Public Notice

U.S. Army Corps of Engineers
Baltimore District

In Reply to Application Number CENAB-OPR-P-2016-01006-P05 (Renovo Natural Gas Powered Power Plant)

PN- 16-60 Comment Period: November 4 to December 3, 2016

THE PURPOSE OF THIS PUBLIC NOTICE IS TO SOLICIT COMMENTS FROM THE PUBLIC REGARDING THE WORK DESCRIBED BELOW. NO DECISION HAS BEEN MADE AS TO WHETHER OR NOT A PERMIT WILL BE ISSUED AT THIS TIME.

This District has received an application for a Department of the Army permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and/or Section 404 of the Clean Water Act (33. U.S.C. 1344) as described below:

APPLICANT: Renovo Energy Center LLC
c/o Richard Franzese
12011 Sunset Hills Road, Suite 110
Reston, Virginia 20190

WATERWAY AND LOCATION OF THE PROPOSED WORK: In and adjacent to Shintown Run, Brewery Run and the West Branch of the Susquehanna River, in Renovo, Clinton County, Pennsylvania

PROPOSED WORK AND PURPOSE: The applicant proposes, in accordance with the attached plans, to develop a two-unit, gas-fired power plant with expected net output of approximately 950 megawatts (MW). The power plant will be located in Renovo Borough, Pennsylvania, several hundred yards north of the West Branch of the Susquehanna River (WBSR). Components of the project include the water intake and discharge on the WBSR, a waterline from the river to the power plant, the main power plant site, transmission lines, switchyards, and the natural gas pipeline with associated compressor and metering stations. The limit of disturbance (LOD) for all project components is approximately 170 acres. The proposed project will temporarily impact 2,933 linear feet (0.39 ac) of streams across 15 stream channels and permanently impact 2,892 linear feet (0.38 ac) of streams across nine stream channels. Of the total temporary and permanent stream impacts, 3,772 will be associated with repairs and replacement of culverts onsite. The proposed project will also temporarily impact two emergent wetlands for a total of 4,252 sf (0.1 ac), permanently impact two forested wetlands for a total of 2,222.82 square feet (0.05 acres), and permanently impact one scrub-shrub wetland tor a total of 1,795.66 square feet (0.04 acres). The applicant is proposing to complete compensatory mitigation for the project by enhancing 5,825 linear feet of Kettle Creek, which was conceptualized by a partnership between U.S. Fish and Wildlife Service, Clinton County Soil and Water Conservation District, the Kettle Creek Watershed Association, and the United States Army Corps of Engineers. The project would include cross vanes, in-stream structures to create habitat for hellbenders, which exist just downstream, and riparian plantings of existing riparian wetlands.

All work is proposed to be completed in accordance with the enclosed plan(s). If you have any questions concerning this matter, please contact (Marion Gall at marion.gall@usace.army.mil, 814-235-1761, 1631 South Atherton Street, Suite 101 State College, Pennsylvania 16801).

The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit, which reasonable may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors, which may be relevant to the proposal will be considered, including the cumulative effects thereof; among those are conservation, economic, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, and consideration of property ownership and in general, the needs and welfare of the people.

The Corps of Engineers is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments provided will become part of the public record for this action. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity. Written comments concerning the work described above related to the factors listed above or other pertinent factors must be received by the District Engineer, U.S. Army Corps of Engineers, Baltimore District, (Regulatory Field Office, 1631 South Atherton Street, Suite 101, State College, PA 16801) within the comment period specified above.

ESSENTIAL FISH HABITAT: The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 04-267), requires all Federal agencies to consult with the National Marine Fisheries Service (NMFS) on all actions, or proposed actions, permitted, funded, or undertaken by the agency that may adversely effect Essential Fish Habitat (EFH). The Corps has determined this project will not affect any EFH.

WATER QUALITY CERTIFICATION: The applicant is required to obtain a water quality certification in accordance with Section 401 of the Clean Water Act from the Pennsylvania Department of Environmental Protection. The Section 401 certifying agency has a statutory limit of one year from the date of this public notice to make its decision.

COASTAL ZONE MANAGEMENT PROGRAMS: Where applicable, the applicant has certified in this application that the proposed activity complies with and will be conducted in a manner consistent with the approved Coastal Zone Management (CZM) Program. By this public notice, we are requesting the State concurrence or objection to the applicant's consistency statement. It should be noted that the CZM Program has a statutory limit of 6 months to make its consistency determination.

The applicant must obtain any State or local government permits which may be required.

A preliminary review of this application indicates that the proposed work will not affect Federal listed threatened or endangered species or their critical habitat, pursuant to Section 7 of the Endangered Species Act, as amended. As the evaluation of this application continues, additional information may become available which could modify this preliminary determination.

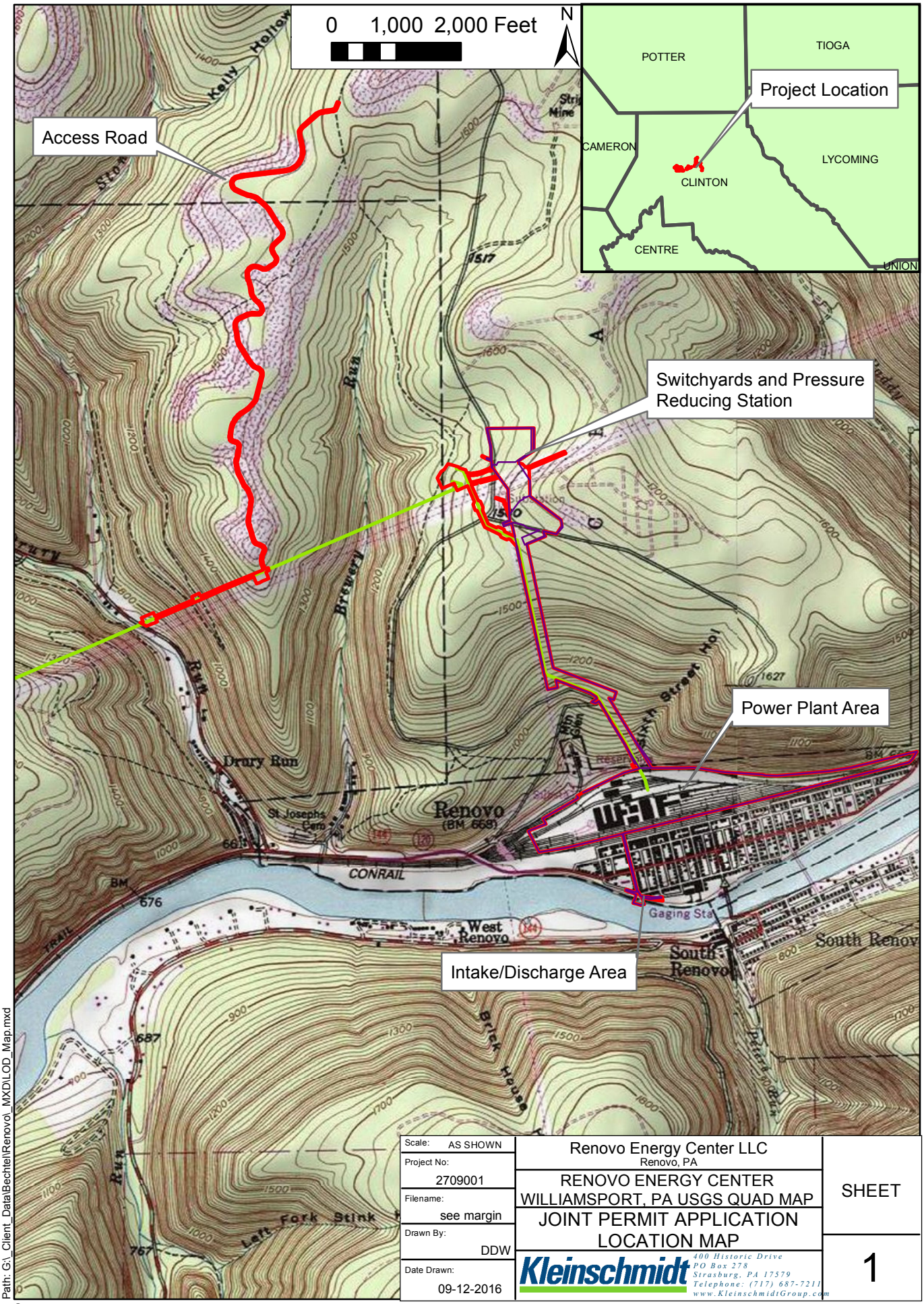
Review of the latest published version of the National Register of Historic Places indicates that no registered properties listed as eligible for inclusion, therein, are located at the site of the proposed work. Currently unknown archeological, scientific, prehistoric, or historical data may be lost or destroyed by the work to be accomplished under the request permit.

The evaluation of the impact of this project on the public interest will include application of the guidelines promulgated by the Administrator, U.S. Environmental Protection Agency, under authority of Section 404 of the Clean Water Act.

Any person who has an interest which may be adversely affected by the issuance of this permit may request a public hearing. The request, which must be in writing, must be received by the District Engineer, U.S. Army Corps of Engineers, Baltimore District, (Regulatory Field Office, 1631 South Atherton Street, Suite 101, State College, PA 16801), within the comment period as specified above to receive consideration. Also it must clearly set forth the interest which may be adversely affected by this activity and the manner in which the interest may be adversely affected.

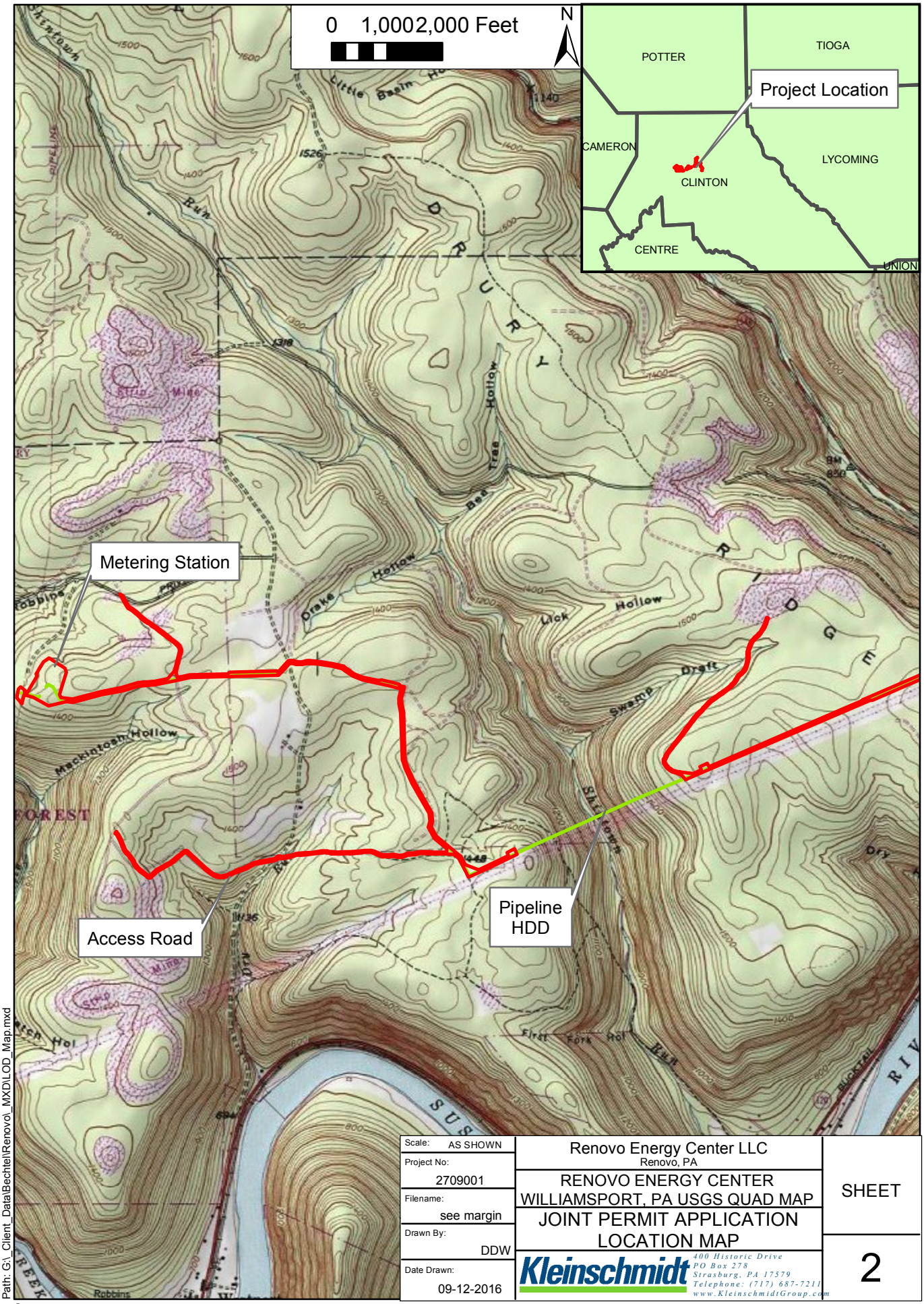
It is requested that you communicate this information concerning the proposed work to any persons know by you to be interested and not being known to this office, who did not receive a copy of this notice.

Wade B. Chandler
Chief, Pennsylvania Section
Regulatory Branch



Scale: AS SHOWN	Renovo Energy Center LLC Renovo, PA	SHEET
Project No: 2709001	RENOVO ENERGY CENTER WILLIAMSPORT, PA USGS QUAD MAP	
Filename: see margin	JOINT PERMIT APPLICATION LOCATION MAP	
Drawn By: DDW	Kleinschmidt 400 Historic Drive PO Box 278 Strasburg, PA 17579 Telephone: (717) 687-7211 www.KleinschmidtGroup.com	1
Date Drawn: 09-12-2016		

Source:



Scale: AS SHOWN	Renovo Energy Center LLC Renovo, PA
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Date Drawn: 09-12-2016	

Kleinschmidt
400 Historic Drive
PO Box 278
Strasburg, PA 17579
Telephone: (717) 687-7211
www.KleinschmidtGroup.com

SHEET 2

Source:

Source:

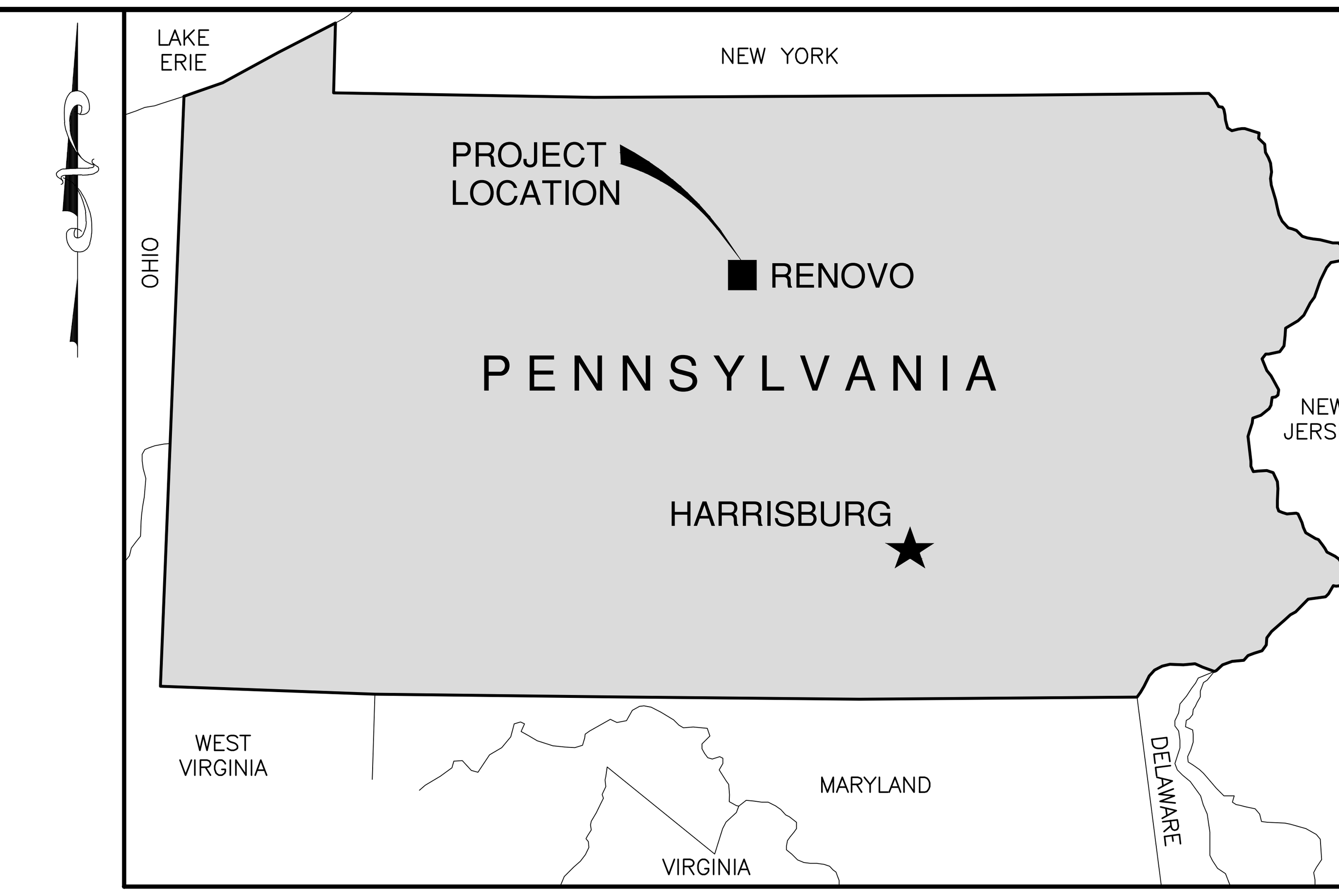
BECHTEL ENTERPRISES
RESTON, VA

RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT

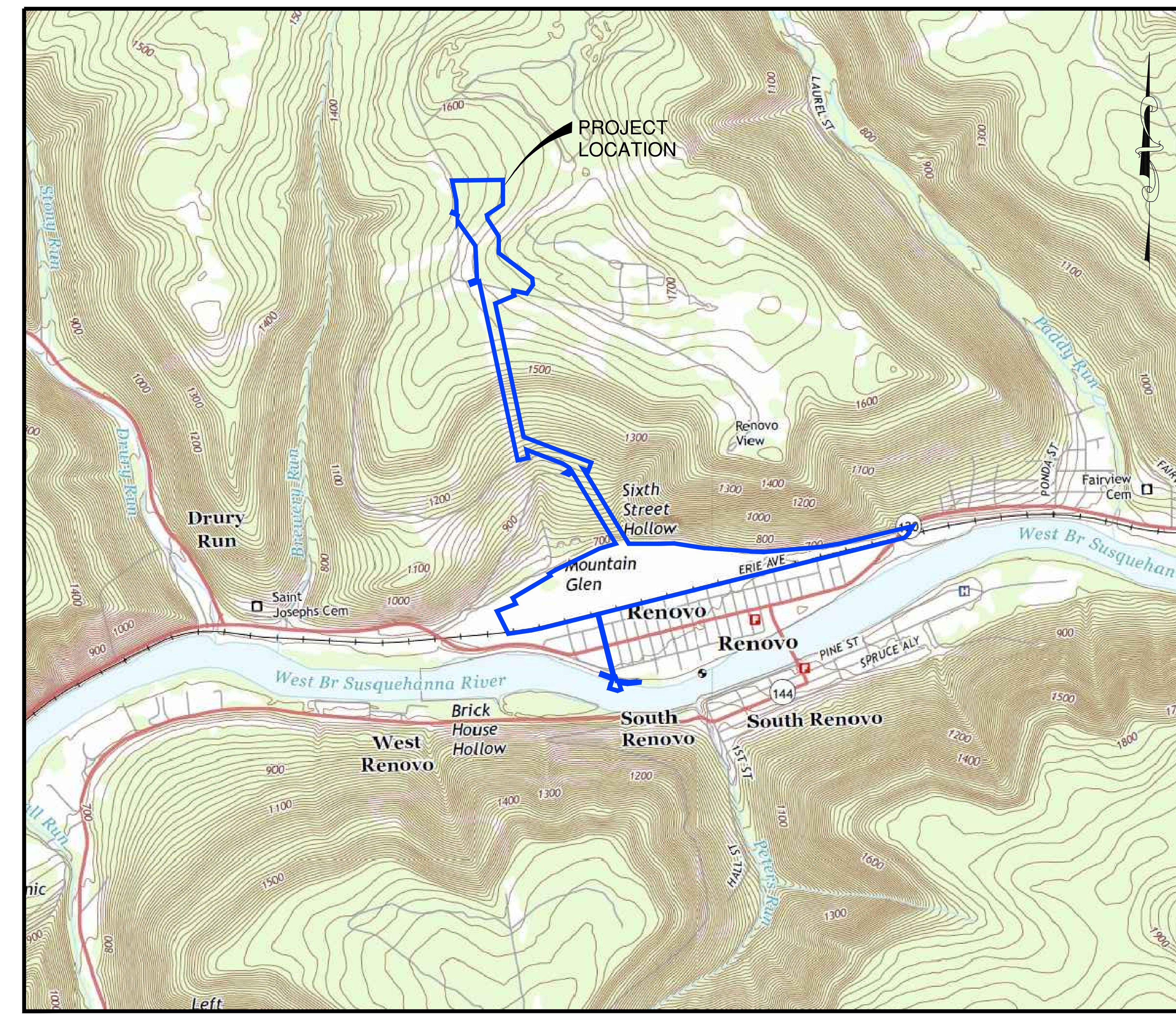
JOINT PERMIT APPLICATION

DRAWING LIST

SHEET NO.	SHEET DESCRIPTION	DATE	REVISION	STATUS
1	COVER	10-21-16	-	DRAFT
2	EXISTING CONDITIONS OVERALL PROJECT PLAN	10-21-16	-	DRAFT
3	EXISTING CONDITIONS PLAN AT INTAKE	10-21-16	-	DRAFT
4	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
5	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
6	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
7	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
8	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
9	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
10	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
11	EXISTING CONDITIONS SITE PLAN	10-21-16	-	DRAFT
12	PROPOSED CONDITIONS OVERALL PROJECT PLAN	10-21-16	-	DRAFT
13	PROPOSED CONDITIONS PLAN AT INTAKE	10-21-16	-	DRAFT
14	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
15	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
16	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
17	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
18	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
19	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
20	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
21	PROPOSED CONDITIONS SITE PLAN	10-21-16	-	DRAFT
22	PROPOSED CONDITIONS CROSS SECTIONS	10-21-16	-	DRAFT
23	PROPOSED CONDITIONS CROSS SECTIONS	10-21-16	-	DRAFT
24	PROPOSED CONDITIONS CROSS SECTIONS	10-21-16	-	DRAFT



STATE MAP



VICINITY MAP

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SCALE IN FEET

NOT FOR CONSTRUCTION

PENNSYLVANIA ONE CALL SYSTEM, INC. 1-800-242-1776 STOP - CALL BEFORE YOU DIG

ATTENTION ALL CONTRACTORS: LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANY RECORDS AND/OR ABOVE-GROUND INSPECTION OF THE SITE COMPLETENESS OR ACCURACY OF TYPE, SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND FACILITIES OR STRUCTURES CANNOT BE GUARANTEED. PURSUANT TO REQUIREMENTS OF PENNSYLVANIA LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2008, CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. SERIAL NO. 20142972094

OWNER: XXXXXXXXXXXXXXXXXXXXXXXXXXXX

TAX PARCEL ID: XXXXXXXXXXXXXXXXXXXX

ACREAGE OF PARCEL: XXX ACRES

LIMIT OF GRADING: XXX ACRES

ROUTE 120
RENOVO, PA 17764
CLINTON COUNTY

WEST BRANCH SUSQUEHANNA RIVER

BECHTEL

Kleinschmidt

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

BECHTEL ENTERPRISES
RESTON, VA

RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

COVER

Kleinschmidt 888-224-5942 KleinschmidtGroup.com

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	1

22x34 = FULL SCALE

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LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF WATER
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- PROJECT LOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83–NF)

500 0 500 1000
SCALE IN FEET

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BECHTEL ENTERPRISES
RESTON, VA

RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

OVERALL PROJECT PLAN

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	2

22x34 = FULL SCALE
3" 2" 1" 0

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22x34 = FULL SCALE

3" 2" 1" 0

SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- OH — OH — OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- S — S — STORM DRAIN LINE
- WETLAND
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

20 0 20 40
SCALE IN FEET

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PLAN AT INTAKE

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Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	3

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LEGEND

— — ### — —	EXISTING MAJOR CONTOUR
— — ### — —	EXISTING MINOR CONTOUR
— · · · —	EDGE OF PERENNIAL WATERBODY
— · · —	EDGE OF INTERMITTENT WATERBODY
— · —	EDGE OF WETLAND
— - —	PROPERTY LINE
~~	VEGETATION LINE
++++	RR TRACKS
— OH — OH —	OVERHEAD UTILITY LINES
——	PROJECT LOD LINE
→ S → S →	STORM DRAIN LINE
	WETLAND
——	FEMA FLOOD LINE

NOTES:
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SCALE IN FEET

22x34 = FULL SCALE

0 1" 2" 3"

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POWERPLANT PROJECT - JOINT PERMIT APPLICATION

EXISTING SITE PLAN

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-	RL	-	1665005	10-21-16	4

22x34 = FULL SCALE

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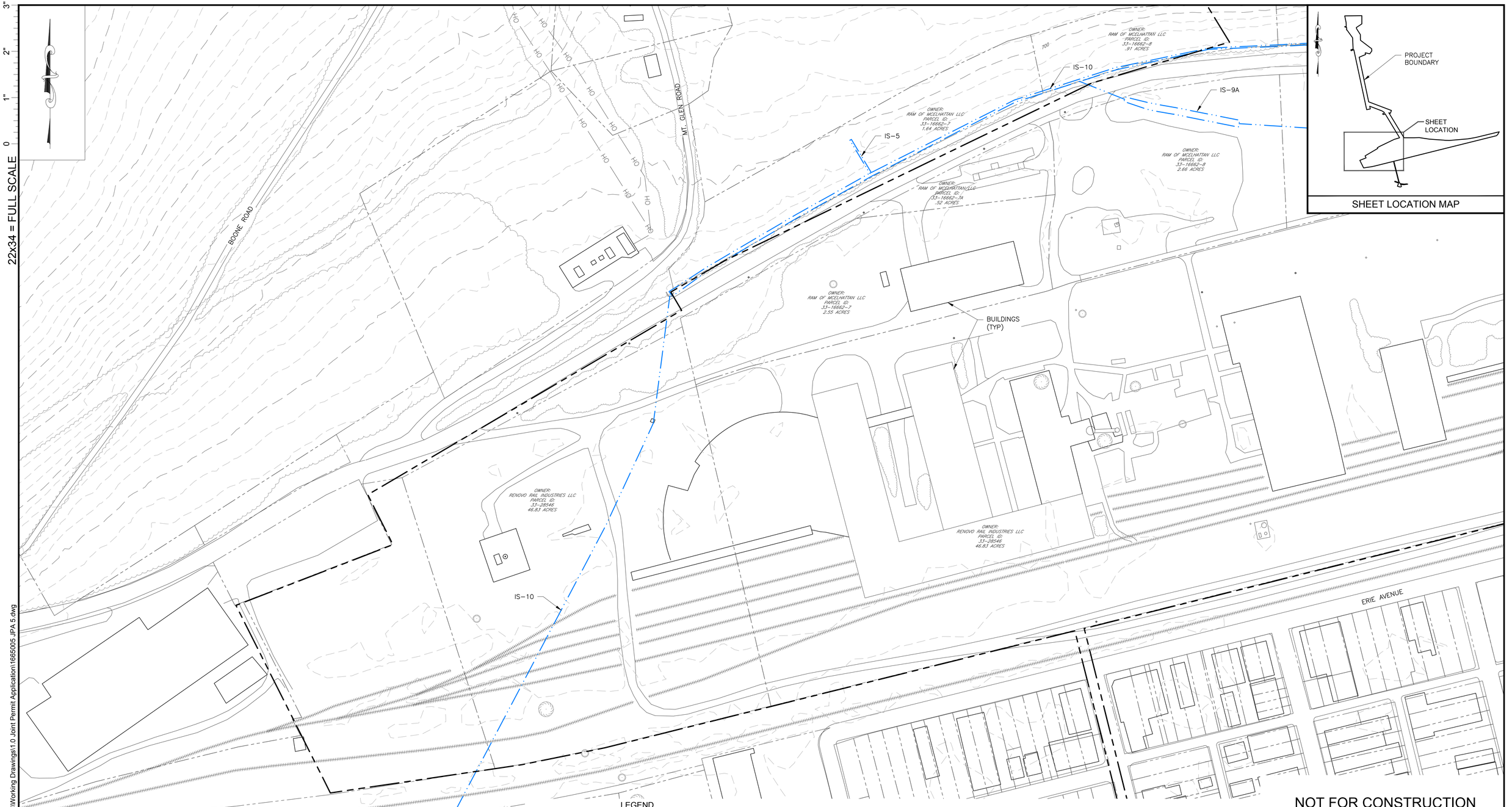

SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- FENCE LINE
- VEGETATION LINE
- RR TRACKS
- OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- STORM DRAIN LINE

WETLAND

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

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SCALE IN FEET

NOT FOR CONSTRUCTION

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POWERPLANT PROJECT - JOINT PERMIT APPLICATION

EXISTING SITE PLAN

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Project No.	Date Revised	Drawing No.
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22x34 = FULL SCALE

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LEGEND

Symbol	Description
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- - ### - -	EXISTING MINOR CONTOUR
— · · —	EDGE OF PERENNIAL WATERBODY
— · · · —	EDGE OF INTERMITTENT WATERBODY
— · —	EDGE OF WETLAND
———	PROPERTY LINE
— X — X —	FENCE LINE
~~	VEGETATION LINE
++++	RR TRACKS
— OH — OH —	OVERHEAD UTILITY LINES
— — —	PROJECT LOD LINE
— > S > — > S > —	STORM DRAIN LINE
	WETLAND

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83–NF)

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RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

EXISTING SITE PLAN

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-	RL	-	1665005	10-21-16	6

SHEET LOCATION MAP

22x34 = FULL SCALE

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SCALE IN FEET

LEGEND

Symbol	Description
— — ### — —	EXISTING MAJOR CONTOUR
- - ### - -	EXISTING MINOR CONTOUR
	EDGE OF PERENNIAL WATERBODY
	EDGE OF INTERMITTENT WATERBODY
	EDGE OF WETLAND
	PROPERTY LINE
— X — X —	FENCE LINE
	VEGETATION LINE
	RR TRACKS
— OH — OH —	OVERHEAD UTILITY LINES
	PROJECT LOD LINE
→ S → S →	STORM DRAIN LINE
	WETLAND

NOTES:
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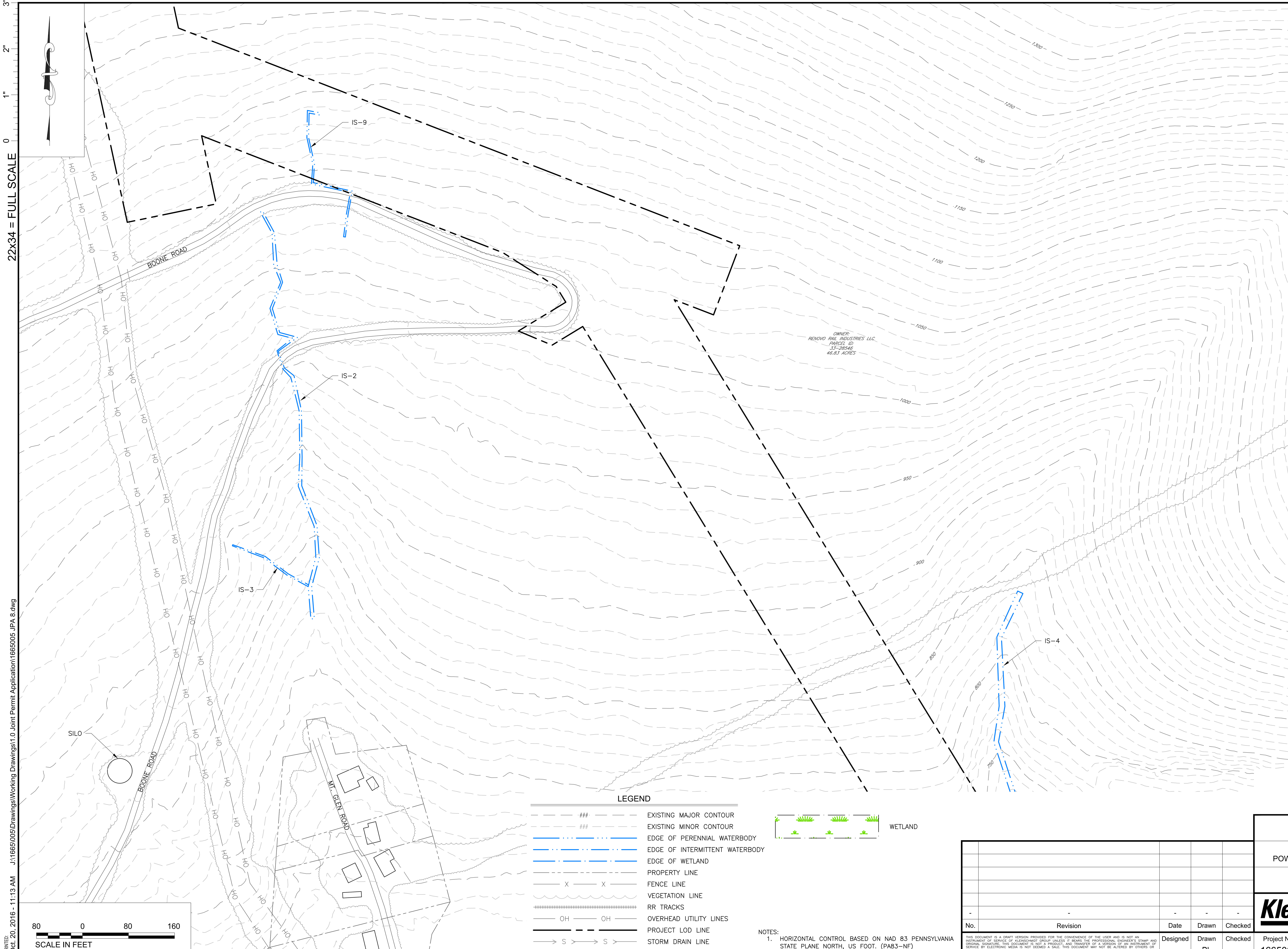
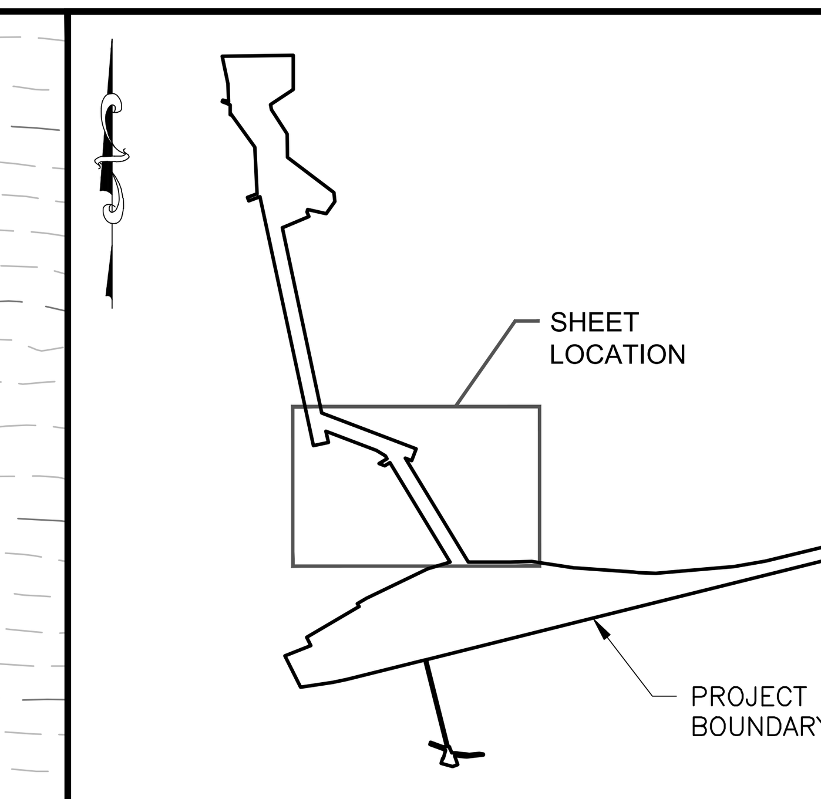
-	RL	-	1665005	10-21-16	7





SHEET LOCATION MAP

LEGEND

###	EXISTING MAJOR CONTOUR
###	EXISTING MINOR CONTOUR
	EDGE OF PERENNIAL WATERBODY
	EDGE OF INTERMITTENT WATERBODY
	EDGE OF WETLAND
	PROPERTY LINE
X X	FENCE LINE
	VEGETATION LINE
	RR TRACKS
OH OH	OVERHEAD UTILITY LINES
	PROJECT LOD LINE
S S	STORM DRAIN LINE
	WETLAND

NOTES:
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EXISTING SITE PLAN

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No.	Revision	Date	Drawn	Checked
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Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	8

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22x34 = FULL SCALE

3" 2" 1" 0

S-11

IS-9

UTILITY POLES (TYP.)

1550 1500 1450 1400 1350 1300 1250 1200 1150 1100 1050

SHEET LOCATION

PROJECT BOUNDARY

SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- OVERHEAD UTILITY LINES (OH)
- PROJECT LOD LINE
- STORM DRAIN LINE (S)
- WETLAND
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

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SCALE IN FEET

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-	-	-	-	-

Designed	Drawn	Checked
-	RL	-

BECHTEL ENTERPRISES
RESTON, VA

RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

EXISTING SITE PLAN

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Project No.	Date Revised	Drawing No.
1665005	10-21-16	9

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SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
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SCALE IN FEET

22x34 = FULL SCALE

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EXISTING SITE PLAN-

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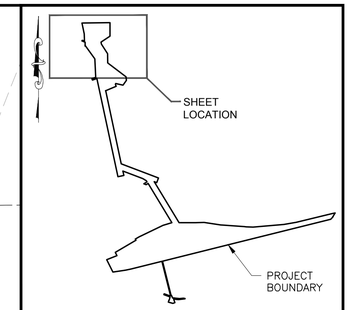
No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	10

22x34 = FULL SCALE

3" 2" 1" 0



SHEET LOCATION MAP

BOONE ROAD

IS-10B

IS-7

IS-8

IS-6

IS-10

IS-9

W-7

W-6

S-8

S-13

PEM1

PEM2

PEM3

PEM4

UTILITY POLES (TYP.)

OWNER:
RENOVO RAIL INDUSTRIES LLC
PARCEL ID:
33-28546
16.83 ACRES

OWNER:
PENNA POWER & LIGHT CO
PARCEL ID:
7-4197A
1.86 ACRES

RENOVO VIEW ROAD

1500 1450 1400 1350

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
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- OH — OH — OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- S — S — STORM DRAIN LINE
- WETLAND
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

80 0 80 160
SCALE IN FEET

NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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Designed	Drawn	Checked
-	RL	-

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RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

EXISTING SITE PLAN

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Project No.	Date Revised	Drawing No.
1665005	10-21-16	11

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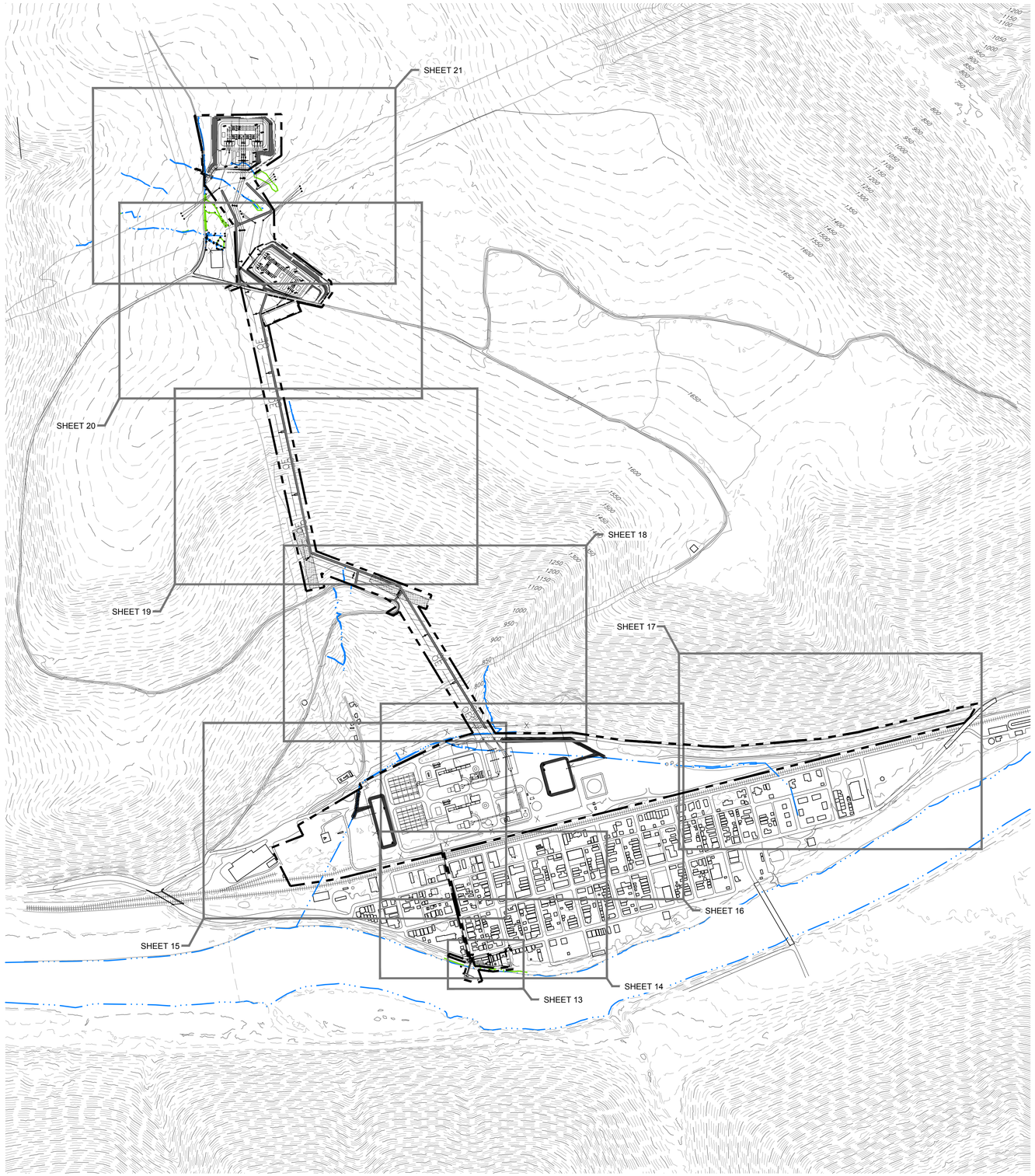
22x34 = FULL SCALE



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF WATER
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- PROJECT LOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83–NF)

500 0 500 1000
SCALE IN FEET

NOT FOR CONSTRUCTION

BECHTEL ENTERPRISES
RESTON, VA

RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

PROPOSED CONDITIONS
OVERALL PROJECT PLAN

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	12

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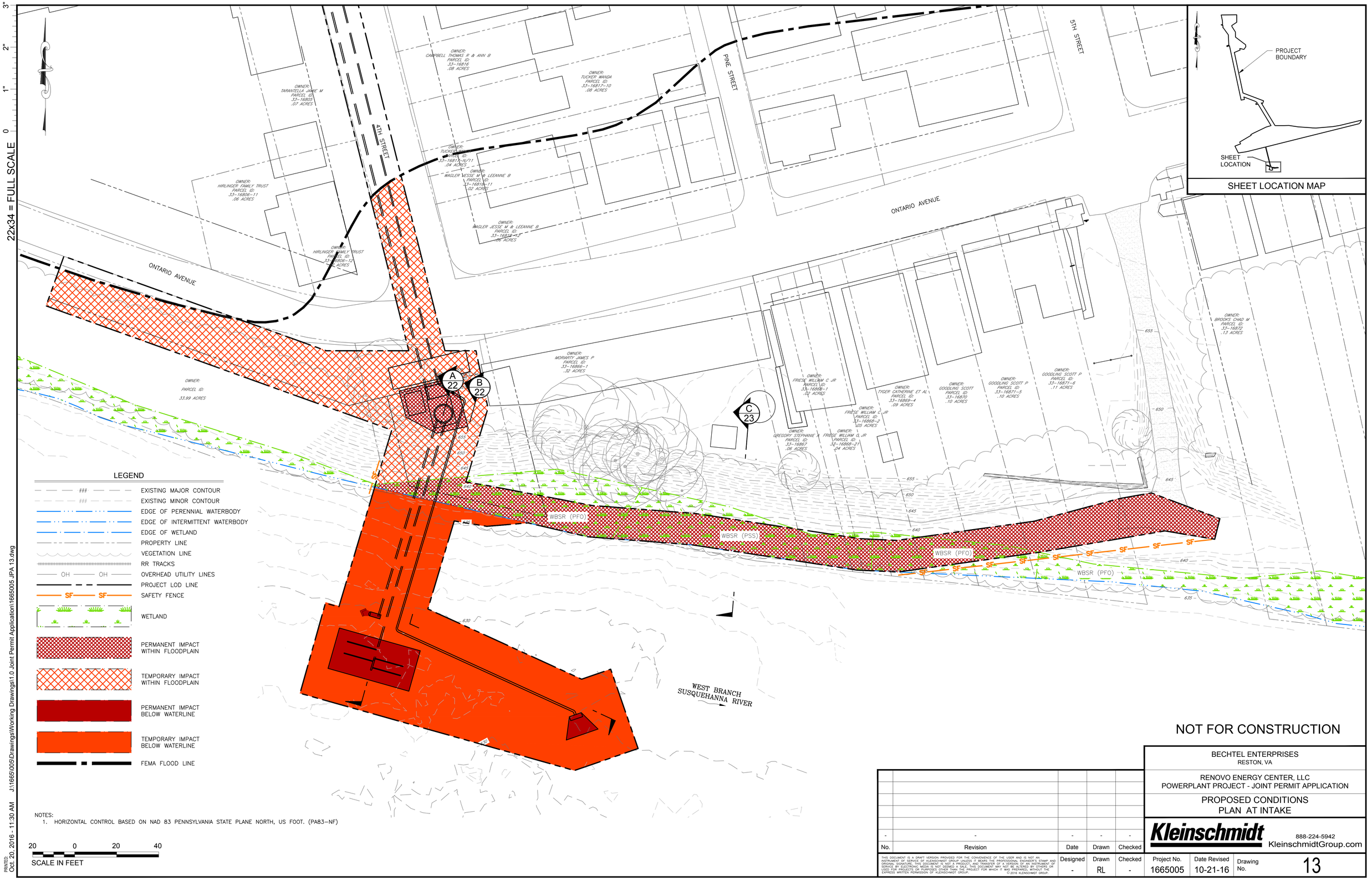
22x34 = FULL SCALE

3" 2" 1" 0



SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- OH — OH — OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- SF — SF — SAFETY FENCE
- WETLAND
- PERMANENT IMPACT WITHIN FLOODPLAIN
- TEMPORARY IMPACT WITHIN FLOODPLAIN
- PERMANENT IMPACT BELOW WATERLINE
- TEMPORARY IMPACT BELOW WATERLINE
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

20 0 20 40
SCALE IN FEET

NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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PROPOSED CONDITIONS
PLAN AT INTAKE

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Project No.	Date Revised	Drawing No.
1665005	10-21-16	13

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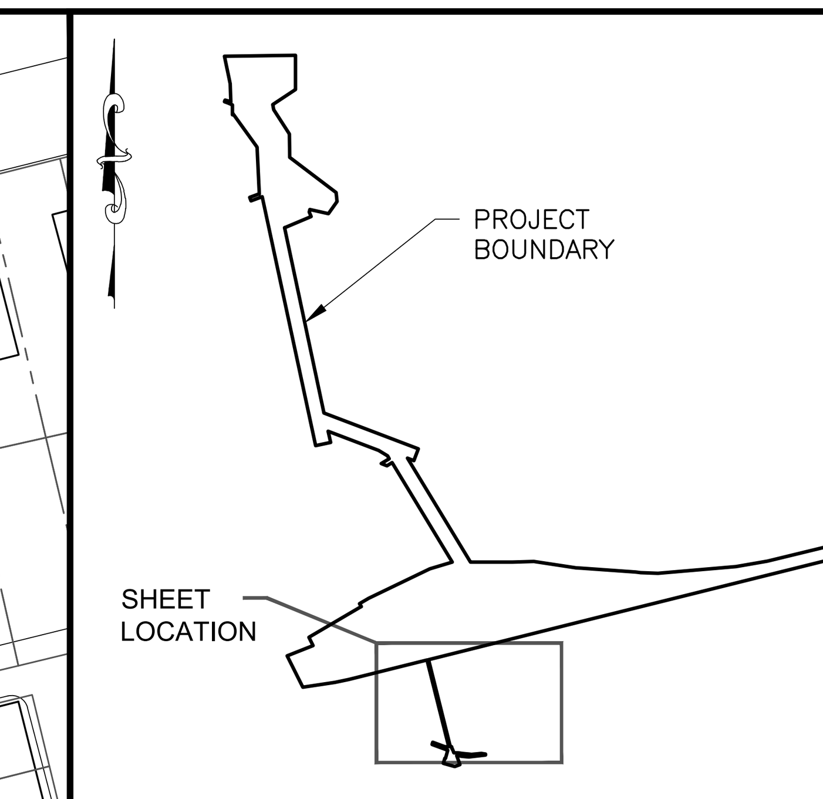
22x34 = FULL SCALE

3" 2" 1" 0



SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- OH — OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- SF — SAFETY FENCE
- S — STORM DRAIN LINE
- WETLAND
- PERMANENT IMPACT WITHIN FLOODPLAIN
- TEMPORARY IMPACT WITHIN FLOODPLAIN
- PERMANENT IMPACT BELOW WATERLINE
- TEMPORARY IMPACT BELOW WATERLINE
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

60 0 60 120

SCALE IN FEET

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POWERPLANT PROJECT - JOINT PERMIT APPLICATION

PROPOSED CONDITIONS
SITE PLAN

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	14

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LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- FENCE LINE
- VEGETATION LINE
- RR TRACKS
- OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- SAFETY FENCE
- STORM DRAIN LINE
- WETLAND
- PERMANENT IMPACT WITHIN FLOODPLAIN
- TEMPORARY IMPACT WITHIN FLOODPLAIN
- PERMANENT IMPACT BELOW WATERLINE
- TEMPORARY IMPACT BELOW WATERLINE

NOTES:

1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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PROPOSED CONDITIONS
SITE PLAN

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-	RL	-	1665005	10-21-16	15

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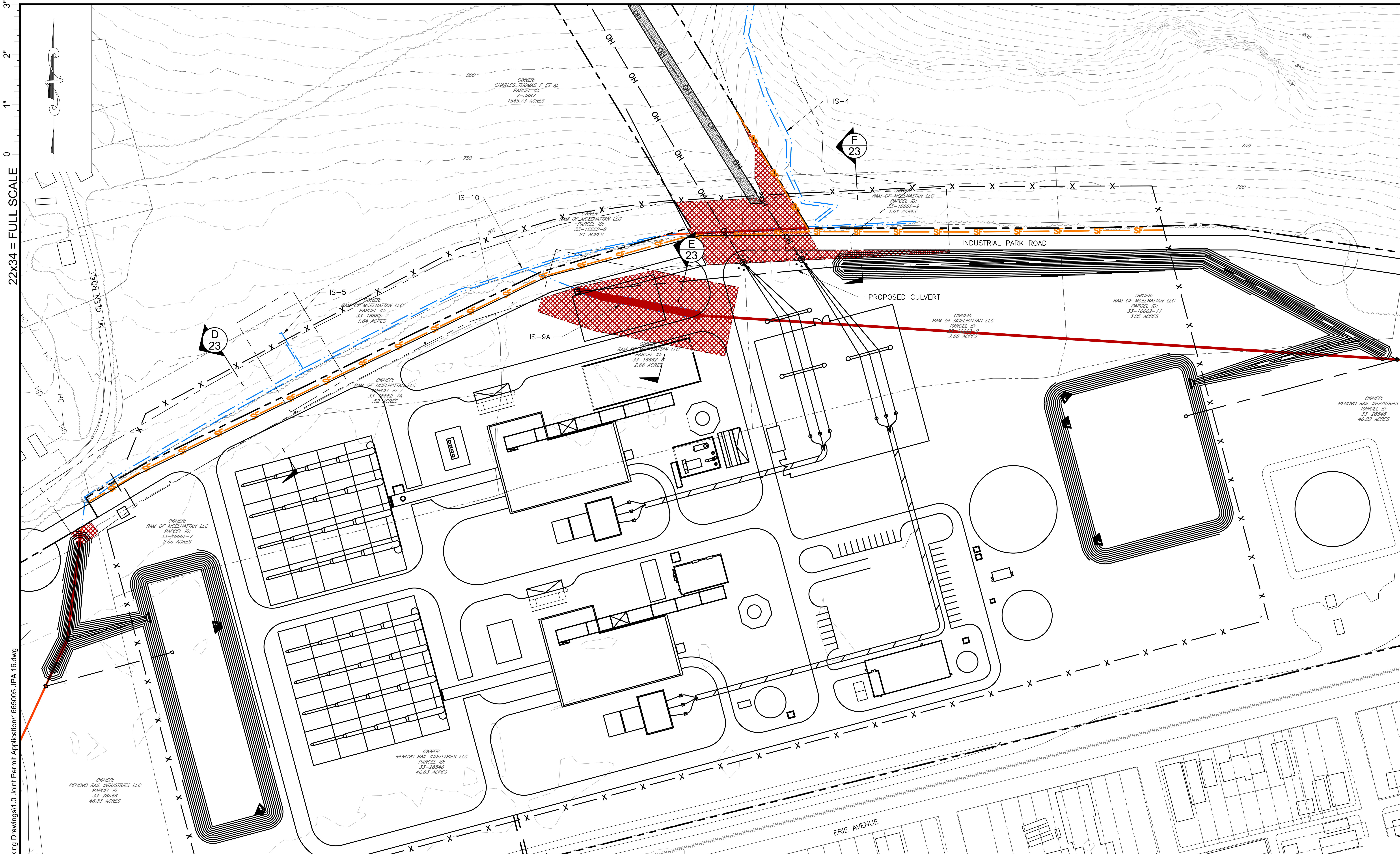

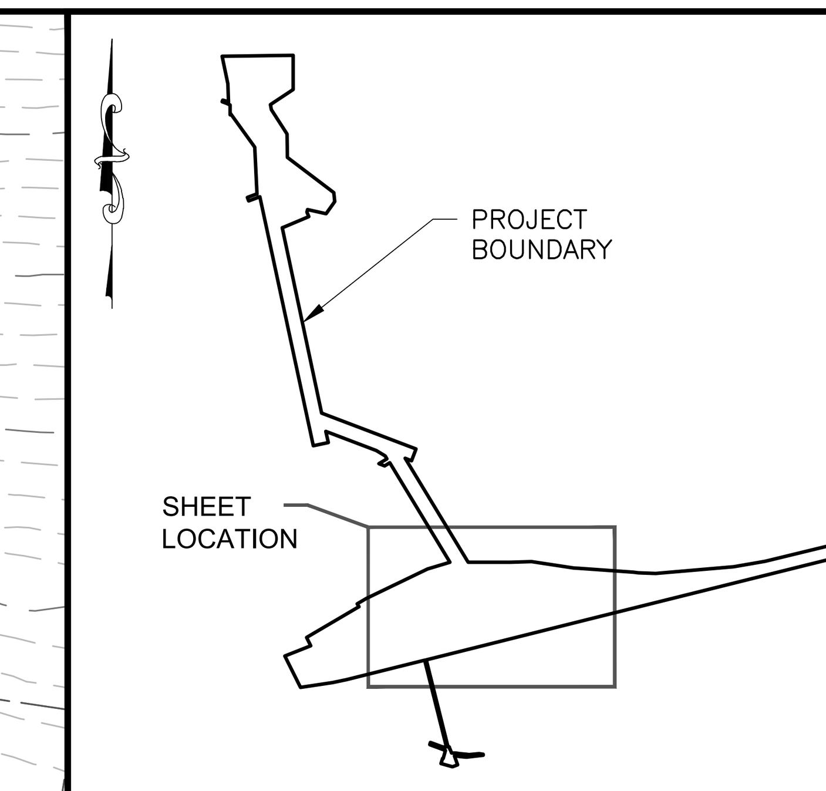

SHEET LOCATION MAP

LEGEND

Symbol	Description
###	EXISTING MAJOR CONTOUR
###	EXISTING MINOR CONTOUR
	EDGE OF PERENNIAL WATERBODY
	EDGE OF INTERMITTENT WATERBODY
	EDGE OF WETLAND
	PROPERTY LINE
X X	FENCE LINE
	VEGETATION LINE
	RR TRACKS
OH OH	OVERHEAD UTILITY LINES
	PROJECT LOD LINE
SF SF	SAFETY FENCE
S S	STORM DRAIN LINE
	WETLAND
	PERMANENT IMPACT WITHIN FLOODPLAIN
	TEMPORARY IMPACT WITHIN FLOODPLAIN
	PERMANENT IMPACT BELOW WATERLINE
	TEMPORARY IMPACT BELOW WATERLINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

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PROPOSED CONDITIONS
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No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	16

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80 0 80 160
SCALE IN FEET

LEGEND

Symbol	Description
— ### —	EXISTING MAJOR CONTOUR
- - ### - -	EXISTING MINOR CONTOUR
	EDGE OF PERENNIAL WATERBODY
	EDGE OF INTERMITTENT WATERBODY
	EDGE OF WETLAND
	PROPERTY LINE
— X — X —	FENCE LINE
	VEGETATION LINE
	RR TRACKS
— OH — OH —	OVERHEAD UTILITY LINES
	PROJECT LOD LINE
— SF — SF —	SAFETY FENCE
→ S → S →	STORM DRAIN LINE
	WETLAND
	PERMANENT IMPACT WITHIN FLOODPLAIN
	TEMPORARY IMPACT WITHIN FLOODPLAIN
	PERMANENT IMPACT BELOW WATERLINE
	TEMPORARY IMPACT BELOW WATERLINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83–NF)

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No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	17

22x34 = FULL SCALE

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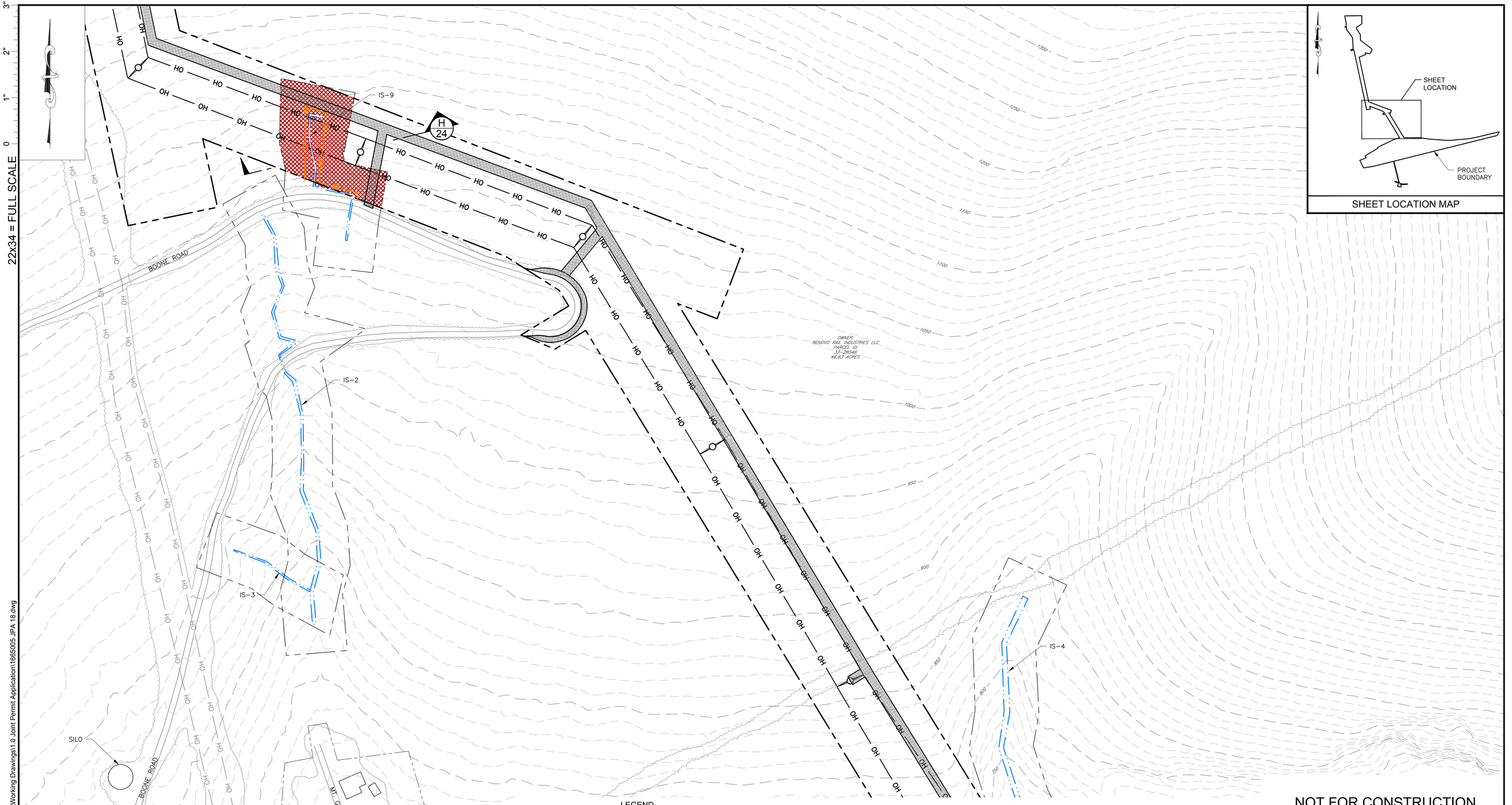
22x34 = FULL SCALE

3" 2" 1" 0



SHEET LOCATION MAP

80 0 80 160

SCALE IN FEET

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
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NOTES:
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NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

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Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	18

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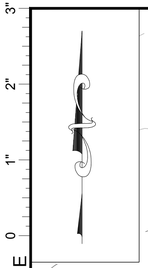
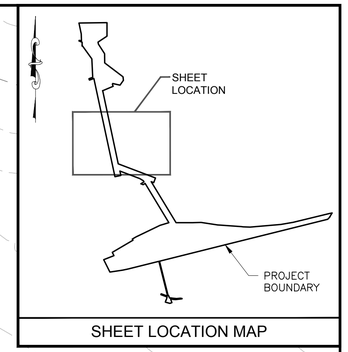
22x34 = FULL SCALE

3" 2" 1" 0





SHEET LOCATION MAP

J/24

S-11

IS-9

UTILITY POLES (TYP.)

1550 1500 1450 1400 1350 1300 1250 1200 1150

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
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- TEMPORARY IMPACT BELOW WATERLINE
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

80 0 80 160
SCALE IN FEET

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PROPOSED CONDITIONS
SITE PLAN

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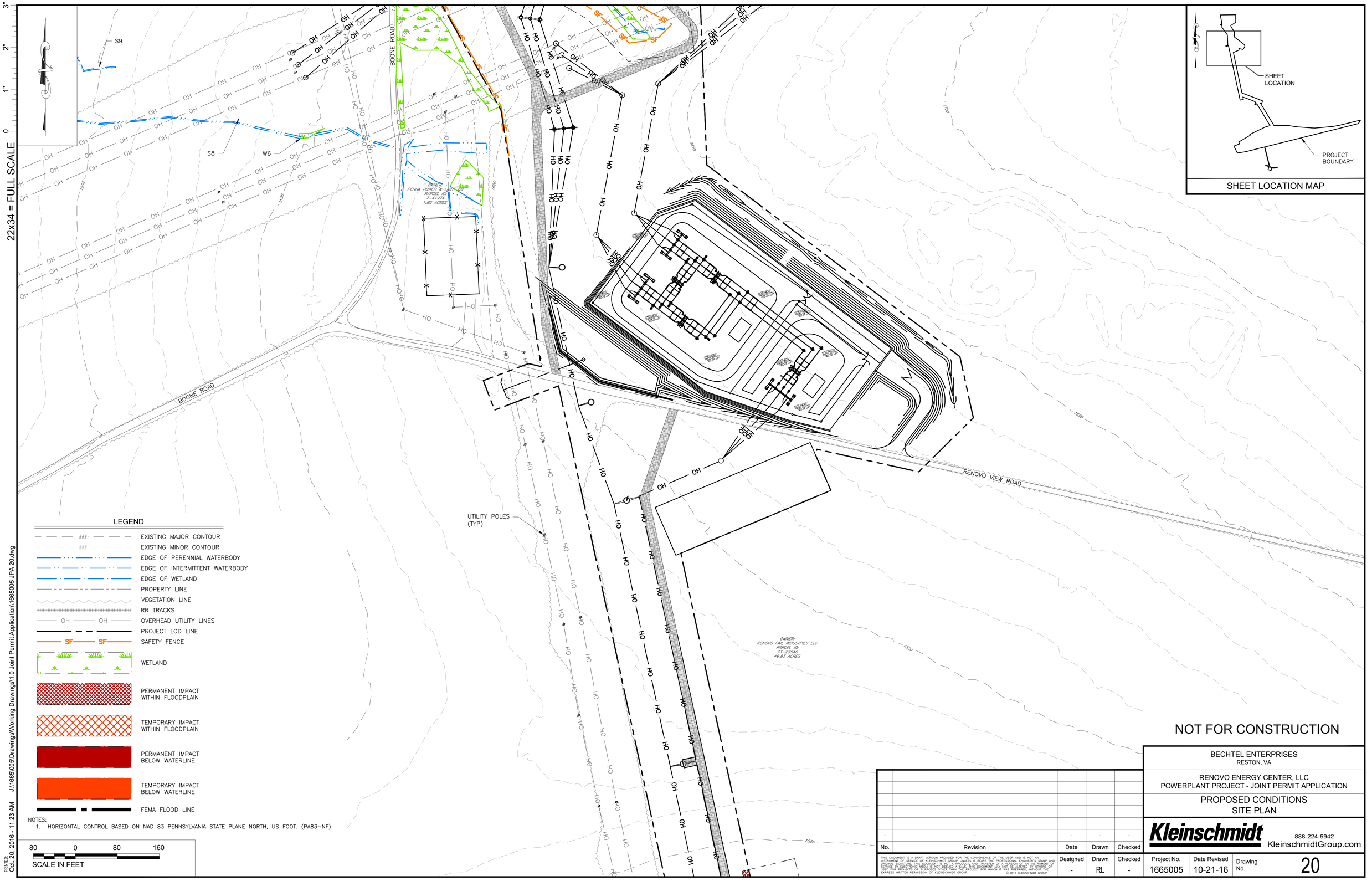
No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked
-	RL	-

Project No.	Date Revised	Drawing No.
1665005	10-21-16	19

22x34 = FULL SCALE

3" 2" 1" 0



SHEET LOCATION MAP

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- OVERHEAD UTILITY LINES
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- TEMPORARY IMPACT WITHIN FLOODPLAIN
- PERMANENT IMPACT BELOW WATERLINE
- TEMPORARY IMPACT BELOW WATERLINE
- FEMA FLOOD LINE

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

80 0 80 160
SCALE IN FEET

NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	20

BECHTEL ENTERPRISES
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SITE PLAN

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22x34 = FULL SCALE

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EDGE OF PERENNIAL WATERBODY
- EDGE OF INTERMITTENT WATERBODY
- EDGE OF WETLAND
- PROPERTY LINE
- VEGETATION LINE
- RR TRACKS
- OVERHEAD UTILITY LINES
- PROJECT LOD LINE
- SAFETY FENCE
- WETLAND
- PERMANENT IMPACT WITHIN FLOODPLAIN
- TEMPORARY IMPACT WITHIN FLOODPLAIN
- PERMANENT IMPACT BELOW WATERLINE
- TEMPORARY IMPACT BELOW WATERLINE
- FEMA FLOOD LINE

NOT FOR CONSTRUCTION

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)

80 0 80 160
SCALE IN FEET

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POWERPLANT PROJECT - JOINT PERMIT APPLICATION

PROPOSED CONDITIONS
SITE PLAN

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No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	21

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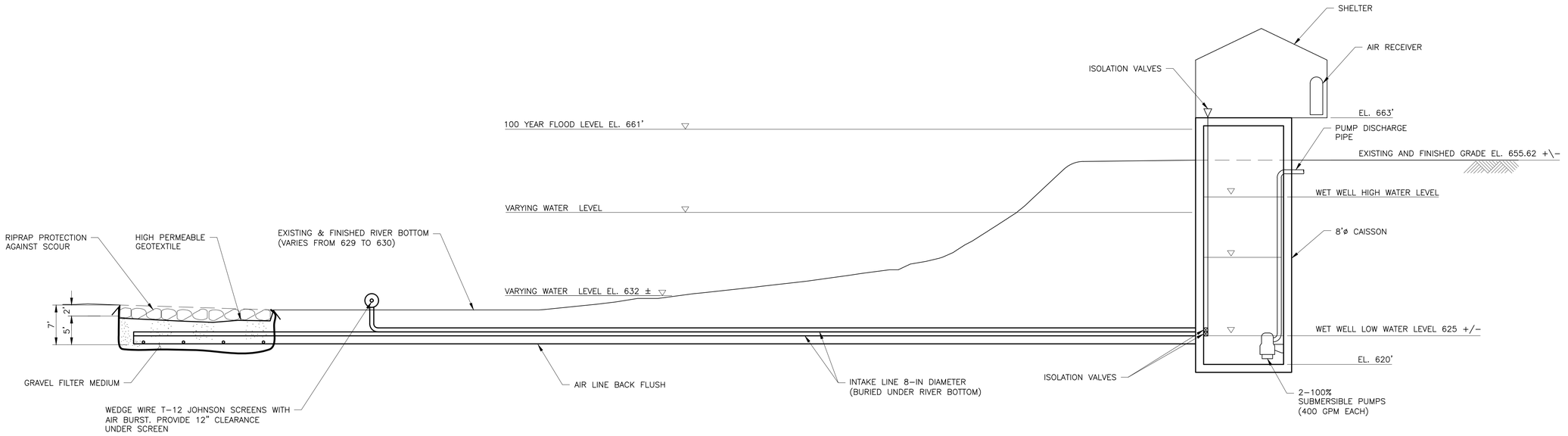
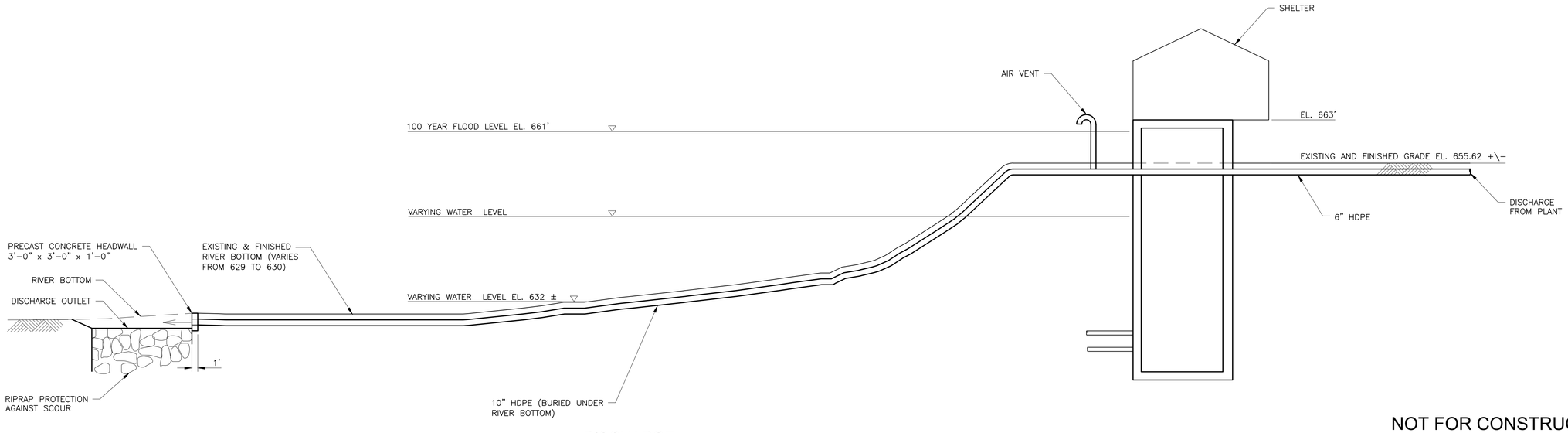


INTAKE LINE SECTION A/13

1" = 10'-0"



DISCHARGE SECTION B/13

1" = 10'-0"

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)
2. ELEVATIONS ARE IN NGVD 1929

10 0 10 20
SCALE IN FEET

NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

BECHTEL ENTERPRISES
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POWERPLANT PROJECT - JOINT PERMIT APPLICATION

PROPOSED CONDITIONS
CROSS SECTIONS

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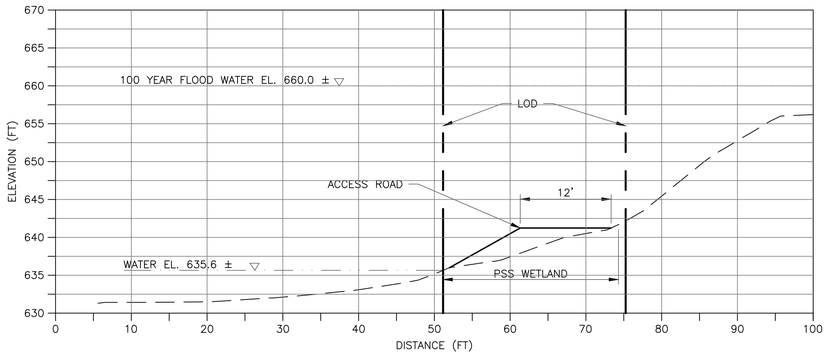
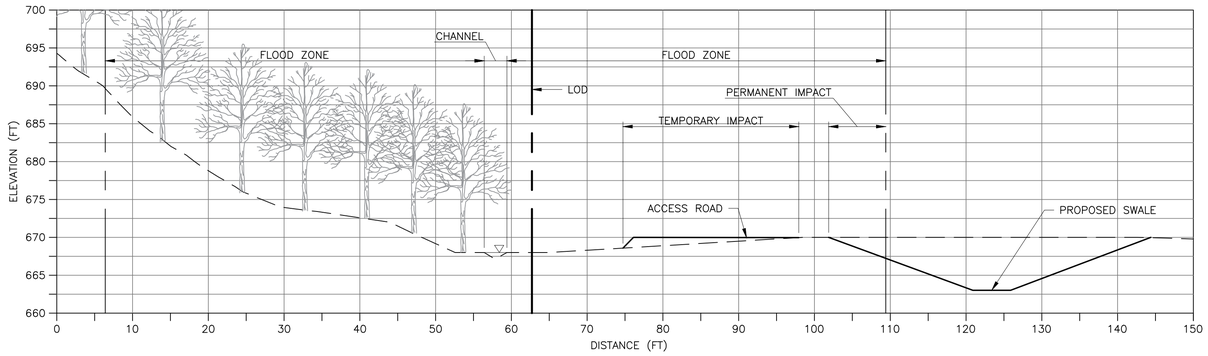
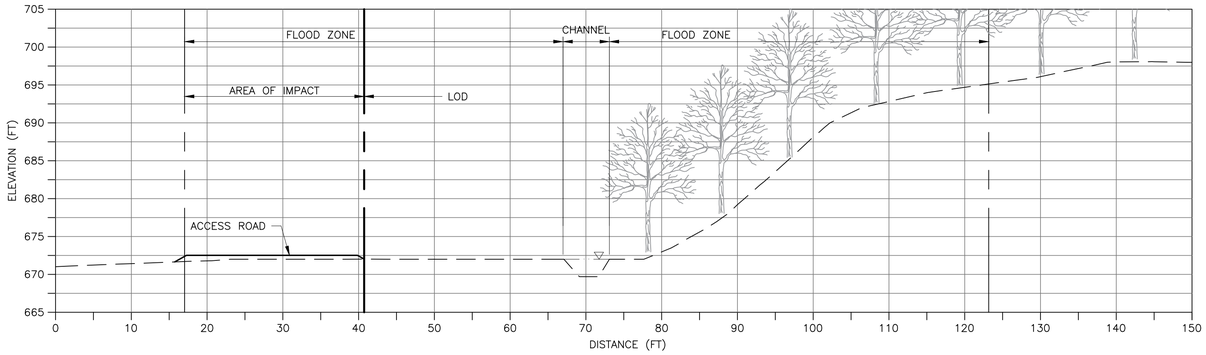
Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	22



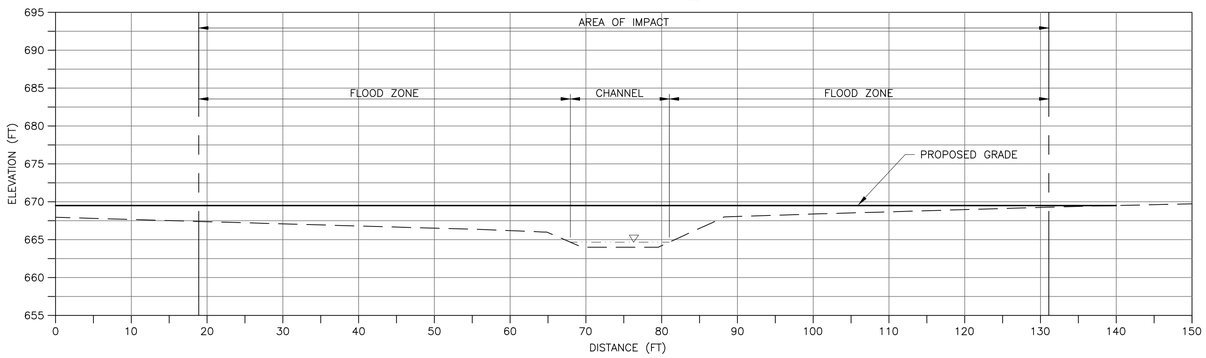
RIVER BANK SECTION C/13
1" = 10'-0"



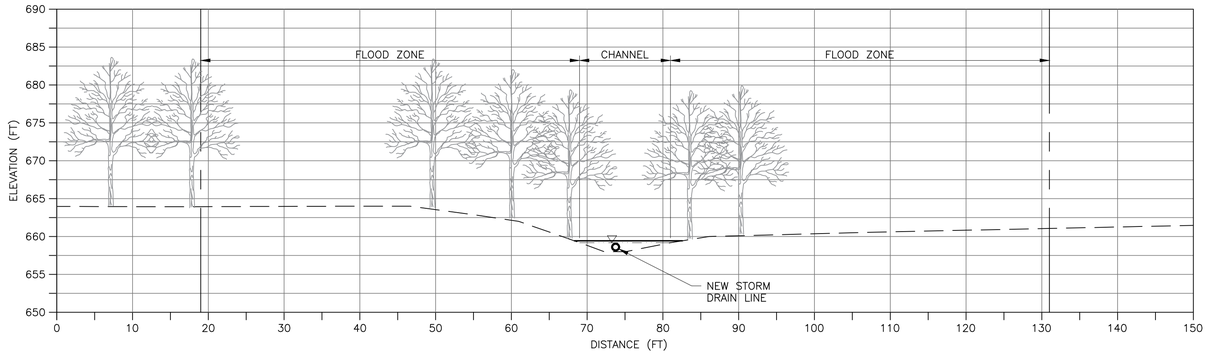
IS-10 SECTION F/16
1" = 10'-0"



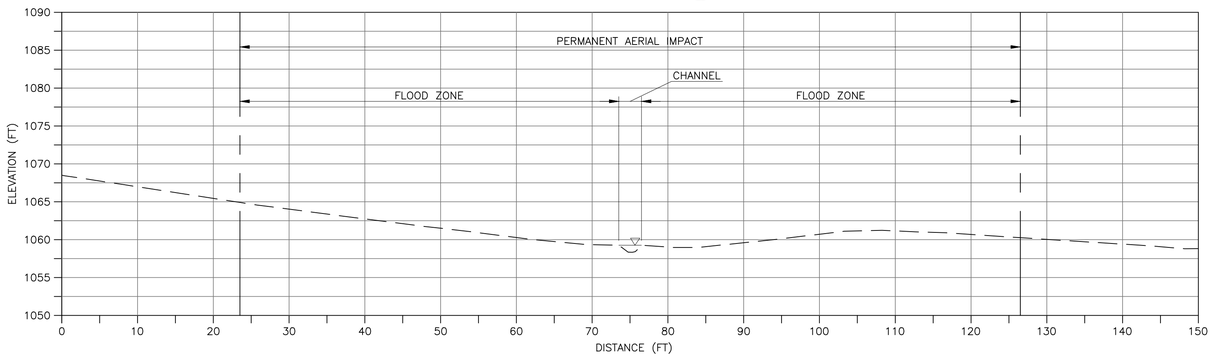
IS-10 SECTION D/15
1" = 10'-0"



IS-9 SECTION E/15
1" = 10'-0"



IS-10 SECTION G/17
1" = 10'-0"



IS-9A SECTION H/18
1" = 10'-0"

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83–NF)
2. ELEVATIONS ARE IN NGVD 1929

10 0 10 20
SCALE IN FEET

NOT FOR CONSTRUCTION

BECHTEL ENTERPRISES
RESTON, VA

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POWERPLANT PROJECT - JOINT PERMIT APPLICATION

PROPOSED CONDITIONS
CROSS SECTIONS

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-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	23

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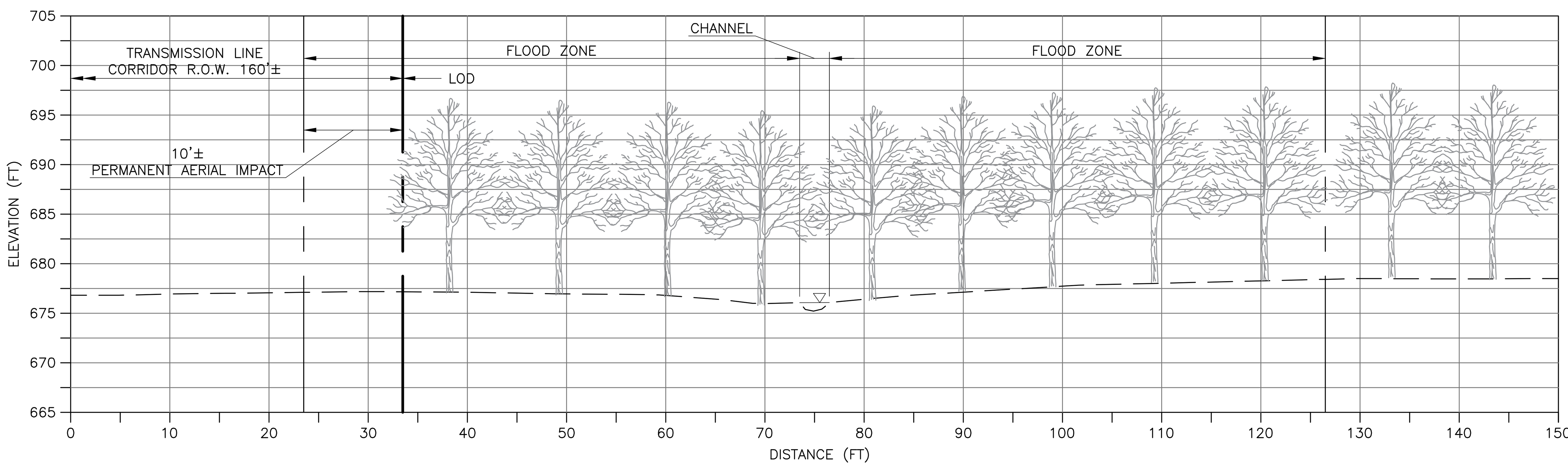
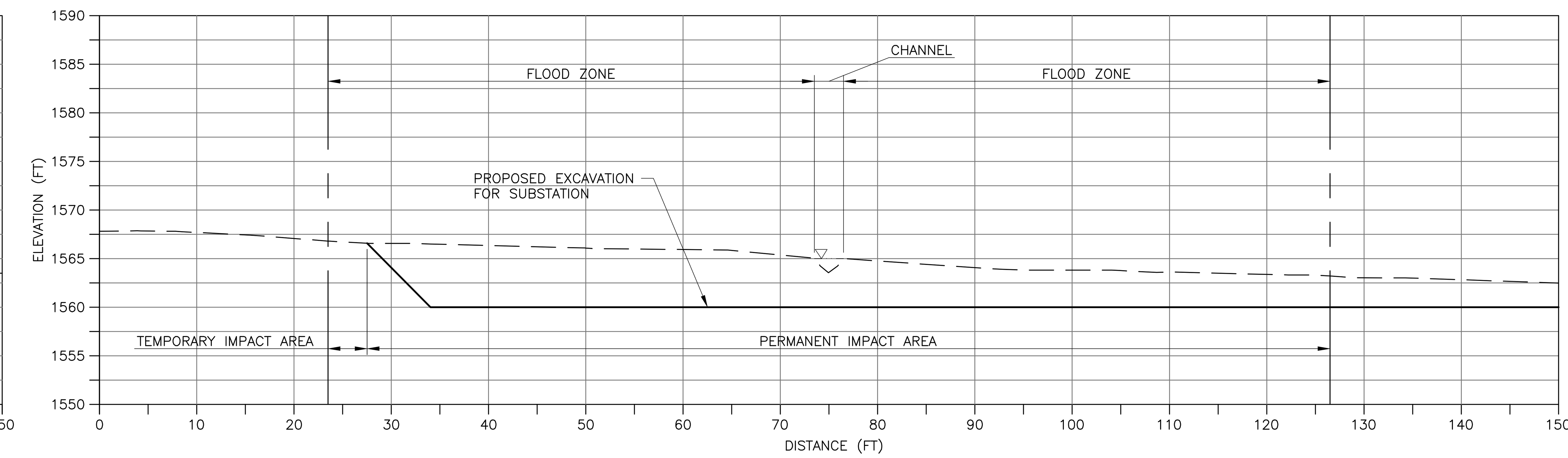
22x34 = FULL SCALE

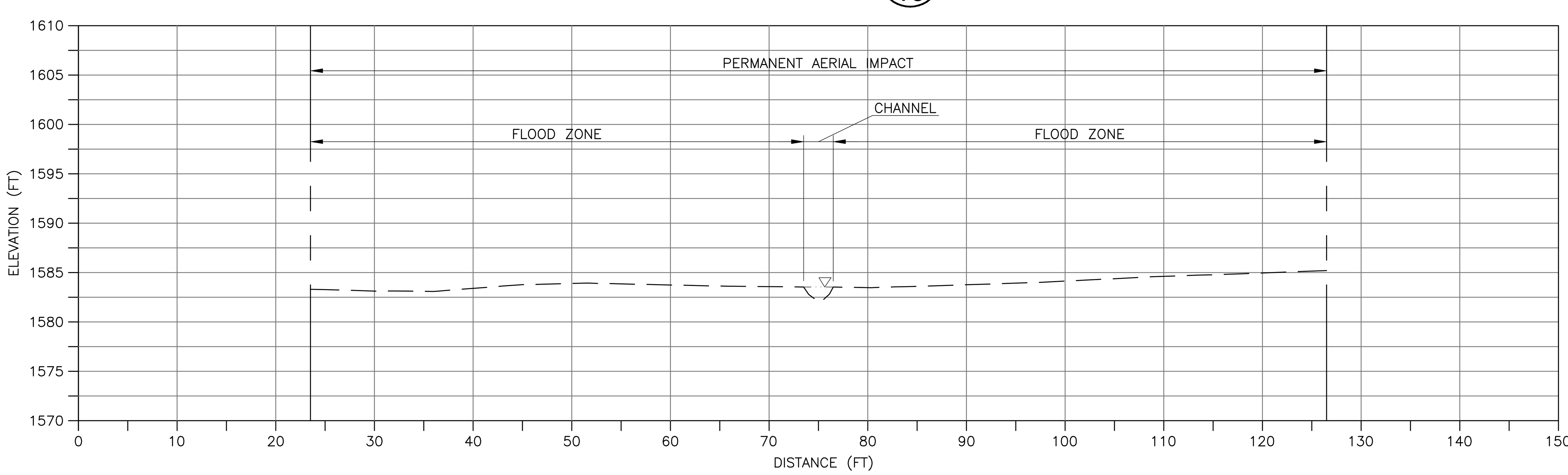
22x34 = FULL SCALE



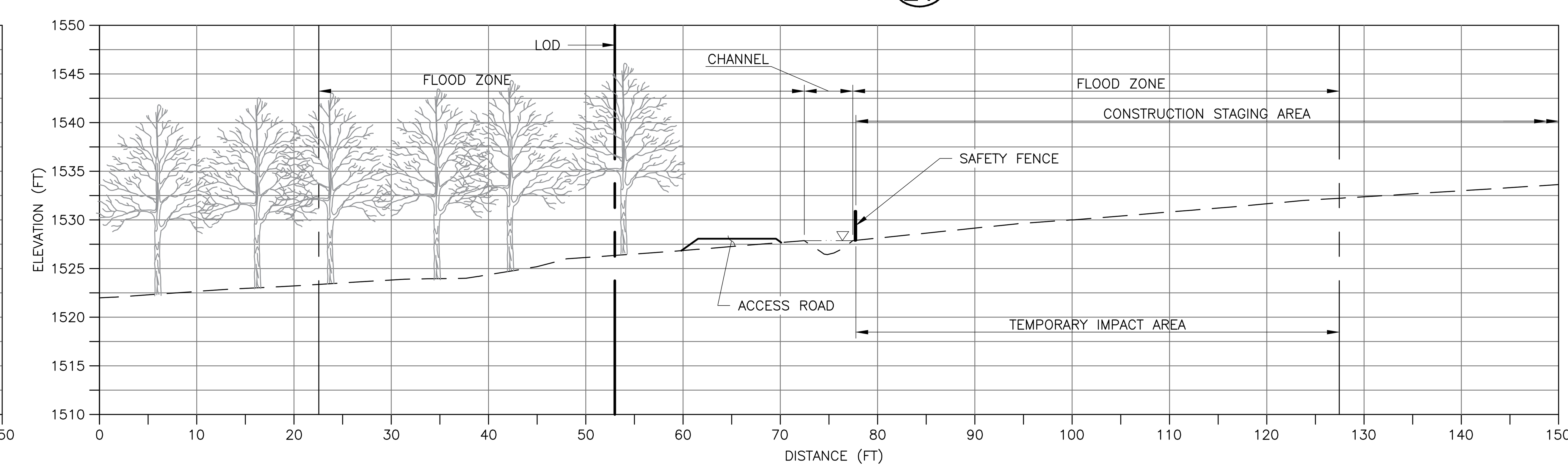
S-11
SECTION J/19
1" = 10'-0"



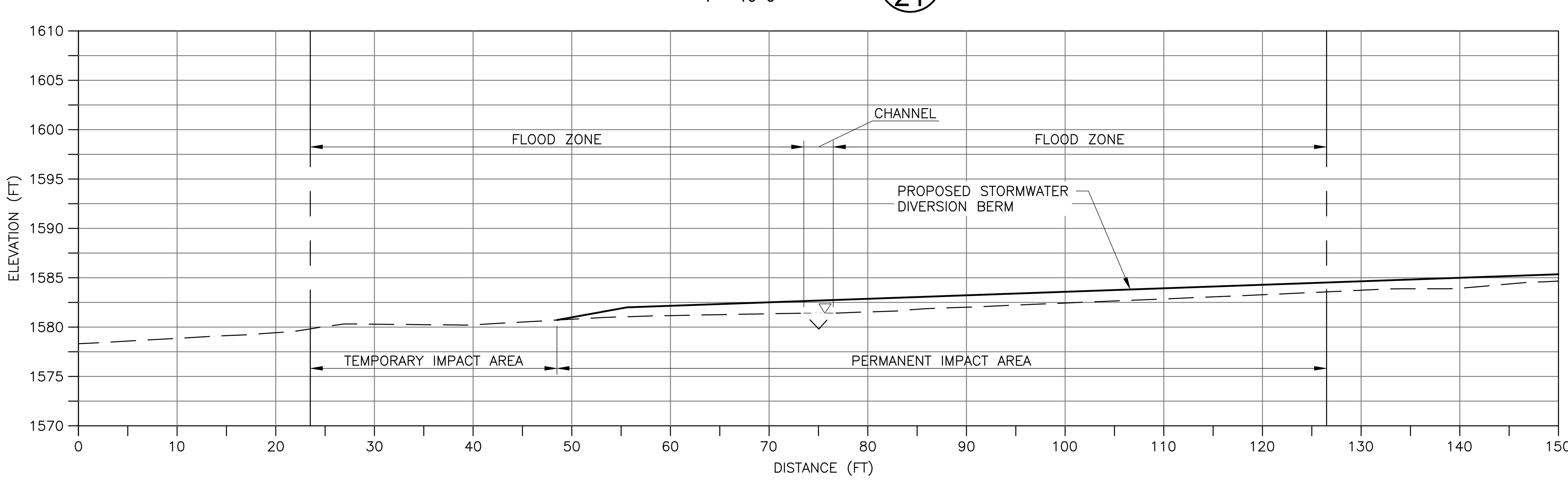
IS-8
SECTION M/21
1" = 10'-0"



IS-6
SECTION K/21
1" = 10'-0"



IS-10B
SECTION N/21
1" = 10'-0"



IS-8
SECTION L/21
1" = 10'-0"

NOTES:
1. HORIZONTAL CONTROL BASED ON NAD 83 PENNSYLVANIA STATE PLANE NORTH, US FOOT. (PA83-NF)
2. ELEVATIONS ARE IN NGVD 1929

10 0 10 20
SCALE IN FEET

PRINTED: Oct. 20, 2016 - 11:34 AM J:\1665\005\Drawings\Working Drawings\1.0 Joint Permit Application\1665005 JPA 24.dwg

NOT FOR CONSTRUCTION

No.	Revision	Date	Drawn	Checked
-	-	-	-	-

Designed	Drawn	Checked	Project No.	Date Revised	Drawing No.
-	RL	-	1665005	10-21-16	24

BECHTEL ENTERPRISES
RESTON, VA

RENOVO ENERGY CENTER, LLC
POWERPLANT PROJECT - JOINT PERMIT APPLICATION

PROPOSED CONDITIONS
CROSS SECTIONS

Kleinschmidt
888-224-5942
KleinschmidtGroup.com

RENOVO NATURAL GAS PIPELINE PROJECT

WETLAND/WATERS ENCROACHMENT PERMIT PLANS

NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH CLINTON COUNTY PENNSYLVANIA

Plans Prepared By:

HanoverEngineering

3355 ROUTE 611, SUITE 1
BARTONSVILLE, PA 18321-7822
PHONE: 570.688.9550
FAX: 570.688.9768

Project Owner/Applicant:

RENOVO ENERGY CENTER, LLC
12011 SUNSET HILLS ROAD, SUITE 100
RESTON, VA 20190
CONTACT: RICHARD P. FRANZESE
PHONE: 571.392.6300

"CALL BEFORE YOU DIG"

PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE – STOP CALL

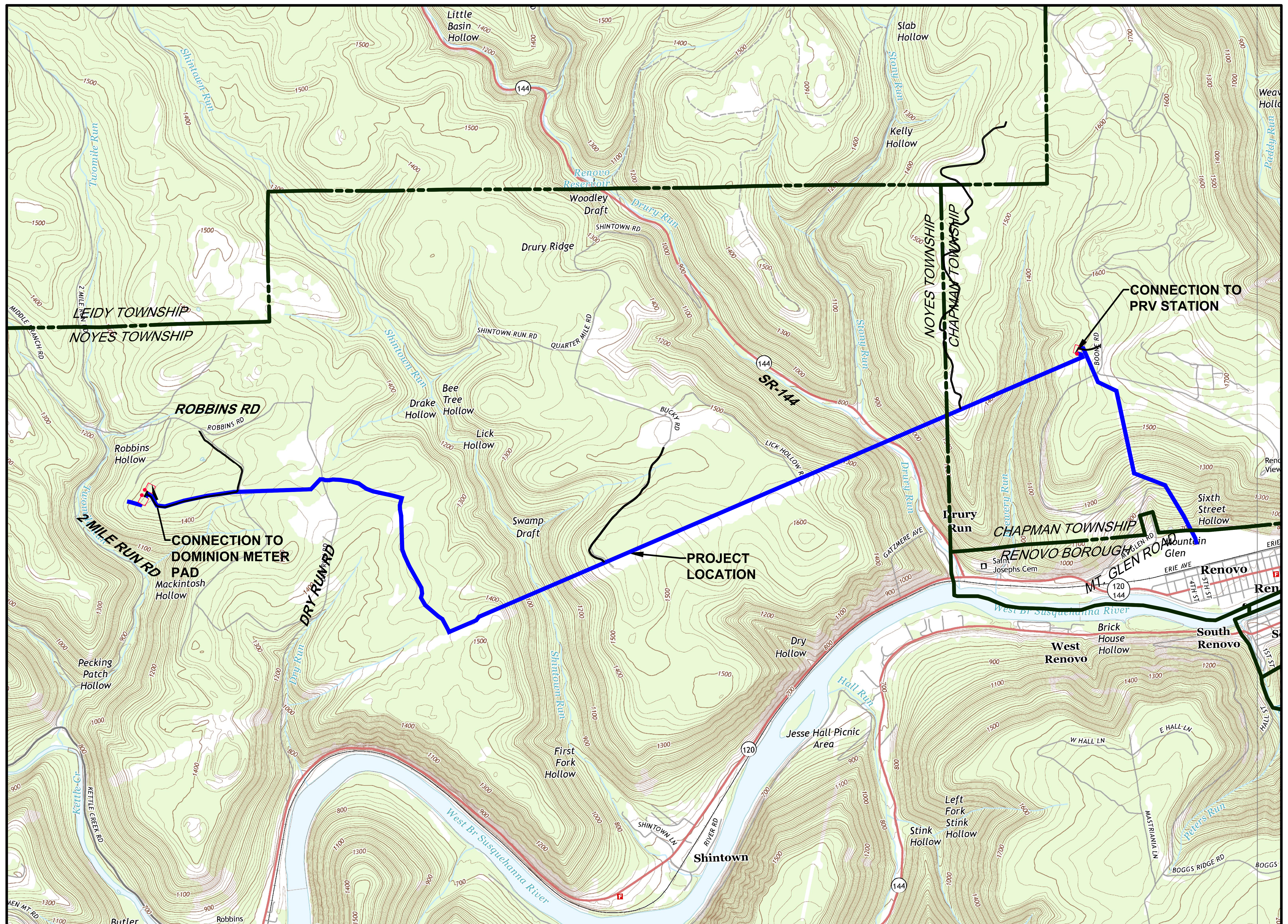
PENNSYLVANIA ONE CALL SYSTEM, INC.

1-800-242-1776

PA ONE CALL

1. SERIAL NUMBER 20162350745 – ROBBINS RD TO TWO MILE RUN RD (NEAREST INTERSECTION)
2. SERIAL NUMBER 20162350850 – TAMARACK RD TO STONEY RUN RD (NEAREST INTERSECTION)
3. SERIAL NUMBER 20162350851 – TAMARACK RD TO STONEY RUN RD (NEAREST INTERSECTION)
4. SERIAL NUMBER 20162373657 – ROBBINS RD TO TWO MILE RUN RD (NEAREST INTERSECTION)
5. SERIAL NUMBER 20162373659 – DRY RUN RD TO RENOVO RD (NEAREST INTERSECTION)
6. SERIAL NUMBER 20162373661 – BUCKY RD TO LICK HOLLOW RD (NEAREST INTERSECTION)
7. SERIAL NUMBER 20162373662 – BOONE RD TO STONEY RUN RD (NEAREST INTERSECTION)
8. SERIAL NUMBER 20162373663 – BOONE RD TO STONEY RUN RD (NEAREST INTERSECTION)
9. SERIAL NUMBER 20162373664 – BOONE RD TO STONEY RUN RD (NEAREST INTERSECTION)
10. SERIAL NUMBER 20162373667 – BOONE RD TO STONEY RUN RD (NEAREST INTERSECTION)

	HORZ. LENGTH	SLOPE LENGTH
MAIN LINE R.O.W.	34,784 L.F.	35,782 L.F.



Project Area Map

SCALE: 1" = 2000'

Sheet Index

RECEIVING WATERS

TRIBUTARIES TO WEST BRANCH SUSQUEHANNA RIVER	(WWF, MF)
SIXTH STREET HOLLOW	(WWF, MF)
BREWERY RUN	(HQ-CWF, MF)
STONY RUN	(CWF, MF)
DRURY RUN	(CWF, MF)
SWAMP DRAFT	(HQ-CWF, MF)
SHINTOWN RUN	(HQ-CWF, MF)
DRY RUN	(HQ-CWF, MF)
MACKINTOSH HOLLOW	(TSF, MF)
TWO MILE RUN	(TSF, MF)

CHECKED BY: SJC
DATE: 10.21.16
DRAWN BY: JPR
SCALE: 1"=2000'
PROJECT NO. REC-1001
SHEET NO. 1 OF 14

NO.	REVISIONS	DATE

SEAL:

PLAN TITLE: COVER SHEET

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH CLINTON COUNTY PENNSYLVANIA

HanoverEngineering

Pocono Office
3355 Route 611, Suite 1
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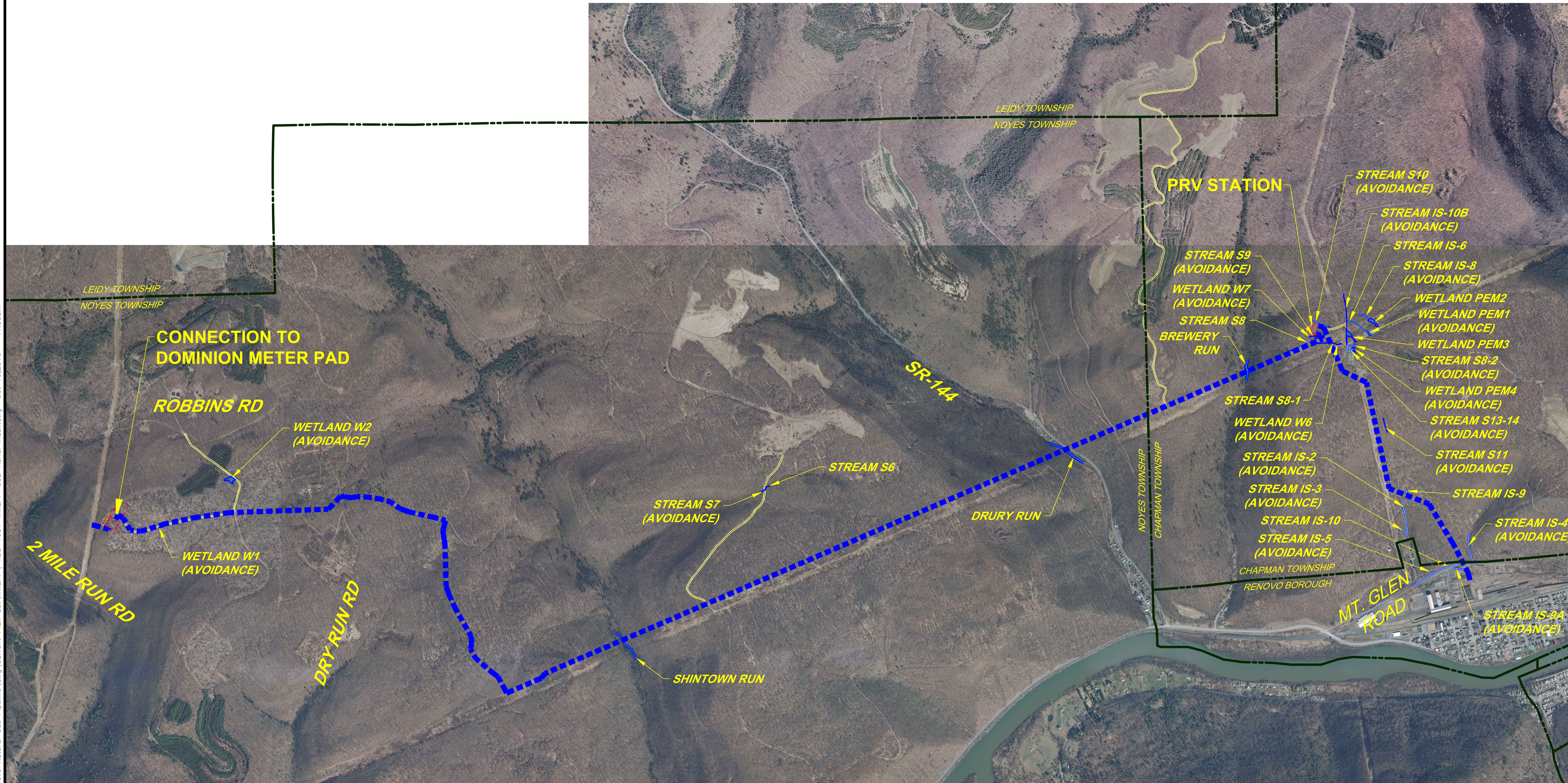
HanoverEng.com



Legend

(dashed blue line)	CENTERLINE OF PIPELINE R.O.W.
FLOW →	PERENNIAL STREAM
FLOW →	EPHEMERAL/INTERMITTENT STREAM
ORD. HIGH WATER MARK	ORD. HIGH WATER MARK LINE
PEM / PSS / PFO	WETLANDS

Note:

AERIAL MAP ORIGINATED FROM THE PA DCNR. COUNTY BOUNDARIES ORIGINATED FROM PA DEPARTMENT OF TRANSPORTATION. BOTH CAN BE FOUND AT WWW.PASDA.COM.

Y:\Projects\Energy\Renovo Energy Center, LLC\REC-1001 Renovo Natural Gas Pipeline\dwg\Current Plan Set\WWEPP\ REC-1001-WWEPP-002-Aerial Index.dwg Oct 19,2016 – 11:00am

CHECKED BY: SJC | DATE: 10.21.16 | DRAWN BY: JPR | SCALE: 1"=1000' | PROJECT NO. REC-1001 | SHEET NO. 2 of 14

REVISIONS | NO. | DATE

SEAL:

PLAN TITLE: AERIAL INDEX MAP

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1000 0 500 1000 2000
1" = 1000'

NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

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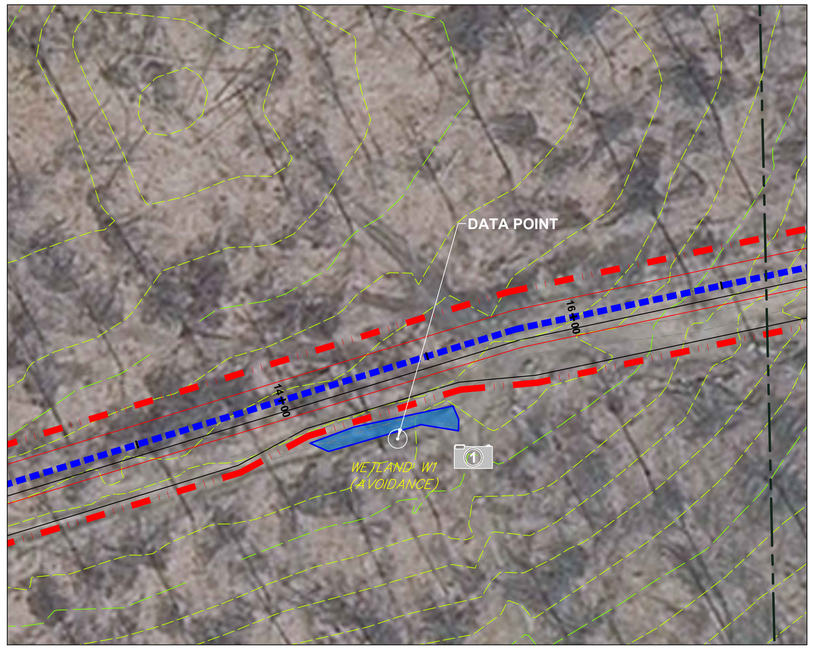

WETLAND #1 (AVOIDANCE)
SCALE: 1" = 50'

WETLAND W2 (AVOIDANCE)
SCALE: 1" = 50'

① **WETLAND W1 (AVOIDANCE)**
08.02.16

② **WETLAND W2 (AVOIDANCE)**
08.02.16

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- PERENNIAL STREAM (FLOW)
- EPHEMERAL/INTERMITTENT STREAM (FLOW)
- ORD. HIGH WATER MARK — ORD. HIGH WATER MARK LINE
- FLOODWAY
- PEM / PSS / PFO — WETLANDS
- EROSION CONTROL MATTING
- APPROXIMATE LOCATION OF WETLAND DATA POINT
- PHOTOGRAPH LOCATION
- BRIDGE
- LOG MAT

Notes:

1. THE WETLAND BOUNDARY WAS DELINEATED ACCORDING TO THE CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL (JANUARY 1987) SUBSEQUENT GUIDANCE DOCUMENTS, AND APPLICABLE REGIONAL SUPPLEMENTS.
2. HANOVER ENGINEERING ASSOCIATES, INC. RECOMMENDS, ALTHOUGH IT MAY NOT BE REQUIRED, THAT THE WETLANDS BOUNDARIES BE VERIFIED BY THE UNITED STATES ARMY CORPS OF ENGINEERS THROUGH A FORMAL JURISDICTIONAL DETERMINATION PROCESS PRIOR TO ANY SOILS DISTURBANCE OR SITE DEVELOPMENT ACTIVITIES.
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4. SEE DETAIL SHEET FOR STREAM BANK RESTORATION SPECIFICATIONS.
5. ALTHOUGH A BRIDGE IS SHOWN, A TEMPORARY CULVERT CROSSING MAY BE INSTALLED. PLEASE REFER TO E&SPC TYPICAL DETAIL SHEET 1 FOR THE SPECIFIED SIZE AND NUMBER OF CULVERTS.

NO.	REVISIONS	DATE

SEAL:

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

NOYES, CHAPMAN, & LEIDY TOWNSHIPS;
& RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

1" = 50'

DRAWN BY: JPR | SCALE: 1"=50' | CHECKED BY: SJC | DATE: 10.21.16

PROJECT NO. REC-1001

SHEET NO. 3 OF 14

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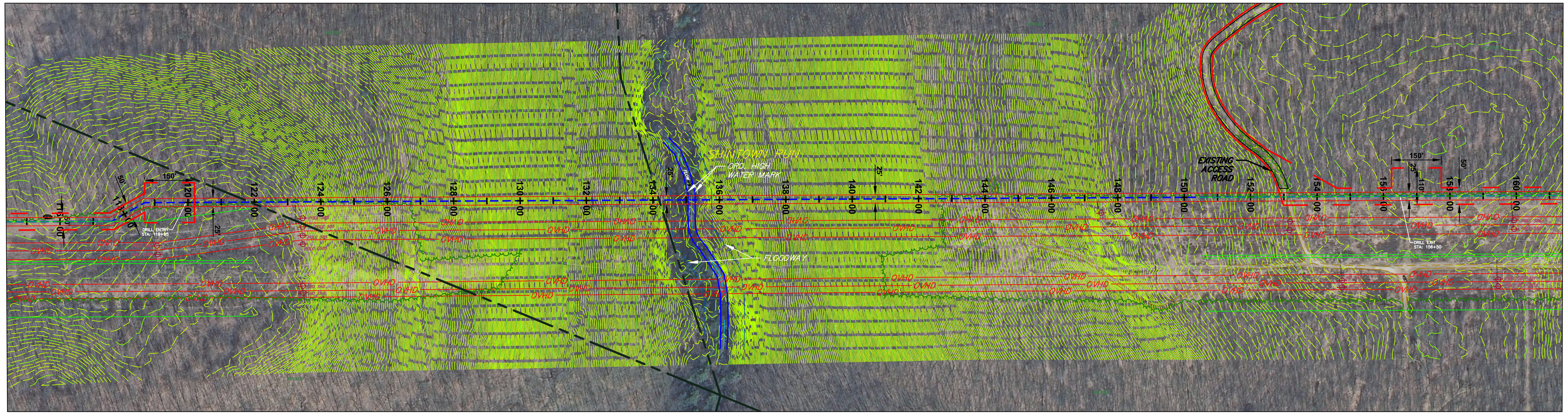
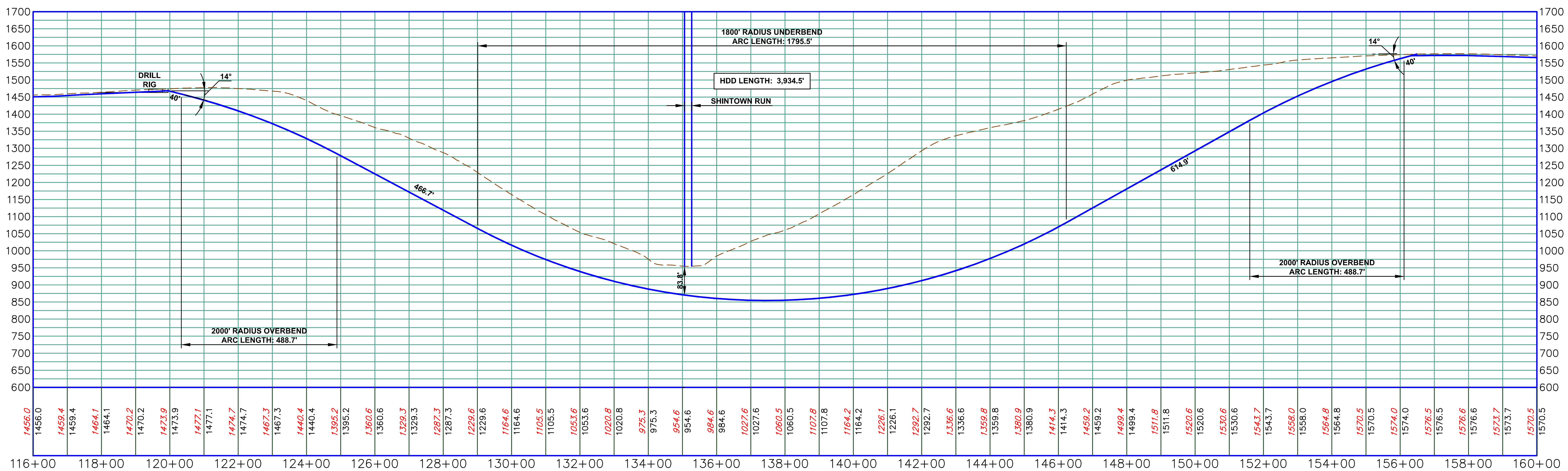


SHINTOWN RUN

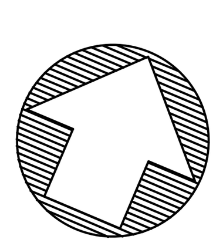
SCALE: 1" = 200'



SHINTOWN RUN PROFILE

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- FLOW → PERENNIAL STREAM
- FLOW → EPHEMERAL/INTERMITTENT STREAM
- ORD. HIGH WATER MARK — ORD. HIGH WATER MARK LINE
- FLOODWAY
- PEM / PSS / PFO — WETLANDS
- EROSION CONTROL MATTING
- APPROXIMATE LOCATION OF WETLAND DATA POINT
- PHOTOGRAPH LOCATION
- BRIDGE
- LOG MAT



Notes:

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5. ALTHOUGH A BRIDGE IS SHOWN, A TEMPORARY CULVERT CROSSING MAY BE INSTALLED. PLEASE REFER TO E&SPC TYPICAL DETAIL SHEET 1 FOR THE SPECIFIED SIZE AND NUMBER OF CULVERTS.

NO PHOTO AVAILABLE

SHINTOWN RUN

DRAWN BY: JPR | CHECKED BY: SJC | SCALE: 1"=50' | DATE: 10.21.16 | PROJECT NO. REC-1001 | SHEET NO. 4 of 14

NO.	REVISIONS	DATE

SEAL:

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 200'

NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

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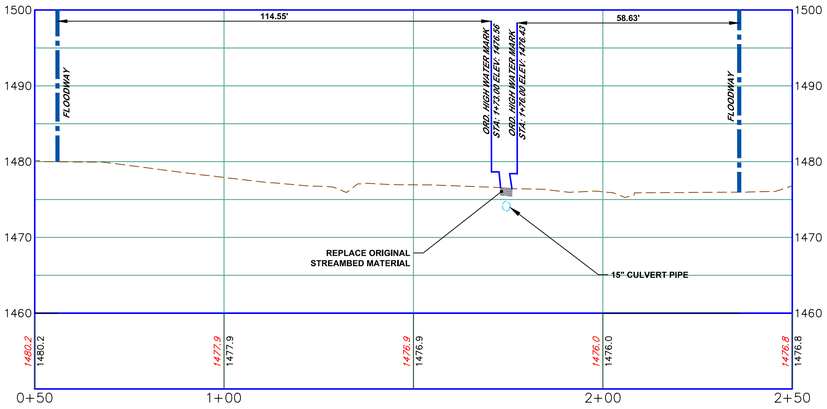
P:570.688.9550
F:570.688.9768
HanoverEng.com

STREAM S6 & STREAM S7

SCALE: 1" = 50'



STREAM S6 PROFILE

(ON 22x34 SHEET)
HORIZONTAL
Graphic Scale

20 0 10 20 40 80

(IN FEET)
1 inch = 20 Ft.

(ON 22x34 SHEET)
VERTICAL
Graphic Scale

10 0 5 10 20 40

(IN FEET)
1 inch = 10 Ft.

1 STREAM S6
08.23.16

2 STREAM S7 (AVOIDANCE)
08.23.16

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- FLOW → PERENNIAL STREAM
- FLOW → EPHEMERAL/INTERMITTENT STREAM
- ORD. HIGH WATER MARK — ORD. HIGH WATER MARK LINE
- FLOODWAY
- PEM / PSS / PFO — WETLANDS
- EROSION CONTROL MATTING
- APPROXIMATE LOCATION OF WETLAND DATA POINT
- PHOTOGRAPH LOCATION
- BRIDGE
- LOG MAT

Notes:

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CHECKED BY: SJC
DRAWN BY: JPR
DATE: 10.21.16
SCALE: 1"=50'
PROJECT NO. REC-1001
SHEET NO. 5 OF 14

NO.	REVISIONS	DATE

SEAL:

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

100 50 25 0 50 1" = 50'

NOYES, CHAPMAN, & LEIDY TOWNSHIPS;
& RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

HanoverEngineering

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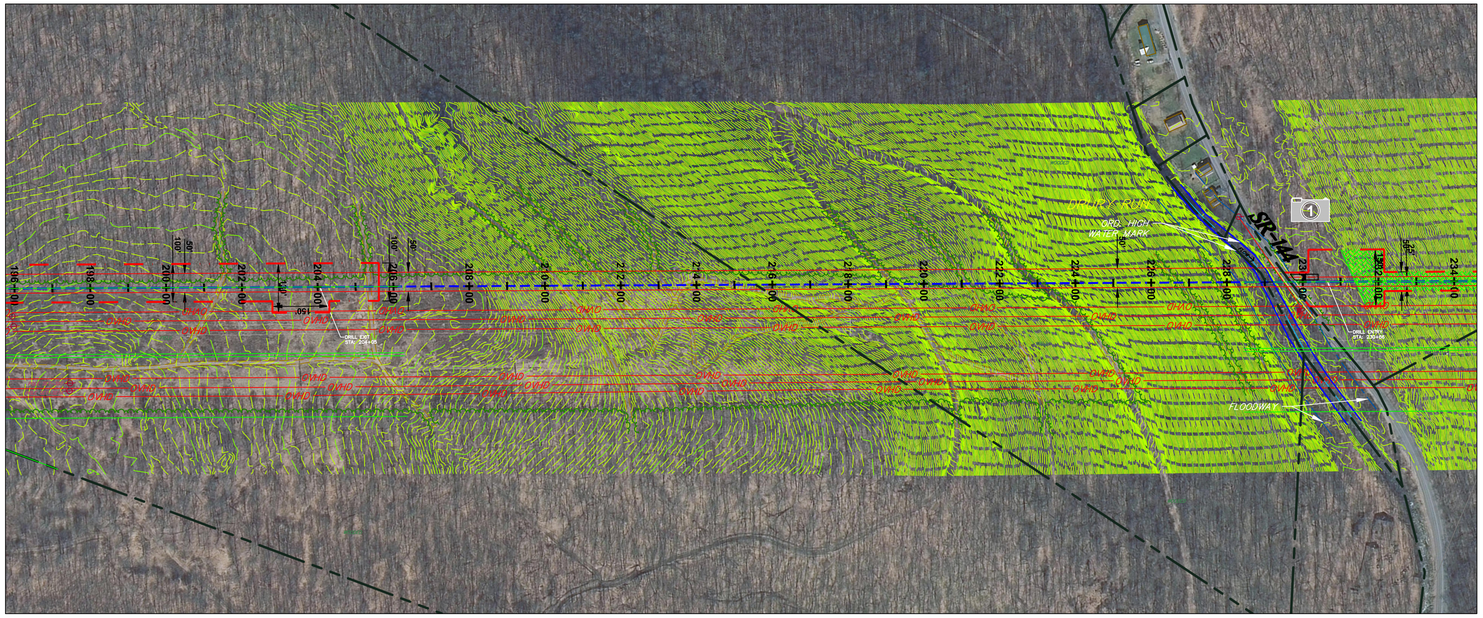

DRURY RUN

SCALE: 1" = 200'

① **DRURY RUN**

09.08.16

DRURY RUN PROFILE

Legend

— — —	*PROPERTY LINE*
— · · —	TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
——	PERMANENT PIPELINE R.O.W.
- - -	CENTERLINE PIPELINE R.O.W.
FLOW →	*PERENNIAL STREAM*
FLOW →	*EPHEMERAL/INTERMITTENT STREAM*
ORD. HIGH WATER MARK	*ORD. HIGH WATER MARK LINE*
— · —	*FLOODWAY*
PEM *PSS* *PFO*	*WETLANDS*
▨	EROSION CONTROL MATTING
⊙	APPROXIMATE LOCATION OF WETLAND DATA POINT
📷	PHOTOGRAPH LOCATION
▭	BRIDGE
▥	LOG MAT

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NOYES, CHAPMAN, & LEIDY TOWNSHIPS;
& RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

PLAN TITLE:
SITE DETAIL PLAN

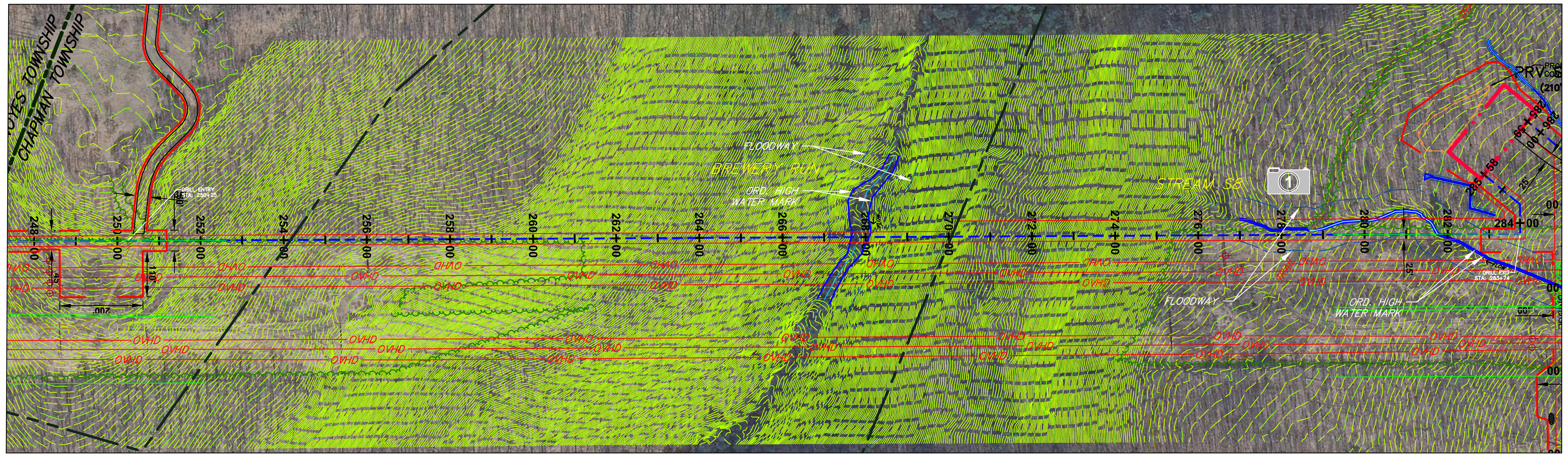
PROJECT TITLE:
RENOVO NATURAL GAS PIPELINE PROJECT

200 0 100 200 400
1" = 200'

SEAL:

NO.	REVISIONS	DATE

DRAWN BY: JPR
CHECKED BY: SJC
SCALE: 1"=50'
DATE: 10.21.16
PROJECT NO. REC-1001
SHEET NO. 6 OF 14



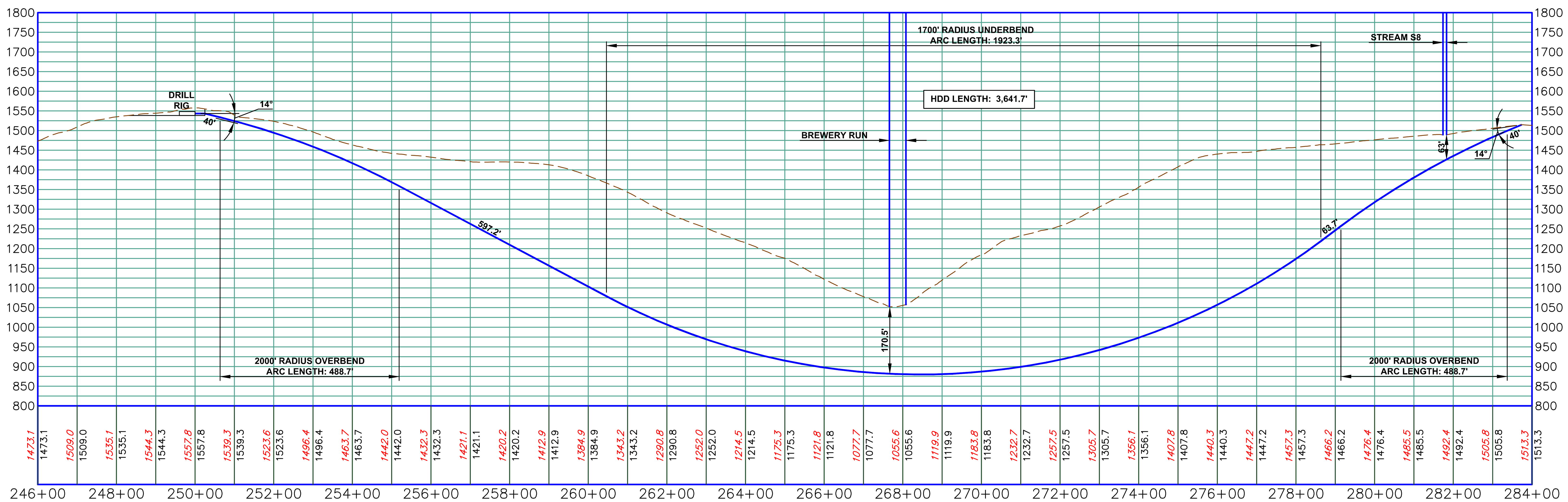
BREWERY RUN & STREAM S8 - HDD PORTION

SCALE: 1" = 200'

STREAM S8
08.25.16

NO PHOTO AVAILABLE

BREWERY RUN



STREAM S8 PROFILE

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- FLOW — PERENNIAL STREAM
- FLOW — EPHEMERAL/INTERMITTENT STREAM
- ORD. HIGH WATER MARK — ORD. HIGH WATER MARK LINE
- FLOODWAY
- PEM / PSS / PFO — WETLANDS
- EROSION CONTROL MATTING
- APPROXIMATE LOCATION OF WETLAND DATA POINT
- PHOTOGRAPH LOCATION
- BRIDGE
- LOG MAT

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NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

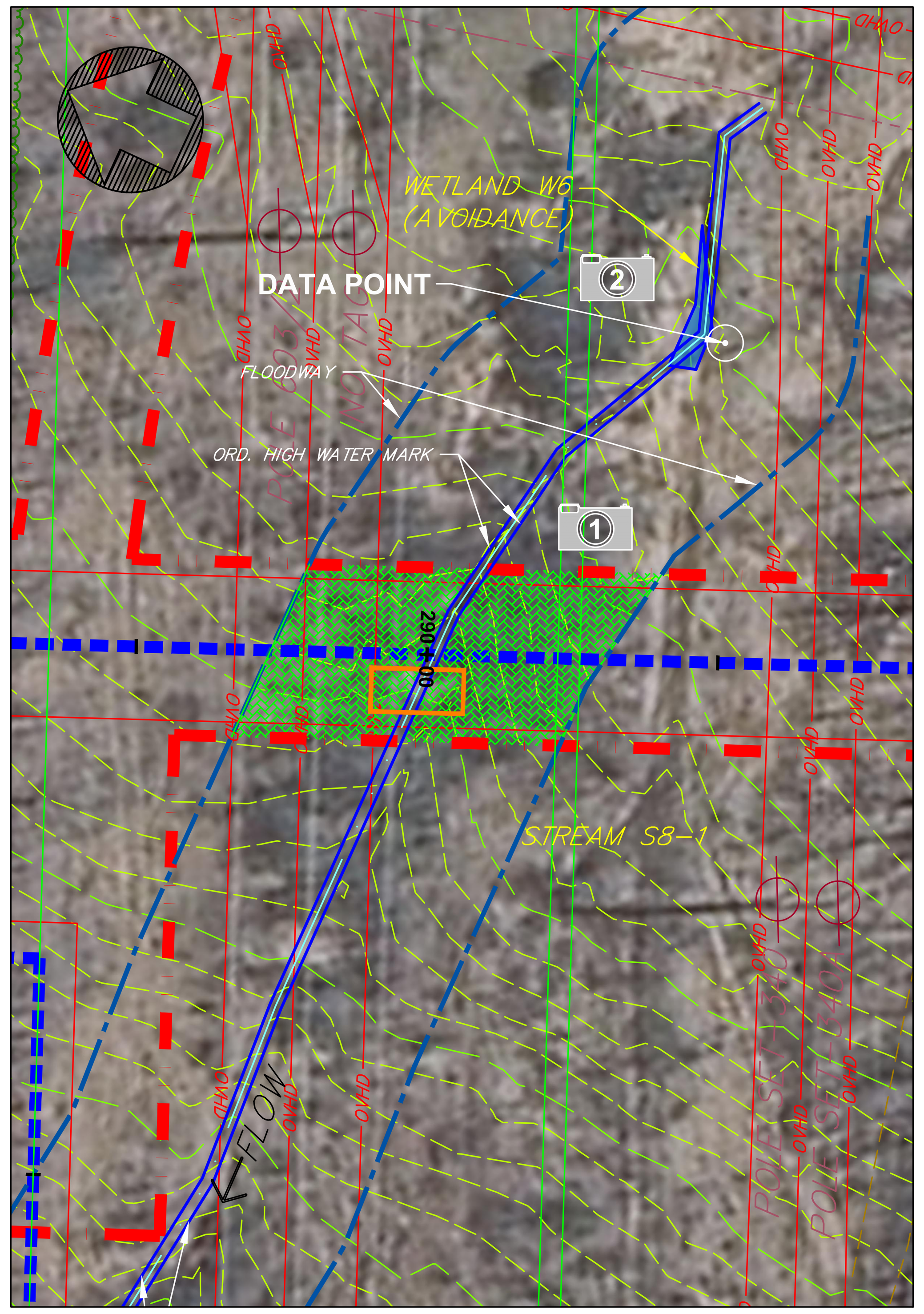
PLAN TITLE: SITE DETAIL PLAN
PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 200

SEAL:

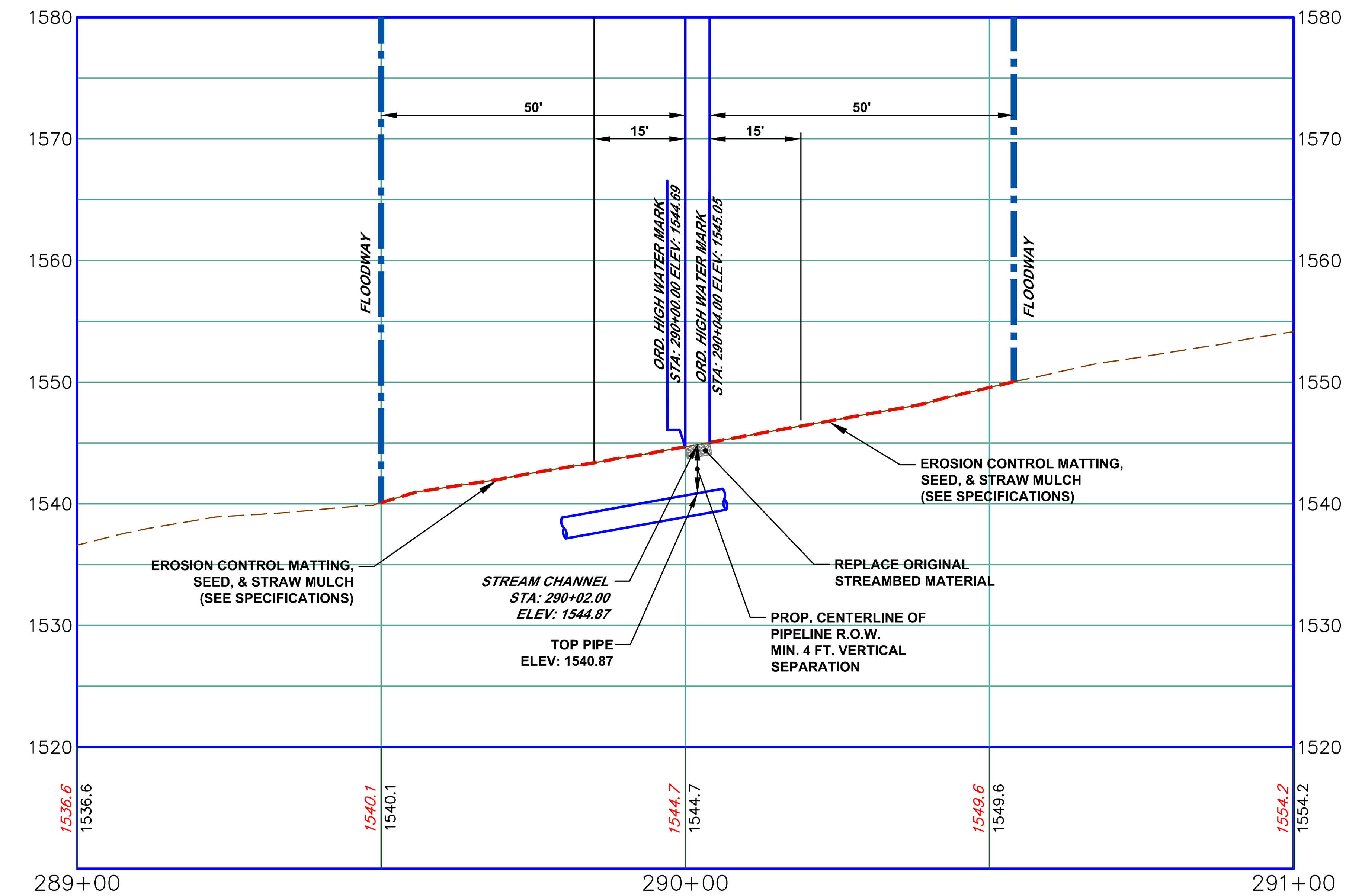
NO.	REVISIONS	DATE

DRAWN BY: JPR | CHECKED BY: SJC
SCALE: 1"=50' | DATE: 10.21.16
PROJECT NO. REC-1001
SHEET NO. 7 OF 14



STREAM S8-1 & WETLAND W6 (AVOIDANCE)

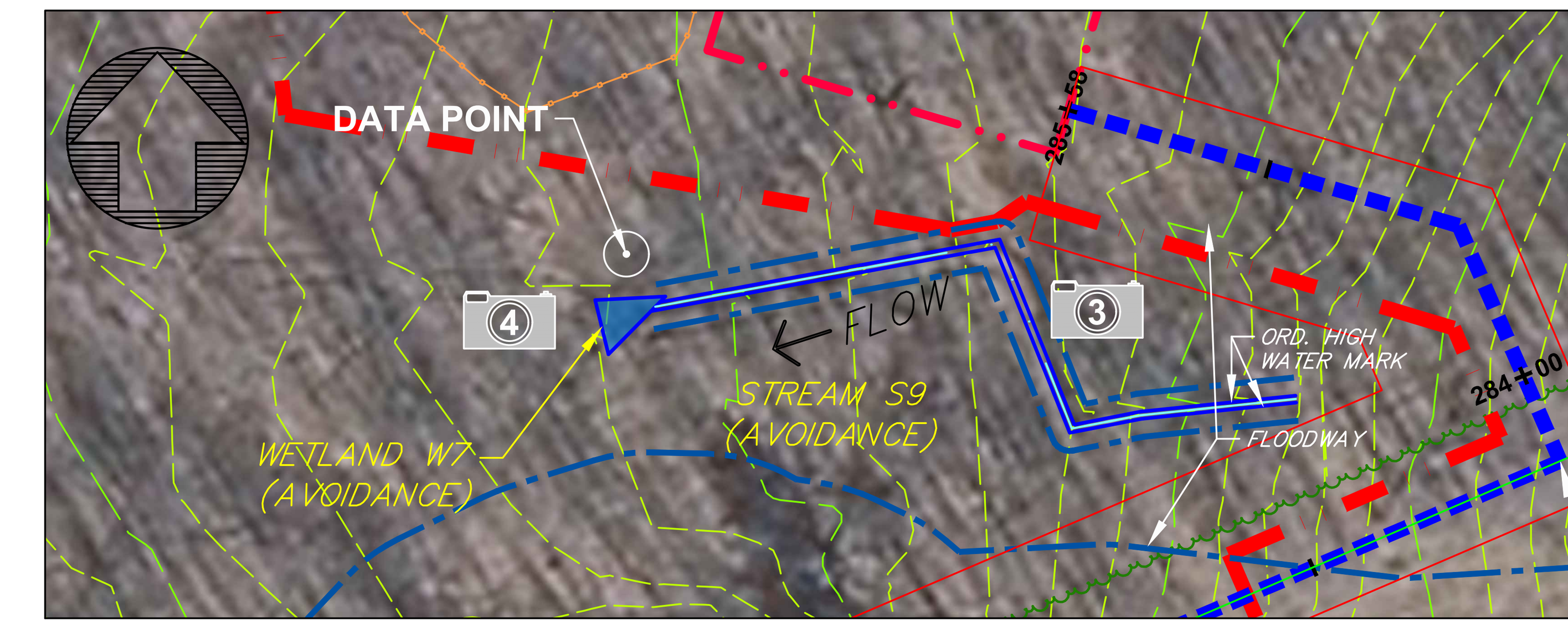
SCALE: 1" = 50'



STREAM S8-1 PROFILE

(ON 22x34 SHEET) HORIZONTAL
Graphic Scale
(IN FEET)
1 inch = 20 Ft.

(ON 22x34 SHEET) VERTICAL
Graphic Scale
(IN FEET)
1 inch = 10 Ft.



STREAM S9 (AVOIDANCE) & WETLAND W7 (AVOIDANCE)

SCALE: 1" = 50'

① **STREAM S8-1**
08.25.16

② **WETLAND W6 (AVOIDANCE)**
08.08.16

③ **STREAM S9 (AVOIDANCE)**
08.08.16

④ **WETLAND W7 (AVOIDANCE)**
08.08.16

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- FLOW → PERENNIAL STREAM
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- PHOTOGRAPH LOCATION
- BRIDGE
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Y:\Projects\Energy\Renovo Energy Center, LLC\REC-1001 Renovo Natural Gas Pipeline\dwg\Current Plan Set\WWEPP\ REC-1001-WWEPP-003-012-SITE DETAIL PLAN.dwg Oct 19,2016 - 10:54am

DRAWN BY: JPR	CHECKED BY: SJC
SCALE: 1"=50'	DATE: 10.21.16
PROJECT NO. REC-1001	
SHEET NO. 8 OF 14	

NO. | REVISIONS | DATE

SEAL:

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 50'

NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

HanoverEngineering
Pocono Office
3355 Route 611, Suite 1
Bartonsville, PA 18321-7822
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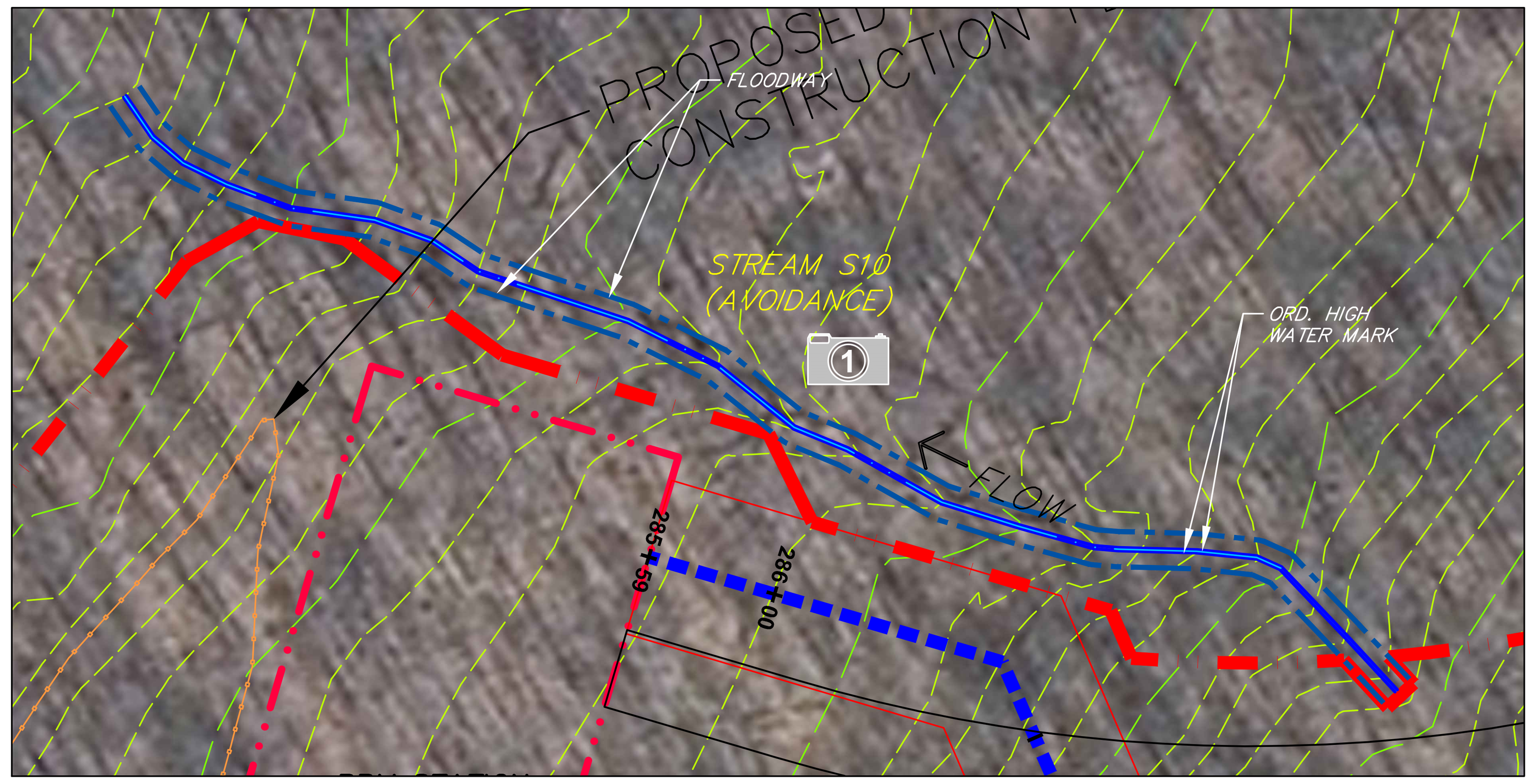
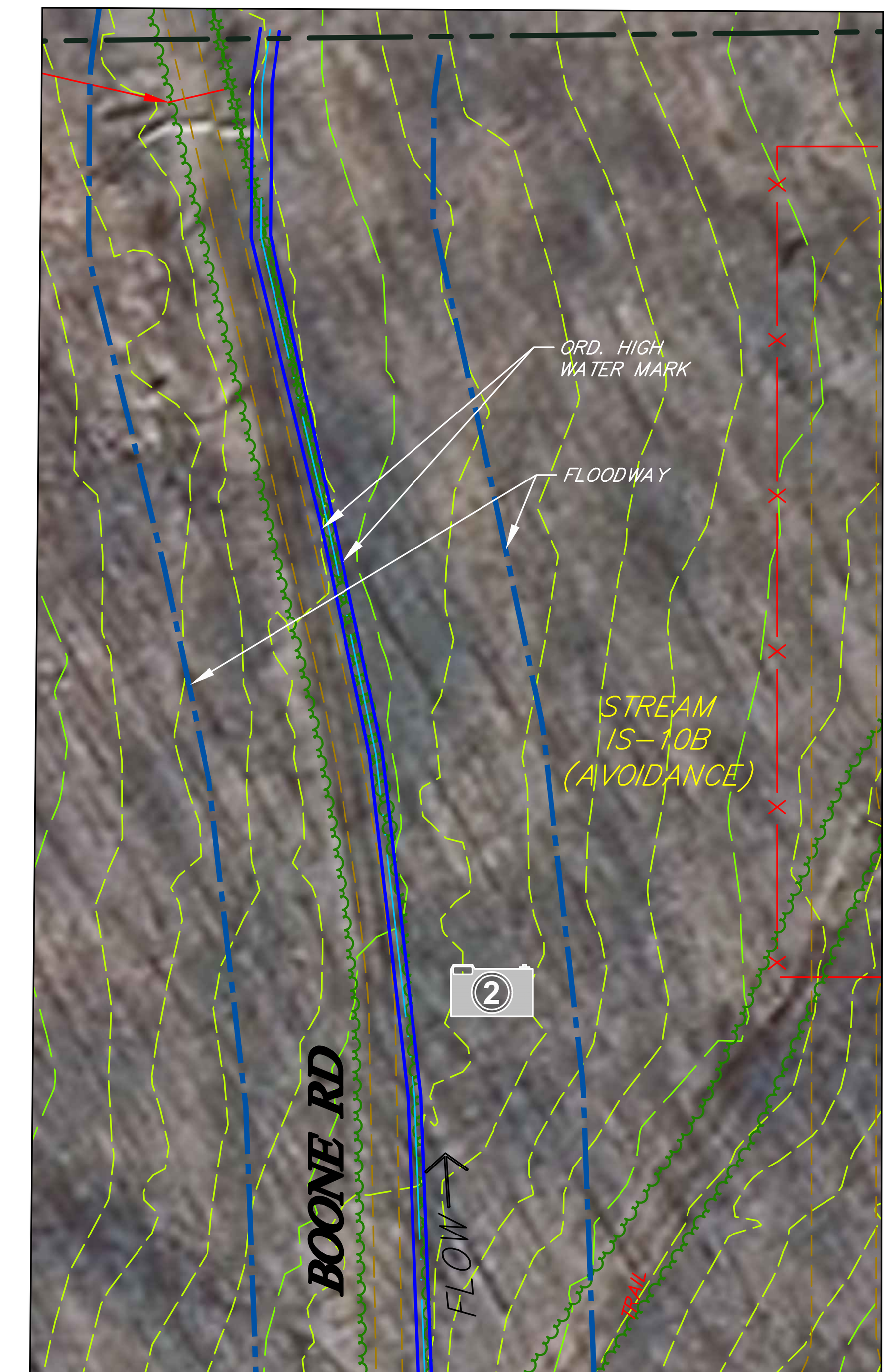


STREAM S10 (AVOIDANCE)

SCALE: 1" = 50'

1 **STREAM S10 (AVOIDANCE)**
08.08.16




STREAM IS10-B (AVOIDANCE), STREAM IS-6, & WETLAND PEM1 (AVOIDANCE)

SCALE: 1" = 50'

2 **STREAM IS-10B (AVOIDANCE)**
08.08.16

3 **STREAM IS-6**
08.08.16

4 **WETLAND PEM1 (AVOIDANCE)**
08.08.16

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- FLOW — PERENNIAL STREAM
- FLOW — EPHEMERAL/INTERMITTENT STREAM
- ORD. HIGH WATER MARK — ORD. HIGH WATER MARK LINE
- FLOODWAY
- PEM / PSS / PFO — WETLANDS
- EROSION CONTROL MATTING
- APPROXIMATE LOCATION OF WETLAND DATA POINT
- PHOTOGRAPH LOCATION
- BRIDGE
- LOG MAT

Notes:

1. THE WETLAND BOUNDARY WAS DELINEATED ACCORDING TO THE CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL (JANUARY 1987) SUBSEQUENT GUIDANCE DOCUMENTS, AND APPLICABLE REGIONAL SUPPLEMENTS.
2. HANOVER ENGINEERING ASSOCIATES, INC. RECOMMENDS, ALTHOUGH IT MAY NOT BE REQUIRED, THAT THE WETLANDS BOUNDARIES BE VERIFIED BY THE UNITED STATES ARMY CORPS OF ENGINEERS THROUGH A FORMAL JURISDICTIONAL DETERMINATION PROCESS PRIOR TO ANY SOILS DISTURBANCE OR SITE DEVELOPMENT ACTIVITIES.
3. STREAM BUFFER IS 25 FEET FROM THE ORDINARY HIGH WATER MARK AND WETLAND BUFFER IS 25 FT. FROM WETLAND BOUNDARY.
4. SEE DETAIL SHEET FOR STREAM BANK RESTORATION SPECIFICATIONS.
5. ALTHOUGH A BRIDGE IS SHOWN, A TEMPORARY CULVERT CROSSING MAY BE INSTALLED. PLEASE REFER TO E&SPC TYPICAL DETAIL SHEET 1 FOR THE SPECIFIED SIZE AND NUMBER OF CULVERTS.

Y:\Projects\Energy\Renovo Energy Center, LLC\REC-1001 Renovo Natural Gas Pipeline\dwg\Current Plan Set\WWEPP\ REC-1001-WWEPP-003-012-SITE DETAIL PLAN.dwg Oct 19,2016 - 10:58am

NO.	REVISIONS	DATE

DRAWN BY: JPR | CHECKED BY: SJC | SCALE: 1"=50' | DATE: 10.21.16

PROJECT NO. REC-1001

SHEET NO. 9 OF 14

SEAL:

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 50' (scale bar: 50, 0, 25, 50, 100)

NOYES, CHAPMAN, & LEIDY TOWNSHIPS; & RENOVO BOROUGH
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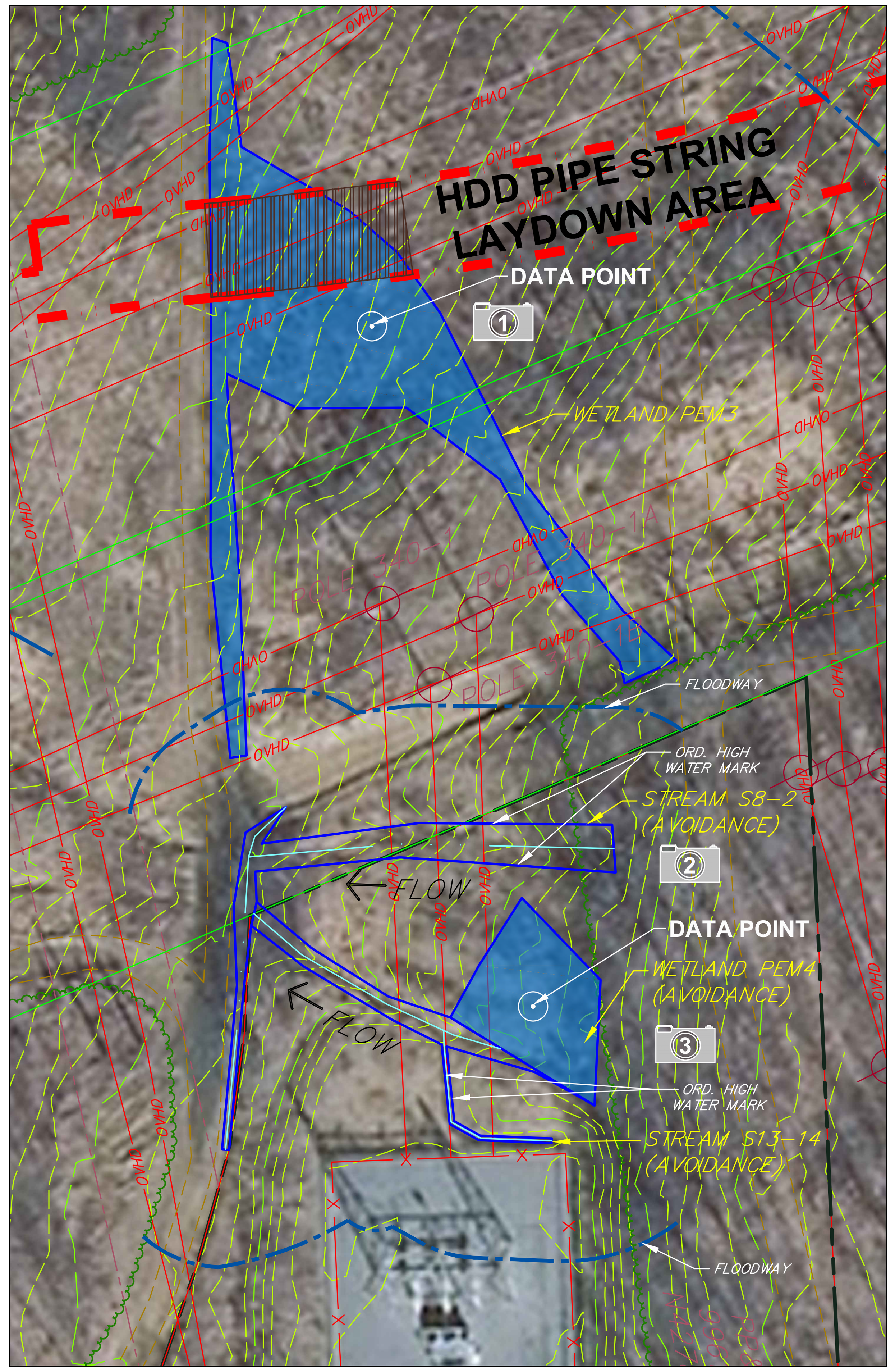

WETLAND PEM3, WETLAND PEM4 (AVOIDANCE), STREAM S8-2 (AVOIDANCE), & STREAM S13-14 (AVOIDANCE)

SCALE: 1" = 50'

① **WETLAND PEM3**
10.11.16

② **STREAM S8-2 (AVOIDANCE)**
10.11.16

③ **WETLAND PEM4 (AVOIDANCE) & STREAM S13-14 (AVOIDANCE)**
10.11.16

Legend

- PROPERTY LINE
- TEMP. CONSTRUCTION EASEMENT/LIMIT OF DISTURBANCE
- PERMANENT PIPELINE R.O.W.
- CENTERLINE PIPELINE R.O.W.
- FLOW → PERENNIAL STREAM
- FLOW → EPHEMERAL/INTERMITTENT STREAM
- ORD. HIGH WATER MARK — ORD. HIGH WATER MARK LINE
- FLOODWAY
- PEM / PSS / PFO — WETLANDS
- EROSION CONTROL MATTING
- APPROXIMATE LOCATION OF WETLAND DATA POINT
- PHOTOGRAPH LOCATION
- BRIDGE
- LOG MAT

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3. STREAM BUFFER IS 25 FEET FROM THE ORDINARY HIGH WATER MARK AND WETLAND BUFFER IS 25 FT. FROM WETLAND BOUNDARY.
4. SEE DETAIL SHEET FOR STREAM BANK RESTORATION SPECIFICATIONS.
5. ALTHOUGH A BRIDGE IS SHOWN, A TEMPORARY CULVERT CROSSING MAY BE INSTALLED. PLEASE REFER TO E&SPC TYPICAL DETAIL SHEET 1 FOR THE SPECIFIED SIZE AND NUMBER OF CULVERTS.

DRAWN BY: JPR | CHECKED BY: SJC
SCALE: 1"=50' | DATE: 10.21.16
PROJECT NO. REC-1001
SHEET NO. 10 of 14

NO.	REVISIONS	DATE

SEAL:

PLAN TITLE: SITE DETAIL PLAN
PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

50 0 25 50 100 — 1" = 50'

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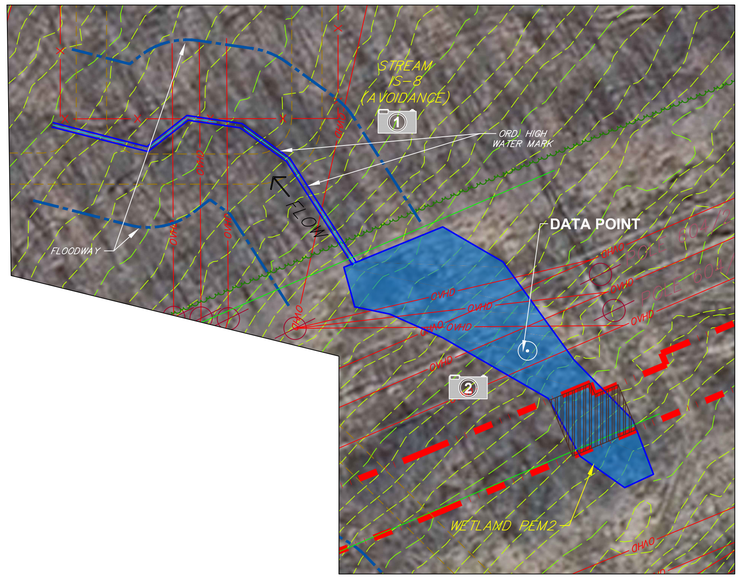
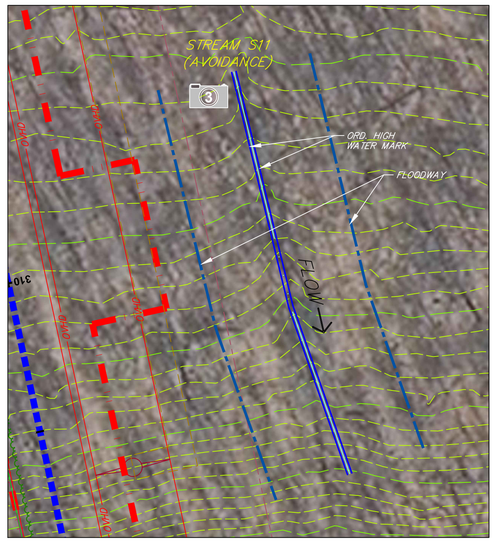


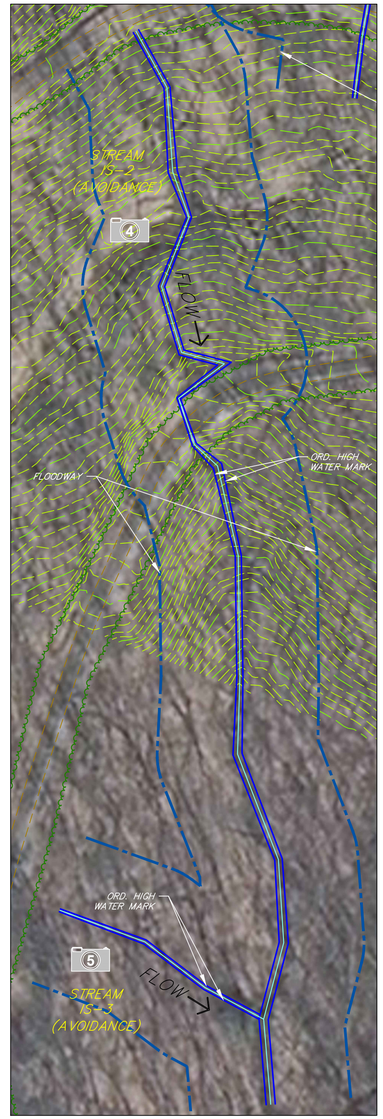
STREAM IS-8 (AVOIDANCE) & WETLAND PEM2

SCALE: 1" = 50'



STREAM S11 (AVOIDANCE)

SCALE: 1" = 50'



STREAM IS-2 (AVOIDANCE) & STREAM IS-3 (AVOIDANCE)

SCALE: 1" = 50'

① **STREAM IS-8 (AVOIDANCE)**
08.08.16

② **WETLAND PEM2**
08.08.16

③ **STREAM S11 (AVOIDANCE)**
08.08.16

④ **STREAM IS-2 (AVOIDANCE)**
08.08.16

⑤ **STREAM IS-3 (AVOIDANCE)**
08.08.16

Legend

- PROPERTY LINE
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DRAWN BY: JPR | CHECKED BY: SJC
SCALE: 1"=50' | DATE: 10.21.16
PROJECT NO. REC-1001
SHEET NO. 11 OF 14

NO.	REVISIONS	DATE

SEAL

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 50'

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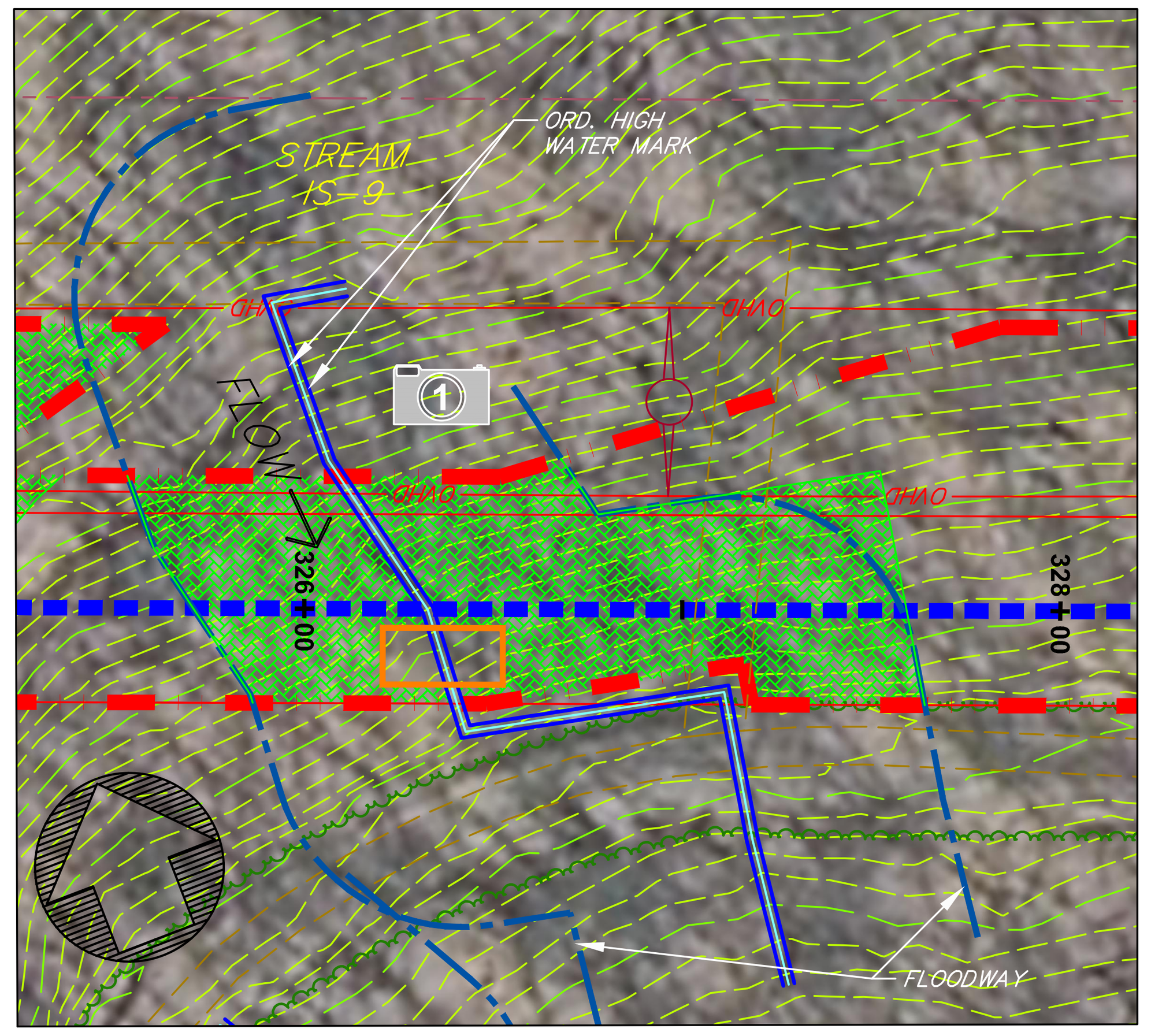
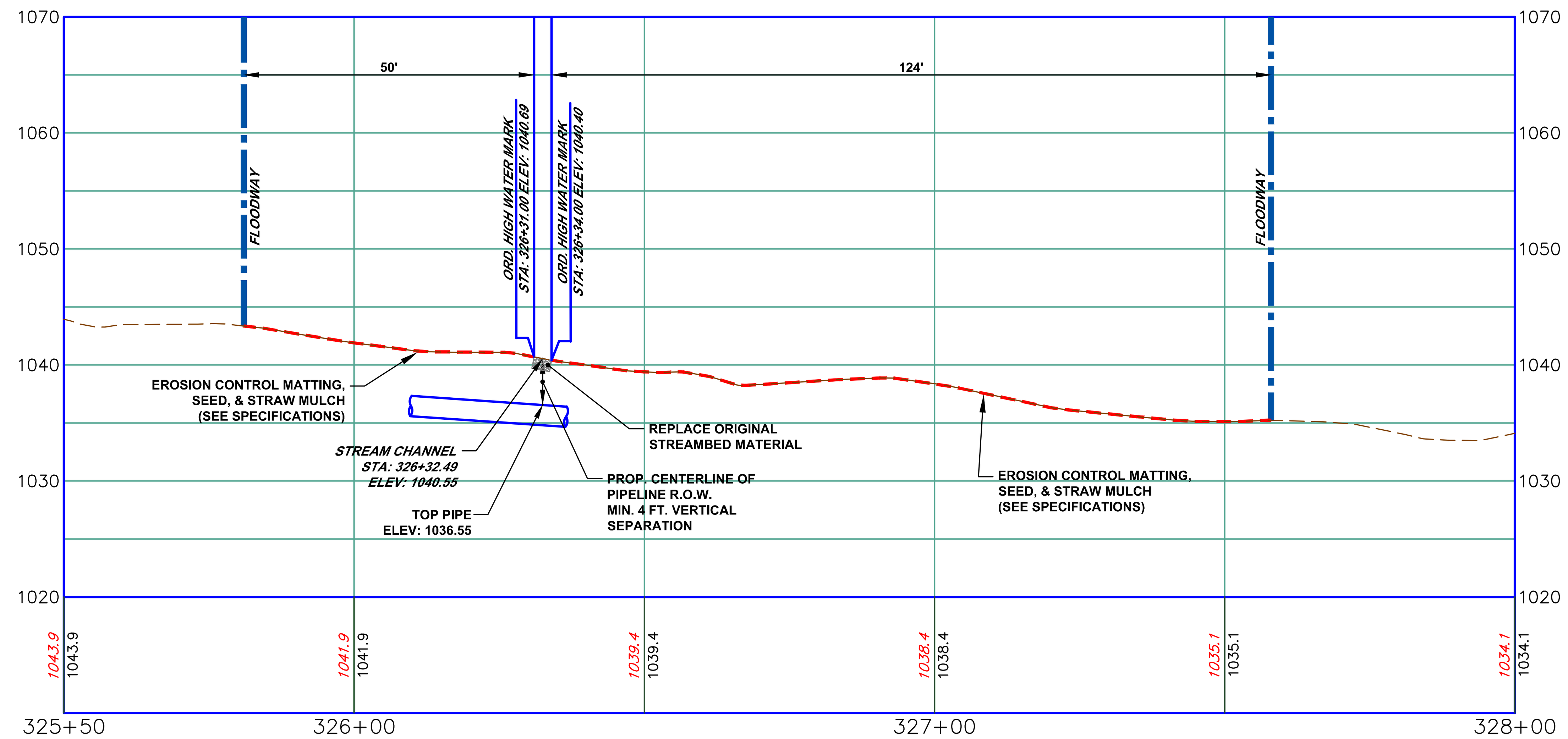


STREAM IS-9
SCALE: 1" = 50'

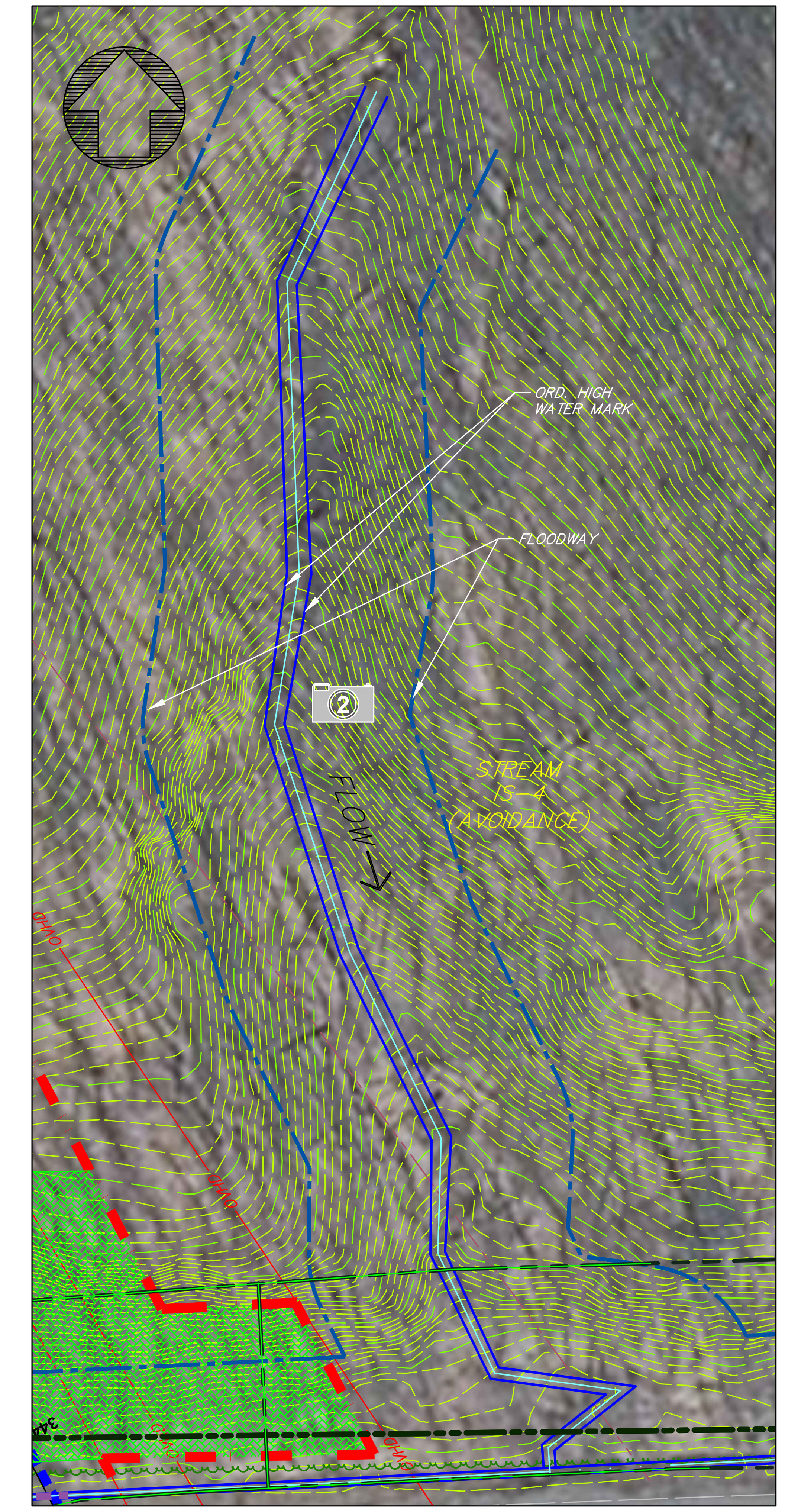
STREAM IS-9
08.08.16



STREAM IS-9 PROFILE

(ON 22x34 SHEET)
HORIZONTAL
Graphic Scale
20 0 10 20 40 80
(IN FEET)
1 inch = 20 Ft.

(ON 22x34 SHEET)
VERTICAL
Graphic Scale
10 0 5 10 20 40
(IN FEET)
1 inch = 10 Ft.



STREAM IS-4 (AVOIDANCE)
SCALE: 1" = 50'

STREAM IS-4 (AVOIDANCE)
08.08.16

Legend

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Y:\Projects\Energy\Renovo Energy Center, LLC\REC-1001 Renovo Natural Gas Pipeline\dwg\Current Plan Set\WWEPP\ REC-1001-WWEPP-003-012-SITE DETAIL PLAN.dwg Oct 19,2016 - 11:15am

DRAWN BY: JPR | CHECKED BY: SJC | SCALE: 1"=50' | DATE: 10.21.16 | PROJECT NO. REC-1001 | SHEET NO. 12 of 14

NO. | DATE | REVISIONS

SEAL:

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 50'

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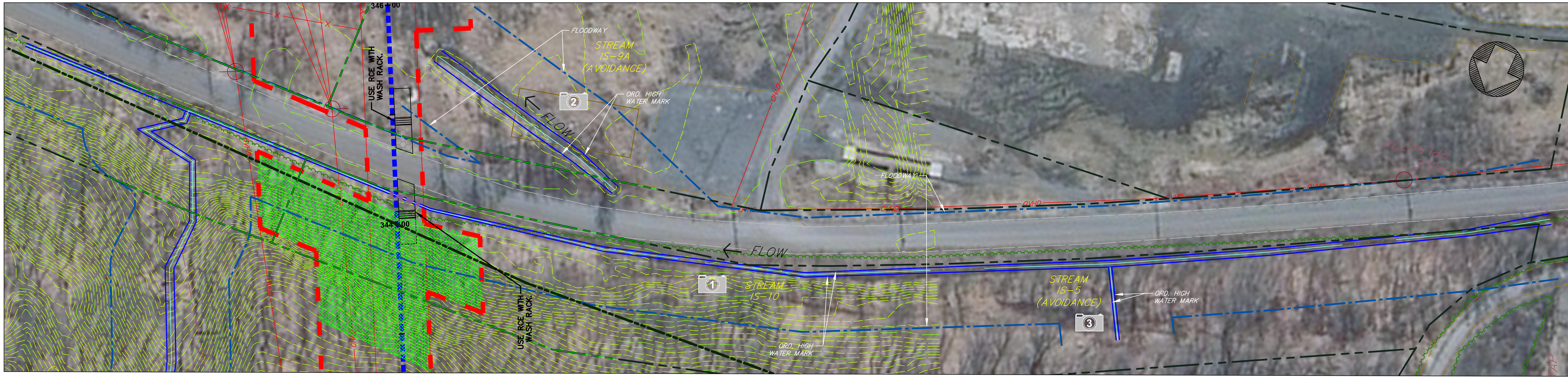
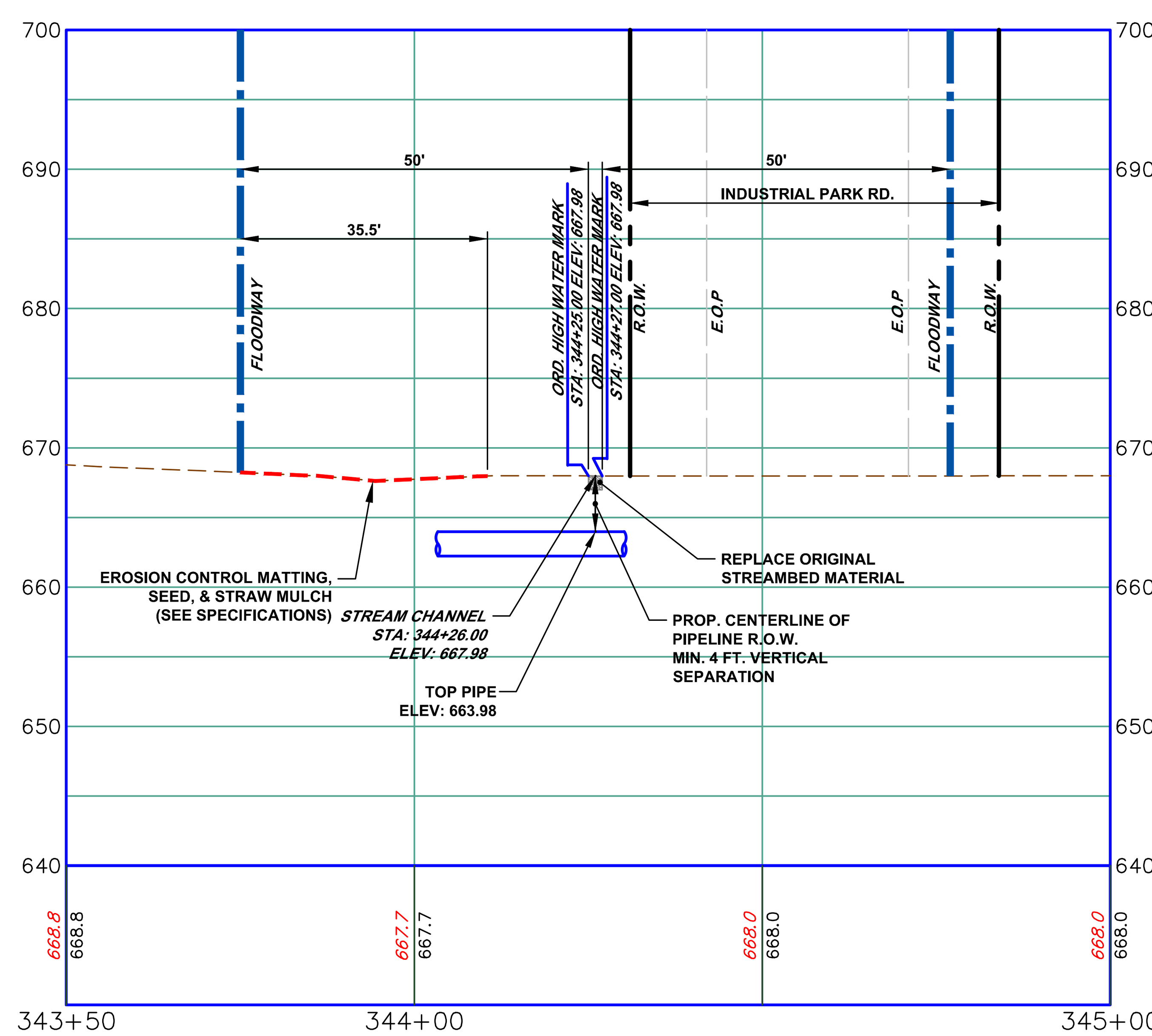


STREAM IS-10 , STREAM IS-9A (AVOIDANCE), & STREAM IS-5 (AVOIDANCE)

SCALE: 1" = 50'



(ON 22x34 SHEET) HORIZONTAL

Graphic Scale

(IN FEET)
1 inch = 20 Ft.

STREAM IS-10 PROFILE

(ON 22x34 SHEET) VERTICAL

Graphic Scale

(IN FEET)
1 inch = 10 Ft.

1 STREAM IS-10
08.08.16

2 STREAM IS-9A (AVOIDANCE)
08.08.16

3 STREAM IS-5 (AVOIDANCE)
08.08.16

Legend

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Y:\Projects\Energy\Renovo Energy Center, LLC\REC-1001 Renovo Natural Gas Pipeline\dwg\Current Plan Set\WWEPP\ REC-1001-WWEPP-003-012-SITE DETAIL PLAN.dwg Oct 19,2016 – 11:20am

DRAWN BY: JPR | CHECKED BY: SJC | SCALE: 1"=50' | DATE: 10.21.16 | PROJECT NO. REC-1001 | SHEET NO. 13 of 14

NO. | DATE | REVISIONS

PLAN TITLE: SITE DETAIL PLAN

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

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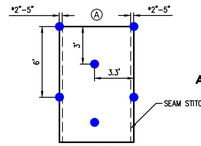
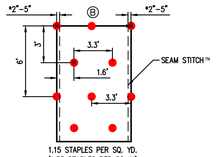
Staple Pattern Guide

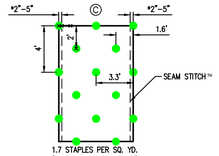
NOT TO SCALE



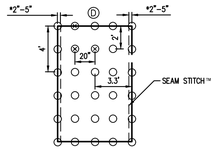
0.7 STAPLES PER SQ. YD.
(0.8 STAPLES PER SQ. M)
FOR BLANKETS WITH THE OPTIONAL NORTH AMERICAN GREEN DOT SYSTEM™ PLACE STAPLES/STAKES THROUGH EACH OF THE BLUE COLORED DOTS.
(FOR 4:1 SLOPE TYPICALLY. SEE DESIGN CHART.)



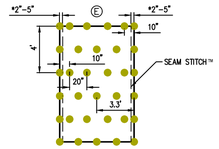
1.15 STAPLES PER SQ. YD.
(1.35 STAPLES PER SQ. M)
FOR BLANKETS WITH THE OPTIONAL NORTH AMERICAN GREEN DOT SYSTEM™ PLACE STAPLES/STAKES THROUGH EACH OF THE RED COLORED DOTS.
(FOR 3:1 SLOPE TYPICALLY. SEE DESIGN CHART.)



1.7 STAPLES PER SQ. YD.
(2.0 STAPLES PER SQ. M)
FOR BLANKETS WITH THE OPTIONAL NORTH AMERICAN GREEN DOT SYSTEM™ PLACE STAPLES/STAKES THROUGH EACH OF THE GREEN COLORED DOTS.
(FOR 2:1 SLOPE TYPICALLY. SEE DESIGN CHART.)



3.4 STAPLES PER SQ. YD.
(4.1 STAPLES PER SQ. M)
FOR BLANKETS WITH THE OPTIONAL NORTH AMERICAN GREEN DOT SYSTEM™ PLACE STAPLES/STAKES THROUGH EACH OF THE WHITE COLORED DOTS.
(FOR 1:1 SLOPE AND STEEPER OR MEDIUM/HIGH FLOW CHANNELS TYPICALLY. SEE DESIGN CHART.)



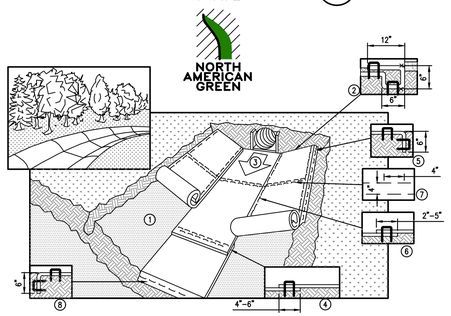
3.75 STAPLES PER SQ. YD.
(4.5 STAPLES PER SQ. M)
FOR BLANKETS WITH THE OPTIONAL NORTH AMERICAN GREEN DOT SYSTEM™ PLACE STAPLES/STAKES THROUGH EACH OF THE YELLOW COLORED DOTS.
(FOR HIGH FLOW CHANNEL AND SHORELINE TYPICALLY. SEE DESIGN CHART.)

*LOCATION OF SEAM STITCH™ WILL VARY DEPENDING ON NORTH AMERICAN GREEN PRODUCT TYPE.

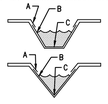
14649 HIGHWAY 41 NORTH, EVANSVILLE, INDIANA 47725
USA 1-800-772-2040 CANADA 1-800-448-2040
www.nagreen.com

Channel Installation

NOT TO SCALE



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. USE SHOREMAX MAT AT THE CHANNEL/CULVERT OUTLET AS SUPPLEMENTAL SCOUR PROTECTION AS NEEDED. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (DEPENDING ON BLANKET TYPE) AND STAPLED. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH™ ON THE BLANKET BEING OVERLAPPED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.



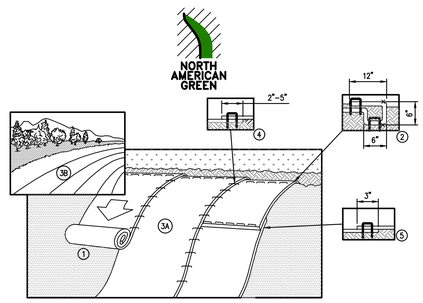
CRITICAL POINTS
A. OVERLAPS AND SEAMS
B. PROJECTED WATER LINE
C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

NOTE:
* HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.

14649 HIGHWAY 41 NORTH, EVANSVILLE, INDIANA 47725
USA 1-800-772-2040 CANADA 1-800-448-2040
www.nagreen.com

Slope Installation

NOT TO SCALE



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH™ ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE BLANKET WIDTH.

NOTE:
* IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.

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USA 1-800-772-2040 CANADA 1-800-448-2040
www.nagreen.com

Streambank Stabilization Specifications:

1. FILTER BAGS USED TO REMOVE SEDIMENTS FROM SEDIMENT-LADEN PUMPED WATER FROM THE WORK CELL SHALL BE "DIRT BAG" BRAND NAME OR APPROVED EQUIVALENT. THE FILTER BAG SHALL BE PLACED IN AN UPLAND AREA, DOWNSTREAM AND ADJACENT TO THE UNDISTURBED AREAS OF THE SITE WHEN IN USE.
2. JUTE MATTING OR MATTING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS ON ALL DISTURBED AND SEEDED/MULCHED SLOPES IN EXCESS OF 4:1 SLOPE, OR AS SPECIFIED IN STREAM CROSS-SECTIONS.
3. LIVE STAKES SHALL BE INSTALLED RANDOMLY WITH 3-5 FT SPACING THROUGHOUT THE ENTIRE UPPER BANK (BARE SOIL AREAS) OR AS SHOWN IN THE STREAM CROSS-SECTIONS. SPECIES SHALL INCLUDE STREAMCO WILLOW (SALIX PURPUREA), SILKY WILLOW (SALIX SERICEA), SANDBAR WILLOW (SALIX EXIGUA SSP INTERIOR), SILKY DOGWOOD (CORNUS AMOMUM), AND/OR ELDERBERRY (SAMBUCUS CANADENSIS).

Wetland Seed Method :

WETLAND AREAS SHALL BE SEEDED PER
"SEASONALLY FLOODED WILDLIFE FOOD MIX"-
MODIFIED ERNMX-128 APPLIED AT A SEEDING RATE OF 20 LBS PER ACRE,
OR 1/2 LB PER 1,000 SQFT.
ERNST CONSERVATION SEEDS
9006 MERCER PIKE
MEADVILLE, PA 16335
PHONE: (800) 873-3321 (814) 336-2404
FAX: (814) 336-5191
EMAIL: SALES@ERNSTSEED.COM , cmeiller@ERNSTSEED.COM

1. NO LIME OR FERTILIZER SHALL BE USED IN WETLAND AREAS.

Streambank Seed Mix Option:

"PIPELINE MIX W/SWITCHGRASS-MODIFIED ERNMX-102-1"-
APPLIED AT A SEEDING RATE OF 40 LBS PER ACRE.
FROM:
ERNST CONSERVATION SEEDS
9006 MERCER PIKE
MEADVILLE, PA 16335
PHONE: (800) 873-3321 (814) 336-2404
FAX: (814) 336-5191
EMAIL: SALES@ERNSTSEED.COM , cmeiller@ERNSTSEED.COM

DRAWN BY: JPR
CHECKED BY: SJC
SCALE: 1"=50'
DATE: 10.21.16
PROJECT NO. REC-1001
SHEET NO. 14 OF 14

NO.	REVISIONS	DATE

SEAL:

PLAN TITLE: TYPICAL DETAIL SHEET

PROJECT TITLE: RENOVO NATURAL GAS PIPELINE PROJECT

1" = 50'

NOYES, CHAPMAN, & LEIDY TOWNSHIPS;
& RENOVO BOROUGH
CLINTON COUNTY
PENNSYLVANIA

HanoverEngineering
Pocono Office
3355 Route 611, Suite 1
Bartonsville, PA 18321-7822
P:570.688.9550
F:570.688.9768
HanoverEng.com

Renovo Energy Center, LLC (REC) owns and will operate the proposed project as described in Section J of the project narrative. The proposed construction effects caused to streams and wetlands will require REC to develop a compensatory mitigation project. REC's proposed compensatory mitigation project at Kettle Creek was conceptualized by a partnership between U.S. Fish and Wildlife Service (USFWS), Clinton County Soil and Water Conservation District (CCSWCS), the Kettle Creek Watershed Association, and the United States Army Corps of Engineers (USACE). The applicant is proposing to develop the stream restoration and enhancements as described below as well as onsite restoration of wetlands using riparian plantings at the Kettle Creek Site. If approved, and following construction, REC will be responsible for monitoring and maintenance of the proposed mitigation project. REC will also be responsible for on-site restoration of impacted wetlands resulting from the proposed project. This conceptual plan was provided to REC by the CCSWCS, the final plan will include success criteria, monitoring criteria, invasive species control plans and detailed construction drawings. Riverine assessment forms and functional worksheets have been included based on the current understanding of the project description.

Kettle Creek at Leidy Bridge Restoration Project Description

Introduction

The Leidy Bridge Restoration project is located on Kettle Creek in Leidy Township in Clinton County. Existing topographic features of the Leidy Bridge at Kettle Creek Project and immediate surroundings, taken from the Hammersley Fork USGS 7.5' Quad., are shown in Figure 1. The Chapter 93 designation for this stream is HQ-TSF, high quality trout stock fishing between Trout Creek and Alvin Bush Dam. The drainage area for Kettle Creek at the project location is 207.5 square miles. Preliminary numbers for the project reach are based upon a Pennsylvania Regional Curve developed by Clapsaddle/Dillingham and are as follows: Cross-sectional area = 730 square feet, bankfull width = 112 feet, bankfull depth = 5.2 feet, and Q = 5,040 cfs. The affected soil unit consists of (UpF) Ungers-Meckesville and (Bb) Barbour-Craigsville.

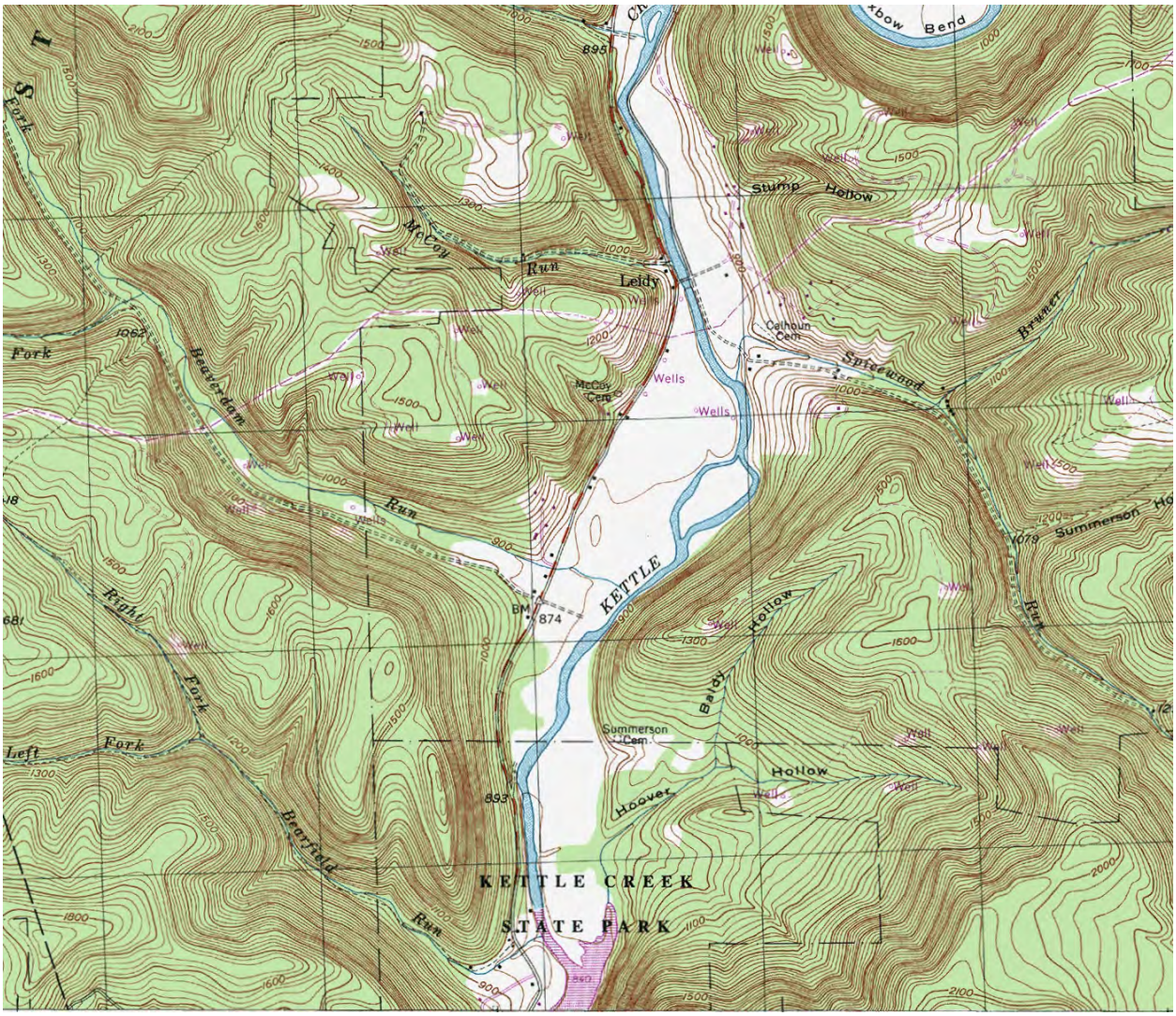


Figure 1. Location of the Leidy Bridge Restoration Project on Kettle Creek, north (and upstream) of Kettle Creek State Park.

The reach of stream where the restoration project is proposed is from the where the Leidy Bridge crosses Kettle Creek to the bend approximately 2675 feet to the north. Presently this reach is straight, wider than the stream's accepted bankfull width, and relatively shallow under low flow conditions. There is a dearth of in-stream habitat features, which reportedly will not support fish. In conditions of low flow over the summer, water temperatures can reach as high as 84 degrees. A portion of the stream bank is showing signs of severe active erosion as well.

Project Objectives

The project objectives are two-fold. The project is designed to narrow the stream so as to increase flow velocities and depth in the project reach especially in low flow conditions. The project will also significantly increase the in-stream habitat features in the project reach.

Project Design

The project objectives will be satisfied through the installation of 12 rock straight vanes along the project reach, beginning approximately 340 downstream of the confluence of Walters Run with Kettle Creek. The plan view of the conceptual design is shown in Figure 2. Six vanes are proposed on each respective bank, oriented to encourage high velocity along what appears to be the active thalweg of the channel. The intent was to promote the formation of a distinct low flow channel of greater depth, higher velocity, and narrower width. The vanes will also encourage a slight increase in sinuosity under low flow conditions. Each vane will support and maintain the formation of a scour hole on the downstream side of each respective vane, which will improve the in-stream habitat of the reach. The two downstream-most vanes will serve to channel the high velocity flow through the center portion of the bridge, and will help to reduce scour at the bridge abutments.

Structure Details

Each vane will be approximately 70 feet in length, and will form a ramp starting from the bankfull level at the stream bank down into the stream bed. Structures construction details are shown in Figure 3. The ramp will be maintained by a laid up rock wall, oriented approximately 25 degrees from the bank line. The rock wall will be constructed of dimensional wall rock from a limestone quarry, with rocks such as depicted in Figure 4 measuring roughly 5 ft long, 3-4 ft wide, and 3 ft high. The structures will be constructed using an excavator with a progressive link hydraulic thumb that can pick up, manipulate, and place large rocks. Figure 5 shows the excavation for a footer rock, which is typically the same dimension as the top rock that is seated squarely on top. A top rock being installed on a footer rock is shown in Figure 6. The rock wall is installed at a slope into the stream bed at typically between 5 and 7%. The rocks are held to an elevation tolerance of ± 0.1 ft.

Once the rock wall has been completed from the bankfull level at the stream bank down below the stream bed level, any large gaps between the rocks are filled by hand with small boulders and cobbles, as shown in Figure 7. The gaps are filled to provide support and backing for geofabric, which is installed next on the upstream side of the rock wall. The fabric is draped along the side of the rocks, and laid out under what will be the backfilled ramp, as indicated in Figure 8.

Stream bed material is excavated from what will become the downstream scour hole, and placed on top of the geofabric on the upstream side of the rock wall to form the ramp. The finished vane is shown in Figure 9.

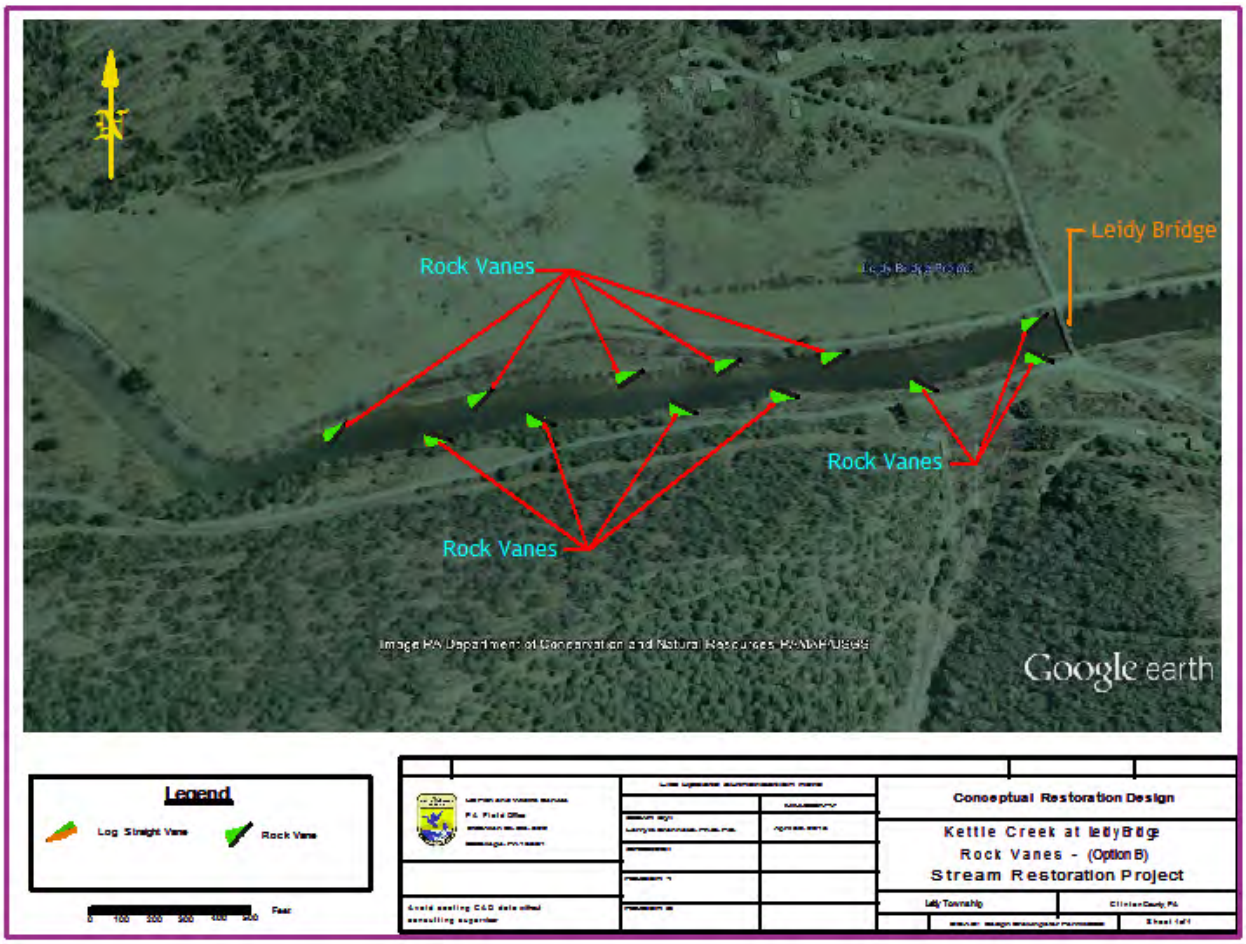


Figure 2. Conceptual design for the Kettle Creek Leidy Bridge Restoration Project.

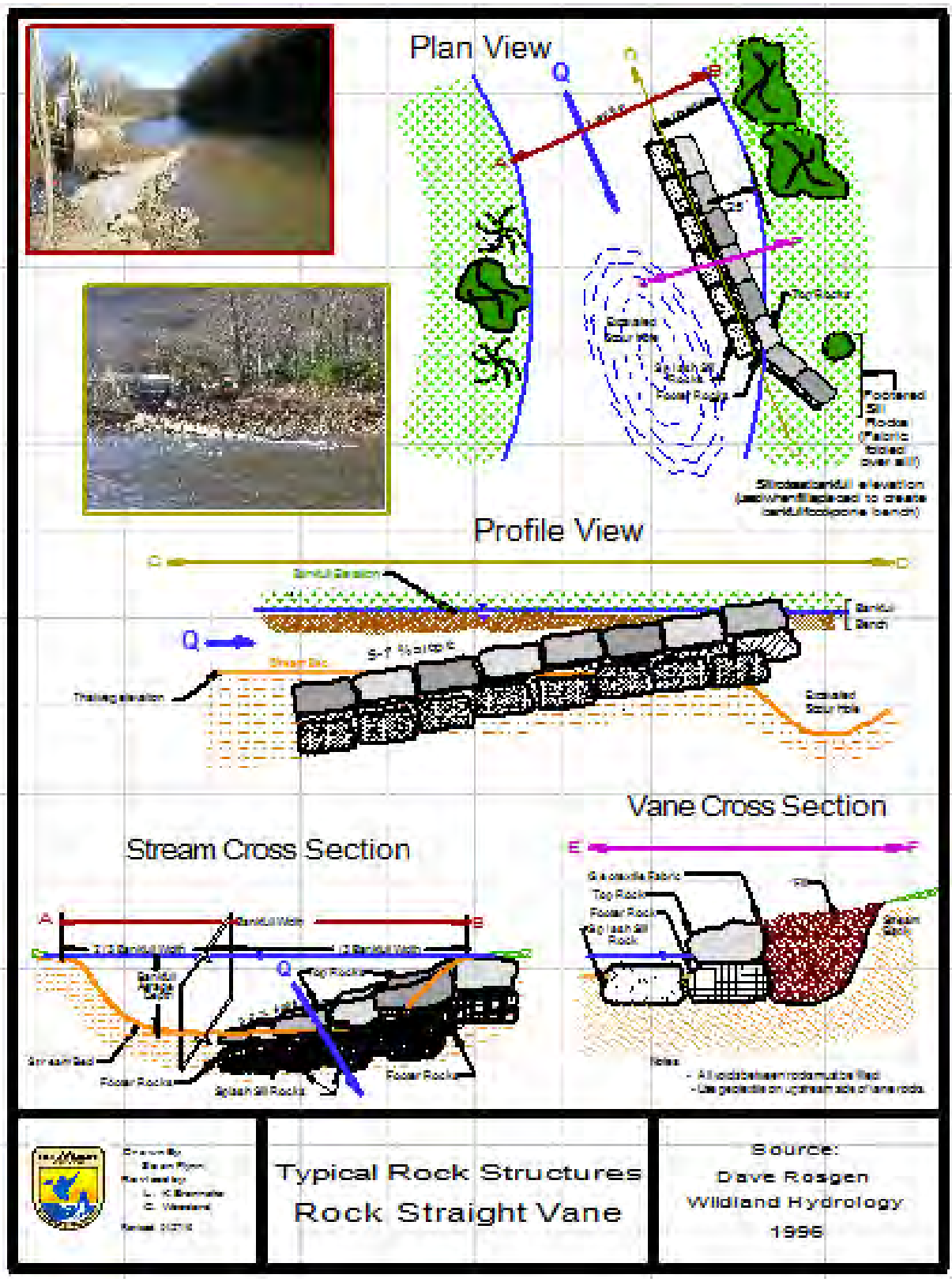


Figure 3. Details of straight rock vane construction.

Figure 4. Rocks to be used for the construction of a straight rock vane.

Figure 5. Excavation for the installation of a footer rock, such as the rock on top of the stack on the left.

Figure 6. Placement of top rock to seat on a footer rock, already buried in the stream bed.

Figure 7. The gaps between both the footer rocks and top rocks are filled by hand with small boulders and cobbles.

Figure 8. Geofabric is installed along the upstream side of the rocks, and extended under the ramp material.

Figure 9. Rock vane backfilled with stream bed material.

On the stream bank, sill rocks are installed across the bankfull bench to prevent stream flow from eroding around the butt rock of the vane. The sill rock gaps are hand filled, as illustrated in Figure 10, and then covered with geofabric as shown in Figure 11 to present a cohesive barrier to stream flow erosion. The sill rocks are backfilled with bankfull bench material to complete the installation of the primary vane structure, as illustrated in Figure 12.

To complete the rock vane, a splash sill is installed by excavating along the downstream side of the footer rocks, and installing a row of rocks at the footer rock level, as indicated in Figure 13. The splash sill prevents scour from the water that pours over the vane from undermining the footer rock of the primary vane structure, which would result in the top rock tipping into the scour hole. Only the primary rock wall structure is typically visible of the completed rock straight vane, as shown in Figure 14.

The ramp of the finished vane forces water flowing along the bank to run uphill, slowing the velocity of the water. This creates a zone of slower moving water in the vicinity of the vane, and also upstream of the vane structure. The water pouring over the rock wall structure of the vane creates a zone of slow moving water downstream of the vane. Vanes are typically spaced so that the eddy pools formed by the structure upstream and downstream intersect with those from adjacent vanes. The result is slower moving water along the respective bank on which the vanes are installed, which greatly reduces erosion of the bank. High velocity flow is forced out away from the stream bank. In the case of this project on Kettle Creek, the higher velocity flow will be moved to the center from both banks. This should create a faster current in the middle of the creek, which may eventually form a deeper low flow channel. This will potentially help keep the stream water cooler in the summer months. At flood flows, the banks will be protected from potentially erosive flow, and the faster water will still be shifted to the central portion of the channel. The project should serve to “hydraulically” narrow the channel, meaning that a narrower width will have the faster flow, which will help bring the most active channel width in line with the bankfull width of the stream in stable reaches upstream and down from the project reach.

Figure 10. Sill rocks are installed across the bankfull bench to serve as an erosion barrier.

Figure 11. Geofabric is draped over the sill rocks to complete the erosion barrier across the bankfull bench.

Figure 12. The sill is backfilled and machine compacted.

Figure 13. The splash sill rocks are installed on the downstream side of the rock vane footer rocks to protect the footer rocks from being undermined by pour-over scour.

Figure 14. A rock vane after backfill and splash sill installation is complete.

Cost Estimate for Construction of Kettle Creek Leidy Bridge Project

Cost Item:				Cost
Materials:				
Rock	2678	Ton	$40/ton	$107,136.00
Geofabric	5	Rolls	$325/roll	$1,625.00
Contractor:				
Excavator & Operator				$23,100.00
Equipment Rental & Mob/Demob				$3,000.00
Travel Expenses				$1,500.00
Total Cost				$136,361.00
FWS Labor:				
Interns				$2,016.00
Staff				$7,677.00
Total Labor				$9,693.00
FWS In-Kind Donation				
Hydrologist				$18,339.50

The table above summarizes the expected project expenses. The cost for the renovation of eroding banks and the installation of twelve rock straight vanes including bank sills was estimated assuming an experienced contractor would be engaged to do the in-stream construction, and that rock could be trucked in for $40/ton. These estimates may have to be adjusted depending on the current rate for acquiring dimensional wall rock for the project. The wall rock constitutes the biggest expense; it is estimated that the project will require approximately 2680 ton of dimensional wall rock. Five rolls of geofabric will also be required.

The FWS labor includes putting together the permit package and meeting with regulators to facilitate obtaining the appropriate permits to implement the project. It also includes intern labor during the project implementation, and performing as-built surveys upon project completion. The FWS Hydrologist's time will count as in-kind donation for project planning and implementation supervision.

RIVERINE ASSESSMENT FORMS

WEST BRANCH SUSQUEHANNA RIVER (WBSR)

Form 1 Riverine Assessment Form

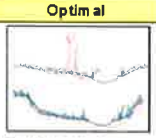
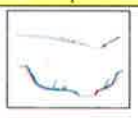
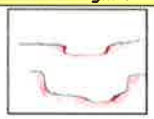
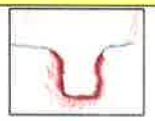
Riverine Assessment Form 1

Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 7,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	RENOVO ENERGY CENTER	Renovo, PA	9/30/16	Designated: / Existing:		500'
Latitude		**Longitude**	**FGM Level 1 Channel Classification**			
Evaluator(s)		**Stream Name and Information**	**Notes:**			
Antonio Federici		WBSR	Applicability of form to be discussed w/ PADEP & USACE			

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions

	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Severe**
Channel Condition	 **Channel Geometry:** These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom. **Active Floodplain Connection:** The channel has access to the active floodplain or has fully developed wide bankfull benches.	 **Channel Geometry:** These channels are slightly incised and contain a few areas of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. **Active Floodplain Connection:** The stream has access to bankfull benches, or newly developed floodplains along portions of the reach.	 Channel Geometry: These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. **Channel Stability:** Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 80% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. **Active Floodplain Connection:** Marginal streams have no connection to the active floodplain.	 **Channel Geometry:** These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. **Channel Stability:** Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often uniformed-sized materials; 5) depositional features such as point bars and bank full benches are absent. **Active Floodplain Connection:** Poor streams are not connected to the active floodplain.	 **Channel Geometry:** Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. **Channel Stability:** visual indications of a deeply incised stream include: 1) the streambed elevation is below the average pooling depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or subterranean flow may be present in certain aggrading channels. **Active Floodplain Connection:** Severe streams are not connected to the active floodplain.
Score	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

Comments:

FEMA flood plain (Zone X) extends over entire town (Renovo Borough). Zone AE extends beyond Ontario Ave. Reinforced banks (fill) isolate a +/- 30' active flood plain.

CI = (Score)/20	CI
	0.55

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable)

	Condition Category										**Comments:**
	Optimal	**Suboptimal**		**Marginal**		**Poor**					
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine ecosystems ≥ 10 acres are scored as optimal.	High Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	Low Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	High Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	Low Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree strata (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	High Poor: Riparian area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.	Low Poor: Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	Top of bank and some of active floodplain contain row of 1-2 Trees in width. Active 30' wide floodplain dense shrub sapling herbaceous Cover
		High	Low	High	Low	High	Low				
Score	20 19 18 17 16	15 14	13 12 11	10 9	8 7 6	5 4 3	2 1				

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below. Ensure the sum of the % Riparian Area Blocks equal 100

										Side Sub-Index	
Right Side	Condition Category										
	% Riparian Area:	0.60	0.40							NA	Side Sub-Index = SUM(%Areas*Scores)/20
	Score:	12	10								
	Total Sub-score:										
Left Side	Condition Category										
	% Riparian Area:										CI = (Left Side CI + Right Side CI)/2
	Score:										CI
	Total Sub-score:										0.56

NA → Right Side

DOWNSTRM LEFT

Drainage Area of River: 7,000 sq.mi (2005 State of Watershed Report, WBSR Task Force)

NOTE: Focus of this form is Downstream Left side of river

(0.6 x 12) + (0.4 x 10) / 20

7.2 + 4 / 20

WBSR

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category					Comments:
	Optimal	Suboptimal	Marginal	Poor		
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory. **Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover. **Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries, no till cropland, actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition. **Low Poor:** Riparian ZOI area consists of impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions	Approx 50' Vegetated to top of bank ⇒ Upland backyards (residential) 50'
		High / Low	High / Low	High / Low		
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1		

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below. Ensure the sums of % Riparian ZOI Blocks equal 100

								Side Sub-Index	
Right Side	Condition Category								Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area								
	Score							NA	
	Total Sub-score:								
Left Side	Condition Category								
	% Riparian Area:	50	50						CI = (Left Side CI + Right Side CI)/2
	Score	12	2						CI: 0.35
	Total Sub-score								

NA

(0.5 x 12) + (0.5 x 2) / 20

6 + 1/20

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embeddedness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach.	Near bank visual evaluation assoc. w/ intake & discharge areas proposed.
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20: CI: 0.35

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category					Comments:
	Negligible	Minor		Moderate	Severe	
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present. **Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.		**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered. **Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	Fill material observed assume banks alter historically for residential development.
		High / Low		High / Low		
Score	20 19 18 17 16	15 14 13 12 11		10 9 8 7 6	5 4 3 2 1	CI = (Score)/20: CI: 0.45

RIVERINE CONDITION INDEX (RCI)	RCI
NOTE: The CIs and RCI should be rounded to 2 decimal places.	RCI = (Sum of all CI's)/5: RCI: 0.45

General Comments:

0.55 + 0.56 + 0.35 + 0.35 + 0.45 / 5

2.26/5

IS-9A

Intermittent

Form 1 Riverine Assessment Form

Riverine Assessment Form 1

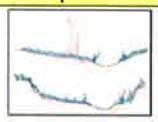
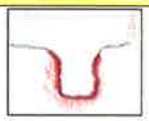
Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	Renovo Energy Center	Renovo, PA	9/30/16	Designated: / Existing:		200'
Latitude		**Longitude**		**FGM Level 1 Channel Classification**		

Evaluator(s)	Stream Name and Information	Notes:
Antonio Federici	IS-9A (UNT)	200 ft daylighted / riprap lined segment of stormwater system.

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions

	Condition Category																			
	Optimal				**Suboptimal**				**Marginal**				**Poor**				**Severe**			
Channel Condition	 Channel Geometry: These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. Channel Stability: Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom. Active Floodplain Connection: The channel has access to the active floodplain or has fully developed wide bankfull benches.				 Channel Geometry: These channels are slightly incised and contain a few areas of active erosion or unprotected banks. Channel Stability: Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. Active Floodplain Connection: The stream has access to bankfull benches, or newly developed floodplains along portions of the reach.				 Channel Geometry: These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. Channel Stability: Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 60% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V-shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. Active Floodplain Connection: Marginal streams have no connection to the active floodplain.				 Channel Geometry: These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. Channel Stability: Visual indicators of over-widening and incision include 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often uniformed-sized materials; 5) depositional features such as point bars and bank full benches are absent. Active Floodplain Connection: Poor streams are not connected to the active floodplain.				 Channel Geometry: Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. Channel Stability: visual indications of a deeply incised stream include: 1) the streambed elevation is below the average pooling depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 5) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or subterranean flow may be present in certain aggrading channels. Active Floodplain Connection: Severe streams are not connected to the active floodplain.			
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Comments:

Channel segment within asphalt brownfield site (Renovo Industrial Park). Uniform / vertical banks. Drains to piped stormwater system.

No floodplain connection.

CI = (Score)/20	CI
	0.2

100% * 4 / 20

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable)

	Condition Category																					Comments:
	Optimal					**Suboptimal**					**Marginal**					**Poor**					
Riparian Vegetation (Floodplain)	Riparian area vegetative consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and boundless resources ≥ 10 acres are scored as optimal.					High Suboptimal: Riparian area vegetative consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-established understory.	Low Suboptimal: Riparian area vegetative consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a established understory.				High Marginal: Riparian area vegetative consists of non-established, dense herbaceous vegetative with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	Low Marginal: Riparian area vegetative consists of non-established, dense herbaceous vegetative, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with established understory.			High Poor: Riparian area vegetative consists of lawn, mowed, and maintained areas, cemeteries; no-till cropland; actively grazed pasture, seasonally vegetated non-established area, pervious fields, recently seeded and stabilized, or other comparable condition.			Low Poor: Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious fields, or other comparable conditions.			No riparian buffer. Dense Japanese knotweed on bed and banks. Asphalt / gravel beyond top of banks.
						High		**Low**			**High**		**Low**			**High**			**Low**		
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1		

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sum of the % Riparian Area Blocks equal 100

									Side Sub-Index	
	Condition Category									
Right Side	% Riparian Area:	100							0.1	Side Sub-Index = SUM(%Areas*Scores)/20
	Score:	2								
	Total Sub-score:									
	Condition Category									
Left Side	% Riparian Area:	100							0.1	CI = (Left Side CI + Right Side CI)/2
	Score:	2								
	Total Sub-score:									

CI
0.1

IS-9A
Intermittent

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	Asphalt and gravel buffer. FEMA unmapped, assessed 100' from each bank.
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory **Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover. **Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present tree stratum (dbh > 3 inches) present with less than 30% tree canopy cover with maintained understory	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition **Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions	
		High / Low	High / Low	High / Low	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 **2** 1	

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sums of % Riparian ZOI Blocks equal 100

			Side Sub-Index	
Right Side	Condition Category:	POOR		Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	100		
	Score:	2	0.1	
	Total Sub-score:			
Left Side	Condition Category:	POOR		CI = (Left Side CI + Right Side CI)/2 → CI: 0.1
	% Riparian Area:	100		
	Score:	2	0.1	
	Total Sub-score:			

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features.

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	Intermittent Not Applicable Protocol Page 3
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach	CI = (Score)/20 → CI: NA
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category				Comments:
	Negligible	Minor	Moderate	Severe	Assume excavated from pipe failure, and other historic alterations of industrial park.
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present. **Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered. **Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	
		High / Low	High / Low		
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 **2** 1	CI = (Score)/20 → CI: 0.1

RIVERINE CONDITION INDEX (RCI)	**RCI**
NOTE: **The CIs and RCI should be rounded to 2 decimal places.**	**RCI = (Sum of all CI's)/5 *** → RCI: 0.13

0.5/4

* divide by 4 for Intermittent

General Comments: Intermittent altered drainage. Upstream / inlet via culvert connection with IS-10 (roadside drainage of Industrial Park Road).

IS-10
Intermittent

Riverine Assessment Form 1

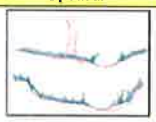
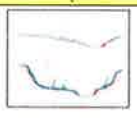
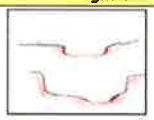
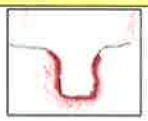
Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	Renovo Energy Ctr	Renovo, PA	9/30/16	Designated: / Existing:		750'
Latitude		Longitude		FGM Level 1 Channel Classification		

Evaluator(s)	Stream Name and Information	Notes:
Antonio Federici	IS-10 (UNT)	Roadside drainage adjacent to Industrial Park Road.

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Severe
					
Channel Condition	Channel Geometry: These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. Channel Stability: Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom; Active Floodplain Connection: The channel has access to the active floodplain or has fully developed wide bankfull benches.	Channel Geometry: These channels are slightly incised and contain a few areas of active erosion or unprotected banks. Channel Stability: Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. Active Floodplain Connection: The stream has access to bankfull benches or newly developed floodplains along portions of the reach.	Channel Geometry: These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. Channel Stability: Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 60% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. Active Floodplain Connection: Marginal streams have no connection to the active floodplain.	Channel Geometry: These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. Channel Stability: Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often uniformed-sized materials; 5) depositional features such as point bars and bank full benches are absent. Active Floodplain Connection: Poor streams are not connected to the active floodplain.	Channel Geometry: Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. Channel Stability: Visual indications of a deeply incised stream include: 1) the streambed elevation is below the average rooting depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or subterranean flow may be present in certain aggrading channels. Active Floodplain Connection: Severe streams are not connected to the active floodplain.
Score	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

Comments: Upstream/inflow from mountainside natural intermittent streams: IS-4 and IS-5. This roadside drainage drains into culvert then IS-9A and seperately to west directly into piped system.

CI = (Score)/20	CI
	0.20

Minimal to none floodplain connection ~ channelized feature roadside

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category										Comments:
	Optimal	Suboptimal		Marginal		Poor					
		High Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	Low Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	High Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	Low Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree strata (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	High Poor: Riparian area vegetation consists of lawns, mowed, and maintained areas, cemeteries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious lots, recently needed and stabilized, or other comparable condition.	Low Poor: Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious lots, or other comparable conditions.	Assume right side is north (mountain toe of slope) and left side Renovo Industrial Park/ Industrial Park Road. Channel drains: east, west and south based on topo.
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and hardwire resources ≥ 10 acres are scored as optimal.	High	Low	High	Low	High	Low				
Score	20 19 18 17 16	15 14	13 12 11	10 9	8 7 6	5 4	3 2 1				

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sum of the % Riparian Area Blocks equal 100

									Side Sub-Index	Side Sub-Index = SUM(%Areas*Scores)/20	
Right Side	Condition Category:	SUBOPT	Marginal								
	% Riparian Area:	85	15						0.56		
	Score:	12	6								
	Total Sub-score:										
Left Side	Condition Category:	Poor									
	% Riparian Area:	100							0.15	CI = (Left Side CI + Right Side CI)/2	CI
	Score:	3									0.36
	Total Sub-score:										

$(0.85 \times 12) + (0.15 \times 6)$ / 20

10.2 + 0.9 / 20

IS-10
Intermittent

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category								Comments:
	Optimal	Suboptimal		Marginal		Poor			
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory	**Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition	**Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions	FEMA unmapped ~ 100' assessment from each bank. $\frac{(0.95 \times 17) + (0.05 \times 6)}{20} = \frac{16.15 + 0.3}{20}$ $1.0/20 = 0.05$ 0.82
		High	Low	High	Low	High	Low		
Score	20 19 18 17 16	15 14	13 12 11	10 9	8 7 6	5 4	3 2 1		

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sums of % Riparian ZOI Blocks equal 100

Right Side	Condition Category:	OPT.	MARGINAL					Side Sub-Index:	Side Sub-Index = SUM(%Areas*Scores)/20	
	% Riparian Area:	95	5							
	Score:	17	6					0.82		
	Total Sub-score:									
Left Side	Condition Category:									
	% Riparian Area:	100							CI = (Left Side CI + Right Side CI)/2	CI
	Score:	1						0.05		0.44
	Total Sub-score:									

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	Intermittent Not applicable Protocol pg. 3 *
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach	CI = (Score)/20 → CI: NA
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category					Comments:
	Negligible	Minor		Moderate	Severe	Entire channel is manmade roadside channel ~ excavated, uniform and straight.
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts), evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered, recent alteration is not present	**Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered	**Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	
		High	Low	High	Low		CI = (Score)/20 → CI: 0.1
Score	20 19 18 17 16	15 14	13 12 11	10 9 8	7 6	5 4 3 2 1	

RIVERINE CONDITION INDEX (RCI)		RCI
NOTE: The CIs and RCI should be rounded to 2 decimal places.	RCI = (Sum of all CI's)/4	0.28 *

General Comments:

$\frac{0.2 + 0.36 + 0.44 + 0.1}{4}$

S-7
Intermittent

Form 1 Riverine Assessment Form

Riverine Assessment Form 1

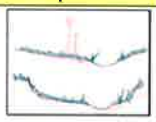
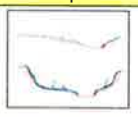
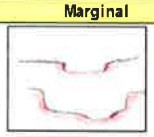
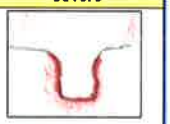
Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	Renovo Energy Center	Noyes Twp, PA	9/30/16	Designated: / Existing:		525'
Latitude		**Longitude**		**FGM Level 1 Channel Classification**		

Evaluator(s)	Stream Name and Information	Notes:
Antonio Federici	S-7 (UNT)	Culvert road crossing ~ existing dirt access road.

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions.

	Condition Category																			
	Optimal				**Suboptimal**				**Marginal**				**Poor**				**Severe**			
Channel Condition	 **Channel Geometry:** These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks, 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom. **Active Floodplain Connection:** The channel has access to the active floodplain or has fully developed wide bankfull benches.				 **Channel Geometry:** These channels are slightly incised and contain a few areas of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks, 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. **Active Floodplain Connection:** The stream has access to bankfull benches or newly developed floodplains along portions of the reach.				 **Channel Geometry:** These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. **Channel Stability:** Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 60% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. **Active Floodplain Connection:** Marginal streams have no connection to the active floodplain.				 **Channel Geometry:** These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. **Channel Stability:** Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate rool depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equalto 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often unflattened-sized materials; 5) depositional features such as point bars and bank full benches are absent. **Active Floodplain Connection:** Poor streams are not connected to the active floodplain.				 **Channel Geometry:** Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. **Channel Stability:** visual indications of a deeply incised stream include: 1) the streambed elevation is below the average rooting depth; 2) both banks are vertical or undercut, 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or sublateneon flow may be present in certain aggrading channels. **Active Floodplain Connection:** Severe streams are not connected to the active floodplain.			
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Comments:

CI = (Score)/20	CI
	0.80

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category																	Comments:
	Optimal					**Suboptimal**				**Marginal**				**Poor**				
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and hemlock resources ≥ 10 acres are scored as optimal.					**High Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.			**High Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.		**High Poor:** Riparian area vegetation consists of lawns, mowed, and maintained areas, reservoirs; no tillage/pasture; actively grazed pasture, sparsely vegetated non-maintained area, pervious lots, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active fixed lots, impervious lots, or other comparable conditions.	
						High			**Low**	**High**			**Low**	**High**			**Low**	
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form(0.00) and Score for each category in the blocks below.

Ensure the sum of the % Riparian Area Blocks equal 100

										Side Sub-Index	
Right Side	Condition Category	SUB.OPT.	POOR							0.68	Side Sub-Index = SUM[%Areas*Scores]/20
	% Riparian Area:	95	5								
	Score:	14	4								
	Total Sub-score:										
Left Side	Condition Category	SUBOPT	POOR							0.68	CI = (Left Side CI + Right Side CI)/2
	% Riparian Area:	95	5								CI: 0.68
	Score:	14	4								
	Total Sub-score:										

$\frac{(0.95 \times 14) + (0.05 \times 4)}{20}$

$\frac{13.3 + 0.2}{20}$

S-7
Intermittent

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category					Comments:
	Optimal	Suboptimal		Marginal		Poor		
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory	**Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover	**Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition	**Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions	FEMA unmapped ~100' assessment from each bank. (0.98 × 17) + (0.02 × 4) / 20 = 16.66 + 0.08 / 20
		High	Low	High	Low	High	Low	
Score	20 19 18 17 16	15 14	13 12 11	10 9	8 7 6	5 4	3 2 1	

1. Identify Condition Category areas along the floodplain using the descriptors above
2. Estimate the % area within each condition category
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below

Ensure the sums of % Riparian ZOI Blocks equal 100

								Side Sub-Index	
Right Side	Condition Category:	Opt	Poor						Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	98	2						
	Score:	17	4					0.84	
	Total Sub-score:								
Left Side	Condition Category:								
	% Riparian Area:	98	2						CI = (Left Side CI + Right Side CI)/2
	Score:	17	4					0.84	CI: 0.84
	Total Sub-score:								

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features

	Condition Category				Comments: Interm. Hab Not applicable Pg 3 Protocol *
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20: CI: N/A

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc

	Condition Category					Comments:
	Negligible	Minor		Moderate		Severe	
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered.	**Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	Culvert crossing dirt road. 15/20
		High	Low	High	Low		
Score	20 19 18 17 16	15 14	13 12 11	10 9	8 7 6	5 4 3 2 1	CI = (Score)/20: CI: 0.75

RIVERINE CONDITION INDEX (RCI)		RCI
NOTE: The CIs and RCI should be rounded to 2 decimal places.	RCI = (Sum of all CI's)/5 4	0.77 *

General Comments:

0.8 + 0.68 + 0.84 + 0.75 / 4

15-9 Intermittent

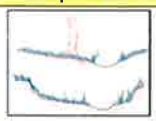
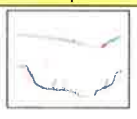
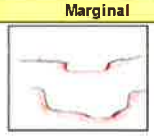
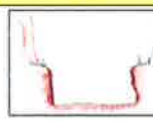
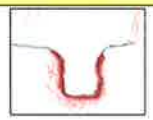
Riverine Assessment Form 1

Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification		AA Id	Length
	Renovo Energy Ctr	Renovo, PA	9/30/16	Designated:	Existing:		300'
Latitude		**Longitude**	**FGM Level 1 Channel Classification**				
Evaluator(s)		**Stream Name and Information**		**Notes:**			
Antonio Federici		15-9 (UNT)		Partially adjacent to Boone Road.			

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions

	Condition Category																			
	Optimal				**Suboptimal**				**Marginal**				**Poor**				**Severe**			
Channel Condition	 Channel Geometry: These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. Channel Stability: Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom. Active Floodplain Connection: The channel has access to the active floodplain or has fully developed wide bankfull benches.				 Channel Geometry: These channels are slightly incised and contain a few areas of active erosion or unprotected banks. Channel Stability: Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 60% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. Active Floodplain Connection: The stream has access to bankfull benches or newly developed floodplains along portions of the reach.				 Channel Geometry: These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. Channel Stability: Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 80% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. Active Floodplain Connection: Marginal streams have no connection to the active floodplain.				 Channel Geometry: These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. Channel Stability: Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often unconsolidated-sized materials; 5) depositional features such as point bars and bank full benches are absent. Active Floodplain Connection: Poor streams are not connected to the active floodplain.				 Channel Geometry: Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. Channel Stability: visual indications of a deeply incised stream include: 1) the streambed elevation is below the average pooling depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or sudden mean flow may be present in certain aggrading channels. Active Floodplain Connection: Severe streams are not connected to the active floodplain.			
Score	20	19	18	17	16	15	(14)	13	12	11	10	9	8	7	6	5	4	3	2	1

Comments:

CI = (Score)/20	CI
	0.7

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category																	Comments:
	Optimal					**Suboptimal**					**Marginal**				**Poor**			
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.					High Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	Low Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.			High Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	Low Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	High Poor: Riparian area vegetation consists of lawns, mowed, and maintained areas, cemeteries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious fields, recently seeded and stabilized, or other comparable condition.	Low Poor: Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious fields, or other comparable conditions.	Relatively young forest ~ recent logging evidence (stumps and truck ruts). Minimal herb and moderate to minimal shrub cover.
						High		**Low**			**High**		**Low**		**High**		**Low**	
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sum of the % Riparian Area Blocks equal 100

									Side Sub-Index	
Right Side	Condition Category:	Sub opt.	Poor						0.57	Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	85	15							
	Score:	13	2							
	Total Sub-score:									
Left Side	Condition Category:								0.67	CI = (Left Side CI + Right Side CI)/2
	% Riparian Area:	95	5							
	Score:	13	2							
	Total Sub-score:									

CI
0.62

$\frac{(0.85 \times 13) + (0.15 \times 2)}{20} + \frac{(0.95 \times 13) + \binom{0.5}{2}}{20}$

$\frac{0.57 + 0.67}{2} \leftarrow \frac{11.05 + 0.3}{20} + \frac{12.35 + 1}{20}$

IS-9
Intermittent

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides 100 feet from edge of floodplain into the upland along the entire AA (rough measurements of length & width may be acceptable)

	Condition Category										Comments:
	Optimal	Suboptimal		Marginal		Poor					
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory	**Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition	**Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions		Not mapped by FEMA ~ assessed 100' from each bank. Low density herb cover. $\frac{(6.9\times13)+(.1\times2)}{20} + \frac{(6.95\times13)+(.05\times2)}{20}$
		High	Low	High	Low	High	Low				
Score	20 19 18 17 16	15 14 13 12 11		10 9 8 7 6		5 4 3 2 1					

1. Identify Condition Category areas along the floodplain using the descriptors above
2. Estimate the % area within each condition category
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below — Ensure the sums of % Riparian ZOI Blocks equal 100

Right Side	Condition Category:	Suboptimal	Poor					Side Sub-Index:	Side Sub-Index = SUM(%Areas*Scores)/20	
	% Riparian Area:	90	10					0.60		
	Score:	13	2							
	Total Sub-score:									
Left Side	Condition Category:									
	% Riparian Area:	95	5					0.62	CI = (Left Side CI + Right Side CI)/2	CI: 0.61
	Score:	13	2							
	Total Sub-score:									

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features

	Condition Category				Comments: Intermittent Not Applicable * Protocol page 3
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach.	CI = (Score)/20: CI = NA
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category					Comments:
	Negligible	Minor		Moderate	Severe	
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered.	**Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	Portion of channel runs alongside Boone Road. Majority w/in young forest. 12/20
		High	Low	High	Low		
Score	20 19 18 17 16	15 14 13 12 11		10 9 8 7 6		5 4 3 2 1	CI = (Score)/20: CI = 0.60

RIVERINE CONDITION INDEX (RCI) — RCI: 0.63

NOTE: The CIs and RCI should be rounded to 2 decimal places.

RCI = (Sum of all CI's)/5 4 *

General Comments:

2.53/4

15-6

Form 1 Riverine Assessment Form

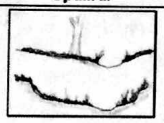
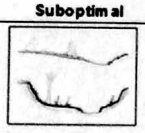
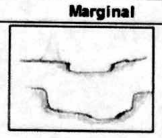
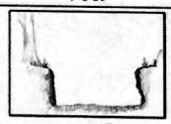
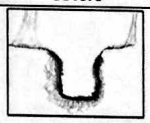
Riverine Assessment Form 1

Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	Renovo Energy CTR	Renovo, PA	10/7/16	Designated: / Existing:		600
Latitude		**Longitude**		**FGM Level 1 Channel Classification**		
Evaluator(s)		**Stream Name and Information**		**Notes:**		
Antonio Federici		15-6		seep fed intermittent drainage		

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions.

	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Severe**
Channel Condition	 **Channel Geometry:** These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom. **Active Floodplain Connection:** The channel has access to the active floodplain or has fully developed wide bankfull benches.	 **Channel Geometry:** These channels are slightly incised and contain a few areas of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. **Active Floodplain Connection:** The stream has access to bankfull benches, or newly developed floodplains along portions of the reach.	 **Channel Geometry:** These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. **Channel Stability:** Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 60% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. **Active Floodplain Connection:** Marginal streams have no connection to the active floodplain.	 **Channel Geometry:** These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. **Channel Stability:** Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often uniformed-sized materials; 5) depositional features such as point bars and bank full benches are absent. **Active Floodplain Connection:** Poor streams are not connected to the active floodplain.	 **Channel Geometry:** Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. **Channel Stability:** visual indications of a deeply incised stream include: 1) the streambed elevation is below the average rooting depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or subterranean flow may be present in certain aggrading channels. **Active Floodplain Connection:** Severe streams are not connected to the active floodplain.
Score	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

Comments: Very shallow (<1') channel without visible defining features such as bankfull elevation and floodplain that are found w/ perennial and more defined intermittent streams.

CI = (Score)/20 → **CI: 0.55**

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category					
	Optimal	**Suboptimal**		**Marginal**		**Poor**	
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree strata (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian area vegetation consists of lawns, mowed, and maintained areas, cemeteries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Riparian area consists of impervious surfaces; mine spoil beds, denuded surfaces, new crops, active feed lots, impervious trails, or other comparable conditions.
Score	20 19 18 17 16	**High** 15 14	**Low** 13 12 11	**High** 10 9 8	**Low** 7 6	**High** 5 4 3	**Low** 2 1

Comments: 75% w/ Util Right-of-way; 25% w/in Forest

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sum of the % Riparian Area Blocks equal 100

Right Side	Condition Category							**Side Sub-Index**	**Side Sub-Index = SUM(%Areas*Scores)/20**
	% Riparian Area:	75	25					0.35	
	Score:	4	14						
	Total Sub-scores:								
Left Side	Condition Category								**CI = (Left Side CI + Right Side CI)/2** → **CI: 0.35**
	% Riparian Area:	75	25					0.35	
	Score:	4	14						
	Total Sub-scores:								

$\frac{(0.75 \times 4) + (0.25 \times 14)}{20}$

$\frac{3 + 3.5}{20}$

15-6

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 80% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory. **Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover. **Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition. **Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	-
		High / Low	High / Low	High / Low	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sums of % Riparian ZOI Blocks equal 100

								Side Sub-Index	
Right Side	Condition Category								Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	25	25					0,35	
	Score:	4	14						
	Total Sub-score:								
Left Side	Condition Category								CI = (Left Side CI + Right Side CI)/2
	% Riparian Area:	75	24					0,35	CI: 0,35
	Score:	4	14						
	Total Sub-score:								

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features.

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach.	NA (Intermittent)
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20 — CI:

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category				Comments:
	Negligible	Minor	Moderate	Severe	
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present. **Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered. **Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	Logging in woods (ruts and stumps observed)
		High / Low	High / Low		
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20 — CI: 0,8

RIVERINE CONDITION INDEX (RCI)		RCI
NOTE: **The CIs and RCI should be rounded to 2 decimal places.**	RCI = (Sum of all CI's)/4	0,51

General Comments:

$$\frac{0,55 + 0.35 + 0.35 + 0,8}{4}$$

Form 1 Riverine Assessment Form

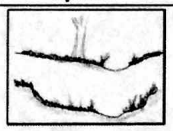
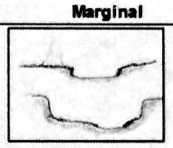
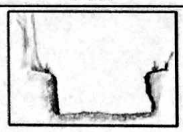
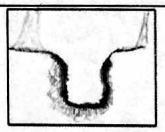
Riverine Assessment Form 1

Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	Renovo Energy Ctr	Renovo, PA	10/7/16	Designated: / Existing:		
Latitude		Longitude		FGM Level 1 Channel Classification		
Evaluator(s)		Stream Name and Information		Notes:		
Antonio Federici		15-8		seep fed intermittent stream/drainage		

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions

	Condition Category															
	Optimal				Suboptimal				Marginal				Poor			
Channel Condition	 Channel Geometry: These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. Channel Stability: Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom; Active Floodplain Connection: The channel has access to the active floodplain or has fully developed wide bankfull benches.				 Channel Geometry: These channels are slightly incised and contain a few areas of active erosion or unprotected banks. Channel Stability: Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. Active Floodplain Connection: The stream has access to bankfull benches, or newly developed floodplains along portions of the reach.				 Channel Geometry: These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. Channel Stability: Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 60% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. Active Floodplain Connection: Marginal streams have no connection to the active floodplain.				 Channel Geometry: These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. Channel Stability: Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often uniformed-sized materials; 5) depositional features such as point bars and bank full benches are absent. Active Floodplain Connection: Poor streams are not connected to the active floodplain.				 Channel Geometry: Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. Channel Stability: visual indications of a deeply incised stream include: 1) the streambed elevation is below the average rooting depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or rawbanks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or subterranean flow may be present in certain aggrading channels. Active Floodplain Connection: Severe streams are not connected to the active floodplain.			
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Comments: Very shallow (1' deep) channel sometimes diffuse / undefined in sections. Lacks formal geomorphology / geometry of a perennial or more defined intermittent stream.

CI = (Score)/20	CI
	0.5

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category																Comments:
	Optimal					Suboptimal				Marginal				Poor			
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and hardline resources ≥ 10 acres are scored as optimal.					High Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.		Low Suboptimal: Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.		High Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.		Low Marginal: Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.		High Poor: Riparian area vegetation consists of lawns, mowed, and maintained areas, meadows; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.		Low Poor: Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active load lots, impervious trails, or other comparable conditions.	
						High		Low		High		Low		High		Low					
Score	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sum of the % Riparian Area Blocks equal 100

									Side Sub-Index	
Right Side	Condition Category								0.6	Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:									
	Score:									
	Total Sub-scores:									
Left Side	Condition Category								0.6	CI = (Left Side CI + Right Side CI)/2 → CI = 0.6
	% Riparian Area:									
	Score:									
	Total Sub-scores:									

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory. **Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover. **Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition. **Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	
		High / Low	High / Low	High / Low	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below.

Ensure the sums of % Riparian ZOI Blocks equal 100

			Side Sub-Index	
Right Side	Condition Category		0.6	Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	100		
	Score:	12		
	Total Sub-score:			
Left Side	Condition Category		0.6	CI = (Left Side CI + Right Side CI)/2 → CI: 0.6
	% Riparian Area:	100		
	Score:	12		
	Total Sub-score:			

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features.

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach.	NA (intermittent)
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20 → CI:

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category				Comments:
	Negligible	Minor	Moderate	Severe	
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present. **Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered. **Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	Logging in woods (ruts and stumps observed)
		High / Low	High / Low		
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20 → CI: 0.8

RIVERINE CONDITION INDEX (RCI)

NOTE: **The CIs and RCI should be rounded to 2 decimal places.**

RCI = (Sum of all CI's)/4 → RCI: 0.63

General Comments:

$$\frac{0.5+0.6+0.6+0.8}{4}$$

KETTLE CREEK ASSESSMENT FORM

Kettle Creek restoration project - Sheet based on POST restoration condition.

Form 1 Riverine Assessment Form

Riverine Assessment Form 1

Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol Version 1.0

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name	Locality	Date	Ch 93 Classification	AA Id	Length
	RENOVO ENERGY CEN.	LEIDY	9/30/16	Designated: EV Existing:	KC	6,288
Latitude		Longitude		FGM Level 1 Channel Classification		
Evaluator(s)		Stream Name and Information		Notes:		
STEVE KUNKA		Kettle Creek				

AA determined by 20 x (Bankfull width) and measured from upstream/downstream extent of the proposed project.

1. Channel Condition: Assess the cross-section of the stream and prevailing conditions

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Severe
					
Channel Condition	**Channel Geometry:** These channels show very little incision or widening and little or no evidence of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this stability include: 1) vegetative surface protection or natural rock stability present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient sediment deposition is present, it covers less than or equal to 10% of the stream bottom; **Active Floodplain Connection:** The channel has access to the active floodplain or has fully developed wide bankfull benches.	**Channel Geometry:** These channels are slightly incised and contain a few areas of active erosion or unprotected banks. **Channel Stability:** Visual indicators of this slight instability include: 1) vegetative surface protection or natural rock stability present along greater than 60% and less than 80% of both banks; 2) depositional features such as point bars and bankfull benches are likely present; 3) if transient sediment is present, it affects or buries greater than 10% and less or equal to 40% of the stream bottom. **Active Floodplain Connection:** The stream has access to bankfull benches, or newly developed floodplains along portions of the reach.	**Channel Geometry:** These channels are often incised or their course has been widened, but to a lesser degree than the Severe and Poor channel conditions. **Channel Stability:** Visual indicators of a marginal stream include: 1) erosional scars present along greater than 40% and less than or equal to 60% of both banks; 2) vegetative surface protection may be present along greater than 40 and less than or equal to 60% of the banks; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; 4) portions of the bankfull channel may still widen while some portions are beginning to narrow; 5) temporary and transient sediment deposit covers greater than 40 and less than or equal to 60% of the natural stream bed or bottom. However, streams that have degraded channel profiles which are recovering will exhibit different characteristics, including: 1) presence of depositional features such as point bars, mid-channel bars, transverse bars and bank full benches may be forming or present; 2) channels have a V shape; 3) vegetative surface protection is present on greater than 40% of the banks but evidence of instability can be observed in unvegetated areas. **Active Floodplain Connection:** Marginal streams have no connection to the active floodplain.	**Channel Geometry:** These channels are over-widened or are incised. These channels are vertically and/or laterally unstable and are more likely to widen rather than incise further. **Channel Stability:** Visual indicators of over-widening and incision include: 1) both banks are near vertical with shallow to moderate root depths; 2) erosional scars present on greater than 60 and less than or equal to 80% of the banks; 3) vegetative surface protection is greater than 20 and less than or equal to 40% of both banks and is insufficient to prevent significant erosion from continuing; 4) greater than 60 and less than or equal to 80% of the natural stream bed or bottom (pools and riffles) is covered by substantial sediment deposition, often uniformed-sized materials; 5) depositional features such as point bars and bank full benches are absent. **Active Floodplain Connection:** Poor streams are not connected to the active floodplain.	**Channel Geometry:** Severe channels are deeply incised (or excavated) with vertical and/or lateral instability and will likely continue to incise or widen. **Channel Stability:** visual indications of a deeply incised stream include: 1) the streambed elevation is below the average rooting depth; 2) both banks are vertical or undercut; 3) vegetative surface protection present on less than 20% of the banks and is not preventing erosion from continuing; 4) bank sloughing present; 5) erosional scars or raw banks present on greater than 80% of the banks; 6) greater than 80% of the natural streambed or bottom (pools and riffles) is covered by substantial sediment deposition; 7) Multiple thread channels and/or subterranean flow may be present in certain aggrading channels. **Active Floodplain Connection:** Severe streams are not connected to the active floodplain.
Score	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

Comments:

Stream restoration includes placement of rock vanes to encourage channel development - portions of the floodplain still disconnected due to existing roadway. 16/20

CI = (Score)/20	CI
	0.80

2. RIPARIAN VEGETATION: Assess the floodplain along the entire SAR (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category					
	Optimal	Suboptimal		Marginal		Poor	
	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and impervious areas ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree strata, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree strata (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian area vegetation consists of lawn, mowed, and maintained areas, meadow; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious soils, recently needed and stabilized, or other comparable condition.	**Low Poor:** Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, new crops, active load lots, impervious soils, or other comparable conditions.
		High	Low	High	Low	High	Low
Score	20 19 18 17 16	15 14	13 12 11	10 9	8 7 6	5 4	3 2 1

Comments:

bank full shelf includes Sycamore trees w/ some willow occasional shrub understory

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below. Ensure the sum of the % Riparian Area Blocks equal 100

								Side Sub-Index	
Right Side	Condition Category	15	10	6				.51	Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	.1	.8	.1					
	Score:								
	Total Sub-score:	1.5	8	.6					
Left Side	Condition Category	15	10	6				.53	CI = (Left Side CI + Right Side CI)/2
	% Riparian Area:	.20	.70	.10					
	Score:								
	Total Sub-score:	3	7	.6					

CI
0.52

Riverine Assessment Form 1 Page 2

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category				Comments:
	Optimal	**Suboptimal**	**Marginal**	**Poor**	
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory. **Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover. **Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition. **Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	
		High / Low	High / Low	High / Low	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below. Ensure the sums of % Riparian ZOI Blocks equal 100

								Side Sub-Index	
Right Side	Condition Category								Side Sub-Index = SUM(%Areas*Scores)/20
	% Riparian Area:	.20	.60	.10				.48	
	Score:								
	Total Sub-score:	3	6	.5					
Left Side	Condition Category	15	10	5					CI = (Left Side CI + Right Side CI)/2
	% Riparian Area:	.10	.70	.20				.48	
	Score:								CI: .48
	Total Sub-score:	1.5	7	1					

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embededness, shade, undercut banks, root mats, SAV, macrophyles, emergent vegetation, riffle-pool complexes, stable features.

	Condition Category				Comments:
	Optimal	**Suboptimal**	**Marginal**	**Poor**	
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities the reach.	
Score	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20 — CI: 1.0

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category				Comments:
	Negligible	**Minor**	**Moderate**	**Severe**	
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present. **Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered. **Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.	
		High / Low	High / Low		
Score	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	CI = (Score)/20 — CI: 1.0

RIVERINE CONDITION INDEX (RCI)	RCI
NOTE: **The CIs and RCI should be rounded to 2 decimal places.**	RCI = (Sum of all CI's)/5 — 0.76

General Comments:

AQUATIC RESOURCE FUNCTION WORKSHEETS

Aquatic Resource Function Worksheet 1

Compensation Requirement Determination

Version 1.0

Project Name: RENOVO				Resource Identifier: WBSR		
Resource Type	**Function Group**	**Area of Impact (A_I in 0.00 acres)**	**Project Effect Factor (P_E)**	**Resource Value Factor (R_V)**	**Resource Condition Value (C_I)**	**Compensation Requirement (credits 0.00)**
Streams and/or Floodplains	**HYD1**	0.25	0.0	2.5	0.45	0.00
	BGC1	0.25	0.0	2.5	0.45	0.00
	HAB1	0.25	3.0	2.5	0.45	0.84
	REC1 - RS	0.25	3.0	2.5	0.45	0.84
Wetlands	**HYD2**	0.00	0	0	0.00	0.00
	BGC2	0.00	0	0	0.00	0.00
	HAB2	0.00	0	0	0.00	0.00
Reservoirs and Large Rivers	**HAB3**	0.00	0	0	0.00	0.00
	REC2	0.00	0	0	0.00	0.00

822.3 Sq Ft. of Permanent Impact to the WBSR and 9,959.7 Sq Ft. of temporary impact to the WBSR. Both permanent and temporary included in the 0.25 acres of Area of Impact.

Aquatic Resource Function Worksheet 2

Proposed Compensation Valuation

Version 1.0

Project Name:	Site Identifier:
Kettle Creek	Kettle Creek

Resource Type	Function Group	Area of Project (A_p in 0.00 acres)	Compensation Value Factor (C_V)	Resource Value Factor (R_V)	Resource Condition Differential Value (C_I)	Proposed Compensation Value (credits 0.00)
Streams and/or Floodplains	HYD1	0.00	0	0	0.00	0.00
	BGC1	0.00	0	0	0.00	0.00
	HAB1	6.71	1.0	3.0	0.31	6.24
	REC1 - RS	0.00	0	0	0.00	0.00
Wetlands	HYD2	0.00	0	0	0.00	0.00
	BGC2	0.00	0	0	0.00	0.00
	HAB2	0.00	0	0	0.00	0.00
Reservoirs and Large Rivers	HAB3	0.00	0	0	0.00	0.00
	REC2	0.00	0	0	0.00	0.00

Kettle Creek is a Chapter 93 designated use EV water Resource Value of 1.0

Only HAB1 included in restoration Compensation Value of 1.0