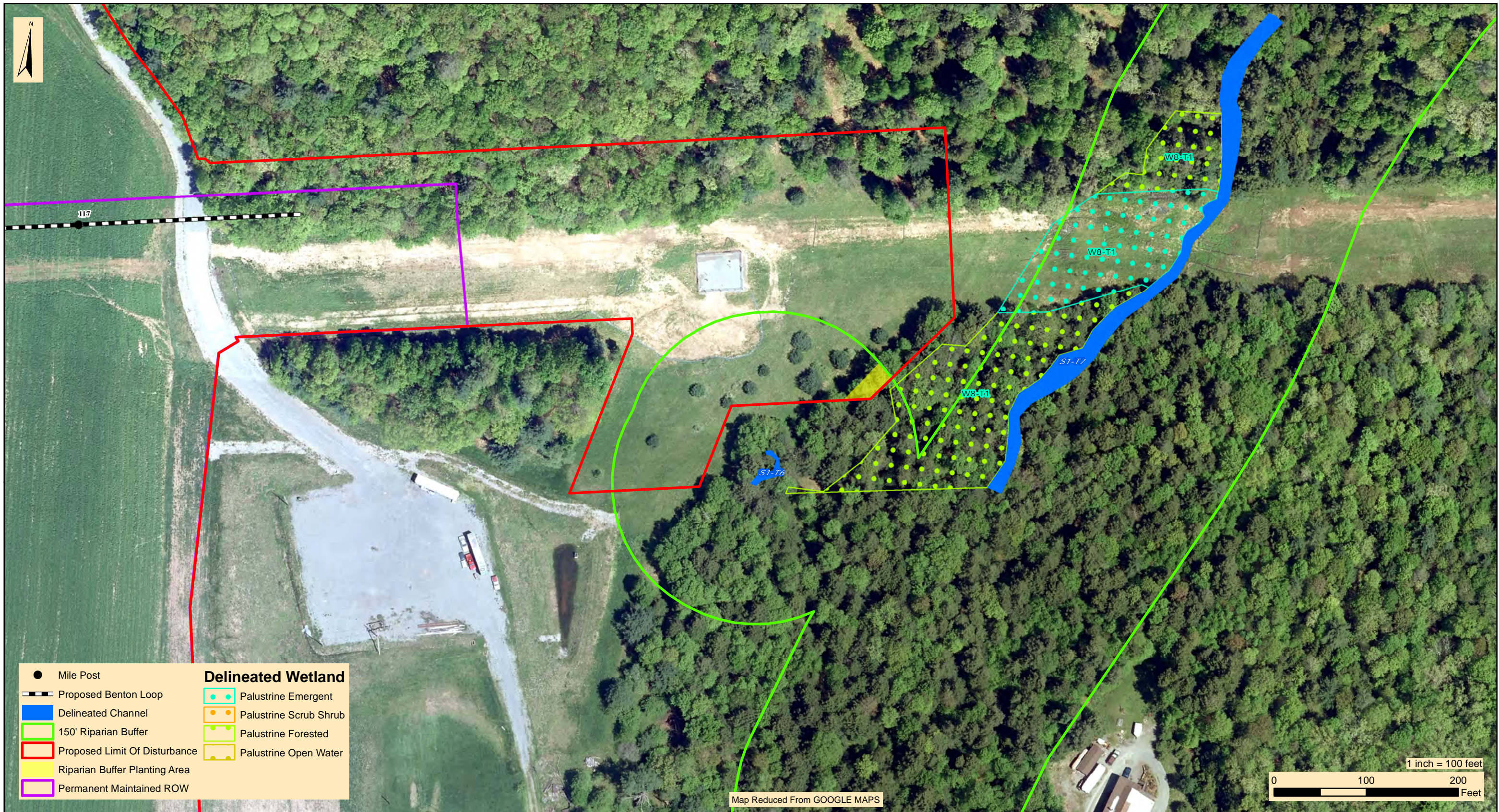
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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - BENTON LOOP
WETLAND AND RIPARIAN REFORESTATION PLAN

MAP KEY

JORDAN TOWNSHIP LYCOMING COUNTY PENNSYLVANIA

Date:	08/06/19
WHM DRAWING NUMBER:	WILLIAMS202B001-BL
Drawn By:	PJF
Figure Number:	BL-1



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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 1 (RP-1)

JORDAN TOWNSHIP

LYCOMING COUNTY

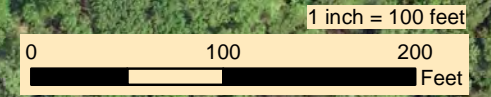
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Figure Number:	BL-2



Proposed Benton Loop	Delineated Wetland
Delineated Channel	Palustrine Emergent
150' Riparian Buffer	Palustrine Scrub Shrub
Proposed Limit Of Disturbance	Palustrine Forested
Riparian Buffer Planting Area	Palustrine Open Water
Permanent Maintained ROW	

Map Reduced From GOOGLE MAPS



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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 3 (BL-4, BL-6)

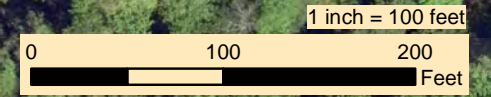
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Date:	08/25/19
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Drawn By:	PJF
Figure Number:	BL-4



● Mile Post	Delineated Wetland
▬ Proposed Benton Loop	▭ Palustrine Emergent
▭ Delineated Channel	▭ Palustrine Scrub Shrub
▭ 150' Riparian Buffer	▭ Palustrine Forested
▭ Proposed Limit Of Disturbance	▭ Palustrine Open Water
▭ Riparian Buffer Planting Area	
▭ Permanent Maintained ROW	
▭ PFO Wetland Planting Area	

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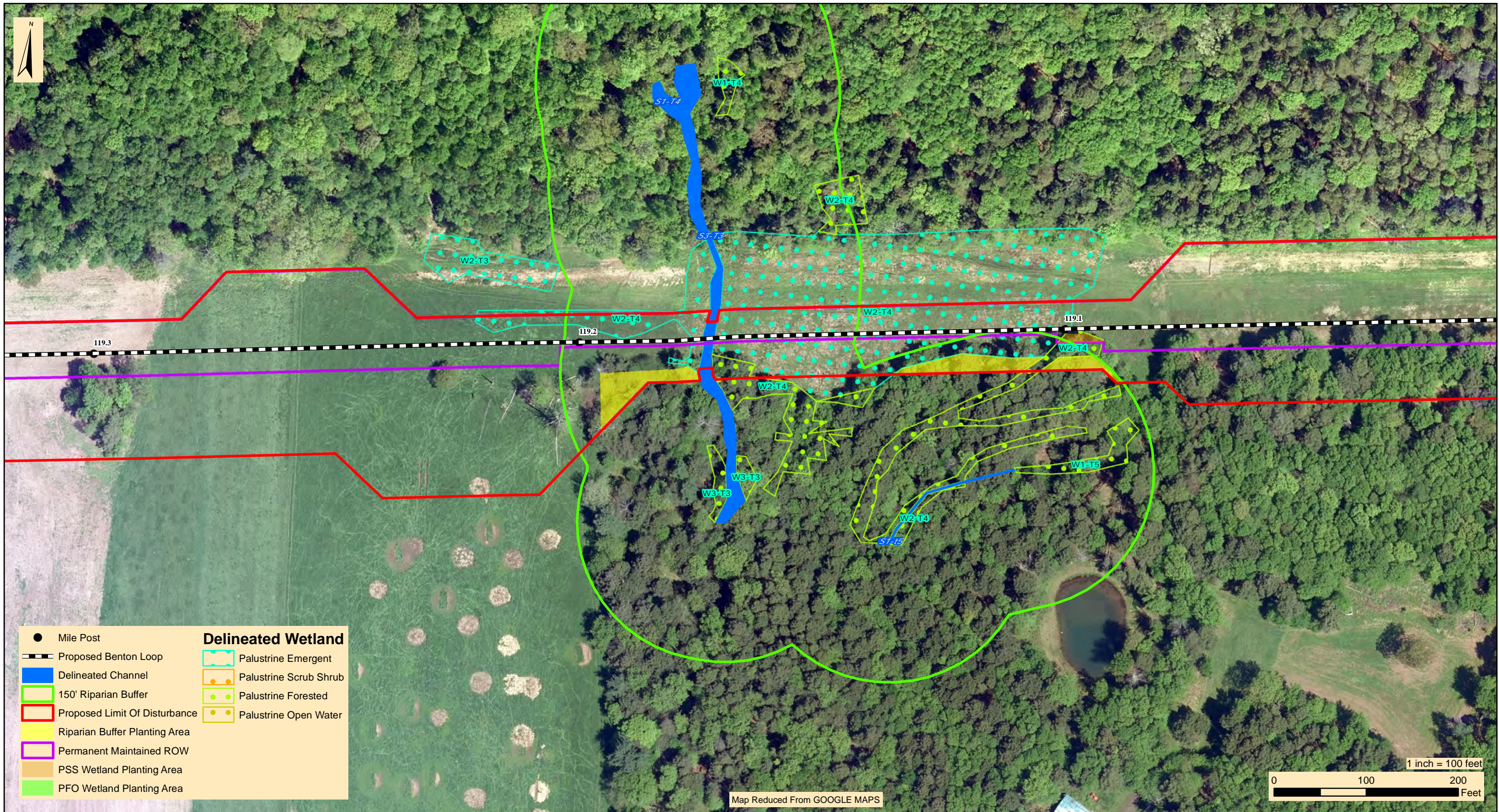
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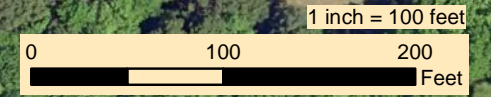
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Drawn By:	PJF
Figure Number:	BL-5



● Mile Post	Delineated Wetland
--- Proposed Benton Loop	Palustrine Emergent
Delineated Channel	Palustrine Scrub Shrub
150' Riparian Buffer	Palustrine Forested
Proposed Limit Of Disturbance	Palustrine Open Water
Riparian Buffer Planting Area	
Permanent Maintained ROW	
PSS Wetland Planting Area	
PFO Wetland Planting Area	

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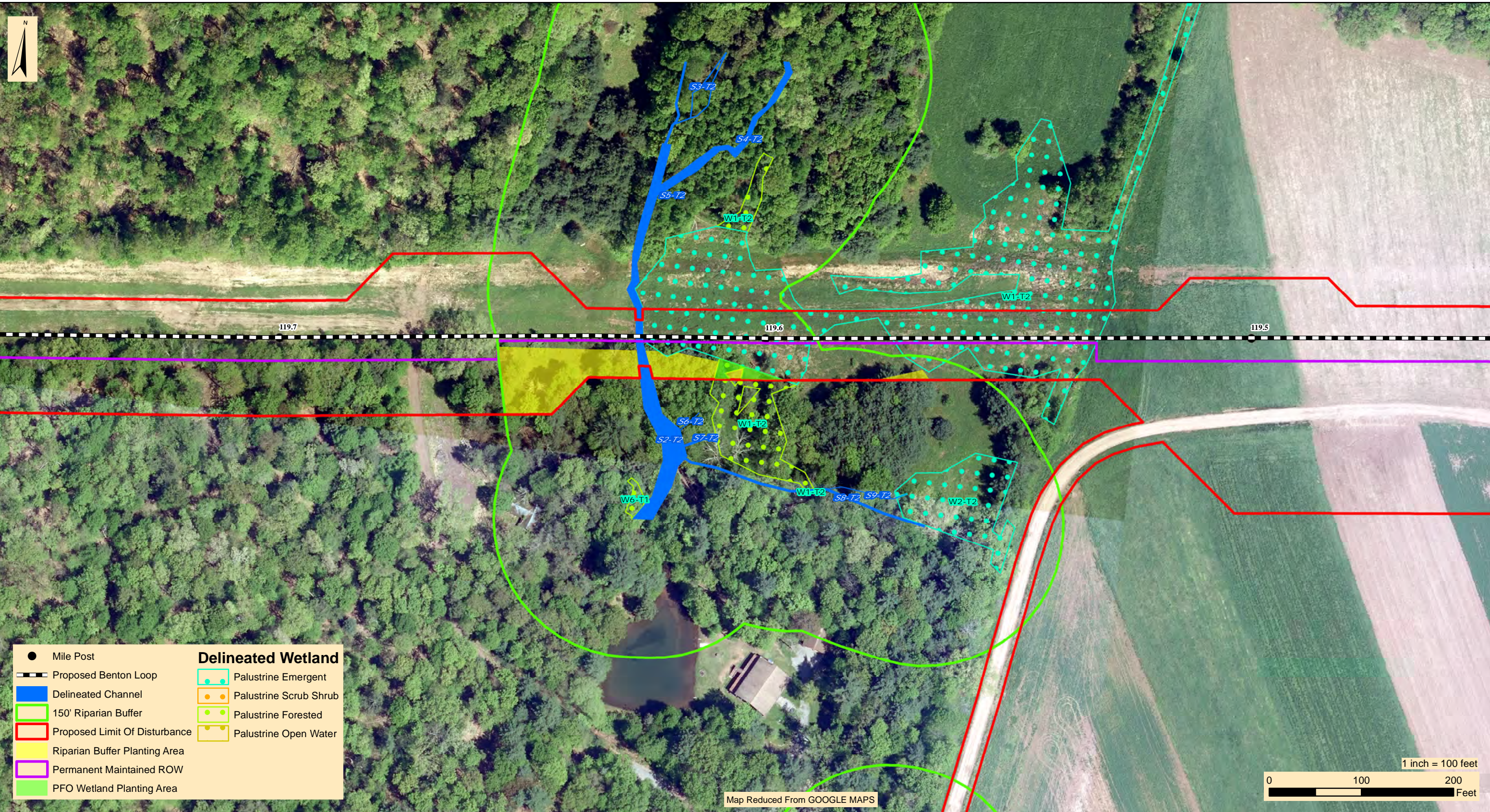
RESOURCE CROSSING 5 (BL-8)

JORDAN TOWNSHIP

LYCOMING COUNTY

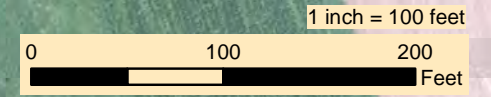
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Figure Number:	BL-6



● Mile Post	Delineated Wetland
▬ Proposed Benton Loop	▭ Palustrine Emergent
▭ Delineated Channel	▭ Palustrine Scrub Shrub
▭ 150' Riparian Buffer	▭ Palustrine Forested
▭ Proposed Limit Of Disturbance	▭ Palustrine Open Water
▭ Riparian Buffer Planting Area	
▭ Permanent Maintained ROW	
▭ PFO Wetland Planting Area	

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WETLAND AND RIPARIAN REFORESTATION PLAN
RESOURCE CROSSING 6 (BL-9)

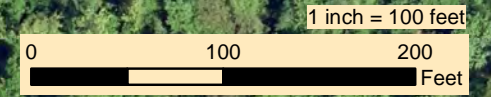
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Figure Number:	BL-7



● Mile Post	Delineated Wetland
--- Proposed Benton Loop	Palustrine Emergent
Delineated Channel	Palustrine Scrub Shrub
150' Riparian Buffer	Palustrine Forested
Proposed Limit Of Disturbance	Palustrine Open Water
Riparian Buffer Planting Area	
Permanent Maintained ROW	
PSS Wetland Planting Area	

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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 7 (BL-10)

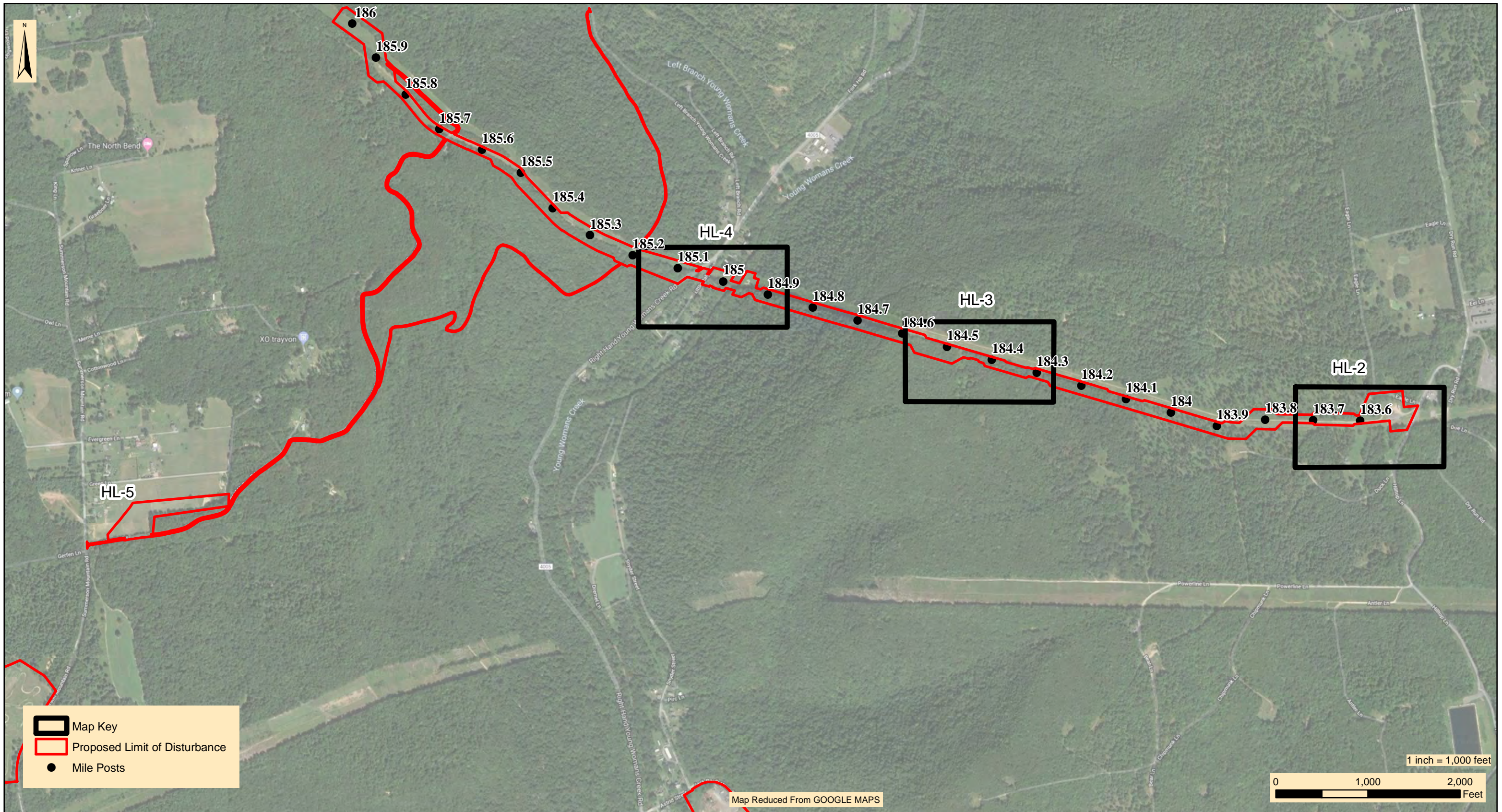
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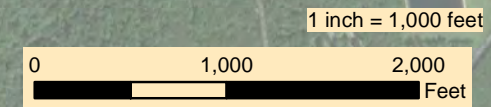
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HILLTOP LOOP



Map Key
 Proposed Limit of Disturbance
 Mile Posts



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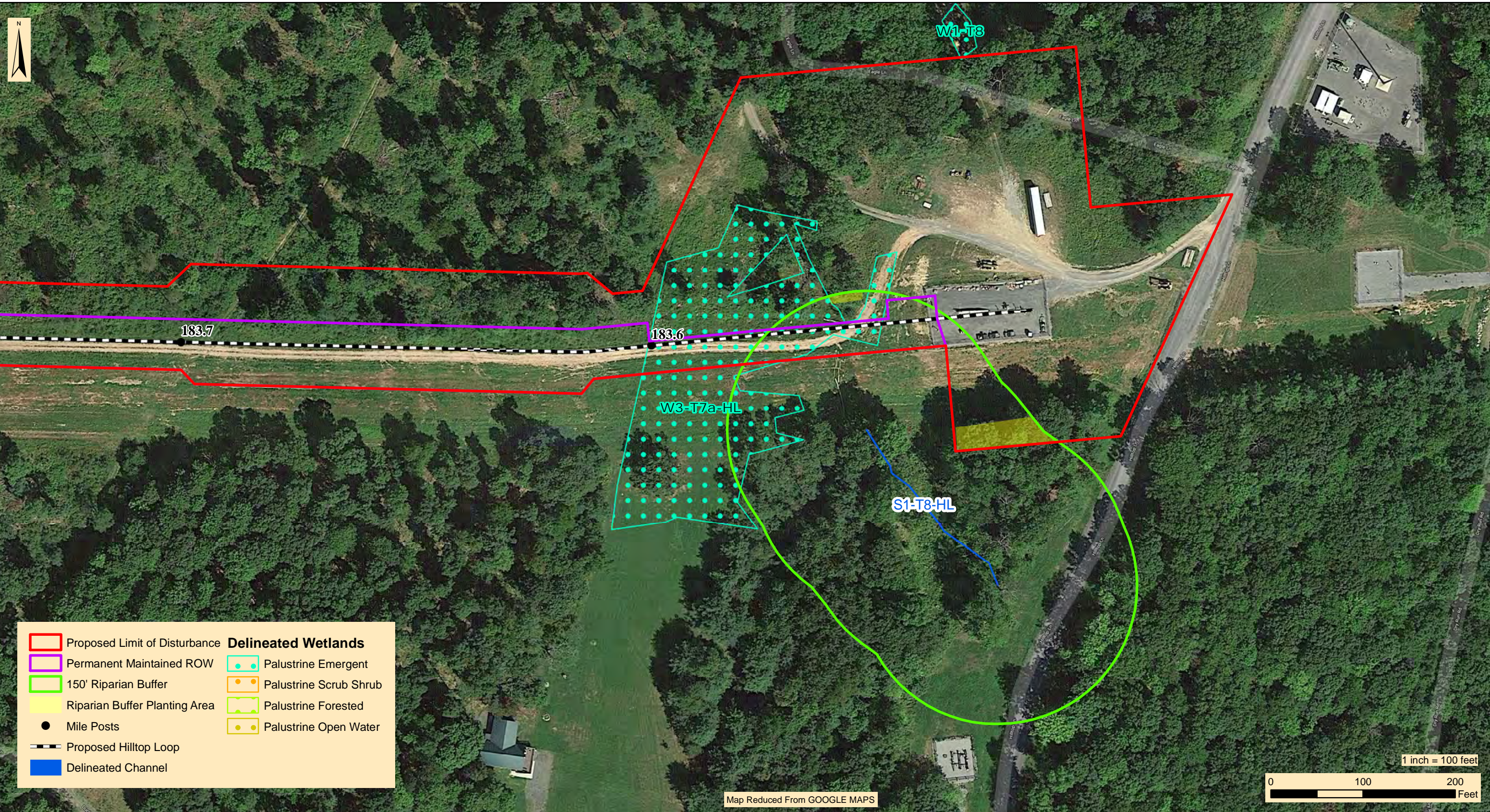
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CHAPMAN TOWNSHIP

CLINTON COUNTY

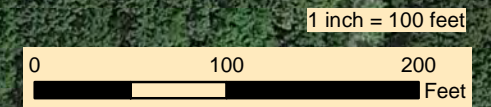
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Figure Number:	HL-1



Proposed Limit of Disturbance	Delineated Wetlands
Permanent Maintained ROW	Palustrine Emergent
150' Riparian Buffer	Palustrine Scrub Shrub
Riparian Buffer Planting Area	Palustrine Forested
Mile Posts	Palustrine Open Water
Proposed Hilltop Loop	
Delineated Channel	

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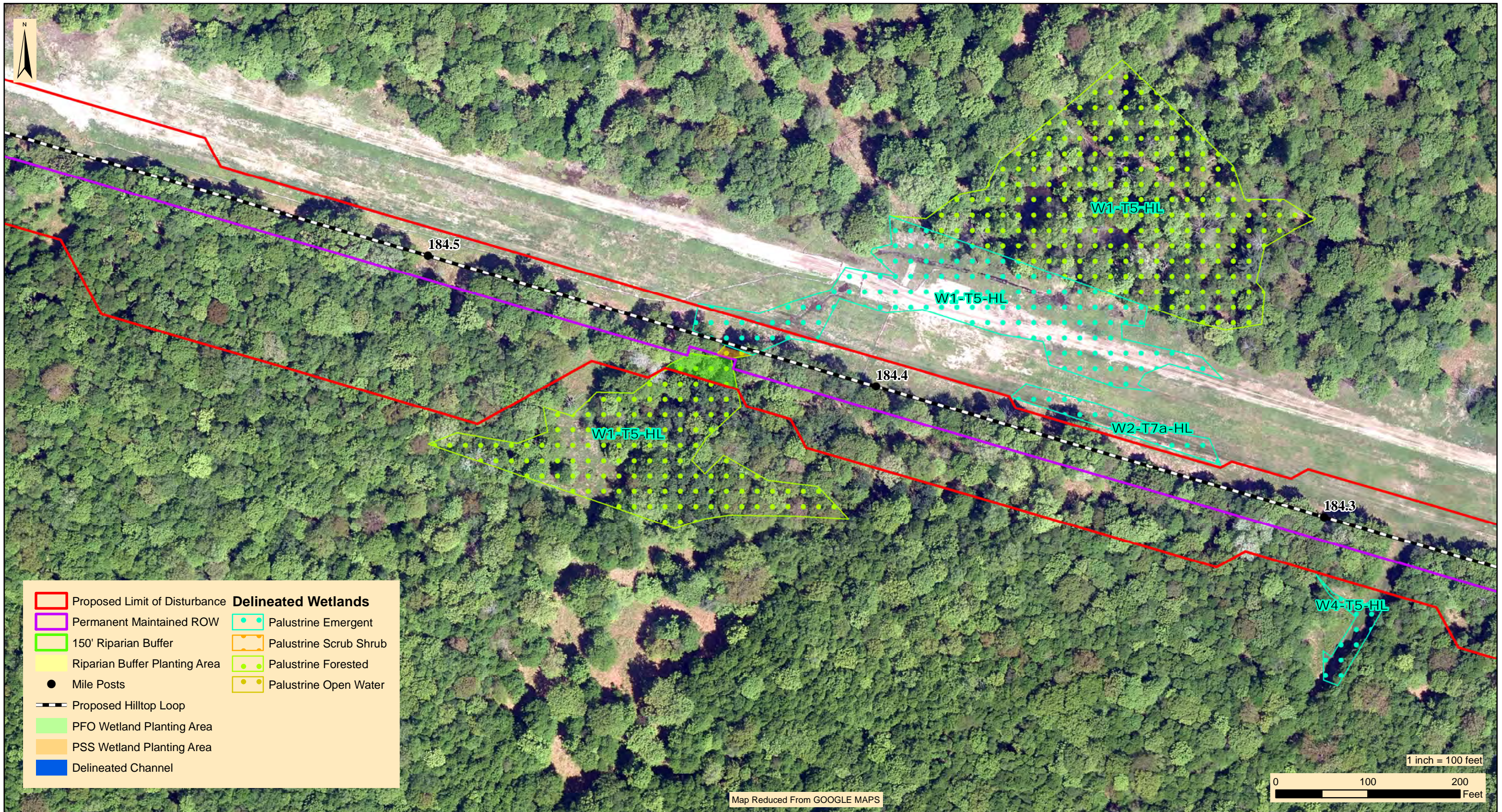


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WETLAND AND RIPARIAN REFORESTATION PLAN
 RESOURCE CROSSING - 1 (RP-1)

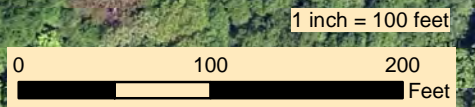
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Drawn By:	PJF
Figure Number:	HL-2



Proposed Limit of Disturbance	Delineated Wetlands
Permanent Maintained ROW	Palustrine Emergent
150' Riparian Buffer	Palustrine Scrub Shrub
Riparian Buffer Planting Area	Palustrine Forested
Mile Posts	Palustrine Open Water
Proposed Hilltop Loop	
PFO Wetland Planting Area	
PSS Wetland Planting Area	
Delineated Channel	

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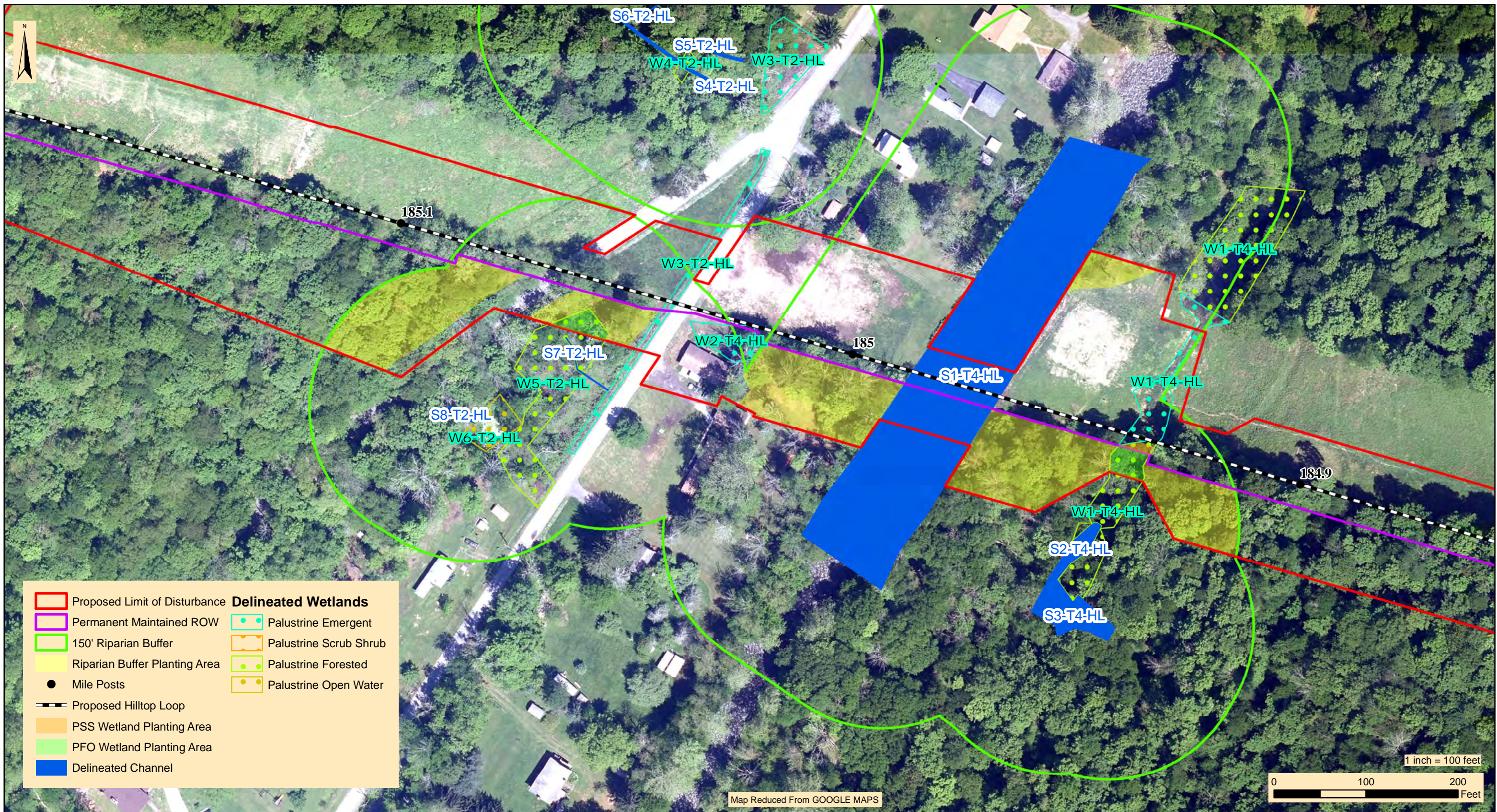
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WETLAND AND RIPARIAN REFORESTATION PLAN
RESOURCE CROSSING - 2 (HL-2)

CHAPMAN TOWNSHIP

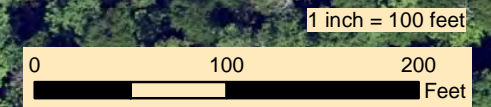
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WHM DRAWING NUMBER:	WILLIAMS201B003-HL
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Figure Number:	HL-3



- | | |
|-------------------------------|----------------------------|
| Proposed Limit of Disturbance | Delineated Wetlands |
| Permanent Maintained ROW | Palustrine Emergent |
| 150' Riparian Buffer | Palustrine Scrub Shrub |
| Riparian Buffer Planting Area | Palustrine Forested |
| Mile Posts | Palustrine Open Water |
| Proposed Hilltop Loop | |
| PSS Wetland Planting Area | |
| PFO Wetland Planting Area | |
| Delineated Channel | |



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WETLAND AND RIPARIAN REFORESTATION PLAN
 RESOURCE CROSSING - 3 (HL-3)

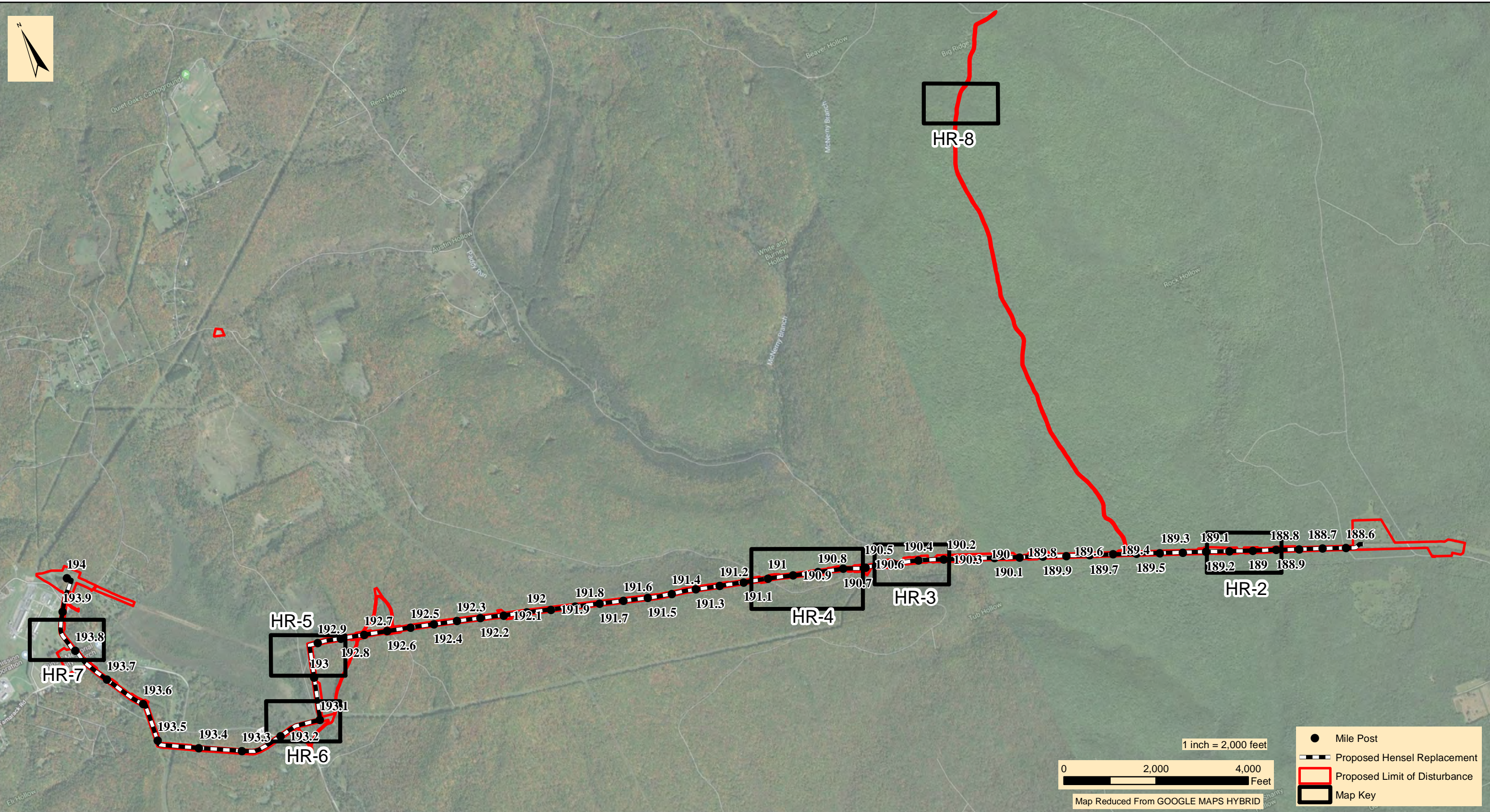
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CLINTON COUNTY

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HENSEL REPLACEMENT



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LEIDY SOUTH PROJECT- HENSEL REPLACEMENT
WETLAND AND RIPARIAN REFORESTATION PLAN

MAP KEY

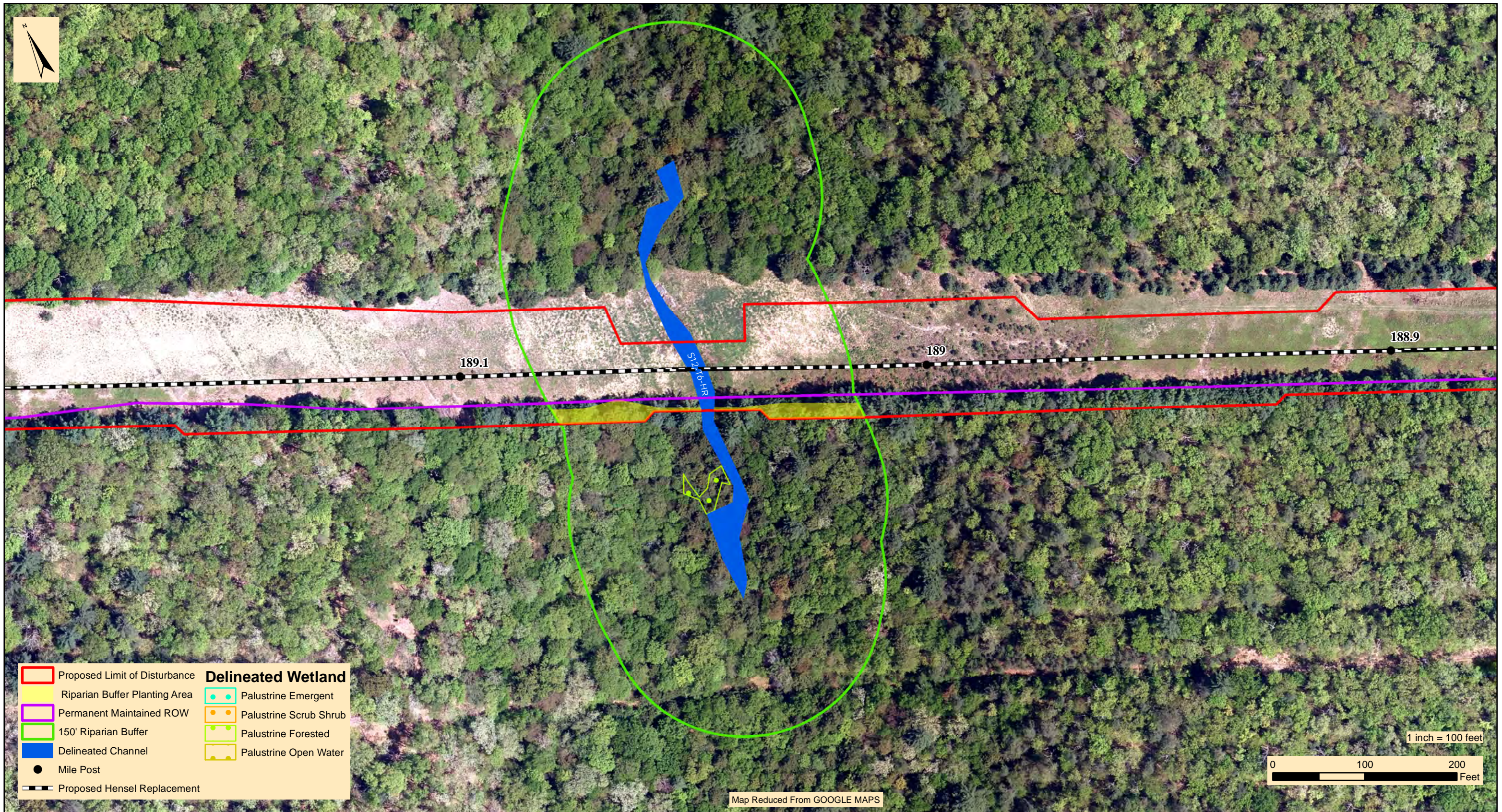
LEIDY AND CHAPMAN TOWNSHIPS CLINTON COUNTY PENNSYLVANIA

Date:
08/09/19

WHM DRAWING NUMBER:
WILLIAMS200B001-HR

Drawn By:
PJF

Figure Number:
HR-1



Proposed Limit of Disturbance	Delineated Wetland
Riparian Buffer Planting Area	Palustrine Emergent
Permanent Maintained ROW	Palustrine Scrub Shrub
150' Riparian Buffer	Palustrine Forested
Delineated Channel	Palustrine Open Water
Mile Post	
Proposed Hensel Replacement	

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC LEIDY SOUTH PROJECT- HENSEL REPLACEMENT WETLAND AND RIPARIAN REFORESTATION PLAN

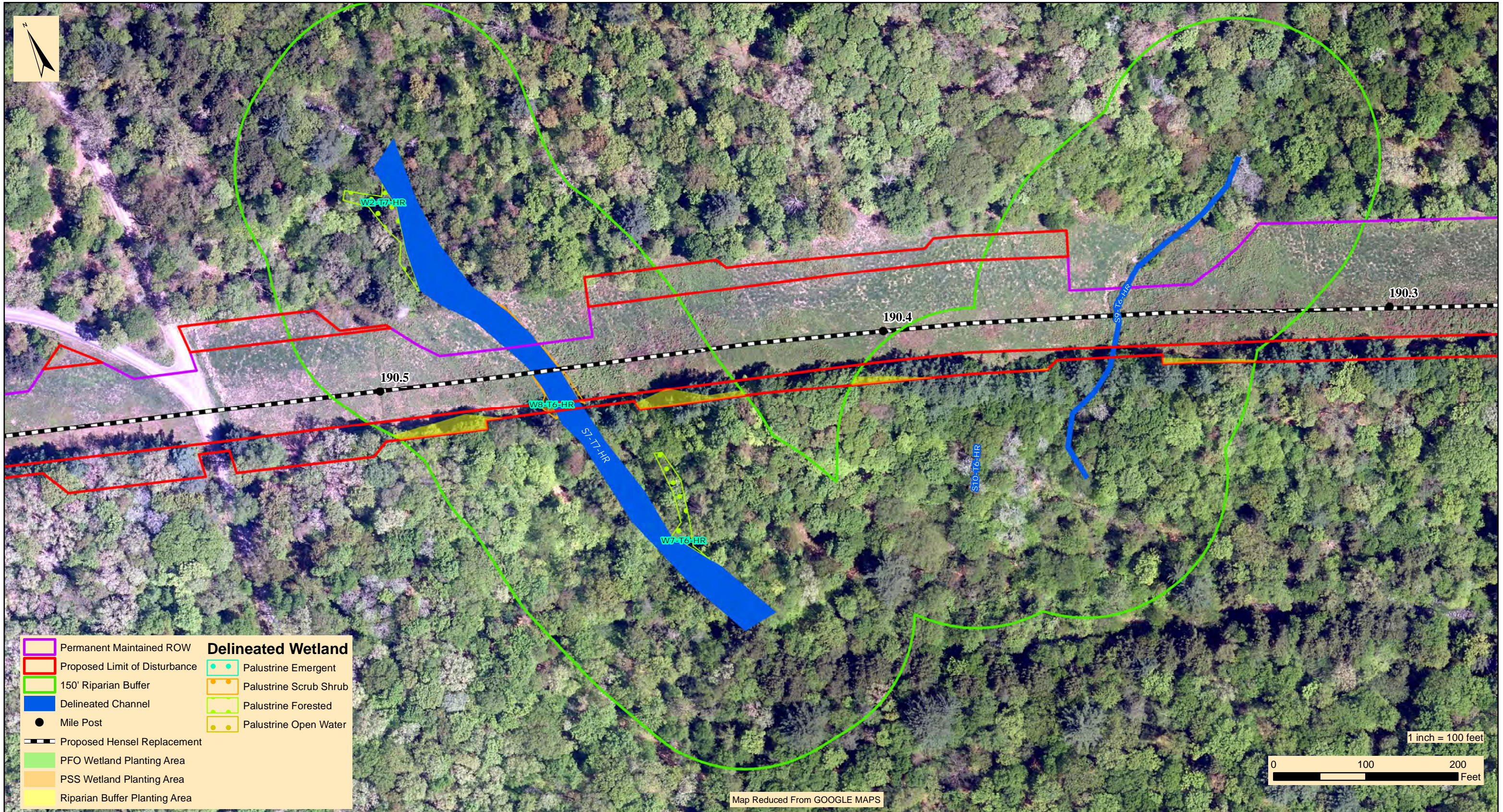
RESOURCE CROSSING - 1 (HR-1)

CHAPMAN TOWNSHIP

CLINTON COUNTY

PENNSYLVANIA

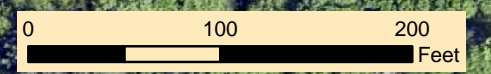
Date:	08/09/19
WHM DRAWING NUMBER:	WILLIAMS200B002-HR
Drawn By:	PJF
Figure Number:	HR-2



- | | | | |
|--|-------------------------------|---------------------------|------------------------|
| | Permanent Maintained ROW | Delineated Wetland | |
| | Proposed Limit of Disturbance | | Palustrine Emergent |
| | 150' Riparian Buffer | | Palustrine Scrub Shrub |
| | Delineated Channel | | Palustrine Forested |
| | Mile Post | | Palustrine Open Water |
| | Proposed Hensel Replacement | | |
| | PFO Wetland Planting Area | | |
| | PSS Wetland Planting Area | | |
| | Riparian Buffer Planting Area | | |

Map Reduced From GOOGLE MAPS

1 inch = 100 feet



2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT- HENSEL REPLACEMENT
WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 2 (HR-3)

CHAPMAN TOWNSHIP

CLINTON COUNTY

PENNSYLVANIA

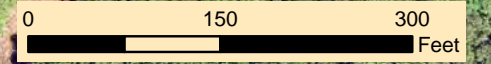
Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B003-HR
Drawn By:	PJF
Figure Number:	HR-3



	Proposed Limit of Disturbance	Delineated Wetland		Palustrine Emergent
	Permanent Maintained ROW		Palustrine Scrub Shrub	
	150' Riparian Buffer		Palustrine Forested	
	Delineated Channel		Palustrine Open Water	
	Mile Post			
	Proposed Hensel Replacement			
	Riparian Buffer Planting Area			
	PSS Wetland Planting Area			
	PFO Wetland Planting Area			

Map Reduced From GOOGLE MAPS

1 inch = 150 feet



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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT- HENSEL REPLACEMENT
WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 3 (HR-5 and HR-7)

LEIDY TOWNSHIP

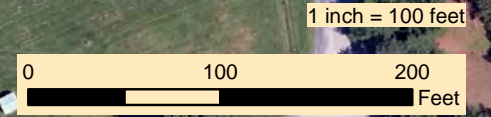
CLINTON COUNTY

PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B004-HR
Drawn By:	PJF
Figure Number:	HR-4



Permanent Maintained ROW	Delineated Wetland
150' Riparian Buffer	Palustrine Emergent
Delineated Channel	Palustrine Scrub Shrub
Proposed Hensel Replacement	Palustrine Forested
Mile Post	Palustrine Open Water
Proposed Limit of Disturbance	
PSS Wetland Planting Area	
PFO Wetland Planting Area	
Riparian Buffer Planting Area	



Map Reduced From GOOGLE MAPS

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WETLAND AND RIPARIAN REFORESTATION PLAN

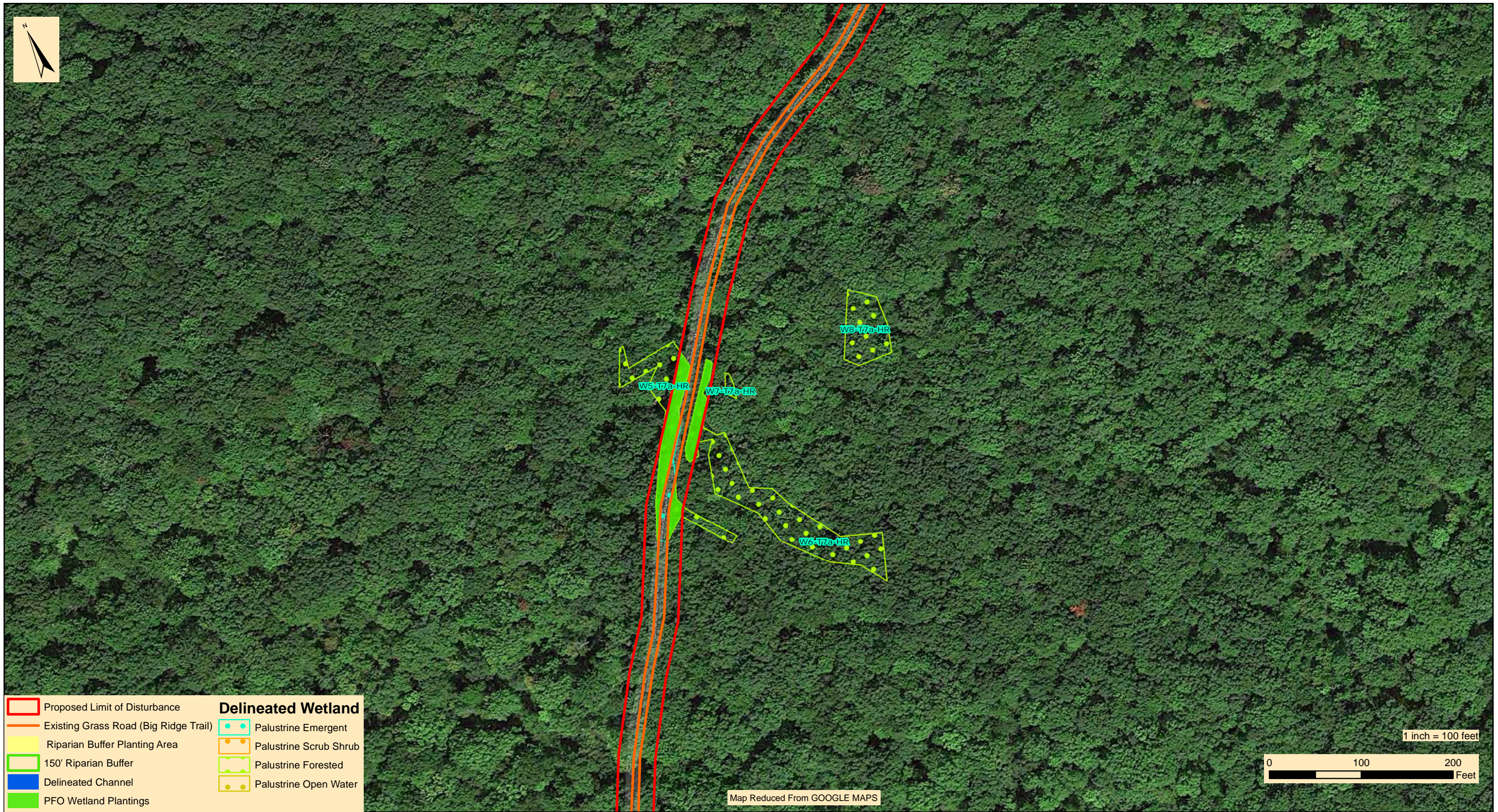
RESOURCE CROSSING -6 (RP-1)

LEIDY TOWNSHIP

CLINTON COUNTY

PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B007-HR
Drawn By:	PJF
Figure Number:	HR-7



Proposed Limit of Disturbance	Delineated Wetland
Existing Grass Road (Big Ridge Trail)	Palustrine Emergent
Riparian Buffer Planting Area	Palustrine Scrub Shrub
150' Riparian Buffer	Palustrine Forested
Delineated Channel	Palustrine Open Water
PFO Wetland Plantings	

WHM
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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT- HENSEL REPLACEMENT
WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 7 (AR-2)

LEIDY TOWNSHIP

CLINTON COUNTY

PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B008-HR
Drawn By:	DMW
Figure Number:	HR-8

ATTACHMENT A
ERNST – FACW MEADOW MIX (ERNMX-122)



Ernst Conservation Seeds

8884 Mercer Pike
 Meadville, PA 16335
 (800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: April 04, 2018

FACW Meadow Mix - ERNMX-122

Botanical Name	Common Name	Price/lb
32.00 % <i>Carex vulpinoidea</i> , PA Ecotype	Fox Sedge, PA Ecotype	24.00
20.00 % <i>Elymus virginicus</i> , PA Ecotype	Virginia Wildrye, PA Ecotype	9.65
14.00 % <i>Carex lurida</i> , PA Ecotype	Lurid (Shallow) Sedge, PA Ecotype	64.00
10.00 % <i>Carex lupulina</i> , PA Ecotype	Hop Sedge, PA Ecotype	72.00
6.30 % <i>Carex scoparia</i> , PA Ecotype	Blunt Broom Sedge, PA Ecotype	72.00
3.00 % <i>Juncus effusus</i>	Soft Rush	40.00
2.00 % <i>Aster puniceus</i> , PA Ecotype	Purplestem Aster, PA Ecotype	320.00
2.00 % <i>Heliopsis helianthoides</i> , PA Ecotype	Oxeye Sunflower, PA Ecotype	42.00
2.00 % <i>Verbena hastata</i> , PA Ecotype	Blue Vervain, PA Ecotype	32.00
1.50 % <i>Asclepias incarnata</i> , PA Ecotype	Swamp Milkweed, PA Ecotype	240.00
1.00 % <i>Aster umbellatus</i> , PA Ecotype	Flat Topped White Aster, PA Ecotype	320.00
1.00 % <i>Eupatorium perfoliatum</i> , PA Ecotype	Boneset, PA Ecotype	300.00
1.00 % <i>Onoclea sensibilis</i>	Sensitive Fern	108.00
0.50 % <i>Alisma subcordatum</i> , PA Ecotype	Mud Plantain (Water Plantain), PA Ecotype	160.00
0.50 % <i>Carex intumescens</i> , PA Ecotype	Bladder Sedge, PA Ecotype	128.00
0.50 % <i>Cinna arundinacea</i> , PA Ecotype	Wood Reedgrass, PA Ecotype	120.00
0.50 % <i>Juncus tenuis</i> , PA Ecotype	Path Rush, PA Ecotype	66.00
0.50 % <i>Scirpus cyperinus</i> , PA Ecotype	Woolgrass, PA Ecotype	180.00
0.50 % <i>Zizia aurea</i> , PA Ecotype	Golden Alexanders, PA Ecotype	240.00
0.30 % <i>Eupatorium fistulosum</i> , PA Ecotype	Joe Pye Weed, PA Ecotype	228.00
0.30 % <i>Penthorum sedoides</i> , PA Ecotype	Ditch Stonecrop, PA Ecotype	240.00
0.20 % <i>Chelone glabra</i> , PA Ecotype	Turtlehead, PA Ecotype	600.00
0.20 % <i>Ludwigia alternifolia</i> , PA Ecotype	Seedbox, PA Ecotype	180.00
0.20 % <i>Mimulus ringens</i> , PA Ecotype	Square Stemmed Monkeyflower, PA Ecotype	260.00

100.00 %

Mix Price/lb Bulk: \$58.22

Seeding Rate: 20 lb per acre, or 1/2 lb per 1,000 sq ft

Wet Meadows & Wetlands

The diverse species provide pollinator habitat and erosion control in wet meadows. Excellent for facultative wetland mitigation sites. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

Price quotes guaranteed for 30 days.
All prices are FOB Meadville, PA.
Please check our web site at www.ernstseed.com
for current pricing when placing orders.

ATTACHMENT B

ERNST – RIPARAIN BUFFER MIX (ERNMX-178)



Ernst Conservation Seeds

8884 Mercer Pike
 Meadville, PA 16335
 (800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: February 06, 2018

Riparian Buffer Mix - ERNMX-178

Botanical Name	Common Name	Price/lb
30.00 % <i>Panicum clandestinum</i> , 'Tioga'	Deertongue, 'Tioga'	17.09
16.00 % <i>Sorghastrum nutans</i> , PA Ecotype	Indiangrass, PA Ecotype	12.62
15.00 % <i>Elymus riparius</i> , PA Ecotype	Riverbank Wildrye, PA Ecotype	7.44
10.00 % <i>Andropogon gerardii</i> , 'Niagara'	Big Bluestem, 'Niagara'	12.25
7.00 % <i>Panicum virgatum</i> , 'Carthage', NC Ecotype	Switchgrass, 'Carthage', NC Ecotype	5.17
3.00 % <i>Chamaecrista fasciculata</i> , PA Ecotype	Partridge Pea, PA Ecotype	10.00
3.00 % <i>Rudbeckia hirta</i> , Coastal Plain NC Ecotype	Blackeyed Susan, Coastal Plain NC Ecotype	20.00
3.00 % <i>Verbena hastata</i> , PA Ecotype	Blue Vervain, PA Ecotype	32.00
2.00 % <i>Asclepias incarnata</i> , PA Ecotype	Swamp Milkweed, PA Ecotype	240.00
2.00 % <i>Heliopsis helianthoides</i> , PA Ecotype	Oxeye Sunflower, PA Ecotype	42.00
2.00 % <i>Juncus effusus</i>	Soft Rush	40.00
2.00 % <i>Juncus tenuis</i> , PA Ecotype	Path Rush, PA Ecotype	66.00
1.50 % <i>Aster puniceus</i> , PA Ecotype	Purplestem Aster, PA Ecotype	320.00
1.00 % <i>Eupatorium perfoliatum</i> , PA Ecotype	Boneset, PA Ecotype	300.00
0.80 % <i>Vernonia noveboracensis</i> , PA Ecotype	New York Ironweed, PA Ecotype	220.00
0.50 % <i>Aster novae-angliae</i> , PA Ecotype	New England Aster, PA Ecotype	360.00
0.50 % <i>Eupatorium fistulosum</i> , PA Ecotype	Joe Pye Weed, PA Ecotype	228.00
0.50 % <i>Monarda fistulosa</i> , Fort Indiantown Gap-PA Ecotype	Wild Bergamot, Fort Indiantown Gap-PA Ecotype	160.00
0.20 % <i>Pycnanthemum tenuifolium</i>	Narrowleaf Mountainmint	140.00
100.00 %	Mix Price/lb Bulk:	\$33.05

Seeding Rate: 20 lb per acre with a cover crop at 30 lb per acre
 (dry sites - grain oats, Jan 1-Aug 1; or, grain rye,
 Aug 1-Jan 1; moist sites - grain rye year-round)

Riparian Sites

A diverse mix of upland and wetland grasses, forbs and shrubs with extensive wildlife and pollinator value. Provides food and cover for many of our songbirds, pheasants, deer and turkey. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

Price quotes guaranteed for 30 days.
All prices are FOB Meadville, PA.
Please check our web site at www.ernstseed.com
for current pricing when placing orders.

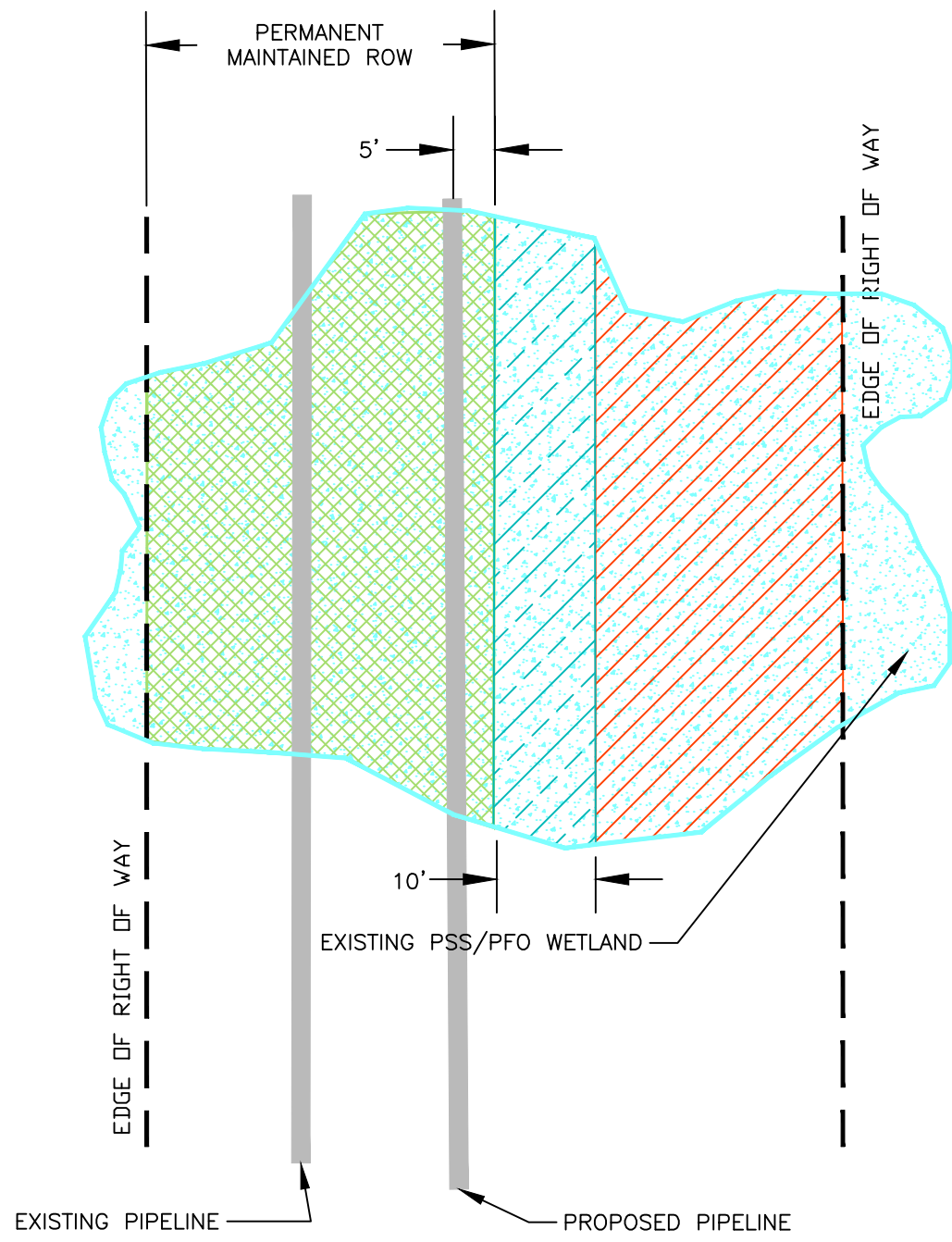
ATTACHMENT C
ONSITE WETLAND AND RIPARIAN BUFFER REPLANTING TABLE

ATTACHMENT C

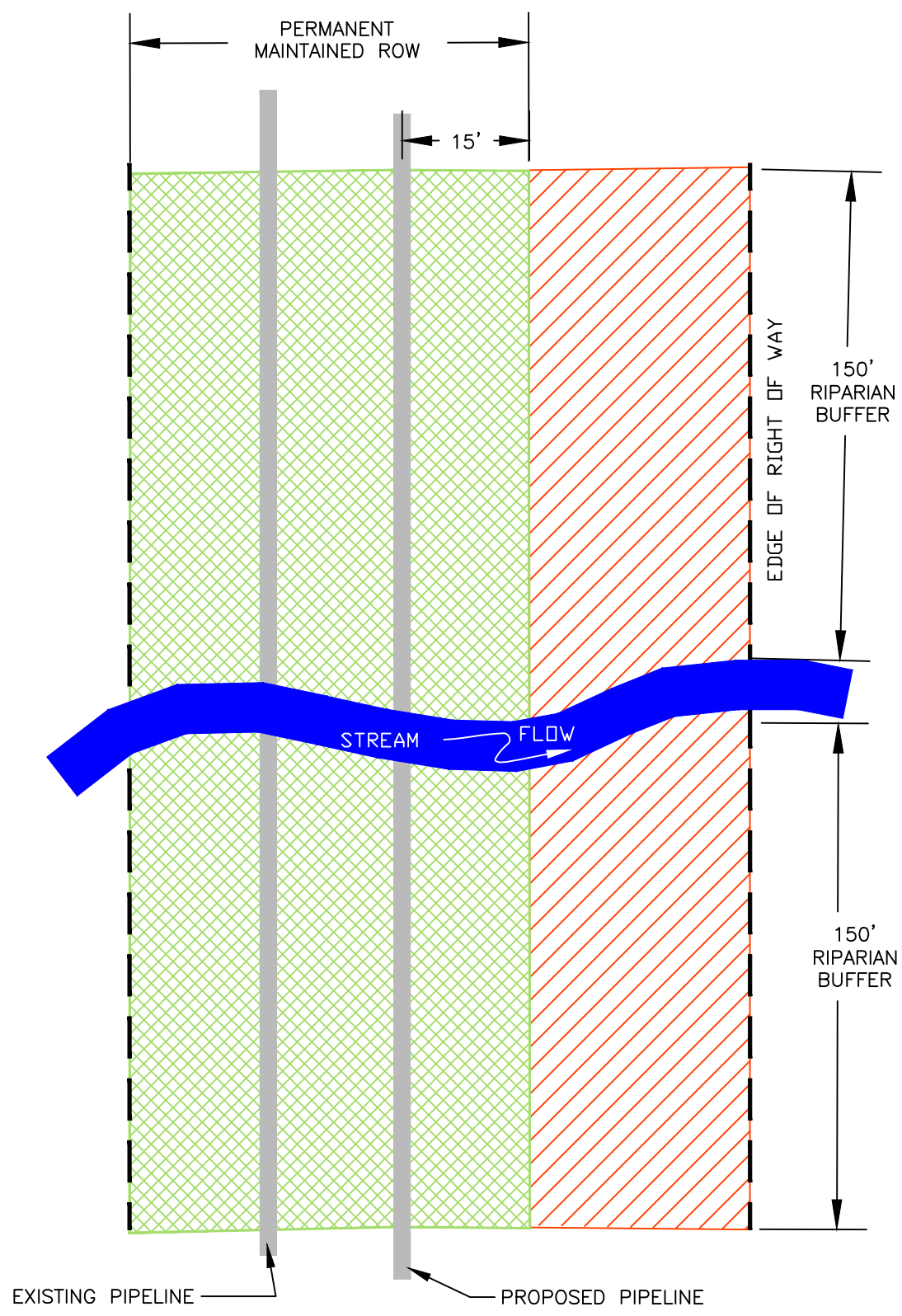
Onsite Wetland and Riparian Buffer Replanting Table

Pipeline Facility	Crossing Number	Mile Post	Feature ID	Type	Replanting Area (sq.ft.)	Replanting Area (acres)	
Benton Loop	RP-1	117.0	S1-T6	RIPARIAN	939	0.02	
	BL-3	117.8	S2-T6	RIPARIAN	6,251	0.14	
	BL-4	118.1	S5-T6	RIPARIAN	9,387	0.22	
	BL-6	118.2	S6-T6	RIPARIAN	12,585	0.29	
	BL-7	118.7	W16-T6	PFO	2,991	0.07	
	BL-7	118.7	S9-T6, S10-T6	RIPARIAN	5,724	0.13	
	BL-7	118.8	W4-T5	PFO	326	0.01	
	BL-7	118.8	S2-T5, S3-T5	RIPARIAN	13,246	0.30	
	BL-8	119.1	W2-T4	PFO	2,026	0.05	
	BL-8	119.1	W2-T4	PFO to PSS	388	0.01	
	BL-8	119.1	S1-T5	RIPARIAN	3,247	0.07	
	BL-8	119.1	S3-T3	RIPARIAN	2,761	0.06	
	BL-9	119.6	W1-T2	PFO	728	0.02	
	BL-9	119.6	S2-T2, S9-T2	RIPARIAN	9,988	0.23	
	BL-10	120.2	W3-T1	PSS	2,101	0.05	
	BL-10	120.2	S1-T1, S3-T1	RIPARIAN	6,558	0.15	
	PSS Replanting Area					2,101	0.05
	PFO Replanting Area					6,071	0.14
PFO to PSS Conversion Area					388	0.01	
Forested Riparian Replanting Area					70,686	1.62	
Hilltop Loop	RP-1	183.6	S1-T8-HL	RIPARIAN	2,925	0.07	
	HL-2	184.4	W1-T5-HL	PFO	1,683	0.04	
	HL-2	184.4	W1-T5-HL	PFO to PSS	240	0.01	
	HL-3	184.9	W1-T4-HL	PFO	1,124	0.03	
	HL-3	184.9	W1-T4-HL	PFO to PSS	269	0.01	
	HL-3	184.9	S2-T4-HL	RIPARIAN	6,661	0.15	
	HL-3	185.0	W5-T2-HL	PFO	1,017	0.02	
	HL-3	185.0	S1-T4-HL	RIPARIAN	26,583	0.61	
	HL-3	185.1	S7-T2-HL, S8-T2-HL	RIPARIAN	15,910	0.37	
	PFO Replanting Area					3,825	0.09
	PFO to PSS Conversion Area					509	0.01
	Forested Riparian Replanting Area					52,079	1.20
Hensel Replacement	HR-1	189	S12-T6-HR	RIPARIAN	4,067	0.09	
	HR-3	190.3	S9-T6-HR	RIPARIAN	814	0.02	
	HR-3	190.5	S7-T7-HR	RIPARIAN	2,509	0.06	
	HR-3	190.5	W8-T6-HR	PSS	110	0.00	
	HR-5	190.7	S1-T7-HR	RIPARIAN	2,367	0.05	
	HR-5	190.7	W1-T7-HR	PFO to PSS	200	0.00	
	HR-5	190.7	W1-T7-HR	PFO	271	0.01	
	HR-7	191	S1-T7-HR	RIPARIAN	5,523	0.13	
	HR-8	193.0	W4-T5-HR	PSS	4,182	0.10	
	HR-8	193.0	S2-T5-HR	RIPARIAN	673	0.02	
	HR-9	193.1	W4-T5-HR	PFO	1,694	0.04	
	HR-9	193.1	W4-T5-HR	PSS	10,376	0.24	
	HR-9	193.1	W4-T5-HR	PFO to PSS	432	0.01	
	HR-9	193.1	S1-T5-HR, S2-T7a-HR	RIPARIAN	10,758	0.25	
	RP-1	193.9	S1-T1-HR	RIPARIAN	3,023	0.07	
	AR-2		W5-T7a-HR, W6-T7a-HR	PFO	3,653	0.08	
	PSS Replanting Area					14,668	0.34
PFO Replanting Area					5,618	0.05	
PFO to PSS Conversion Area					632	0.01	
Forested Riparian Replanting Area					29,734	0.70	

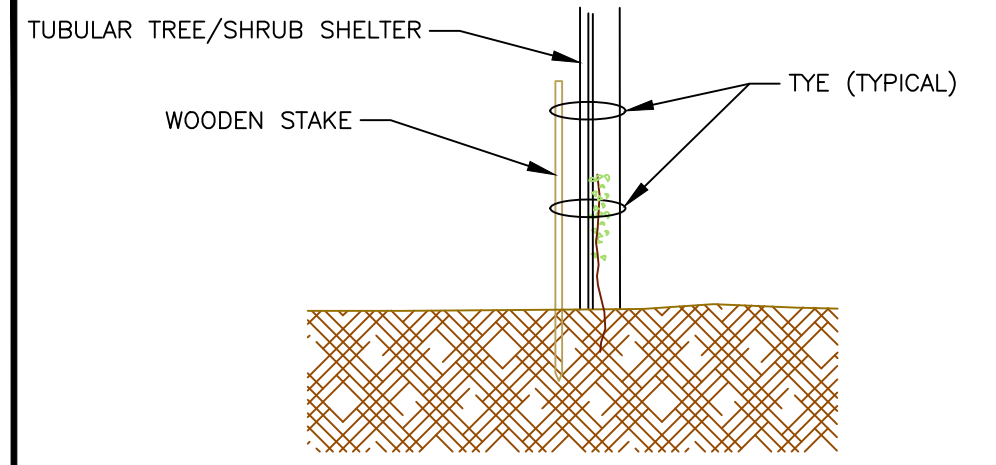
ATTACHMENT D
PLANTING DETAILS



TYPICAL PSS / PFO REPLANTING DETAIL
NOT TO SCALE

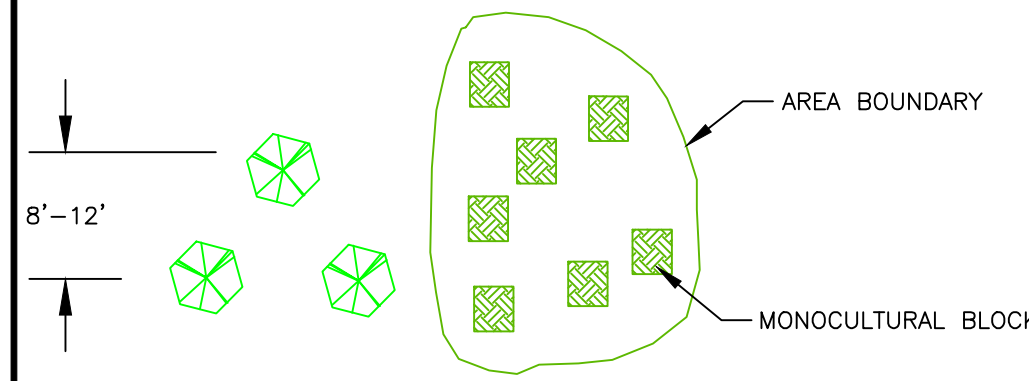


TYPICAL RIPARIAN REPLANTING DETAIL
NOT TO SCALE



NOTE: TREE/SHRUB SHELTERS ARE TO BE MADE FROM BIODEGRADABLE PLASTIC TUBING. SIZE OF SHELTERS AND WOODEN STAKE TO BE DETERMINED BY PROJECT MANAGER.

TYPICAL TREE / SHRUB SHELTER DETAIL
NOT TO SCALE



TYPICAL PLANT SPACING DETAIL
NOT TO SCALE

1. TYPICAL SPACING IS APPROXIMATE. PLANTS SHOULD BE LOCATED RANDOMLY TO AVOID THE APPEARANCE OF ORGANIZED ROWS WITHIN THE MONOCULTURAL PLANTING BLOCKS.
2. TREES AND SHRUBS ARE TO BE PLANTED IN THE PLANTING ZONES IDENTIFIED IN THE PLANTING SCHEDULE. MONOCULTURAL BLOCKS SHOULD CONTAIN 3-6 PLANTS IN SHRUB AND TREE ZONES. MONOCULTURAL BLOCKS SHOULD BE APPROXIMATELY 20' BY 20' IN SIZE, OR AS DIRECTED OR MODIFIED BY THE CONSTRUCTION MANAGER.

TYPICAL PLANT SPACING DETAIL
NOT TO SCALE

* ALL PLANTINGS ARE TO BE PLANTED AND MAINTAINED IN ACCORDANCE WITH NURSERY RECOMMENDATIONS FOR THE FERTILIZER, LIME, SOIL AMENDMENTS, WATER, AND WILDLIFE PROTECTION. WEEKLY INSPECTION, WATERING AS NEEDED, AND OTHER NECESSARY CARE SHOULD BE PROVIDED DURING THE FIRST WEEKS OF THE GROWING SEASON UNTIL SUCCESSFUL TRANSPLANTATION IS EVIDENT.

LEGEND

	TREE / SHRUB REPLANTING AREA
	SHRUB REPLANTING AREA
	WETLAND / RIPARIAN SEED MIX ONLY



2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
TELEPHONE: (814)-689-1650 FAX: (814)-689-1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
**LEIDY SOUTH PROJECT
WETLAND AND RIPARIAN REFORESTATION PLAN**
REPLANTING DETAILS

LYCOMING AND CLINTON COUNTY PENNSYLVANIA

DATE:	08/08/19
DRAWN BY:	KMC
CHECKED:	PF
DRAWING NO.	WILLIAMS186B001
SHEET NO.	ATTACHMENT D