Attachment H

Conowingo Hydroelectric Project
(FERC Project No. 405)

American Eel Passage and Restoration Plan
("EPRP")

CONOWINGO HYDROELECTRIC PROJECT
FERC PROJECT NUMBER 405

AMERICAN EEL PASSAGE AND RESTORATION PLAN

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LIST OF ABBREVIATIONS

CEECF	Conowingo East Eel Collection Facility
cfs	cubic feet per second
Conowingo Project or Project	Conowingo Hydroelectric Project
CWA	Chester Water Authority
CWECF	Conowingo West Eel Collection and Holding Facility
DO	dissolved oxygen
EFL	East Fish Lift
EPAG	Eel Passage Advisory Group
EPRP	American Eel Passage and Restoration Plan
Exelon	Exelon Generation Corporation, LLC
FERC or Commission	Federal Energy Regulatory Commission
hp	horsepower
L	Liter
MD	Maryland
MDE	Maryland Department of the Environment
MDE Settlement	Joint Offer of Settlement and Explanatory Statement of Exelon Generation Company, LLC and The Maryland Department of the Environment
m	meter
mL	milliliter
mm	millimeter
MRPSP	Muddy Run Pumped Storage Project
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
OECF	Octoraro Creek Eel Collection Facility
PA	Pennsylvania
ppm	parts per million
rpm	revolutions per minute
SRBC	Susquehanna River Basin Commission
USFWS	United States Fish and Wildlife Service
WQC	Water Quality Certificate

1 BACKGROUND

Exelon Generation Company, LLC (Exelon) is the licensee for the 570.15-megawatt Conowingo Hydroelectric Project (Conowingo Project or Project). The Project is located on the Susquehanna River (at river mile 10) in Pennsylvania and Maryland. Conowingo Dam is in Maryland, connecting Cecil and Harford counties, as are the lowermost six miles of the Project reservoir, Conowingo Pond. The remaining eight miles of Conowingo Pond are in Pennsylvania, within York and Lancaster counties.

The Conowingo Project Federal Energy Regulatory Commission (FERC or Commission) License requires Exelon to develop and submit an American Eel Passage and Restoration Plan (EPRP). Specifically, Article 415 states:

> *Within six months of license issuance, the licensee must file with the Commission for approval, an eel passage and restoration plan. The plan must include:*
>
> *a) detailed plans for modifications to the East Fish Lift to specifically accommodate a temporary eel trapping facility at a location within the East Fish Lift stilling basin in the vicinity of the foot of the spillway;*
>
> *b) details regarding the annual operation and maintenance of all current and proposed eel fishways; and*
>
> *c) proposed attraction flow velocity and volume, slopes of the ramps, matting, and methods to reduce predation.*
>
> *Within 30 days of license issuance, the licensee must submit the plan to the Maryland Department of the Environment (MDE), the Pennsylvania Department of Environmental Protection (Pennsylvania DEP), the Pennsylvania Fish and Boat Commission (Pennsylvania Fish and Boat), the Susquehanna River Basin Commission (SRBC), the U.S. Fish and Wildlife Service (FWS), and the Maryland Department of Natural Resources (Maryland DNR), for review. In the event that MDE, in consultation with the Pennsylvania DEP, the Pennsylvania Fish and Boat, SRBC, FWS, or the Maryland DNR, determines that additional information, revisions, modifications, or amendments are necessary to the eel passage and restoration plan, then within 60 days of receipt of written notice, the licensee must submit such information, revisions or amendments to the above-listed agencies.*
>
> *The licensee must include with the plan an implementation schedule, documentation of consultation, copies of recommendations on the completed plan after it has been prepared and provided to the entities above, and specific descriptions of how the entities' comments are accommodated by the plan. The licensee must provide a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.*
>
> *The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.*

The Joint Offer of Settlement and Explanatory Statement of Exelon Generation Company, LLC and The Maryland Department Of The Environment (MDE Settlement) (2019) also requires the development of an Eel Passage and Restoration Plan that will:

> *(i) provide for modification of the EFL to accommodate a temporary eel trapping facility in the EFL stilling basin (the "Temporary Eel Trapping Facility"); (ii) contain details regarding the operation and maintenance of all existing and proposed eel fishways at the Project, including continued use of the EFL for eel passage after shad and herring season has ended; and (iii) establish attraction flow speed and volume, slopes of ramps, matting, and methods to reduce predation.*

Exelon also operates the Muddy Run Pumped Storage Project (MRPSP) on the Susquehanna River in Pennsylvania (PA). The MRPSP FERC license includes an American Eel Passage Plan that requires Exelon to trap, transport, and stock eels in the Susquehanna River watershed from the Octoraro Eel Collection Facility (OECF) located at the Chester Water Authority (CWA) facility (located in Nottingham, PA) and the Conowingo West Eel Collection Facility (CWECF) located on the west bank at Conowingo Dam. Under the MRPSP License, the eel collection season starts May 1 and ends September 15 at the OECF. The CWECF will begin operation on May 1 and continue until the mean daily water temperature, as determined by hourly readings at Exelon's monitoring station 643 (located 0.6 miles downstream of Conowingo Dam) or by manual readings taken at an alternative location within the Project tailrace, is 10 degrees Celsius or less for three consecutive days. The Conowingo East Eel Collection Facility (CEECF)[1] will commence operation 10 days following the end of EFL operation and will continue to operate until the mean daily water temperature is 10 degrees Celsius or less for three consecutive days, as determined by hourly readings at Exelon's monitoring station 643 (located 0.6 miles downstream of Conowingo Dam) or by manual readings taken at an alternative location within the Project tailrace.

[1] The temporary eel collection facility at the East Fish Lift stilling basin will be installed within twelve (12) months of completing the East Fish Lift modifications described in the FERC License, Appendix 1.

2 PROJECT CONFIGURATION

The Project consists of 1) a main dam, 2) a spillway, 3) a reservoir (Conowingo Pond), and 4) an intake and powerhouse.

The Conowingo Dam is a concrete gravity dam with a maximum height of approximately 94 feet and a total length of 4,648 feet. The dam consists of four distinct sections from east to west: a 1,190-foot long non-overflow gravity section with an elevation of 115.7 feet[2]; an ogee shaped spillway, the major portion of which is 2,250 feet long with a crest elevation of 86.7 feet, and the minor portion of which is 135 feet long with a crest elevation of 98.7 feet; an intake-powerhouse section which is 950 feet long; and a 100-foot long abutment section (Figure 2.0-1). The dam and powerhouse also support US Highway Route No. 1, which passes over the top of Conowingo Dam. The East and West Fish Lifts are located at opposite ends of the powerhouse.

Flow over the Conowingo Main Dam spillway is controlled by 50 stony-type crest gates with crest elevations of 86.7 feet and two regulating gates with crest elevations of 98.7 feet. Each of the crest gates are 22.5 feet high by 38 feet wide and have a discharge capacity of approximately 16,000 cubic feet per second (cfs) at a reservoir elevation of 109.2 feet. The two regulating gates are 10 feet high by 38 feet wide and have a discharge capacity of approximately 5,000 cfs per gate at a reservoir elevation of 109.2 feet.

Conowingo Pond extends approximately 14 miles upstream from Conowingo Dam to the lower end of the Holtwood Project tailrace. The Conowingo Pond is generally maintained at an elevation of 109.2 feet, with a surface area of approximately 8,500 acres and a total impoundment design volume of 310,000 acre-feet at that elevation.

The Project powerhouse contains eleven main turbines, as well as two house turbines (Table 2.0-1). The house units are located on the far western end of the powerhouse, whereas the larger units are arranged in order such that Unit 1 discharges near the western end of the dam, and Unit 11 discharges near the eastern end of the dam. Units 2 and 5 are equipped with aerating runners, which serve to increase dissolved oxygen (DO) levels in the turbine discharge water. The Project intakes for each turbine are individually protected by seven trash racks; five are entirely steel (clear spacing of 5.375 inches) and two are steel framed with wood racks (clear spacing of 4.75 inches). The top two racks are constructed of wood due to frazzle ice accumulations on the steel sections.

[2] Unless noted otherwise, elevations are in the National Geodetic Vertical Datum of 1929 (NGVD 1929), as opposed to Conowingo Datum. There is 0.702-foot difference between Conowingo Datum and NGVD 1929 Datum (i.e. El. 100.00 Conowingo Datum = 100.702 NGVD 1929 Datum).

Table 2.0-1: Conowingo Project Turbine Specifications

Unit	Type	Runner Speed (rpm)	Rated Output (hp)	Approx. Rated Discharge (cfs)
House #1	Francis	360	1,900	247
House #2	Francis	360	1,900	247
1	Francis	81.8	64,500	6,749
2	Francis	81.8	54,000	6,320
3	Francis	81.8	64,500	6,749
4	Francis	81.8	64,500	6,749
5	Francis	81.8	54,000	6,320
6	Francis	81.8	64,500	6,749
7	Francis	81.8	64,500	6,749
8	Mixed-Flow Kaplan	120	85,000	9,352
9	Mixed-Flow Kaplan	120	85,000	9,727
10	Mixed-Flow Kaplan	120	85,000	9,727
11	Mixed-Flow Kaplan	120	85,000	9,727

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405
Eel Passage and Restoration Plan

N

0 250 500 1,000 Feet

1 inch = 500 feet

Figure 2.0-1:
Project Configuration

Path: X:\GISMaps\project_maps\eel_passage_and_restoration\figure_2_0-1_configuration.mxd

3 UPSTREAM TRAPPING, TRANSPORT, AND STOCKING FOR AMERICAN EEL

Exelon will trap and hold American Eels and then transport them to designated stocking locations in the Susquehanna River watershed in compliance with Article 414 and FERC License Appendix 1. Article 414 reads:

> *Upon license issuance, in addition to complying with U.S. Department of the Interior's section 18 prescription (Appendix 1), the licensee must:*
>
> *a) Operate all current and proposed eel fishways on the west side of the Conowingo Dam from May 1 until mean daily water temperature, as determined by hourly readings at Exelon's monitoring station 643 (located 0.6 mile downstream of Conowingo Dam), is 10 degrees Celsius or less for three consecutive days.*
>
> *b) Operate all current and proposed eel fishways on the east side of Conowingo Dam from 10 days after the date that American shad operations cease at the East Fish Lift until mean daily water temperature, as determined by hourly readings at Exelon's monitoring station 643 (located 0.6 mile downstream of Conowingo Dam), is 10 degrees Celsius or less for three consecutive days*[3].
>
> *c) Maintain the upstream eel passage trap and transport program through 2035 .*
>
> *d) During the 10 years of operating the East Fish Lift with the eel temporary modifications (12.6.1 of the section 18 prescription), if the number of eels exceeds the maximum capacity of eels per unit of ramp area, redesign and construct the East Fish Lift - Eel Temporary Modifications to reduce crowding.*
>
> *e) If, after 10 years of operating the East Fish Lift with the eel temporary modifications (12.6.1 of the section 18 prescription), the 10-year average annual catch of the East Fish Lift is greater than or equal to 50% of the comparable 10-year average catch of eels at the eel trapping facility at the West Fish Lift, design, install, and operate a permanent eel trapping facility at the location of the East Fish Lift, in accordance with a schedule agreed upon by the Maryland Department of the Environment (MDE) and the U.S. Fish and Wildlife Service (FWS), and approved by the Commission. The 10-year average must be based on comparable dates of operation, as the East Fish Lift eel temporary modifications will operate a shorter period than the eel trapping facility at the West Fish Lift. The licensee must maintain and operate the eel trapping facility at the West Fish Lift for the term of the new license, but is not required to maintain and operate more than two permanent eel traps (e.g., the eel trapping facility at the West Fish Lift and either an eel trapping facility at the location of the East Fish Lift or Octoraro Creek, or comparable facility required under the Muddy Run Project License (FERC No. 2355) at any time, unless otherwise directed by the Commission.*
>
> *Unless otherwise directed by the Commission, the licensee must not make any modifications, undertake any construction, or make any changes to the operation of any eel fishway without the agreement of the MDE and FWS and approval from the Commission.*

[3] Station 643 will operate through October 31 each year. Beginning November 1, water temperature readings will be taken manually at the CWECF.

> *The Commission reserves the right to require changes to any proposed modification. Modifications must not begin until the licensee is notified by the Commission that the modifications are approved. Upon Commission approval, the licensee must implement proposed modifications, including any changes required by the Commission.*

All activities addressed in this EPRP that occur in Maryland waters are subject to any permits, licenses, or authorizations that may be required by the State of Maryland. All activities addressed in this EPRP that occur in Pennsylvania waters are subject to any permits, licenses, or authorizations that may be required by the Commonwealth of Pennsylvania.

3.1 Description of Facilities

Per MRPSP FERC license requirements, Exelon currently operates two American Eel collection facilities, the CWECF on the west shore of the Susquehanna River near Conowingo Dam and the OECF on Octoraro Creek below the Pine Grove Dam in Chester County, Pennsylvania. In addition to these two collection facilities, Exelon will design, construct, and operate a temporary eel collection facility in the vicinity of the Conowingo EFL, the CEECF. Features of each collection facility are detailed below.

3.1.1 Conowingo West Eel Collection Facility

The CWECF is located on the right (west) bank of the Conowingo Dam tailrace (Figure 3.1.1-1). Beginning in 2005, US Fish and Wildlife Service (USFWS) began collecting eels near the base of the Conowingo Dam at various locations. Information from these initial studies assisted in directing restoration efforts in the Susquehanna watershed above Conowingo Dam. During 2005 and 2006 exploratory efforts were conducted to determine the best placement and design of a temporary trapping facility. In 2007, elvers were observed climbing up the riprap where water was spilling over from pumps operated to supply water for the West Fish Lift operations. Since 2008, eels have been trapped and transported near this area on the west side of the Conowingo Dam in some capacity. From 2008 through 2016, excess water from the West Fish Lift operations was used as attraction flow over riprap. Elvers that found this attraction flow would crawl up the riprap to the trap and they were then transported and stocked in tributaries to the Susquehanna River and the Susquehanna River mainstem. In 2013, the USFWS increased the number of holding tanks and water supply and drainpipe sizes to improve holding capability. From 2005 to 2016, annual eel captures ranged from 19 to 293,141, with a total of 839,120 eel captures during the entire 2005-2016 period. The current facility was constructed in 2017 per USFWS design criteria and consists of four main elements: (1) a water supply line; (2) a ramp; (3) a collection tank; and (4) multiple holding tanks.

3.1.2 Octoraro Creek Eel Collection Facility[4]

The OECF is located on the left bank of Octoraro Creek immediately downstream of the CWA's Pine Grove Low-Head Dam (Figure 3.1.2-1). The facility was constructed in 2015 and consists of three main elements: (1) a water supply line and a submersible pump; (2) two ramps; and (3) a collection tank. Eels collected at the OECF are transported directly to, and held at, the CWECF at Conowingo Dam prior to transport upstream.

3.1.3 Conowingo East Eel Collection Facility

The CEECF will be located at the stilling basin dissipation wall within the EFL at Conowingo Dam, as called for in the MDE Settlement (2019) (Figure 3.1.1-1). The CEECF is an experimental facility that will operate for 10 years on a temporary basis to determine its suitability as a potential permanent location for the collection of eels. The location of the facility within the EFL was recommended by MDE to evaluate the feasibility of capturing eels on the easterly side of Conowingo Dam, as the American Eel Passage Plan

[4] Details governing the Octoraro Creek Eel Collection Facility are contained in the MRPSP American Eel Passage Plan.

contained in the MRPSP FERC license as well as the Conowingo FERC license, Appendix 1 precludes the construction of any American Eel collection facilities below the Conowingo spillway. The facility will consist of three main elements: (1) a water supply line; (2) a ramp; and (3) a collection tank. Eels collected at the CEECF will be transported directly to, and held at, the CWECF prior to transport upstream. This facility will be installed and put in service 12 months after modifications related to upstream American Shad and river herring passage at the EFL are completed. Operation of the facility will start each season ten (10) days following the end of the operation of the East Fish Lift.[5]

3.2 Trapping and Collection

3.2.1 Design

For the purposes of this plan, "trapping" includes the operation of a ramp-style trap and "collection" refers to operation of the collection tank where juvenile eels are temporarily held after ascending the ramp. All facilities are a flow-through system and no recirculation of any water is used except for attraction flow.

Conowingo West Eel Collection Facility

This facility was put in service on May 1, 2017 upon approval by FERC and the Muddy Run Eel Passage Advisory Group (EPAG)[6]. Under Conowingo License Article 414, the CWECF will operate through 2035. The CWECF contains one collection tank, which is 1.02 meter (m) wide with a length of 1.83 m. The depth of the water in the collection tank is about 686 millimeters (mm), with a volume of approximately 1,274 liters (L). With a maximum density of 10 eels per L, the collection tank can hold up to 12,740 eels at once. The collection tank has 203 mm of freeboard to keep eels from climbing out of the tank. The main flow into the collection tank is provided from the 51-mm fill line with the terminus of the pipe about 51 mm above the waterline providing a constant flow of freshwater to the tank. Also, some water from the spray bar flow also enters the collection tank from the backside of the ramp. The upper end of the ramp is custom fitted into the collection tank and ends about 102 mm above the high-water mark in the tank. The collection tank contains a drain comprised of a 102-mm diameter PVC pipe with holes drilled through it and wrapped in 1-mm mesh to prevent juvenile eel escapement. The 102-mm collection tank drain line contains a 25-mm gravity drain line with a ball valve that is directed to the highest point possible (gravity feed) of the ramp, thus providing eel scent from the eels in the collection tank to the ramp. The collection tank also contains a 76-mm drain line, positioned about 76 mm off the bottom. The drain line attaches to a gate valve that remains closed until eels are removed. The 76 and 102-mm flexible drain lines empty into the overflow tank. The collection tank was custom fitted with a lid made from 6-mm polycarbonate sheet. In addition to the in-line flow meter, the collection tank contains a water temperature and DO probe.

The juvenile eel ramp is constructed of an aluminum cable tray. The cable tray contains landscape fabric climbing substrate (Enkamat 7010) attached to the tray bottom. This substrate consists of a dense three-dimensional mesh of fused filaments, which provides a climbing surface for the juvenile eels. The ramp consists of an approximately 8.75 m long by 457 mm wide cable tray positioned at a 42.5° angle, plus a continuous length of tray that is bent and shaped at a 90° angle over a 25 mm radius at the top of the ramp to convey juvenile eels into the collection tank. The entrance of the ramp is at elevation 29 feet, which is above the normal high-water line (elevation ±21 feet), with a smooth transition to the existing rip-rap shoreline. The facility is designed so that eels ascend the riprap between the tailwater surface and the entrance of the ramp. This portion of the riprap is wetted from the attraction flow exiting the eel ramp and the overflow tank down to the tailwater level. Once eels ascend the rip-rap portion, they enter the eel ramp

[5] The East Fish Lift operation will operate until river temperatures rise above 72 degrees Fahrenheit for four consecutive days, but ending no earlier than June 1 and no later than June 15.

[6] EPAG is a requirement under the MRPSP License and is chaired by Exelon with membership consisting of representatives of Pennsylvania Department of Environmental Protection, Pennsylvania Fish and Boat Commission, USFWS, the Maryland Department of Natural Resources, and the SRBC.

and can ascend to the collection tank. The ramp is held in place by six metal braces, evenly spread across the length of the ramp, and attached to large substrate along the shoreline. The ramp is covered from the top down to near the entrance to protect juvenile eels when ascending. The large 60% shade cloth[7] is installed below the entrance to help protect juvenile eels between the tailrace and the entrance of the ramp.

The facility uses up to 265 L per minute of water to provide attraction flow to the eel ramp and for use within the collection tank. A 203-mm diameter gravity feed line supplies water for the CWECF. The water line forms a manifold at elevation 46 feet and contains four 51 mm globe valves for the Conowingo West Fish Lift and one 76 mm gate valve for the CWECF. The main water line for the CWECF is 76 mm in diameter, but each fill line for each tank is 51 mm in diameter. Each fill line has one 51 mm gate valve and one 51 mm angle valve along with an inline flow meter between these valves. A separate 25 mm line with a ball valve continuously discharges water down the ramp and into the collection tank via a spray bar, keeping the substrate moist and creating a flow to attract juvenile eels. Climbing ramp flow is augmented by a 25-mm diameter scent line from a tap and ball valve from the collection tank drain providing additional attraction flow via this gravity feed hose. The overflow tank collects the water from the collection tank and the holding tanks that are in service. Two 102-mm diameter additional attraction flow pipes drain the overflow tank and are discharged near the entrance of the ramp. These additional flow pipes are discharged above the shade cloth allowing the water to disperse over a larger area and provide additional attraction. All water from the ramp and the additional attraction pipes provides the overall attraction flow down the shoreline riprap to the tailrace. Engineering drawings for the facility are in Appendix A.

Octoraro Creek Eel Collection Facility

The OECF collection tank is 660 mm wide with a length of 1,575 mm. The depth of the water in the collection tank is about 299 mm, with a volume of approximately 310.4 L. With a maximum density of 10 eels per L, the collection tank can hold up to 3,104 eels at once. The collection tank has 209 mm of freeboard to keep eels from climbing out of the tank. The collection tank is filled by allowing some of the spray bar flow to enter the collection tank, thus providing a constant flow of freshwater to the tank. The collection tank contains two drains that are comprised of a 76-mm PVC pipe with holes drilled through it and wrapped in 1-mm mesh to prevent juvenile eels from escaping. The drain line is directed to the highest point possible (gravity feed) to the cover of the ramp to add the scent of the eels into the ramp. The upper end of the ramp is custom fitted into the collection tank and ends about 50 mm above the high-water mark in the tank. The collection tank is custom fitted with a lid that is held down by clamps.

Each ramp consists of approximately 12.34 m x 305 mm wide cable trays positioned at approximately a 30° angle, plus a continuous length of tray that was bent and shaped at a 90° angle over a 25 mm radius at the top to convey juvenile eels into the collection tank. The entrance of each ramp is located underwater, during all tailwater elevations, with a smooth transition to the existing riverbed adjacent to a quiescent pool located in the creek. Ramps are held in place by a scaffold structure located approximately mid-length and four T-shaped solid metal braces, evenly spread across the length of the ramp and driven into the ground beneath the ramps. Ramps are covered from the top down to near the tailwater median flow height to protect juvenile eels when ascending. One cable tray contains a landscape fabric climbing substrate (Enkamat 7010) attached to the tray bottom. The other cable tray contains Milieu small substrate, with staggered vertical tubes.

Water flow to the ramps is supplied from a one horsepower (hp) submersible pump that is installed in a 114-L barrel in the forebay above CWA's Pine Grove Low-Head Dam. The barrel contains about 50, 38 mm holes that are covered with 1 mm mesh screen to prevent any material from entering the pump, lines

[7] The percentage listed refers to the percentage of sunlight and corresponding UV rays that is blocked by the shade cloth.

and manifold that could cause clogging. The barrel is deployed in the forebay about 1.2 m below the water surface. The underground 51 mm water line is encased in 203-mm PVC, to protect the line. The 51 mm water line is attached to a 51 mm manifold with seven 25 mm ball valves that supply water to the spray bars and additional attraction flow lines. Water is continuously discharged down the ramp and into the collection tank via a spray bar, keeping the substrates moist and creating a flow to attract juvenile eels. Climbing ramp flow is augmented by additional attraction flow from the overflow of the collection tank via a gravity feed 25 mm scent line hose. Two additional 25 mm hoses are attached to the cover of each ramp near the water's edge to create splashing and additional attraction flow for the juvenile eels. The facility uses up to 265 L per minute of water to provide attraction flow to the eel ramp and for use within the collection tank. Each ramp has one spray bar and two attraction flow lines. Engineering drawings for the facility are in Appendix B.

Conowingo East Eel Collection Facility [8]

The temporary CEECF will be installed each year ten (10) days after the completion of the upstream anadromous fish migration season, beginning the first eel season after the completion of the modifications to the EFL under the FERC License, Appendix 1, Section 12.6.1[9], and will be located in the EFL stilling basin in the vicinity of the spillway.[10] The temporary CEECF will be operated for ten (10) years, beginning after the EFL modifications are completed. If, after 10 years of operating the CEECF, the 10-year average annual catch of the CEECF is greater than or equal to 50% of the comparable 10-year average catch of eels at the CWECF, Exelon will design, install, and operate a permanent eel trapping facility at the location of the CEECF, in accordance with a schedule agreed upon by MDE and USFWS and approved by FERC. The 10-year average must be based on comparable dates of operation, as the CEECF will operate a shorter period than the CWECF. Exelon will maintain and operate the CWECF and either an eel trapping facility at the location of the CEECF or Octoraro Creek, or comparable facility required under the MRPSP FERC License at any time, unless otherwise directed by FERC. No modifications, construction, or other changes will be made to the operation of any eel fishway at the Conowingo Dam without the agreement of MDE and USFWS and approval of FERC.

The CEECF will contain one collection tank positioned on a platform, which is 660 mm wide with a length of 1,575 mm. The depth of the water in the collection tank is about 299 mm, with a volume of approximately 310.4 L. With a maximum density of 10 eels per L, the collection tank can hold up to 3,104 eels at once. The collection tank has 209 mm of freeboard to keep eels from climbing out of the tank. The collection tank is filled by a 25-mm fill line and also filled by allowing some of the spray bar flow to enter the collection tank, thus providing a constant flow of freshwater to the tank. The top end of the ramp is custom fitted into the collection tank and ends about 50 mm above the high-water mark in the tank. The 76-mm collection tank drain line contains a 25-mm gravity drain line with a ball valve that is directed to the highest

[8] The attached drawings for the temporary eel facility at the EFL are based upon the most current EFL designs and will be resubmitted to the Resource Agencies and FERC for approval, if there are any changes to the EFL designs resulting from FERC License Appendix 1, Section 12.6.1. The Fishway Operations and Maintenance Plan will also be updated to reflect any changes in flows, unit operation, or other aspects with respect to eel collection facilities at Conowingo.

[9] The construction schedule for the EFL modifications for river herring and American Shad has not been finalized. The CEECF will be installed after the EFL modifications are complete. Exelon will provide schedule updates at a minimum during the annual EPAG meetings and will also update this plan accordingly and submit it to the resource agencies for review and FERC for approval. Exelon also participates in monthly design-planning meetings with resource agencies, and schedule is discussed during these meetings.

[10] Due to safety concerns, no equipment will be placed in the spillway. This is confirmed in the MDE Settlement, Draft Article XX. Eel Passage, i, "…in no case, shall any temporary or permanent eel ramps be required to be constructed in the Conowingo Dam spillway area. Additionally, the MRPSP FERC License requirements also exclude the spillway as a potential location for an eel facility due to safety concerns.

point possible (gravity feed) of the ramp, thus providing eel scent from the eels in the collection tank to the ramp. The collection tank also contains a 76-mm drain line, positioned near the bottom of the collection tank. The drain line attaches to a knife valve that remains closed until eels are removed. The collection tank is custom fitted with a lid that is held down by clamps. The EFL gravity-feed water supply, which withdraws water from approximately elevation 100.7 feet from Conowingo Pond, will provide water for the attraction flow for the CEECF. (Attraction flow will be approximately 265 L-per-minute). Proper operation of the components will be ensured through daily inspections and recording of water temperature and DO levels and weekly calibration of the water supply systems.

The juvenile eel ramp is constructed of an aluminum cable tray. The cable tray contains landscape fabric climbing substrate (Enkamat 7010) attached to the tray bottom. This substrate consists of a dense three-dimensional mesh of fused filaments, which provides a climbing surface for the juvenile eels. The ramp consists of an approximately 5 m long by 457 mm wide cable tray positioned at a 30° angle, plus a continuous length of tray that is bent and shaped at a 90° angle over a 25 mm radius at the top of the ramp to convey juvenile eels into the collection tank. The base of the ramp is at approximately elevation 17.8 feet, which is above the minimum tailwater line of approximately 12.9 feet (elevation at a flow of 4,000 cfs), with a smooth transition to the existing concrete stilling basin/east fish lift area floor. The facility is designed so that eels ascend the concrete floor between the tailwater surface and the end of the ramp. This portion of the concrete is wetted from the attraction flow exiting the eel ramp down to the tailwater level. Once eels ascend the concrete portion, they enter the eel ramp and can ascend to the collection tank. The ramp is held in place by metal braces, evenly spread across the length of the ramp, and attached to the existing concrete structures. The ramp is covered with a metal plate from the top down to near the normal high-water line (elevation ±21 feet) to protect juvenile eels from avian predators when ascending. A large 60% shade cloth is installed below the entrance to help protect juvenile eels between the tailrace and the entrance of the ramp.

A gravity feed water line supplies at least 265 L per minute to the collection tank and ramp for eel attraction. A 51-mm diameter gravity feed line supplies water for the CEECF. The water line forms a manifold at elevation 48 feet and contains one 51-mm ball valve and two 25-mm ball valves for the CEECF (i.e., supply water to the spray bars and additional attraction flow lines). The main water line for the CEECF is 25 mm in diameter. The fill line has one 25-mm ball valve. A separate 25-mm line with a ball valve continuously discharges water down the ramp and into the collection tank via a spray bar, keeping the substrate moist and creating a flow to attract juvenile eels. Climbing ramp flow is augmented by additional attraction flow from the overflow of the collection tank via a gravity feed 25-mm scent line hose and 25 -mm ball valve. Two additional 25-mm hoses are attached to the cover of each ramp near the water's edge to create splashing and additional attraction flow for the juvenile eels. All water from the ramp and the additional attraction pipes provides the overall attraction flow down the concrete to the tailrace. Engineering drawings for the facility are in Appendix C and an annotated presentation of the drawings is included in Appendix D.

During the 10 years of operation, if the number of American Eels attempting to migrate to the CEECF exceeds 90,000 eels per day, which is the maximum capacity of American Eels per unit of ramp area[11], or if densities in the collection tank exceed 10 eels per L, the facility will be modified, or operational protocols adjusted to reduce crowding, in consultation with MDE, USFWS, and EPAG.

[11] The maximum capacity of American Eels per unit of ramp area is based on the USFWS Fish Passage Engineering Design Criteria (USFWS, 2019), which gives a guideline of 5,000 eels per day per inch of ramp width, assuming that the mean eels are a size of 150 mm, total length.

3.2.2 Construction

Both the CWECF and OECF are constructed and have been in operation since 2017 and 2015, respectively. Modifications to the EFL to improve passage of American shad and river herring will be constructed as required by the Conowingo License, Appendix 1. The CEECF will be constructed, to be operational within 12 months of completion of construction of the EFL American shad and river herring improvements.

3.2.3 Operational Protocols

All trapping and collection facilities will be operated in accordance with the schedule outlined in Section 5 and the following protocols.

The CEECF will be operated using the following gate position downstream of the facility inside the EFL[12].

- Downstream Weir Gate C: 100% open
- Downstream Weir Gate B: 0% open
- Upstream Weir Gate A: 0% open (to keep debris out of EFL)
- Diffuser Gate A: 100% open
- Diffuser Gate B: 100% open
- Crowder Area Gate: 100% open
- Crowder doors: fully open
- Crowder Screen Hoist: fully lowered (to keep debris out of hopper area)
- Crowder Dividing Screen: fully raised
- Crowder Channel Screen: fully raised
- Trash Rack A: fully raised
- Trash Rack B: raised a few feet (bottom of rack at full generation elevation)

Attraction flows for the CEECF will be from the gravity-fed water system from the headpond only. The Spillway Gates A and B along with the Spillway Trough Gate will be fully closed and locked out for safety measures prior to and during eel passage season at the CEECF.

The ramp will be removed when flows are forecast to exceed 113,000 cfs and will be reinstalled when flows have receded to a level that will allow for safe access.

Monitoring

At each facility, proper operation of the components will be ensured either through the continuous monitoring of water flow supplied to the ramp and collection tank with an alarm system triggered by low flows or low DO conditions that are not within design parameters (CWECF), or by daily inspections and continuous recording of water temperature and DO levels and weekly calibration of the water supply systems (OECF and CEECF). If an alarm at the CWECF is triggered by low DO or flow, an alarm sounds in the Station control room and a text message/email is sent to Exelon's contractor. If Exelon station personnel are unable to resolve the issue, the contractor will come to the site to troubleshoot and correct the issue. Daily Field Sheets are included in Appendix E. The collection tanks hold American Eel at densities not exceeding 10 elvers per L unless otherwise agreed to by Exelon, MDE, and the USFWS. If deemed necessary by MDE, USFWS, or FERC, Exelon will provide aeration to the collection tanks.

During any instance when alarms indicate or daily inspections suggest that attraction or ramp flow is not within design parameters and cannot be adjusted to operate within these parameters within 24 hours, it will

[12] This section will be updated if there are if there are any changes to the CEECF operation required by updated EFL designs per from Appendix 1 Section 12.6.1 of the Conowingo License. Any changes to operation protocols will be resubmitted to the Resource Agencies and FERC for approval.

be considered an emergency, and operators must follow the Emergency Response Protocols outlined in Section 3.6.

Verification and Testing

The main flow and spray bar flow will be independently measured once per week to verify that the flow meters are providing accurate measurements. If a flow meter provides measurements that differ from the design parameters the main flow meter will be re-calibrated or replaced.

Similarly, the temperature and DO meter will be tested once each week using an independent meter(s) to verify that they are accurate. The independent meter(s) will be calibrated according to manufacturer instructions and recommendations. If any continuous monitor provides measurements different than verification measurements, or outside the designed parameters, then it will be re-calibrated, repaired, or replaced.

The alarm systems monitoring flow rates will be tested once per week. Monitors will be tested against deliberate deviations from the design range to ensure that these deviations trigger the alarms. The Conowingo Control Room will be contacted prior to any testing of the alarms.

Inspection

The ramp, cover, substrate, attraction flow, spray bar, and ramp flow will be visually inspected daily to ensure proper operation. If any component is not functioning properly, corrections and/or repairs will be made as soon as practicable. Results of any inspection items that require further action will be recorded on a Daily Field Sheet (Appendix E).

If an inspection suggests that any structure or flow component is not performing properly and no alarm has been triggered, verification of this potential deviation will be performed as described above and corrective action will be taken as soon as possible. If equipment function cannot be immediately repaired, inspectors will refer to Inspection Response Protocols outlined in Section 3.6.

Maintenance

The collection tanks will be drained daily to ensure all eels have been removed. At least once per week, the collection tank(s) will be scrubbed. Scrubbing the tanks is performed with water, a brush, and scouring pad. No chemicals are used.

Debris that would block or hinder passage of eels that is observed on the ramp and substrate during visual inspections will be removed at the time of the inspection. If the debris cannot be removed upon inspection for any reason, it will be removed as soon as practicable thereafter.

At the end of each sampling season, and if determined to be necessary during the season, the ramp will be cleaned. During this cleaning process the substrate will be inspected for any degradation or damage. Sections of substrate will be replaced if necessary. Maintenance activities are recorded on a Daily Field Sheet (Appendix E).

American Eel Counting

Juvenile eels will be counted during each daily check upon removal from the collection tank. When small numbers of eels (fewer than 1,000) are observed in the collection tank, actual counts will be performed. Large quantities of eels will be counted volumetrically. Volumetric estimates will be performed by placing 200 mL of water in a graduated container and then placing anesthetized juvenile eels in the graduated container until it is filled to the 400 mL mark. These juvenile eels will be counted to determine the number of eels displaced by 200 mL of water. Four Ls of water will be added into a 20-L graduated bucket, the

remaining eels from the collection tank will be added to the 20-L bucket, and the resulting displacement of water will indicate the number of eels[13]. This process will be repeated until all juvenile eels have been removed from the collection tank. Length measurements, weight, and condition factor will be taken from a maximum of 25 eels on a bi-weekly basis. Eels will be measured to the nearest mm and weighed to the nearest 0.1 grams after being anesthetized.

All data collected will be recorded on the Daily Field Sheet (Appendix E). Any dead eels will be removed, enumerated, and recorded on the Daily Field Sheet. At the CWECF, the number of eels added to a given holding tank will be recorded, and at the other facilities, the number transferred to the holding tank(s) at the CWECF will be recorded.

3.3 Holding

For this plan, "holding" refers to the retention of eels in holding tanks after removal from the collection tank.

Conowingo West Eel Collection Facility

The only facility with holding capabilities other than in a collection tank is the CWECF. Eels from the OECF and CEECF are transported daily to the CWECF for holding. At the CWECF, there are three holding tanks positioned along a concrete pad. Juvenile eels captured in the collection tank(s) are counted and transferred to one of the three holding tanks. Eel that are transferred to holding tanks are recorded on the Daily Field Sheet (Appendix E).

3.3.1 Design

The CWECF contains three stainless steel holding tanks, with a total holding capacity of 51,660 juvenile eels at a maximum density of 10 eels per L of water. Each holding tank is 1.68 m wide and 1.68 m long. The depth of the water in each collection tank is 0.61 m, providing approximately 1,722 L of water in each tank. A freeboard of 203 mm is provided to prevent eels from climbing and escaping. The bottom of each holding tank is sloped to the center drain to help flush all water and eels from the tank. The top of the center drainpipe is fitted with a 457-mm square screen drain that has a height of 203 mm. The screen drain is constructed of 1-mm mesh to prevent eels from escaping and allows consistent water exchange. This screened box is attached to a 102-mm PVC pipe fitted into a 102-mm bulkhead fitting that is removed to drain the tank completely. The bulkhead fitting is attached to a 90° PVC fitting and attached to a 102-mm flexible hose by a cam fitting that drains into an overflow tank. The main flow into a holding tank is supplied by the 51-mm fill line with the terminus of the pipe about 51-mm above the waterline, providing a constant flow of freshwater to the tank.

An overflow tank holds the overflow water discharged from the holding tank system, where it is discharged to the bottom of the ramp to provide attraction flow and eel scent. The overflow tank is a 568-L tank containing three 76 mm bulkhead fittings. These bulkhead fittings are attached to 76-mm PVC solid wall pipe that is used to provide the additional attraction flow near the entrance of the ramp. The overflow tank is filled by the collection tank and all in-service holding tank drain lines. Prior to any tank being drained, a very fine mesh bag is hose clamped to the end of the drain hose to ensure that no eels are released into the overflow tank. The drain hose with the mesh bag attached is placed into the overflow, which acts as a water cushion for the eels being collected in the bag.

[13] For example, if 100 eels were counted in the displaced 200 mL graduated container, the resulting ratio would be 500 eels per L. If the displacement of water in the 20-L bucket is four L, then 2,000 eels are in the 20-L bucket.

3.3.2 Operational Protocols

The number of holding tanks operating at any time will be determined by the number of eels being held at the CWECF. The number of juvenile eels in each holding tank will not exceed 17,222 eels, which is 10 juvenile eels per L. Juvenile eels may be held in holding tanks for a maximum of seven days prior to transport unless conditions (water temperature above 28.0°C or air temperature above 32.0°C on consecutive days) warrant transports to be conducted on multiple days throughout the week. Specifically, EPAG agreed that transports should occur at least twice per week starting in mid-June and continue through September 15. Additionally, daily transports are also conducted pre-emptively as water temperatures near 28°C or eels become crowded in the holding tanks. The CWECF is maintained daily and decisions to transport are made in real-time based on eel condition, environmental conditions, and the number of eels in holding. A transport vehicle is left on-site to facilitate the ability to conduct transports as needed.

Monitoring

Proper operation of the holding facility will be ensured through the continuous monitoring of flow and water quality parameters, weekly verification of monitors, and daily inspections.

Water Exchange: The amount of water flowing into each operational holding tank will be monitored continuously. If measured flows are not within the design parameters flow (19 to 151 L per minute per tank in service), a sensor will trigger an alarm that will alert the Conowingo Control Room. Also, in the event of an alarm, an e-mail notification will be sent immediately to operational personnel. Contact lists are updated regularly and will be distributed to resource agencies, Station staff, and contractors each season.

Temperature: Water temperature in each operational holding tank will be monitored continuously. If measured temperature is not within the design parameters (10-35° C), a sensor will trigger an alarm that will alert the Conowingo Control Room. Also, in the event of an alarm, an e-mail notification will be sent immediately to operational personnel.

Dissolved Oxygen: Concentration of DO in each operational holding tank will be monitored continuously. If measured concentrations are not within the design parameters (5-20 ppm), a sensor will trigger an alarm that will alert the Conowingo Control Room. Also, in the event of an alarm, an e-mail notification will be sent immediately to operational personnel.

Verification and Testing

The flow into each holding tank will be measured once per week to verify that the flow meters are providing accurate flow measurements. If a flow meter provides measurements that differ from the design parameters, then the holding tank flow meter will be re-calibrated or replaced.

Similarly, the temperature and DO meters will be tested once each week using an independent meter(s) to verify that they are accurate. The independent meter(s) will be calibrated according to manufacturer instructions and recommendations. If any continuous monitor provides measurements different than verification measurements, or outside the designed parameters, then it will be re-calibrated, repaired, or replaced.

Alarm systems for holding tanks will be tested once per week. Monitors of flow, temperature, and DO will be tested against deliberate deviations from the design ranges to ensure that these deviations trigger the alarms. The Conowingo Control Room will be contacted prior to any testing of the alarms.

Inspection

The holding tanks in use will be inspected daily to ensure proper operation. Results of any inspection items that require further action will be recorded on a Daily Field Sheet. If the flow through the holding tanks,

water temperature, or DO is suspected of operating outside of design parameters, investigation of this suspected deviation will be performed via verification measuring, as described above, and, if found to be operating outside of design parameters, immediate action will be taken to find a solution. Upon a failed inspection, inspectors will refer to Failed Inspection protocols outlined in Section 3.6.

Maintenance

Every week, the holding tank(s) that were used will be scrubbed and air dried, and this cleaning will be recorded on the associated Daily Field Sheet. Eels will be removed from the holding tanks prior to scrubbing, and every effort will be made to coordinate cleaning with transport so that the tanks are cleaned after eels are removed for transport.

The holding tanks will be drained and cleaned at the end of the trapping season, after operations at the ramp have ceased and all juvenile eels have been transported.

American Eel Counting

During daily inspections of holding tanks, and immediately prior to transfer to transport tanks, any dead eels will be removed, enumerated, and recorded on the Daily Field Sheets.

3.4 Transport

For the purpose of this plan, "transport" refers to movement of eels from holding tanks to transport tanks and transport to the upstream stocking locations.

3.4.1 Design

Conowingo West Eel Collection Facility

When fewer than 150 eels are collected during a sampling event, transport will occur using aerated 19-L buckets with lids, containing the maximum amount of water to prevent sloshing, with no more than 50 eels in each bucket. When counts of juvenile eels are greater than 150 but less than 2,500 individuals, a small, enclosed transport tank (250 L) with supplemental oxygen capability will be used to transport eels to designated locations. When large loads (more than 2,500) of American Eels are transported, a custom-made transport truck and tank unit will be used to deliver eels efficiently and safely to designated stocking locations.

The transport truck is a non-CDL licensed, Department of Transportation truck with a 2,498-L two-chambered transport tank (1,249 L = 12,490 eels per compartment)[14] permanently centered on a flat bed. Each compartment contains a micro pore oxygen diffuser and an oxygen manifold connected to an oxygen bottle by a regulator. A monitor in the cab of the truck attached to a water quality probe that reads water temperature and DO concentration continuously is installed in each compartment. Each compartment has a 968-mm screen drain to release water prior to eels being released to check for any mortality. A 102-mm hose is connected to the 102-mm knife valve that is flush with the floor of the tank to ensure all eels and water are flushed from the tank. Engineering drawings for the transport facility are in Appendix F.

Octoraro Creek Eel Collection Facility

All juvenile eels that are captured at the OECF will be transported to the CWECF at Conowingo Dam daily where they will be held before subsequent transport and release at designated locations in the Susquehanna River watershed. When less than 150 eels are collected at the OECF during a sampling event, the eels will be transported in aerated 19-L buckets with lids that contain the maximum amount of water to prevent sloshing, with up to 50 eels in each bucket. When counts of juvenile eels are greater than 150 individuals,

[14] Transport tanks are designed to hold eels at densities less than 10 juvenile eels per liter.

a small, enclosed transport tank (250 L) filled completely to prevent sloshing and equipped with supplemental oxygen to maintain DO levels in the tank, will be used. When more eels are collected in a single day than the OECF collection tank or the transport tank can accommodate, multiple trips to transport eels from the OECF to the CWECF holding tanks are made.

Conowingo East Eel Collection Facility

All juvenile eels that are captured at the CEECF will be transported to the CWECF at Conowingo Dam daily where they will be held before subsequent transport and release at designated locations in the Susquehanna River watershed. Eels collected at the CEECF during a sampling event will be transported in aerated 19-L buckets with lids that contain the maximum amount of water to prevent sloshing, with no more than 50 eels in each bucket.

3.4.2 Operation Protocols

Monitoring

Transport of juvenile eels will occur at least once per week. Eels will be trucked to appropriate release locations on the same day of removal from holding. The frequency of transport will be increased if the capacity of the holding tanks is approached or if water temperatures are above 28°C. Specifically, EPAG agreed that transports should occur at least twice per week starting in mid-June and continue through September 15. Additionally, daily transports are also conducted pre-emptively as water temperatures near 28°C or eels become crowded in the holding tanks. Multiple daily transports could occur if holding capacity is expected to be exceeded at the CWECF. The number of juvenile eels placed in the transport tank(s) will not exceed 10 juvenile eels per L, and each transport tank will be equipped with supplemental oxygen for aeration. The tank will be fully enclosed during transport.

Temperature: Water temperature in the transport tank(s) will be monitored with the same meter used to monitor DO; the probe measures both parameters.

Dissolved Oxygen: A continuous supply of DO is provided with an oxygen bottle, regulator, and diffuser. Concentration of DO in the transport tank(s) will be monitored. If measured concentrations fall below 5 ppm, the transport crew will pull over at a safe location to quickly resolve the issue (adjust regulator pressure, hook up spare oxygen bottle, etc.).

Verification and Testing

Temperature and DO meters in the transport tanks will be tested once each week using an independent meter(s) to verify that they are accurate. The independent meter(s) will be calibrated according to manufacturer instructions and recommendations. If any continuous monitor provides measurements different than verification measurements, then it will be re-calibrated, repaired, or replaced.

Inspection

Prior to each trip, the transport truck and associated equipment will be inspected to confirm that all equipment is operating as intended. The initial inspection will be done before any eels are transferred to a transport tank. Any necessary adjustments will be made, and the tank will then be filled approximately three-quarters full, immediately prior to inspection and subsequent transfer of eels to the transport tank. All drains and tanks will be secured and examined for leaks. Water quality parameters will be recorded prior to eels being added to the tank. The supplemental oxygen system will be checked to verify that it is functioning properly. A final inspection will be conducted after the eels are transferred to the transport tank. The transport tank will be completely filled to prevent sloshing when driving. All drains and tanks will again be examined for leaks again and water quality parameters will be recorded.

Water quality data during transports will be recorded. The transport system must pass initial inspection before any eels are transferred to the transport tank and final inspection before transport begins. If the transport system does not pass inspection, it may not be used for transport until all issues are resolved and it passes a subsequent inspection. These data are recorded on the Transport Data Sheet located in Appendix E.

Maintenance

Upon return to the CWECF, the transport tank will be opened to the air until the next transport. Transport tanks will be cleaned weekly.

American Eel Counting

The number of eels transferred to the transport tank from holding tanks will be recorded on the Daily Field Sheets and will be recorded as the total number of live eels currently present in the holding tanks.

Transport mortality will be determined by visually inspecting the transport tanks prior to and after the eels are released. Additionally, release areas will be inspected prior to leaving the stocking site. The stocking location is monitored until the water returns to pre-stocking conditions (i.e. water and sediment have settled following stocking). Most eels will seek cover as soon as they are stocked. Eels that have died will be visible lying belly-up and motionless on the stream bottom. Dead eels are retrieved by the stocking crew when access allows. Any dead eels observed during transport and release will be considered transport mortality. Eel mortalities from collection, holding, and transport will be reported to MDE, USFWS, and EPAG in the final report.

3.5 Stocking

Proposed stocking locations are summarized on Table 3.5-1 and shown in Figure 3.5-1. Stocking locations will be finalized and the amount stocked at each location will be determined in consultation with MDE, USFWS, and EPAG by February 1 each year. Progress in stocking these locations will be reported to MDE and EPAG after each transport trip and will be summarized during the annual eel passage meeting, during which input will be received on future stocking locations.

In addition to these stocking locations, which are focused on stocking eels to areas upstream of the Conowingo Project in the Susquehanna River watershed, MDE, USFWS, and EPAG will consider requests for eels to support research or alternative stocking projects (Appendix G). All requests are subject to approval from Exelon, MDE, USFWS, and EPAG. Requests for research or alternate stocking projects within New York State are also subject to approval from the New York State Department of Conservation. No more than 20% of the average annual catch will be provided in a given year for research or alternate stocking projects and transport of eels will be provided by the entity requesting the eels.

Each year, prior to April 1, 60 juvenile eels will be sampled randomly from tributaries below Conowingo Dam and sent to the USFWS or another resource agency for wild fish health screening. Protocols for selecting, preserving, and handling these eels will be developed in consultation with the receiving entity. Results of the wild fish health screening will be shared with MDE, USFWS, and EPAG.

3.6 Emergency Response Protocols

The goal of the restoration program is to achieve a minimum annual survival rate of 95% for juvenile eel during collection and holding processes. If these survival rates are not met in a given year, Exelon will, in consultation with MDE, USFWS, and EPAG, review the reasons that the 95% survival rates were not achieved and, if necessary, develop modifications that will be implemented prior to the start of the eel passage program in the following year.

3.6.1 Alarms and Contacts

For emergency purposes, a contact list with multiple emergency contacts will be developed for the Conowingo Control Room. These individuals will be responsible for responding to and resolving emergency situations at the facilities if station personnel cannot resolve the problem. Alarm systems, where applicable by facility, for flows, and DO in the collection and holding facilities, will be linked to the Conowingo Control Room for immediate alarm notification. Also, in the event of an alarm, an e-mail notification or text message will be sent to operational personnel five minutes after the Control Room has been notified. The operational personnel will contact the Conowingo Control Room and determine the appropriate action to be taken to correct the problem.

3.6.2 Inspection Response Protocols

As indicated in the previous sections, routine inspections will be performed at the facilities. Equipment that is not functioning as intended will be repaired or corrected immediately, if possible. If a facility is not functioning as intended and there is the potential for increased eel mortality (e.g., low flow to collection or holding tanks, high ambient river water temperatures, low DO concentrations), all eels in the facility will be transported to the next scheduled stocking location as soon as possible and, if necessary, the facility temporarily shut down until the issue is resolved. If there is no potential for increased eel mortality (e.g., attraction flow is not operating within design parameters), then it may not be required to temporarily shut down or immediately transport eels.

If an initial inspection determines that a transport tank or associated equipment are not functioning as intended prior to having eels transferred to it, no eels will be transferred to it until repairs have been completed and the equipment has been tested for proper function. If eels are transferred to a transport tank that then fails the final inspection, all eels must be transferred back to a holding tank unless the cause of failure can be addressed immediately, or to another transport tank if one is immediately available that has already passed initial inspection. Inspection forms are included in Appendix E.

3.7 Quality Assurance and Quality Control

As detailed in previous sections, important parameters associated with trapping, collecting, holding, transport, release, and stocking will be recorded to assure and control the quality of various program elements. The collection of these data will assure that the program will be conducted according to design parameters, will adhere to sound scientific principles, and will allow for any necessary adjustments. The results of these quality assurance and quality control measures will be included in annual reports to MDE, USFWS, and EPAG.

Various alarms and inspections, along with regular and seasonal maintenance, will ensure that the facilities are operating properly. All staff responsible for operating and maintaining trapping, holding, and transport components of the facilities will be trained and familiar with the specifications and operational parameters of applicable facilities/components. Supervising biologists will be responsible for training new staff members. Additionally, all operating personnel will be required to read and understand the Conowingo Fishway Operation and Maintenance Plan, as well as this Plan. Pertinent equipment and parts that are critical to operation of the facilities will be obtained and securely stored, to reduce the probability and extent of potential eel passage facility shutdowns.

Table 3.5-1: Stocking Locations for Juvenile Eel in the Susquehanna River Watershed

Site Number	Location	Water Body	County	Driving Distance (Miles)	Minimum Transport Time (hr:min)[15]
1	Conowingo Pool	Susquehanna River	Lancaster	< 20	< 0:30
2	Between Holtwood and Safe Harbor	Susquehanna River	Lancaster/York	25	0:40
3	Between Safe Harbor and York Haven Dam	Susquehanna River	Lancaster	36	0:55
4	Upstream of York Haven Dam	Susquehanna River	Dauphin	55	1:20
5	West Fairview Access (Route 11/15)	Susquehanna River	Cumberland	72	1:30
6	Fort Hunter Access	Susquehanna River	Dauphin	75	1:30
7	Shikellamy State Park	Susquehanna River	Northumberland	125	2:25
8	Route 487 Bloomsburg	N. Br. Susquehanna River	Columbia	130	2:40
9	Route 29 Bridge (Wilkes Barre) Nesbitt Park, (Kingston)	N. Br. Susquehanna River	Luzerne	142	2:50
10	Upstream of Hepburn Street Dam (Williamsport)	W. Br. Susquehanna River	Lycoming	155	3:00
11	Upstream of Grant Street Dam	W. Br. Susquehanna River	Clinton	180	3:10
12	City Island	Susquehanna River	Dauphin	70	1:30

[15] Actual transport times may be longer, due to slower driving with a loaded vehicle and multiple stocking locations per trip.

EXELON GENERATION COMPANY, LLC
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PROJECT NO. 405
Eel Passage and Restoration Plan

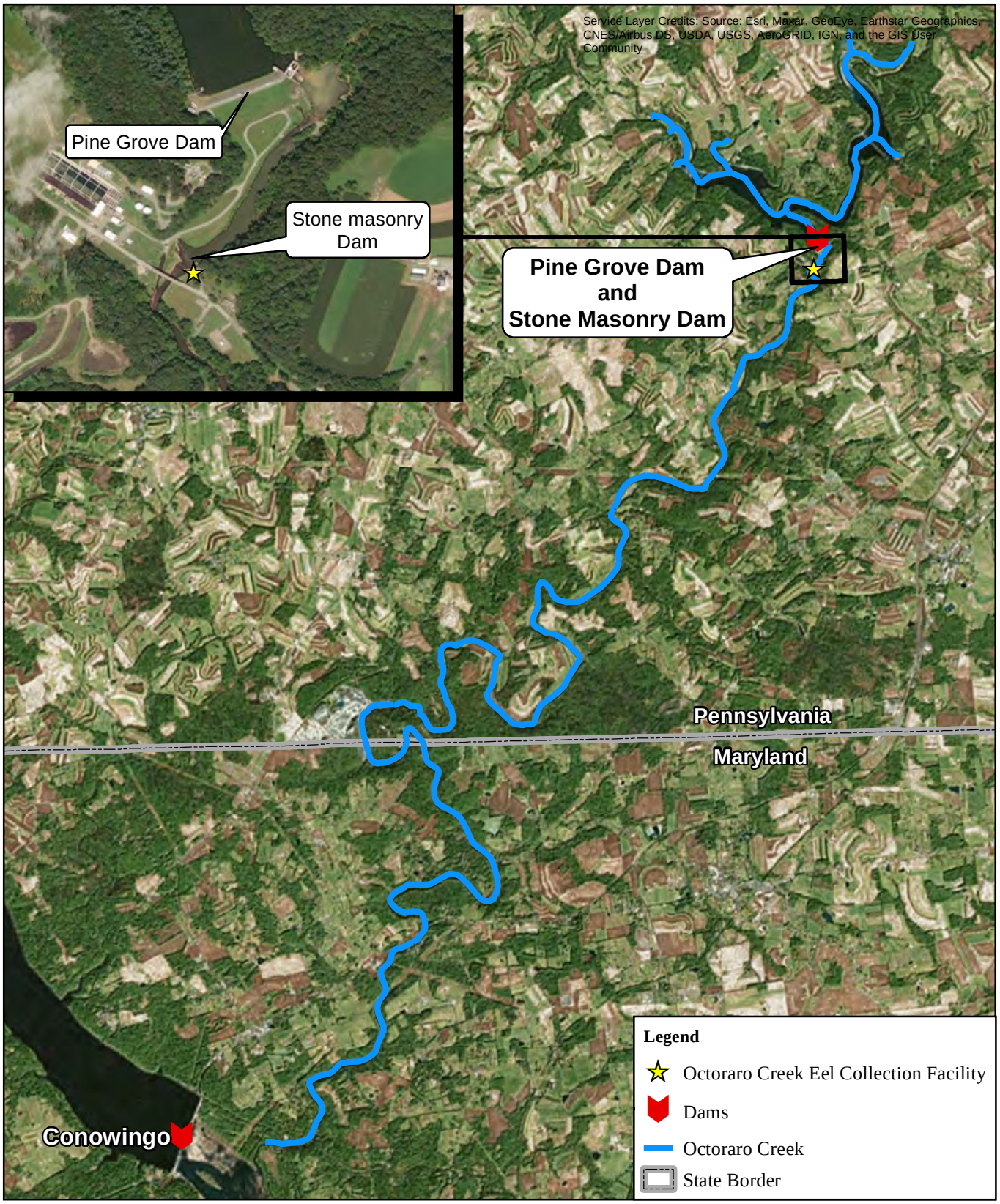
N

0 250 500 1,000 Feet

1 inch = 500 feet

Figure 3.1.1-1:
Locations of Conowingo West Eel Collection and Holding Facility and Conowingo East Eel Collection Facility

Path: X:\GISMaps\project_maps\eel_passage_and_restoration\figure_3_1_1-1_eel_collection_facilities.mxd



EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405
Eel Passage and Restoration Plan

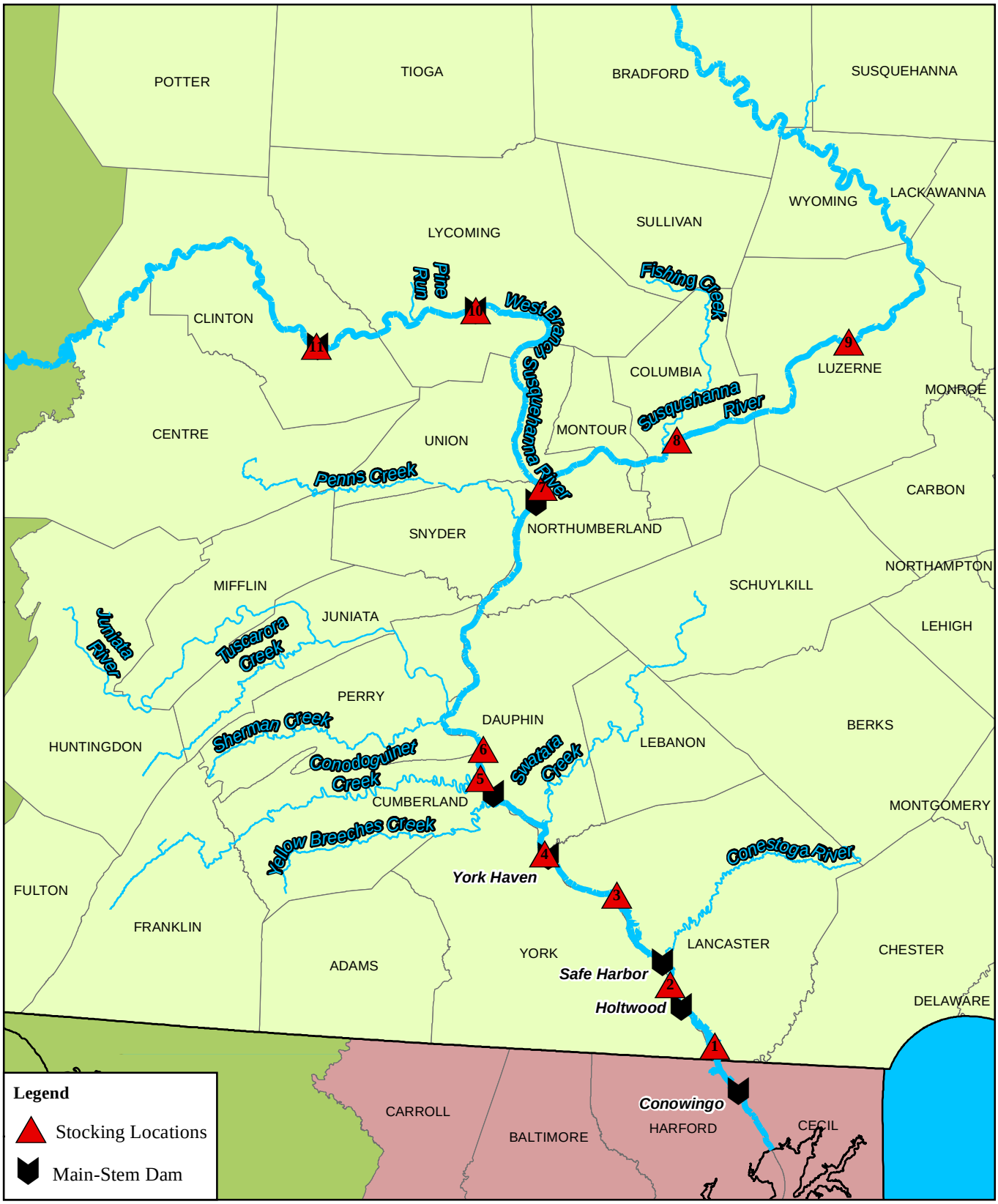
N

0 0.75 1.5 3 Miles

1 inch = 1.5 miles

Figure 3.1.2-1:
Location of Octoraro Creek Eel Collection Facility

Path: X:\GISMaps\project_maps\eel_passage_and_restoration\figure_3_1_2-1_octoraro_eel_facility.mxd



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PROJECT NO. 405
Eel Passage and Restoration Plan

N

0 10 20 40 Miles
1 inch = 20 miles

Figure 3.5-1:
Stocking Locations for Eel in the Susquehanna River Watershed

Path: X:\GISMaps\project_maps\eel_passage_and_restoration\figure_3_5-1_stocking_locations.mxd

4 IMPLEMENTATION SCHEDULE

This Eel Passage and Restoration Plan will be implemented following FERC approval. The CWECF operated has operated since 2017. It is anticipated that this plan will be approved prior to the 2022 eel passage season. and the CWECF will begin operation per this plan on May 1, 2022.

Preliminary drawings for the CEECF have been developed (Appendix C). Design, including all reviews, will be further developed as the EFL modification designs are completed and approved. Permitting and other consultations will begin when the design is at least 60% finalized. Installation and operation of the temporary eel collection tank and eel ramp will occur no later than twelve (12) months following the completion of the EFL modifications.

5 ANNUAL SCHEDULES AND DURATION OF OPERATIONS

Each facility will operate annually in accordance with the schedule outlined below. During periods of operation, the facilities will each be operated 24 hours per day, seven days per week.

Facility	Start	End*
CWECF	May 1	Mean Daily Water Temperature < 10°C for three (3) consecutive days in the fall
CEECF	No more than ten (10) days after ceasing EFL shad passage operations	Mean Daily Water Temperature < 10°C for three (3) consecutive days in the fall
OECF	May 1	September 15

*Water temperatures will be monitored hourly at Station 643, approximately 0.6 miles downstream of Conowingo Dam, or by manual readings taken at an alternative location within the Project tailrace unless MDE, USFWS, EPAG, and FERC require a different location.

The operational schedule of the facilities may also be temporarily modified due to extreme hydrological conditions, as defined below, or by agreement between Exelon, MDE, USFWS, and EPAG. "Extreme Hydrologic Conditions" means the occurrence of events beyond Exelon's control that may potentially damage the facility(s) such as, but not limited to, abnormal precipitation, extreme runoff, flood conditions, or other hydrologic conditions such that the operation of the eel facilities is impractical or is inconsistent with the safe operation of the Project.

The trap and transport program will continue through the year 2035 at the Conowingo Project, at a minimum, prior to development of volitional passage structures. However, trapping operations at these specific facilities could change. Exelon is required to maintain and operate the CWECF for the term of the new license but is not required to maintain and operate more than two permanent eel traps (this includes the CWECF and either the CEECF or OECF (or comparable facility required under the MRPSP License) at any time and, in no case, shall any temporary or permanent eel ramps be required to be constructed in the Conowingo Dam spillway area. The OECF is required to be run through 2030 consistent with the MRPSP FERC License.

6 REPORTING AND MEETINGS

6.1.1 Daily Operation Summaries

Throughout the collection facilities' operational season, Exelon will email daily summaries of American Eel collection, holding, transport, and stocking to representatives from MDE, USFWS, and EPAG and any other interested resource agencies. Daily reports will include:

- The estimated number of juvenile eel captured (i.e., number of eels in collection tank).
- The estimated number of eels in the holding tanks.
- The number of eels transported or moved.
- The disposition (location and status) of any transported eels, and
- The count of any mortalities encountered at the CWECF and during transport.

6.1.2 Annual Reports

Due to different season requirements and different reporting requirements between the Conowingo and Muddy Run License requirements, annual reports will include, but not be limited to, the following information:

- The estimated number of juvenile eel captured each day (i.e., number of eels in collection tank).
- The estimated number of eels in the holding tanks.
- The number and dates of eels transported to each stocking location or moved.
- The number of mortalities observed during collection, holding, and transport.
- Statistics (average, maximum, minimum) showing operational parameters for the main components (i.e., flows, temperatures, DO concentrations).
- A description of any significant problem encountered with the trapping, collecting, and holding systems including results of weekly verification efforts and any repair/maintenance actions taken.

Draft annual reports will be submitted to MDE, USFWS, and EPAG by December 1 each year. The draft reports will detail eel collection, holding, and transport from May 1 through September 15 of each year. For the CWECF and the CEECF, eel collection, holding, and transport counts from September 16 through the close of the season will be added to this report as an addendum, and a draft updated report will be submitted to MDE, USFWS, and EPAG for review and comment by December 31[16]. Following review by MDE, USFWS, and EPAG, the final OECF report will be submitted to MDE, USFWS, and EPAG as well as filed with FERC by January 15 of the following year. The final CWECF and CEECF reports will be submitted to MDE, USFWS, and EPAG as well as filed with FERC by February 15 of the following year.

Report	Draft Report Submission Date	Final Report Filing Date
CWECF and CEECF annual reports (May 1 to Sept 15 period)	December 1	February 15
CWECF and the CEECF annual report addendum (Sept 16 to end of season period)	December 31	February 15
OECF annual report (May 1 to Sept 15 period)	December 1	January 15
Fishway Operation and Maintenance Plan annual report	---	December 31

[16] The Fishway Operation and Maintenance Plan annual report will be filed on December 31 and will include daily counts of American eel collected at each facility.

6.1.3 Teleconferences and Remote Meetings

Monthly remote meetings with MDE, USFWS, and EPAG will include discussions of each operating eel passage facility, and also be used to administer implementation of this EPRP.

6.1.4 Meetings

Exelon will meet with MDE, USFWS, and EPAG annually to discuss this EPRP. This meeting will occur no later than January 31 each year unless Exelon and MDE, USFWS, and EPAG agree on a different date. The purpose of the meeting will be to discuss the eel passage results from the previous year and discuss any modifications for the upcoming eel passage season.

7 VOLITIONAL UPSTREAM PASSAGE FOR AMERICAN EEL

License Article 414 requires Exelon to maintain the upstream eel passage trap and transport program for American Eels through 2035.[17] Exelon will work with the Resource Agencies to resolve the timing issues between the two licenses related to volitional and/or trap and transport of American eels.

[17] This date differs from the Offer of Settlement and Explanatory Statement between Exelon and the US Department of Interior (2016), which states, "The Licensee shall conduct trap and transport of American eels until 2030, and will implement volitional American eel passage starting in the 2031 season," and, "Consistent with the Eel Passage Plan established by the Muddy Run license, construction of the volitional passage facility will eliminate the Licensee's obligation to participate in the trap and transport program once the volitional upstream eel passage facility is operational. However, if the upstream eel trap and transport and periodic evaluation program continues beyond 2030, the Licensee will continue to provide access to the Conowingo eel collection facilities for as long as the program continues. The Licensee, however, shall bear no cost responsibility for the trap and transport and periodic evaluation program until 2046, at which time cost responsibility shall be shared among all participants in the program."

8 REFERENCES

Exelon Generation Company, LLC. (2016). *Conowingo Hydropower Project Settlement Agreement Between Exelon Generation Company, LLC and the United States Department of the Interior Fish & Wildlife Service.*

Exelon Generation Company, LLC and the Maryland Department of the Environment. (2019). *Joint Offer of Settlement and Explanatory Statement Of Exelon Generation Company, LLC and the Maryland Department of the Environment.*

Federal Energy Regulatory Commission. (2015). *Final Multi-Project Environmental Impact Statement For Hydropower Licenses.* Federal Energy Regulatory Commission, Office of Energy Projects, Division of Hydropower Licensing. Washington, DC: Federal Energy Regulatory Commission.

USFWS. (2019). *Fish Passage Engineering Design Criteria.* Fish and Aquatic Conservation, Fish Passage Engineering Ecological Services, Conservation Planning Assistance. Northeast Region: USFWS. Retrieved from https://www.fws.gov/northeast/fisheries/pdf/USFWS-R5-2019-Fish-Passage-Engineering-Design-Criteria-190622.pdf

APPENDIX A. CONOWINGO WEST EEL COLLECTION FACILITY DRAWINGS

PROJECT OWNER:

Exelon®
EXELON GENERATION COMPANY, LLC

CONOWINGO HYDROELECTRIC PROJECT FERC NO. 405

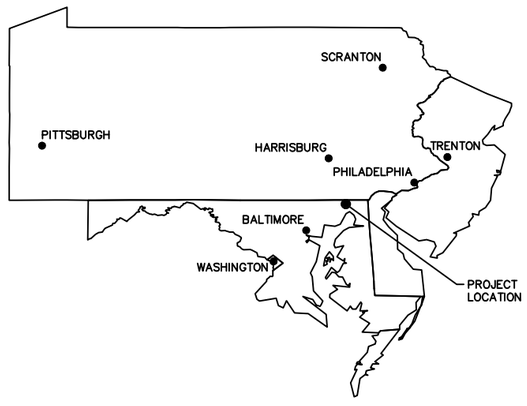
PROJECT TITLE:

CONOWINGO EEL PASSAGE

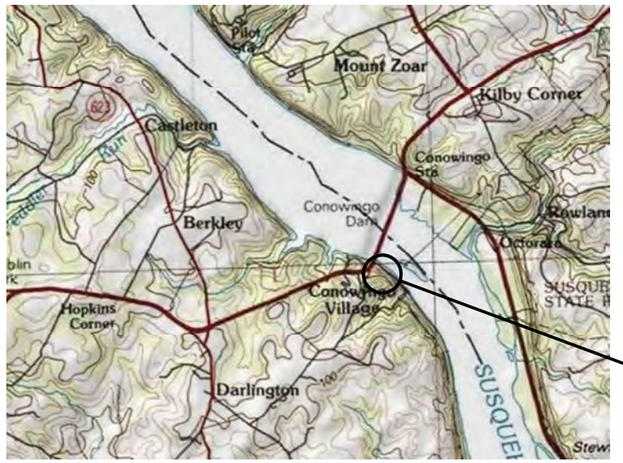
PROJECT ENGINEER:

GOMEZ AND SULLIVAN ENGINEERS

DRAWING INDEX	
DRAWING NO.	DRAWING TITLE
CS	COVER SHEET AND LOCATION PLAN
1	GENERAL NOTES
GP–1	SITE ACCESS PLAN
2	PROPOSED PIPE LAYOUT
3	EEL FACILITY PIPING CONFIGURATION
4	8" PIPELINE 3D PROFILE (INSIDE)
5	8" AND 3" PIPELINES 3D PROFILE (OUTSIDE)
6	EEL FACILITY PIPELINE 3D PROFILE
7	DETAILED PIPE LAYOUT PLANS, SHEET 1
8	DETAILED PIPE LAYOUT PLANS, SHEET 2
9	SECTIONS AND DETAILS
10	EXCAVATION AND CONCRETE ENCASEMENT PLAN
11	EXCAVATION, CONCRETE ENCASEMENT, AND ROAD SECTIONS
12	PIPE SUPPORTS
13	EEL FACILITY PLAN LAYOUT
14	TYPICAL TANK SECTIONS
15	HOLDING TANK PLAN AND SECTIONS
16	HOLDING TANK SECTIONS AND DETAILS
17	COLLECTION TANK PLAN AND SECTIONS
18	EEL RAMP SECTIONS AND DETAILS
19	EEL RAMP ELEVATION AND PIPE SUPPORT DETAILS
20	SITE AND SEDIMENT AND EROSION CONTROL PLAN AND DETAILS
21	MISCELLANEOUS DETAILS



1 CS LOCUS PLAN
NOT TO SCALE



2 CS LOCATION PLAN
NOT TO SCALE

DATE	#		BY	APP

DRAWN BY: ALR CHECKED BY: HNN APPROVED BY: DAG
GSE PROJECT NO.: 1714 DATE: 2/17/2017

Exelon®
EXELON GENERATION COMPANY, LLC

CONOWINGO EEL PASSAGE

GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
www.gomezandsullivan.com

COVER SHEET AND LOCATION PLAN

SCALE: AS NOTED DRAWING NO.: CS

STRUCTURAL DESIGN DATA NOTES

1. DESIGN REFERENCES
   AMERICAN SOCIETY OF CIVIL ENGINEERS 7-10
   UNITED STATES GEOLOGICAL SURVEY EARTHQUAKE HAZARDS PROGRAM 2014 MAPPING
   AMERICAN SOCIETY OF CIVIL ENGINEERS MANUAL 79
   AMERICAN IRON AND STEEL INSTITUTE WELDED STEEL PIPE
   AMERICAN WATER WORKS ASSOCIATION C208-12
   AMERICAN WATER WORKS ASSOCIATION M11
   AMERICAN SOCIETY OF MECHANICAL ENGINEERS B16.9
   AMERICAN SOCIETY OF MECHANICAL ENGINEERS PRESSURE VESSEL CODE
   US BUREAU OF RECLAMATION WELDED STEEL PENSTOCKS MONOGRAPH NO.3
   AMERICAN CONCRETE INSTITUTE 318
   AMERICAN WELDING SOCIETY D.1.1
   AMERICAN INSTITUTE OF STEEL CONSTRUCTION STEEL CODE
2. RISK CATEGORY: III
3. TERRAIN/EXPOSURE CATEGORY: D
4. DEAD LOAD
   UNIT WEIGHT OF CONCRETE: 150PCF
   UNIT WEIGHT OF STEEL: 490PCF
   UNIT WEIGHT OF WATER: 62.4PCF
5. WIND LOADS
   BASIC WIND SPEED (3 SECOND GUST): 120 MPH
   DIRECTIONALITY FACTOR (Kd): 0.95
   TOPOGRAPHIC FACTOR (Kzt): 1.0
   HEIGHT OF STRUCTURE: 0-15' ABOVE FIN. GRADE
   DESIGN WIND PRESSURE: 37 PSF
6. HYDROSTATIC
   NORMAL POOL: EL. 108.5
   MAX POOL (IDF): EL. 116.5
   WATER HAMMER: 140% STATIC HEAD
   STATIC HEAD: ±71.1 FT
   ASSUMED TRANSIENT/SURGE PRESSURE: 52 PSI
   DESIGN PRESSURE: 150 PSI
7. HYDRODYNAMIC
   TOTAL FLOW IN SYSTEM = 1400 GPM (3.08 CFS)
   DESIGN FLOW TO EEL FACILITY = 145 GPM (0.319 CFS)
   ADDITIONAL FLOW CAPACITY (FOR WEST FISH LIFT & FUTURE USE) = 1255 GPM (2.76 CFS)
8. THERMAL
   ΔTmax = 48° F (BETWEEN INSTALLATION AND EXTREME ANNUAL AIR/WATER TEMPERATURES)
9. DAM HAZARD CLASSIFICATION: HIGH

EROSION AND SEDIMENT CONTROL NOTES:

1. THE LIMIT OF DISTURBANCE SHALL BE CLEARLY DELINEATED IN THE FIELD PRIOR TO THE PRE-CONSTRUCTION MEETING AND ANY GRADING ACTIVITIES TO ENSURE COMPLIANCE WITH THE APPROVED PLAN.
2. THE APPROVED EROSION AND SEDIMENT CONTROL PLAN MUST BE KEPT AT THE PROJECT SITE.
3. THE SOIL CONSERVATION DISTRICT (SCD) RESERVES THE RIGHT TO MODIFY THE EROSION AND SEDIMENT CONTROL PLANS.
4. THE SCD MAY REVOKE THE APPROVAL OF THE EROSION AND SEDIMENT CONTROL PLAN IF WORK PERFORMED AT THE PROJECT SITE DOES NOT CONFORM TO THE PROVISIONS OF THE GRADING PERMIT, TO THE APPROVED PLAN OR TO ANY WRITTEN INSTRUCTIONS FROM MDE, COUNTY DPW OR THE SCD.
5. THE CONTRACTOR SHALL CONSTRUCT ALL EROSION AND SEDIMENT CONTROL MEASURES PER THE APPROVED PLAN AND CONSTRUCTION SEQUENCE AND SHALL HAVE THEM INSPECTED AND APPROVED BY THE SEDIMENT CONTROL INSPECTOR PRIOR TO BEGINNING ANY OTHER LAND DISTURBANCES.
6. THE CONTRACTOR SHALL ENSURE THAT ALL RUNOFF FROM DISTURBED AREAS IS DIRECTED TO THE SEDIMENT CONTROL DEVICES AND SHALL NOT REMOVE ANY EROSION OR SEDIMENT CONTROL MEASURE WITHOUT PRIOR PERMISSION FROM THE SEDIMENT CONTROL INSPECTOR.
7. THE FOLLOWING MINOR PLAN MODIFICATIONS MAY BE APPROVED BY THE SEDIMENT CONTROL INSPECTOR IN THE FIELD:
   A. SEDIMENT CONTROL STRUCTURES (EXCEPT BASINS AND TRAPS) MAY BE MOVED TO MEET THE EXISTING CONTOURS AND FIELD CONDITIONS, WHEN MOVING THESE STRUCTURES WOULD HAVE NO IMPACT ON THEIR FUNCTION OR DESIGN CRITERIA.
   B. SUBSTITUTION OF PERIMETER CONTROL MEASURES MAY BE MADE PROVIDED THE MEASURE SUBSTITUTED IS EQUIVALENT (I.E., SILT FENCE FOR STRAW BALES) OR IS AN UPGRADE OF THE ORIGINAL MEASURE (I.E., SILT FENCE TO A PERIMETER BERM WITH PROPERLY SIZED OUTLET).
   C. ADDITION AND EXTENSION OF PERIMETER CONTROLS (INCLUDING STONE CONSTRUCTION ENTRANCES) MAY BE MADE TO MEET FIELD CONDITIONS.
8. THE CONTRACTOR SHALL PROTECT ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS TO PREVENT THE DEPOSITION OF MATERIALS ONTO PUBLIC ROADS. ALL MATERIALS DEPOSITED ONTO PUBLIC ROADS SHALL BE REMOVED IMMEDIATELY.
9. ON-SITE TEMPORARY STOCKPILE AREAS MUST BE PLACED AS SHOWN ON THE APPROVED PLAN. IF THE CONSTRUCTION SCHEDULE IS TO EXCEED 3 DAYS, THE STOCKPILE AREAS MUST BE STABILIZED. STOCKPILE AREAS SHOULD NOT EXCEED FIFTEEN FEET IN HEIGHT. IF A STOCKPILE IS TO EXCEED FIFTEEN FEET IN HEIGHT, IT MUST BE SHOWN ON THE PLAN TO BE TERRACED WITH PIPE SLOPE DRAINS INSTALLED AND APPROVED BY SCD. UPON THE COMPLETION OF THE USE OF THE STOCKPILE AREA, EXISTING GROUND SURFACES SHALL BE RESTORED TO THEIR ORIGINAL CONDITIONS AND PERMANENTLY STABILIZED.

EROSION AND SEDIMENT CONTROL NOTES CONTINUED:

10. VARIOUS STEPS IN THE SEQUENCE OF CONSTRUCTION MAY REQUIRE THE CONTRACTOR TO REMOVE EXCESS EXCAVATED MATERIAL TO AN APPROVED LOCATION OR TO IMPORT MATERIAL FROM AN APPROVED LOCATION. FOR PURPOSES OF THIS PLAN, AN APPROVED LOCATION SHALL BE ONE WHICH IS OPERATING UNDER AN APPROVED EROSION AND SEDIMENT CONTROL PLAN AND AN ACTIVE GRADING PERMIT AT THE TIME OF CONSTRUCTION.
11. THE CONTRACTOR SHALL INSPECT DAILY AND MAINTAIN CONTINUOUSLY IN AN EFFECTIVE OPERATING CONDITION ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL SUCH TIME AS THEY ARE REMOVED WITH PRIOR PERMISSION FROM THE SEDIMENT CONTROL INSPECTOR.
12. FOLLOWING INITIAL SOIL DISTURBANCE OR RE-DISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN:
   A. THREE (3) CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES EQUAL TO OR GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1), AND
   B. SEVEN (7) DAYS AS TO ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.
   THE ABOVE REQUIREMENTS DO NOT APPLY TO THOSE AREAS WHICH ARE SHOWN ON THE PLAN AND ARE CURRENTLY BEING USED FOR MATERIAL STORAGE OR FOR THOSE AREAS ON WHICH ACTUAL CONSTRUCTION ACTIVITIES ARE CURRENTLY BEING PERFORMED OR TO INTERIOR AREAS OF A SURFACE MINE SITE WHERE THE STABILIZATION MATERIAL WOULD CONTAMINATE THE RECOVERABLE RESOURCE.
   MAINTENANCE SHALL BE PERFORMED AS NECESSARY TO ENSURE THAT THE STABILIZED AREAS CONTINUOUSLY MEET THE APPROPRIATE REQUIREMENTS OF THE MOST CURRENT MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.
13. SEDIMENT CONTROL PRACTICES WILL BE MAINTAINED UNTIL THE ENTIRE CONTRIBUTING AREA TO THE PRACTICE HAS BEEN PERMANENTLY STABILIZED AND MEETS THE SATISFACTION OF THE SEDIMENT CONTROL INSPECTOR. SEDIMENT CONTROLS MAY ONLY BE REMOVED WITH THE AUTHORIZATION OF THE SEDIMENT CONTROL INSPECTOR.
14. ALL AREAS DISTURBED BY THE REMOVAL OF SEDIMENT CONTROL DEVICES MUST BE IMMEDIATELY STABILIZED.
15. SURFACE DRAINAGE FLOWS OVER UNSTABILIZED CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER PREVENTING DRAINAGE FLOWS FROM TRAVERSING THE SLOPES OR BY INSTALLING PROTECTIVE DEVICES TO CONVEY THE WATER DOWNSLOPE WITHOUT CAUSING EROSION. DIKES SHALL BE INSTALLED AND MAINTAINED AT THE TOP OF CUT OR FILL SLOPES UNTIL THE SLOPE AND DRAINAGE AREA TO IT ARE FULLY STABILIZED, AT WHICH TIME THE DIKES MUST BE REMOVED AND FINAL GRADING DONE TO PROMOTE SHEET FLOW DRAINAGE. EROSION CONTROL MEASURES MUST BE IMPLEMENTED AT POINTS OF CONCENTRATED FLOW WHERE EROSION IS LIKELY TO OCCUR.
16. SEDIMENT REMOVED SHALL BE PLACED AND STABILIZED IN APPROVED AREAS, BUT NOT WITHIN A FLOODPLAIN, WETLAND OR FOREST RETENTION AREA. WHEN PUMPING SEDIMENT LADEN WATER, THE DISCHARGE MUST BE DIRECTED TO A SEDIMENT TRAPPING DEVICE PRIOR TO RELEASE FROM THE SITE.
17. FOR APPROVED DEWATERING STRATEGIES FOR TRAPS AND BASINS, SEE SECTION F OF THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL. PUMPING SEDIMENT LADEN WATER INTO THE WATERS OF THE STATE WITHOUT FILTRATION IS STRICTLY FORBIDDEN.
18. THE DEVELOPER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS PRIOR TO ANY CONSTRUCTION ACTIVITIES. FURTHER, THE ISSUANCE OF A GRADING PERMIT DOES NOT RELIEVE THE DEVELOPER OF THE RESPONSIBILITY TO OBTAIN ANY ADDITIONAL LOCAL, STATE OR FEDERAL PERMITS.

GENERAL NOTES:

1. THESE DRAWINGS DO NOT INCLUDE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION SAFETY AND FOR COMPLIANCE WITH ALL OSHA REGULATIONS DURING CONSTRUCTION.
2. CONTRACTOR SHALL DETERMINE LOCATION OF EXISTING UTILITIES BEFORE COMMENCING WORK. CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR DAMAGES WHICH MAY OCCUR BY FAILURE TO LOCATE AND PRESERVE EXISTING UTILITIES.
3. CONTRACTOR SHALL CONTACT THE LOCAL CALL BEFORE YOU DIG CENTER TWO FULL WORKING DAYS IN ADVANCE OF DIGGING. THE CONTACT NUMBER FOR MARYLAND IS 811.
4. THE LOCATIONS AND INFORMATION ABOUT UNDERGROUND PIPES, UTILITIES OR OTHER STRUCTURES ARE COMPILED FROM AVAILABLE RECORD DATA AND VISIBLE FIELD OBSERVATIONS AND ARE NOT REPRESENTED AS BEING EXACT OR COMPLETE.
5. THE CONTRACTOR SHALL RECORD TIE MEASUREMENTS, DEPTHS, DIMENSIONS, MATERIALS, FIELD CONDITIONS AND OTHER PERTINENT DATA ABOUT ALL UNDERGROUND PIPES, UTILITIES AND STRUCTURES ENCOUNTERED DURING THE WORK, BOTH EXISTING AND CONSTRUCTED. CONTRACTOR SHALL SUBMIT RECORD DRAWINGS WITH THIS INFORMATION TO THE CONSTRUCTION MANAGER WHO WILL SUBMIT TO THE ENGINEER, UPON COMPLETION OF THE WORK.
6. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PROTECT AND PREVENT DAMAGE TO ELECTRICAL AND MECHANICAL EQUIPMENT, CONTROLS, AND OTHER EXISTING STRUCTURES FROM CONSTRUCTION ACTIVITIES.
7. DIMENSIONS AND EXISTING CONDITIONS SHALL BE VERIFIED IN FIELD BY CONTRACTOR.
8. DO NOT SCALE DRAWINGS. CONTRACTOR SHALL NOTIFY CONSTRUCTION MANAGER WHO SHALL NOTIFY ENGINEER OF ANY DISCREPANCIES IN THE DRAWINGS.
9. DO NOT CHANGE SIZE OR SPACING OF STRUCTURAL ELEMENTS WITHOUT PRIOR APPROVAL FROM ENGINEER.
10. DETAILS SHOWN ARE TYPICAL; SIMILAR DETAILS APPLY TO SIMILAR CONDITIONS UNLESS OTHERWISE INDICATED.
11. THE CONTRACTOR SHALL PROVIDE AND DESIGN TEMPORARY BRACING/SHORING OF STRUCTURES AND EQUIPMENT DURING CONSTRUCTION AS REQUIRED UNTIL FINAL STRUCTURAL ELEMENTS NEEDED FOR STABILITY ARE INSTALLED..
12. CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER WHO SHALL NOTIFY THE ENGINEER IN WRITING OF PROPOSED DEVIATIONS OR SUBSTITUTIONS OF DIMENSIONS, MATERIALS, OR EQUIPMENT SHOWN ON THE DRAWINGS AND MAKE ONLY THOSE DEVIATIONS OR SUBSTITUTIONS ACCEPTED BY ENGINEER.
13. IF CONTRACTOR OBSERVES FIELD CONDITIONS WHICH VARY SIGNIFICANTLY FROM WHAT IS SHOWN ON THESE PLANS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER WHO SHALL NOTIFY THE ENGINEER FOR RESOLUTION OF THE CONFLICTING INFORMATION.
14. THE CONTRACTOR SHALL NOT BEGIN DEMOLITION UNTIL AFTER RECEIVING WRITTEN AUTHORIZATION FROM THE OWNER TO BEGIN DEMOLITION.
15. THE OWNER SHALL BE RESPONSIBLE FOR HAZARDOUS MATERIAL ABATEMENT AND PROTECTION OF WORKERS. MEASURES SHALL BE TAKEN, AS REQUIRED, PRIOR TO AND DURING CONSTRUCTION TO IDENTIFY, EVALUATE, AND REMOVE ANY ENCOUNTERED HAZARDOUS MATERIALS.
16. ALL ELECTRICAL WORK TO BE DESIGNED AND CONSTRUCTED BY OTHERS.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH THE OWNER AND OTHER CONTRACTORS (AS NECESSARY) FOR ISOLATION AND DRAINAGE OF THE EXISTING HEADER PIPE.
18. PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION, EXELON SHALL CONSULT AND COOPERATE WITH THE STATE HISTORIC PRESERVATION OFFICER (SHPO) TO DETERMINE THE NEED FOR, AND EXTENT OF ANY ARCHEOLOGICAL OR HISTORIC SURVEYS, AND MITIGATION MEASURES THAT MAY BE NECESSARY. IF ANY PREVIOUSLY UNRECORDED ARCHAEOLOGICAL OR HISTORIC SITES ARE DISCOVERED DURING THE COURSE OF CONSTRUCTION, CONSTRUCTION ACTIVITY IN THE VICINITY SHALL BE HALTED, AND A QUALIFIED ARCHEOLOGIST SHALL BE CONSULTED TO DETERMINE THE SIGNIFICANCE OF THE SITES.

SURVEY NOTES

1. EXISTING PROJECT DRAWINGS AND FIELD MEASUREMENTS WERE USED TO DEVELOP THIS DRAWING SET.
2. HORIZONTAL DATUM IS NAD83 MARYLAND STATE PLANE US FEET.
3. THE VERTICAL DATUM IS CONOWINGO DATUM (0.7 FEET LOWER THAN NGVD29 AND .14 FEET HIGHER THAN NAVD88).

GENERAL CONCRETE NOTES:

1. THE FOLLOWING STANDARDS SHALL BE USED
   - CONCRETE DESIGN STANDARD: ACI 318;
   - CONCRETE DETAILING STANDARD: ACI 315;
   - CONCRETE SPECIFICATION STANDARD: ACI 301;
   - CONCRETE FIELD REFERENCE MANUAL: ACI MNL-15
2. ALL CORNERS, INTERSECTIONS, AND ENDS IN CONCRETE STRUCTURES SHALL BE REINFORCED WITH ADDITIONAL BARS. REFER TO SECTIONS AND DETAILS ON SHEET 11.
3. REINFORCEMENT STEEL SHALL EXTEND THROUGH CONCRETE CONSTRUCTION JOINTS AT LEAST A FULL DEVELOPMENT LENGTH ON EITHER SIDE OF JOINT.
4. ALL REINFORCING STEEL SHALL CONFORM WITH ASTM A615, GRADE 60 UNLESS GRADE 75 IS SPECIFIED. ALL REINFORCING SHALL BE PLAIN DEFORMED BARS.
5. PROTECT CONCRETE FROM PREMATURE DRYING IMMEDIATELY AFTER PLACEMENT. CURING OF CONCRETE SHALL START WITHIN TWO HOURS AFTER FINISHING OPERATIONS ARE COMPLETE. REFER TO THE PROJECT SPECIFICATIONS FOR ADDITIONAL CURING, THERMAL, AND MOISTURE RETENTION REQUIREMENTS.
6. CONCRETE FINISHES SHALL BE AS REQUIRED BY ACI 301, UNLESS OTHERWISE NOTED. ALL CONCRETE REMAINING EXPOSED TO VIEW AT THE COMPLETION OF CONSTRUCTION SHALL RECEIVE A BROOM FINISH. THE FINISH SHALL BE INSTALLED IMMEDIATELY UPON FORM REMOVAL.
7. THE CONTRACTOR SHALL COORDINATE THE SIZE OF ALL OPENINGS, PENETRATIONS, JOINTS AND UTILITIES WITH THE OWNER. THE FINAL SIZE AND LOCATION OF ALL ITEMS AFFECTING THE CONCRETE WORK SHALL BE INDICATED ON THE CONCRETE REINFORCING DRAWINGS AT THE TIME OF SUBMISSION TO THE ENGINEER FOR REVIEW. IF ADDITIONAL OPENINGS ARE REQUIRED THAT ARE NOT SHOWN, CONTRACTOR SHALL IDENTIFY SUCH OPENINGS TO THE OWNER'S PROJECT MANAGER WHO SHALL NOTIFY THE ENGINEER.
8. ALL EXPOSED EDGES SHALL HAVE A 3/4" CHAMFER UNLESS OTHERWISE NOTED.
9. CONCRETE COVER SHALL BE AS FOLLOWS:

COVER	DESCRIPTION
3"	CONCRETE IN CONTACT WITH THE GROUND.
2"	CONCRETE GREATER THAN 12" THICK OR EXPOSED TO WEATHER.
*	CONCRETE LESS THAN OR EQUAL TO 12" THICK SHALL USE COVER REQUIREMENTS IN ACI 318.

10. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4500PSI AT 28 DAYS.

GENERAL EARTHWORK NOTES:

1. PLACE FOUNDATIONS ON COMPETENT BEDROCK OR ON A SUITABLE SUBGRADE UNLESS OTHERWISE APPROVED. IF PLACED ON BEDROCK, REMOVE ORGANICS, DEBRIS, AND LOOSE SOIL/ROCK AND PRESSURE WASH PRIOR TO PLACING CONCRETE. IF ON SOIL; OVER EXCAVATE ±1FT AND REPLACE WITH COMPACTED STRUCTURAL FILL.
2. NO BORINGS ARE AVAILABLE.
3. PROVIDE BACKFILL WITH POSITIVE DRAINAGE AWAY FROM STRUCTURES.

GENERAL STEEL NOTES:

1. STRUCTURAL STEEL:
   - STEEL PLATE, SHAPES, AND BARS - ASTM A36
   - STAINLESS STEEL PLATE AND SHAPES - ASTM A276, TYPE 304
   - STEEL PIPE - ASTM A106, GRADE B (Fy=35KSI, Fu=50KSI)
   - STEEL FITTINGS - ASTM A105 (Fy=36KSI, Fu=70KSI)
2. DESIGN, FABRICATION, AND ERECTION SHALL BE AS PER SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (AISC 360-10).
3. WHERE STEEL MEMBERS ARE WELDED AND NO SIZE IS SPECIFIED, PROVIDE FULL LENGTH FILLET WELDS BOTH SIDES OF MEMBER. WELD SIZES SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE:

MEMBER THICKNESS	WELD SIZE
3/16"	3/16"
1/4"	3/16"
5/16"	3/16"
3/8"	1/4"
7/16"	1/4"
1/2"	5/16"
9/16"	3/8"
5/8"	7/16"

4. SPLICING OF STRUCTURAL STEEL MEMBERS IS PROHIBITED WITHOUT PRIOR APPROVAL OF THE ENGINEER AS TO LOCATION AND TYPE OF SPLICE TO BE MADE. ANY MEMBER HAVING A SPLICE NOT SHOWN AND DETAILED ON SHOP DRAWINGS WILL BE REJECTED.
5. ALL WELDING SHALL CONFORM TO THE AMERICAN WELDING SOCIETY CODE. USE E70 SERIES ELECTRODES FOR ALL STRUCTURAL STEEL WELDS.
6. UNLESS OTHERWISE SPECIFIED, ALL STRUCTURAL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION, INCLUDING BOLTS, WASHERS, AND SHIMS.
7. ULTRASONIC INSPECTION OR OTHER APPROVED METHOD, BY THE TESTING LABORATORY SHALL BE PROVIDED FOR ALL WELDS CALLED FOR ON THE STRUCTURAL DRAWINGS OR SHOP DRAWINGS AS FULL PENETRATION OR COMPLETE JOINT PENETRATION WELDS.
8. ALL BOLTED CONNECTIONS SHALL CONFORM TO ASTM F3125, GRADE A325, UNLESS NOTED OTHERWISE.
9. REFER TO THE CONSTRUCTION SPECIFICATIONS FOR PIPE COATING REQUIREMENTS.
10. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL PRIOR TO STARTING FABRICATION

DATE	#		BY	APP

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GSE PROJECT NO.: 1714 DATE: 2/17/2017

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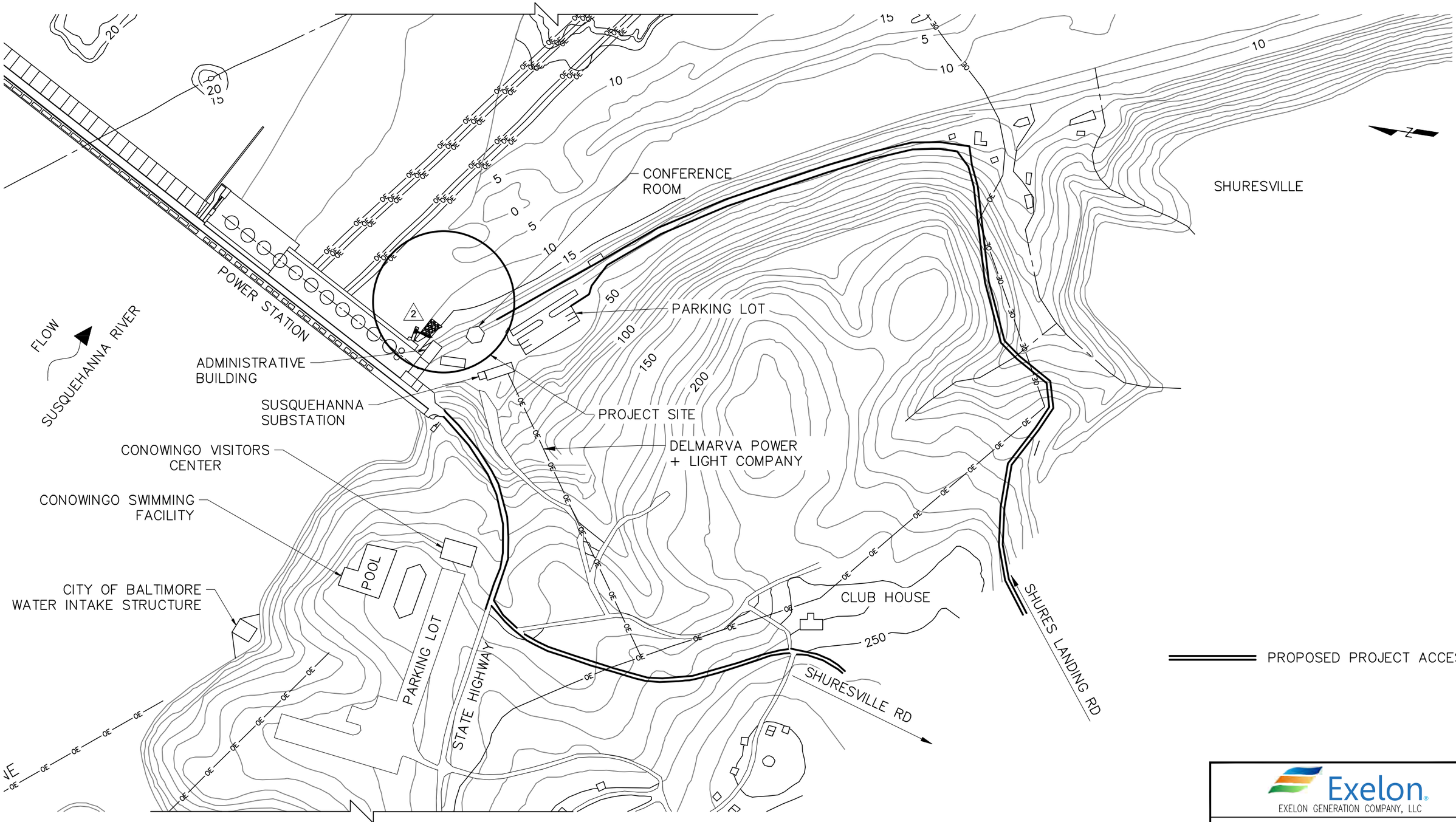
GENERAL NOTES

SCALE: AS NOTED DRAWING NO.: 1



2000' 0 2000' 4000'

SCALE: 1" = 2000'–0"

NOTE: THIS DRAWING REFERENCES CONOWINGO DATUM, IN CONTRAST TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29). CONOWINGO ELEVATIONS ARE 0.7 FT LOWER THAN NGVD 29 ELEVATIONS SUCH THAT 108.5 FT CONOWINGO DATUM EQUALS ELEVATION 109.2 FT NGVD 29. CONOWINGO DATUM IS 0.14 FT HIGHER THAN NAVD 88.

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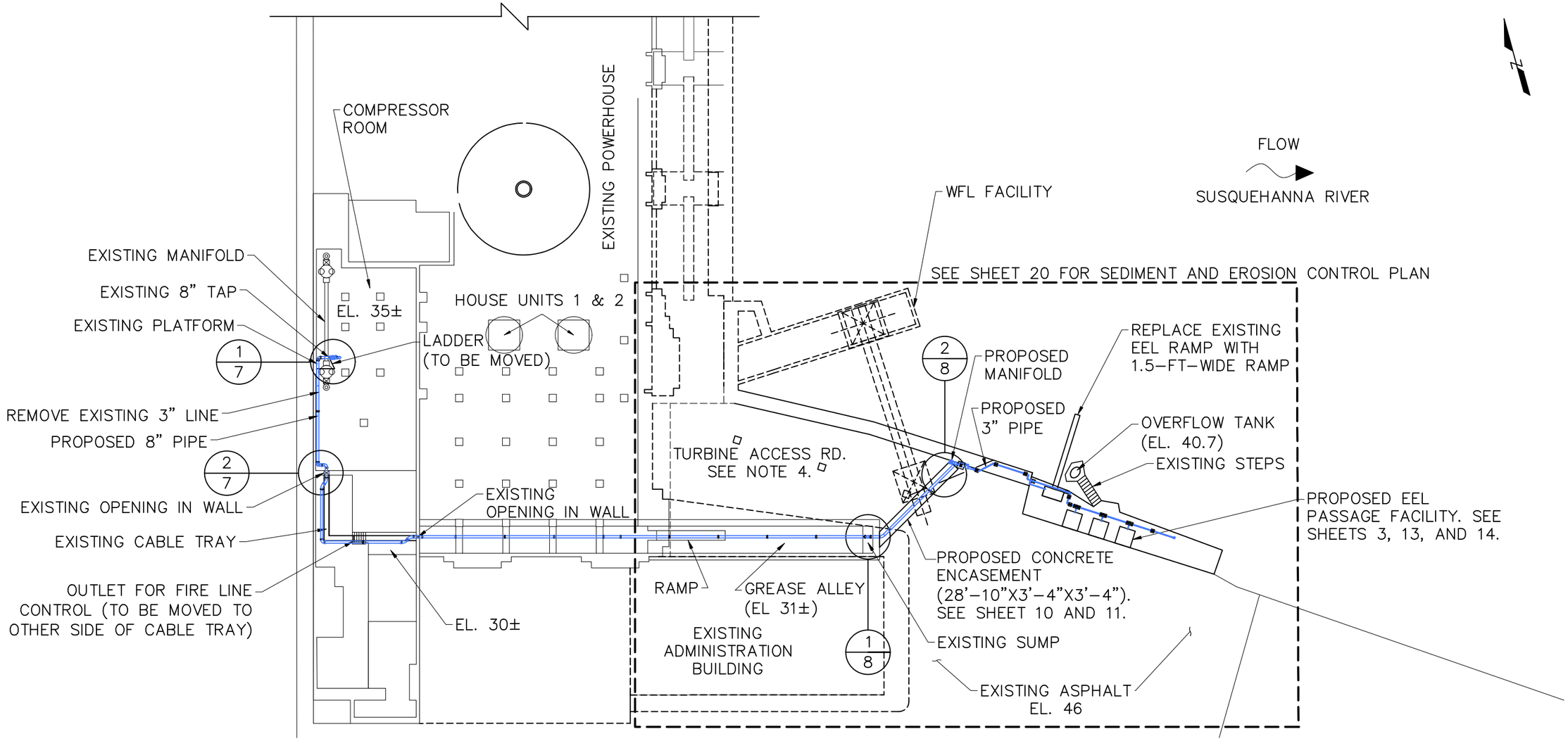
SITE ACCESS PLAN

SCALE: AS NOTED DRAWING NO.: GP–1



NOTES

1. ELEVATIONS SHOWN ARE CONOWINGO DAM DATUM (0.7 FEET LOWER THAN NGVD 29 AND 0.14 FEET HIGHER THAN NAVD88)
2. MAXIMUM SUPPORT SPACING SHALL BE 18 FEET FOR 8" PIPE AND 12 FEET FOR 3" PIPE. WHERE POSSIBLE THERE SHALL BE A SUPPORT AT EACH END OF AN ELBOW/BEND. ALL VERTICAL SUPPORTS SHALL BE SADDLE-SHAPED AND SHALL HAVE A MINIMUM CAPACITY OF 1500 LB. SEE SHEET 12 FOR TYPICAL SUPPORT DETAILS.
3. CONTRACTOR SHALL REMOVE EXISTING 3" PIPE THAT EXISTS ALONG THE ALIGNMENT OF THE PROPOSED 8" PIPE. AVOID OR MOVE OTHER PIPES UPON EXELON'S APPROVAL.
4. LOCATE AND PROTECT EXISTING BURIED DRAINS BENEATH TURBINE ACCESS ROAD (SEE EXISTING P.E. CO. DRAWING H-80531). RAILROAD TIES AND TRACKS MAY ALSO BE BURIED UNDER TURBINE ACCESS ROAD. IF ENCOUNTERED, AND PENDING SHPO CONSULTATION, THE RAILS AND TIES SHALL BE PRESERVED IN PLACE.

16' 0 16' 32'

SCALE: 1" = 16'-0"

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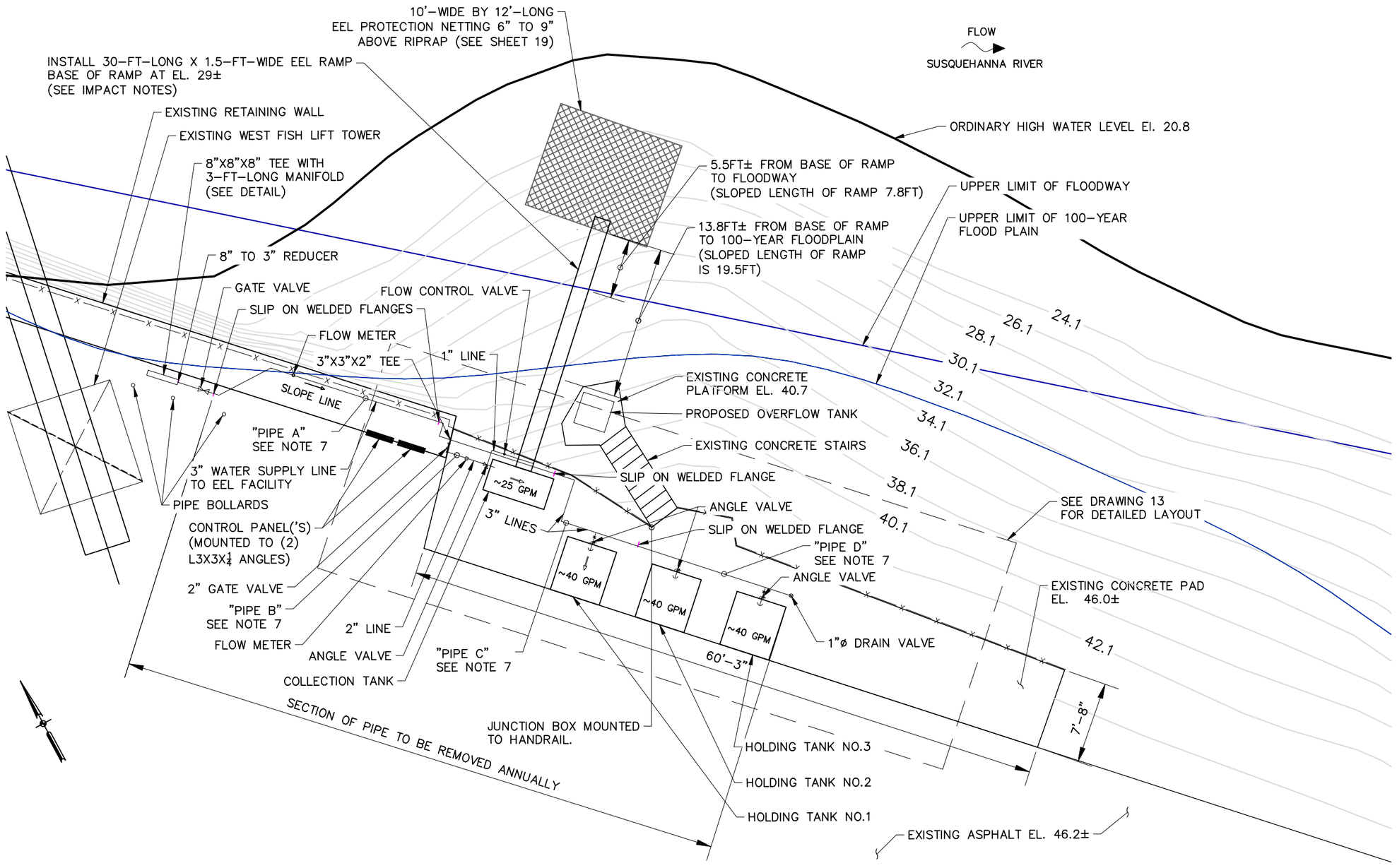
PROPOSED PIPE LAYOUT

SCALE: AS NOTED DRAWING NO.: 2



IMPACTS TO FLOODPLAIN

1. LINEAR FEET OF EEL RAMP WITHIN 100–YEAR FLOODPLAIN IS 13.8 FT.
2. AREA OF EEL RAMP WITHIN 100–YEAR FLOOD PLAIN IS 20.7 FT^2.
3. AREA OF EEL RAMP PIPE SUPPORT IS 2 FT^2.
4. AREA OF TWO FLEXIBLE DRAINAGE HOSES IS 9.2 FT^2.
5. AREA OF ANTI–PREDATOR NETTING IS 120 FT^2.

NOTES

1. ELEVATIONS SHOWN ARE IN CONOWINGO DATUM.
2. CONTOUR DATA WAS OBTAINED FROM THE HARFORD COUNTY GIS AND RECORDS MANAGEMENT. CONTOURS WERE DEVELOPED FROM LIDAR DATA COLLECTED ON 3/9/2013 AND 4/6/2013 WITH VERTICAL ACCURACY OF 0.223 FEET.
3. FLOODWAY AND 100–YEAR FLOODPLAIN LINES WERE OBTAINED FROM FEMA'S NATIONAL FLOOD HAZARD LAYER.
4. SEE DRAWING 6 FOR ADDITIONAL PIPING INFORMATION.
5. SEE DRAWING 13 FOR DETAILED LAYOUT.
6. SEE DRAWING 14 FOR TYPICAL TANK SECTIONS.
7. PIPES SHALL BE CLEARLY MARKED AND LABELED WITH 1" HIGH LETTERS.

5' 0 5' 10'

SCALE: 1" = 5'–0"

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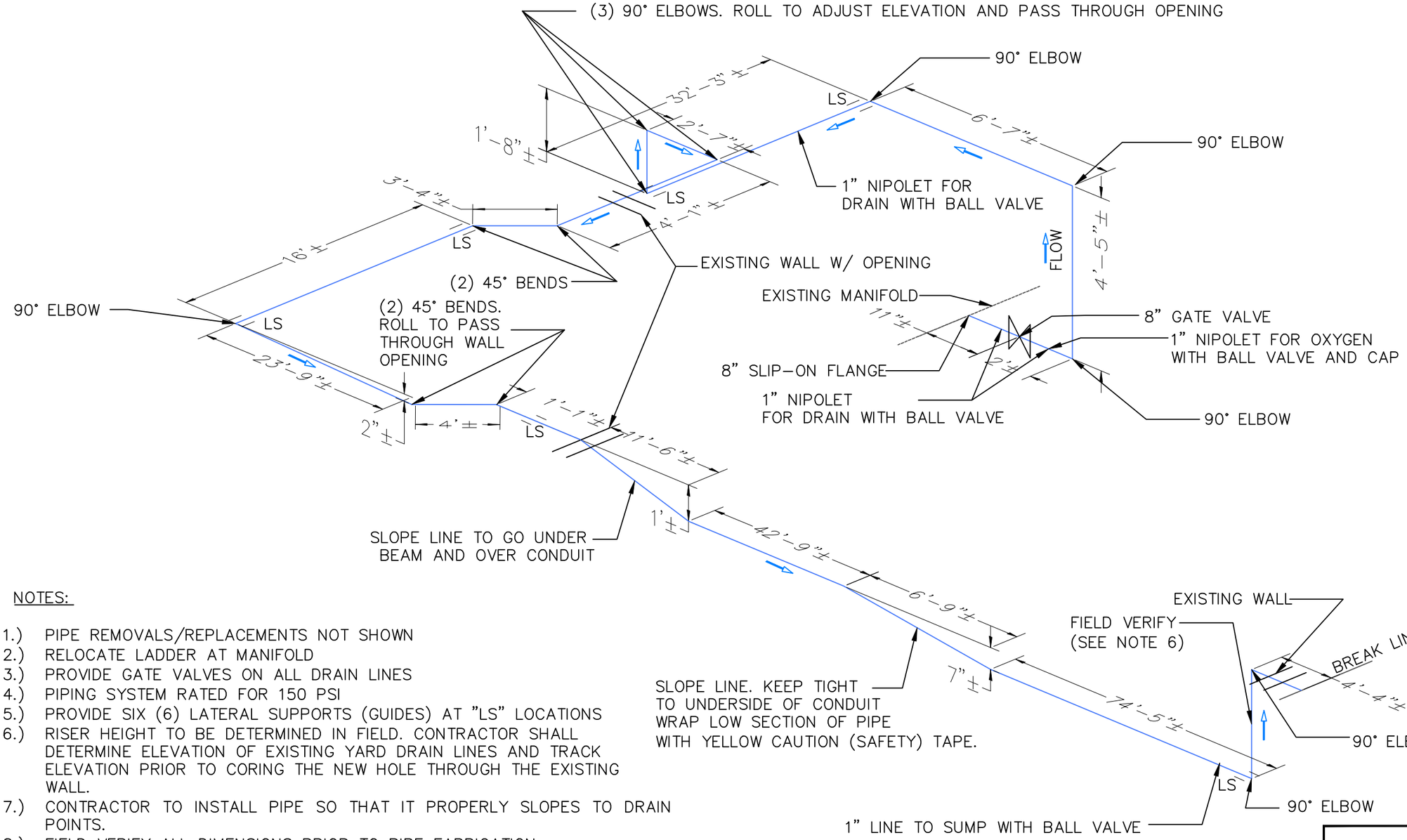
EEL FACILITY PIPING CONFIGURATION

SCALE: AS NOTED DRAWING NO.: 3



NOTES:

1.) PIPE REMOVALS/REPLACEMENTS NOT SHOWN
2.) RELOCATE LADDER AT MANIFOLD
3.) PROVIDE GATE VALVES ON ALL DRAIN LINES
4.) PIPING SYSTEM RATED FOR 150 PSI
5.) PROVIDE SIX (6) LATERAL SUPPORTS (GUIDES) AT "LS" LOCATIONS
6.) RISER HEIGHT TO BE DETERMINED IN FIELD. CONTRACTOR SHALL DETERMINE ELEVATION OF EXISTING YARD DRAIN LINES AND TRACK ELEVATION PRIOR TO CORING THE NEW HOLE THROUGH THE EXISTING WALL.
7.) CONTRACTOR TO INSTALL PIPE SO THAT IT PROPERLY SLOPES TO DRAIN POINTS.
8.) FIELD VERIFY ALL DIMENSIONS PRIOR TO PIPE FABRICATION.
9.) REFER TO NOTES 4 & 5 ON DRAWING 7 REGARDING ISOLATION OF THE PRESSURIZED MANIFOLD.

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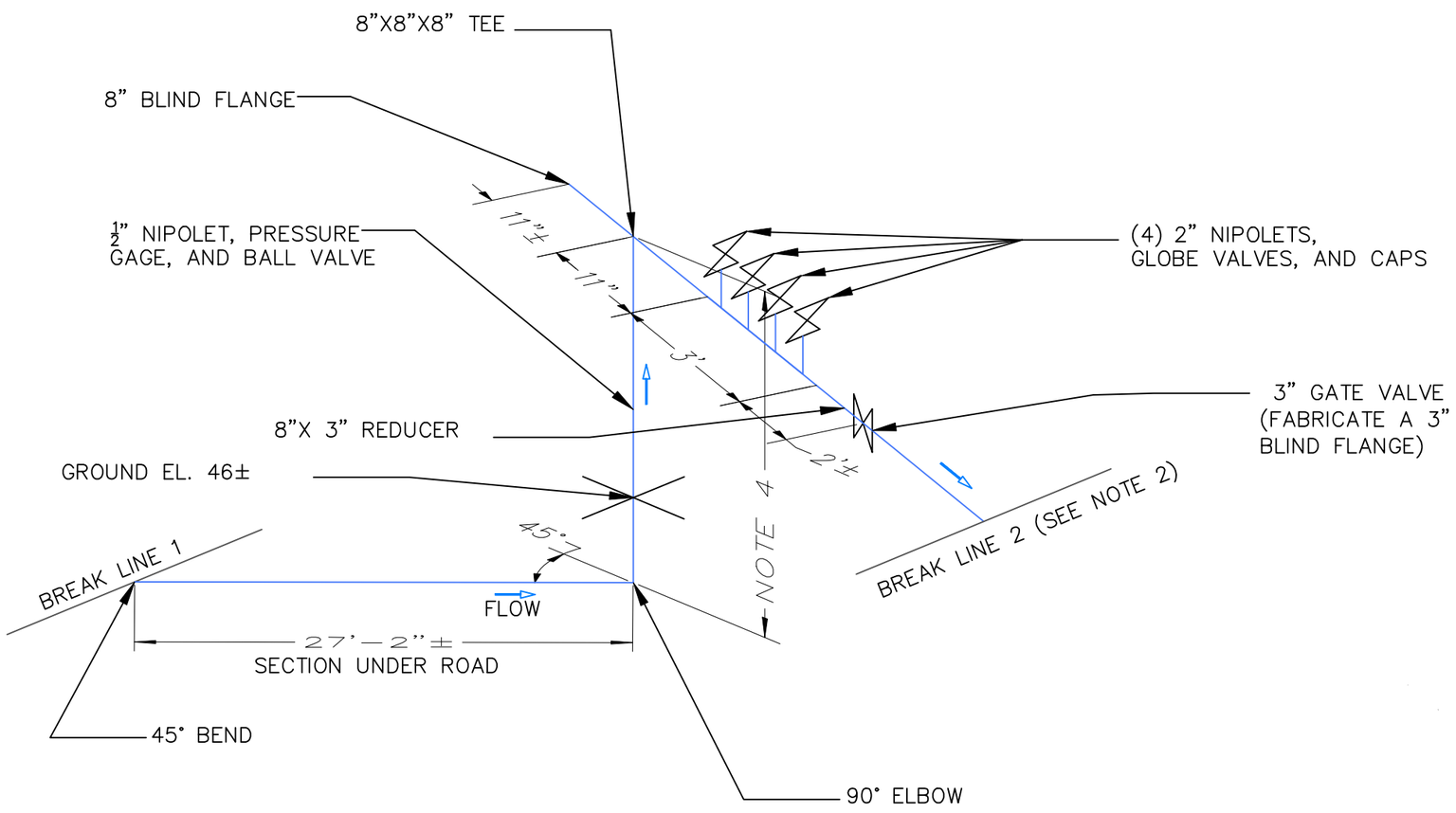
8" PIPELINE 3D PROFILE (INSIDE)

SCALE: AS NOTED DRAWING NO.: 4



NOTES:

1.) PIPING SYSTEM RATED FOR 150 PSI
2.) SEE ATTACHED SHEET 6 FOR CONTINUED PIPE PROFILE TO EEL PASSAGE STORAGE TANKS
3.) PIPING UNDER ROAD TO BE ENCASED IN CONCRETE.
4.) RISER HEIGHT TO BE DETERMINED IN FIELD. CONTRACTOR SHALL DETERMINE ELEVATION OF EXISTING YARD DRAIN LINES AND TRACK ELEVATION. CENTERLINE OF MANIFOLD SHALL BE AT ELEVATION 48±.
5.) 3-INCH SCHEDULE 40 STEEL CONDUIT (ELECTRICAL) TO BE INSTALLED ABOVE PIPE. SEE DRAWING 11.
6.) LENGTH OF PIPING IN BILL OF MATERIALS ASSUMES 10% CONTINGENCY. ALL LENGTHS OF PIPE TO BE FIELD VERIFIED PRIOR TO FABRICATION.
7.) BILL OF MATERIALS DOES NOT INCLUDE VALVES AND PIPING ATTACHED TO OR DOWNSTREAM OF THE EEL FACILITY TANKS. REFER TO SHEET 18 FOR EEL FACILITY SUPPLIES.

BILL OF MATERIALS

Piping

Item Description	Total Length
8-inch Schedule 40 Steel Pipe	±282 ft.
3-inch Schedule 40 Steel Pipe	±110 ft.
2-inch Schedule 40 PVC Pipe	±19 ft.
1-inch Schedule 40 Steel Pipe	±2 ft.

Valves

# of Item	Item Description
1	8-inch Steel Gate Valve
6	1-inch Steel Ball Valve
1	1/2-inch Steel Ball Valve
4	2-inch Steel Globe Valve
1	3-inch Steel Gate Valve
4	2-inch PVC Gate Valve
4	2-inch PVC Angle Valve

Fittings

# of Item	Item Description
3	8-inch Class D Slip-on Steel Flange
6	1-inch Steel Nipolet
6	1-inch Steel Threaded Cap
10	8-inch, 90-degree, Short Radius, Steel Elbow
5	8-inch, 45-degree Steel Bend
1	1/2-inch Steel Nipolet
1	1/2-inch Steel Threaded Cap
1	8"x8"x8" Steel Tee
1	8-inch Steel Blind Flange
4	2-inch Steel Nipolet
4	2-inch Steel Threaded Cap
1	8"x3" Steel Reducer (2' Long)
4	3-inch Slip-on Steel Flange
2	3-inch, 45-degree Steel Bend
4	3-inch, 90-degree, Short Radius Steel Elbow
4	3"x3"x2" Steel Tee
2	3-inch Steel Blind Flange
9	2-inch, 90-degree, PVC Elbow
4	Steel to PVC Adaptor
2	3-inch Steel Threaded Cap

Instruments

# of Item	Item Description
1	1/2-inch Pressure Gage
1	3-inch Flow Meter
4	2-inch Flow Meter

BILL OF MATERIALS, CONT'D

Pipe Supports

# of Item	Item Description
5	2-inch Pipe Stand
15	3-inch Pipe Stand
5	Type A Lateral Support
1	Type B Lateral Support
4	Type C Lateral Support
3	Type A Vertical Hanger Support
14	Type B Vertical Hanger Support
2	Type C Vertical Hanger Support

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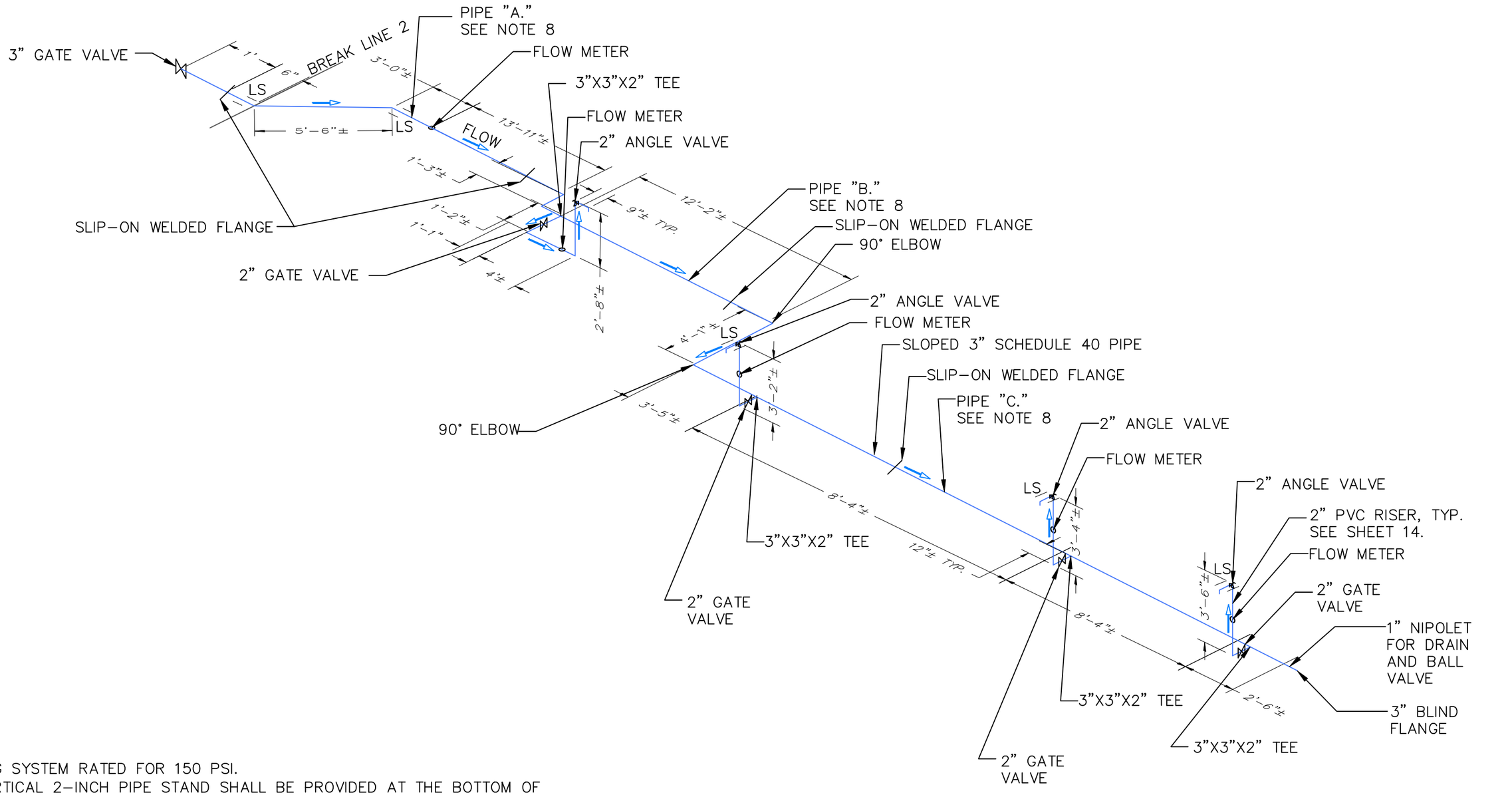
8" & 3" PIPELINES 3D PROFILE (OUTSIDE)

SCALE: AS NOTED DRAWING NO.: 5



NOTES:

1.) PIPING SYSTEM RATED FOR 150 PSI.
2.) A VERTICAL 2–INCH PIPE STAND SHALL BE PROVIDED AT THE BOTTOM OF EACH 2–INCH RISER.
3.) SLOPE PIPE TO DRAIN WITH DOWNSTREAM END 6" ABOVE GRADE.
4.) PROVIDE VERTICAL PIPE STANDS AT "LS" LOCATIONS SHOWN ON DRAWING.
5.) MAXIMUM SPACING OF PIPE STANDS SHALL BE 12 FEET FOR 3–INCH PIPING.
6.) PROVIDE LATERAL SUPPORT, TYPE C AT THE TOP OF EACH 2–INCH RISER.
7.) LABEL PIPE SEGMENTS AS SPECIFIED ON DRAWING 3.
8.) FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION.

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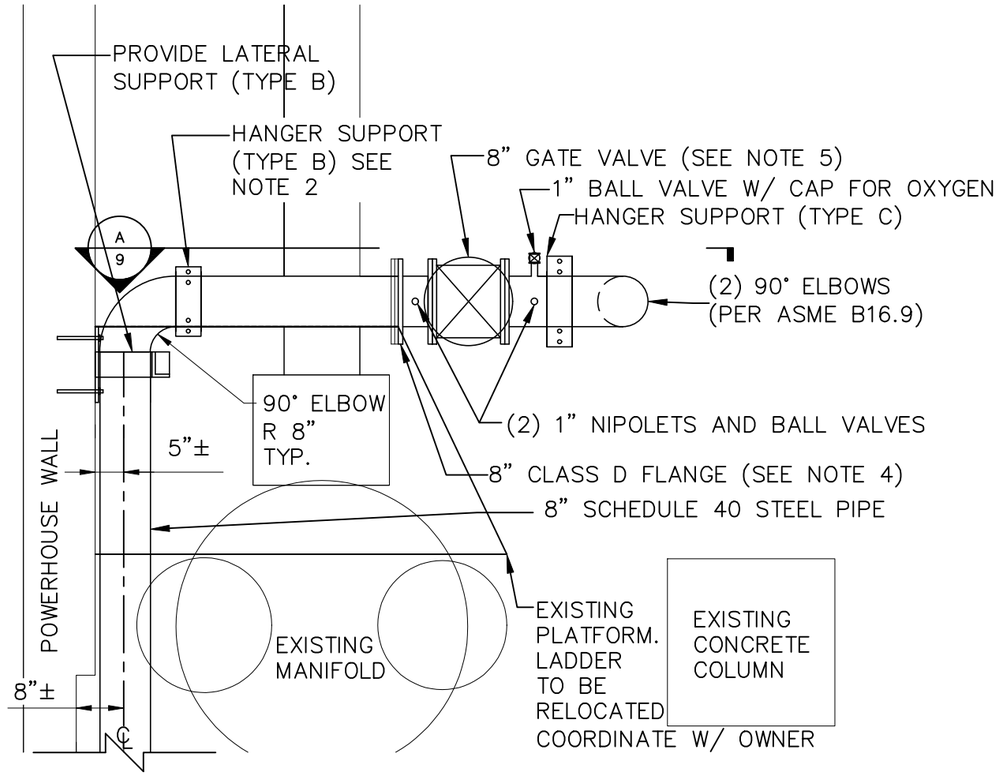
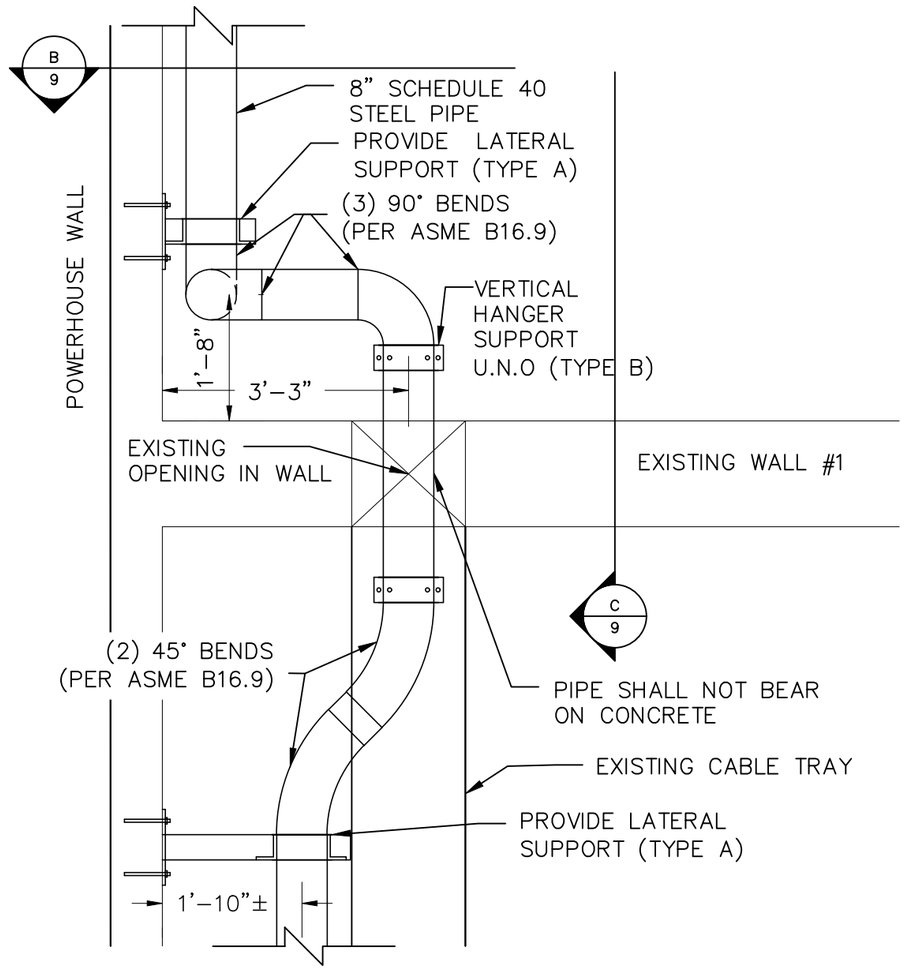
EEL FACILITY PIPELINE 3D PROFILE

SCALE: AS NOTED DRAWING NO.: 6



1/7 PLAN OF PIPE AT EXISTING MANIFOLD
Scale: 1"=1'



2/7 PLAN OF PIPE THROUGH WALL #1
Scale: 1"=1'

NOTES

1. ELEVATIONS SHOWN ARE CONOWINGO DAM DATUM (0.7 FEET LOWER THAN NGVD 29)
2. MAXIMUM SUPPORT SPACING SHALL BE 18 FEET FOR 8" PIPE AND 12 FEET FOR 3" PIPE. WHERE POSSIBLE THERE SHALL BE A SUPPORT AT EACH END OF AN ELBOW/BEND. ALL VERTICAL SUPPORTS SHALL BE SADDLE-SHAPED AND SHALL HAVE A MINIMUM CAPACITY OF 1500 LB. SEE SHEET 12 FOR TYPICAL SUPPORT DETAILS.
3. CONTRACTOR SHALL REMOVE EXISTING 3" PIPE THAT EXISTS ALONG THE ALIGNMENT OF THE PROPOSED 8" PIPE. AVOID OR MOVE OTHER PIPES UPON EXELON'S APPROVAL.
4. EXISTING MANIFOLD IS UNDER PRESSURE AND MUST BE ISOLATED (DOUBLE ISOLATED PREFERRED) PRIOR TO COMMENCING ANY WORK. BLIND FLANGE IS TO BE CAREFULLY REMOVED IN SUCH A MANNER TO CHECK LINE IS NOT PRESSURIZED.
5. THE NEW GATE VALVE IS TO BE INSTALLED AND CLOSED WITHIN 2 HOURS OF THE REMOVAL OF THE EXISTING BLIND FLANGE. TEMPORARILY SUPPORT THE VALVE UNTIL NEW SUPPORTS ARE INSTALLED.

1' 0 1' 2'
SCALE: 1" = 1'-0"

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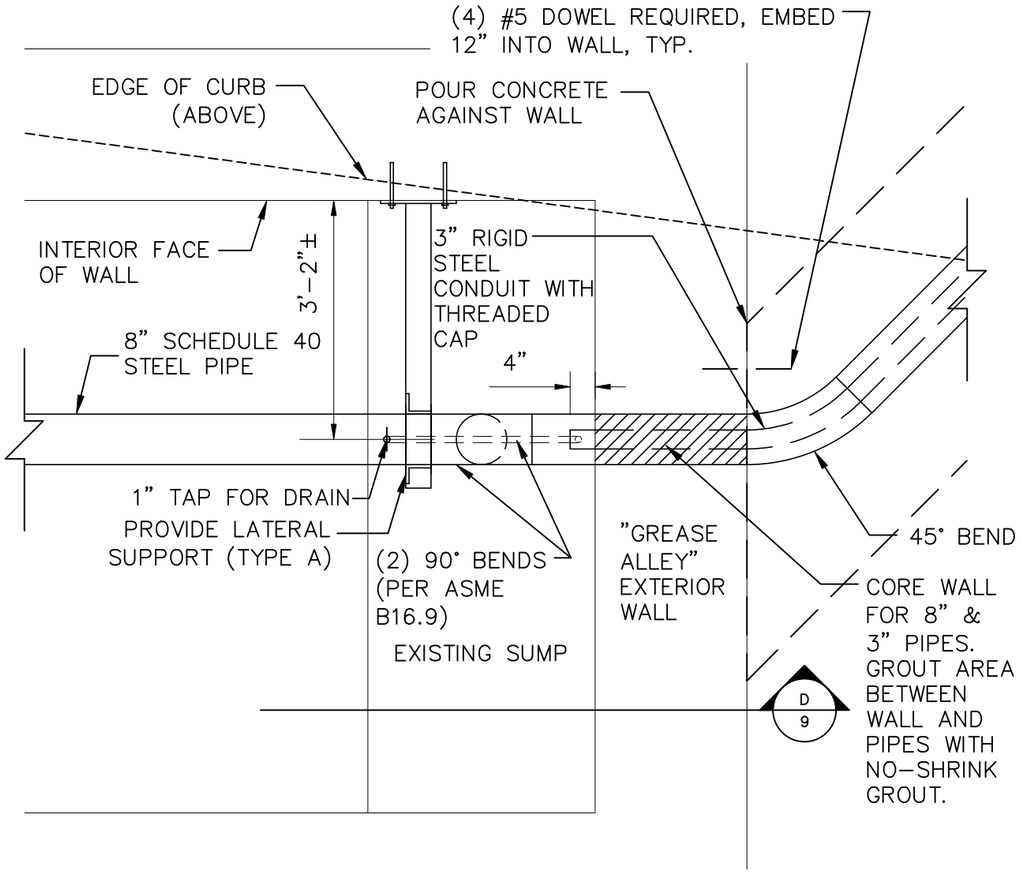
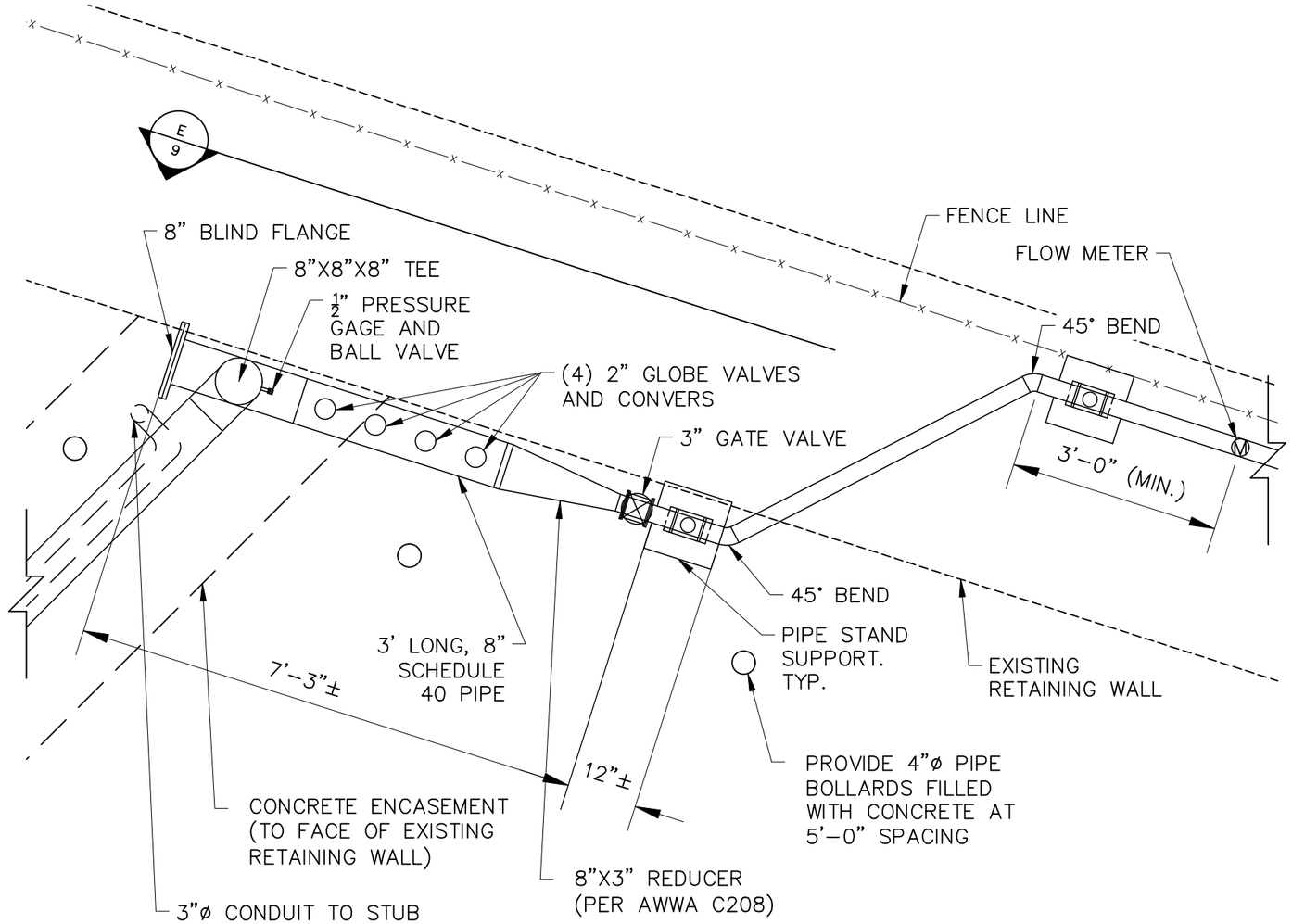
DETAILED PIPE LAYOUT PLANS, SHEET 1

SCALE: AS NOTED DRAWING NO.: 7



1/8 PLAN OF PIPE AT END OF ALLEY
Scale: 1"=1'



2/8 PLAN OF PROPOSED MANIFOLD
Scale: 1"=1'

NOTE: 3" RIGID STEEL CONDUIT TO STUB UP 4" ABOVE FINISH GRADE. PLACE 12" AWAY FROM MANIFOLD.

NOTES

1. ELEVATIONS SHOWN ARE CONOWINGO DAM DATUM (0.7 FEET LOWER THAN NGVD 29)
2. MAXIMUM SUPPORT SPACING SHALL BE 18 FEET FOR 8" PIPE AND 12 FEET FOR 3" PIPE. WHERE POSSIBLE THERE SHALL BE A SUPPORT AT EACH END OF AN ELBOW/BEND. ALL VERTICAL SUPPORTS SHALL BE SADDLE-SHAPED AND SHALL HAVE A MINIMUM CAPACITY OF 1500 LB. SEE SHEET 12 FOR TYPICAL SUPPORT DETAILS.

1' 0 1' 2'
SCALE: 1" = 1'-0"

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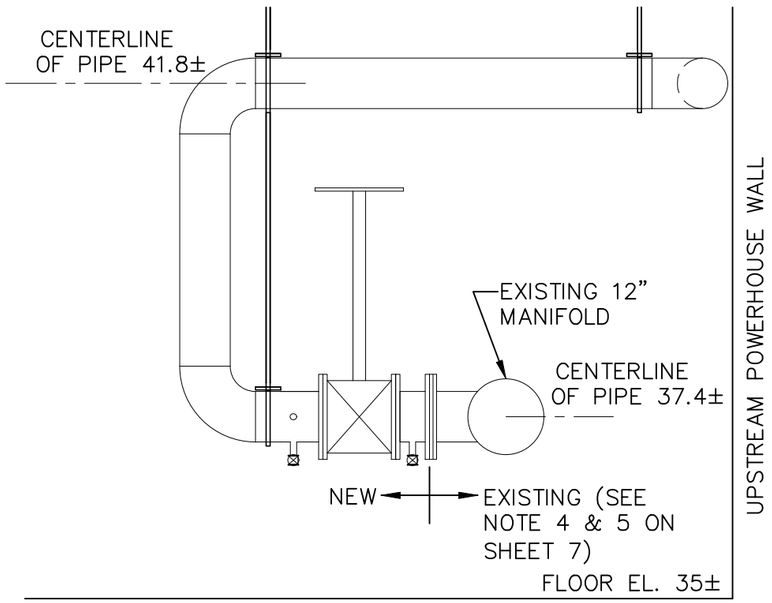
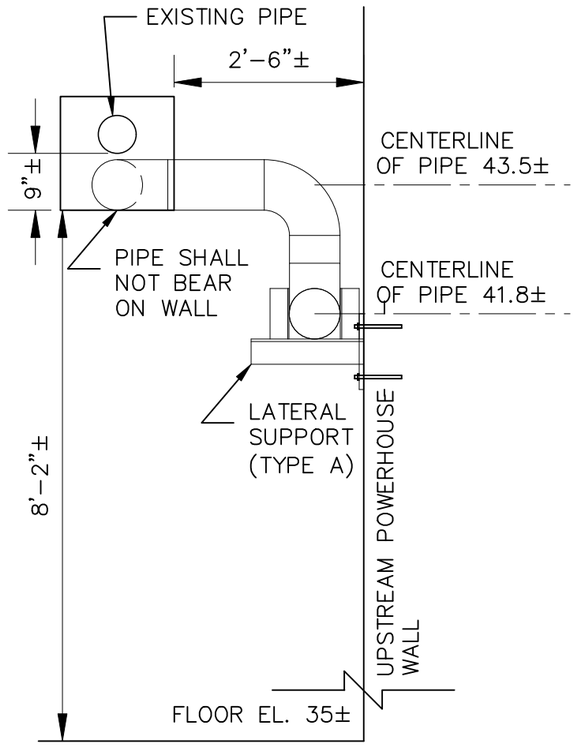
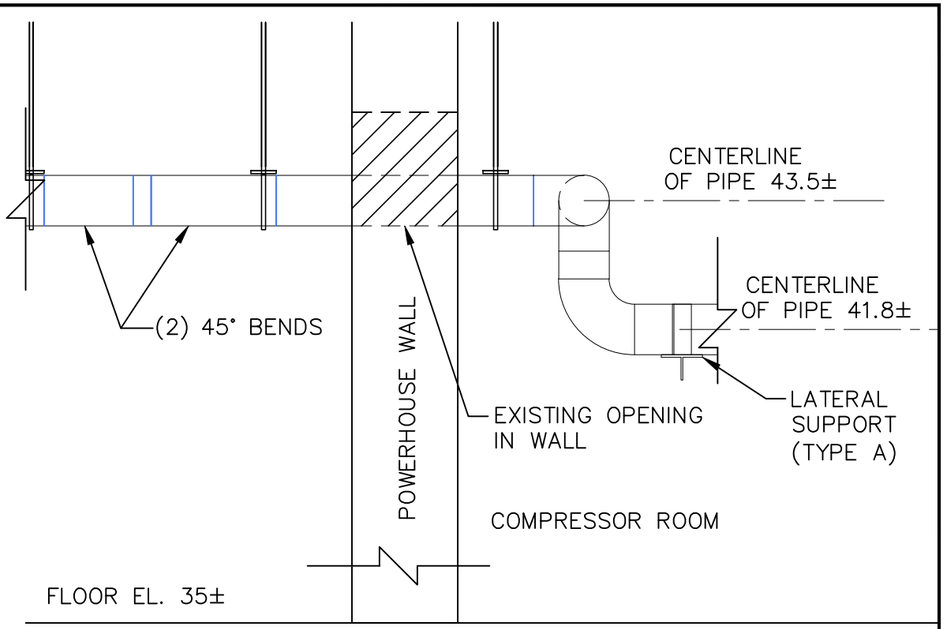
DETAILED PIPE LAYOUT PLANS, SHEET 2

SCALE: AS NOTED DRAWING NO.: 8

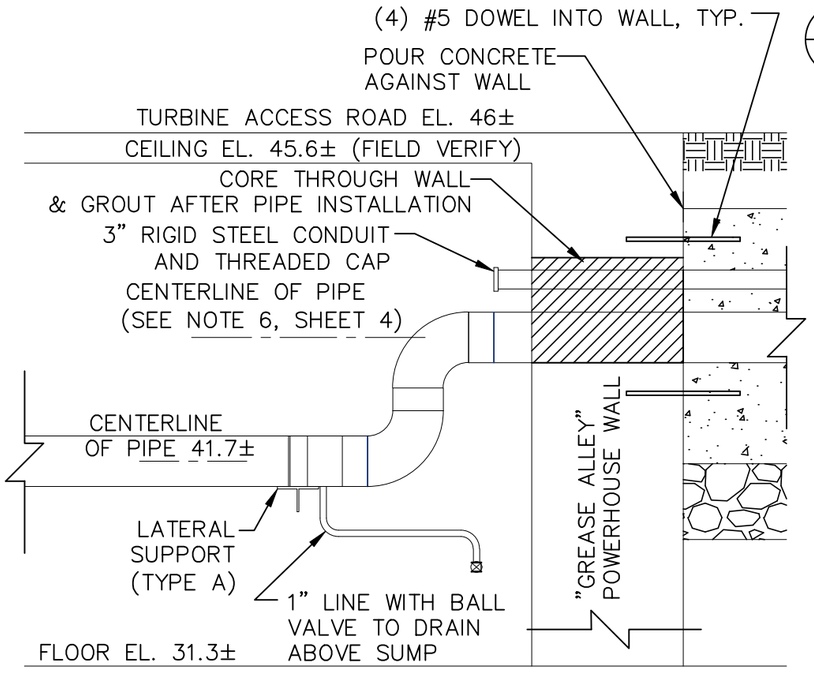


A/9 ELEVATION AT EXISTING MANIFOLD
Scale: 1"=1'



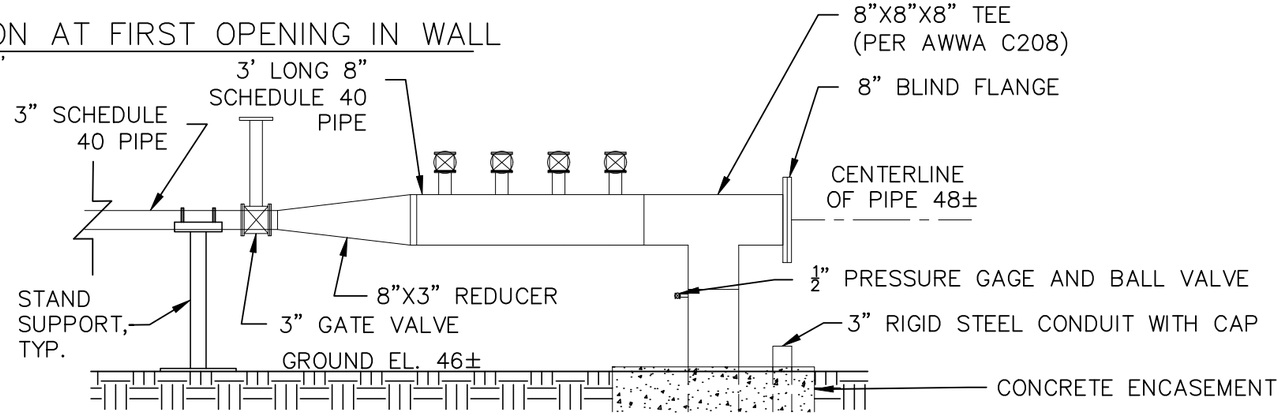


C/9 ELEVATION AT FIRST OPENING IN WALL
Scale: 1"=1'



D/9 ELEVATION AT END OF "GREASE ALLEY"
Scale: 1"=1'

B/9 SECTION AT FIRST OPENING IN WALL
Scale: 1"=1'



E/9 MANIFOLD DETAIL ELEVATION
Scale: 1"=2'

NOTES

1. ELEVATIONS SHOWN ARE CONOWINGO DAM DATUM (0.7 FEET LOWER THAN NGVD 29)

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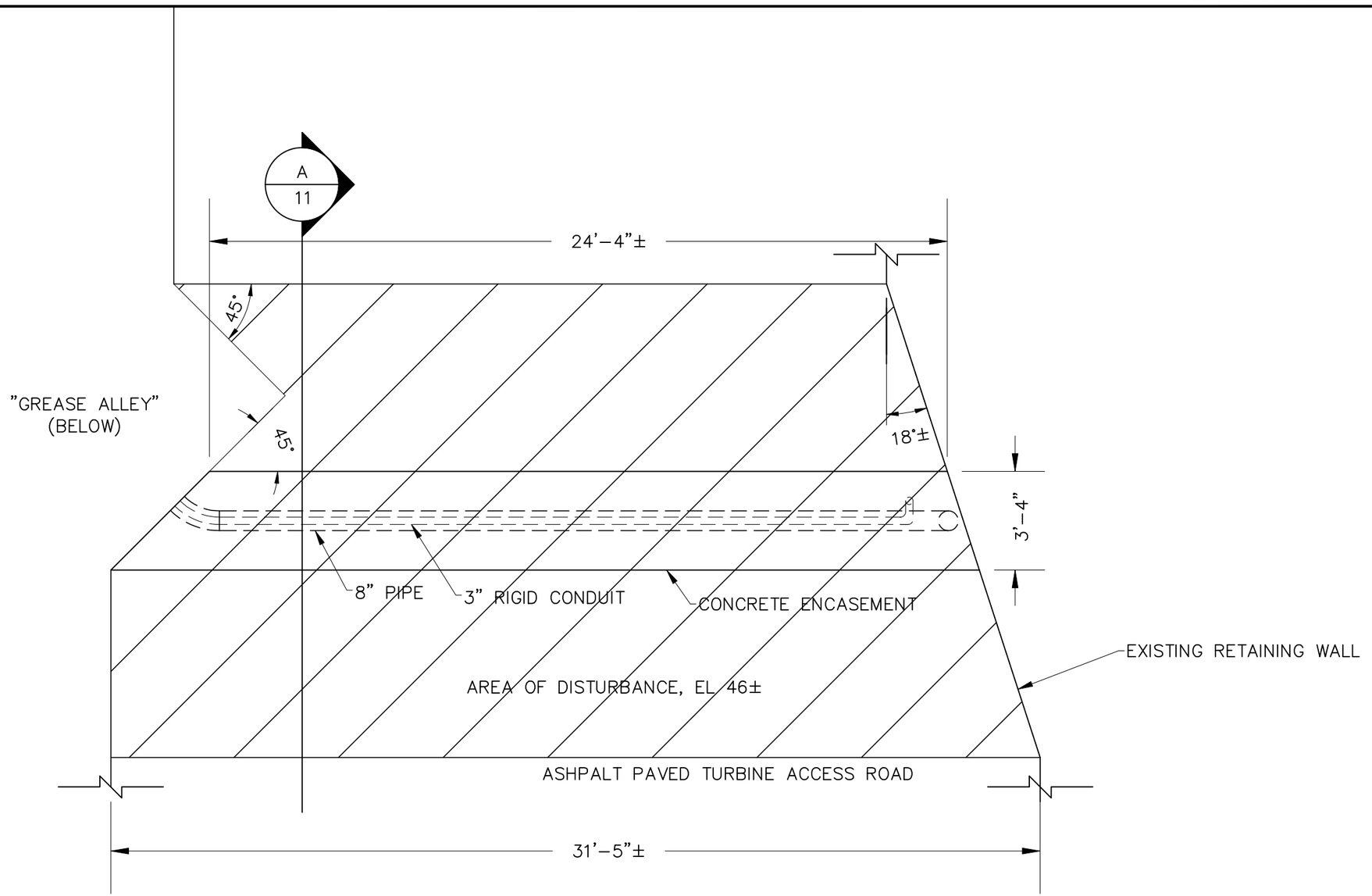
SECTIONS AND DETAILS

SCALE: AS NOTED DRAWING NO.: 9



NOTES:

1. THE 8" PIPE SHALL RUN UNDER THE EXISTING YARD DRAINAGE LINES. EXCAVATE BY HAND TO LOCATE DRAIN LINES AND TO ENSURE LINES ARE NOT DAMAGED OR DISTURBED DURING INSTALLATION OF NEW PIPE. ELEVATION ACROSS DRIVEWAY WILL BE DEPENDENT ON LOCATION OF DRAIN LINES AND RAILROAD TRACKS.
2. MAXIMUM AREA OF DISTURBANCE EQUAL TO 507 SQ. FT.

2' 0 2' 4'

SCALE: 1" = 2'–0"

DATE	#		BY	APP

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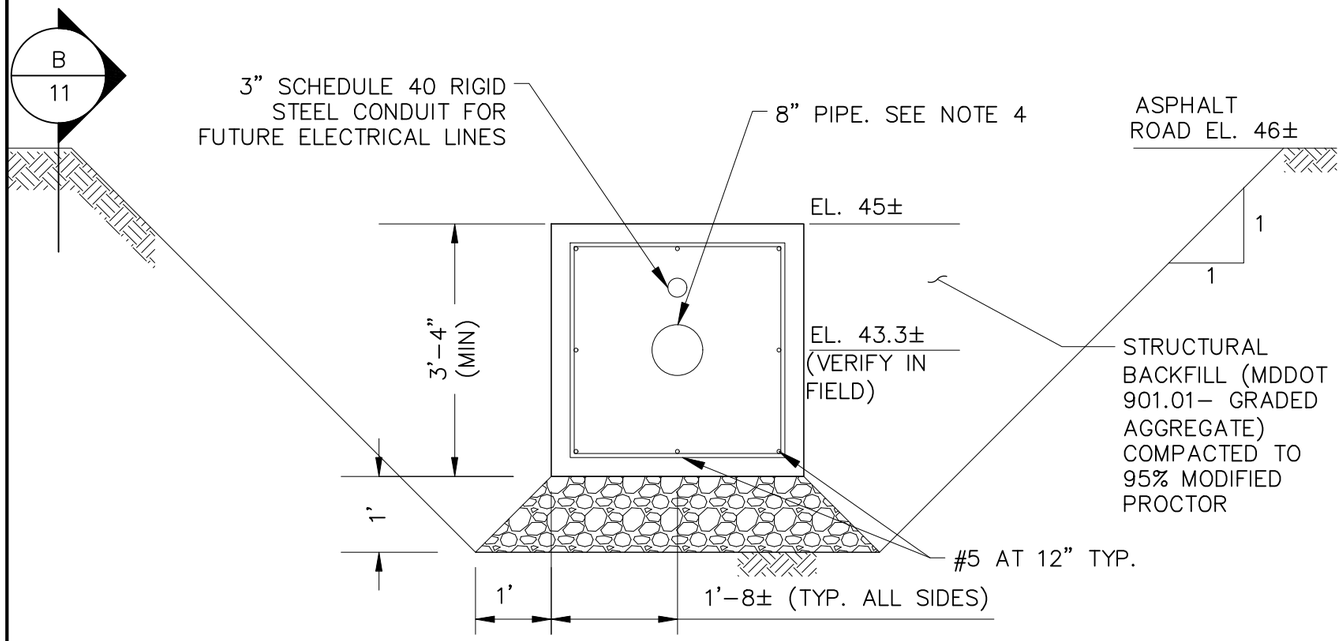
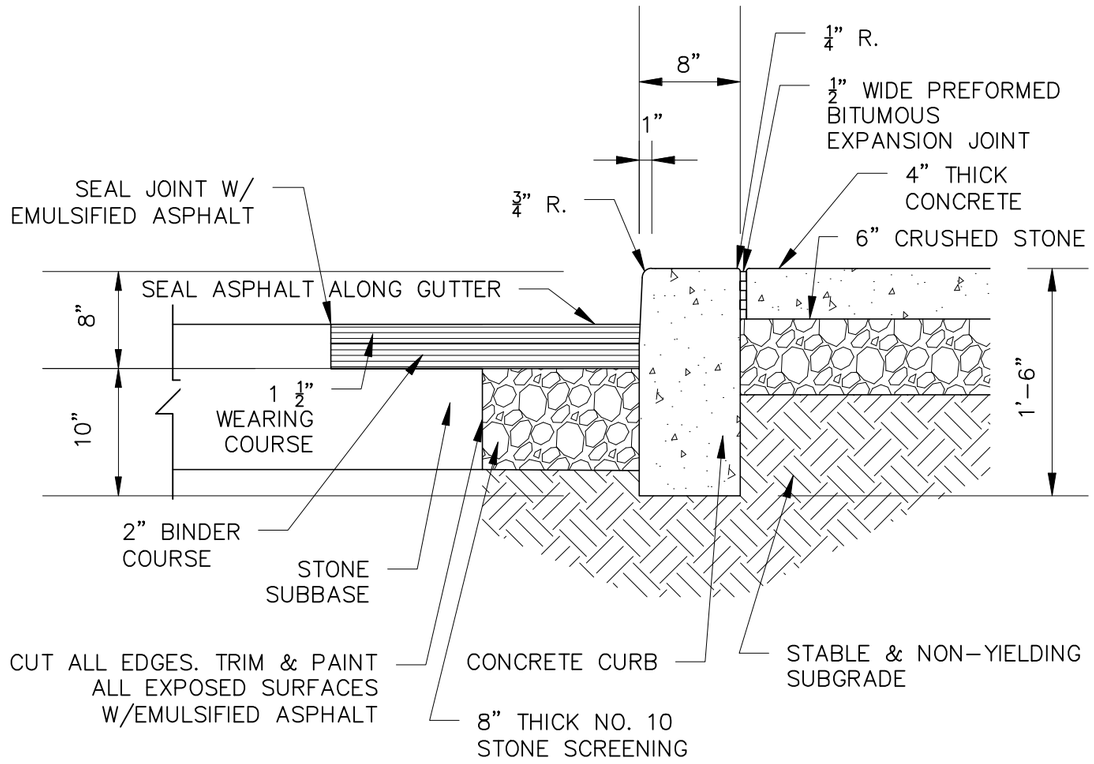
EXCAVATION AND CONCRETE ENCASEMENT PLAN

SCALE: AS NOTED DRAWING NO.: 10



A 11 CONCRETE ENCASEMENT SECTION AND EXCAVATION DETAIL
Scale: 1"=1'



B 11 ROAD BASE DETAIL TYP.
Scale: 1"=6"

NOTES

1. ELEVATIONS SHOWN ARE CONOWINGO DAM DATUM (0.7 FEET LOWER THAN NGVD 29)
2. A BUOYANT FORCE OF 950 LB MUST BE RESISTED DURING POUR AND CURING OF CONCRETE
3. GROUND SHALL BE COMPACTED TO ASTM D 1557 (95% MODIFIED PROCTOR).
4. THE 8" PIPE SHALL RUN UNDER THE EXISTING YARD DRAINAGE LINES. EXCAVATE BY HAND TO LOCATE DRAIN LINES, TO LOCATE POSSIBLE RAILROAD TRACKS, AND TO ENSURE LINES ARE NOT DAMAGED OR DISTURBED DURING INSTALLATION OF NEW PIPE.
5. ASPHALT ROAD TO BE REPLACED PER SECTION B.
6. EROSION AND SEDIMENT CONTROL REQUIREMENTS ARE SHOWN ON DRAWING 20.

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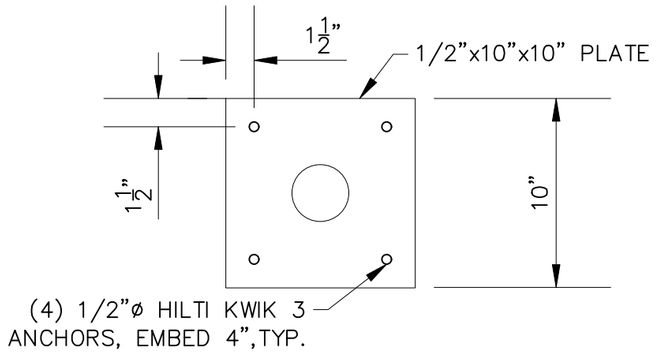
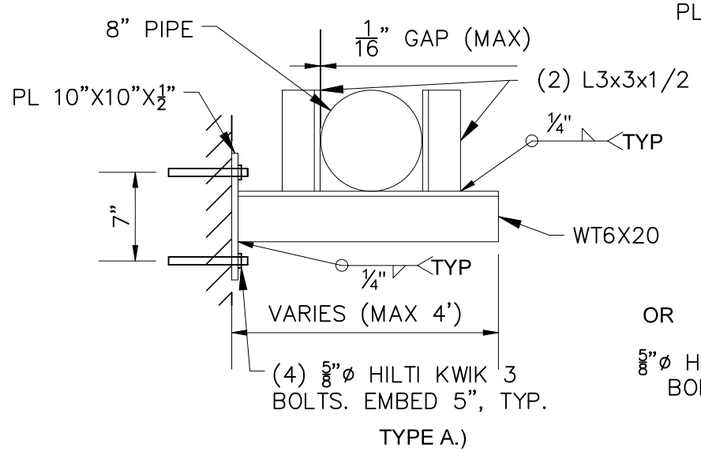
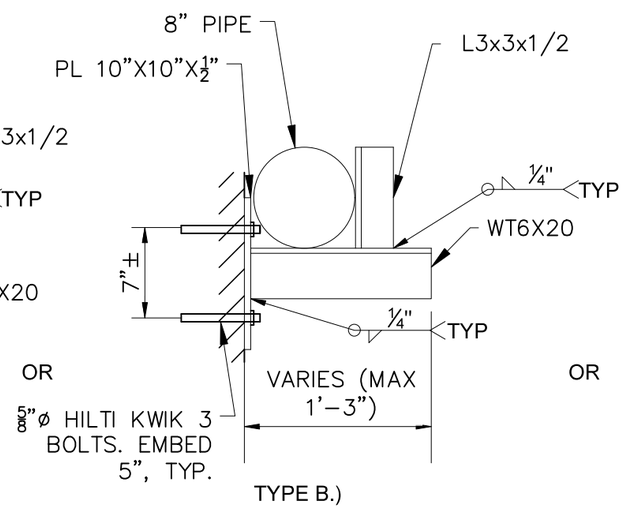
EXCAVATION, CONCRETE ENCASEMENT AND ROAD SECTIONS

SCALE: AS NOTED DRAWING NO.: 11



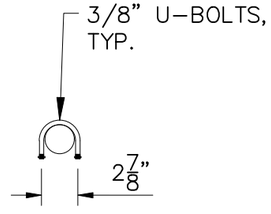
B/12 STAND PIPE SUPPORT BASE (TYP.)
Scale: 3"=1'



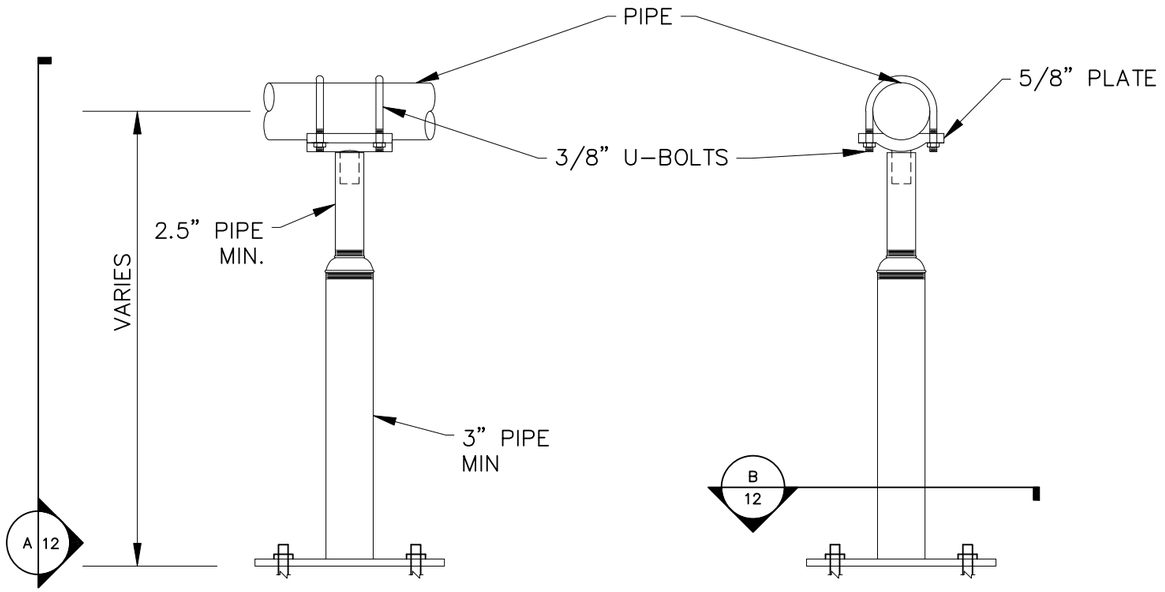


OR

OR

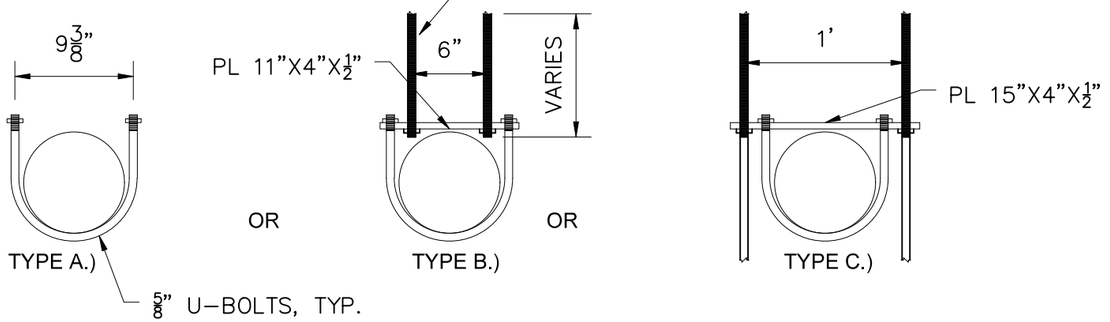


2/12 8" LATERAL PIPE SUPPORT (TYP.)
Scale: 2"=1'



1/12 ADJUSTABLE STAND VERTICAL PIPE SUPPORT (TYP.)
Scale: 3"=1'

A/12 ELEVATION STAND PIPE SUPPORT
Scale: 3"=1'



OR

OR

3/12 8" HANGER (VERTICAL) PIPE SUPPORTS (TYP.)
Scale: 2"=1'

NOTES

1. MAXIMUM SUPPORT SPACING SHALL BE 18 FEET FOR 8" PIPE AND 12 FEET FOR 3" PIPE. WHERE POSSIBLE THERE SHALL BE A SUPPORT AT EACH END OF AN ELBOW/BEND. ALL VERTICAL SUPPORTS SHALL BE SADDLE-SHAPED AND SHALL HAVE A MINIMUM CAPACITY OF 1500 LB.
2. LATERAL SUPPORTS MUST BE CAPABLE OF SUPPORTING 1000 LB HORIZONTAL LOAD AND 1500 POUND VERTICAL LOAD.

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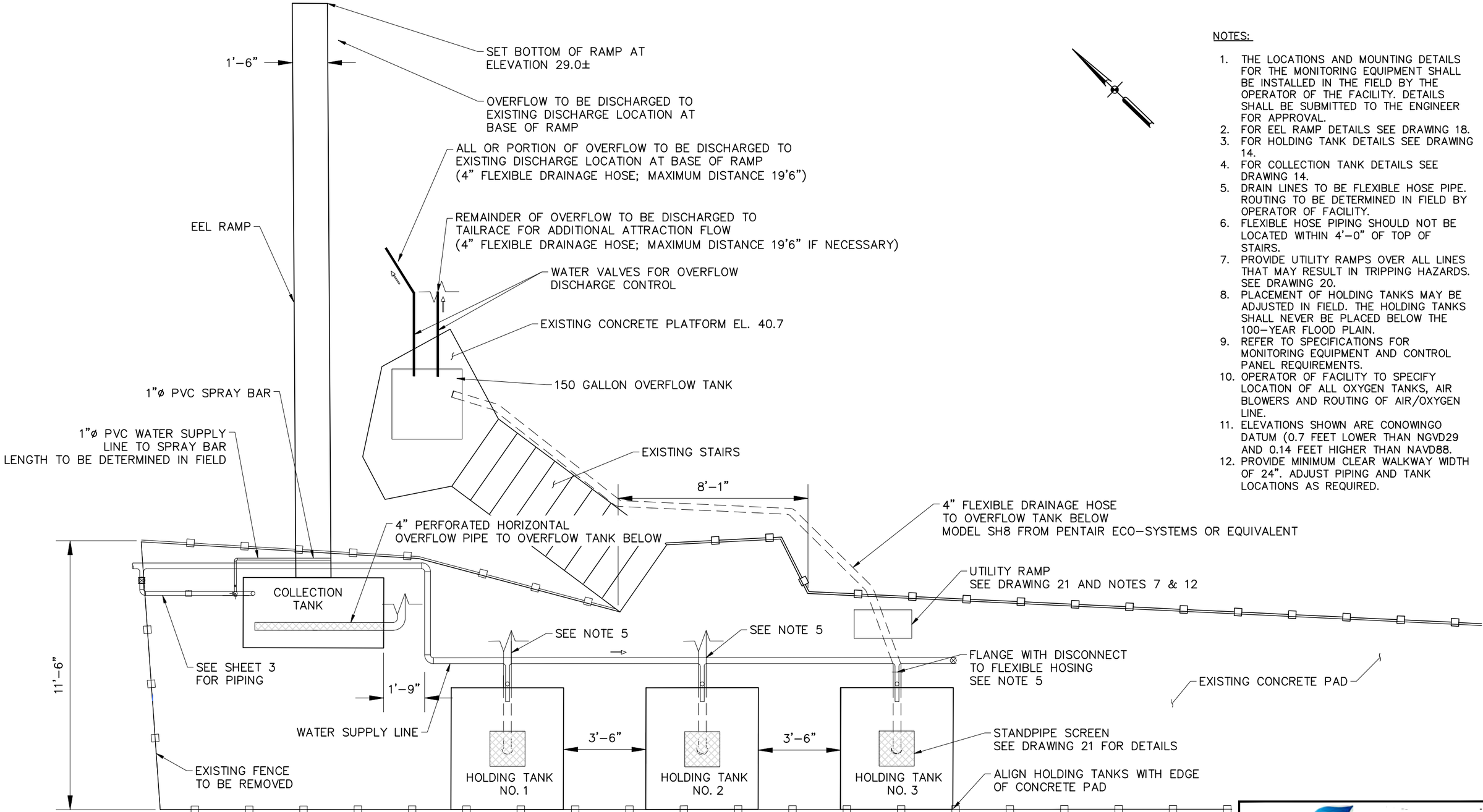
PIPE SUPPORTS

SCALE: AS NOTED DRAWING NO.: 12



NOTES:

1. THE LOCATIONS AND MOUNTING DETAILS FOR THE MONITORING EQUIPMENT SHALL BE INSTALLED IN THE FIELD BY THE OPERATOR OF THE FACILITY. DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. FOR EEL RAMP DETAILS SEE DRAWING 18.
3. FOR HOLDING TANK DETAILS SEE DRAWING 14.
4. FOR COLLECTION TANK DETAILS SEE DRAWING 14.
5. DRAIN LINES TO BE FLEXIBLE HOSE PIPE. ROUTING TO BE DETERMINED IN FIELD BY OPERATOR OF FACILITY.
6. FLEXIBLE HOSE PIPING SHOULD NOT BE LOCATED WITHIN 4'–0" OF TOP OF STAIRS.
7. PROVIDE UTILITY RAMPS OVER ALL LINES THAT MAY RESULT IN TRIPPING HAZARDS. SEE DRAWING 20.
8. PLACEMENT OF HOLDING TANKS MAY BE ADJUSTED IN FIELD. THE HOLDING TANKS SHALL NEVER BE PLACED BELOW THE 100–YEAR FLOOD PLAIN.
9. REFER TO SPECIFICATIONS FOR MONITORING EQUIPMENT AND CONTROL PANEL REQUIREMENTS.
10. OPERATOR OF FACILITY TO SPECIFY LOCATION OF ALL OXYGEN TANKS, AIR BLOWERS AND ROUTING OF AIR/OXYGEN LINE.
11. ELEVATIONS SHOWN ARE CONOWINGO DATUM (0.7 FEET LOWER THAN NGVD29 AND 0.14 FEET HIGHER THAN NAVD88.
12. PROVIDE MINIMUM CLEAR WALKWAY WIDTH OF 24". ADJUST PIPING AND TANK LOCATIONS AS REQUIRED.

2' 0 2' 4'

SCALE: 1/2" = 1'–0"

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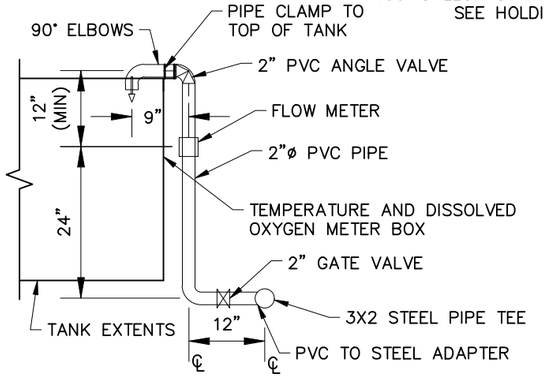
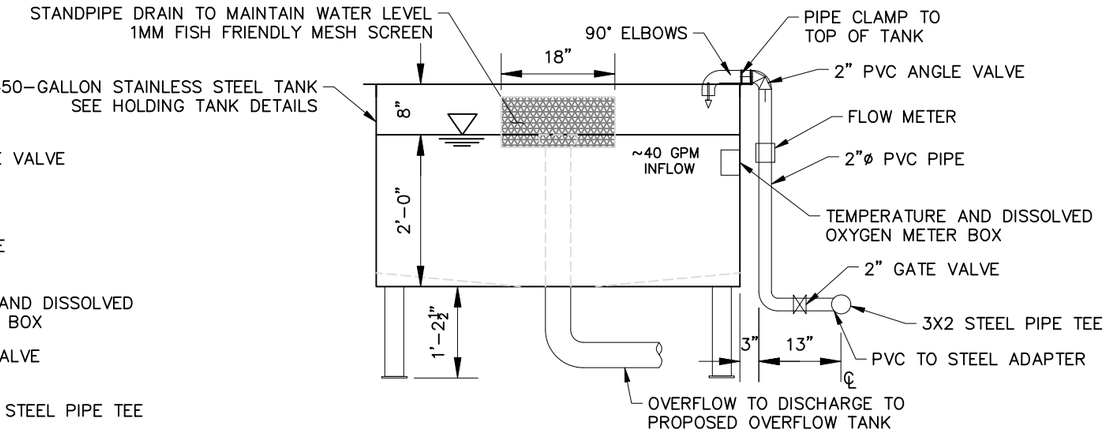
EEL FACILITY PLAN LAYOUT (FIGURE 2.2.3-1)

SCALE: AS NOTED DRAWING NO.: 13



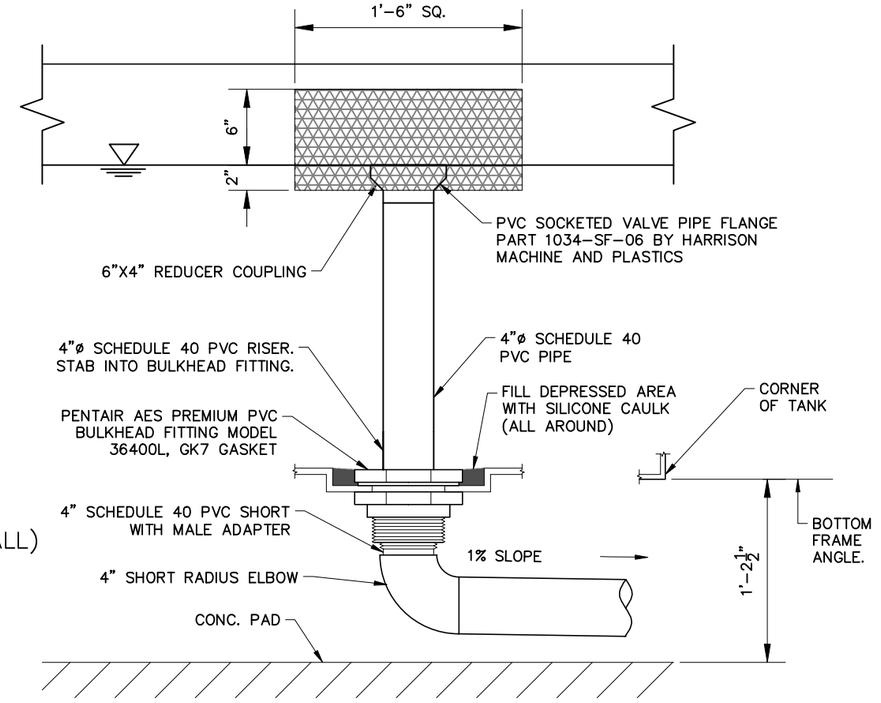
1 TYPICAL RISER DETAIL – HOLDING TANK

Scale: 1" = 1'–0"



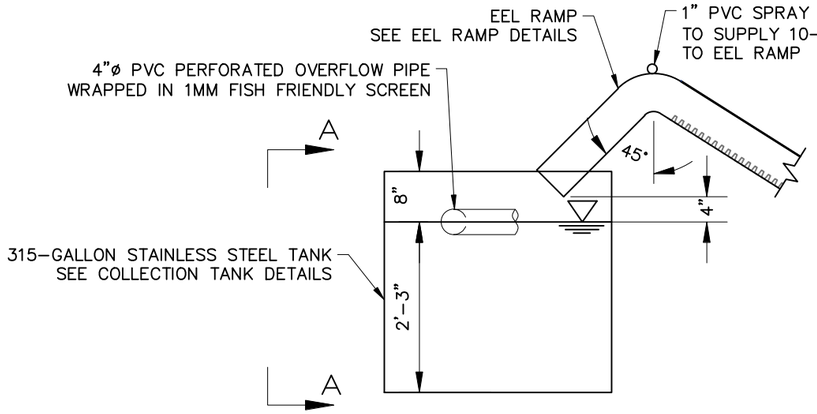
1/14 SECTION OF HOLDING TANK

1" = 1'–0" (APPROXIMATE TANK SIZE 5'6"X5'6"X2'8" TALL)



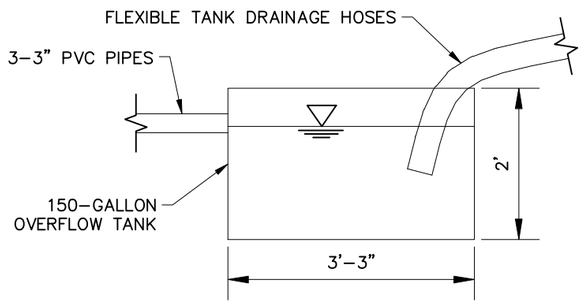
2 STANDPIPE DETAIL – HOLDING TANK

Scale: 1" = 1'–0"



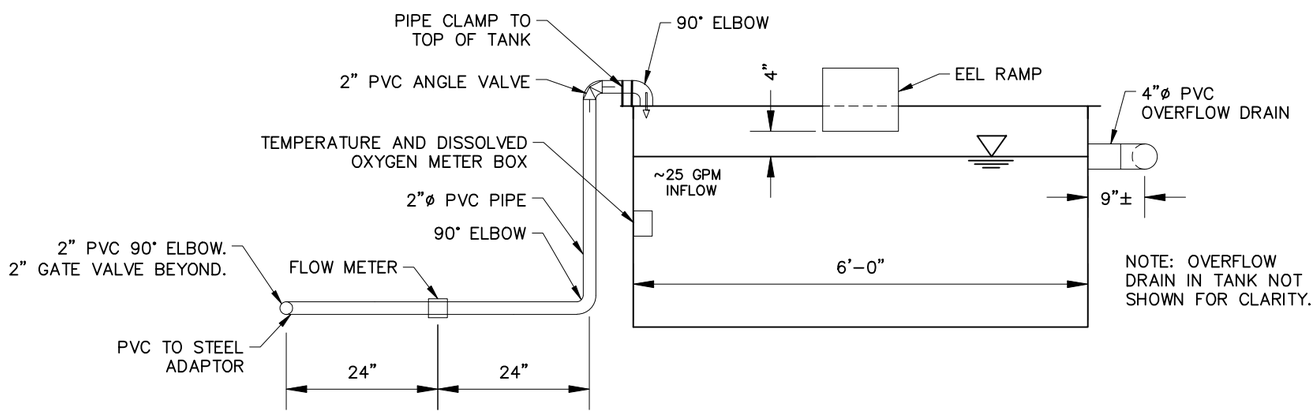
2/14 SECTION OF COLLECTION TANK

1" = 1'–0" (APPROXIMATE TANK SIZE 6'X3'4"X3'1" TALL)



3/14 SECTION OF OVERFLOW TANK

1" = 1'–0" (APPROXIMATE TANK SIZE 39"X58"X24" TALL)



A/14 ELEVATION OF COLLECTION TANK

1" = 1'–0"

NOTES

1. REFER TO SPECIFICATIONS FOR MONITORING EQUIPMENT AND CONTROL PANEL REQUIREMENTS.
2. HOLES IN TANK COVERS FOR DISSOLVED OXYGEN AND AERATION LINES TO BE DRILLED IN FIELD.
3. OPERATOR OF FACILITY TO SPECIFY LOCATION OF ALL OXYGEN TANKS, AIR BLOWERS AND ROUTING OF AIR/OXYGEN LINE.
4. ELEVATIONS SHOWN ARE CONOWINGO DATUM (0.7 FEET LOWER THAN NAGVD 29 AND 0.14 FEET HIGHER THAN NAVD88).

1' 0 1' 2'

SCALE: 1" = 1'–0"

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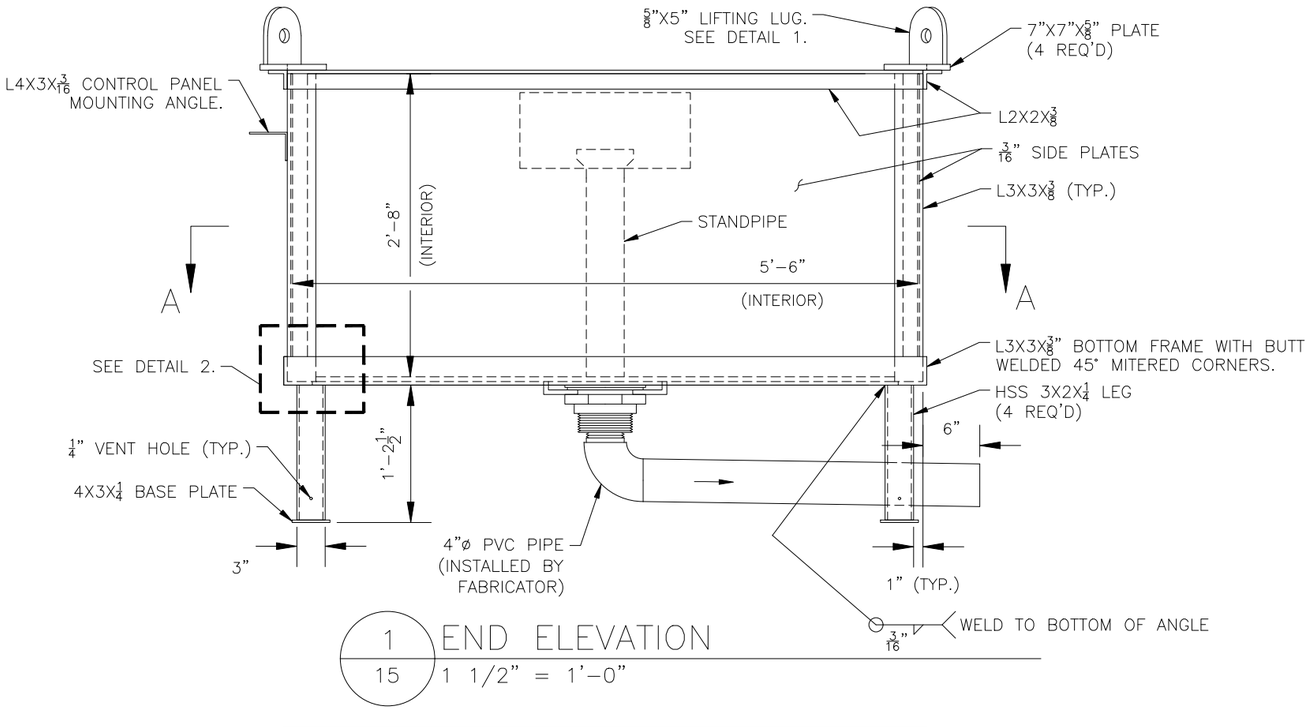
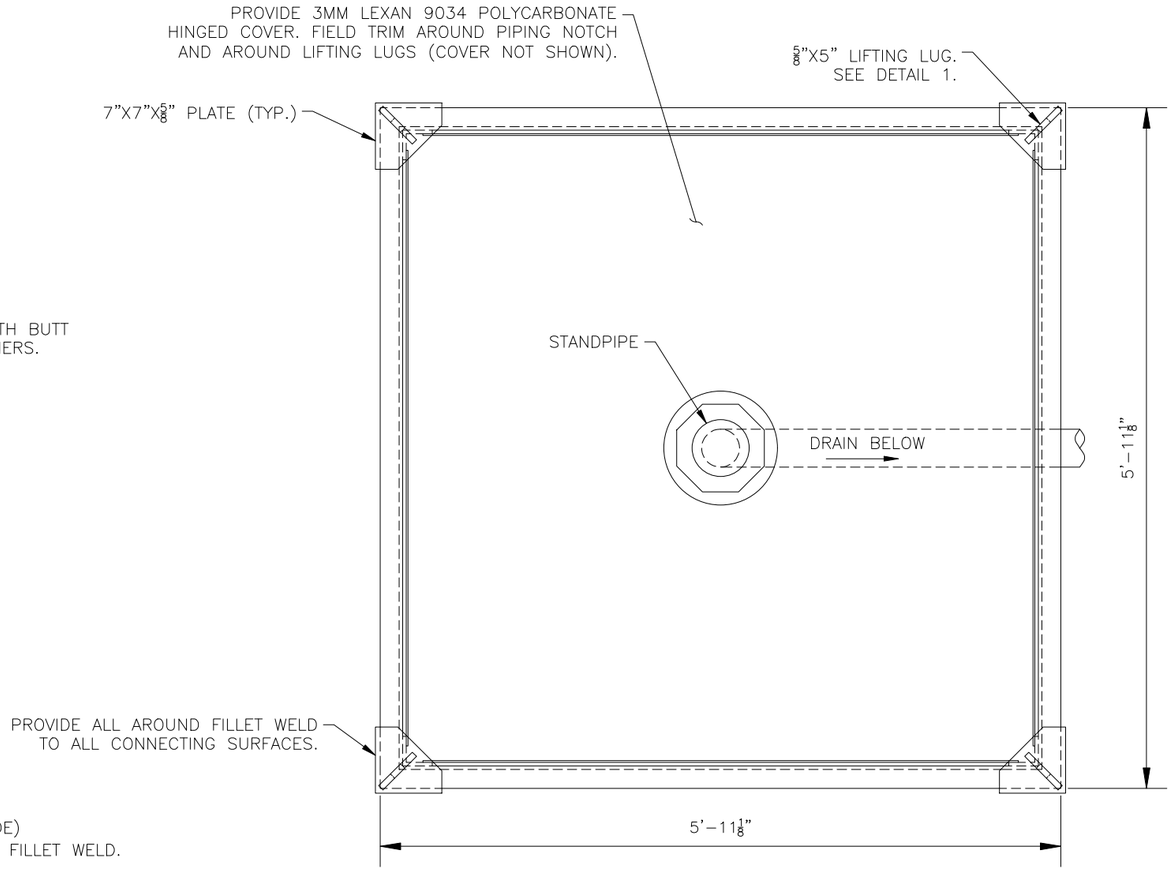
TYPICAL TANK SECTIONS (FIGURE 2.2.3-2)

SCALE: AS NOTED DRAWING NO.: 14



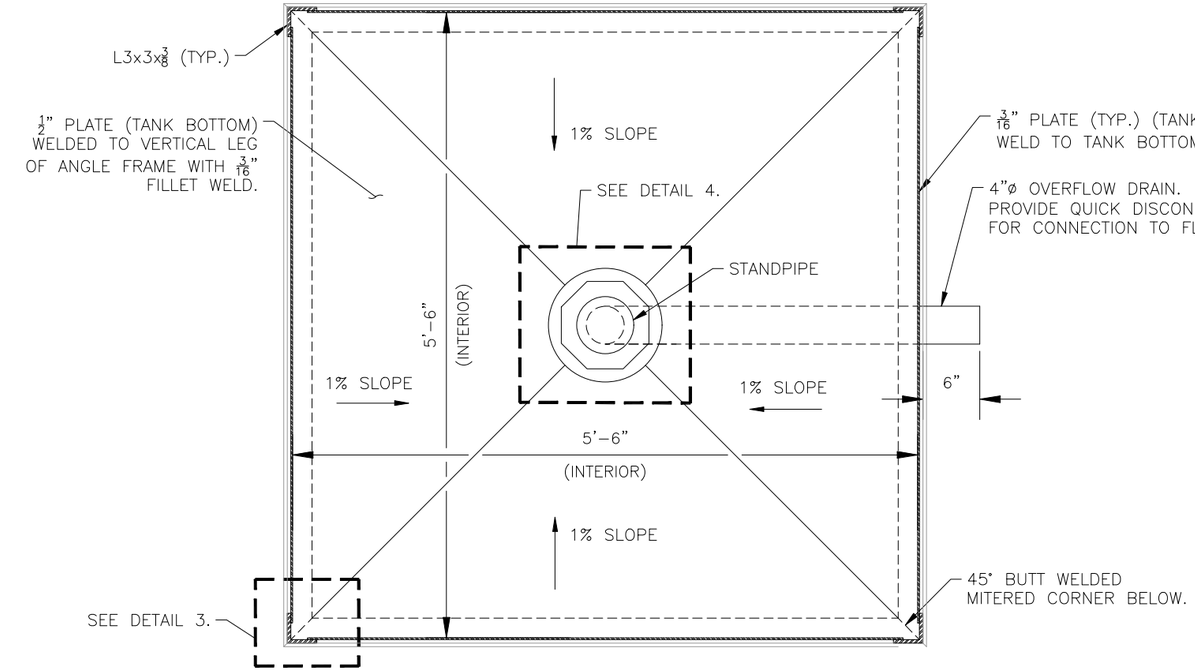
1/15 END ELEVATION

1 1/2" = 1'-0"



2/15 PLAN – TOP OF TANK

1 1/2" = 1'-0"



A/15 PLAN THROUGH TANK

1 1/2" = 1'-0"

NOTES:

1. USE STAINLESS STEEL ELECTRODES.
2. UNLESS OTHERWISE SPECIFIED, ALL WELDS TO BE CONTINUOUS.
3. UNLESS OTHERWISE SPECIFIED, ALL WELDS TO BE 3/16" FILLET WELDS.
4. ALL OVERLAPPING SURFACES TO BE FULLY WELDED WITH 3/16" FILLET WELDS.
5. LIFTING LUGS ARE DESIGNED TO LIFT TANK ASSUMING TANK IS COMPLETELY DRAINED.
6. SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL.
7. TANK FABRICATOR SHALL DRILL/CUT HOLES IN TANK SIDES FOR MONITORING EQUIPMENT (TEMPERATURE AND OXYGEN METERS). LOCATIONS AND SIZES TO BE DETERMINED DURING MEETING WITH OWNER'S REPRESENTATIVE(S) AND ENGINEER.
8. LOCATION OF CONTROL PANEL MOUNTING ANGLE TO BE DETERMINED DURING THE SITE MEETING WITH OWNER, OWNER'S REPRESENTATIVE, AND ENGINEER.
9. FITTINGS ATTACHED TO TANKS TO BE SUPPLIED AND INSTALLED BY TANK MANUFACTURER.

8" 0 8" 16"

SCALE: 1 1/2" = 1'-0"

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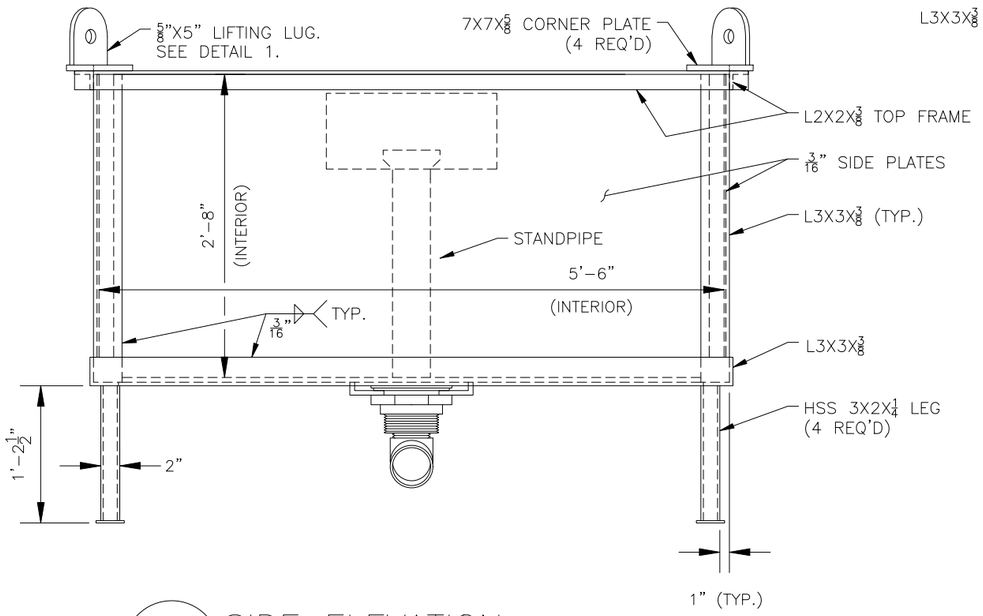
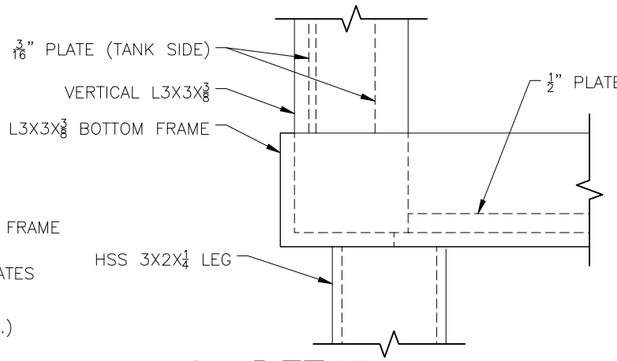
HOLDING TANK PLAN AND SECTIONS

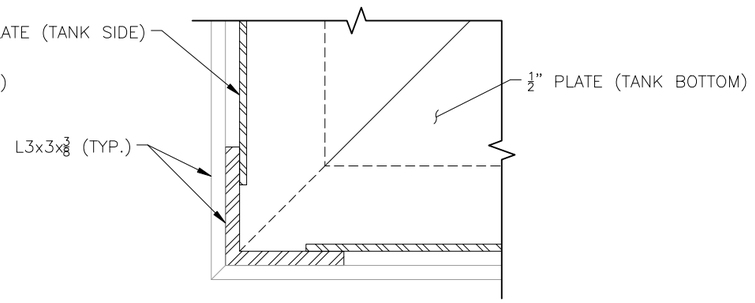
SCALE: AS NOTED DRAWING NO.: 15



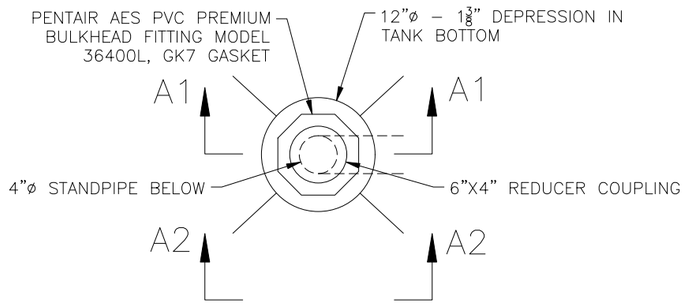
1/16 SIDE ELEVATION
3/4" = 1'-0"



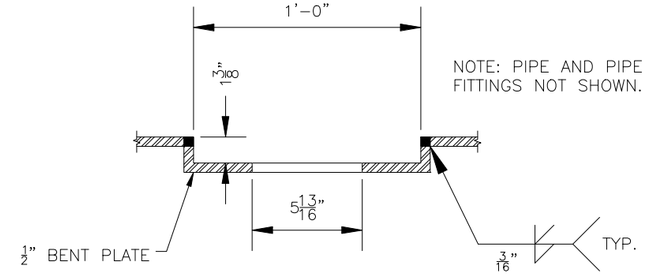
2 DETAIL
Scale: 6" = 1'-0"



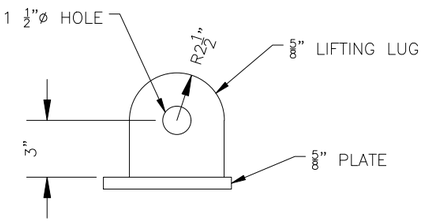
3 DETAIL
Scale: 6" = 1'-0"



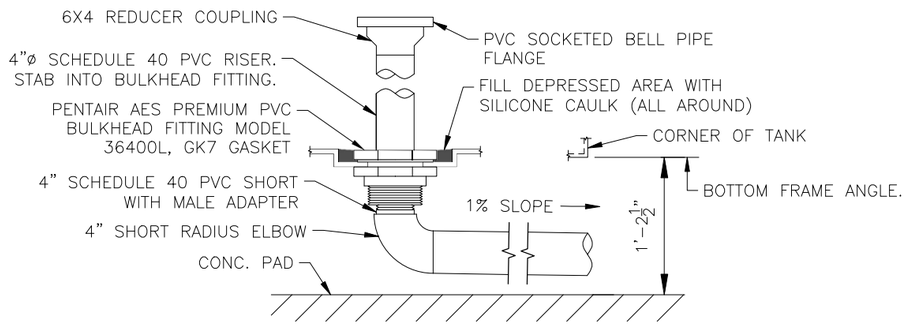
4 DETAIL
Scale: 1 1/2" = 1'-0"



A1/16 SECTION THROUGH TANK BOTTOM
3" = 1'-0"



1 DETAIL
Scale: 3" = 1'-0" (SEE NOTE 8)



A2/16 SECTION OF TANK BOTTOM
1 1/2" = 1'-0"

NOTES:

1. USE STAINLESS STEEL ELECTRODES.
2. UNLESS OTHERWISE SPECIFIED, ALL WELDS TO BE CONTINUOUS.
3. UNLESS OTHERWISE SPECIFIED, ALL WELDS TO BE 3/16" FILLET WELDS.
4. ALL OVERLAPPING SURFACES TO BE FULLY WELDED WITH 3/16" FILLET WELDS.
5. SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL.
6. BULKHEAD FITTINGS TO BE PROVIDED AND INSTALLED BY THE FABRICATOR AT THE FABRICATION PLANT.
7. TANK FABRICATOR SHALL DRILL/CUT HOLES IN TANK SIDES FOR MONITORING EQUIPMENT (TEMPERATURE AND OXYGEN METERS). LOCATIONS AND SIZES TO BE DETERMINED DURING MEETING WITH OWNER'S REPRESENTATIVE AND ENGINEER.
8. LIFTING LUGS ARE DESIGNED TO LIFT TANK ASSUMING TANK IS COMPLETELY DRAINED.

4" 0 4" 8"
SCALE: 3" = 1'-0"

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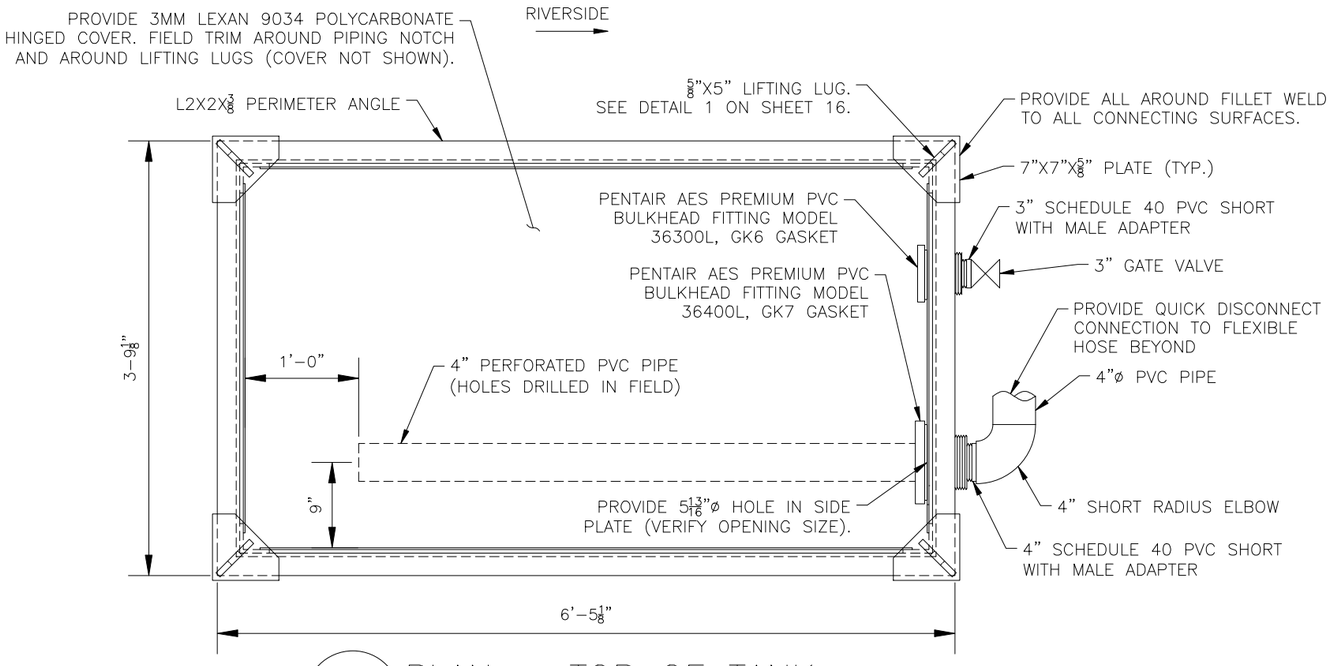
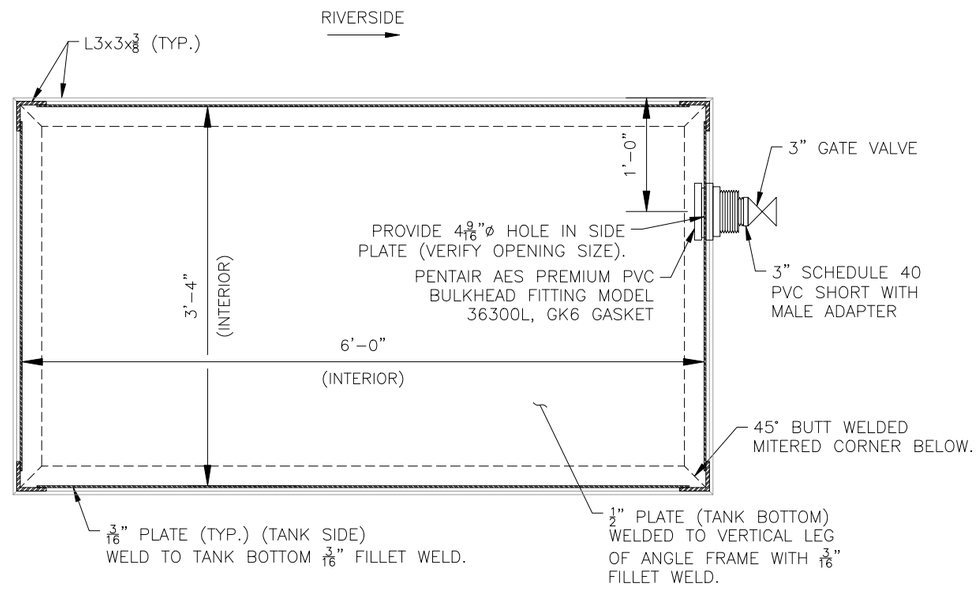
HOLDING TANK SECTIONS AND DETAILS

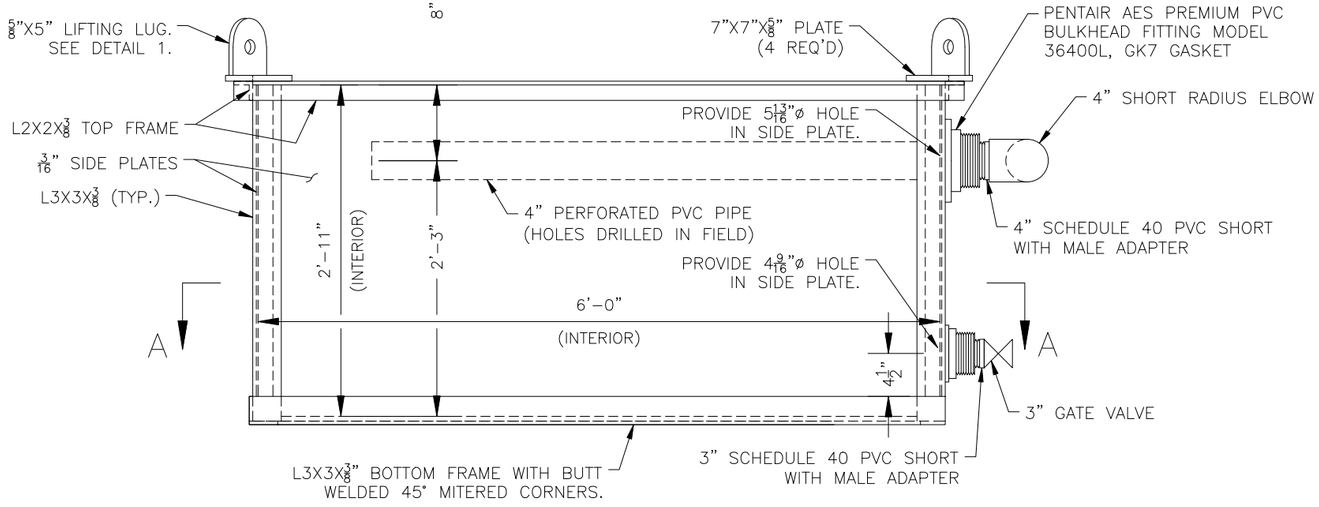
SCALE: AS NOTED DRAWING NO.: 16



1/17 PLAN – TOP OF TANK
1 1/2" = 1'-0"



A/17 PLAN THROUGH TANK
1 1/2" = 1'-0"



2/17 SIDE ELEVATION
1 1/2" = 1'-0"

NOTES:

1. USE STAINLESS STEEL ELECTRODES.
2. UNLESS OTHERWISE SPECIFIED, ALL WELDS TO BE CONTINUOUS.
3. UNLESS OTHERWISE SPECIFIED, ALL WELDS TO BE 3/16" FILLET WELDS.
4. ALL OVERLAPPING SURFACES TO BE FULLY WELDED WITH 3/16" FILLET WELDS.
5. SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL.
6. FABRICATION DETAILS SHALL BE SIMILAR TO THOSE SHOWN FOR THE FABRICATION TANK.
7. TANK FABRICATOR SHALL DRILL/CUT HOLES IN TANK SIDES FOR MONITORING EQUIPMENT (TEMPERATURE AND OXYGEN METERS). LOCATIONS AND SIZES TO BE DETERMINED DURING MEETING WITH OWNER'S REPRESENTATIVE AND ENGINEER.
8. LIFTING LUGS ARE DESIGNED TO LIFT TANK ASSUMING TANK IS COMPLETELY DRAINED.
9. FITTINGS ATTACHED TO TANKS TO BE SUPPLIED AND INSTALLED BY TANK MANUFACTURER.

8" 0 8" 16"
SCALE: 1 1/2" = 1'-0"

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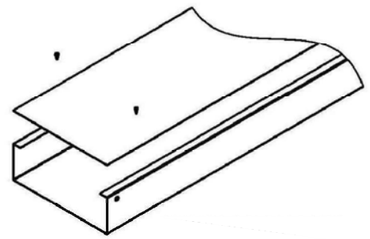
COLLECTION TANK PLAN AND SECTIONS

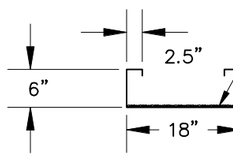
SCALE: AS NOTED DRAWING NO.: 17

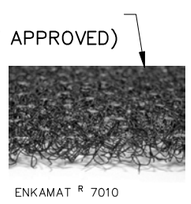


NOTES

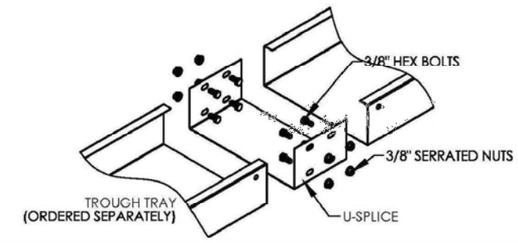
1. PROVIDE COVER WITH (10) #8 SELF DRILLING TEK SCREWS FOR MOUNTING. RECOMMENDED ATTACHMENT LOCATIONS: 3/8" FROM EDGES WIDTH WISE AND 1" FROM END LENGTH WISE, FOLLOWED BY 29–1/2" O.C.

1/18 COVER DETAIL
NOT TO SCALE





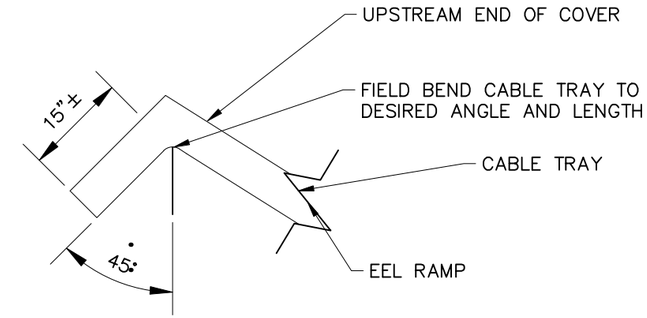
1/18 EEL RAMP ELEVATION
Scale: 1"=1'



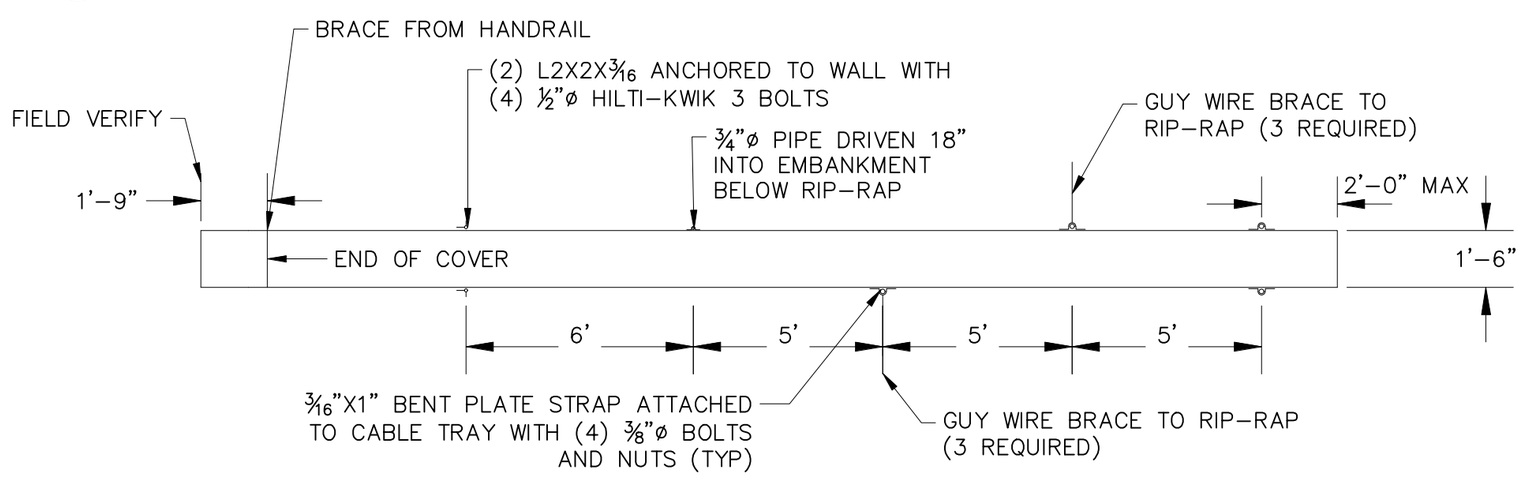
NOTES:

1. USE TO JUNCTION TRAY SECTIONS TOGETHER.
2. FEED PROVIDED 3/8"X3/4" HEX HEAD BOLT THRU TRAY AND U–SPLICE AND ATTACH 3/8" SERRATED NUTS ON OUTSIDE OF U–SPLICE.
3. RECOMMENDED TORQUE:
   FOR 3/8" FASTENERS: 25–35 FT–LBS.
4. IF DESIRED, ADDITIONAL HOLES MAY BE FIELD DRILLED IN THE BOTTOM OF THE TRAY THRU THE C–SPLICE AND ADDITIONAL HARDWARE (BY OTHERS) ATTACHED.

4/18 U–SPLICE DETAIL
NOT TO SCALE



5/18 BENT SECTION OF EEL RAMP
Scale: 1"=1'



3/18 EEL RAMP PLAN
Scale: 1"=2'

2' 0 2' 4'
SCALE: 1" = 2'–0"

1' 0 1' 2'
SCALE: 1" = 1'–0"

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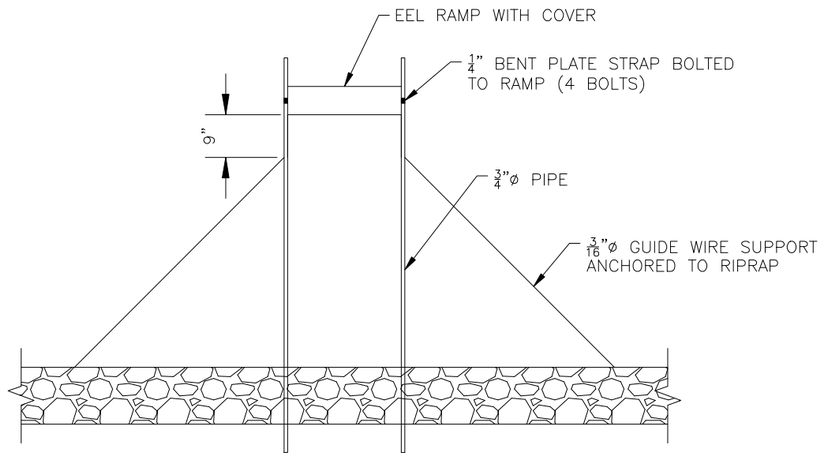
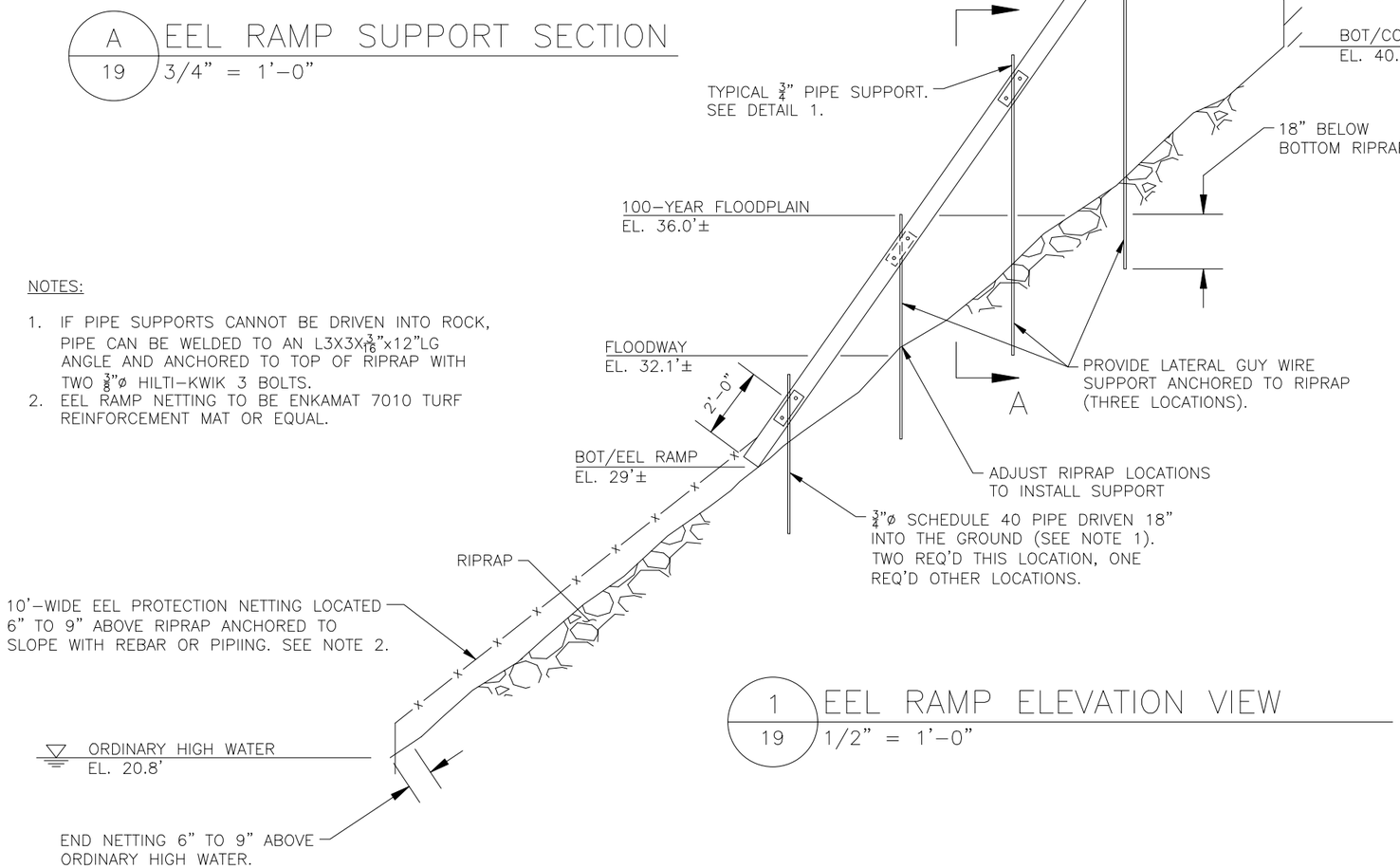
EEL RAMP SECTIONS AND DETAILS

SCALE: AS NOTED DRAWING NO.: 18



A / 19 EEL RAMP SUPPORT SECTION
3/4" = 1'–0"



NOTES:

1. IF PIPE SUPPORTS CANNOT BE DRIVEN INTO ROCK, PIPE CAN BE WELDED TO AN L3X3X3/16"x12"LG ANGLE AND ANCHORED TO TOP OF RIPRAP WITH TWO ¾"ø HILTI–KWIK 3 BOLTS.
2. EEL RAMP NETTING TO BE ENKAMAT 7010 TURF REINFORCEMENT MAT OR EQUAL.

1 / 19 EEL RAMP ELEVATION VIEW
1/2" = 1'–0"

2' 0 2' 4'
SCALE: 1/2" = 1'–0"

EEL FACILITY EQUIPMENT LIST

QUANTITY	ITEM DESCRIPTION	MANUFACTURER
60 feet	Eel Ramp cable tray	Monosystems
1	200-foot roll of Enkamat 7010 Substrate	
1	Overflow tank	Plastic Mart
150 sq-ft	Lexan for tank covers	
4	Dock Ramp	
8	Dock ramp panels	
	TANK DRAINAGE	
4	PVC socketed valve pipe flange	
6	6" X 4" Reducer Coupling	Pentair Ecosystems
30 feet	4" Schedule 40 PVC pipe	Pentair Ecosystems
6	4" Schedule 40 PVC short radius elbow	Pentair Ecosystems
6	4" diameter aluminum quick disconnect fitting	Pentair Ecosystems
6	4" schedule 40 PVC short with male adapter	Pentair Ecosystems
2	3" PVC Bulkhead fitting	Pentair Ecosystems
2	3" PVC gate valve	Pentair Ecosystems
60 feet	4-inch Schedule 40 PVC Pipe	Pentair Ecosystems
10 feet	1-inch Schedule 40 PVC Pipe	Pentair Ecosystems
300 feet	4" Suction Discharge Hose (Model SH8)	Pentair Ecosystems
	OXYGEN/AIR DIFFUSER PIPING	
3	linear piston air pump (SL44B)	Pentair Ecosystems
200 feet	3/4" Vinyl clear tubing for air lines	Pentair Ecosystems
200 feet	1/4" vinyl clear tubing for air lines	Pentair Ecosystems
250 feet	1/4" thick walled rubber tubing for O2	Pentair Ecosystems
50	3/4" polyethylene tubing for airlines	Pentair Ecosystems
200	3/4" hose clamps	Pentair Ecosystems
100	1/4" hose clamps	Pentair Ecosystems
4	O2 bottle regulators	Pentair Ecosystems
4	Reducer from 3/4" to 1/4", prior to splitter	Pentair Ecosystems
3	three way splitters for air lines (needle valves)	Pentair Ecosystems
3	O2 flow meter manifold	Pentair Ecosystems
2	Pump blower boxes with louvers	Pentair Ecosystems
12	Fine pore diffusers (AS300)	Pentair Ecosystems
	SPRAY BAR AND OVERFLOW PIPE	
10 feet	1" PVC solid wall pipe (spray bar)	Pentair Ecosystems
10	1" PVC cap, adapter, ball valve	Pentair Ecosystems
5	3" PVC bulkhead fitting for overflow tank drains	Pentair Ecosystems
	SHADING/EEL PROTECTION	
2	12' X 10' shade cloth (SC70) for eel protection	Pentair Ecosystems
1,250 sq-ft	60% black UV shade cloth over eel facilty	GreenhouseMegastore
	MONITORING EQUIPMENT	
2	3" flow meter	PDIR
6	2" flow meter	PDIR
5	Temperature/DO sensor	PDIR
1	cellular modem	PDIR
2	controller	PDIR
	ADDITIONAL SUPPLIES FOR EEL PROCESSING	
2	Fish measuring board (FMB2)	Pentair Ecosystems
1	Dissecting microscope	Pentair Ecosystems
2	Dissection kit	Pentair Ecosystems
	Digital scale	Pentair Ecosystems
	zip ties	
100	spat bags	Pentair Ecosystems
	Nets of various sizes, small to large	Pentair Ecosystems
2	1,000 ml graduated container	Pentair Ecosystems
2	2,000 ml graduated container	Pentair Ecosystems
5	brushes, bottle, hose, pipe, long handle	Pentair Ecosystems

DATE	#		BY	APP

DRAWN BY: ALR CHECKED BY: HNN APPROVED BY: DAG
GSE PROJECT NO.: 1714 DATE: 2/17/2017

Exelon
EXELON GENERATION COMPANY, LLC

CONOWINGO EEL PASSAGE

GOMEZ AND SULLIVAN ENGINEERS
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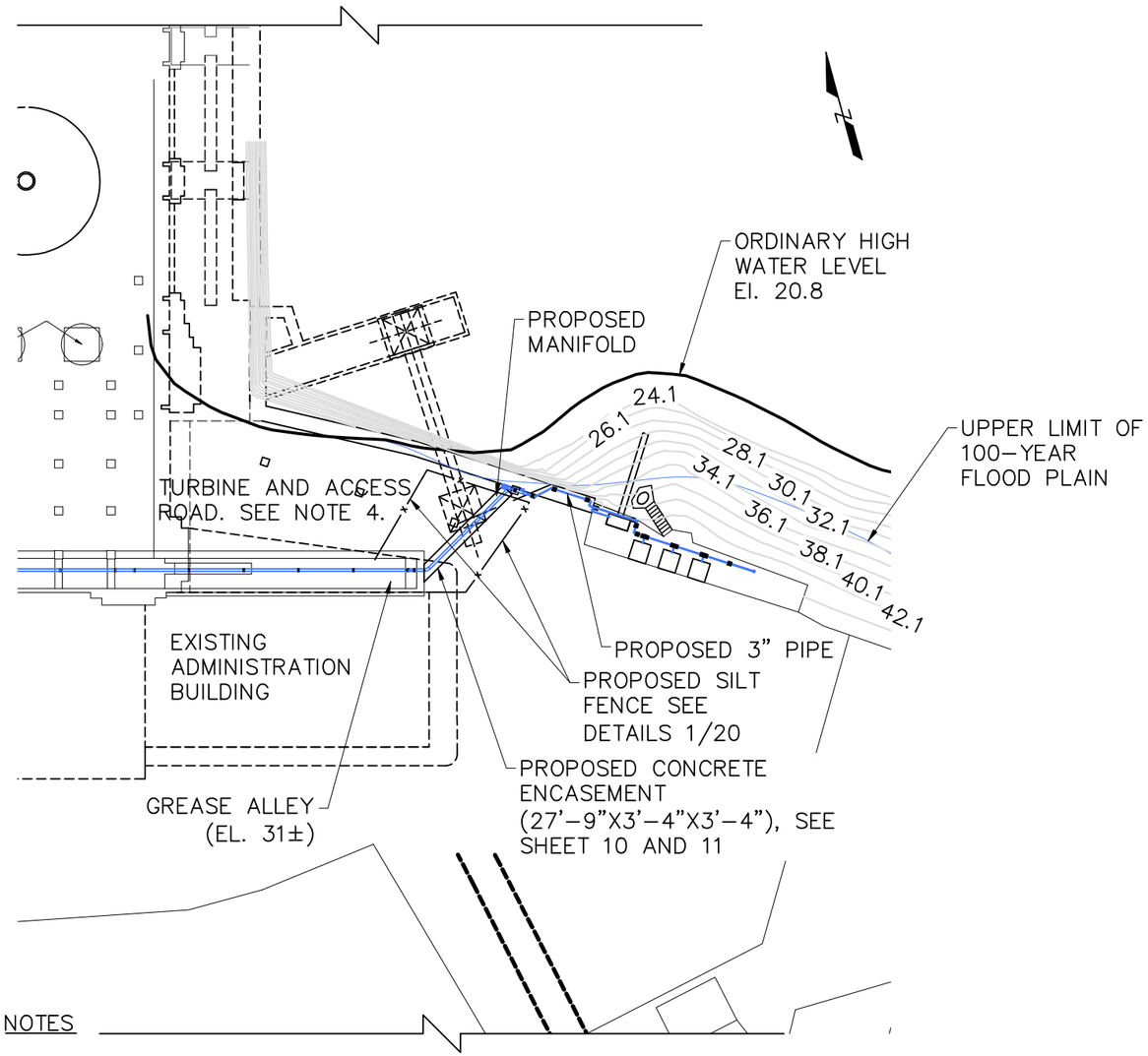
www.gomezandsullivan.com

EEL RAMP ELEVATION AND PIPE SUPPORT DETAILS

SCALE: AS NOTED DRAWING NO.: 19

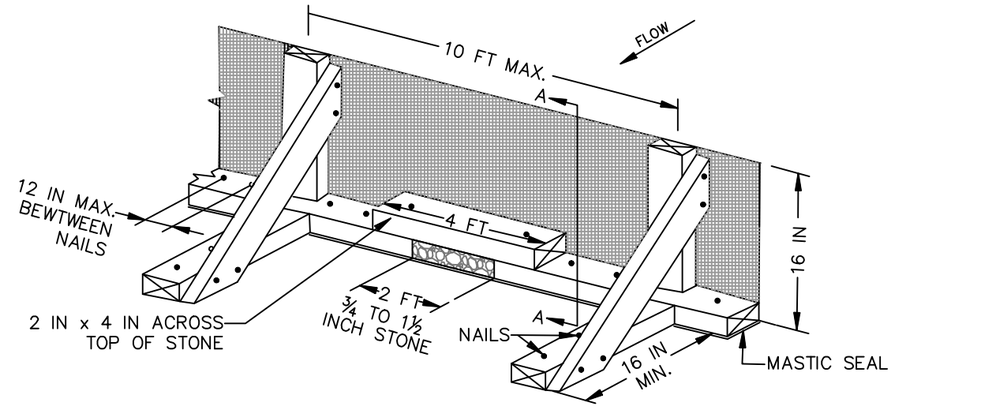


NOTES

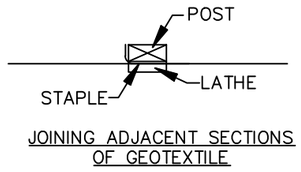
1. ELEVATIONS SHOWN ARE CONOWINGO DAM DATUM (0.7 FEET LOWER THAN NGVD 29 AND 0.14 FEET HIGHER THAN NAVD 88)
2. MAXIMUM SUPPORT SPACING SHALL BE 18 FEET FOR 8" PIPE AND 12 FEET FOR 3" PIPE. WHERE POSSIBLE THERE SHALL BE A SUPPORT AT EACH END OF AN ELBOW/BEND. ALL VERTICAL SUPPORTS SHALL BE SADDLE-SHAPED AND SHALL HAVE A MINIMUM CAPACITY OF 1500 LB. SEE SHEET 12 FOR TYPICAL SUPPORT DETAILS.
3. CONTRACTOR SHALL REMOVE EXISTING 3" PIPE THAT EXISTS ALONG THE ALIGNMENT OF THE PROPOSED 8" PIPE. AVOID OR MOVE OTHER PIPES UPON EXELON'S APPROVAL.
4. LOCATE AND PROTECT EXISTING BURIED DRAINS BENEATH TURBINE ACCESS ROAD (SEE EXISTING P.E. CO. DRAWING H-80531). RAILROAD TIES AND TRACKS MAY ALSO BE BURIED UNDER TURBINE ACCESS ROAD. IF ENCOUNTERED, AND PENDING SHPO CONSULTATION, THE RAILS AND TIES SHALL BE PRESERVED IN PLACE.

20' 0 20' 40'

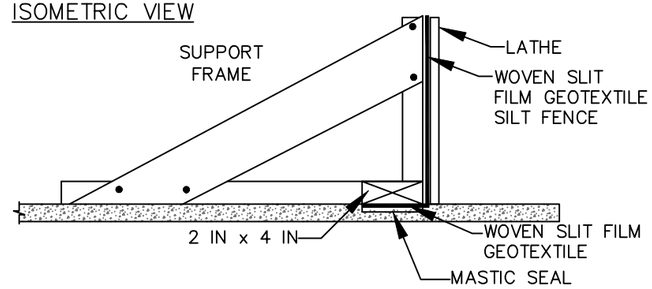
SCALE: 1" = 20'-0"



ISOMETRIC VIEW



JOINING ADJACENT SECTIONS OF GEOTEXTILE



SECTION A-A

1/20 SILT FENCE
Scale: 1"=1'

CONSTRUCTION SPECIFICATIONS

1. USE NOMINAL 2 INCH X 4 INCH LUMBER.
2. USE WOVEN SLIT FILM GEOTEXTILE, AS SPECIFIED IN SECTION H-1 MATERIALS.
3. PROVIDE MANUFACTURER CERTIFICATION TO THE AUTHORIZED REPRESENTATIVE OF THE INSPECTION/ENFORCEMENT AUTHORITY SHOWING THAT THE GEOTEXTILE USED MEETS THE REQUIREMENTS IN SECTION H-1 MATERIALS.
4. SPACE UPRIGHT SUPPORTS NO MORE THAN 10 FEET APART.
5. PROVIDE A TWO FOOT OPENING BETWEEN EVERY SET OF SUPPORTS AND PLACE STONE IN THE OPENING OVER GEOTEXTILE.
6. KEEP SILT FENCE TAUT AND SECURELY STAPLE TO THE UPSLOPE SIDE OF UPRIGHT SUPPORTS. EXTEND GEOTEXTILE UNDER 2x4.
7. WHERE TWO SECTIONS OF GEOTEXTILE ADJOIN: OVERLAP, FOLD, AND STAPLE TO POST IN ACCORDANCE WITH THIS DETAIL. ATTACH LATHE.
8. PROVIDE A MASTIC SEAL BETWEEN PAVEMENT, GEOTEXTILE, AND 2x4 TO PREVENT SEDIMENT-LADEN WATER FROM ESCAPING BENEATH SILT FENCE INSTALLATION.
9. SECURE BOARDS TO PAVEMENT WITH 40D 5 INCH MINIMUM LENGTH NAILS.
10. REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP IN SILT FENCE OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT. REPLACE GEOTEXTILE IF TORN. MAINTAIN WATER TIGHT SEAL ALONG BOTTOM. REPLACE STONE IF DISPLACED.

DATE	#		BY	APP

DRAWN BY: ALR CHECKED BY: HNN APPROVED BY: DAG
GSE PROJECT NO.: 1714 DATE: 2/17/2017

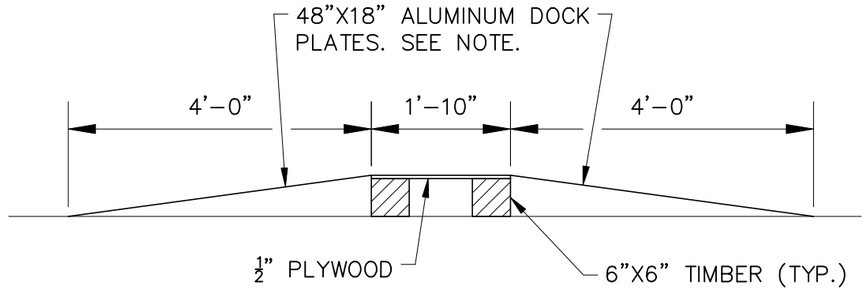
Exelon
EXELON GENERATION COMPANY, LLC

CONOWINGO EEL PASSAGE

GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
www.gomezandsullivan.com

SITE AND SEDIMENT AND EROSION CONTROL PLAN AND DETAILS

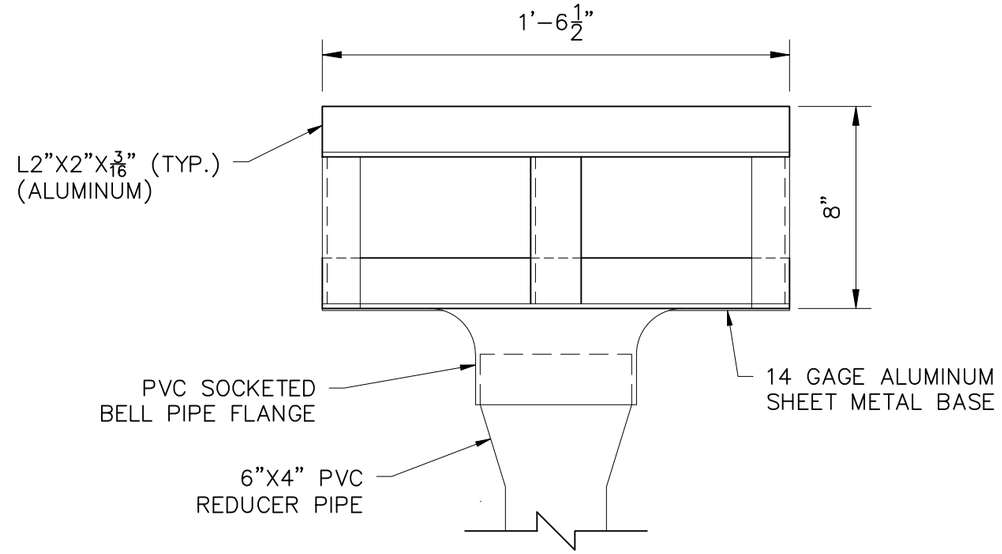
SCALE: AS NOTED DRAWING NO.: 20



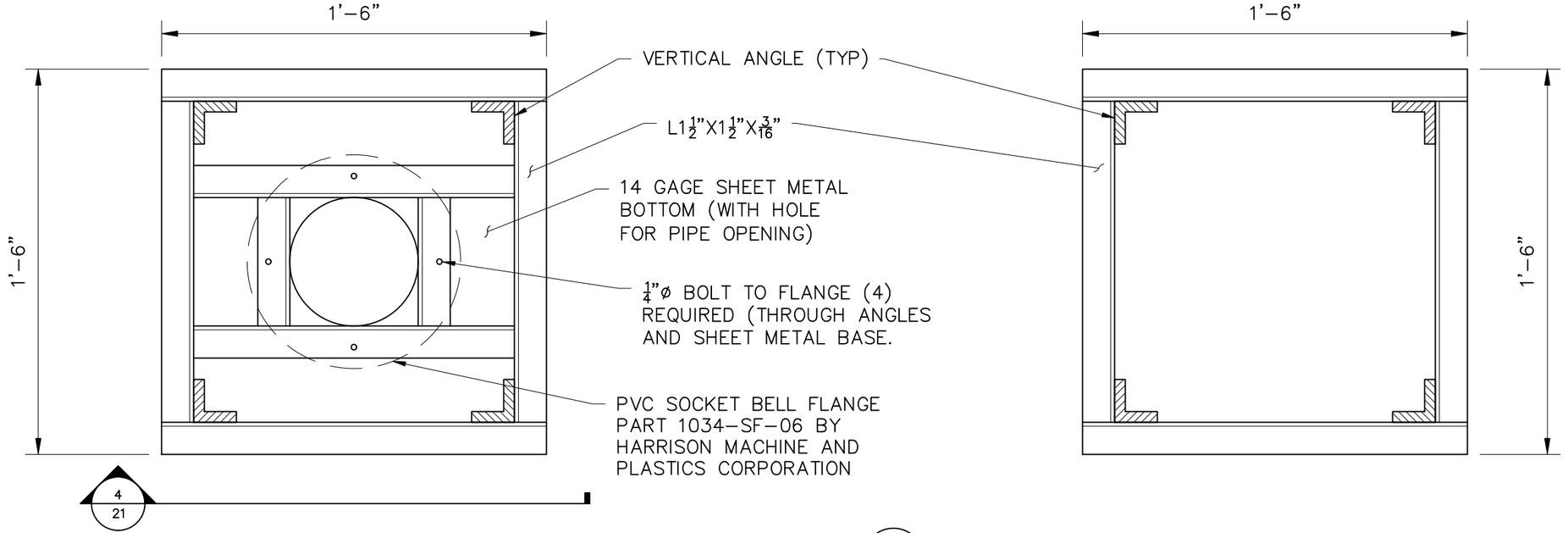
NOTE: PROVIDE 48"X18"X7" ALUMINUM HAND TRUCK DOCK PLATE RATED 500 LBS BY GLOBAL INDUSTRIES OR OR EQUAL. ANCHOR TO 6X6 TIMBERS WITH (4) ¼"ø ROUND HEADED LAG SCREEN. (PROVIDE 4 RAMPS – 8 PANELS.)

1 / 21 DETAIL
Scale: 1" = 1 '– 0"

1' 0 1' 2'
SCALE: 1" = 1'–0"



4 / 21 HOLDING TANK FILTER ELEVATION VIEW
Scale: 4" = 1 '– 0"



2 / 21 HOLDING TANK FILTER LOWER FRAMING PLAN
Scale: 4" = 1 '– 0"

3 / 21 HOLDING TANK FILTER UPPER FRAMING PLAN
Scale: 4" = 1 '– 0"

NOTES:
1. 1MM FILTER SCREEN TO BE WRAPPED AROUND AND FASTENED TO THE FILTER FRAME.
2. DO NOT LIFT OR PRY FRAME FROM EXTERIOR EDGES. LIFT FROM SOCKETED BELL PIPE FLANGE.
3. PROVIDE (4) FRAME STRUCTURES.

3' 0 3' 6'
SCALE: 4" = 1'–0"

DATE	#		BY	APP

DRAWN BY: ALR CHECKED BY: HNN APPROVED BY: DAG
GSE PROJECT NO.: 1714 DATE: 2/17/2017

Exelon
EXELON GENERATION COMPANY, LLC

CONOWINGO EEL PASSAGE

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MISCELLANEOUS DETAILS

SCALE: AS NOTED DRAWING NO.: 21

APPENDIX B. OCTORARO CREEK EEL COLLECTION FACILITY DRAWINGS

LITTLE BRITAIN TWP.
LANCASTER COUNTY

APPROX. MUNICIPAL BOUNDARY LINE

LOWER OXFORD TWP.
CHESTER COUNTY

OCTORARO CREEK

Existing Dam

EXIST. 1 HP SUBMERSIBLE PUMP CONTAINED WITHIN 1MM MESH SCREENED BARREL

EDGE OF WATER

APPROX. ORDINARY HIGH WATER MARK

Stone Steps

Top Steps
Elev.=253.99

100-YEAR FLOOD PLAIN (ZONE A)

Existing 1 ½ Story Stone Art Building

Wood Ramp

Shed

APPROX. QUIESCENT POOL

APPROX. SHORELINE EL. 237.0
(SURVEYED MAY 2019)

EXIST. FENCE

ELECTRICAL PANEL

FIRST FLOOR
EL. 254.55±

Steps

Survey Control Point
Traverse Nail
Elev.=264.17

EXISTING EEL RAMP (SEE R1)

17'-6"

3'-4"

17'-2"

5'-7"

1'-4"

1'-10"

1'-5"

2"

1'-3"

5'

(2) VERTICAL 45° BENDS

Conc. Pad With Art Piece

45° BEND

EXIST. 6" PVC

EXIST. BURIED 2" WATER LINE WITH ADJACENT 2" CONDUIT FOR ELECTRIC (INSIDE PVC PIPING)

SEE BENCHMARK NOTES

APPROX. ORDINARY HIGH WATER MARK
EL. 238.5

Exist. Eroded Area

Sign
Danger
Dam

EXIST. 8" PVC (TO BE REROUTED TO PROPOSED LOCATION)

SCAFFOLDING STRUCTURE

Guy Wire

Underground Electric

EXIST. UTILITY POLES

EXIST. EEL COLLECTION TANK
(APPROX. 85 GALLONS) SEE R1

SCAFFOLDING STRUCTURE

BURIED TAILRACE CENTERLINE

15' BURIED TAILRACE BUFFER

EXIST. GRAVEL DRIVE

OH

UE

240

245

250

255

260

265

NOTES:
1. THE DIMENSIONS NOTED ARE AS MEASURED IN THE FIELD.

BENCHMARK NOTES:
SOUTHEAST CORNER OF CONCRETE PAD
ELEV. = 252.64 FT
NORTHING = 172329.0 FT
EASTING = 2447865.2 FT
VERTICAL DATUM: NAVD88
HORIZONTAL DATUM: NAD83
PA SOUTH ZONE

LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- EDGE OF WATER
- ORDINARY HIGH WATER MARK
- FEMA 100-YEAR FLOODPLAIN
- OH — OVERHEAD ELECTRIC LINE
- UE — UNDERGROUND ELECTRIC LINE
- x — FENCE
- SURVEY CONTROL POINT
- UTILITY POLE
- BENCHMARK

5' 0 5' 10'
SCALE: 1" = 5'

ISSUE	DESCRIPTION	BY	APP

DRAWN BY: JSC
CHECKED BY: HNN
APPROVED BY:
PROJECT NO. 1714 DATE: 4/6/2021

OCTORARO CREEK EEL COLLECTION FACILITY

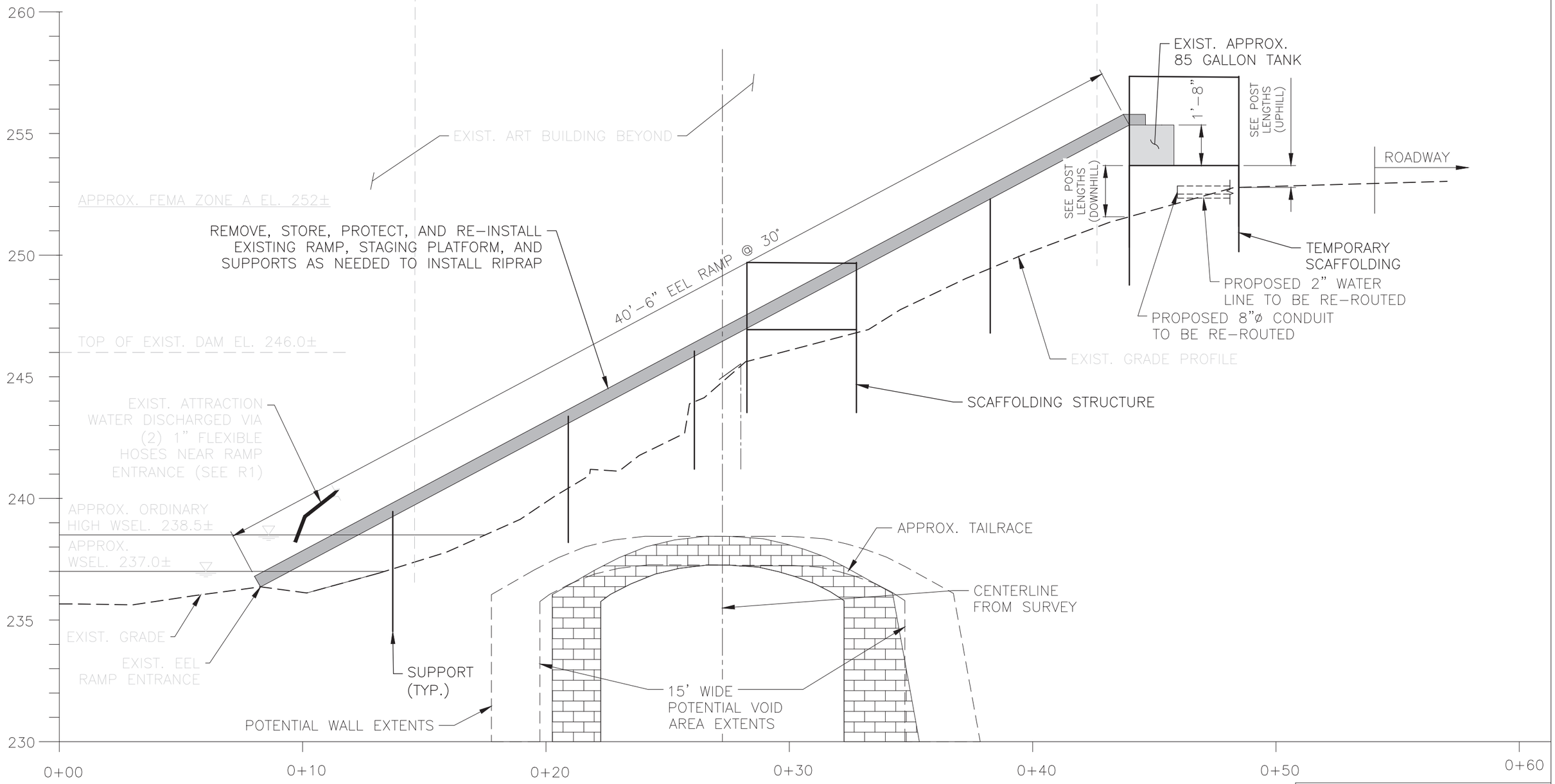
TEMPORARY FACILITY PLAN

Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348

Gomez and Sullivan Engineers, D.P.C.
288 Genesee Street
Utica, NY 13502

SCALE: 1" = 5' (34"x22")

DRAWING: OCTORARO



1/2 PROFILE
Scale: 1" = 2'-0"

NOTES:
1. THE DIMENSIONS NOTED ARE AS MEASURED IN THE FIELD.

SCAFFOLDING POST LENGTHS:
1. UPSTREAM DOWNHILL = 1'-4"
2. DOWNSTREAM DOWNHILL = 3'-6"
3. UPSTREAM UPHILL = 2'-3"
4. DOWNSTREAM UPHILL = 11"

2' 0 2' 4'
SCALE: 1" = 2'

OCTORARO CREEK EEL COLLECTION FACILITY

TEMPORARY FACILITY PROPOSED PROFILE

ISSUE	DESCRIPTION	BY	APP

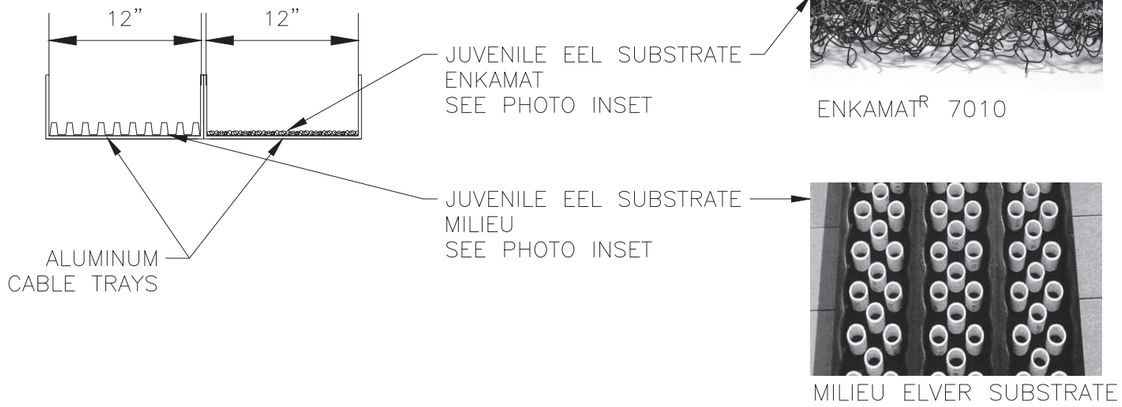
DRAWN BY: JSC
CHECKED BY: HNN
APPROVED BY:
PROJECT NO. 1714 DATE: 4/6/2021

Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348

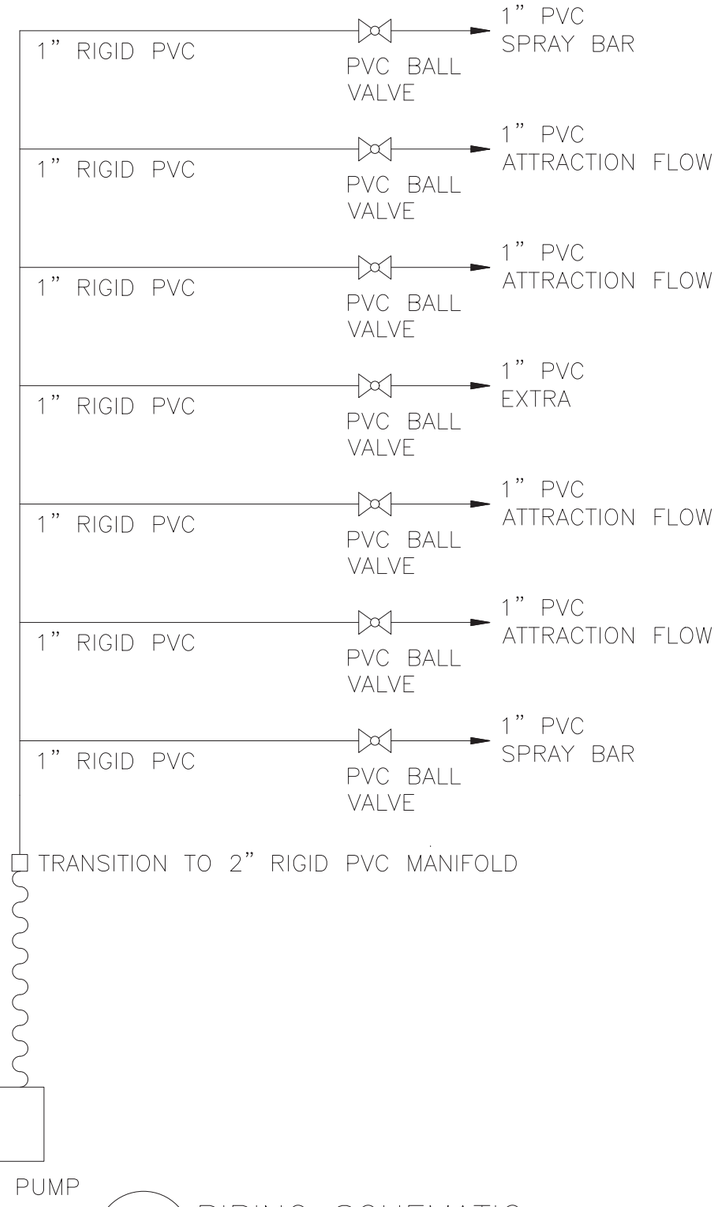
Gomez and Sullivan Engineers, D.P.C.
288 Genesee Street
Utica, NY 13502

SCALE: 1" = 2' (34"x22")

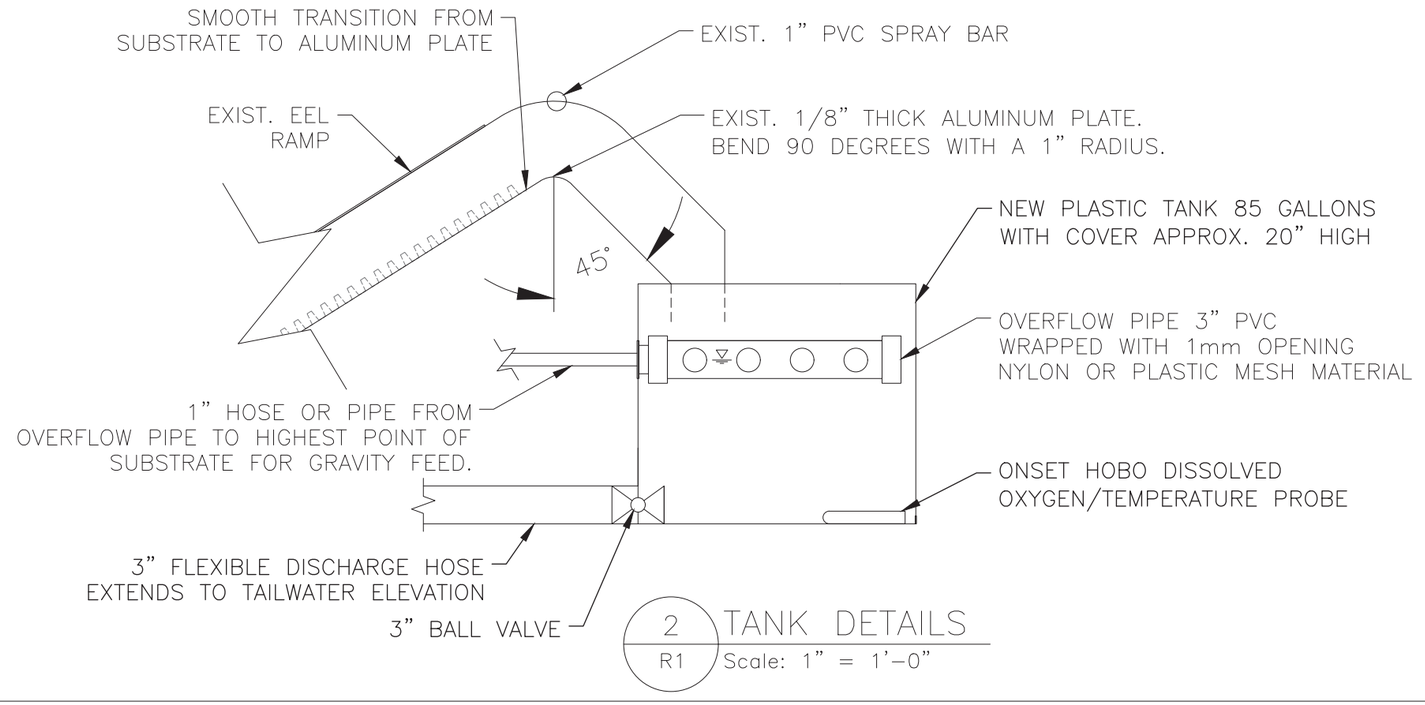
DRAWING: OCTORARO 2 OF 2



1 / R1 EEL RAMP SECTION (TYPICAL)
Scale: 1" = 1'-0"



3 / R1 PIPING SCHEMATIC
Scale: NTS



2 / R1 TANK DETAILS
Scale: 1" = 1'-0"

2' 0 1' 2'
SCALE: 1" = 1'

ISSUE	DESCRIPTION	BY	APP

DRAWN BY: JSC
CHECKED BY: HNN
APPROVED BY:
PROJECT NO. 1714 DATE: 4/6/2021

OCTORARO CREEK EEL COLLECTION FACILITY

TYPICAL EEL LADDER SECTION AND DETAILS (DONE BY OTHERS)

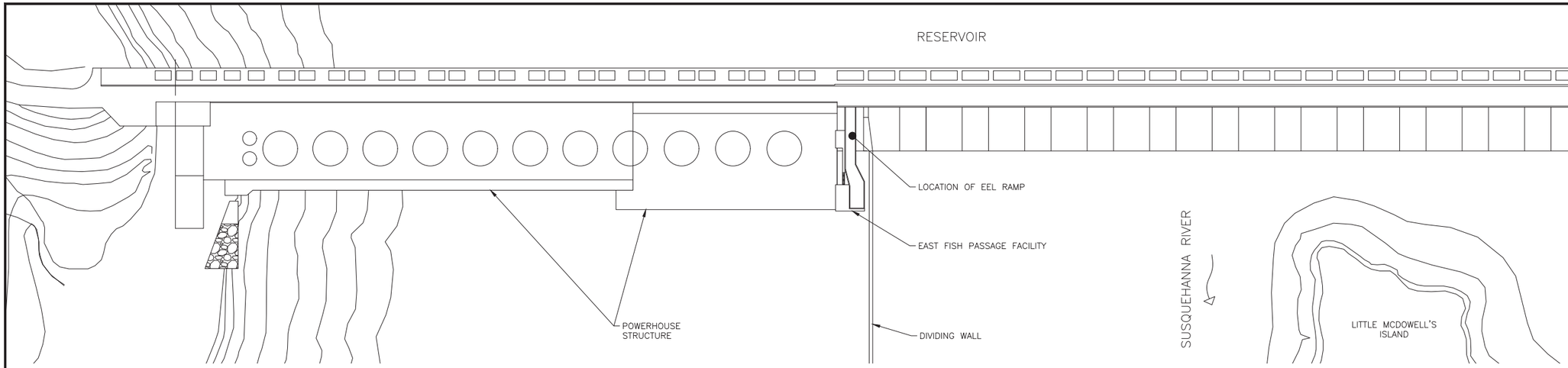
Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348

Gomez and Sullivan Engineers, D.P.C.
288 Genesee Street
Utica, NY 13502

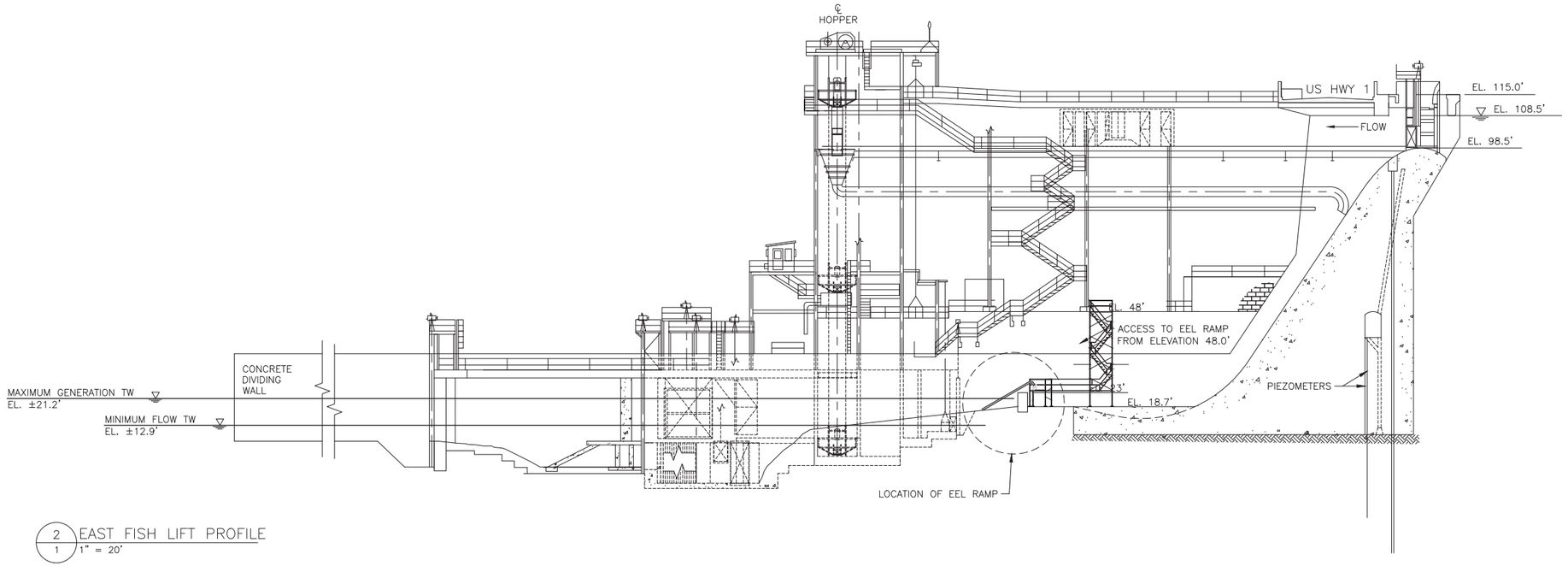
SCALE: AS SHOWN (34"X22") | DRAWING: OCTORARO | R1

APPENDIX C. CONOWINGO EAST EEL COLLECTION FACILITY DRAWINGS

NOTE: ALL ELEVATIONS ARE IN CONOWINGO DATUM



1/1 CONOWINGO DAM PLAN
1" = 1000'



2/1 EAST FISH LIFT PROFILE
1" = 20'

PRELIMINARY DRAWINGS
TO BE REVISED PENDING FINALIZATION OF EAST FISH LIFT MODIFICATIONS FOOTPRINT

NO.	DATE	DESCRIPTION	BY	APP
1	5/22/20	CONCEPTUAL CONOWINGO EFL EEL FACILITIES	BAS	-

FOR: Exelon, EXELON GENERATION COMPANY, LLC
BY: GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
www.gomezandsullivan.com

DESIGNED BY:	BAS
DRAWN BY:	BAS
CHECKED BY:	HNN
APPROVED BY:	-
PROJECT NO.:	2132
DATE:	4/15/2021

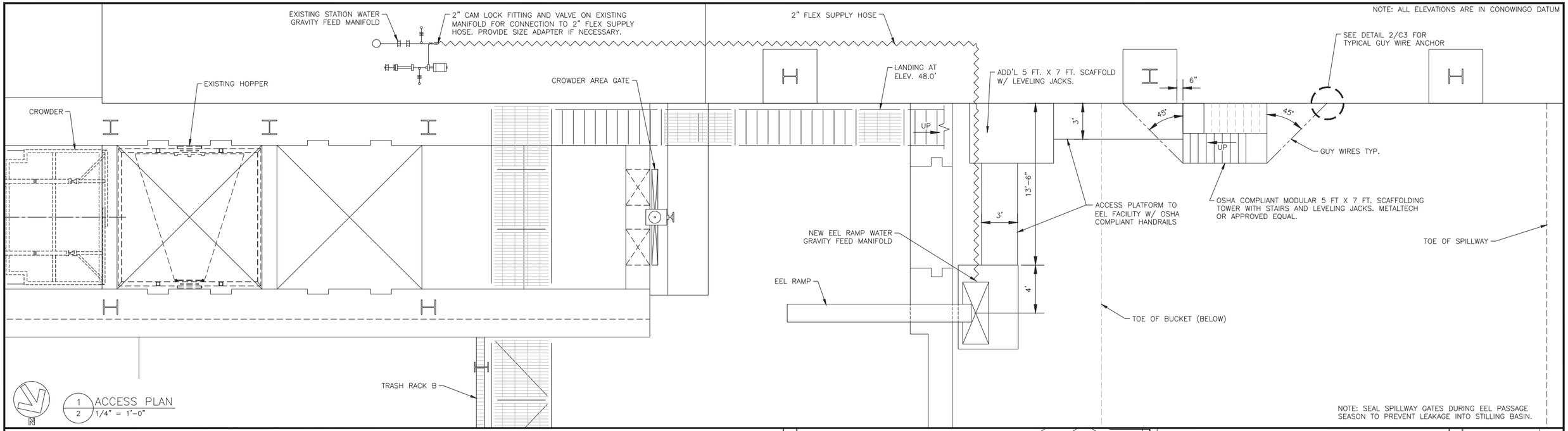
CONOWINGO EAST EEL COLLECTION FACILITY

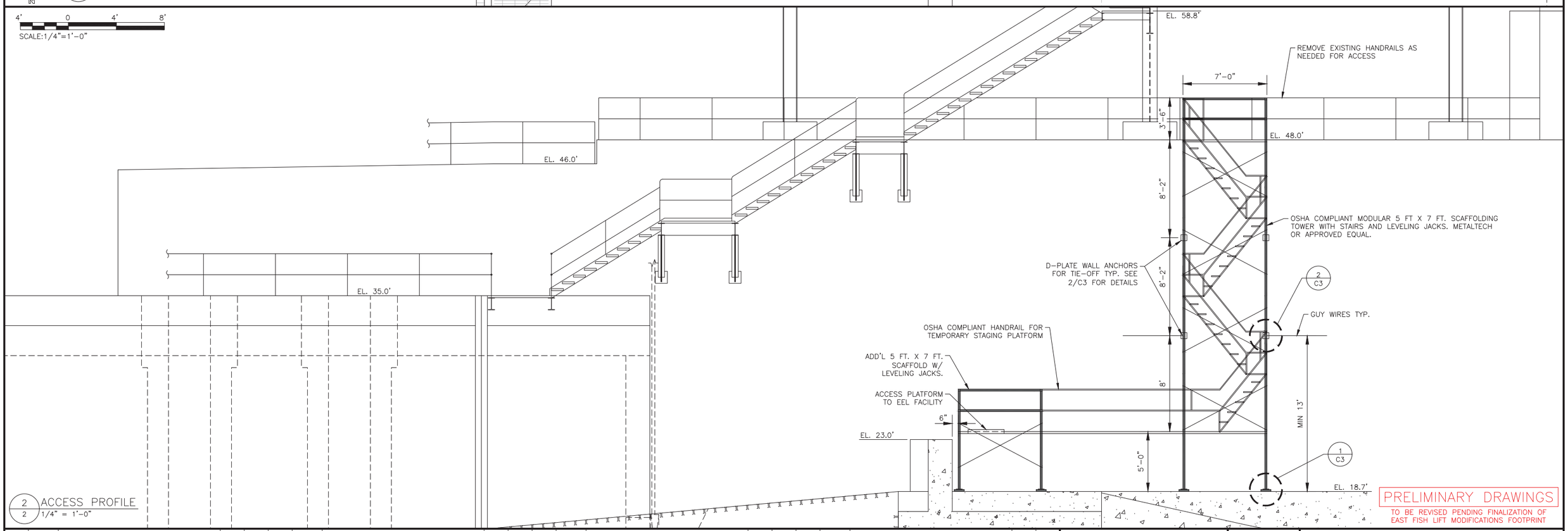
PROPOSED EEL RAMP LOCATION AND PROFILE

SCALE: AS NOTED

DRAWING NO.: 1

NOTE: ALL ELEVATIONS ARE IN CONOWINGO DATUM





PRELIMINARY DRAWINGS

TO BE REVISED PENDING FINALIZATION OF EAST FISH LIFT MODIFICATIONS FOOTPRINT

NO.	DATE	DESCRIPTION	BY	APP
1	5/22/20	CONCEPTUAL CONOWINGO EFL EEL FACILITIES	BAS	-

FOR: Exelon, EXELON GENERATION COMPANY, LLC

BY: GOMEZ AND SULLIVAN ENGINEERS, Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH, www.gomezandsullivan.com

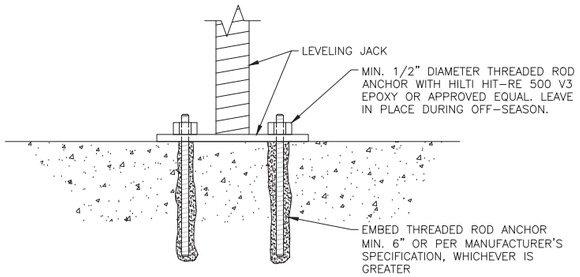
DESIGNED BY:	BAS
DRAWN BY:	BAS
CHECKED BY:	HNN
APPROVED BY:	-
PROJECT NO.:	2132
DATE:	4/15/2021

CONOWINGO EAST EEL COLLECTION FACILITY

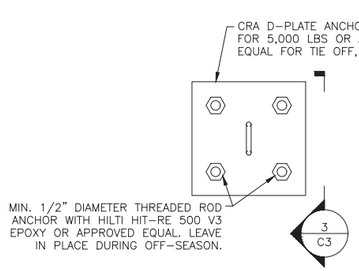
PROPOSED EEL RAMP ACCESS

SCALE: 1/4" = 1'-0" | DRAWING NO.: 2

NOTE: ALL ELEVATIONS ARE IN CONOWINGO DATUM

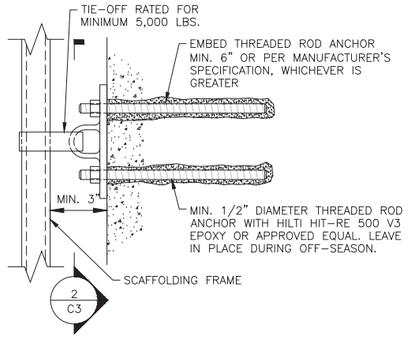


1 / C3 LEVELING JACK ANCHORS
NOT TO SCALE

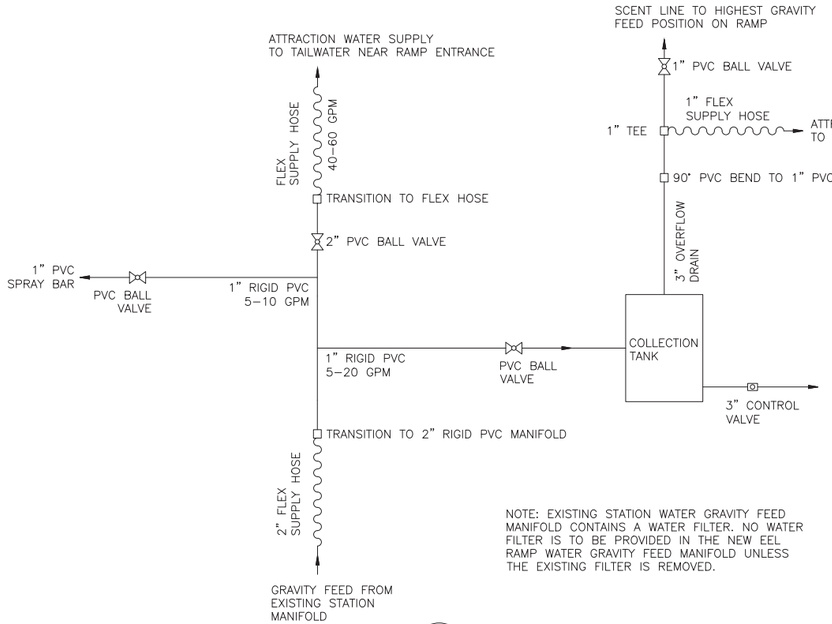


2 / C3 D-PLATE ANCHOR ELEVATION
NOT TO SCALE

NOTE: PROVIDE SIMILAR ANCHOR POINT FOR GUY WIRES



2 / C3 D-PLATE ANCHOR SECTION
NOT TO SCALE



4 / C3 PIPING SCHEMATIC
NO SCALE

PRELIMINARY DRAWINGS
TO BE REVISED PENDING FINALIZATION OF EAST FISH LIFT MODIFICATIONS FOOTPRINT

NO.	DATE	DESCRIPTION	BY	APP
1	5/22/20	CONCEPTUAL CONOWINGO EFL EEL FACILITIES	BAS	-

FOR: Exelon, EXELON GENERATION COMPANY, LLC

BY: GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
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DESIGNED BY:	BAS
DRAWN BY:	BAS
CHECKED BY:	HNN
APPROVED BY:	-
PROJECT NO.:	2132
DATE:	4/15/2021

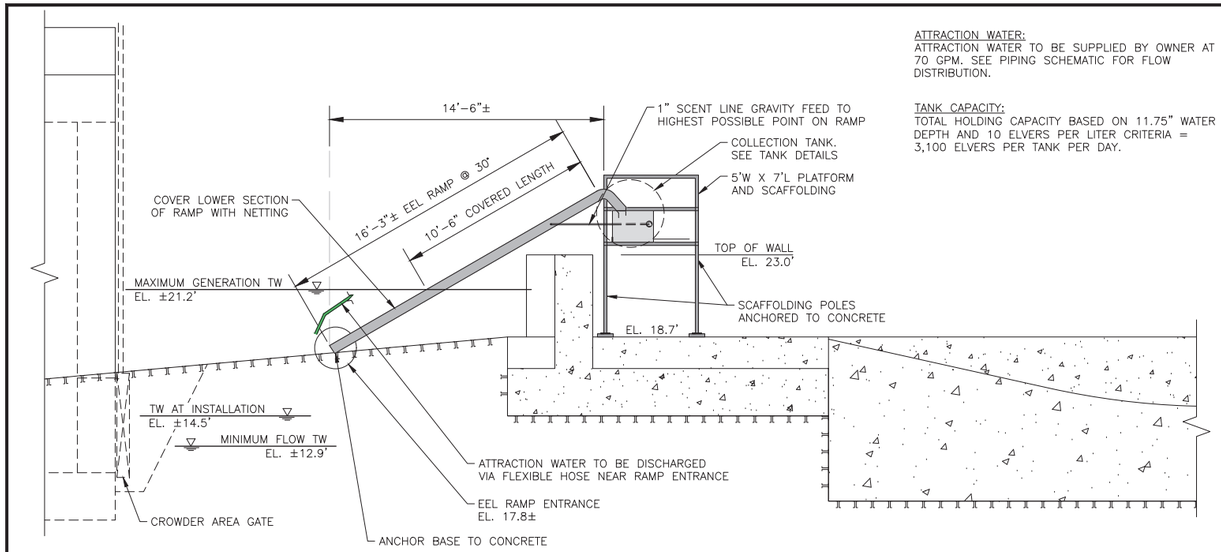
CONOWINGO EAST EEL COLLECTION FACILITY

ANCHORING AND PIPING DETAILS

SCALE: AS NOTED

DRAWING NO.: 3

NOTE: ALL ELEVATIONS ARE IN CONOWINGO DATUM

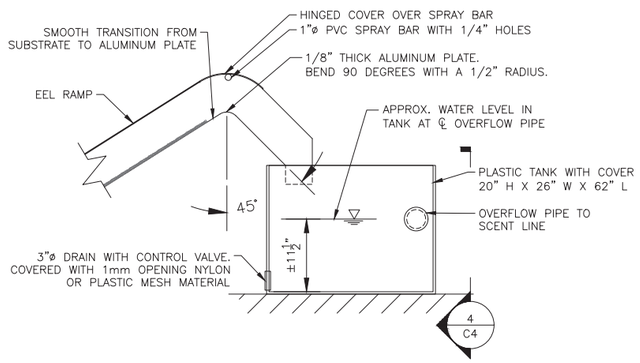


1 C4 EEL RAMP PROFILE
1/4" = 1'-0"

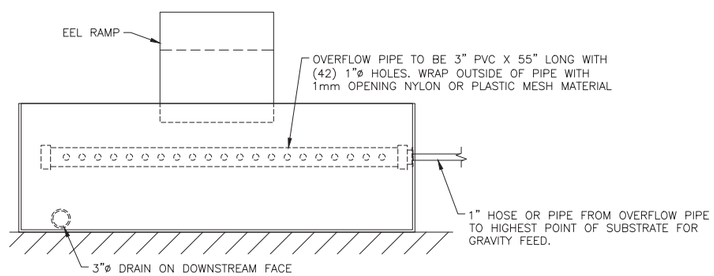
ATTRACTION WATER:
ATTRACTION WATER TO BE SUPPLIED BY OWNER AT 70 GPM. SEE PIPING SCHEMATIC FOR FLOW DISTRIBUTION.

TANK CAPACITY:
TOTAL HOLDING CAPACITY BASED ON 11.75" WATER DEPTH AND 10 ELVERS PER LITER CRITERIA = 3,100 ELVERS PER TANK PER DAY.

2 C4 EEL RAMP SECTION
1"=1'-0"



3 C4 COLLECTION TANK DETAILS
1" = 1'-0"



4 C4 COLLECTION TANK SECTION
1" = 1'-0"

PRELIMINARY DRAWINGS
TO BE REVISED PENDING FINALIZATION OF EAST FISH LIFT MODIFICATIONS FOOTPRINT

NO.	DATE	DESCRIPTION	BY	APP
1	5/22/20	CONCEPTUAL CONOWINGO EFL EEL FACILITIES	BAS	-

FOR: EXELON GENERATION COMPANY, LLC
BY: GOMEZ AND SULLIVAN ENGINEERING
Williamsville, NY • Utica, NY • Albany, NY • Honniker, NH
www.gomezandsullivan.com

DESIGNED BY:	BAS
DRAWN BY:	BAS
CHECKED BY:	HNN
APPROVED BY:	-
PROJECT NO.:	2132
DATE:	4/15/2021

CONOWINGO EAST EEL COLLECTION FACILITY

EEL RAMP DETAILS

SCALE: AS NOTED

DRAWING NO.: 4

APPENDIX D. ANNOTATED CONOWINGO EAST EEL COLLECTION FACILITY DESIGN PRESENTATION

Conowingo Hydroelectric Facility
and
Muddy Run Pumped Storage Project

FERC Project Nos. 405 and 2355

Eel Passage Advisory Group (EPAG) Teleconference

Remote Meeting
October 15, 2020, 2:00 pm to 3:30 pm

Exelon Generation®

Agenda

Review East Fish Lift (EFL) Temporary Eel Facility Design

Review EFL Temporary Eel Facility Drawings and photos of existing structure

Questions and 3D model presentation

Source: NYSDEC Wiki Commons

EFL Eel Facility Design

Water Levels (Conowingo Datum)

- Based on 5% and 95% exceedance flows during passage season (June 1 – November 30)
- Minimum Tailwater (95% exceedance) = El. 12.79’
- Maximum Tailwater (5% exceedance) = El. 21.17’

Eel Ramp

- 18-inches wide, 30° slope, approx. 16’-3” length
- Enkamat substrate, throughout ramp and along concrete to low water level
- Solid cover above max. water level and netting along the remainder
- Ramp entrance elevation = El. 17.8’ +/-

EFL Eel Facility Design (cont.)

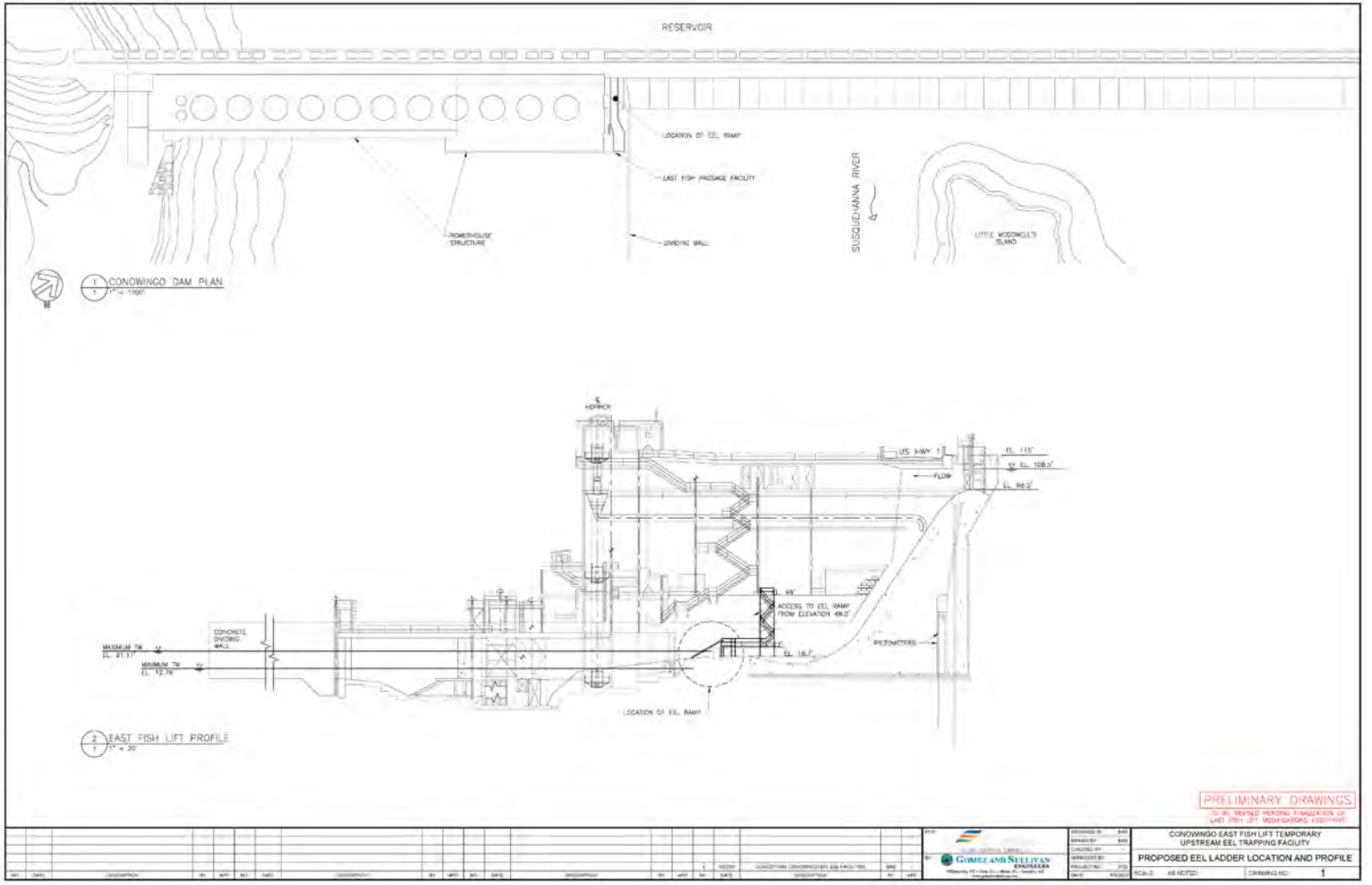
Collection Tank

- Approximately 80-gallon capacity (3100 eels @ 10 eels per liter)
- 11.75-inch +/- water depth

Water Supply

- 1-inch PVC spray bar
- Scent line from tank to highest gravity fed position on ramp
- Overflow line from tank to base of ramp.

EFL Eel Facility Drawings (pg. 1)



Exelon Generation

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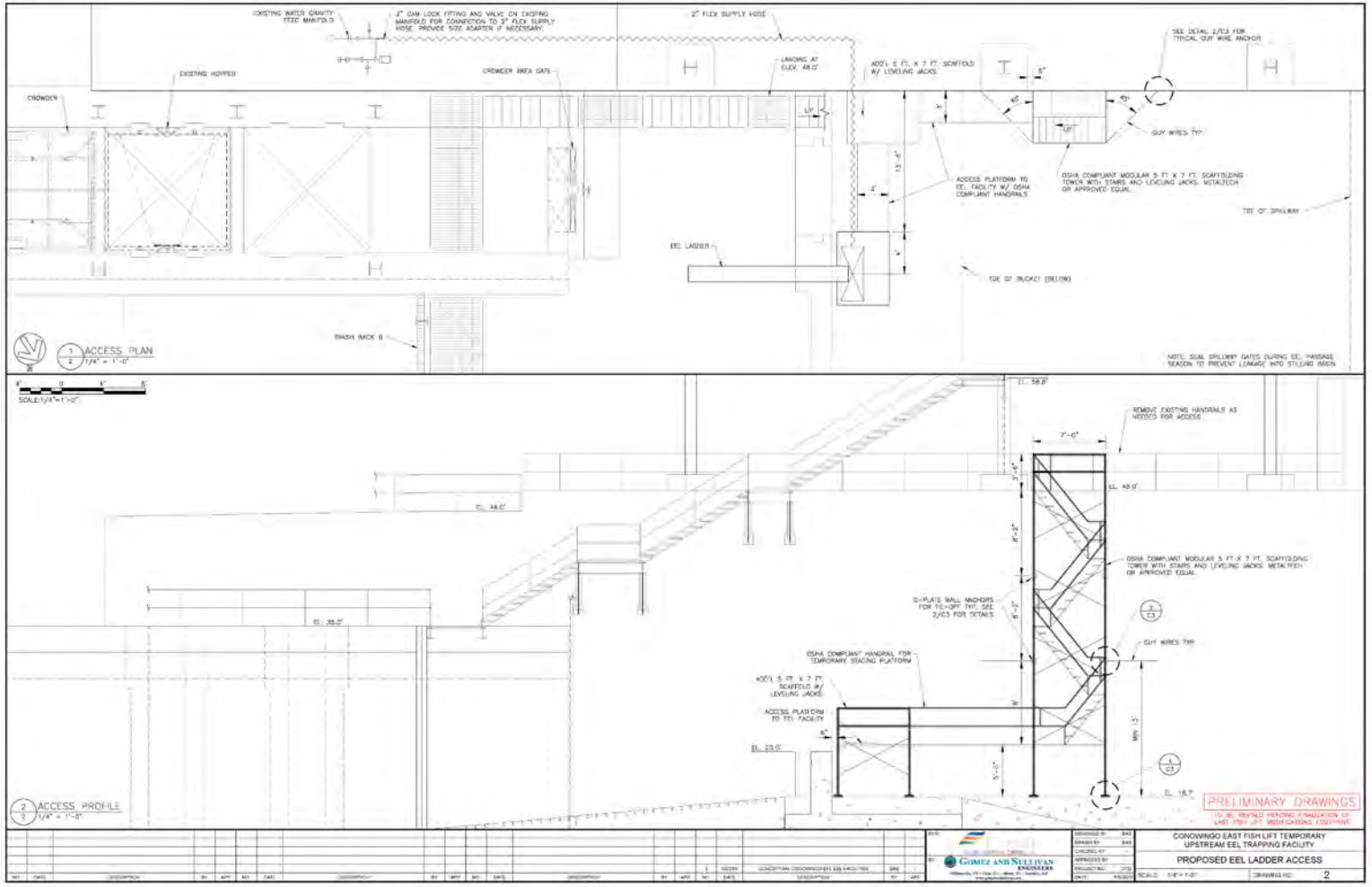
EFL Eel Facility Drawings (pg. 2)



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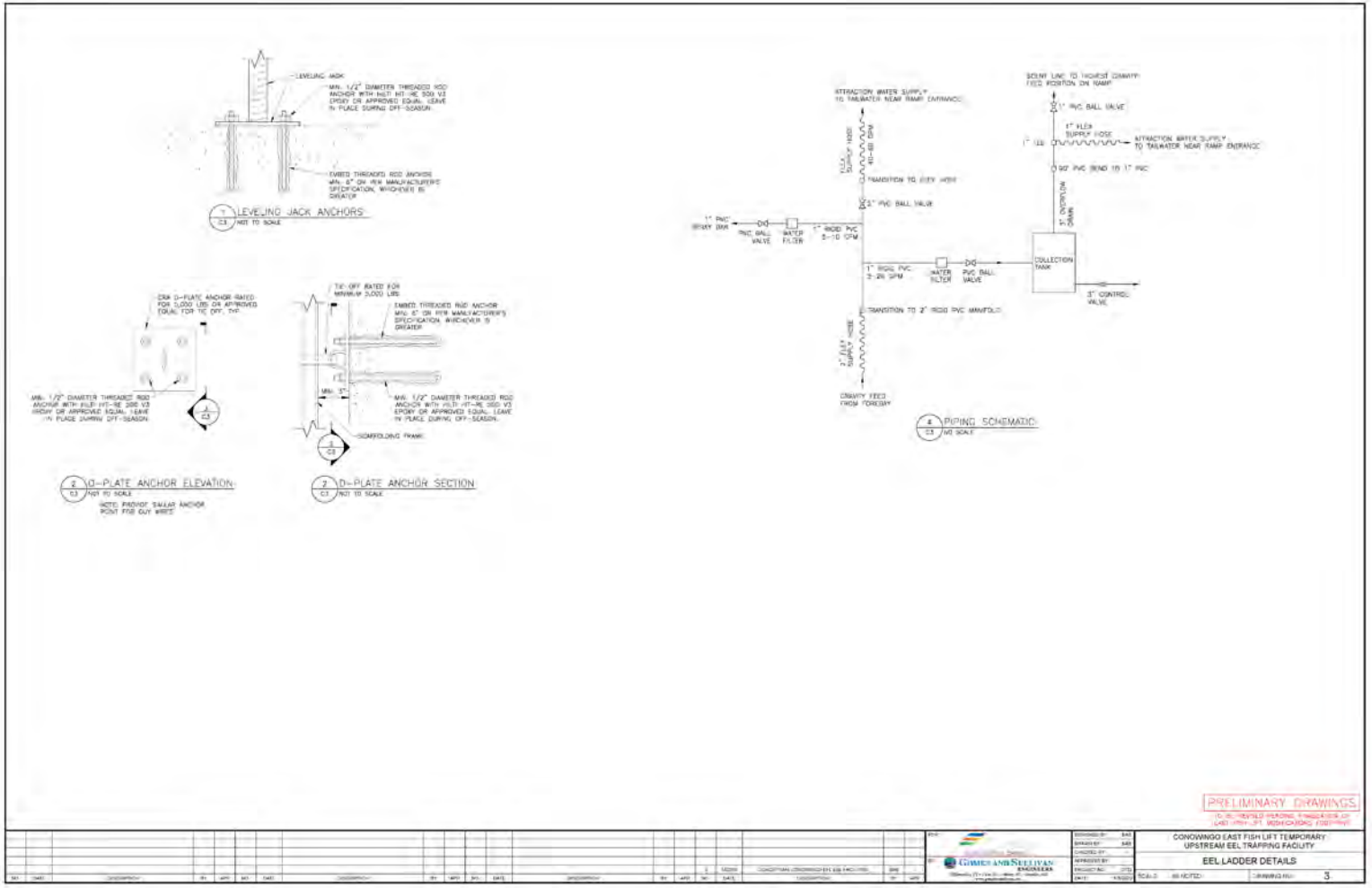
Gomez and Sullivan Engineers

EFL Eel Facility Drawings (pg. 3)



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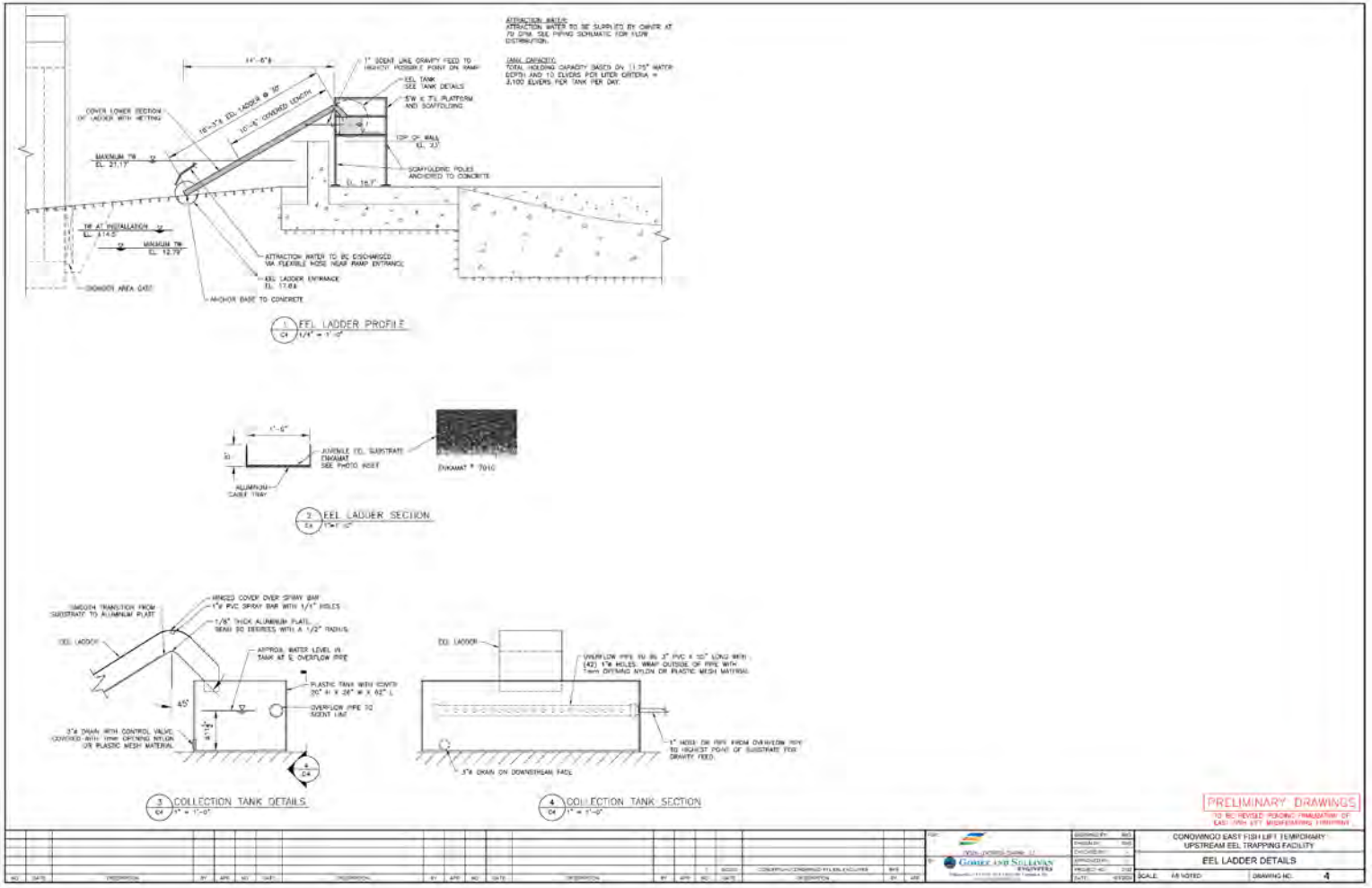
Gomez and Sullivan Engineers

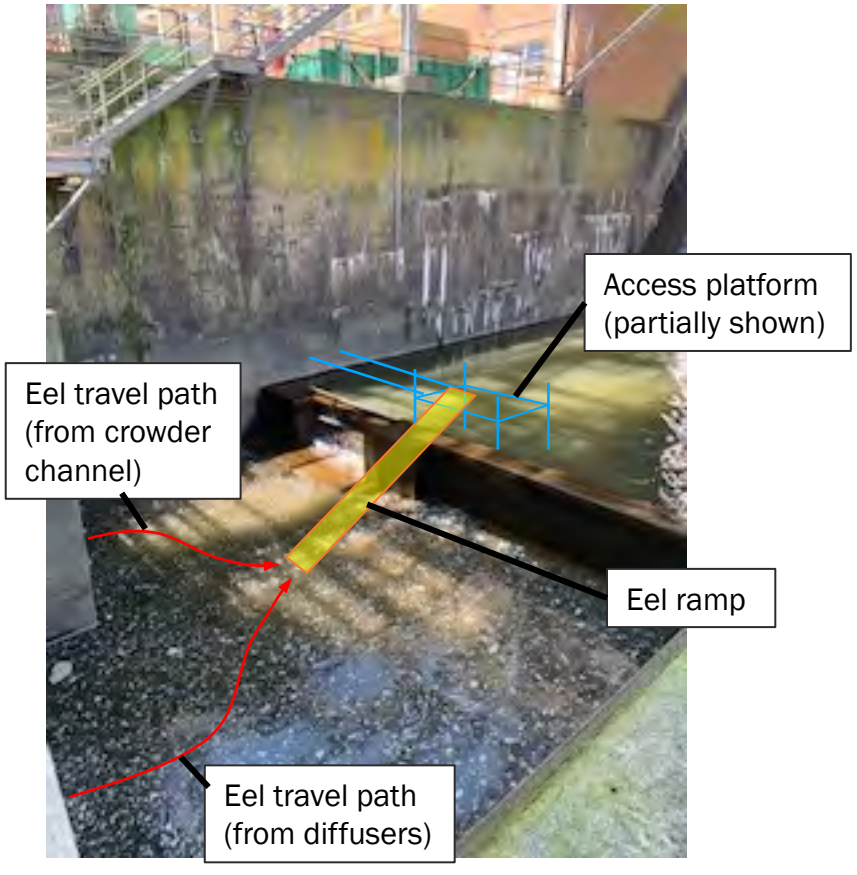
EFL Eel Facility Drawings (pg. 4)



Exelon Generation

GOMEZ AND SULLIVAN ENGINEERS

East Fish Lift Photos



Dissipation Wall

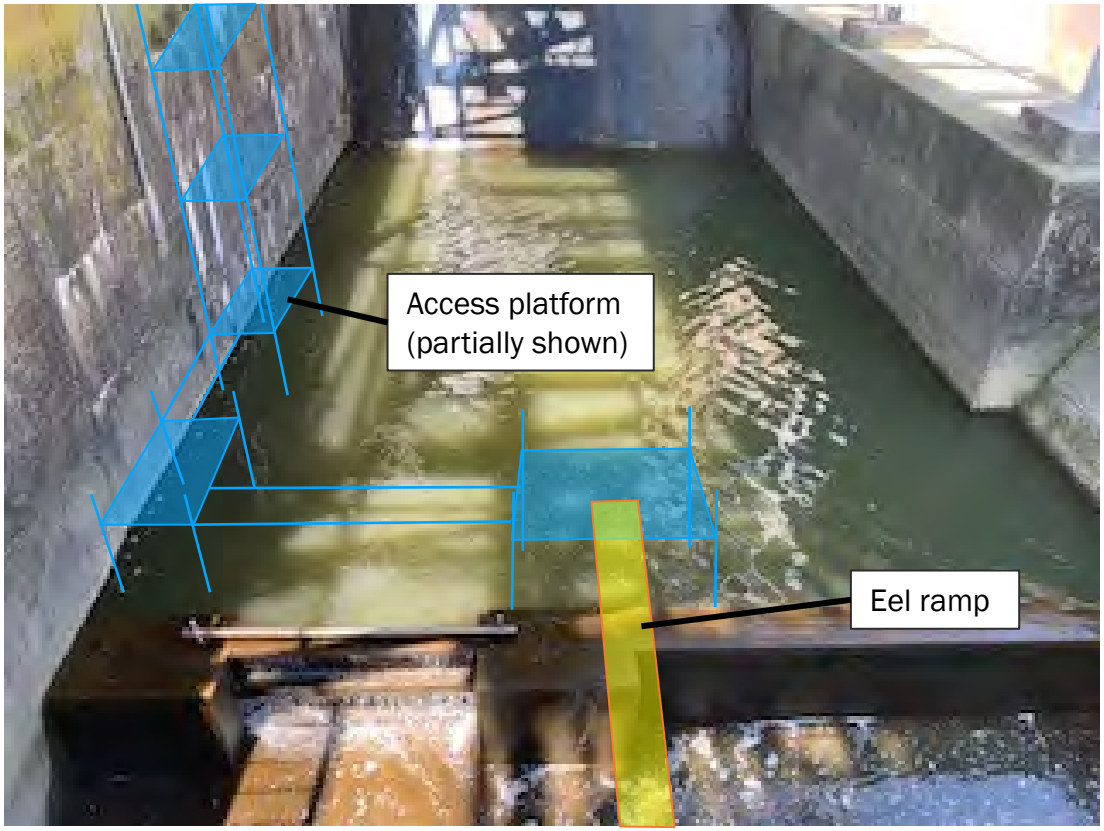
Exelon Generation

Gomez and Sullivan Engineers

East Fish Lift Photos

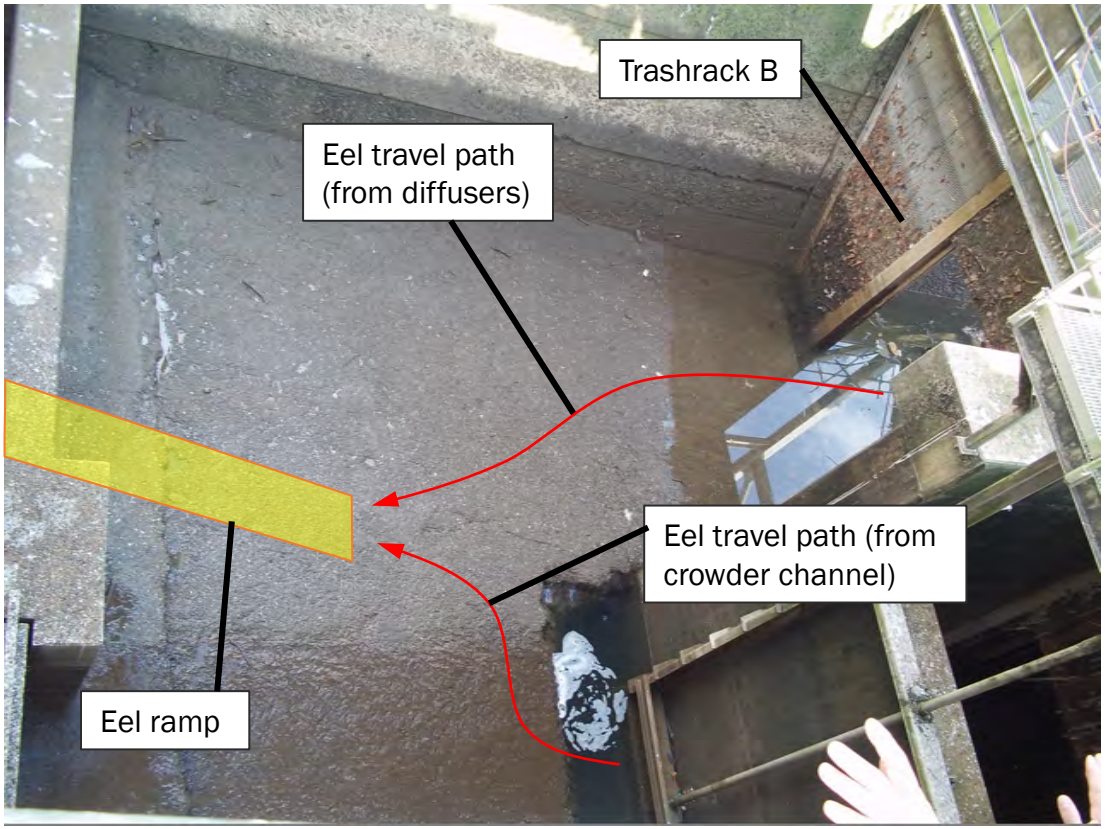
Trashrack B from Crowder Area Gate

East Fish Lift Photos



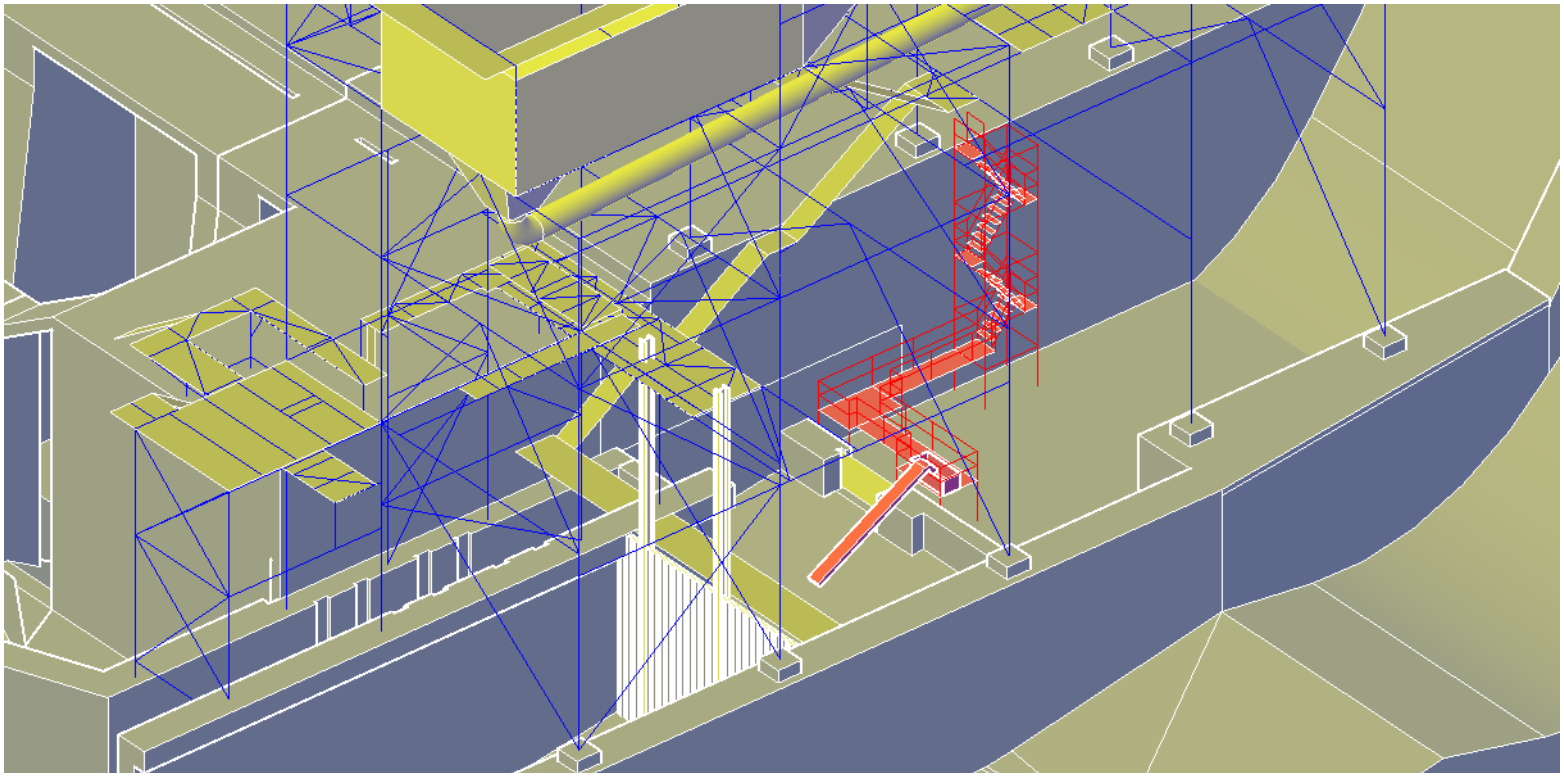
Upper Basin from Crowder Area Gate

East Fish Lift Photos



Stilling Basin Wall to Trashrack B and Crowder Area Gate

3D Model



3D model of EFL with proposed Eel Facilities shown in red

APPENDIX E. DAILY AND WEEKLY DATA SHEETS

Conowingo West Eel Collection Facility Daily Field Sheet

Project Number:	Crew:
Collection Number:	Generation:
Date:	***Control Room DO reading***:
Weather:	

	Collection Tank	Holding Tank # 1	Holding Tank # 2	Holding Tank # 3	Main Flow
Time:					
Flow Meter (gpm):					
Total Flow Volume:					
Temperature (°C):					
Dissolved Oxygen (mg/L):					
In Operation:					

Actual Counted # of Eels:	**Volumetric Estimates**
Dead eels in collection tank #:	Actual # of eels in 200 mL:
Sacrificed #:	# of eels in 1 Liter:
Eels released into holding tank #:	Displacement of water (L):
# Eels released into tank:	Estimated # of eels:
Dead eels in tank #:	**Total estimated:**
Total # of eels in tank: (not to exceed 17,000	(total estimated equals number estimated plus eels in the 200 mL subsample)
	Estimate Check (QA) (if necessary):
	Actual:
	Estimate:
Holding Tank #:	Holding Tank #:
Total alive:	Total alive:
Dead #:	Dead #:
New total:	New total:

Comments:

Octoraro Creek Eel Collection Facility at Pine Grove Daily Field Sheet

Biological Data, Monday and Thursday (sheet 2)
Calibration, Wednesday

Project Number:			Collection Number:
Date:			Time:
Weather:			Rain Gauge Amount (tenths of inch):
	Collection Tank	Head pond	
Temp (°C):			
DO (mg/L):			

Number of eels collected:	**Dissolved Oxygen Probe Download**		
Number of eels transported:		Before	After
Location transported to:	Date:		
Number of dead eels:	Time:		
Answer following questions with YES or NO	DO (mg/L):		
Water running down ramp?	Temp (°C):		
Was the spray bar cleaned?	**Dissolved Oxygen Probe Reading** (inserted later)		
Was the ramp vandalized?		Before	After
Is end of ramp underwater?	DO (mg/L):		
Was the hydro operating?	Temp (°C):		
Was the probe cleaned?	Time:		

Design Parameters - Calibration (Weekly checks, Wednesday)

	Enkamat	Milieu	
Spray bar:			gallons/min
Collection tank:			gallons/min
Top Attraction:			gallons/min
Bottom Attraction:			gallons/min
TOTAL:			gallons/min

Estimate	
Number in 200 ml:	**Estimate check:**
Volumetric estimate:	Actual count:

Equation for estimating number of eel volumetrically: E = 5XD

Where, E = Estimated number of eels in collection X = number of eels in displaced 200 ml sample D = Displaced amount of 2 liter water in bucket when all eels have been added.

Comments

Conowingo East Eel Collection Facility Daily Field Sheet

Project Number:	Crew:
Collection Number:	Generation:
Date:	***Control Room DO reading***:
Weather:	

	Collection Tank
Time:	
Flow Meter (gpm):	
Total Flow Volume:	
Temperature (°C):	
Dissolved Oxygen (mg/L):	

Actual Counted # of Eels:	**Volumetric Estimates**
# dead eels in collection tank:	Actual # of eels in 200 mL:
Eels released into holding tank #:	# of eels in 1 Liter:
# Eels released into tank:	Displacement of water (L):
Yes/No	Estimated # of eels:
Was the end of the ramp underwater?	**Total estimated:**
Was water flowing down the ramp?	(total estimated equals number estimated plus eels in the 200 mL subsample)
	Estimate Check (QA) (if necessary):
	Actual:
	Estimate:

Comments:

American Eel Transport Sheet	
Facility (circle) CWECF CEECF OECF	Transport Tank (circle) Large Small

Prior to transport, while in holding (H1)		Prior to transport, while in holding	
Date	Time	Date	Time
DO	Temp	DO	Temp
No. eels being held		No. eels being held	
No. dead eels in holding prior to transport		No. dead eels in holding prior to transport	
No. eels being transported		No. eels being transported	

After eels have been loaded (in tank)		Prior to releasing eels (in tank)	
Date	Time	Date	Time
DO	Temp	DO	Temp
No. eels transported			
No. of eel dead during transport			
No. eels released			

Release Location			
Date	Time	Creek DO	Creek Temp

Release Locations
A – Muddy Creek Forks (York County)
B – Conewago Creek, Aberdeen PA (Lancaster County)
C – Beaver Creek, Hummelstown, PA

Susquehanna River
1 – Conowingo Pond, Conowingo Creek (Cecil County)
2 – Lake Aldred (York/Lancaster County)
3 – Lake Clarke (Lancaster County)
4 – Etters Boat Ramp, Goldboro, PA
5 – West Fairview Access, Route 11/15 (Cumberland County)
6 – For Hunter Access (Perry County)
7 – Shikellamy State Park (Northumberland County)
8 – Route 487 (Bloomsburg, PA (Columbia County)
9 – Route 29 Bridge (Luzerne County)
10 – Upstream of Hepburn Street Dam, Williamsport PA (Lycoming County)
11 – Upstream of Grant Street Dam (Clinton County)
12 – City Island (Dauphin County)

Daily Conowingo West Eel Collection Facility Email Template

PROVISIONAL DATA SUBJECT TO REVISION

Collection

Today ____ American Eel were collected at the Conowingo West Eel Collection Facility. The season total is now ____.

New collection tank mortalities:

Transport

Today ____ American Eel were transported to _____. The season total transported is now ____.

New transport tank mortalities: ____.

Holding

____ American Eel are in holding.

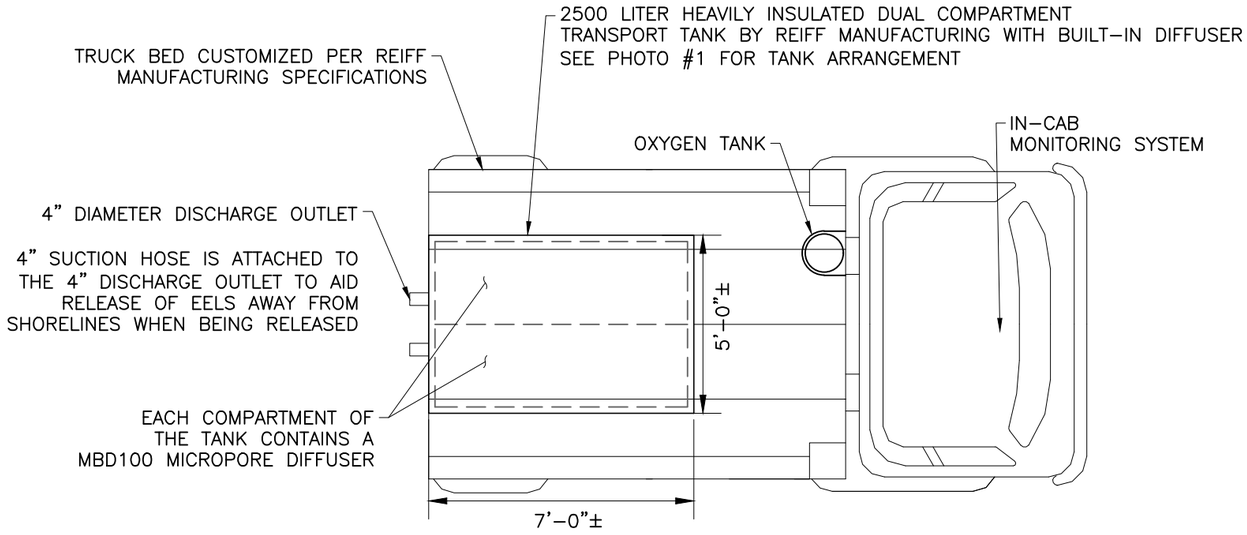
New holding tank mortalities: ____.

Exelon.

Meter and Probe Maintenance

Probe/Meter No.	Date Services	Maintenance Items Performed	Status	By

APPENDIX F. CONOWINGO TRANSPORT FACILITY DRAWINGS



TRANSPORT TRUCK PLAN
SCALE: 1/4" = 1'

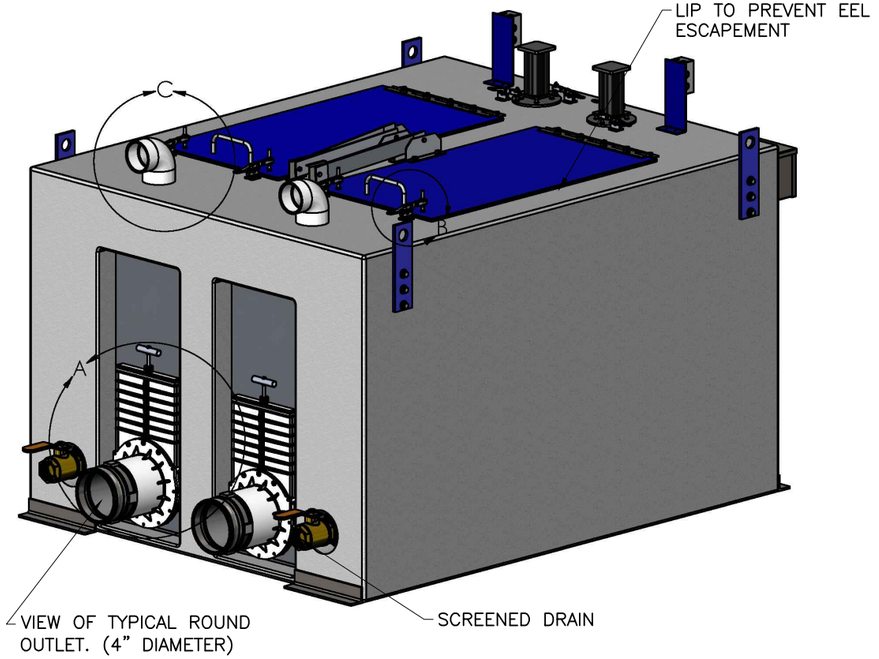


PHOTO 1: ISOMETRIC VIEW OF REIFF MANUFACTURING TRANSPORT TANK

REIFF MANUFACTURING
TRANSPORT TANK ARRANGEMENT

NOTES:

TRANSPORT TRUCK AND MONITORING

1. TRANSPORT TRUCK HAS CAPACITY TO TRANSPORT 25,000 EELS (2,500 LITERS) IN ONE TRIP.
2. TRANSPORT TRUCK INCLUDES CONTINUOUS IN–CAB MONITORING SYSTEM FOR INSUFFICIENT WATER TEMPERATURE AND DISSOLVED OXYGEN PARAMETERS. NO BACK–UP PUMP AND NO ALARMS (FLOW IS NOT NEEDED FOR EELS AND THE TECHNICIAN MONITORS THE IN–CAB MONITORING SYSTEM).

TRANSPORT TANK

1. TANK HAS CAPACITY TO HOLD 25,000 EELS (2,500 LITERS) WITH 4" OF FREEBOARD.
2. TANK INCLUDES LIP TO PREVENT EEL ESCAPEMENT.
3. TANK MANUFACTURED BY REIFF MANUFACTURING.
4. EELS WILL BE EMPTIED DIRECTLY FROM TANK VIA 4" SUCTION HOSE ATTACHED TO THE 4" DRAIN (KNIFE VALVE) TO AID RELEASE OF EELS AWAY FROM SHORELINES AT DESIRED STOCKING LOCATIONS.
5. TANK INCLUDES $1\frac{1}{2}$" SCREENED DRAIN TO LOWER WATER LEVELS AS NEEDED.
6. OTHER DETAILS OF THE TANK CAN BE FOUND ON THE REIFF MANUFACTURING DRAWINGS.

FINAL

NO.	DATE	DESCRIPTION	BY	APP
0	4/15/19	CONOWINGO EEL TRANSPORT FACILITIES	KBS	-

FOR: Exelon
EXELON GENERATION COMPANY, LLC

BY: GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
www.gomezandsullivan.com

DESIGNED BY:	CRS
DRAWN BY:	CRS
CHECKED BY:	-
APPROVED BY:	-
PROJECT NO.:	1385
DATE:	

CONOWINGO AMERICAN EEL TRANSPORT FACILITY

PLAN, SECTION, DETAILS - EEL TRANSPORT

SCALE:

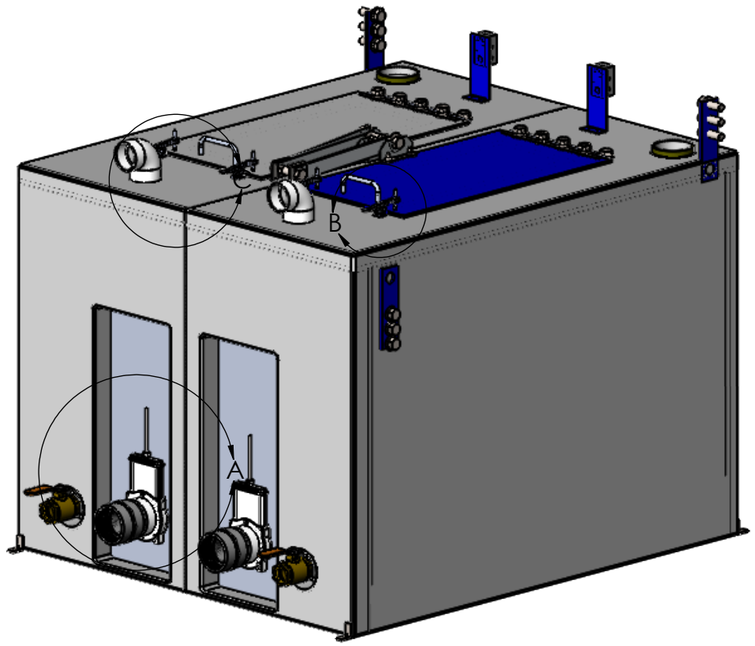
SHEET 1 of 4

Tank Notes:

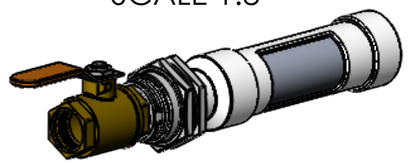
- Inner Tank structure to be built out of 0.19" thick 5025-H32 Aluminum 2 Tank Insulation 2lb. density El Foam P200 or equal (7.9 Rs per in.).
- External Tank to be made of 0.125" thick FRP with additional in corners and bottom for reinforcement.
- Urethane clear coat over outer gelcoal layer for durability and ease of cleaning.
- [2] 4" Round outlet with external mount Valterra 4" Knife gates. (1) per compartment. Gates are mounted to Tank with machined Alum plate.
- (2) - 24 Point Four Systems microbubble diffuser. (1) per compartment.
    - Each diffuser stone is countersunk in tank bottom.
    - Stones have removable alum covers for maintenance and repair.
    - Countersunk pockets have drainline for water drainage of pockets.
    - (2) Oxygen Flowmeter, (1) per stone.
    - (1) Oxygen Regulator.
- (2) Ventilation scoop. SCH 40 PVC elbow with Alum perforated screening. (1) per compartment mounted on access hatch doors.
- (2) Access hatch 18" x 36" with 21" x 39" signle hinge doors. (1) per compartment.
    - Each door has heavy duty Stainless Steel piano style hinge.
    - (1) Alum fabricated jack knife door lock hinge. Hinge holds door in open position to keep accidental closure from occuring.
- Details NOT shown in Submittal drawings include: Point Four oxygen stones and internal oxygen lines. (placement pocket and flush mount cover is shown.

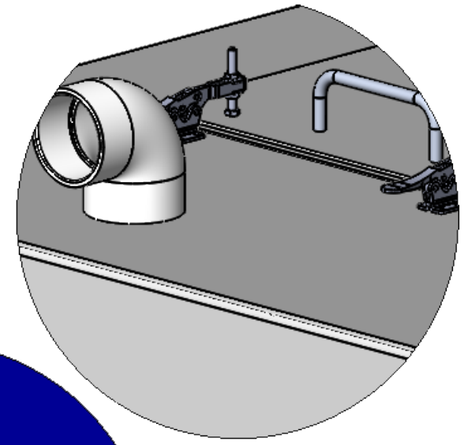
External Valterra Gate Notes

- Gate is double sealed with easily replacable seals.
- Gate is double flanged with full gate able to be removed easily for maintenance or repair.
- Gate seal when gate is closed to be drip ligt, and leak proof, when properly adjusted.
- Bolts for mounting of flanges to allow for seal tension adjustment.
- Outer removable flange has threaded pipe slub in slip flange for mounting threaded 4". Female thread to Male camlock quick coupler.

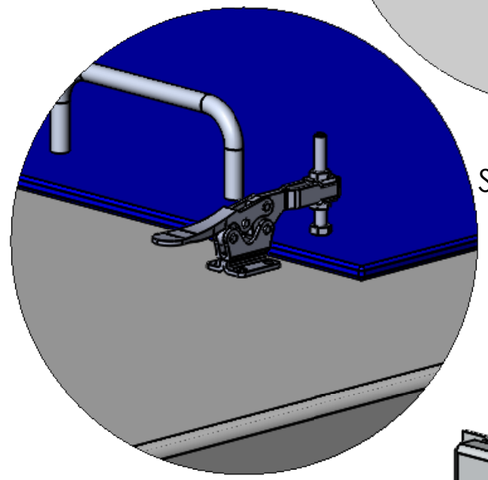


SCREENED TEMPERING VALVE
DETAIL
SCALE 1:8

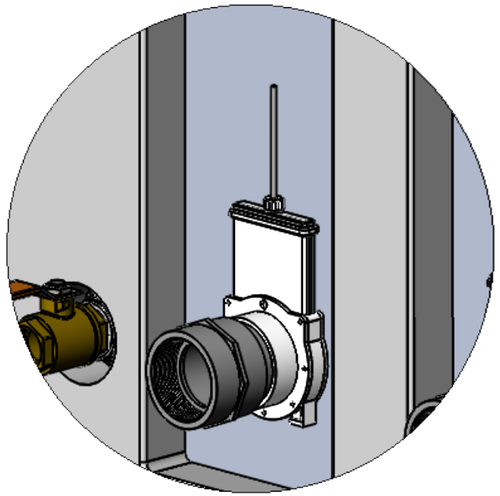




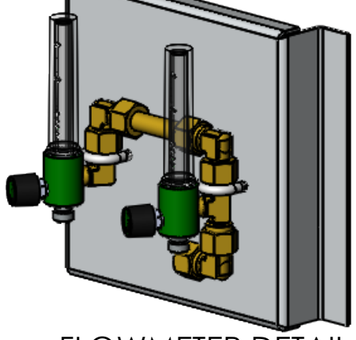
DETAIL C
SCALE 1 : 6



DETAIL B
SCALE 1 : 4



DETAIL A
SCALE 1 : 8



FLOWMETER DETAIL
SCALE 1:4

FINAL

CUSTOMER SUBMITTAL APPROVAL
Signature or Initial: (upon approval)

Date Signed: (MM/DD/YYYY)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/32"
ANGULAR: MACH ±
BEND ±
TWO PLACE DECIMAL ± 0.01
THREE PLACE DECIMAL ±
REIFF Mfg. ACCURACY TOLERANCE (Job Specific): ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	CA	3/23/2016
CHECKED		

Reiff Manufacturing
www.reiffmfg.com
670 B Street, Walla Walla, WA 99362 (509) 525-1081

Reiff MFG.
CITY/COUNTY AIRPORT
670 B Street
WALLA WALLA,WA.99362
PHONE: 509-525-1081

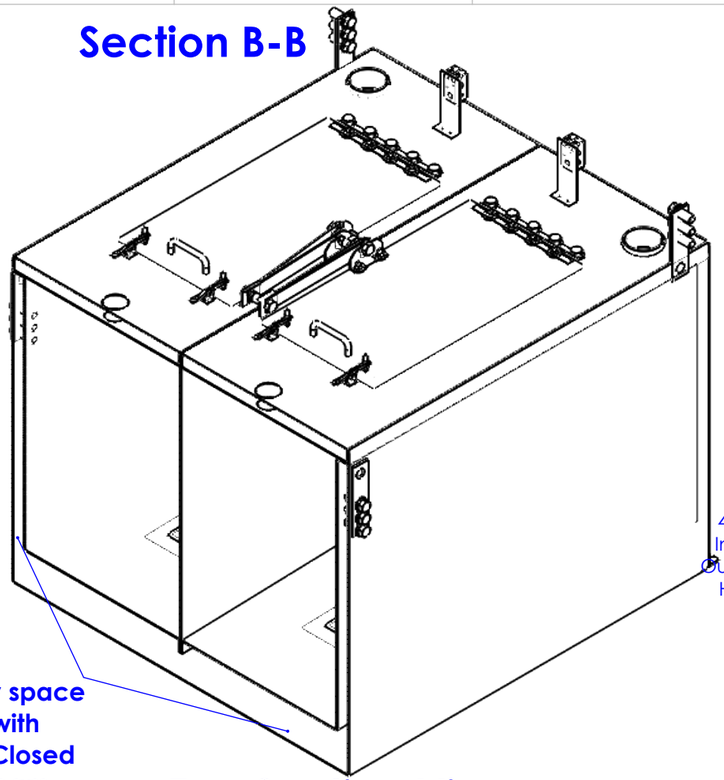
CUSTOMER:
Normandeau - PA

TITLE:
660gal 2 comp fish trans

SIZE	JOB. NO.	REV
B	650gal 2 Comp	1

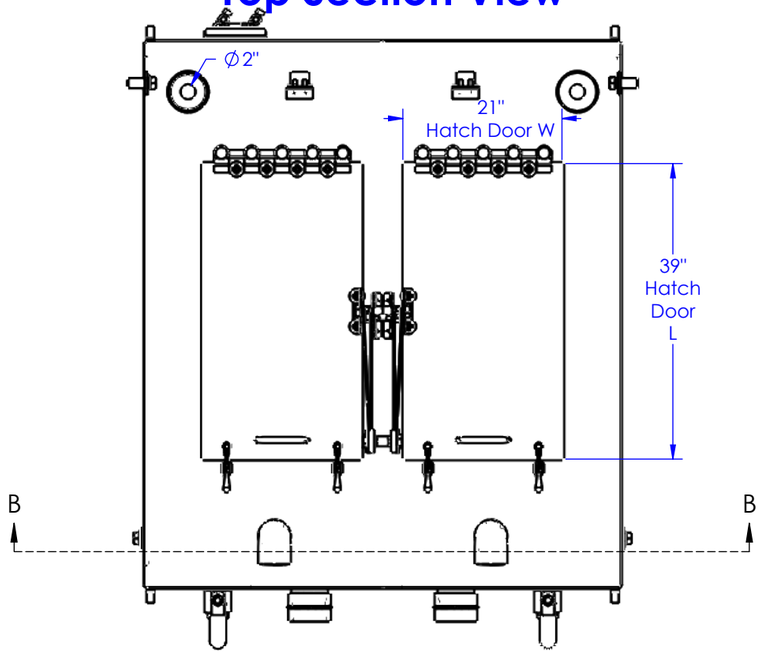
SCALE: 1:20 WEIGHT: SHEET 2 OF 4

Section B-B

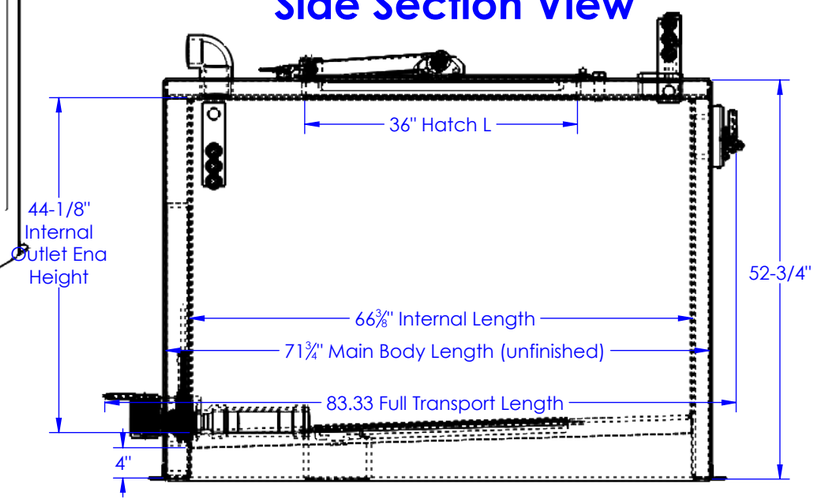


Empty space filled with P200 Closed Cell Foam

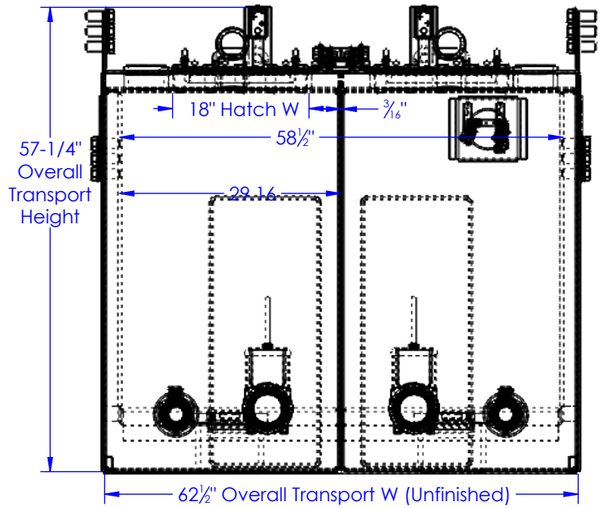
Top Section View



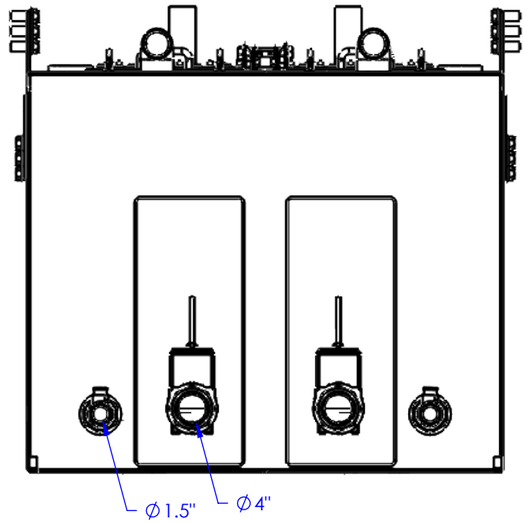
Side Section View



Cab End Section View



Outlet End Section View



FINAL

CUSTOMER SUBMITTAL APPROVAL
Signature or Initial: (upon approval)

Date Signed: (MM/DD/YYYY)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/32"
ANGULAR: MACH ±
BEND ±
TWO PLACE DECIMAL ± 0.01
THREE PLACE DECIMAL ±
REIFF Mfg. ACCURACY TOLERANCE (Job Specific): ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	CA	3/23/2016
CHECKED		

Reiff Manufacturing
www.reiffmfg.com
670 B Street, Walla Walla, WA 99362 (509) 525-1081

Reiff MFG.
CITY/COUNTY AIRPORT
670 B Street
WALLA WALLA,WA.99362
PHONE: 509-525-1081

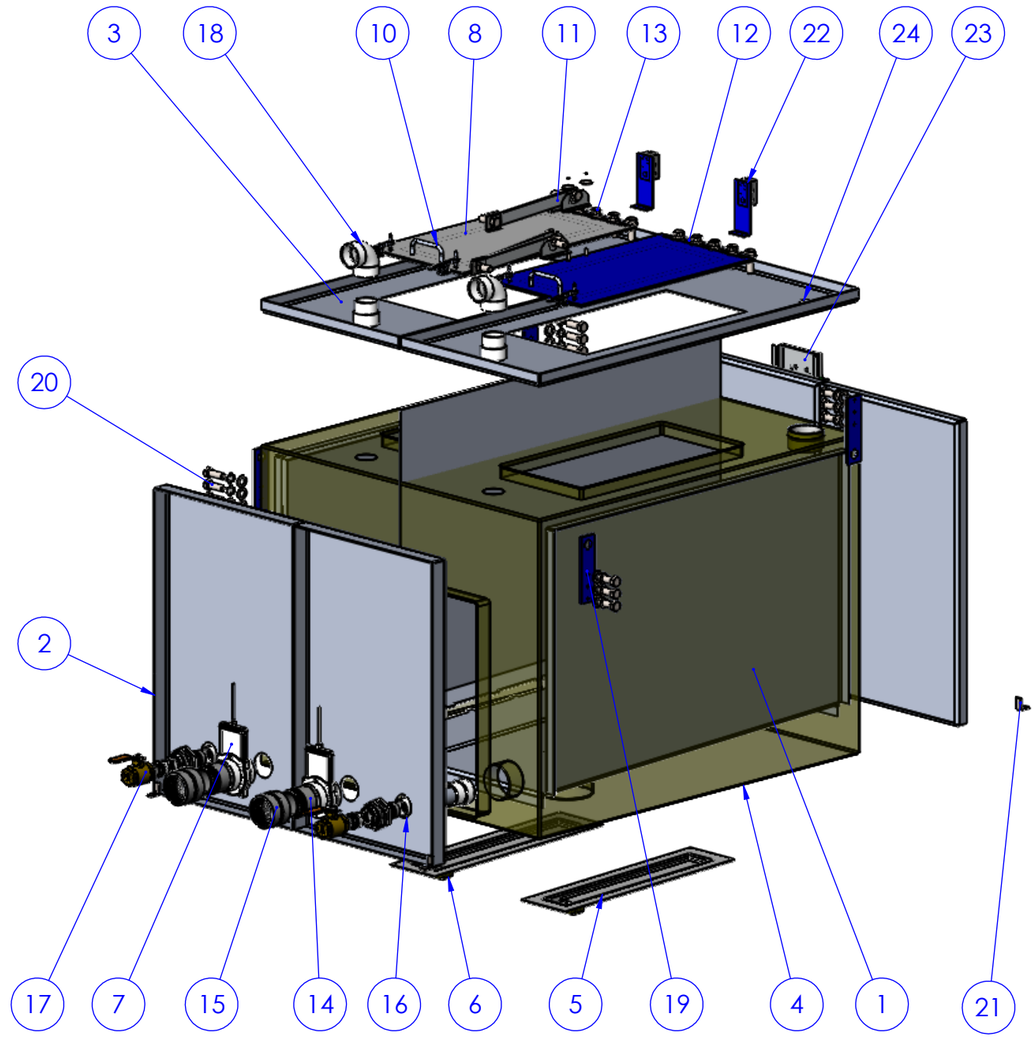
CUSTOMER:
Normandeau - PA

TITLE:
660gal 2 comp fish trans

SIZE	JOB. NO.	REV
B	650gal 2 Comp	1

SCALE: 1:20 WEIGHT: SHEET 3 OF 4

NOTE #	PART	QTY.	DESCRIPTION
1	660 gal Alum Interior Body Piece	2	Tank Body made from 0.19" thick 5052-H32 fabricated Alum Sheet.
2	660 gal Alum Interior Ends	4	Tank Body made from 0.19" thick 5052-H32 fabricated Alum Sheet.
3	660 gal Alum Interior Top	2	Tank Body made from 0.19" thick 5052-H32 fabricated Alum Sheet.
4	Fiberglass Outer Shell	1	White and Clear gel coated, Chop Applicated 0.15" FRP Outer Shell.
5	Point Four System's 24" O2 diffuser stone FRP pockets	2	Pockets are recess mounted to allow flush mounting of O2 stone cover.
6	0.125" 5052-H32 flush mount O2 stone covers	2	Flush Alum covers secured with removable hardware for servicing of O2 stones.
7	4" Valterra External Mount ABS Plastic KnifeGate	2	Valterra 4" ABS Plastic, Alum plate flange mounted exterior fish release knife gate valve.
8	15" x 32" un-insulated 0.25" thick Alum hatchway access door	2	Alum Angle reinforced large access top door for loading fish into transport tank.
9	USS DeStaCo 225 horizontal toggle clamps	4	Toggle clamps for seccuring top hatch door and appling gasket seal pressure. 500 lbs. pressure per clamp.
10	Alum 6" access door handle	2	
11	Reiff Jack-Knife Door Hinge	2	Hinge that is installed to hold door in open position and prevent injury due to accidental closing.
12	18" L Heavy Duty 3" stainless steel hinge	2	18" length Heavy Duty 3" Stainless Stell Piano Style Hinge for Hatch Door.
13	0.25" Bolt hardware		Used to mount hatch door, toogle clamps, other non-load bearing items.
14	4" Male NPT PVC Pipe Stub	2	4" Male NPT PVC pipe stub for attaching camlock fitting to 4" gate valve flange.
15	4" Female NPT to Male Camlock quick connector	2	Female NPT end is threaded onto male pipe stub for attachment of hose with camlock fitting.
16	1.5" PVC screened bulkhead fitting	2	PVC tank wall threaded bulkhead fitting for mounting tempering valve, screened internally.
17	1.5" Tempering and Dewatering ball valve	2	Threaded manual operated ball valve mounted to bulkhead.
18	3" SCH40 90 Elbow Vent	2	Screened Vent elbow for air circulation and keep tank from over pressurization.
19	0.375" thick powder coated Alloy Steel Tank lifting Bracket	4	**Lifting backets that can be used for lifting tank WHILE EMPTY.**
20	0.375" Stainless Steel lifting eye Hardware	12	Hardware for securing lifting eye to backing on tank (3 per lifting eye).
21	3" x 3" x 0.25" Alum Angle	4	Alum Angle for bolting or mounting Transport to bed of truck
22	0.125" thick Alum Outlet Box Bracket Mount and Electric J Box	4	1 Bracket per Aerator with mounted Aerator plug in electrical J box.
23	Oxygen Flow Meters and Mount	2	**(1) Alum mounting bracket, (2) O2 flow meter, Brass fittings connected to green O2 lines.**
24	2" Bulkhead	2	
Extra	Hardware not shown on tank		EI Foam Insulation, Diffuser Stone (MBD100), O2 regulator, Plumbing for O2 delivery, and internal wire routing



FINAL

CUSTOMER SUBMITTAL APPROVAL
Signature or Initial: (upon approval)

Date Signed: (MM/DD/YYYY)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/32"
ANGULAR: MACH ±
BEND ±
TWO PLACE DECIMAL ± 0.01
THREE PLACE DECIMAL ±
REIFF Mfg. ACCURACY TOLERANCE (Job Specific): ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	CA	3/23/2016
CHECKED		

Reiff Manufacturing
www.reiffmfg.com
670 B Street, Walla Walla, WA 99362 (509) 525-1081

Reiff MFG.
CITY/COUNTY AIRPORT
670 B Street
WALLA WALLA,WA.99362
PHONE: 509-525-1081

CUSTOMER:
Normandeau - PA

TITLE:
660gal 2 comp fish trans

SIZE	JOB. NO.	REV
B	650gal 2 Comp	1

SCALE: 1:24 WEIGHT: SHEET 4 OF 4

Conowingo 250-L Transport Tank

Conowingo 19-L Transport Buckets

APPENDIX G. SUSQUEHANNA RIVER AMERICAN EEL ELVER REQUEST FORM

Susquehanna River American Eel Elver Request Form

Submit requests to Aaron Henning of the Susquehanna River Basin Commission (ahenning@srbc.net) by November 15 to be considered for eel distribution the following calendar year. Approval of this request is not a binding contract for the agencies or Exelon to provide eels.

Principal Investigator:_____

Organization Affiliation:_____

Email Address:_____ **Phone Number:**_____

Project Title:_____

Brief Project Description (a project proposal can be attached to this form):_____

_____

_____

_____

Total # Eels requested (by calendar year):_____

Estimated Duration of Holding:_____

Ultimate Disposition of Eels (released or other):_____

Proposed release location, including waterbody, county, municipality, and state:_____

_____

An 8.5"x11" map of the stocking location should be attached to this request

Project Start and End Dates:_____

Have scientific collection and/or stocking permits been secured?:_____

Is this a new or ongoing request?:_____

Has sufficient funding been secured to implement the project?:_____

Has a transport mechanism been approved by the agencies?:_____

Additional Information:

For projects requesting large numbers of eels (i.e. >500/yr), the agencies may require the requestor to give a presentation of the proposed study plan at the annual SRAFRC/Hydro Meeting in December or at another time agreed to by the Resource Agencies.

Annual study reports must be filed with the Resource Agencies each year prior to November 15. Study reports should include the number of eels received by date, the disposition of eels (stocked, retained, died in transport, etc.), the conditions monitored during transport, latitude, longitude, and number of elvers released at each stocking event, and any available information related to the project results. Future eel requests may be denied if annual study reports are not filed in a timely manner.

All requests are subject to approval from the following agencies: Susquehanna River Basin Commission, U.S. Fish and Wildlife Service, Pennsylvania Fish and Boat Commission, Pennsylvania Department of Environmental Protection, New York State Department of Environmental Conservation, and Maryland Department of Natural Resources. No more than 20% of the average annual catch will be provided in a given year for research or alternate stocking projects.

All proposed transport procedures will need to be submitted to the agencies for approval no later than April 1. Procedures need to include details on vehicle, transport tank size, mechanism to continuously monitor temperature and dissolved oxygen during transport, and ability to provide supplemental oxygen during transport. Water quality measurements for transport will need to be reported in the annual report along with number of eels transported and number of mortalities during transport. An inspection of the transport vehicle and water quality monitoring mechanisms may be required by a resource agency staff or Exelon representative prior to approving transport procedures.

All parties receiving eels must comply with Exelon's standard operating procedures for eel transfer and also complete a Chain of Custody form (attached).

Standard Operating Procedures for American Eel Transfer from Exelon

The purpose of this protocol is to ensure the health of the eels removed from and transported to locations as designated by the eel request form. Exelon's ability to hold eels for longer than 24-hours may be limited during the summer due to the increased stress and mortality related to high water temperatures.

A minimum notice of 24 hours is required for an anticipated pickup. No pickups will be facilitated by Exelon on weekends or holidays.

Pickup personnel should be limited to 1-2 people and the names of those individuals must be provided to Exelon prior to arrival, ideally when the pickup is scheduled. For anyone arriving on

station, proper PPE must be worn including closed toe shoes, long pants, and short sleeve shirts. Hard hats and safety glasses will need to be worn on site, but can be provided temporarily by Exelon if notified prior to arrival on station.

Planned pickup time should be around 7:30 a.m. No transfers will occur after 5:00 pm.

Exelon reserves the right to deny transfer of eels if they believe the transport vehicle and supporting equipment could jeopardize safety and survival of eels.

Exelon will notify resource agency staff if the requested eels are (or anticipated to be) available. Agency staff will approve transfer and coordinate with the requestor and Exelon to arrange pickup details for the next day.

ATTACH CHAIN OF CUSTODY FORM

CHAIN OF CUSTODY SHEET: JUVENILE EELS PROVIDED TO RESOURCE AGENCY PERSONNEL FROM THE CONOWINGO EEL COLLECTION FACILITY

Date: _____ **Time:** _____

NUMBER OF EELS PROVIDED:

CECF Collection Tank: _____

Holding Tank # 1: _____

Holding Tank # 2: _____

Holding Tank # 3: _____

Total number of eels provided for Transport: _____

WATER TEMPERATURE:

Collection/Holding Tank: _____

Transport Truck: _____

SIGNATURES:

Normandeau/Exelon Representative: _____

Agency Representative: _____

Agency Rep. Printed Name and Agency: _____

APPENDIX H. FINAL STUDY REPORT: BIOLOGICAL AND ENGINEERING STUDIES OF AMERICAN EEL AT CONOWINGO PROJECT 2011 EEL SAMPLING BELOW CONOWINGO DAM

FINAL STUDY REPORT
BIOLOGICAL AND ENGINEERING STUDIES OF AMERICAN EEL AT CONOWINGO PROJECT
2011 Eel Sampling below Conowingo Dam

RSP 3.3

CONOWINGO HYDROELECTRIC PROJECT

FERC PROJECT NUMBER 405

Prepared for:

Exelon.

Prepared by:

Normandeau Associates, Inc.

Gomez and Sullivan Engineers, P.C.

August 2012

EXECUTIVE SUMMARY

Exelon Generation Company, LLC (Exelon) has initiated with the Federal Energy Regulatory Commission (FERC) the process of relicensing the 573-megawatt Conowingo Hydroelectric Project (Conowingo Project). The current license for the Conowingo Project was issued on August 14, 1980 and expires on September 1, 2014. FERC issued the final study plan determination for the Conowingo Project on February 4, 2010, approving the revised study plan with certain modifications.

The final study plan determination required Exelon to conduct biological and engineering studies of American eel (*Anguilla rostrata*). The objectives of the study are to: 1) summarize available scientific and commercial information regarding the American eel; 2) identify suspected factors affecting American eel abundance; 3) describe the spatial distribution and size characteristics of American eels in the Conowingo tailrace; 4) examine the engineering feasibility and costs of upstream and downstream passage options, including consideration of potential fallback of eels after exiting an upstream passage device; (5) examine the potential impact of upstream and downstream passage of American eels on the Susquehanna River; (6) assess the cumulative impacts to the biodiversity of the Susquehanna River ecosystem of upstream and downstream passage of American eel; and (7) if deemed beneficial to American eel abundance, identify potential locations for an upstream eel passage facility at Conowingo Dam.

An initial study report (ISR) was filed on February 22, 2011 that covered study objective 3, containing Exelon's 2010 study findings. An initial study report meeting was held on March 9, 10 and 11, 2011 with resource agencies and interested members of the public. Formal comments on the ISR including requested study plan modifications were filed with FERC on April 27, 2011 by Commission Staff, several resource agencies and interested members of the public. Exelon filed responses to the ISR comments with FERC on May 27, 2011. On June 24, 2011, FERC issued a study plan modification determination order. The order specified what, if any, modifications to the ISRs should be made. For this study, FERC's June 24, 2011 order required no modifications to the original study plan. An updated study report (USR) describing the results of the 2011 biological sampling at the spillway side of the dam was filed on January 23, 2012. This final study report detailing the 2011 sampling is being filed with the Final License Application for the Project. A separate report was developed to address the remaining study objectives 1, 2, and 4 thru 7.

The 2011 study began June 24, 2011 and ended on September 5, 2011. Heavy rainfall in the spring of 2011 delayed implementation of the study. Construction and deployment of the spillway elver ramps could not be completed until spillway water levels stabilized to safely allow work crews access to the

spillway. During the May 2011 relicensing meeting, the potential impacts of a delayed study start were discussed and it was felt that the heavy rainfall and high river flows probably hindered the upstream elver migration, thus indicating that a late start may not significantly impact the 2011 study results. The USFWS sampling area, (West bank), is accessible at higher river flows which allowed them to start on May 20, 2011 as planned. The spillway area sampled by Normandeau Associates is not accessible during spill conditions, which delayed the set-up and start of sampling. Heavy rainfall associated with Hurricane Irene and Tropical Storm Lee forced both studies, (USFWS and Normandeau), to conclude early.

Two capture methods were deployed for eels. Elver ramps and associated collection facilities were placed on the west and east sides of the spillway below Conowingo Dam. In 2011, two ramps per sample location, each with a different substrate, were deployed. Additional attraction water was provided to each set of ramps which appeared to attract more elvers to the ramp locations and improved upon the elver catch observed in 2010. On the west side a submersible pump provided water which drained down the East Lift wing wall creating water movement at the base of the ramps. The east side ramps were placed downstream of a creek which provided natural water movement and potential attractant. In addition, both sample areas had PVC pipes placed between the dual ramps, which were fed with water provided from a gravity-flow system within Conowingo Dam creating more attraction flow than previously used in 2010.

In concert with the substrate utilized in the 2010 study, (Enkamat®), a second substrate (AkwaDrain™) was placed in a separate parallel ramp. Two different mesh-sized baited eel pots that targeted larger yellow eels were situated adjacent to the two ramps. Both gear types (excluding the new AkwaDrain™ ramp) were consistent with those used in 2010 and previous years by USFWS to enhance data comparability between the two sampling areas.

Elvers and yellow eels were sampled between June 24 and September 5, 2011. A total of 1,159 eels were collected. Of these, 1,100 were elvers collected from the ramps. The east ramps collected 539 elvers, with 133 harvested in the Enkamat® substrate and 406 captured from the AkwaDrain™ substrate. The west ramps collected 561 elvers, with 405 harvested in the Enkamat® substrate and 156 collected in the AkwaDrain™ substrate. Elver lengths ranged from 87 to 188 mm total length (TL), with an average size of 124.9 mm. Yellow eels harvested from the eel pots totaled 59; all yellow eels were collected from the west side. The length range of eels collected in pots ranged from 300 to 689 mm TL, with an average length of 515.4 mm.

Hourly water temperatures were recorded throughout the study period. Water temperatures typically rose and fell three to four degrees Fahrenheit (°F) every day. The water temperature in the Conowingo

spillway ranged from a low of 73.7° F on September 3 to a high of 90.8° F on July 24. A comparison of water temperatures to elver catch at the ramps revealed no apparent relationship.

The study period encompassed three new moon periods and two full moon periods. A possible, but weak and limited relationship between the number of elvers collected and moon periods was observed during part of the study period.

Normandeau Associates also conducted three nighttime surveys to document areas of elver congregation in the spillway. During these surveys, elvers were only observed in abundance below crest gate #30.

Seventy-seven eels were preserved for otolith ageing. A total of 73 of the 77 otoliths preserved were aged successfully. The majority of elvers were split at age I or II, and III to V years of age, at 30% for each group. A large gap in age at years VI to VIII is apparent due to a lack of specimens in the 189 to 299 mm size range. Larger eels were aged IX to XVII, plus one at age XIX.

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LIST OF ABBREVIATIONS

Exelon	Exelon Generation Company, LLC
F	Fahrenheit
FERC	Federal Energy Regulatory Commission
ft	feet
h	hour
in	inch
ISR	Initial Study Report
L	liter
min	minute
mm	millimeter
MW	megawatt
PIT	Passive Integrated Transponder
RSP	Revised Study Plan
TL	total length
USFWS	United States Fish and Wildlife Service
USR	Updated Study Report

1.0 INTRODUCTION

Exelon Generation Company, LLC (Exelon) has initiated with the Federal Energy Regulatory Commission (FERC) the process of relicensing the 573-megawatt Conowingo Hydroelectric Project (Conowingo Project). The current license for the Conowingo Project was issued on August 14, 1980 and expires on September 1, 2014. FERC issued the final study plan determination for the Conowingo Project on February 4, 2010, approving the revised study plan with certain modifications.

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2.0 METHODS

The 2011 study objectives were to acquire; 1) eel spatial distribution data in the tailrace and spillway pool, and 2) collect associated biological and physical data (Appendix A). In order to maximize elver and yellow eel catch, (the life stages targeted by this study), we utilized two capture methods. Elver ramps and associated collection facilities were placed on the west and east sides of the spillway below Conowingo Dam (Figure 2-1). Baited eel pots that targeted larger yellow eels were fished adjacent to these two ramp locations.

During the 2010 study, we had utilized one elver ramp per site containing Enkamat® substrate. In 2011, two ramps per site, each with different substrates (Figure 2-2) were deployed. In addition to the Enkamat® substrate utilized in 2010, a second substrate, AkwaDrain™, was placed in a separate ramp adjacent to the Enkamat® ramp.

The west ramps were constructed and placed parallel to the wing wall near the East Fish Lift on June 23, 2011 (Figures 2-3 and 2-4), with additional water cascading down from the top of the wing wall to create disturbance and additional flow for attraction purposes. The west spillway ramps operated for nearly two weeks prior to the installation of the east spillway ramps.

The east side spillway sampling location used in 2010 was structurally damaged by heavy spring rainfall. Therefore, on July 1, 2011, the east spillway ramps (Figure 2-5) were deployed at a location adjacent to the location used in 2010. The east ramps were constructed on scaffolding located near the mouth of a small intermittent stream entering the Susquehanna River near the base of the dam (Figure 2-6). This provided natural water flow patterns that may have attracted elvers to the ramp.

The ramps were constructed with galvanized ductwork, and Enkamat® or AkwaDrain™ substrate was attached to the tray bottom with industrial grade adhesive (Figure 2-7). These substrates allowed elvers to climb the ascending section of the ramps. As advised by USFWS personnel, the substrate did not extend to the top of the ramp so the climbing elvers were forced to swim the final section of the ascending ramp; this configuration prevented them from using the substrate to pull themselves back up the descending section of the ramp to avoid capture. Each ramp unit was supported by scaffolding, which provided a sturdy base. The angle of each ramp was measured, the east ramp angle was 40°, and the west ramp angle was 35°. Each ramp consisted of approximately 20 ft. of cable tray, 12 in. wide, plus tray and sheet metal curved at the top to convey elvers into secure mesh bags which were housed in holding containers which were medium sized plastic trash cans. All ramps were fastened to scaffolding and located at or near spillway drainage or overflow.

Water flow to each ramp was supplied from a gravity-flow system within Conowingo Dam (Figure 2-8). Water was continuously released down the ramp via a spray bar to provide even sheet flow across the entire width of the ascending and descending sections of the ramps (Figure 2-9), keeping the substrate moist and creating a small amount of flow to attract elvers. The spray bars also directed water into each holding container and played a role in keeping the collected elvers aerated and alive.

Climbing ramp flow was augmented by an additional attraction flow directed to the bottom of the ramp and released between the ramps at each location (Figure 2-9). This attraction water was provided to each set of ramps which appeared to attract more elvers to the ramp locations and improved upon the elver catch observed in 2010.

On the west side a submersible pump provided water which drained down the East Lift wing wall creating water movement at the base of the ramps. The east side ramps were placed downstream of a creek which provided natural water movement and potential attractant.

In addition, both sample areas had PVC pipes placed between the dual ramps which were fed with water from a gravity-flow system within Conowingo Dam providing more attraction flow. Attraction flow volumes from the PVC pipes on both sets of ramps were measured. The west ramp was nearly 57 L/min (15 gpm), while the estimated attraction flow volume on the east ramps was 45 L/min (12 gpm). These volumes were a slight increase to the amounts used in 2010, due in part to the distance of the ramps from the water source. In addition to added attraction flow, water was siphoned from the holding containers where elvers were collected and redirected down each ramp to provide a scent trail to potentially attract elvers to the ramps.

Holding containers were checked for elvers on Mondays, Wednesdays and Fridays during the entire 2011 study with exceptions on holidays, (July 4, Labor Day), when the holding containers were checked the following day. Wednesday and Friday samples represented a 48 h fishing effort while Monday samples included the weekend days and represented a 72 h effort.

Yellow eels were collected with two different size mesh eel pots. The mesh of the pots was 0.25 in. (modified pot) and 0.5 in. (cloth pot). (Figure 2-10). These two sized mesh pots were fished adjacent to each set of elver ramps. Two pots at each end of the spillway were baited and fished for a 48-h period every other week.

Once captured, eels were sedated with MS-222, counted and measured (Figure 2-11). All captured eels were scanned for PIT tags previously inserted by USFWS (Figure 2-12). At the request of USFWS

personnel, PIT tags were implanted into yellow eels captured during the 2011 study period. These tags were provided by USFWS, and the corresponding PIT tag numbers were recorded. After PIT tagging, yellow eels were released back into the Susquehanna River at the point of capture. A subsample of captured elvers and yellow eels was frozen for otolith analysis. All remaining elvers were placed in the USFWS tank located near the West Fish Lift facility for upstream transport.

Water temperature was determined by an ONSET Water Temp Pro2 recording device which was located in the Conowingo spillway at the west ramp. (Figure 2-13). This device measured water temperature on an hourly basis throughout the entire study. Data were retrieved monthly. Data on daily rainfall (measured at Conowingo Dam) and percent lunar fractions at Havre de Grace, MD (www.usno.navy.mil/USNO/astronomical-applications/data-services/lunar-ecl-us) were also collected throughout the study period.

A representative sample of elvers and yellow eels were frozen for otolith removal and aging. Otoliths were removed from the eels, embedded in clear epoxy, and dried for 12 hours. Utilizing a double-bladed, slow speed saw, a 0.2-mm thick transverse section was cut through the nucleus perpendicular to the sulcus. Adhesive was applied to the cut otolith which was then placed on a glass slide. The sample was polished using a series of fine grade lapping films, which were periodically inspected to insure no damage to the polished otolith. After polishing, Toluidine Blue stain was applied to the sample to assist readers when counting the annular rings. All otolith samples were read by two readers. If the two readers agreed on the analysis, the age estimate was accepted. If readers of the slides weren't in agreement on an age, that slide was re-analyzed. If no consensus was met, the otolith was rejected. The age reported herein is the freshwater age (*i.e.*, the numbers of annuli outside the transition mark - the end of larval growth in salt water).

During the 2011 study period, three nighttime surveys were conducted below the Conowingo spillway area to examine potential evening movements of elvers. Correlating with full and new moon periods, two boat crews utilizing headlamps, and LED marine rechargeable spotlights with night vision covers, (red lenses), traversed the spillway area looking for elver abundance. A fourth survey was scheduled but was cancelled due to heavy rains that created unsafe conditions in the spillway area.

3.0 RESULTS

Elvers and yellow eels were sampled between June 24 and September 5, 2011. Heavy rains from Hurricane Irene and Tropical Storm Lee forced the early termination of this year's study. A major spill event at Conowingo Dam was imminent so all equipment was removed on 6 September.

A total of 1,159 eels were collected from the Conowingo Dam spillway in 2011 (Table 3-1). Of these, 1,100 were elvers collected from all elver ramps combined. This represents a substantial increase in the number collected in 2010, when the east elver ramp collected 158 elvers and the west elver ramp collected 8. In 2011, the east elver ramps collected 539 elvers, with 133 harvested in the Enkamat® substrate and 406 captured from the AkwaDrain™ substrate (Table 3-1). Generally, the east ramps collected elvers evenly throughout the study period. However, on July 11, the AkwaDrain™ substrate collected 239 elvers, with none collected in the adjacent Enkamat® ramp. The west elver ramps collected 561 elvers, with 405 harvested in the Enkamat® substrate and 156 collected in the AkwaDrain™ substrate (Figure 3-1). Overall, the majority of elvers were collected in the Enkamat® substrate on the west side (405), and the AkwaDrain™ substrate (406) on the east side. Both of these ramps were located adjacent to walls suggesting that elvers may utilize structures to help orientate them upstream. Elver lengths ranged from 87 to 188 mm TL, with an average size of 124.9 mm (Figure 3-2).

A subsample of elvers (N = 46) and yellow eels (N = 31) caught was frozen for ageing by otolith analysis. All remaining elvers not used for otolith research (1,007) were placed in the USFWS tank located near the West Fish Lift facility for upstream transport (Table 3-2). Yellow eels harvested from the eel pots totaled 59, all of which were collected on the west side. The size of eels collected in the pots ranged from 300 to 689 mm TL, with an average length of 515.4 mm (Figure 3-3). Twenty-seven of the 59 yellow eels were PIT tagged and released back at the point of capture. No recaptures were encountered during the study period.

Water temperature was recorded on an hourly basis throughout the study period. Water temperatures typically rose and fell three to four degrees Fahrenheit each day at all ramps. The water temperature in the Conowingo spillway ranged from a low of 73.7° F on September 3 to a high of 90.8° F on July 24 (Table 3-3). A comparison of water temperature to elver catch revealed no apparent relationships (Figure 3-4).

The 2011study period encompassed three new moon periods (0% lunar phase) and two full moon periods (100% lunar phase). Eels have been observed to move in abundance during new moon periods or periods of little illumination. During the 2010 survey, a correlation between full moon periods and elver collection was observed. The 2011 survey had little data to support any association with movement and

lunar illumination. However, when moon phase is plotted against the number of elvers collected; a slight positive relationship was observed on July 11. (Figure 3-4). July 11 was also the largest single day collection of elvers during 2011.

Three nighttime surveys were conducted in the Conowingo spillway to document locations of elver congregation (Figure 3-5). Elvers were only observed in abundance below crest gate #30 (Figures 2-1 and 3-6). Located immediately downstream of crest gate #30 is a plateau of concrete or macadam. Elvers were observed at this location during all three nighttime surveys. Elvers were also observed, (although not in abundance) near seeps, or areas where water trickled over the spillway sill , and when water cascaded down bedrocks associated near these seeps. In these areas where elvers were observed, predatory fish such as channel catfish, and striped bass also were observed.

Rainfall occurred on 25 of the 74 days during the 2011 elver study. Daily rainfall at Conowingo Dam plotted against the number of elvers collected does not show any relationship between rainfall events and elver movement (Figure 3-7).

Seventy-seven eels were preserved for otolith research. A sample from each size range was collected in the 2011 study. Four otoliths were deemed unreadable. Seventy-three eels were aged successfully. The dominate age group collected (I to V years of age) comprised 60% of the otoliths examined. A large gap in age at years VI to VIII is apparent due to lack of specimens in the 189 to 299 mm size range. Larger eels were aged IX to XVII, plus one eel aged at XIX years (Table 3-4).

The 2011 study ended abruptly due to heavy rainfall from Hurricane Irene and Tropical Storm Lee that forced Conowingo Dam to spill water through forty-three of its fifty crest gates (Figure 3-8).

4.0 DISCUSSION

The low elver catch in 2010 and agency comments provided on that study report prompted some changes for the 2011 study. An additional ramp with a different substrate was added to each spillway sampling location. Additional attraction flow was also provided for both sets of ramps. The west side ramps were located in the same general position as in the 2010 study, but were oriented parallel to the river in 2011 rather than perpendicular in 2010. The east side ramps were relocated due to structural damage at the 2010 sampling location from heavy spring rains. The new location was constructed close to the 2010 placement.

Although the 2011 study period was bookended by heavy rains that attributed to a late start and early finish, the overall elver catch was significantly higher in 2011 (1,159), than in 2010 (258) . Once the study was underway, the elver ramps collected eels for 74 days as compared to 106 days in 2010. Collection of elvers and yellow eels was consistent throughout the entire study period with a few exceptions. The east spillway facility collected 239 elvers from a single ramp on July 11, 2011.

Predation from both land-based animals and birds was not directly observed but may have occurred at the east side. On several collection days, animal tracks were present in the muddy areas near the ramps. This same area exhibited an abundance of avian fecal matter and feathers littered on and around the ramp platform. Predation may have been an issue, but evidence does not exist to quantify. The 2011 catch of elvers was much higher than the total collected in 2010. An increase in elver catch during the 2011 study period may be attributed to additional ramps, (four in 2011, as opposed to two in 2010), additional attraction water and the addition of scent attraction.

In contrast to 2010, both sides of the spillway captured nearly equal numbers of elvers, with the west side collecting slightly more than the east. The absence of eels from ~189 to 299 mm is generally similar to previous year's collections by Normandeau Associates and USFWS. Attempts to collect this size range of yellow eels with smaller-mesh pots (.25 inch) failed. Enkamat® is reportedly size-selective for eels less than 260 mm (Soloman and Beach 2004), but neither Enkamat® nor either type of pot deployed was successful catching eels in the 189 to 299 mm size range.

Elvers were observed during the 3 night surveys below crest gate #30 near the macadam plateau. The macadam and the water cascading over it is an attractant to elvers migrating upstream. Water trapped in the spillway sill after the cessation of full generating conditions, and water seeping from the crest gate provided this attraction flow. Without these two water sources, particularly the leakage from crest gate

#30, water would not flow over the macadam plateau and would likely not attract large numbers of elvers to this particular location.

5.0 2011 USFWS SAMPLING RESULTS

The 2011 USFWS report on elver sampling on the West bank of the Conowingo tailrace is contained in Appendix B. During the 2011 sampling season, USFWS reported that approximately 85,000 elvers were collected from their West side facility and some 62,000 elvers were transported to upstream tributaries of the Susquehanna River in Pennsylvania.

REFERENCES

Soloman, D.J. and M.H. Beach. 2004. Manual for provision of upstream migration facilities for eel and elver. Science Report SC020075/SR2. Environment Agency, Bristol, UK.

TABLE 3-1: DAILY COLLECTION OF YELLOW EELS AND ELVERS FROM EAST AND WEST SPILLWAY AREAS IN 2011.

Date	E. Ramp Enka Mat	E. Ramp Akwa Drain	E. Ramp Cloth Pot	E. Ramp Modified Pot	W. Ramp Enka Mat	W. Ramp Akwa Drain	W. Ramp Cloth Pot	W. Ramp Modified Pot	Lunar %	Rain
6/24	-	-	-	-	-	-	-	-	39	0
6/25	-	-	-	-	-	-	-	-	30	0
6/26	-	-	-	-	-	-	-	-	21	0
6/27	-	-	-	-	0	0	0	0	14	0.01
6/28	-	-	-	-	-	-	-	-	8	0
6/29	-	-	-	-	7	1	5	0	3	0
6/30	-	-	-	-	-	-	-	-	1	0
7/1	-	-	-	-	15	16	0	0	0	0
7/2	-	-	-	-	-	-	-	-	2	0
7/3	-	-	-	-	-	-	-	-	6	0.05
7/4	-	-	-	-	-	-	-	-	13	0
7/5	0	2	0	0	0	0	0	0	22	0
7/6	-	-	-	-	-	-	-	-	32	0
7/7	-	-	-	-	-	-	-	-	43	0
7/8	0	2	0	0	58	2	14	5	50	0.05
7/9	-	-	-	-	-	-	-	-	66	0.8
7/10	-	-	-	-	-	-	-	-	76	0
7/11	0	239	0	0	18	21	0	0	85	0
7/12	-	-	-	-	-	-	-	-	92	0.82
7/13	2	11	0	0	3	17	6	0	97	0
7/14	-	-	-	-	-	-	-	-	100	0
7/15	2	1	0	0	59	18	0	0	100	0
7/16	-	-	-	-	-	-	-	-	98	0
7/17	-	-	-	-	-	-	-	-	94	0
7/18	3	2	0	0	3	13	0	0	88	0
7/19	-	-	-	-	-	-	-	-	81	0
7/20	3	8	0	0	12	7	8	1	73	0.02
7/21	-	-	-	-	-	-	-	-	64	0
7/22	36	11	0	0	5	11	0	0	55	0
7/23	-	-	-	-	-	-	-	-	45	0
7/24	-	-	-	-	-	-	-	-	36	0.04
7/25	3	13	0	0	15	13	0	0	27	0
7/26	-	-	-	-	-	-	-	-	19	0.99
7/27	21	0	0	0	0	0	0	0	11	0
7/28	-	-	-	-	-	-	-	-	5	0
7/29	10	22	0	0	6	2	0	0	2	0.03
7/30	-	-	-	-	-	-	-	-	0	0.02
Totals	**80**	**311**	**0**	**0**	**201**	**121**	**33**	**6**	**1598**	**2.83**

TABLE 3-1: CONTINUED.

Date	E. Ramp Enka Mat	E. Ramp Akwa Drain	E. Ramp Cloth Pot	E. Ramp Modified Pot	W. Ramp Enka Mat	W. Ramp Akwa Drain	W. Ramp Cloth Pot	W. Ramp Modified Pot	Lunar %	Rain
7/31	-	-	-	-	-	-	-	-	1	0
8/1	2	0	0	0	6	0	0	0	5	0
8/2	-	-	-	-	-	-	-	-	11	0.04
8/3	0	5	0	0	6	3	2	0	20	0
8/4	-	-	-	-	-	-	-	-	30	0.12
8/5	1	0	0	0	9	3	0	0	41	0
8/6	-	-	-	-	-	-	-	-	50	0
8/7	-	-	-	-	-	-	-	-	63	0.37
8/8	2	3	0	0	0	0	0	0	74	1.8
8/9	-	-	-	-	-	-	-	-	83	0
8/10	0	0	0	0	5	0	5	5	90	0.33
8/11	-	-	-	-	-	-	-	-	95	0
8/12	4	0	0	0	3	6	0	0	99	0
8/13	-	-	-	-	-	-	-	-	100	0
8/14	-	-	-	-	-	-	-	-	99	1.05
8/15	5	4	0	0	3	3	0	0	96	1.83
8/16	-	-	-	-	-	-	-	-	92	0.07
8/17	3	0	0	0	28	7	5	1	86	0
8/18	-	-	-	-	-	-	-	-	79	0.13
8/19	10	18	0	0	5	1	0	0	71	0.32
8/20	-	-	-	-	-	-	-	-	62	0
8/21	-	-	-	-	-	-	-	-	50	0
8/22	3	7	0	0	47	7	0	0	43	0.22
8/23	-	-	-	-	-	-	-	-	33	0
8/24	2	4	0	0	12	2	2	0	24	0
8/25	-	-	-	-	-	-	-	-	15	0
8/26	9	6	0	0	28	0	0	0	8	0.47
8/27	-	-	-	-	-	-	-	-	3	0
8/28	-	-	-	-	-	-	-	-	0	4.8
8/29	5	36	0	0	13	2	0	0	1	0.014
8/30	-	-	-	-	-	-	-	-	4	0
8/31	5	3	0	0	5	1	0	0	9	0
9/1	-	-	-	-	-	-	-	-	18	0
9/2	2	4	0	0	31	0	0	0	27	0
9/3	-	-	-	-	-	-	-	-	38	0
9/4	-	-	-	-	-	-	-	-	50	0
9/5	0	4	0	0	3	0	0	0	60	0.7
Totals	**53**	**94**	**0**	**0**	**204**	**35**	**14**	**6**	**1730**	**12.26**

TABLE 3-2: NUMBER OF ELVERS PROVIDED TO USFWS FOR UPSTREAM TRANSPORTATION IN 2011.

Date	No. of Elvers
5-Jul-11	16
8-Jul-11	74
11-Jul-11	268
13-Jul-11	29
15-Jul-11	81
22-Jul-11	63
25-Jul-11	47
27-Jul-11	21
29-Jul-11	45
1-Aug-11	7
3-Aug-11	14
5-Aug-11	13
8-Aug-11	19
10-Aug-11	5
12-Aug-11	13
15-Aug-11	15
17-Aug-11	39
19-Aug-11	17
22-Aug-11	62
24-Aug-11	20
26-Aug-11	43
29-Aug-11	39
31-Aug-11	14
2-Sep-11	35
6-Sep-11	8
Total	**1007**

TABLE 3-3: MEAN DAILY WATER TEMPERATURES RECORDED AT THE SPILLWAY ELVER RAMPS, 2011.

Date	Water Temp.	Date	Water Temp.
24-Jun-11	80.5	31-Jul-11	88.2
25-Jun-11	81.1	1-Aug-11	88.6
26-Jun-11	80.8	2-Aug-11	88.1
27-Jun-11	80.6	3-Aug-11	86.5
28-Jun-11	80.5	4-Aug-11	85.2
29-Jun-11	81.2	5-Aug-11	85.9
30-Jun-11	81.2	6-Aug-11	85.4
1-Jul-11	80.9	7-Aug-11	85.6
2-Jul-11	81.3	8-Aug-11	86.1
3-Jul-11	81.3	9-Aug-11	86
4-Jul-11	82.1	10-Aug-11	85.5
5-Jul-11	83.1	11-Aug-11	84.8
6-Jul-11	83.2	12-Aug-11	84.1
7-Jul-11	83.6	13-Aug-11	83.2
8-Jul-11	83.7	14-Aug-11	82.2
9-Jul-11	83.8	15-Aug-11	82.4
10-Jul-11	84.2	16-Aug-11	81.8
11-Jul-11	84.5	17-Aug-11	82.2
12-Jul-11	85.5	18-Aug-11	81.9
13-Jul-11	85.7	19-Aug-11	82.1
14-Jul-11	84.4	20-Aug-11	82.2
15-Jul-11	84.3	21-Aug-11	81.9
16-Jul-11	84.2	22-Aug-11	81.7
17-Jul-11	84.4	23-Aug-11	80.8
18-Jul-11	84.9	24-Aug-11	81.2
19-Jul-11	86.1	25-Aug-11	80.9
20-Jul-11	87	26-Aug-11	81.2
21-Jul-11	87.9	27-Aug-11	81.1
22-Jul-11	89.1	28-Aug-11	79.5
23-Jul-11	89.8	29-Aug-11	78.3
24-Jul-11	90.8	30-Aug-11	76.6
25-Jul-11	89.7	31-Aug-11	75.3
26-Jul-11	88.8	1-Sep-11	74.6
27-Jul-11	88	2-Sep-11	73.9
28-Jul-11	87.1	3-Sep-11	73.7
29-Jul-11	87.9	4-Sep-11	74.2
30-Jul-11	88.6	5-Sep-11	74.8

TABLE 3-4: AGES OF 73 AMERICAN EELS COLLECTED IN THE CONOWINGO DAM SPILLWAY BY SIZE GROUP.

Elver Size Range (mm)										Elver Totals		
75-99		100-124		125-149		150-174		175-274				
Age	No.	Age	No.	Age	No.	Age	No.	Age	No.	Age	No.	Percent
I	9	I	2	–	–	–	–	–	–	I	11	25.0
II	1	II	7	II	3	–	–	–	–	II	11	25.0
–	–	–	–	III	5	III	2	–	–	III	7	15.9
–	–	–	–	IV	1	IV	7	IV	6	IV	14	31.8
–	–	–	–	–	–	V	1	–	–	V	1	0.2
											44	

Yellow Eel Size Range (mm)										Yellow Eel Totals		
275-349		350-449		450-549		550-649		650+				
Age	No.	Age	No.	Age	No.	Age	No.	Age	No.	Age	No.	Percent
IX	1	–	–	–	–	–	–	–	–	IX	1	3.4
X	1	X	3	–	–	–	–	–	–	X	4	13.7
–	–	XI	1	XI	1	–	–	–	–	XI	2	6.8
–	–	XII	1	XII	4	XII	1	–	–	XII	6	20.7
–	–	–	–	XIII	2	XIII	2	–	–	XIII	4	13.7
–	–	–	–	XIV	2	XIV	2	–	–	XIV	4	13.7
–	–	–	–	XV	1	XV	1	–	–	XV	2	6.8
–	–	–	–	–	–	XVI	2	XVI	1	XVI	3	10.3
–	–	–	–	–	–	XVII	1	XVII	1	XVII	2	6.8
–	–	–	–	–	–	–	–	XVIII	–	XVIII	–	0.0
–	–	–	–	–	–	–	–	XIX	1	XIX	1	3.4
											29	

FIGURE 2-1: LOCATION OF ELVER RAMPS, AND EELS POTS FISHED IN SPILLWAY REACH BELOW CONOWINGO DAM.

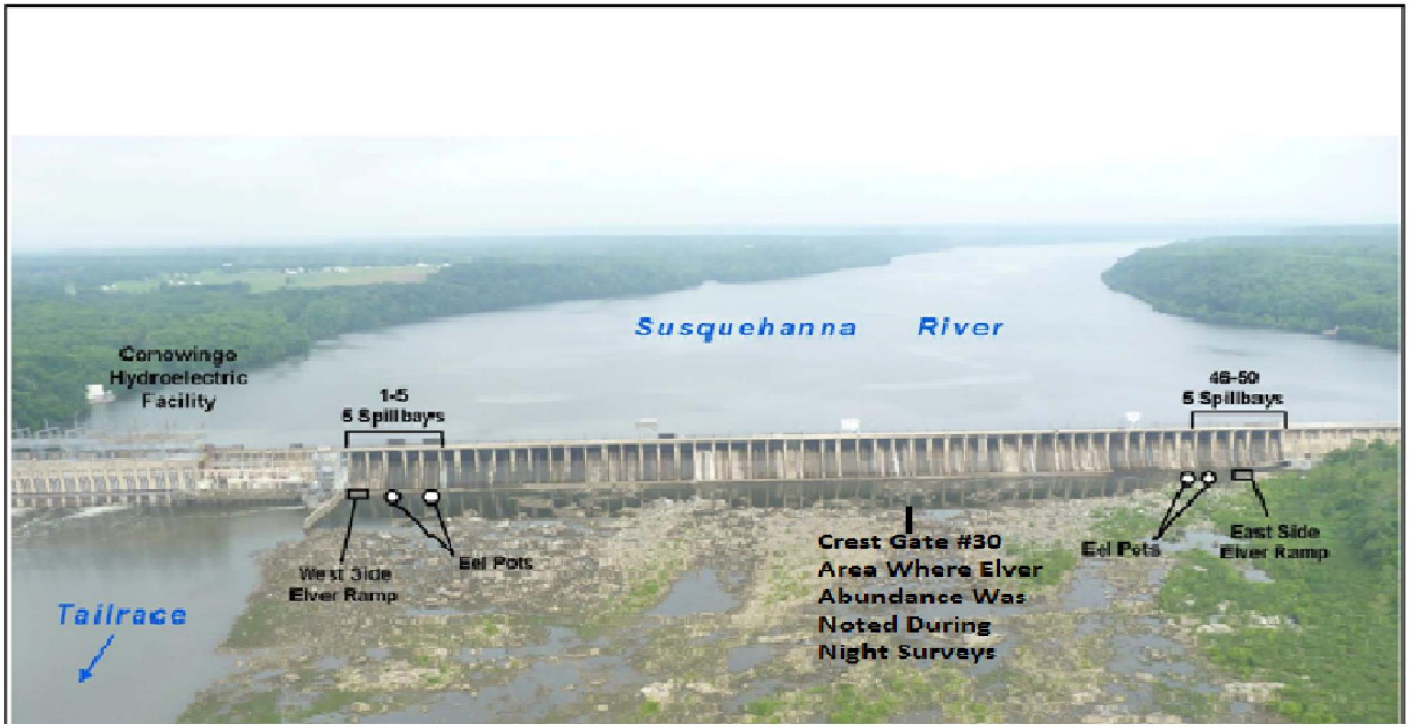

FIGURE 2-2: ENKAMAT® AND AKWADRAIN™ SUBSTRATE.

FIGURE 2-3: WEST SIDE ELVER RAMPS WITH ADDITIONAL ATTRACTION WATER.

FIGURE 2-4: COMPARISON AND SAMPLING LOCATIONS OF 2010 AND 2011 WEST SPILLWAY RAMP LOCATION.

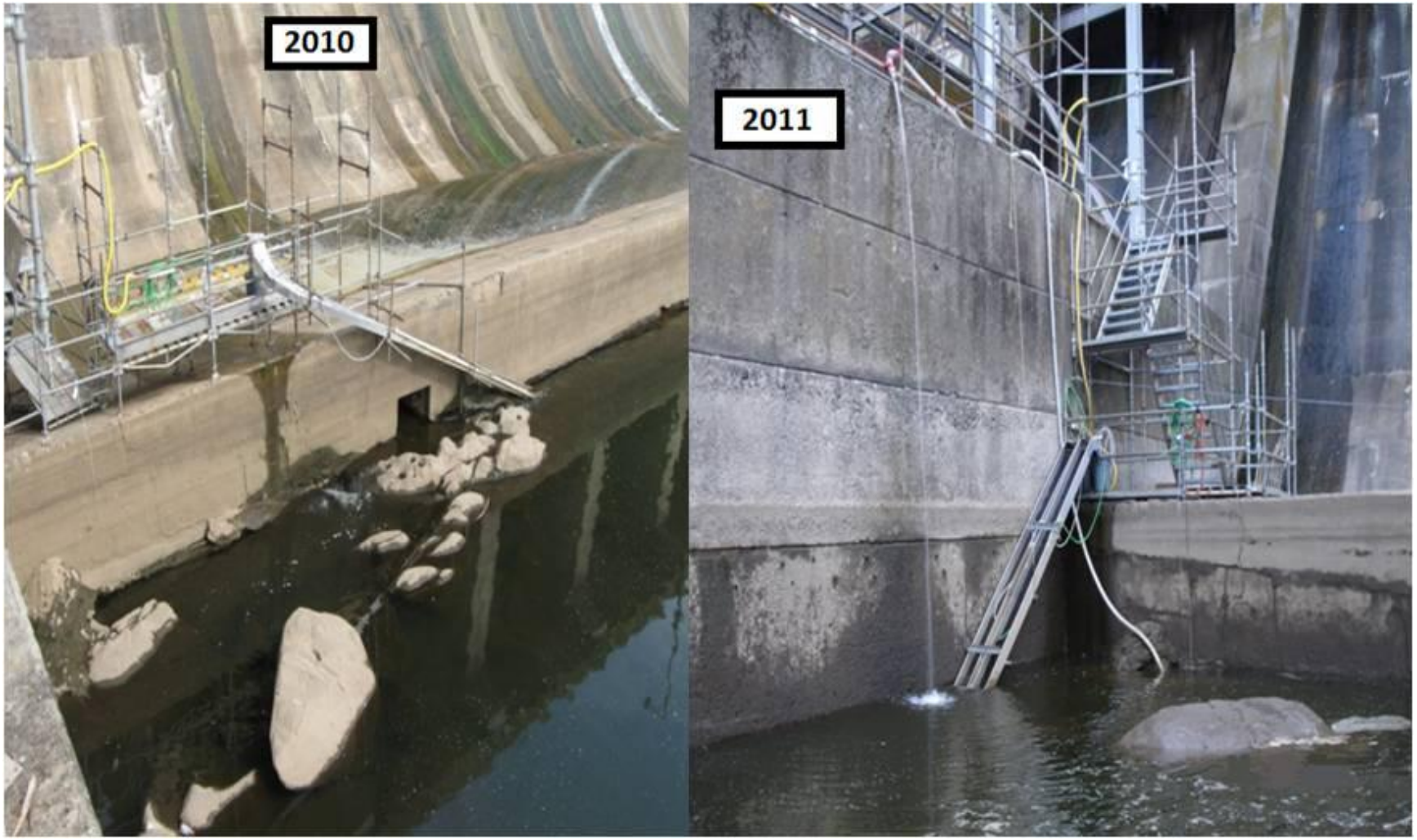

FIGURE 2-5: LOCATION AND CONFIGURATION OF EAST SIDE ELVER RAMPS IN 2010 AND 2011.

FIGURE 2-6: EAST RAMP WITH NATURAL ATTRACTION FLOW FROM INTERMITTENT STREAM.

FIGURE 2-7: CONSTRUCTION OF ELVER RAMPS USING TWO DIFFERENT SUBSTRATES.

FIGURE 2-8: WATER SUPPLY MANIFOLD, SPRAY BARS, AND HOLDING CONTAINERS.

FIGURE 2-9: PHOTO OF SPRAY BAR AND ADDITIONAL FLOW.

FIGURE 2-10: BAITING AND SETTING EEL POTS.

FIGURE 2-11: PROCESSING OF COLLECTED SPECIMENS.

FIGURE 2-12: COLLECTION OF YELLOW EELS AND PITT TAG SCANS.

FIGURE 2-13: WATER QUALITY MEASURING DEVICE, HOBO.

FIGURE 3-1: COMPARISON OF ELVER CATCH TO ENKAMAT® AND AKWADRAIN™ SUBSTRATES.

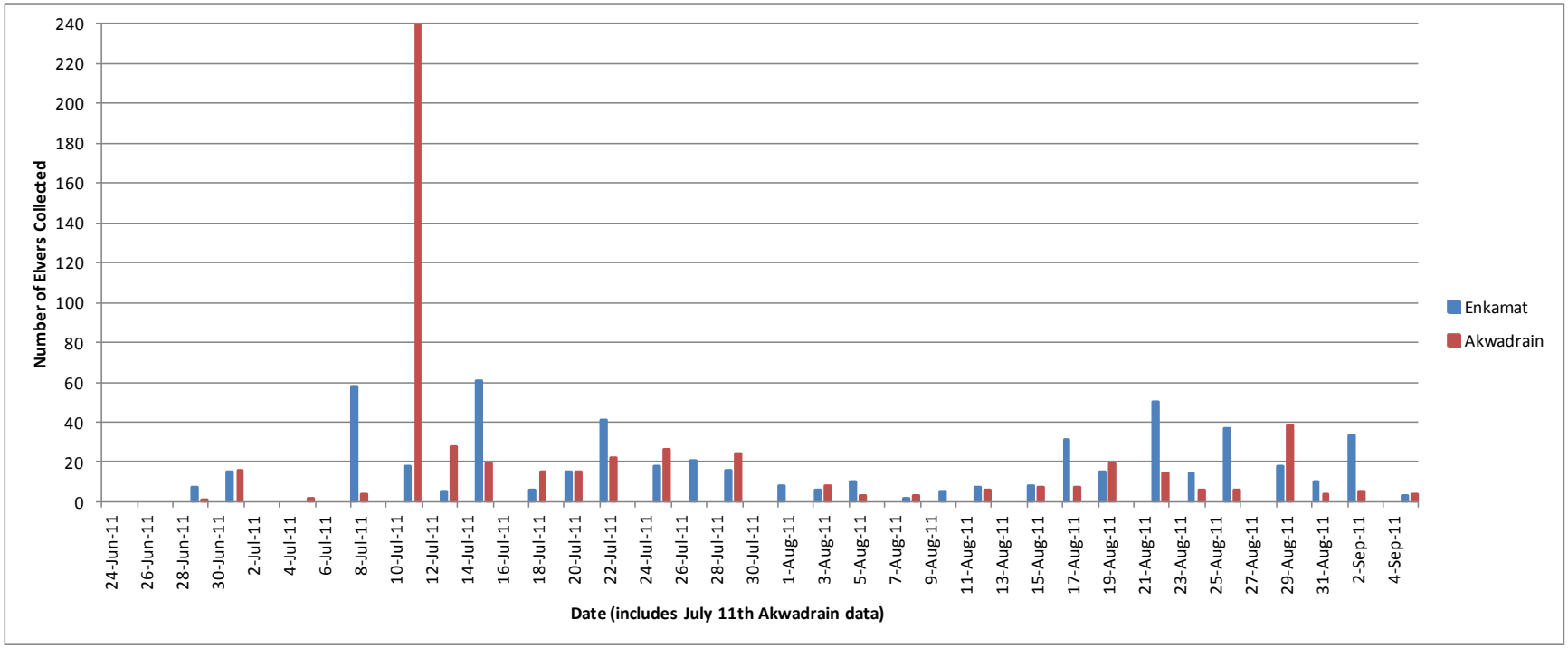

FIGURE 3-1: CONTINUED.

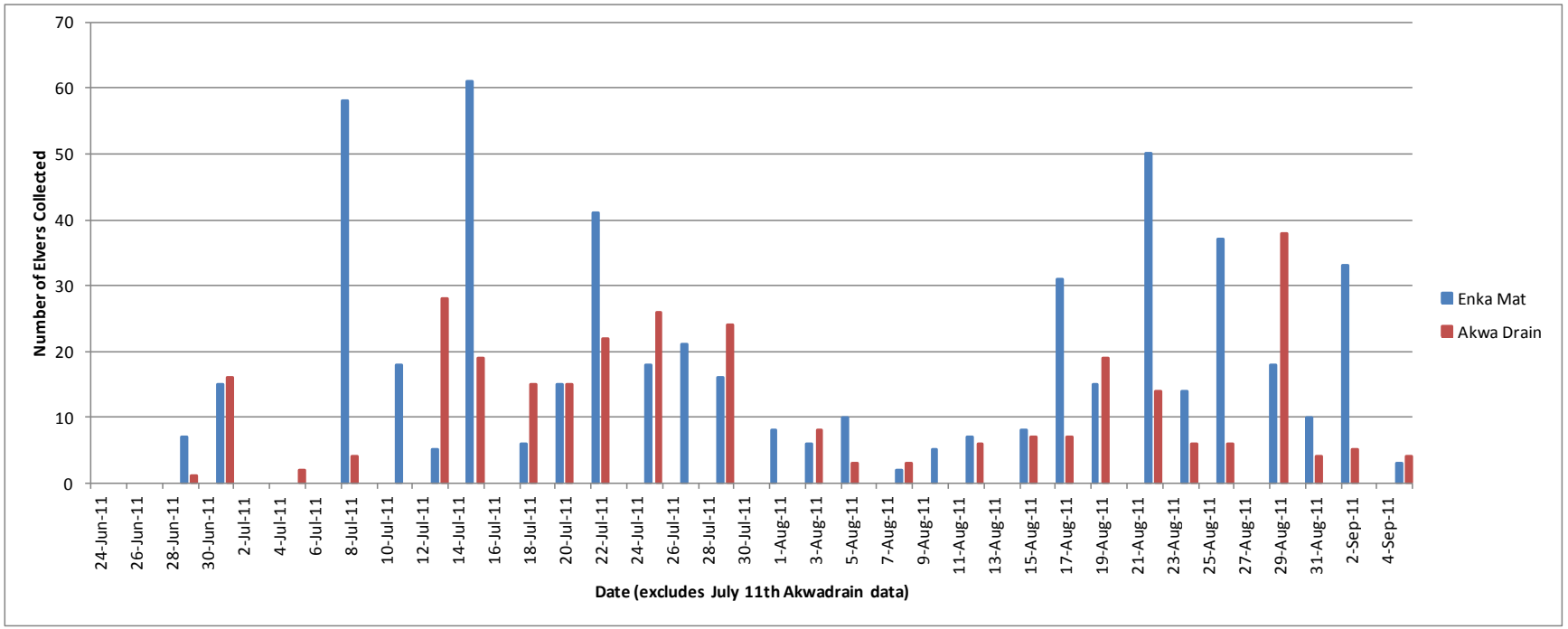

FIGURE 3-2: SIZE RANGE OF ELVERS CAUGHT IN SPILLWAY RAMPS.

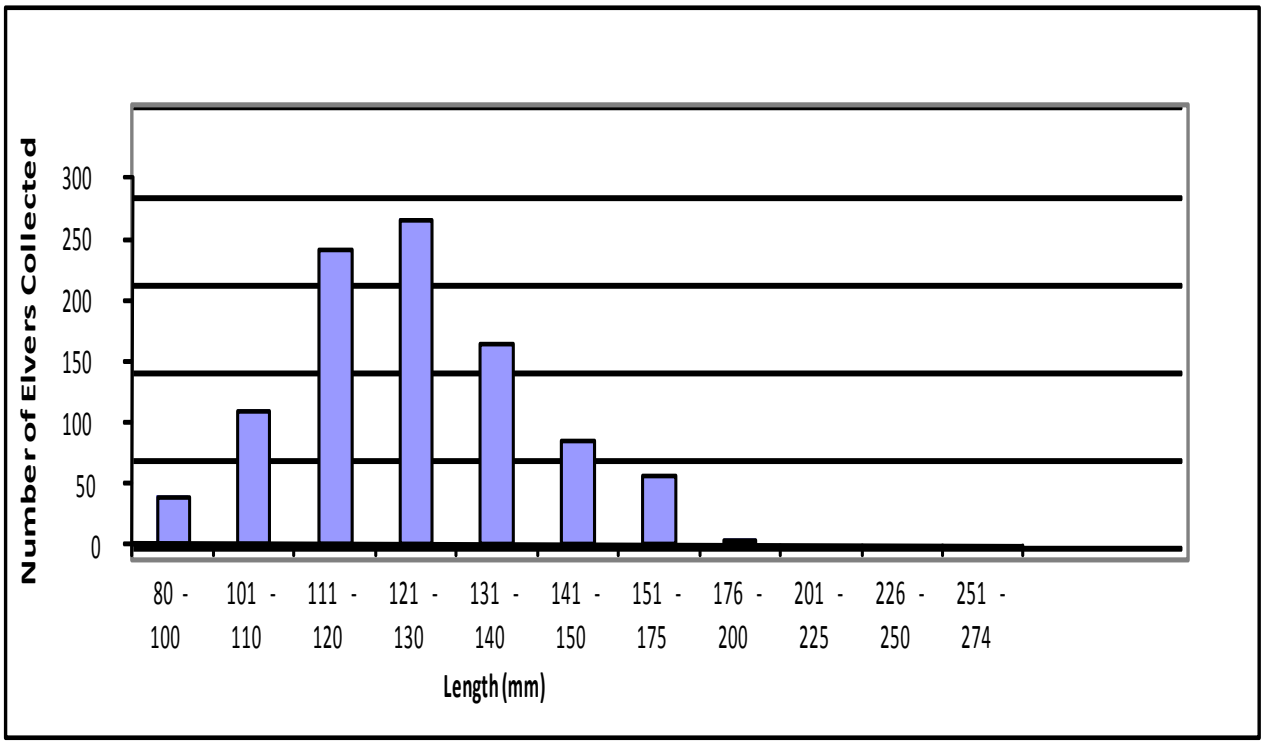

FIGURE 3-3: SIZE RANGE OF YELLOW EELS CAUGHT IN SPILLWAY POTS.

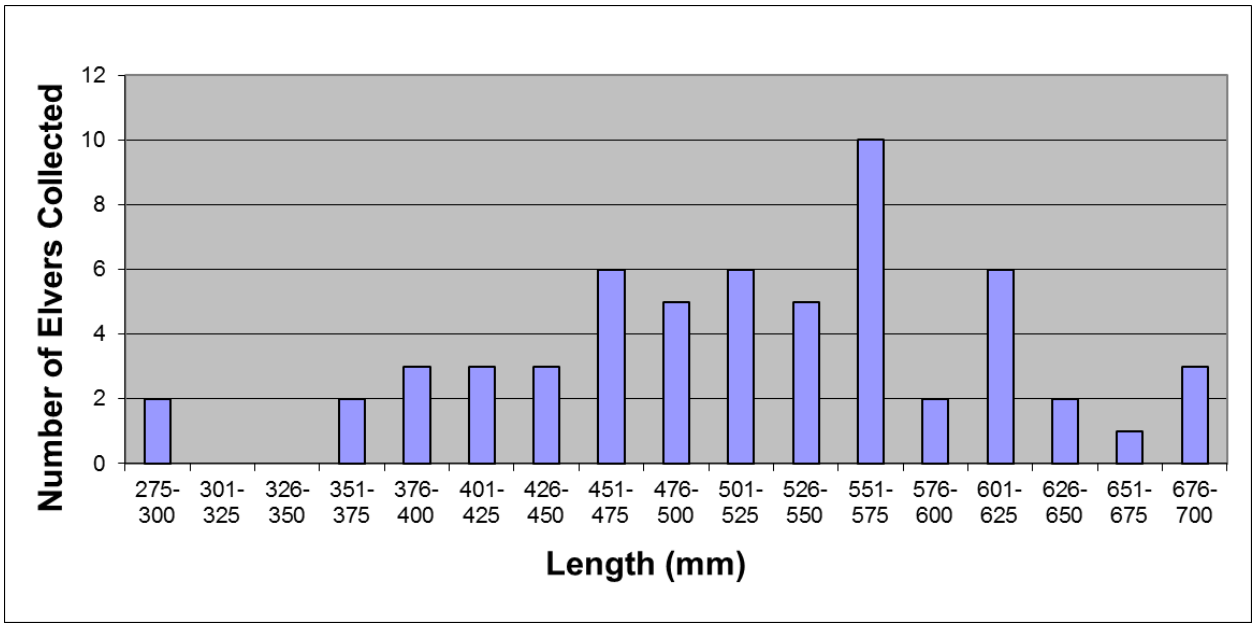

FIGURE 3-4: ELVERS COLLECTED IN RELATION TO WATER TEMPERATURE (°F) AND LUNAR CYLCE IN THE CONOWINGO SPILLWAY.

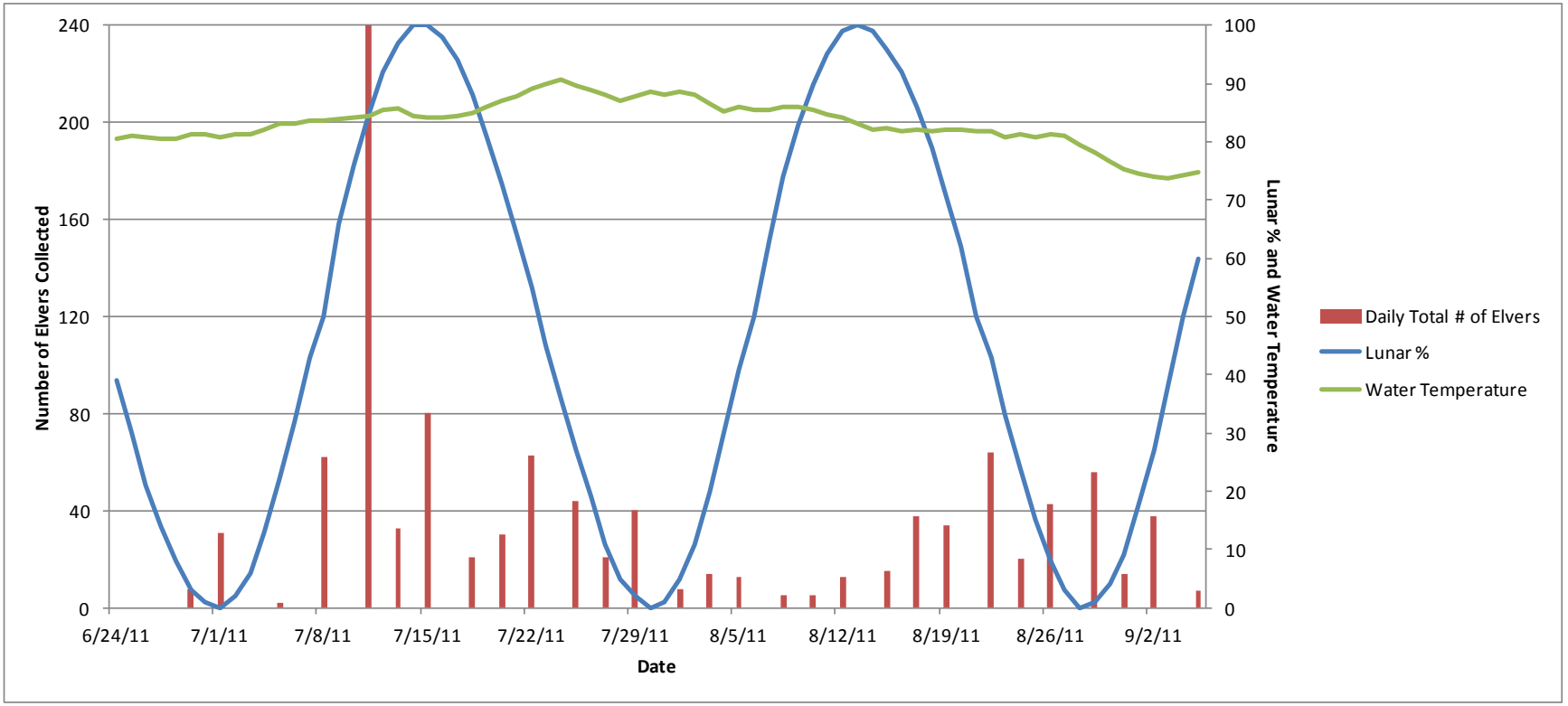

FIGURE 3-5: EVENING ASSESSMENT OF ELVER MOVEMENT.

FIGURE 3-6: AREA IN FRONT OF SPILLBAY 30 WHERE ELVERS WERE OBSERVED.

FIGURE 3-7: NUMBER OF ELVERS COLLECTED IN SPILLWAY RAMPS IN RELATION TO RAINFALL (INCHES) AT CONOWINGO DAM. EXCLUDES DAYS OF NO RECORDED RAINFALL.

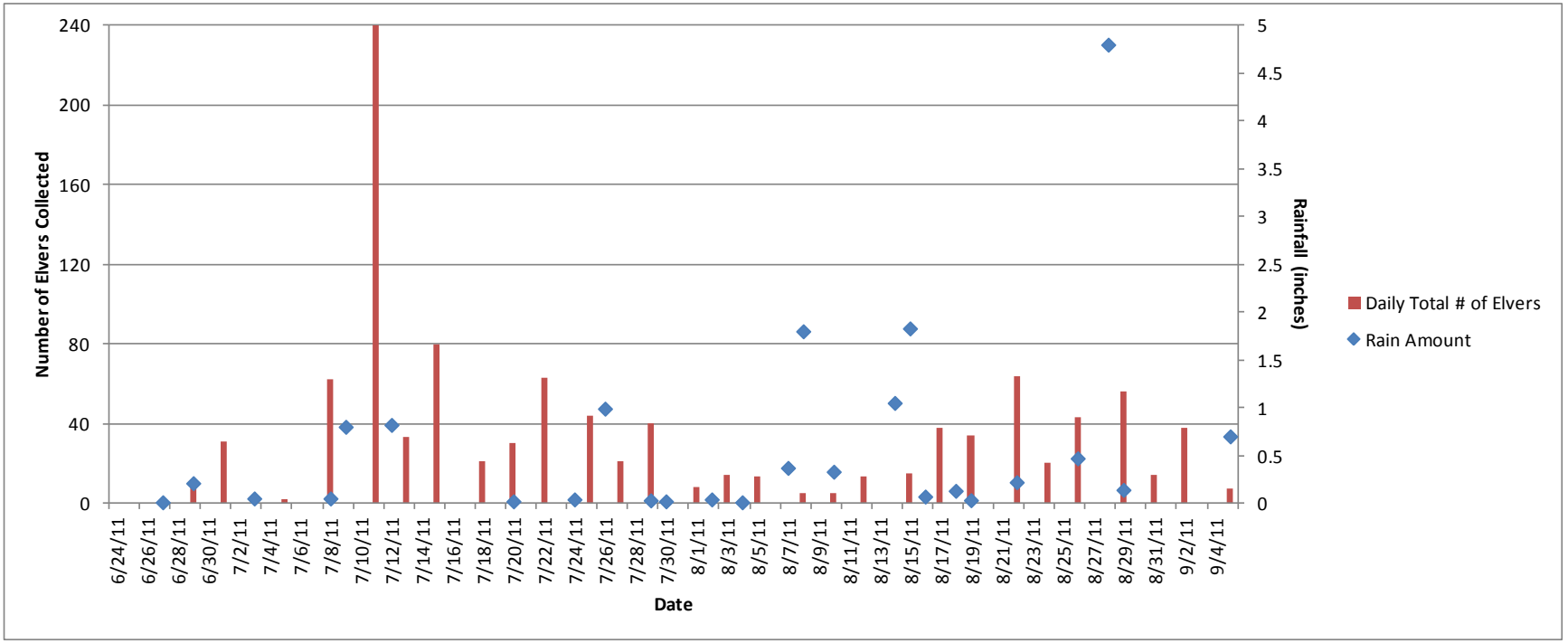

FIGURE 3-8: HURRICANE IRENE AND TROPICAL STORM LEE ENDED THE 2011 SEASON.

APPENDIX A -2011 STUDY PLAN

2011 STUDY WORK PLAN
CONOWINGO HYDROELECTRIC PROJECT

May 13, 2011

3.3 Biological and Engineering Studies of American Eel at the Conowingo Project

3.3.1 Study Request

The FERC, Lower Susquehanna Riverkeeper, MDNR, PaDEP, PFBC, SRBC, and USFWS have requested engineering and biological studies to assess the passage of American eel over the Conowingo Dam. The study requests generally recommend the following elements: (1) assessment of the optimal location for an upstream American eel passage facility; (2) an assessment of the rate of drop-back of migrating American eels; and (3) documentation of seasonal eel abundance and size/age distribution below the Conowingo Dam. Exelon does not plan to address Study Request Component 2 (drop-back study) during the field studies that gather siting and biological data, per the recommendation by MDNR to defer this aspect in their study request letter. Rather, this field study would be more appropriate pre-construction during evaluations of potential design and exit location for an upstream eel passage facility.

In section 5.0 of the Conowingo PAD, Exelon proposed to complete a literature based study on American eel to: (1) summarize available scientific and commercial information; (2) identify suspected factors affecting the American eel population; (3) examine the engineering feasibility of upstream and downstream passage options for American eel; and (4) examine the potential impact of upstream and downstream passage of American eels in the Susquehanna River on the American eel population.

3.3.2 Existing Information (18 CFR § 5.11(d)(3))

Results of 2010 elver and yellow eel biological studies performed in the tailrace (by USFWS) and spillway (by Exelon) below Conowingo Dam were submitted to FERC and participating agencies for review on February 22, 2011. Elvers and yellow eels were sampled between June 14 and September 30, 2010**.** A total of 258 eels were collected on the spillway side of Conowingo Dam. Of these, 166 were elvers collected from the elver ramps. The east elver ramp collected 158 elvers, while the west elver ramp collected eight. Elver lengths ranged from 92 to 154 mm TL. Baited eel pots yielded 91 yellow eels and one elver. The east-side eel pots collected one yellow eel, while the west-side pots collected 90 yellow eels. The length range of yellow eels collected in pots ranged from 301 to 640 mm TL. Seven yellow eels were fin-clipped recaptures from the location where tagged.

Otoliths from 65 eels were aged. Most elvers were age I or II, although 15% had spent four years in fresh water. Most yellow eels were aged VII, VIII, or IX. However, ages IV through VI were likely under sampled by the gears utilized since no eels were collected between 155-300 mm.

The findings in 2010 suggested that the comparatively low numbers of elvers collected in the spillway (relative to 24,000 elvers collected by USFWS in the tailrace) may have resulted from a delayed start, or possibly from additional factors including attraction flow volume, ramp substrate material, and/or ramp location. Consequently, Exelon plans to repeat the spillway study in 2011 to acquire additional information while adjusting for, to the extent feasible, any effects of those factors identified above. For example, different substrate material may allow collection of small yellow eels between 150-300 mm that eluded capture in 2010. Section 3.3.6 below presents plans to collect additional biological information in the spillway area in 2011.

3.3.2 Resource Management Goals (18 CFR § 5.11(d)(2))

The SRAFRC Alosid Management and Restoration Plan for the Susquehanna River Basin was completed November 15, 2010 and provides for restoration of American eels to their historical habitats above dams. ASMFC's eel management plan calls for provision of upstream eel passage facilities at dams throughout the Atlantic coast of the United States.

3.3.3 Purpose (18 CFR § 5.11(d)(1))

The purpose of the 2011 study is to: 1) describe the spatial distribution and size characteristics of American eels in the Conowingo tailrace; 2) identify potential locations for an upstream eel passage facility at Conowingo Dam. Thus, the goals are to refine and improve upon the information learned during the 2010 study.

3.3.4 Project Nexus (18 CFR § 5.11(d)(4))

Conowingo Dam is an impediment to upstream passage of American eel.

3.3.5 Investigation Area

The study area for the desktop portion of this study plan includes the lower Susquehanna River from Conowingo Dam upstream to above the York Haven Dam. The field biological studies will occur in the Conowingo tailrace and below the spillway.

3.3.6 Methodology (18 CFR § 5.11(b)(1), (d)(5)-(6))

Task 1: Field Studies in 2011

Task 1A—Collect Eel Spatial distribution data in the tailrace and spillway pool

Spatial distribution and abundance data will be collected from the tailrace and from below the spillway. Recent USFWS methodology in the tailrace has utilized separate gear types to capture elver-stage eels and larger yellow eels. Exelon will utilize both elver ramps and baited eel pots to collect a broad range of eel sizes within the spillway pool.

Elvers in the tailrace will be collected using the USFWS ascent ramp(s) and collection facility on the west bank. The USFWS west bank facility is typically deployed in May and will be sampled regularly (2-3 times per week) through late summer. This is already a known location where elvers congregate in sizeable numbers. Seasonal abundance and biological data may be obtained from this location.

Historical observations of elver use of the spillway pool exist from the 1960s to the 1980s. Elvers in the spillway pool will be collected by a system of self-contained devices consisting of elver ascent ramps and collection buckets. One station will be located on the spillway lip, adjacent to the east fish lift, and a second station located on the spillway lip adjacent to the eastern river shore. Similar systems have been used below the Roanoke Rapids (NC) Project and others to collect eels in a spillway area. Exelon safety standards will be followed for these locations. The spillway pool collection ramps will be fished from late May through October 2011. This study period is contingent upon the termination of spill conditions at the Project. Upon start-up of ramp and attraction flows, elver ramps will fish continuously and be visited each Monday-Wednesday-Friday each sampling week. If elver numbers dictate, more frequent visits to tend collection tanks or larger collection tanks will be utilized as necessary. This component will determine seasonal use of the spillway pool by elvers as well as contrast spatial abundance with the tailrace.

In 2010, Enkamat substrate was used in the elver ramps, conforming by study design to techniques used over several years in the tailrace ramps utilized by the USFWS. In March 2011, Normandeau biologists attended an eel symposium in Gloucester, MA and intend to incorporate ideas gleaned from the meeting into the design of the elver ramps for the 2011study. Alternate substrate materials will be examined and one selected for use in combination with Enkamat. For example, an alternate substrate such as Akwadrain or equivalent will be fitted to an elver ramp used in tandem with a ramp with Enkamat to compare efficacy. Moreover, such a substrate ideally would pass elvers as well as yellow eels. For this study, attraction flow will be provided simultaneously to both ramps, if the water source is able to provide sufficient flow volume. Substrate coverage will be refined to better lead eels to the collection facilities, as will ramp flow through the substrate.

Among other potential modifications to increase the efficacy of the ramps, further research prior to 2011 start-up will examine appropriate ramp angles for the length of ramp used and the amount of attraction flow. Attraction flow is important and the volume achieved in 2010 may have been too little to attract elvers, given the volume and number of spillway lip overflows available. Attraction flow will be increased as feasible given the in-house supply capability. Periodic review of catch results and ramp performance may also lead to changes to ramp structure throughout the study period. Periodic nighttime observations of the study equipment and surrounding spillway area may be necessary to help ascertain best placement of the catch-gear in the spillway area. Such observations may lead to mid-season relocation of ramp entrances if feasible. Exelon will conduct up to four night surveys of the spillway lip/pool area, timed to match high/peak catch rates of elvers in the spillway and the USFWS WFL facility (June/July 2011). Exelon is currently establishing safety protocols for field crews when conducting these nighttime surveys.

Yellow eels in the tailrace and spillway pool will be collected with baited eel pots. Spillway pool eel pots will be fished at intervals along the spillway lip where lock-out and safety protocol permits. Typically, about 0.5 pound of bait is adequate for a 48-h set. Eel pots will be modified to catch a broader range of size classes. The eel pots will be fished bi-weekly from May through October or as tailrace and spillway pool conditions permit.

Task 1B—Collect Biological and Physical Data

Captured eels will be counted, measured, and scanned for PIT tags. Large counts of elvers may be estimated volumetrically. Yellow eels from both locations will be measured. The first ten specimens from six representative size ranges will be sacrificed for age analysis via otoliths. All remaining yellow eels will have pectoral fins clipped; right pectoral fin for eels captured in east spillway pots, left pectoral for west, then provided to the USFWS for insertion of PIT tags (personal communication with Steve Minkkinen (USFWS). Representative samples of tailrace and spillway pool elvers will be measured. A representative sample from a variety of predetermined size classes will be sacrificed for otolith analysis, including those in the 151 to 300 mm size range that have been uncommon in sampling to date. All other elvers will be placed into the USFWS west bank facility for transport if desired.

Daily and weekly catch data will describe temporal occurrence in relation to several physical variables. Physical data recorded for each sample will include: water temperature, rainfall during the sample period, and percent lunar fraction. Tailrace water temperatures will be obtained from the Exelon tailrace continuous monitor (Station 643). Spillway pool temperatures will be monitored with two ONSET temperature loggers, one at each end of the spillway pool. Percent lunar fraction for a nearby location will be obtained from the Naval Observatory website.

Size structure from each gear type will be determined, including how size structure changes during the sampling season. Size structure informs the choice of substrate material for any upstream passage device.

Task 2: Develop Study Report

Study results will be summarized in a report that will include the study methodology, results of the desktop and field studies, and conclusions. The report will be distributed to interested stakeholders and submitted to the FERC.

3.3.7 Level of Effort and Cost (18 CFR § 5.11(d)(6))

Exelon believes that the proposed level of effort is adequate to analyze this issue. The estimated total cost for the field study outlined in this plan is approximately $100,000.

3.3.8 Study Reporting and Schedule

In accordance with 18 CFR § 5.15(c)(1), a Study Report will be prepared and submitted to FERC and resource agencies by January 21, 2012.

APPENDIX B - USFWS 2011 EEL COLLECTION REPORT, CONOWINGO DAM TAILRACE

American Eel sampling at Conowingo Dam 2011

Steve Minkkinen, Ian Park, Maryland Fishery Resources Office, 1/25/2012

Background

Eels are a catadromous species that ascend freshwater environments as juveniles then reside in riverine habitats until reaching maturity at which time they migrate to the Sargasso Sea where they spawn once and die. Larval eels are transported by ocean currents to rivers along the eastern seaboard of the continent. Unlike anadromous shad and herring, they have no particular homing instinct. Historically, American eels were abundant in East Coast streams, comprising more than 25 percent of the total fish biomass in many locations. However, Atlantic coast commercial landings have been declining sine the 1970's.

The Atlantic States Marine Fishery Commission Fishery Management Plan for American Eel lists access to freshwater habitat as a priority for protecting the population. Although the Chesapeake Bay and tributaries support a large portion of the coastal eel population, eels have been essentially extirpated from the largest Chesapeake tributary, the Susquehanna River. The Susquehanna River basin comprises 43% of the Chesapeake Bay watershed. Construction of Conowingo Dam in 1928 effectively closed the river to upstream migration of elvers at river mile ten (Figure 1).

Mainstem Susquehanna fish passage facilities (lifts and ladder) were designed and sized to pass adult shad and herring and are not effective (due to attraction flow velocities and operating schedules) in passing juvenile eels (elvers) upriver. Specialized passages designed to accommodate elvers are needed to allow them access to the watershed above dams.

Survey methods and Equipment Placement

To determine the best method to reintroduce eels into the Susquehanna River above Conowingo Dam, we have collected baseline information on eel abundance, migration timing, catch efficiency, and attraction parameters at the base of the Conowingo Dam since the spring of 2005. Information from the study will assist in determining the potential for reintroducing eels into the Susquehanna watershed above Conowingo Dam.

The 2011 American eel sampling below Conowingo took place on the west side of the dam adjacent to the West Fish Lift. This sampling served as an attempt to further survey the population of juvenile eels (elvers) at the base of Conowingo Dam. In 2007, elvers were observed climbing up the rip rap where water was spilling over from pumps operated to supply water for the West fish lift operations. From 2008 through 2011 we used this excess water as attraction flow for our elver trap, constructed from industrial cable tray with landscape fabric attached to the bottom (Figure 2). Elvers that found this attraction flow would crawl up the rip rap to the trap and then climb into the trap. The top of the cable tray emptied into a fine mesh collection bag placed in collection tanks (Figure 3). Aerated water was supplied to the collection and holding tanks using a 1/8 HP Sweetwater™ Blower. In 2009 and 2010 we made an attempt

to attract elvers directly from the Susquehanna River at the base of the riprap as well. In 2011 we discontinued the experimental trap going down to the river's edge. Elvers were sedated with, Finquel Tricane Methanesulfonate (MS-222), measured for total length (TL), and individually counted. Large numbers of eels were counted volumetrically. The collection of substantial numbers of eels allowed for the experimental stocking of elvers into Buffalo Creek, Pine Creek and Conowingo Creek. Stocking in Buffalo Creek and Pine Creek is part of a compensatory mitigation for the Sunbury Riverfront Stabilization Project for the City of Sunbury (DA Permit Application Number: NAB 2005-02860-PO5) (attachment 1).

All of the elvers stocked were marked with a 6 hour immersion in buffered oxytetracycline (OTC) at a concentration of 550 ppm prior to release. A subsample of elvers captured was also sent to the Lamar Fish Health Center (Lamar, PA) for disease testing before any stocking occurred.

In previous years, eel pots with a 6 mm square mesh were set around the base of the West Fish Lift to catch larger eels. In 2011, we changed our collection device from a cylindrical eel pot to a double throated rectangular trap with a 25 mm by 13 mm mesh that is more consistent with local commercial gear. Yellow eels captured in eel pots were sedated with a concentrated solution of MS-222 (450g/L), measured, fin clipped, and had a Passive Integrated Transponder (PIT) tag inserted in the dorsal musculature and released.

In 2011, young-of-year (glass eels) were collected by Maryland Department of Natural Resources (Maryland DNR) in Turville Creek, MD. These eels were then transported to the United State Geological Survey lab in Wellsboro, Pennsylvania. The glass eels were held in the lab until June, and then released in Buffalo and Pine Creek (Table 1).

Results

Eels were sampled between 23 May and 8 September 2011 and elvers were collected throughout the sampling timeframe (Table 2). A total of 85,000 elvers were collected during 2011 with the majority collected in two pulses. The first wave occurred in the month of July and the second wave occurred at the end of August through the beginning of September during high flows associated with hurricane Irene and tropical storm Lee. Sampling ended abruptly due to flooding subsequently caused by tropical storm Lee. The seasonal pattern of migration in 2011 was similar to that observed in 2008 when a majority of the eel collection occurred in the end of June through the end of July. During 2009 the migration was later and more protracted with the majority of elvers being collected in the end of July through August. In 2008, 2010 and 2011 we saw multiple waves of elvers throughout our sampling efforts; where as in 2009 there did not appear to be spikes in collections, but more of a steady level of migration through the sampling period (Figure 4).

Juvenile eel lengths ranged from 84 to 225 mm TL (Figure 5), slightly larger than previous years sampling. In 2011, 75%of elvers measured were between 110 and 149 mm, and from 2005-2009 56% of elvers measured were between 110 and 149 mm.

Yellow and silver eel collections in eel pots have taken place from 2007 - 2011. In 2011, we caught 224 yellow and silver eels that ranged from 333 to 659 mm TL. Of the 224 captures, 127 eels had new PIT tags inserted, 55 were recaptures from tagging done in 2011 or in previous year, and the rest were released without being tagged. This year we caught significantly more yellow and silver eels than in previous years. The largest number of yellow and silver eels previously caught was in 2009, when we had 68 new captures (Table 3). The addition of the 127 new captures brings the total number of PIT-tagged yellow eels in the study to 289. We are tracking annual growth rates of the 31 PIT tagged eels that have been recaptured after at least one year after tagging (Table 4).

A total of ten stockings from elvers captured at Conowingo Dam were conducted, with an estimated total of 62,000 elvers being stocked in Buffalo, Pine and Conowingo Creek (Table 1).

To evaluate stocking success at Buffalo and Pine Creek, we conducted electrofishing surveys using 3 backpack shockers and a barge shocker in August 2011. We duplicated methods used by the Maryland Biological Stream Survey (2007) to quantify the catch per unit effort (CPUE) and the biomass of eels. Two sites, bracketing the eel release sites, in each creek were surveyed (Table 1). At each site, 75 meters of stream were blocked off using ¼" mesh block net. In order to quantify the fauna in the stream, two passes with the electrofishing units were conducted and all species of fish collected were enumerated. Captured eels were measured to assess growth and a subsample of the eels collected was brought back to confirm previous marking of otoliths by OTC. In August of 2011, 441 elvers were recaptured in Buffalo Creek. All but 9 of these were recaptured at the Strawbridge Rd site. An attempt was made to sample at the foot bridge on Rte. 1003 but high flows prevented a depletion study from being conducted. The average TL of stocked elvers from Conowingo was 127 mm, and the average TL of glass eels stocked was 80mm, while the average TL of recaptured eels in Buffalo Creek was 137 mm (Figure 6). Sampling Pine Creek in 2011 provided 20 recaptured elvers, 12 of which were recaptured at the Darling Run site, and the rest were caught at the Ansonia Bridge site. The average TL of recaptured eels in Pine Creek was 143 mm. In addition to eels, 4,854 individuals of 30 fish species were collected in Buffalo Creek and 3,663 individuals of 23 fish species were collected in Pine Creek during electrofishing surveys. (Minkkinen et al. 2011)

Maryland DNR conducts an American eel young of year (glass eel) survey to characterize trends in American eel recruitment over time (ASMFC 2000). Sampling takes place at Turville Creek, MD using a modified Irish elver ramp. We compared estimated recruitment of glass eels from Turville Creek to captures of elvers below Conowingo dam one year later. Based on four years of data it appears that the glass eel recruitment index at Turville Creek does predict elver abundance the following year at Conowingo Dam (Figure 7).

A subsample of elvers was sacrificed to evaluate the presence of the parasite *Anguillicola crassus*. A total of 46 eels were euthanized using MS-222, then examined for the presence of *Anguillicola crassus* in the swim bladder. The samples were collected in 2010 and 2011, with 19 samples from 2010 and 27 samples from 2011. *Anguillicola crassus* was found in 22 of the samples, with the highest infection rate of 6 being found in one eel. There does not appear to be any relation between the length of an eel and the infection rate (Figure 8) or an increase in infection rate from one year to the next.

Discussion

Throughout the project we have compared elver captures to several environmental factors. This year we increased the environmental factors analyzed. The factors we looked at were lunar fraction, river flow in Havre De Grace MD, barometric pressure, air temperature, daily precipitation levels, and the average daily values of dissolved oxygen, salinity, water temperature, pH, turbidity, and chlorophyll. In years past we have not been able to determine what environmental factors control the timing of the elver migration below Conowingo Dam. Typically elvers reach the dam between the first week of May through the end of June and peak captures usually occur in June and July. Using Pearson correlation it appears that turbidity, river flow and precipitation have the largest correlation value and these three values are directly related to one another (Table 5). With an increase of rain, for example the tropical storm that was observed this year, there was an increase in elver collection.

Interruptions in power supply to our pumps have impacted elver catch on several occasions. We have implemented several sampling design changes in an attempt to ensure that we would have an uninterrupted supply of water throughout the sample period. We have also increased the size of our collection and holding tanks in an effort to increase survival and decrease stress while holding the elvers for stocking. These measures have improved our ability to capture and hold larger numbers of elvers for stocking above the dam.

In 2012 we will attempt to release an additional 36,000 elvers in Pine Creek. We also will attempt to release elvers into Conowingo Creek in Maryland and Buffalo Creek in Pennsylvania. Elvers will be marked with OTC before being released. The Maryland Biological Stream Survey plans on conducting surveys in Conowingo Creek to evaluate the stocking effort. The Maryland Fishery Resources Office will survey elvers released in Buffalo Creek and Pine Creek using methods identical to those used in 2010 and 2011.

Figure 1. Map of the Maryland Biological Stream Survey (MBSS) sampling sites of tributaries to the Susquehanna River in Maryland. The numbers in boxes indicates eel counts at each sampling site. Note the difference in densities of eels in tributaries below Conowingo Dam compared to above the Dam.

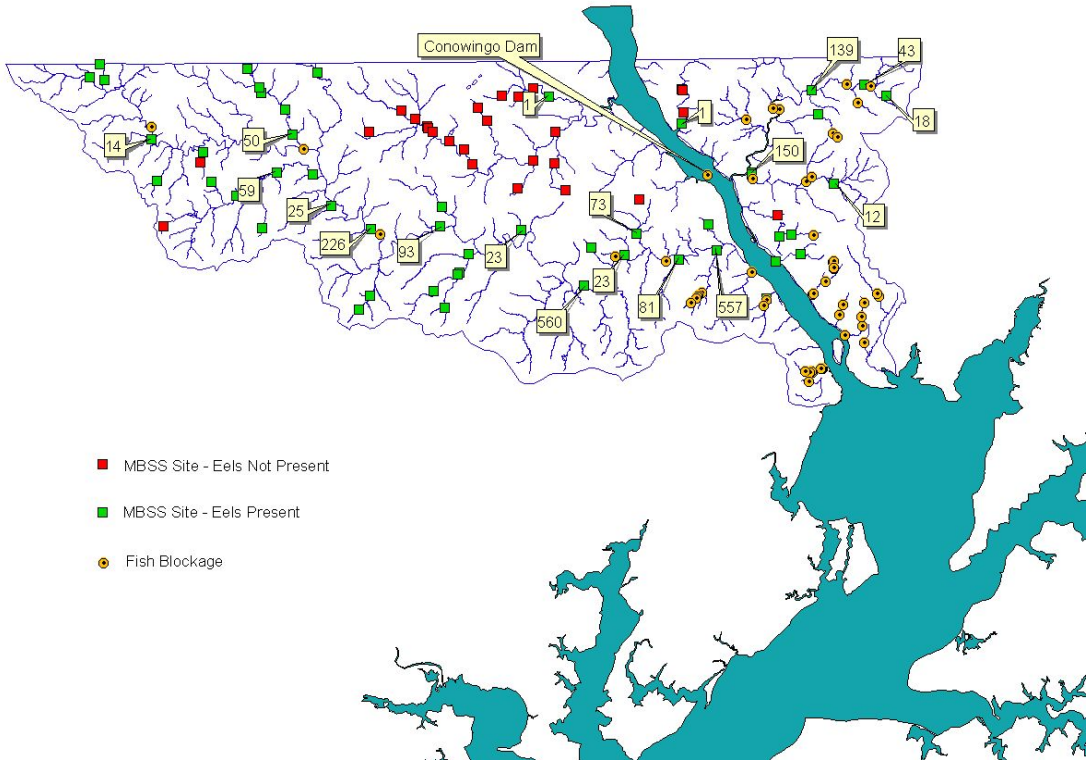

Figure 2. Eel trap constructed of industrial cable tray and landscape fabric.

Figure 3. The cable tray emptying into a collection bag in a holding tank.

Figure 4 Elver capture in relation to date for 2008 – 2011.

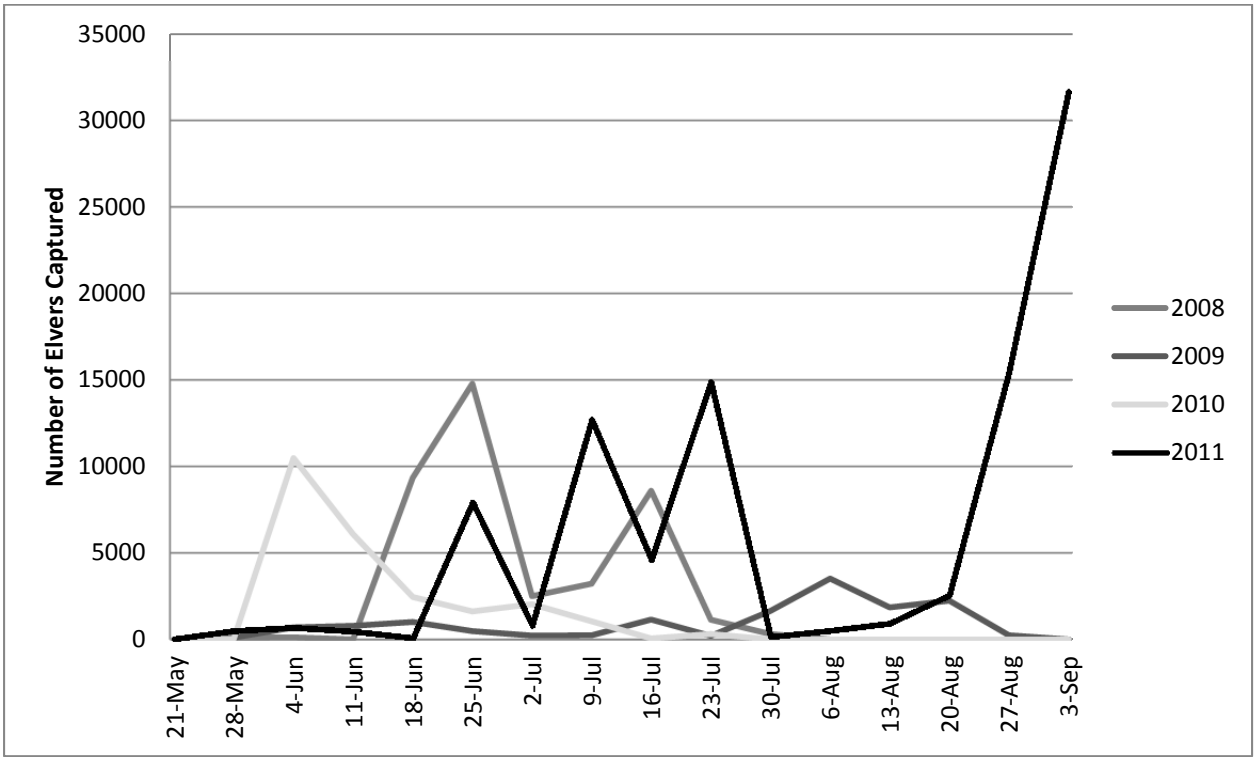

Figure 5 Length frequency of elvers captured below Conowingo Dam 2005-2011.

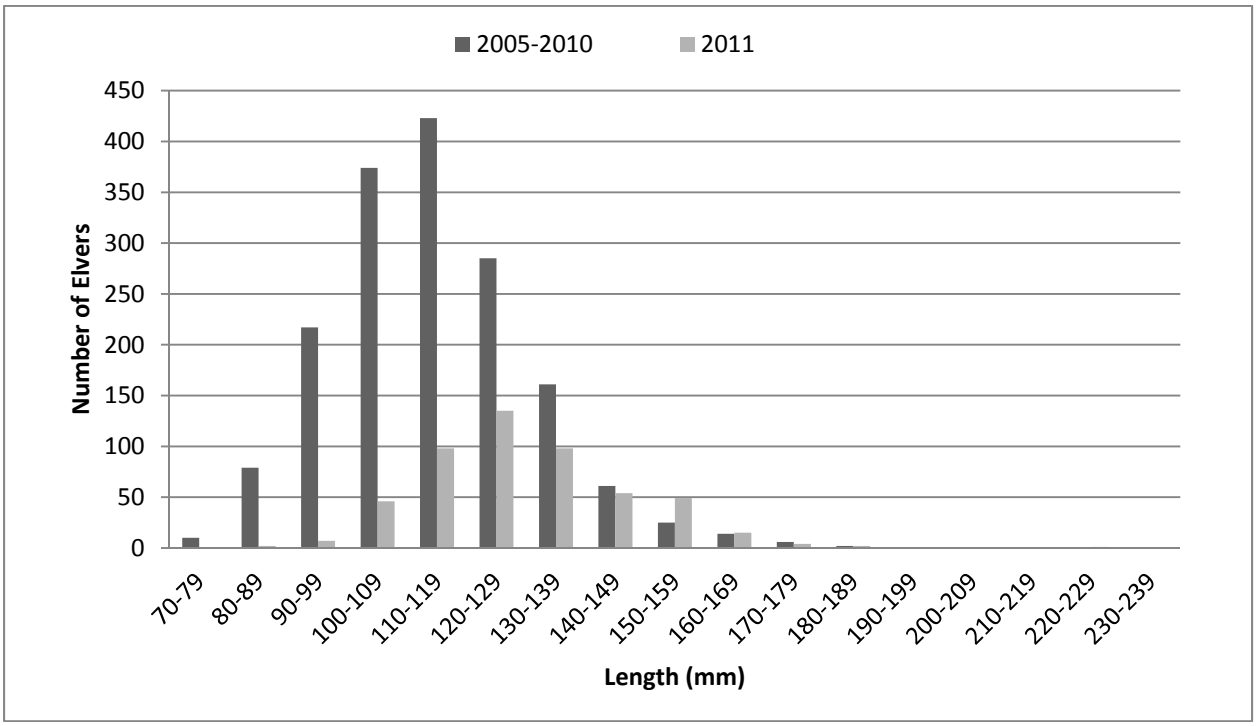

Figure 6 Length frequency of elvers recaptured in Buffalo Creek 2011

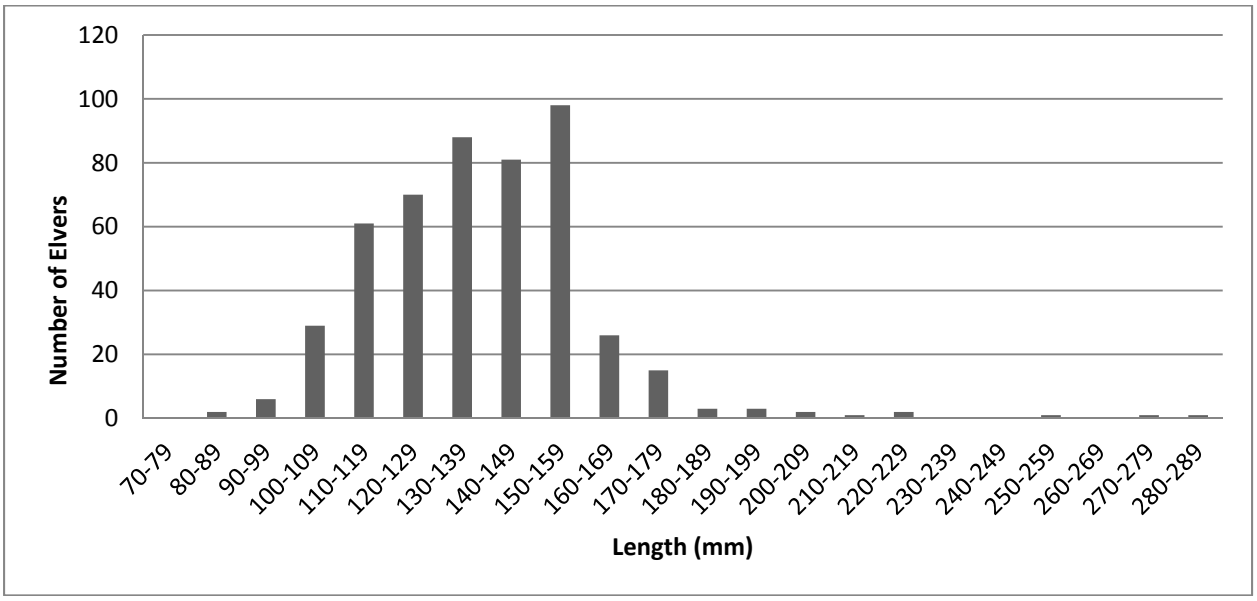

Figure 7 Yearly catch rates of glass eels from Turville Creek and elvers from Conowingo Dam

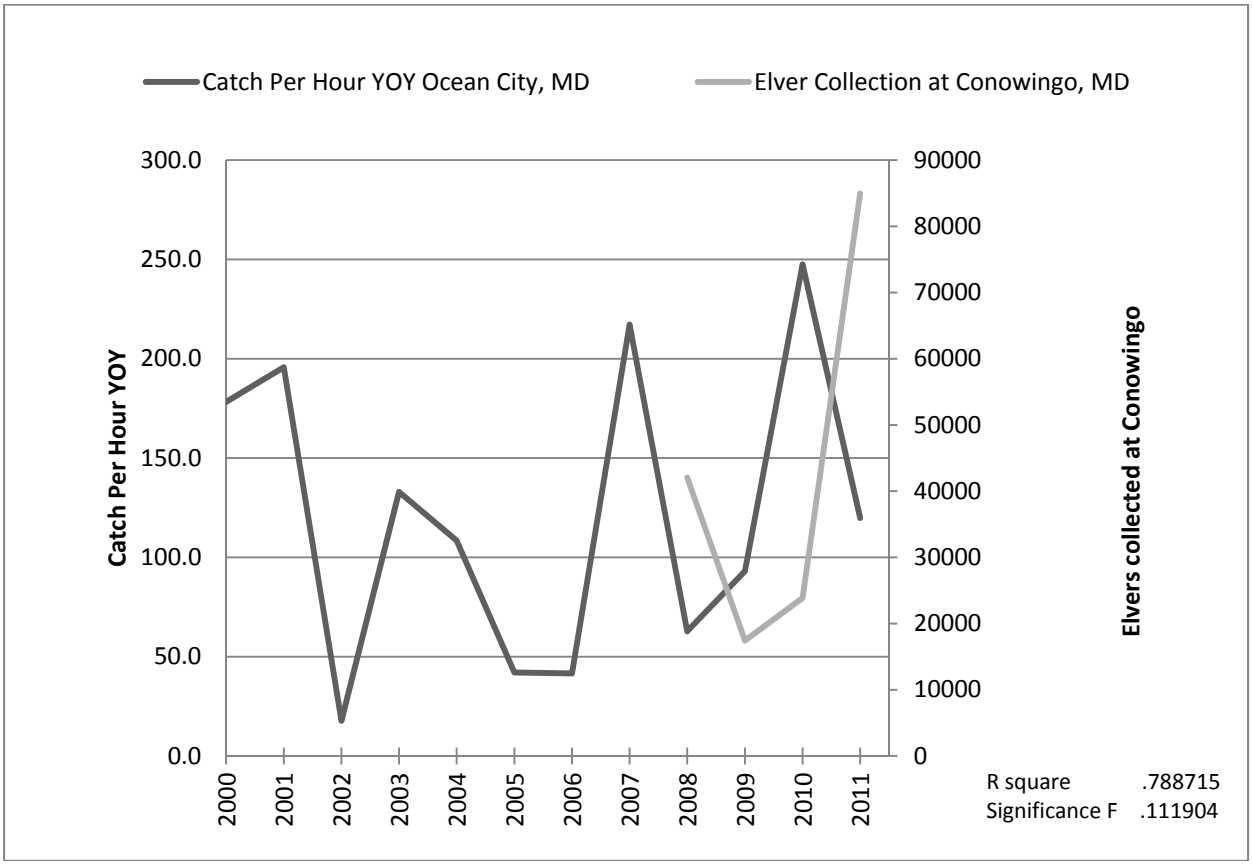

Figure 8 The number of *Anguillicola crassus* present in different lengths of elvers.

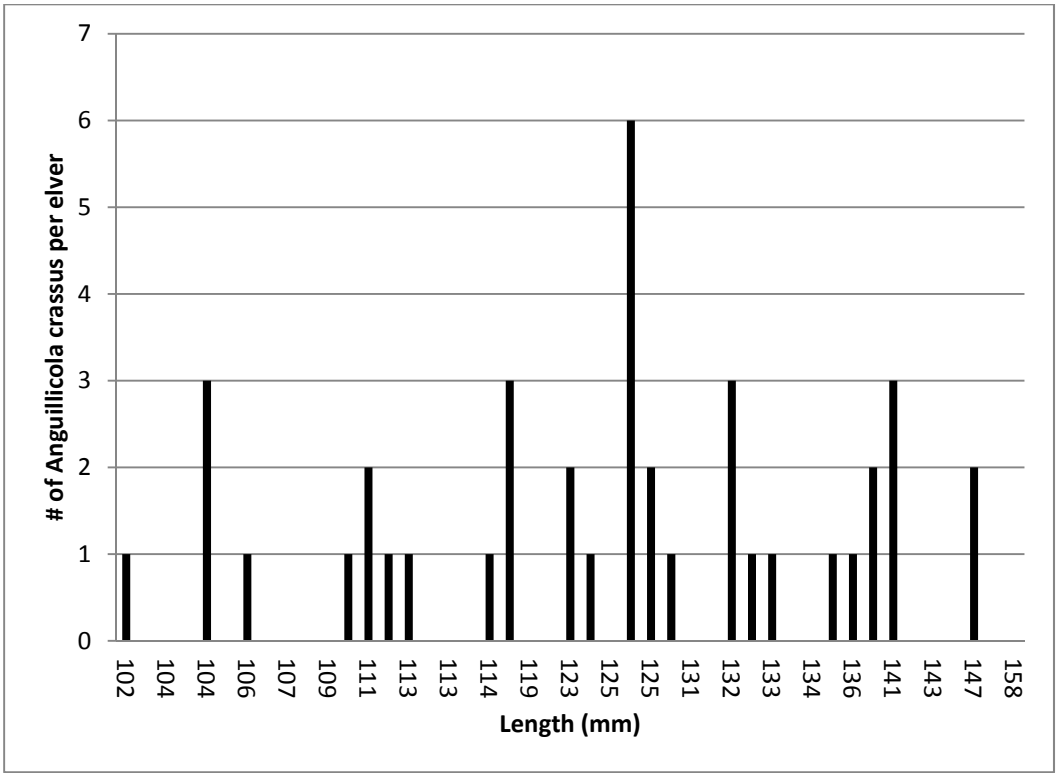

Table 1. Date, location, and number of elvers collected and stocked in 2011

STOCKING DATE	TOTAL ELVERS	STOCKING SITE	Latitude	Longitude	Origin
6/21/2011	16110	Buffalo Creek	40 58.864' N	76.57.081' W	Turville Creek
6/21/2011	16109	Buffalo Creek	40 59.139' N	76 55.930' W	Turville Creek
6/22/2011	10666	Pine Creek	41 44.633' N	77 26.031' W	Turville Creek
6/22/2011	10666	Pine Creek	41 16.285' N	77 19.894' W	Turville Creek
6/22/2011	10666	Pine Creek	41 44.203' N	77 25.822' W	Turville Creek
6/22/2011	1797	Conowingo Creek	39 43.852' N	76 10.701' W	Conowingo Dam
6/30/2011	7222	Pine Creek	41 44.633' N	77 26.031' W	Conowingo Dam
7/14/2011	6326	Buffalo Creek	40 59.139' N	76 55.930' W	Conowingo Dam
7/18/2011	4390	Buffalo Creek	40 59.139' N	76 55.930' W	Conowingo Dam
7/28/2011	3603	Buffalo Creek	40 59.139' N	76 55.930' W	Conowingo Dam
8/22/2011	1528	Pine Creek	41 44.633' N	77 26.031' W	Conowingo Dam
8/31/2011	8940	Pine Creek	41 44.633' N	77 26.031' W	Conowingo Dam
9/2/2011	8084	Pine Creek	41 44.633' N	77 26.031' W	Conowingo Dam
9/7/2011	12205	Pine Creek	41 44.633' N	77 26.031' W	Conowingo Dam
9/8/2011	7844	Conowingo Creek	39 43.852' N	76 10.701' W	Conowingo Dam

Table 2. Number of eels caught at the base of Conowingo Dam on the West side of the dam during 2011.

Date	# of Elvers		Date	# of Elvers
5/23/2011	34		7/20/2011	282
5/25/2011	8		7/22/2011	1380
5/27/2011	1		7/25/2011	2013
5/31/2011	41		7/27/2011	3603
6/3/2011	476		7/29/2011	34
6/6/2011	511		8/1/2011	87
6/8/2011	70		8/2/2011	16
6/10/2011	121		8/5/2011	58
6/13/2011	382		8/8/2011	250
6/15/2011	79		8/10/2011	126
6/17/2011	21		8/12/2011	149
6/20/2011	71		8/15/2011	257
6/22/2011	6		8/17/2011	184
6/24/2011	21		8/19/2011	506
6/27/2011	1217		8/22/2011	928
6/29/2011	4467		8/24/2011	850
6/30/2011	1817		8/26/2011	797
7/1/2011	439		8/29/2011	1344
7/3/2011	378		8/30/2011	2648
7/5/2011	162		8/31/2011	3358
7/7/2011	288		9/1/2011	3548
7/11/2011	1132		9/2/2011	4573
7/12/2011	5514		9/3/2011	3880
7/13/2011	1660		9/4/2011	7250
7/14/2011	2074		9/6/2011	6275
7/15/2011	2340		9/7/2011	6424
7/16/2011	2187		9/8/2011	7844
7/18/2011	780			

Table 3. Number of Passive Integrated Transponder Tags (PIT) applied to yellow eels by year.

Year	# of Tags Applied
2007	51
2008	32
2009	68
2010	11
2011	127

Table 4. Growth of yellow eels caught and recaptured in pots at the base of Conowingo dam by year.

	Average Length (mm)					*Average Annual Growth Increase (mm)*
ID	**2007**	**2008**	**2009**	**2010**	**2011**	
257C63E092	594	617	*	*	*	23
257C6534CA	733	770	*	*	*	37
257C6526C0	463	474	*	*	*	11
257C65EB48	404	510	521	*	*	58.5
257C655F24	426	445	*	*	*	19
257C65F2F2	338	390	505	*	*	83.5
257C63E581	551	589	*	*	*	38
257C65F8B0	475	511	*	*	*	36
257C65E87B	405	471	510	*	*	55
257C65FBAB	377	405	440	*	*	31.5
257C652B3A	466	490	*	*	*	24
257C63C580	391	520	*	557	*	55.3
257C660193	386	428	*	*	*	21
257C63CE9A	458	*	565	*	*	53.5
257C63CF54	484	*	624	*	*	70
257C652735	457	*	590	*	*	66.5
257C6534A4	386	*	478	*	*	46
257C66192F	447	*	580	*	*	66.5
257C63D36E	*	419	433	*	*	14
257C652BF4	*	364	383	395	449	28.3
257C65342C	*	393	516	*	*	123
257C65B1E0	*	479	543	*	*	64
257C660279	*	497	575	*	*	78
257C65E54F	*	454	*	550	*	48
1C2D05239A	*	*	612	626	*	14
1C2D0529B9	*	*	495	578	*	83
257C63D39B	*	*	432	462	470	19
257C6553FB	*	335	*	*	446	37
257C655957	*	321	*	*	377	18.6
1C2D05286B	*	*	476	*	508	16
1C2D052453	*	*	368	*	465	48.5

Table 5 Pearson Correlation performed on number of elvers captured and environmental variables

	# eels	*Lunar Fraction*	*Avg. Att Flow*	*Barrometric Pressure*	*Air Temp*	*Precipitation Sum*	*AVG of DO (conc.)*	*AVG of Salinity (ppt)*	*AVG of Temp (°C)*	*AVG of pH*	*AVG of Turbidity (NTU)*	*AVG of Chlorophyll a (µg/l)*
# eels	1											
Lunar Fraction	0.0260	1										
AVG Flow	0.4241	0.0330	1									
Barrometric Pressure	0.1454	-0.2805	0.1595	1								
Air Temp	-0.2163	0.0302	-0.2621	-0.4116	1							
Precipitation	0.3088	0.0424	0.2415	0.0207	-0.3217	1						
AVG of DO	-0.0735	-0.1243	0.2647	0.2474	0.0248	-0.1219	1					
AVG of Salinity	-0.2894	-0.0734	-0.5819	-0.1535	0.1199	-0.1368	-0.5397	1				
AVG of Temp	-0.2502	0.0874	-0.6924	-0.2893	0.5639	-0.1738	-0.3882	0.6475	1			
AVG of pH	-0.5675	-0.1282	-0.3780	-0.0321	0.2888	-0.2476	0.6206	-0.0170	0.3254	1		
AVG of Turbidity	0.6111	0.1400	0.8525	0.0083	-0.1800	0.2524	0.0581	-0.4502	-0.4174	-0.4150	1	
AVG of Chlorophyll a	-0.1177	-0.4422	0.2031	0.1431	-0.0758	-0.0637	0.6783	-0.3313	-0.2645	0.6269	0.1055	1

REFERENCES

ASMFC (Atlantic States Marine Fisheries Commission). 2000. Standard procedures for American eel young of the year survey.

Maryland DNR. 2007. Maryland Biological Stream Survey: Sampling Manual Field Protocols. 65 pp.

Minkkinen S.P., Devers J.L. & W.A. Lellis. 2011. Experimental Stocking of American Eels in the Susquehanna River Watershed. Report of U.S. Fish and Wildlife Service to City of Sunbury, Pennsylvania.

APPENDIX I. AGENCY CONSULTATION RECORDS

From: Danucalov, Andrea H:(Exelon Power) <Andrea.Danucalov@exeloncorp.com>
Sent: Friday, April 16, 2021 4:52 PM
To: denise.keehner@maryland.gov; Heather Nelson -MDE-; David Seaborn -MDE-; 'Eyler, Sheila'; 'McCorkle, Richard'; jesus_morales@fws.gov; 'Minkkinen, Steve'; 'Henning, Aaron'; 'McCollum, Allyson'; 'Miller, Jeremy'; 'Williamson, Scott'; Eberts, Ron; Tony Prochaska -DNR-; Brett Coakley -DNR-; 'Seaman, Shawn'; Bob Sadzinski - MD DNR; 'Steffy, Luanne'; 'Tryninewski, Joshua'
Cc: Bleistine, Ray; David Frazier; Ian Kiraly; Erin Redding; Kirk Smith; Martinek, Michael; 'Slowik, Adam'
Subject: Conowingo Eel Passage and Restoration Plan
Attachments: Conowingo_Eel_Passage_and_Restoration_Plan (MDE Version).pdf

All,

On March 19, 2021, the Federal Energy Regulatory Commission issued a new license for the Conowingo Hydroelectric Project (P-405) to Exelon Generation, LLC (Exelon). Article 415 of the license requires Exelon to develop an *American Eel Passage and Restoration Plan* and submit the Plan to the Maryland Department of the Environment (MDE), the Pennsylvania Department of Environmental Protection (PADEP), the Pennsylvania Fish and Boat Commission (PFBC), the Susquehanna River Basin Commission (SRBC), the U.S. Fish and Wildlife Service (USFWS), and the Maryland Department of Natural Resources (MDNR) within 30 days of license issuance (April 18, 2021). Accordingly, please find attached to this email a copy of the Plan for your review and comment.

Please send your comments to me at andrea.danucalov@exeloncorp.com by May 18, 2021.

The approval of the Plan by MDE will also be completed pursuant to Section 2.5(g), Procedure for Approval of Plans, of the Conowingo Dam Water Quality Settlement Agreement between MDE and Exelon, dated October 29, 2019. In addition, the document will be posted on our web portal on Monday, April 19, 2021. I will send the link separately.

Article 415 of the license also requires Exelon to file a final version of the Plan with FERC within 6 months of license issuance (September 19, 2021).

Please let me know if you have any questions, comments, or concerns.

Have a good weekend!

Andrea

Andrea Danucalov
FERC License Compliance Manager
Exelon.
Exelon Generation
Conowingo Hydroelectric Generating Station
2569 Shures Landing Road
Darlington, MD 21034
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andrea.danucalov@exeloncorp.com

From: Eyler, Sheila <sheila_eyler@fws.gov>
Sent: Thursday, May 6, 2021 8:53 AM
To: Danucalov, Andrea; denise.keehner@maryland.gov; Heather Nelson -MDE-; David Seaborn -MDE-; McCorkle, Richard; Morales, Jesus J; Minkkinen, Steve; 'Henning, Aaron'; 'Miller, Jeremy'; Eberts, Ron; 'Seaman, Shawn'; Bob Sadzinski - MD DNR; 'Tryninewski, Joshua'
Cc: Bleistine, Ray; David Frazier; Ian Kiraly; Erin Redding; Kirk Smith; Martinek, Michael; 'Slowik, Adam'
Subject: Re: [EXTERNAL] Conowingo Eel Passage and Restoration Plan

Andrea,

FWS has reviewed the Conowingo Eel Passage and Restoration Plan. Generally, we have no significant concerns with the document. We recommend the following edits and additions be included in the final version of the Plan:

1. Background, Page 2: Exelon states that the Conowingo East Eel Collection Facility (CEECF) (the temporary eel facility to be placed in the vicinity of the stilling basin at the East Fish Lift (EFL) will begin operation on May 1. This is inconsistent with the license and EFL operations. According to the license, operation of the CEECF will not commence until 10 days following the end of the operation of the EFL, as correctly stated in section 3.1.3.
2. Reporting and Meetings, Page 23: Regarding eel transport in Sections 6.1.1 and 6.1.2, Exelon describes reporting on transport in the text but does not include the reporting on transport in the bulleted list of items to be included in the daily and annual reports. Transport information (i.e. number transported by date and location) should be included in bulleted lists for both sections.
3. Appendix D: Daily datasheets for transport efforts should be included in this section or added as a separate appendix item.

Thank you for the opportunity to review.

Sheila Eyler
U.S. Fish and Wildlife Service
Mid-Atlantic Fish & Wildlife Conservation Office
177 Admiral Cochrane Dr.
Annapolis, MD 21401
717-387-2117

From: Henning, Aaron <ahenning@srbc.net>
Sent: Friday, May 7, 2021 7:53 AM
To: Danucalov, Andrea; denise.keehner@maryland.gov; Heather Nelson -MDE-; David Seaborn -MDE-; 'Eyler, Sheila'; 'McCorkle, Richard'; jesus_morales@fws.gov; 'Minkkinen, Steve'; 'McCollum, Allyson'; 'Miller, Jeremy'; 'Williamson, Scott'; Eberts, Ron; Tony Prochaska -DNR-; Brett Coakley -DNR-; 'Seaman, Shawn'; Bob Sadzinski - MD DNR; Steffy, Luanne; 'Tryninewski, Joshua'
Cc: Bleistine, Ray; David Frazier; Ian Kiraly; Erin Redding; Kirk Smith; Martinek, Michael; 'Slowik, Adam'
Subject: RE: Conowingo Eel Passage and Restoration Plan

Andrea,

Thank you for the opportunity to comment on the eel plan. The Susquehanna River Basin Commission submits the following comments for consideration:

- In Table 3.5-1, Site 9 refers to rt. 29 bridge in Wilkes Barre. Rt. 29 crosses the Susquehanna River in Nanticoke and does not offer a safe offload point. Consider Nesbitt Park, Kingston PA for comparable alternative access (-75.8851, 41.2513)
- In Table 6.1.1 Daily Operations Summary, in addition to the two listed items please include the following in daily reports: The number of eels transported or moved from the CECF (even if zero), disposition (location and status) of any eels transported from the CECF, any mortalities encountered at the CECF or during transport
- On page 10, paragraph two the document states: “During the 10 years of operation if the number of American Eels attempting to migrate to the CEECF exceeds the maximum capacity of American Eels per unit of ramp area, or if densities exceed 10 eels per L, the facility will be modified….” The “maximum capacity of American eels per unit of ramp area” needs a clear definition and determination on how this will be measured, by who and when.

Aaron Henning
Fisheries Biologist
Susquehanna River Basin Commission
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ahenning@srbc.net

Maryland
Department of
the Environment

Larry Hogan, Governor
Boyd K. Rutherford, Lt. Governor

Ben Grumbles, Secretary
Horacio Tablada, Deputy Secretary

May 14, 2021

Via electronic mail
Ms. Andrea Danucalov
FERC License Compliance Manager
Exelon Generation
Conowingo Dam
2569 Shures Landing Road
Darlington, MD 21034
Andrea.Danucalov@exeloncorp.com

Re: Conowingo Dam, Draft American Eel Passage and Restoration Plan

Dear Ms. Danucalov:

The Maryland Department of the Environment, Wetlands and Waterways Program, (MDE) has consulted with the Maryland Department of Natural Resources, Power Plant and Research Program, (MDNR) to review and comment on the Draft American Eel Passage and Restoration Plan (Plan) submitted by Exelon Generation Company, LLC (Exelon) on April 16, 2021 in accordance with the Federal Energy and Regulatory Commission (FERC) License, specifically License Article 415. A requirement of License Article 415 is that the Plan be submitted to MDE within 30 days of the FERC License issuance for the operation of the hydropower facility at the Conowingo Dam. Exelon has prepared the Plan and is seeking initial agency comments prior to a formal submission by a requisite due date per the FERC License. MDE and MDNR are offering the attached comments requesting additional information, revisions and modifications to the Plan. MDE and MDNR are not approving in whole or in part the Plan. Please see Attachment I for comments regarding the Plan.

If you would like to discuss these comments further, please contact David Seaborn, Deputy Program Manager, MDE, Wetlands and Waterways Program via email at david.seaborn@maryland.gov to arrange a time to discuss with the appropriate MDE and MDNR staff.

Sincerely,

Heather L. Nelson, Manager
Wetlands and Waterways Program
Water and Science Administration

Attachment

(Via electronic mail)
cc: Bob Sadzinski, MDNR
Shawn Seaman, MDNR
Sheila Eyler, USFWS

Attachment I

General Comments:

1) The history of the WFL eel ramp does not include the time when U.S. Fish and Wildlife Service (USFWS) setup the ramp and operated it. Please include the complete history of the ramp.

2) Regarding FERC Article 414: The trigger for the eel ramp to operate within the East Fish Lift (EFL) is based on the closing of the EFL after the shad season. The Plan should describe what happens if the EFL does not operate or operates intermittently. We anticipate the Conowingo East Eel Collection Facility (CEECF) would operate during those extended periods when the EFL is not operating and after 1 May of any year.

3) The east side eel ramp is based on "modifications" of the new EFL. The Plan should include a construction timeline for the rebuilding of the EFL and any provisions to capture eels during this period. Interim eelway collections during construction or modifications to the eelway or EFL should not be considered as years to be compared between the CEECF and the west side eelway.

4) Maryland recommends including an eelway shakedown period that does not affect the ten-year comparison clock for the ramp to become permanent.

5) Small "tweaks" (*e.g.*, flow changes, gate openings/closings, ramp substrate(s)) should not be considered as modifications and should be differentiated from modifications requiring approval from the FERC. This needs to be defined in the Plan.

6) The Plan should address how the parties resolve disagreements regarding modifications to the eel collection facilities. (see Page 90 of the FERC Order)

7) Significant numbers of eels were observed during nighttime observations below the spillway during an Exelon study conducted in 2011. These eels could be redirected to the new eel ramp if access including attraction water could be provided through the wing wall. Exelon should consider this option (or other alternatives) to provide passage to eels attracted to the spill gate area? Since the EFL is being redesigned, this may be a minor modification to significantly improve the catchability of eels on the east side of the river.

8) Studies to determine ramp efficiency should be implemented during the first full season of operation and any time the ramp substrate is changed, or ramp flows are significantly changed by using a known number of eels released at the base of the ramp versus the number captured in the holding tank. Identified problems with the ramp must be addressed immediately.

Specific Comments:

1) 3.2.1 Design Conowingo East Eel Collection Facility (CEECF)

a. The Plan states that the CEECF be supplied with at least 265 liters per minute (70 gal/min, 1.2 gal/sec) of water. This flow may be insufficient to attract eels past the diffuser's flow and to the ramp. Additional attraction water may need to be provided such that it does not spill or sheet across the concrete pad creating false attraction when tailwater is low.

b. Nighttime observations should also be made of the concrete pad to ensure no eels are congregating toward this flow.

c. How does Exelon plan to determine if ramp density (overcrowding) is an issue?

2) 3.2.3 Operational Protocols

The plan states that:

- Weir gate C open 100% open.
- Weir gates B 0% open.
- Weir gates A 0% open
- Diffuser gates A 100% open
- Diffuser gates B 100% open

a. The plan should describe the amount of flow from diffusers. How will this configuration affect internal EFL flow patterns, and the amount of flow at Weir Gate C?

i. Exelon should also include diffuser Gate C into the operation plan along with options for the operation of entrance Gate A.

ii. Sufficient flow from the weir gate(s) is necessary to attract eels while maintaining velocities suitable for entry. The plan should also address the potential for attraction of eels into flow from the diffuser(s).

b. Prior to initial operation of the CEECF, operation flows should be observed and agreed to by agency representatives/personnel. Any subsequent modifications to flows or gate operations should also be observed and agreed to by agency representatives/personnel.

c. Entrance gates should be constructed with bar racks to reduce the number of predators accessing the EFL during the operation of the eel ramp.

d. Internal and zone-of-passage (ZOP) flow modeling should be conducted at the CEECF to ensure no velocity barriers exist for American Eels.

e. Monitoring- aeration of the collection tanks at the CEECF and CWECF should be performed unless DO is continuously monitored in those tanks.

3) 3.4 Transport, 3.4.1 Design

a. The plan should include density of eels in 19-liter buckets and 250-liter tank during transport to stocking locations.

b. If density is same as in large tanks (10 eels per liter) then continuous DO monitoring is needed.

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT (FERC NO. 405)
EEL PASSAGE AND RESTORATION PLAN REMOTE MEETING SUMMARY
JULY 9, 2021, 1:00 PM TO 2:30 PM EST
Call-in Number: Microsoft Teams Call-in 716-402-6612, passcode 20670122

Attendees

Attendee	Affiliation	Email
Andrea Danucalov	Exelon	andrea.danucalov@exeloncorp.com
Erin Redding	Gomez and Sullivan Engineers	eredding@gomezandsullivan.com
Ben Sawyer	Gomez and Sullivan Engineers	bsawyer@gomezandsullivan.com
Kirk Smith	Gomez and Sullivan Engineers	ksmith@gomezandsullivan.com
Heather Nelson	Maryland Department of the Environment	hnelson@maryland.gov
David Seaborn	Maryland Department of the Environment	David.seaborn@maryland.gov
Shawn Seaman	Maryland Dept. of Natural Resources	shawn.seaman@maryland.gov
Ray Bleistine	Normandeau Associates, Inc.	rbleistine@normandeau.com
Mike Martinek	Normandeau Associates, Inc.	mmartinek@normandeau.com
Jeremy Miller	PA Dept of Environmental Protection	jeremmille@pa.gov
Josh Tryninewski	PA Fish and Boat Commission	jtryninews@pa.gov
Aaron Henning	Susquehanna River Basin Commission	ahenning@srbc.net
Sheila Eyler	US Fish and Wildlife Service	sheila_eyler@fws.gov
Rick McCorkle	US Fish and Wildlife Service	richard_mccorkle@fws.gov
Jesus Morales	US Fish and Wildlife Service	jesus_morales@fws.gov
Don Pugh	Consultant for Maryland	don.pugh@outlook.com

Meeting Purpose

Andrea Danucalov began the meeting. The focus of this meeting will be to review the resource agencies' comments on Exelon's Draft Eel Passage and Restoration Plan (EPRP). Exelon would like to finalize the EPRP and submit it to FERC. Following this meeting, an updated draft EPRP will be distributed to resource agencies for a final review.

Conowingo East Eel Collection Facility Design and Planned Operation

Ben Sawyer shared a 3-D model of the Conowingo East Eel Collection Facility (CEECF) on his screen. Major features were highlighted to show how the facility will be laid out.

The CEECF is in the stilling basin. A scaffolding stairway leads down from the dam to a walkway that allows for access to the collection tank, positioned at the top of the ramp. The ramp runs from the stilling basin down over the dissipation wall.

Eels may access the ramp via multiple routes. Once they reach and ascend the ramp, they are collected from the tank and carried out of the facility in buckets. The EPRP discusses which gates will be open or closed.

Ben showed the model in low and in high water level conditions. The model can show approximate low and high water levels.

Attraction flow for the CEECF is sourced from the dam. Water is supplied via the same pipe that feeds the stilling basin. The pipe is from the forebay located between Unit 11 and the EFL. Flow will be tapped off that pipe and sent to the CEECF via pipes or hoses. A manifold is located on top of the concrete at the powerhouse level. All the provided flow comes off the existing manifold, and all the flow will eventually come out the bottom of the ramp. The flow will then continue out the crowder channel or the diffuser channel.

There will be no water upstream of the dissipation wall where the scaffolding is placed. The scaffolding area will be dry, even during high water conditions.

The attraction flow will be 70 gallons per minute (0.16 cfs). Jesus Morales asked the manifold's flow capacity. Ben did not have this information available. Ray Bleistine said that the pipe that feeds the manifold is a six-inch pipe and previously provided water for the east lift. There is sufficient flow for the 70 gpm. Mike Martinek said that there is a two-inch hose called out for this facility, so flows will be very similar to flow at the Conowingo West Eel Collection Facility.

Jesus asked which gates will be open for eels to enter the East Fish Lift. He noted that most of the time, more water will be coming into the East Fish Lift than 70 gpm. He asked what the expectation is for how fish will find their way through the gates to the ramp. He also asked if the gates be completely open, screened, or covered. Gate C will be fully open. Mike said that there are no plans for screening the entrances to the channels; however, areas susceptible to avian predation will be screened. Jesus asked for confirmation that when the water level is dry, the attraction flow will be the only water coming down the concrete slab. Mike confirmed that this statement is correct.

Don Pugh asked how much flow will pass through the diffuser gates. Mike said that the attraction flow of 70 gpm will pass through the diffuser gates. Don expressed doubt that the eels would be able to locate the 70 gpm attraction flow where there would also be potentially thousands of gallons of flow coming downstream from the Conowingo operating units. Don thinks that the eels will instead be attracted to the flow from the dam. Jesus agreed and said that there would be more water going into Gate A than water coming out. Jesus said that he thinks some eels will eventually locate the ramp; however, he is wondering what will draw eels into the east fish lift to begin with. He acknowledged that they may follow the wall on that leads to Gate C and enter the fish lift there. Ray said that there are historic observations of eels in this area, before the east fish lift was built. Eels were observed coming through leakage from the regulating gate. An eel ramp at this location is in response to agency requests. The ramp cannot be put into the spillway due to safety and operation concerns. Ray said that there is no guarantee that there are eels here; this is an experiment. Benefits of the site include access and water availability.

Jesus agreed that this location is experimental and agreed that there are positive aspects of this location. He said he still wonders if something else could be done to improve the attraction flow for eels as the 70 gpm will be competing with the flow from the powerhouse. Ray said that the specifications for the CEECF are aligned with the CWECF as Exelon is required to compare the two facilities after ten years of operation. Ray said that he is concerned that having a different set up in the CEECF may bias the required comparisons. Don said the CEECF's purpose is to collect eels, not to replicate the CWECF for comparison. Conditions on the west side of the river are different; eels come up the edge of the river into an open area. This area is not open. Ray said that the eels could come up the wingwall. Don said that that the attraction flow is not sufficient to bring eels into the fish lift. They may wander into the fish lift, but could still miss the attraction flow due to water movement within the lift. Mike said that when the units are operating, flow from the dam will be too great for eels to swim up to the dam. The flow will push eels toward the wingwall where they will find Gate C. Don said that the eels will only be pushed to the wingwall

and Gate C if units 10 and 11 are running. Otherwise they could swim up to Gate A, which will be closed. Mike said that if unit 5 is on, the eels will be throughout the tailrace. Don said that this makes his point that collecting on the west side does not collect all the eels in the river that are trying to pass upstream of Conowingo Dam. The locations of the eels in the river downstream of the dam are unknown as they are too small for tracking studies.

Regarding diffuser flows, Don asked if the water could go through the diffusers and down the channel. It can.

Don said that predators entering the east fish lift may also be an issue. He asked if there will be bar racks in front of the gate. Bar racks are not currently planned for in front of the gates. Ray said there is an eddy below the CWECF where predatory fish rest; however, there is no evidence that it is impacting the CWECF catch. Don said that it is not possible to know if predatory fish are impacting the CWECF catch or not because no one knows how many eels are available. It is known that the species of predatory fish in the eddy do like to eat eel. Aaron Henning said that there were eels in the stomachs of some of the snakeheads caught this summer.

Conowingo Eel Passage and Restoration Plan – Agency Comments and Exelon's Responses

A comments response matrix was shared on the meeting screen and Kirk Smith led the group through a discussion. For each comment, Kirk summarized Exelon's response and solicited further comments or questions from the resource agencies. The matrix and meeting discussion begin on the next page.

	Comment	How Addressed
MDE & MDNR		
General Comments		
	Meeting Discussion: Ray said that the C-channel will be narrowed with supports and steel plates, making it even more challenging to create a hole for attraction flow here.	
8	Studies to determine ramp efficiency should be implemented during the first full season of operation and any time the ramp substrate is changed, or ramp flows are significantly changed by using a known number of eels released at the base of the ramp versus the number captured in the holding tank. Identified problems with the ramp must be addressed immediately.	FERC License, Appendix 1, Section 12.7.3 requires that upstream American Eel effectiveness testing be completed in the year immediately following license issuance unless Exelon and the USFWS agree that effective technology is not available. Based on the available scientific literature, Exelon and USFWS agree that the appropriate, proven tagging technology does not currently exist to conduct ramp efficiency studies for the size range of eels currently collected at Conowingo Dam (mean length 125 mm). Per the FERC License, Appendix 1, Section 12.7.3, available technology will be reconsidered and the potential for tests of upstream passage efficiency will be discussed at annual meetings with USFWS. In addition, Section 12.7.3 requires that when technology is available and following any modifications to the operation or physical structure an upstream efficiency study will be conducted to evaluate the relative success of the modifications. This language has been added to the Eel Passage and Restoration Plan. Additionally, to perform a comparative analysis with the CWECF, substantial modifications such as changing ramp substrate or attraction flow should be avoided during the 10-year comparative period so as not bias results.
	Meeting Discussion: Don said that Maryland is requesting a ramp efficiency study, rather than a passage efficiency study. The requested study would involve containing a fixed number of eels at the base of the eel ramp and then, over a set time-period, seeing what percentage of the eels reach the collection tank. Ray said that, at Conowingo, it would be a challenge to keep other eels from entering the ramp via the sides of the ramp, as the eels climb up the rip-rap. Ray also noted that closing off the ramp for a day to eels that are trying to move upstream could result in not passing thousands of eels. Don agreed that this type of study would be difficult at the CWECF, but it could be possible at the CEECF. Exelon now understands Don's request and will consider it further.	

	Comment	How Addressed
Specific Comments		
1	**3.2.1** Design Conowingo East Eel Collection Facility (CEECF) a. The Plan states that the CEECF be supplied with at least 265 liters per minute (70 gal/min, 1.2 gal/sec) of water. This flow may be insufficient to attract eels past the diffuser's flow and to the ramp. Additional attraction water may need to be provided such that it does not spill or sheet across the concrete pad creating false attraction when tailwater is low. b. Nighttime observations should also be made of the concrete pad to ensure no eels are congregating toward this flow. c. How does Exelon plan to determine if ramp density (overcrowding) is an issue?	a. There will be no flow provided through the EFL diffusers. The weir and diffuser gates are open to allow eels the opportunity to enter the EFL via multiple locations, but there will be no flow provided through the gates via the conventional operation of the EFL. Attraction flow to the CEECF will be provided from a separate water source. This flow will consist of 70 gpm of water discharged through the ramps attraction flow system as described in Section 3.2.1. Therefore, there is no potential for the creation of false attraction by the EFL diffusers when the tailwater is low. b. Nighttime observations are not necessary, since the EFL will not be providing flow through diffusers; thus, eliminating the potential for false attraction. c. The proposed eel ramp is 18 inches wide. Using the USFWS Fish Passage Engineering Design Criteria (2019) of a maximum capacity of 5,000 eels/day per inch of ramp width, assuming a mean eel size of 150 mm total length, the proposed ramp will have a capacity of 90,000 eels/day. During the 10 years of operation, if the number of American Eels attempting to migrate through the CEECF exceeds 90,000 eels per day, based on volumetric estimates, or if densities in the collection tank exceed 10 eels per L, the facility will be modified, or operational protocols adjusted to reduce crowding, in consultation with MDE, USFWS, and EPAG, and following approval from FERC. This information has been added to page **Error! Bookmark not defined.**.
	Meeting Discussion: Don asked where the maximum ramp capacity metric comes from, other than the USFWS' guidelines. Jesus suggested that Alex Haro may know the source of this metric. Don said that he has asked Alex Haro, and Alex did not know either. (At the end of the meeting, Jesus typed in the chat that the maximum capacity metric was taken from the UK Environment Agency's eel manual.)	

	Comment	How Addressed
2	**3.2.3** Operational Protocols The plan states that: Weir gate C open 100% open. Weir gates B 0% open. Weir gates A 0% open Diffuser gates A 100% open Diffuser gates B 100% open	Appendix D has been added to provide additional information regarding operations.
	e. Monitoring- aeration of the collection tanks at the CEECF and CWECF should be performed unless DO is continuously monitored in those tanks.	Daily DO checks and weekly downloads of continuous monitoring data will be performed. Aeration will be provided if DO monitoring indicates that it is necessary. See Section 3.2.1 for details.
	Meeting Discussion: Don asked for confirmation that there will be a daily check as well as logged continuous monitoring. Ray confirmed that Normandeau will perform manual daily checks of water quality and a HOBO is also in place to collect continuous monitoring data. These data are downloaded on an established schedule. This approach is similar to how monitoring is completed at the Octoraro Creek Eel Collection Facility.	
3	3.4 Transport, 3.4.1 Design a. The plan should include density of eels in 19-liter buckets and 250-liter tank during transport to stocking locations. b. If density is same as in large tanks (10 eels per liter) then continuous DO monitoring is needed.	a. The density of eels in the transport buckets and transport tank are less than less than 10 juvenile eels per liter. Section 3.4 has been revised to clarify this. b. Eels are transported with continuous DO supply. This has been clarified in Section 3.4.2.
	Meeting Discussion: Don asked if Normandeau has ever transported eels in 5-gallon buckets. Mike said yes; this is done when eel numbers are low. No more than 50 eels are placed in a 5-gallon bucket. Normandeau puts a blower in the bucket during transport to ensure there is sufficient oxygen.	

Agency Comments on April 16, 2021 Draft and Exelon Responses

	Comment	How Addressed
MDE & MDNR		
General Comments		
1	The history of the WFL eel ramp does not include the time when U.S. Fish and Wildlife Service (USFWS) setup the ramp and operated it. Please include the complete history of the ramp.	A brief history of the WFL eel ramp has been incorporated into Section 3.1.1.
2	Regarding FERC Article 414: The trigger for the eel ramp to operate within the East Fish Lift (EFL) is based on the closing of the EFL after the shad season. The Plan should describe what happens if the EFL does not operate or operates intermittently. We anticipate the Conowingo East Eel Collection Facility (CEECF) would operate during those extended periods when the EFL is not operating and after 1 May of any year.	Exelon does not anticipate any periods when the EFL would not be operating in some capacity from May 1 to June 15. Exelon must operate the EFL, as required by the FERC license. Not operating the EFL or operating the EFL intermittently would require FERC to approve a variance request in advance of any changes to operation of the EFL. Also, per the MDE Settlement the temporary eel facility is to start operating twelve months after the EFL modifications required under Appendix 1 of the FERC license (i.e., the DOI Fishway Prescription) in order to allow for the construction of the upgrades required by the license to occur. Exelon does not anticipate a scenario where the EFL will not be operated in either trap and transport or volitional mode after the EFL initial modifications are complete. Given this, there does not appear to be any circumstance where the CEECF would operate prior to the closing of the typical American Shad passage season.
3	The east side eel ramp is based on “modifications” of the new EFL. The Plan should include a construction timeline for the rebuilding of the EFL and any provisions to capture eels during this period. Interim eelway collections during construction or modifications to the eelway or EFL should not be considered as years to be compared between the CEECF and the west side eelway.	Exelon is developing a schedule to complete the upgrades to the EFL. Per the MDE Settlement, Exelon and MDE agreed to initiate operation of the CEECF 12 months after completion of the EFL upgrades. Due to safety concerns and the required EFL upgrade requirement, collection of eels will not occur until completion of the EFL upgrades. There are no specific requirements in the MDE Settlement or FERC License to capture eels on the east side of the dam during the EFL construction period. However, operation of the CWECF and the

		OECF will continue during the EFL construction period and will continue to provide a source of eels for upstream transport.
4	Maryland recommends including an eelway shakedown period that does not affect the ten-year comparison clock for the ramp to become permanent.	The current CEECF design follows USFWS's Fish Passage Engineering Design Criteria (2019) in relation to attraction flow, general design configuration, and substrate material. The design has also been discussed with EPAG, USFWS, and MDE. The CWECF and OECF did not require shakedown periods after their initial construction and have not required any substantive modifications since operation began. As part of the normal operating procedure before the start of the eel passage season, each ramp undergoes a series of pre-season checks as well. Exelon anticipates the same for the proposed CEECF and therefore is not proposing a shakedown period.
5	Small "tweaks" (*e.g.*, flow changes, gate openings/closings, ramp substrate(s)) should not be considered as modifications and should be differentiated from modifications requiring approval from the FERC. This needs to be defined in the Plan.	Article 414 has been added to Section 3 for reference. The language of Article 414 does not suggest that small changes or "tweaks" to design or operation may be made without MDE, USFWS, and FERC approval; therefore, Exelon considers it appropriate to have all changes to the design or operation approved by FERC before they are implemented to ensure license compliance.
6	The Plan should address how the parties resolve disagreements regarding modifications to the eel collection facilities. (see Page 90 of the FERC Order)	Exelon maintains regular consultation with MDE, USFWS and EPAG through monthly virtual meetings, emails and phone calls, and annual meetings, and meeting records are maintained. Exelon will attempt to resolve any disagreements regarding modifications to the eel collection facilities through conversations held during these meetings, phone calls, and emails. In the case of unresolved disagreements between MDE, USFWS, and EPAG regarding modifications, FERC will maintain and exercise its decision authority based upon the consultation record.
7	Significant numbers of eels were observed during nighttime observations below the spillway during an Exelon study conducted in 2011. These eels could be redirected to the new eel ramp if access including attraction water could be provided through the wing wall. Exelon should consider this option (or other alternatives) to provide	Three nighttime surveys were conducted in 2011. Elvers were observed in the same area below Crest gate #30 during all three surveys, which is located approximately 1,200 feet away from the EFL.

	passage to eels attracted to the spill gate area? Since the EFL is being redesigned, this may be a minor modification to significantly improve the catchability of eels on the east side of the river.	However, crest gate #30 was leaking a significant amount of water since it had been opened during high spring river flows that resulted in spill, and it had not been resealed prior to the survey. It was concluded that eels would not have been attracted to that location if the crest gate had not been leaking. A copy of the 2011 study is attached as Appendix H. Exelon is not proposing any modifications to the EFL wingwall as it serves to regulate the tailwater elevation in the vicinity of Gate C of the EFL as generation and spillway flows change. In addition, there is a channel at the terminus of the wingwall that maintains connectivity between the spillway and tailrace under nearly all flow conditions experienced at the Project.
8	Studies to determine ramp efficiency should be implemented during the first full season of operation and any time the ramp substrate is changed, or ramp flows are significantly changed by using a known number of eels released at the base of the ramp versus the number captured in the holding tank. Identified problems with the ramp must be addressed immediately.	FERC License, Appendix 1, Section 12.7.3 requires that upstream American Eel effectiveness testing be completed in the year immediately following license issuance unless Exelon and the USFWS agree that effective technology is not available. Based on the available scientific literature, proven tagging technology does not currently exist to conduct ramp efficiency studies for the size range of eels currently collected at Conowingo Dam (mean length 125 mm). Per the FERC License, Appendix 1, Section 12.7.3, available technology will be reconsidered and the potential for tests of upstream passage efficiency will be discussed at annual meetings with USFWS. In addition, Section 12.7.3 requires that when technology is available and following any modifications to the operation or physical structure an upstream efficiency study will be conducted to evaluate the relative success of the modifications. This language has been added to the Eel Passage and Restoration Plan. Testing of ramp efficiency by placing a known number of unmarked eels at the bottom of an eel ramp to determine the percentage of eels that successfully ascend the ramp has had mixed results. A method for marking juvenile eels (size range 70 to 130 mm) needs to be developed in

		order to detect eels as they enter, ascend, and exit the eel ramp. This would allow testing to occur without shutting down the ramp for some length of time and eliminate concerns of eels not in the test group infiltrating the ramp and skewing the results. Until a marking technique is developed for small eels that provides reliable detectability to ensure accurate results, it is our consensus that this type of study be delayed. Exelon will continue to work with the resource agencies to address this issue.
Specific Comments		
1	3.2.1 Design Conowingo East Eel Collection Facility (CEECF) a. The Plan states that the CEECF be supplied with at least 265 liters per minute (70 gal/min, 1.2 gal/sec) of water. This flow may be insufficient to attract eels past the diffuser's flow and to the ramp. Additional attraction water may need to be provided such that it does not spill or sheet across the concrete pad creating false attraction when tailwater is low. b. Nighttime observations should also be made of the concrete pad to ensure no eels are congregating toward this flow. c. How does Exelon plan to determine if ramp density (overcrowding) is an issue?	a. There will be no flow provided through the EFL diffusers. The weir and diffuser gates are open to allow eels the opportunity to enter the EFL via multiple locations, but there will be no flow provided through the gates via the conventional operation of the EFL. Attraction flow to the CEECF will be provided from a separate water source. This flow will consist of 70 gpm of water discharged through the ramps attraction flow system as described in Section 3.2.1. Therefore, there is no potential for the creation of false attraction by the EFL diffusers when the tailwater is low. b. Nighttime observations are not necessary, since the EFL will not be providing flow through diffusers; thus, eliminating the potential for false attraction. c. The proposed eel ramp is 18 inches wide. Using the USFWS Fish Passage Engineering Design Criteria (2019) of a maximum capacity of 5,000 eels/day per inch of ramp width, assuming a mean eel size of 150 mm total length, the proposed ramp will have a capacity of 90,000 eels/day. During the 10 years of operation, if the number of American Eels attempting to migrate through the CEECF exceeds 90,000 eels per day, based on volumetric estimates, or if densities in the collection tank exceed 10 eels per L, the facility will be modified, or operational protocols adjusted to reduce crowding, in consultation with MDE, USFWS, and EPAG, and following approval from

		FERC. This information has been added to page 11.
2	3.2.3 Operational Protocols The plan states that: Weir gate C open 100% open. Weir gates B 0% open. Weir gates A 0% open Diffuser gates A 100% open Diffuser gates B 100% open	Appendix D has been added to provide additional information regarding operations.
	a. The plan should describe the amount of flow from diffusers. How will this configuration affect internal EFL flow patterns, and the amount of flow at Weir Gate C? i. Exelon should also include diffuser Gate C into the operation plan along with options for the operation of entrance Gate A. ii. Sufficient flow from the weir gate(s) is necessary to attract eels while maintaining velocities suitable for entry. The plan should also address the potential for attraction of eels into flow from the diffuser(s).	The weir and diffuser gates are open to allow eels the opportunity to enter the EFL via multiple locations; however, there will be no flow provided through the EFL diffusers or through the gates via the conventional operation of the EFL. Attraction flow to the CEECF will be provided from a separate water source. This flow will consist of 70 gpm of water discharged through the ramps attraction flow system as described in Section 3.2.1. Note that items have been added to the Operational Protocols list on page 12. Exelon has attached a copy of the PowerPoint presented at the October 15, 2020 EPAG meeting, which provides additional information regarding the operation of the temporary eel facility at the EFL (Appendix D).
	b. Prior to initial operation of the CEECF, operation flows should be observed and agreed to by agency representatives/personnel. Any subsequent modifications to flows or gate operations should also be observed and agreed to by agency representatives/personnel.	As described above, there will be no attraction flow provided through conventional operation of the EFL. Therefore, observation of flows is not necessary, aside from regular inspections made by the ramp operating staff. The magnitude (70 gpm) of attraction flow water for the eel ramp itself is provided based on the USFWS Fish Passage Engineering Design Criteria (2019).
	c. Entrance gates should be constructed with bar racks to reduce the number of predators accessing the EFL during the operation of the eel ramp.	The proposed eel ramp design does not require bar racks on the EFL entrance gates. The only EFL entrance gate that will be open during operation of

		the eel ramp will be Gate C. There is no provision within the MDE Settlement to modify the current EFL entrance gates with bar racks.
	d. Internal and zone-of-passage (ZOP) flow modeling should be conducted at the CEECF to ensure no velocity barriers exist for American Eels.	There will be no attraction flow provided through conventional operation of the EFL. The 70-gpm magnitude of attraction flow water for the eel ramp itself is provided based on the USFWS Fish Passage Engineering Design Criteria (2019). The 70-gpm (0.16 cfs) attraction flow is not expected to form any velocity barriers within the EFL, so flow modeling is unnecessary.
	e. Monitoring- aeration of the collection tanks at the CEECF and CWECF should be performed unless DO is continuously monitored in those tanks.	Daily DO checks and weekly downloads of continuous monitoring data will be performed. Aeration will be provided if DO monitoring indicates that it is necessary. See Section 3.2.1 for details.
3	3.4 Transport, 3.4.1 Design a. The plan should include density of eels in 19-liter buckets and 250-liter tank during transport to stocking locations. b. If density is same as in large tanks (10 eels per liter) then continuous DO monitoring is needed.	a. The density of eels in the transport buckets and transport tank are less than less than 10 juvenile eels per liter. Section 3.4 has been revised to clarify this. b. Eels are transported with continuous DO supply. This has been clarified in Section 3.4.2.
PADEP		
1	Page 10, Paragraph 2: Please provide description of maximum capacity of American Eels per unit of ramp area for CEECF.	The proposed eel ramp is 18 inches wide. Using the USFWS Fish Passage Engineering Design Criteria (2019) of a maximum capacity of 5,000 eels/day per inch of ramp width, assuming a mean eel size of 150 mm total length, equates to a capacity of 90,000 eels/day. This information has been added to page 11.
2	Table 3.5-1 Stocking Locations for Juvenile Eel in the Susquehanna River Watershed: Site #6 Fort Hunter should be Dauphin County not Perry County.	The county has been corrected in the table.
SRBC		

1	In Table 3.5-1, Site 9 refers to Rt. 29 bridge in Wilkes Barre. Rt. 29 crosses the Susquehanna River in Nanticoke and does not offer a safe offload point. Consider Nesbitt Park, Kingston PA for comparable alternative access (-75.8851, 41.2513).	Comment noted. This alternative access point has been added to Table 3.5-1.
2	In Table 6.1.1 Daily Operations Summary, in addition to the two listed items please include the following in daily reports: The number of eels transported or moved from the CECF (even if zero), disposition (location and status) of any eels transported from the CECF, any mortalities encountered at the CECF or during transport.	These items are now included in the list of items for daily reports. (Note, this comment refers to Section 6.1.1, not Table 6.1.1.)
3	On page 10, paragraph two the document states: "During the 10 years of operation if the number of American Eels attempting to migrate to the CEECF exceeds the maximum capacity of American Eels per unit of ramp area, or if densities exceed 10 eels per L, the facility will be modified…." The "maximum capacity of American eels per unit of ramp area" needs a clear definition and determination on how this will be measured, by who and when.	The proposed eel ramp is 18 inches wide. Using the USFWS Fish Passage Engineering Design Criteria (2019) of a maximum capacity of 5,000 eels/day per inch of ramp width, assuming a mean eel size of 150 mm total length, the proposed ramp will have a capacity of 90,000 eels/day. This information has been added to page 11. During the 10 years of operation, if the number of American Eels attempting to migrate through the CEECF exceeds 90,000 eels per day, based on volumetric estimates, or if densities in the collection tank exceed 10 eels per L, the facility will be modified, or operational protocols adjusted to reduce crowding, in consultation with MDE, USFWS, and EPAG, and following approval from FERC.
USFWS		
1	Background, Page 2: Exelon states that the Conowingo East Eel Collection Facility (CEECF) (the temporary eel facility to be placed in the vicinity of the stilling basin at the East Fish Lift (EFL) will begin operation on May 1. This is inconsistent with the license and EFL operations. According to the license, operation of the CEECF will not commence until 10 days following the end of the operation of the EFL, as correctly stated in section 3.1.3.	The text in the Section 1. Background has been corrected.
2	Reporting and Meetings, Page 23: Regarding eel transport in Sections 6.1.1 and 6.1.2, Exelon describes reporting on transport in the text but does not include the reporting on transport in the bulleted list of items to be included in the daily and annual reports. Transport information (i.e. number transported by date and location) should be included in bulleted lists for both sections.	Transport information has been added to the list of items to be included in the daily and annual reports on page 25.
3	Appendix E: Daily datasheets for transport efforts should be included in this section or added as a separate appendix item.	Daily transport sheets have been added to what is now Appendix E.

From: Kirk Smith
Sent: Wednesday, August 18, 2021 10:33 AM
To: Erin Redding; Danucalov, Andrea; Bleistine, Ray; Brett Coakley; Mike.Cox@ERM.com; David Frazier; Eberts, Ron; 'Eyler, Sheila'; 'Henning, Aaron'; denise.keehner@maryland.gov; Ian Kiraly; jesus_morales@fws.gov; Martinek, Michael; 'McCollum, Allyson'; 'McCorkle, Richard'; 'Miller, Jeremy'; 'Minkkinen, Steve'; Heather Nelson -MDE-; Tony Prochaska; 'Sadzinski, Robert'; David Seaborn -MDE-; 'Seaman, Shawn'; 'Slowik, Adam'; Smith, Fred; 'Steffy, Luanne'; 'Tryninewski, Joshua'; 'Williamson, Scott'
Subject: Exelon EPAG July Meeting Summary and August Meeting Agenda
Attachments: EPAG_Meeting_Summary_20210715.pdf; EPAG_Meeting_Agenda_20210819.pdf; Conowingo_Eel_Passage_and_Restoration_Plan_2021.pdf

Hello,

Please see the attached Exelon EPAG July 2021 Meeting Summary and August 2021 Meeting Agenda.

Also attached is a revised version of the *American Eel Passage and Restoration Plan* required by Article 415 of the new license. The plan was previously distributed in April 2021 and has been revised based on resource agency comments.

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Maryland DNR / Power Plant Research Program

Comments, Questions and Recommendations

Exelon's Proposed American Eel Passage and Restoration Plan

9/1/21

Received 9/2/2021

Section 2 – Project Configuration:

- 2nd Paragraph: Be consistent with acronym definitions (i.e. define WFL. Use of both WFL and West Fish Lift is below).
- 2nd Paragraph: Figure 2.0-1 should depict all that is described in the text (i.e. spillway, abutment sections, etc.)

Section 3.2.1 - Conowingo West Eel Collection Facility

- 2nd Paragraph: Suggest including the elevation of the normal high-water line in the text.
- 3rd Paragraph: What is defined as 'large 60% shade cloth'. Additional clarification is needed.

Section 3.2.1 - Octoraro Creek Eel Collection Facility

- 2nd Paragraph: Add angle to 90-degrees.
- 3rd Paragraph: Define L as Liter and use consistently throughout.

Section 3.2.1 - Conowingo East Eel Collection Facility

- How was the location of the ramp determined?
- Does the attraction water come off the top of the pond?
- What is the general difference in water temperatures during the summer? Water temperatures in the tailrace compared to the CEECF attraction water should be recorded.
- The plan should describe how predators prevented from entering the EFL?
- Clarify the amount of attraction water coming out of the entrance gate C and how that will be a signal for eels to enter the EFL
- The plan should describe the flows when the eel ramp will be pulled.
- Provide an approximate year of project initiation/operation startup. We realize this is defined in the schedule section but mention of it here is recommended.
- 2nd Paragraph last sentence: Sentenced needs to be edited. Use of with versus will.
- 3rd Paragraph:
    - Include elevation of normal high-water line.
    - 7th sentence: is it 'tailwater level', or 'existing tailwater elevation'.

Section 3.2.2 – Construction

- Provide an estimated construction date.

Section 3.2.3 – Operational Protocols: Intro

- Re: Operation of CEECF - Diffuser gates A & B are to be open. With only 70 gal/min 'attraction flow' it might be better to close them off to get max guidance in the open channel for any eels that enter the EFL.

- Section 3.2.3 references a schedule outlined in Section 4. Section 4 needs more detailed information detailing actual operation and monitoring schedules at all three facilities.

Section 3.2.3 – Operational Protocols: Monitoring

- Are there specific monitoring forms? If so, please include in the plan
- Continuous monitoring / alarm systems at both the OECK and CEECF should be considered for replacement instead of daily inspections.

Section 3.2.3 – Operational Protocols: Inspection

- Page 12 states: *if an inspection suggests that any structure or flow component is not performing properly and no alarm has been triggered, verification of this potential deviation will be performed as described above and corrective action will be taken as soon as possible.* The plan should define this process.
- Alarms are mentioned but not discussed in enough detail.
- Please reference or clarify use, operation, etc. of alarms.
- What defines a failed inspection?

Section 3.2.3 – Operational Protocols: Maintenance

- Will the CEECF ramp be accessible for daily clearing obstructions?
- Is there a process or specific procedure for scrubbing the collection tank?
- What triggers a determination that the ramp needs to be cleaned?
- Are there specific maintenance logs/sheets?
- Are they provided in this plan and where will they be stored?
- Is anyone qualified to conduct the monitoring and maintenance activities or will this be a requirement?

Section 3.3 – Holding (Conowingo West Eel Collection Facility)

- Include a reference that all eels transferred to holding tanks will be recorded on the daily inspection sheet.
- Maryland is concerned that the plan continues to recommend holding eels for seven days until water temperatures exceed 28°C on consecutive days. Eels in crowded conditions can become stressed and develop fungus, as has been observed. Eels should be transported within 48 hours of capture. A recommended alternative would be the transportation and stocking to the Conowingo Pond and Lake Aldred eels that, held 48 hours, when the number held does not meet the threshold for stocking at upriver locations.

Section 3.3.2 – Operational Protocols

- What is the QA/QC process associated with the inspection sheets such that holding time and temperatures are met for transport?

Section 3.3.2 – Operational Protocols / Monitoring

- What defines continuous? Operation is noted later as 24 hours a day 7 days a week. This implies that monitoring will be conducted non-stop during the collection season/operation.
- 2nd Paragraph: Please reference and maintain/update a contact list including operational personnel in the plan.
- 4th Paragraph: Is there an elevated concentration that will trigger an alarm or just the minimum?

Section 3.3.2 – Operational Protocols / Inspection

- Once per day? Continuous measurements on other systems and only daily for holding tanks? Please clarify.

Section 3.4.1 – Design

Conowingo West Eel Collection Facility

- How often is the water quality probe calibrated and maintained?
- Where are the calibration and maintenance forms located in this plan?

  GLOBAL note for calibration forms as it is discussed in other sections of the plan
- Appendix F references engineering drawings for transport facility. Are there drawings for the 19-L buckets and enclosed transport tank?

Octoraro Creek Eel Collection Facility

– the holding tank has a capacity of 3,140 eels. The transport truck for more than 150 eels is a 250 liter tank which can transport 2,500 eels. In 2021, more than 2,500 eels were collected on July 13 – 3,474, 14 – 4,738 and 15 – 6,168. The plan should describe operations when more eels are collected in a single day than the holding tank or the transport tank can accommodate.

- How are the 19-L buckets loaded and transported?

Conowingo East Eel Collection Facility

- How are 19-L buckets transported?
- What are the plans to transport eels from CEECF to CWECF if a significant number of eels are collected? All in the 19-L bucket?

Section 3.4.2 Operation Protocols Monitoring (1st Paragraph):

- Is there a maximum amount of trips that are prohibitive per week based on staff or equipment limitations?
- Will this be an area of concern if the capacity of the holding tanks are continuously met and/or water temperatures exceed 28-degrees C?
- How are oxygen levels monitored and maintained?
- What is the calibration program for monitoring these levels?

Section 3.4.2 Operation Protocols Temperature

- Please provide additional detail on how the temperature will be monitored.

Section 3.4.2 Operation Protocols Dissolved Oxygen

- Regarding prior note on calibration protocols – this should be addressed in the plan.

Section 3.4.2 Operation Protocols Inspection (1st Paragraph)

- Please reference and provide an inspection check list.

Section 3.4.2 Operation Protocols Inspection (2nd Paragraph)

- How and where is this data recorded - data logger or field form?
- Please define the criteria for passing inspection. This is a vague statement.

Section 3.4.2 Operation Protocols Maintenance

- What is defined as the facility? Conowingo?
- Clarify the meaning here. Are you saying all tanks will be cleaned weekly?

Section 3.4.2 Operation Protocols American Eel Counting (1st Paragraph)

- Is it determined or recorded?

Section 3.4.2 Operation Protocols American Eel Counting (2nd Paragraph)

- What does this evaluation consider?
- Will all deceased eels float to the top of the tank or remain in the tank after release?
- At the release site how long is the area inspected to evaluate for mortality?
- Is the mortality evaluation process defined or is it subjective depending on the transport staff?

Section 3.6 – Emergency Response Protocols

- Maryland advises that if 95% survival is not achieved then modifications are deemed necessary.

Section 3.6.1 – Alarms and Contacts

- The contact list should be maintained, updated and provided in this plan.
- Is temperature included in the alarm system process?

Section 3.6.2 – Failed Inspections (2nd Paragraph)

- All inspections, passed or failed will be recorded how?
- Where are the forms/sheets documenting the inspections?

Section 3.7 – Quality Assurance and Quality Control

- A QA/QC plan should be developed and included as an appendix.
- Please define training requirements and how training records will be maintained.
- Table 3.5-1: In support of stocking locations, consider adding written directions and/or maps from Conowingo Dam to each of the stocking locations. In the event a new driver is needed how will they locate the site?

Section 4 – Implementation Schedule

- We believe the second sentence should be both CWECF and CEECF.

Section 6 – Reporting and Meetings

- Plan should identify (and be updated) as to which emails and staff receive these reports.
- Daily reports should include alarms, maintenance and cleaning operations that occurred if any

Section 6.1.2 - Annual Reports

- Draft reports for the CWECF and CEECF are proposed to be submitted on December 1 (up to Sept 15) and December 31 (16th to end of season). Final report filing dates are February 15. While time may be short between the end of the eel passage season and December 1, it is much preferable that there be only one report for the season.

Appendix I - Agency Consultation Records

General Comments #4

The recommended shakedown period was not intended for ramp efficiency (efficiency test) but to see if eels were attracted into the EFL and then to the ramp location. With additional attraction flow (See comment 1a below) a shakedown period will still be necessary. Tweaks are standard practice as indicated by the many tweaks and upgrades at the CWEFC and the shakedown periods for the rebuilt east and west fish lifts. Maryland would again strongly recommend a period of time when tweaks and upgrades be made and this time period not counted towards a fully functioning CEEFC evaluation period.

General Comments #8

Maryland disagrees with Exelon in that ramp efficiency testing technology is not available. Determining the efficiency of an eel ramp is feasible and has been done at a number of other projects. As Exelon described, a ramp efficiency test is simple. Enclose a known number of eels at the bottom of the ramp, which has been cleared of eels, and count the number in the capture/holding tank at the top over a fixed period such as 6, 12, 18, 24, etc. hours.

Ramp efficiency has been evaluated on three ladders at the Woronoco project (FERC # 2631) on the Westfield River in Massachusetts (Woronoco 2010 & 2012), at the Lawrence dam (FERC # 2800) on the Merrimack River in Massachusetts (Normandeau 2015), and on the Messalonskee Stream in Maine (Hickey 2012). In all cases, eelway efficiency was determined. At Woronoco the results were 99% in 96 hours at the North Ladder, 93% at the Middle Ladder in 66 hours, and 100% at the South Ladder in 18 hours. At the Lawrence Dam results after 36 hours were 55% and 32%. At the Automatic project on the Messalonskee Stream 97% efficiency was reported on the Enkamat side and 90% efficiency on the Plinko side. No times were reported.

Exelon states that where ramp efficiency tests have been done the results are mixed. That is true in that in the above projects two had high efficiencies and one was poor. Exelon expressed concern that eels infiltrating the eelway might affect the result as happened at Lawrence. The report surmises that eels at Lawrence may have infiltrated the ramp due to gaps in the wooden channel where sections were joined or were not detected under the substrate which was not checked prior to the tests. Infiltration would not be an issue at the ramps at Conowingo as they

are aluminum trays with a climbing material where all eels in the ramp could be observed and removed prior to the test. Any concerns with shutting down the west ramp could be mitigated by installing a temporary ramp or scheduling the test when eels movement is expected to be low.

Specific Comments 1a

Maryland disagrees with the proposed attraction flow for the eel ramp (70 gpm) which results in 0.16 cfs. This ramp must attract eels away from the flow from the turbines and leakage from the spill and into the EFL; 70 gpm is virtually no attraction flow and therefore must be increased to a flow such that eels are attracted into the EFL.

Specific Comments 1b

Night time observations are reasonable as a means of observing eels in the EFL to note concentration locations and to compare observations with captures.

Specific Comments 2a

Closing diffusers would direct flow to the open channel providing a stronger signal in the open channel to guide eels to the ramp.

Specific Comments 2b

As noted above, 70 gal/min is insufficient to attract eels into the EFL. It is concerning that Exelon has proposed an eelway with no attraction flow beyond ramp and side splash flows.

Specific Comment 2c

That there is no provision in settlement to include bar racks is does not justify rejecting them.. Many modifications to both fishways have been included as designs are developed. Adding slots for bar racks is a less than minor modification to protect eels from snakeheads and other invasives lying in wait in the EFL.

References

Hickey, S.J. January 26, 2012. Letter to Mr. Steven Shepard, USFWS. Kennebec Water District Upstream and Downstream Proposal. Pg. 4.

Normandeau. 2015. Assessment of eel pass effectiveness at the Lawrence hydroelectric project (FERC No. 2800), Merrimack River, Lawrence, MA.

Woronoco Hydro. 2010. Report on the 2009 testing of the upstream passage for juvenile American eels phase i – passability testing and site observations. FERC # 2631. Accession No. 20110131-5111.

Woronoco Hydro. 2012. Report on the 2011 testing of the upstream passage of juvenile eels, Phase 1 Passability tests of all eel ladders and repeat of Phase II attractiveness testing and observations –article 404. FERC # 2631. Accession No. 20120229-5139.

From: Miller, Jeremy <jeremmille@pa.gov>
Sent: Friday, September 3, 2021 6:32 AM
To: Danucalov, Andrea H:(Exelon Power) <Andrea.Danucalov@exeloncorp.com>
Cc: Eberts, Ron <reberts@pa.gov>; Williamson, Scott <scwilliams@pa.gov>
Subject: RE: [External] American Eel Passage and Restoration Plan

Andrea,

DEP has reviewed the revised Conowingo American Eel Passage and Restoration Plan dated August 2021 and have no further comments or questions.

Thank you for the opportunity to review.

Jeremy

Jeremy Miller | Aquatic Biologist
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DEP's 24-hour Emergency Response Number is 1.800.541.2050

Agency Comments on August 18, 2021 Draft and Exelon Responses

	Comment	How Addressed
MDE & MDNR, Received September 2, 2021		
Section 2 – Project Configuration		
1	2nd Paragraph: Be consistent with acronym definitions (i.e. define WFL. Use of both WFL and West Fish Lift is below).	WFL has been removed from the document.
2	2nd Paragraph: Figure 2.0-1 should depict all that is described in the text (i.e. spillway, abutment sections, etc.)	This figure has been updated.
Section 3.2.1 - Conowingo West Eel Collection Facility		
3	2nd Paragraph: Suggest including the elevation of the normal high-water line in the text.	The elevation of the normal high-water line has been added to the text.
4	3rd Paragraph: What is defined as 'large 60% shade cloth'. Additional clarification is needed.	The percentage listed refers to the percentage of sunlight and corresponding UV rays that are blocked by the shade cloth. This explanation has been added as a footnote to the text.
Section 3.2.1 - Octoraro Creek Eel Collection Facility		
5	2nd Paragraph: Add angle to 90-degrees.	The word "angle" has been added to the text.
6	3rd Paragraph: Define L as Liter and use consistently throughout.	L is defined as liter in Section 3.2.1, the first paragraph under Conowingo West Eel Collection Facility. The document has been checked for consistency as liter has been replaced with L in one location within the document.
Section 3.2.1 - Conowingo East Eel Collection Facility		

	Comment	How Addressed
7	How was the location of the ramp determined?	The MDE Settlement Joint Explanatory Statement, Section A.2.a.i says, "Exelon will develop an 'Eel Passage and Restoration Plan' that will (i) provide for modification of the EFL to accommodate a temporary eel trapping facility in the EFL stilling basin (the 'Temporary Eel Trapping Facility')". The MDE Settlement Draft License Article Eel Passage says, "The Eel Passage and Restoration Plan shall include (i) detailed plans for modifications to the East Fish Lift to specifically accommodate a temporary eel trapping facility at a location within the East Fish Lift stilling basin in the vicinity of the foot of the spillway ('EFL Eel Temporary Modifications')". Due to the language of the MDE Settlement draft license article, Article 415 then specifically calls for a temporary eel trapping facility at a location within the East Fish stilling basin. The MDE Settlement is referenced in Section 3.1.3. The stilling basin location allows for a water source, power source, and safety from vandalism. No facility can be placed below the spillway itself due to safety concerns. The CEECF is considered experimental and temporary. The design for the CEECF is not finalized and will be developed further, as necessary, in consultation with the resource agencies, after the design of the EFL modifications for American Shad and river herring are complete.
8	Does the attraction water come off the top of the pond?	Attraction flow water to the CEECF comes from a 6-inch gravity feed water line from the headpond near elevation 100.7 feet (full pond elevation is 109.2 feet) to valve located near the EFL. Then the water line is reduced to a 2-inch line to feed the CEECF.

	Comment	How Addressed
9	What is the general difference in water temperatures during the summer? Water temperatures in the tailrace compared to the CEECF attraction water should be recorded.	Available data from Exelon's 2010 water quality study[18] conducted during relicensing indicates there is little to no thermal stratification during summer in Conowingo Pond at sampling locations near the dam. In addition, a comparison of water temperatures measured at monitoring locations throughout the water column just upstream of the dam indicated that temperatures were comparable to those measured in the tailrace at monitoring station 643. Water temperature from the continuous monitor located in the collection tank can be compared to temperature data recorded in the tailrace at monitoring station 643.
10	The plan should describe how predators prevented from entering the EFL?	Predators will not be excluded from the EFL but will be excluded from the diffuser pits and above the crowder screen hoist by grating with 7/8-inch opening. This grating opening may change depending on the final design of the EFL modifications.
11	Clarify the amount of attraction water coming out of the entrance gate C and how that will be a signal for eels to enter the EFL	The attraction flow out of entrance gate C will be 265 L-per-minute. This is the same amount of attraction flow used at the CWECF, which as of September 2021 had captured over 580,000 moving along the west side of the tailrace, along the margin of the main generation flow. The CEECF is intended to collect eels that may move along the east side of the tailrace to the EFL entrances along the margin of the main generation flow. The amount of attraction flow has been added to Section 3.2.1.
12	The plan should describe the flows when the eel ramp will be pulled.	The ramp should be pulled when flows are forecasted to exceed 113,000 cfs. This has been added to Section 3.2.3. The ramp will be redeployed once flows have receded to a level that allow for safe access.

[18] Normandeau Associates, Inc. and Gomez and Sullivan Engineers, P.C., 2012. Seasonal and Diurnal Water Quality in Conowingo Pond and Below Conowingo Dam.

	Comment	How Addressed
13	Provide an approximate year of project initiation/operation startup. We realize this is defined in the schedule section but mention of it here is recommended.	The construction schedule for the EFL modifications for river herring and American Shad has not been finalized. The CEECF will be installed after the EFL modifications are complete. Exelon will provide schedule updates at a minimum during the annual EPAG meetings and will also update this plan accordingly and submit it to the resource agencies for review and FERC for approval. Exelon also participates in monthly design-planning meetings with resource agencies, and schedule is discussed during these meetings. This has been added to Section 3.2.1.
14	2nd Paragraph last sentence: Sentenced needs to be edited. Use of with versus will.	This sentence has been corrected.
15	3rd Paragraph: Include elevation of normal high-water line. 7th sentence: is it 'tailwater level', or 'existing tailwater elevation'.	This sentence has been revised to reference the elevation of the base of the ramp (+/-17.8 ft) relative to the minimum tailwater elevation (+/-12.9 ft) expected to occur during the operational season for the CEECF (mid-June to early November).
Section 3.2.2 – Construction		
16	Provide an estimated construction date.	The construction schedule for the EFL modifications for river herring and American Shad has not been finalized. The CEECF will be installed after the EFL modifications are complete. Exelon will provide schedule updates at a minimum during the annual EPAG meetings and will also update this plan accordingly and submit it to the resource agencies for review and FERC for approval. Exelon also participates in monthly design-planning meetings with resource agencies, and schedule is discussed during these meetings.
Section 3.2.3 – Operational Protocols: Intro		

	Comment	How Addressed
17	Re: Operation of CEECF - Diffuser gates A & B are to be open. With only 70 gal/min 'attraction flow' it might be better to close them off to get max guidance in the open channel for any eels that enter the EFL.	If eels are near the bottom of the channel, having the Diffuser C open will help guide eels into the stilling basin, otherwise they could become trapped in this area and have no way out. The situation is similar at the Crowder Area Gate. Leaving Diffuser Gate A and B open along with Crowder Area Gate will allow eels to reach the CEECF, without becoming isolated and trapped in these passages.
18	Section 3.2.3 references a schedule outlined in Section 4. Section 4 needs more detailed information detailing actual operation and monitoring schedules at all three facilities.	Section 3.2.3 should refer to Section 5, which outlines the annual schedule and duration of operation at each of the facilities. The text has been revised to reflect this. Monitoring schedules are outlined in Section 3.2.3 under the monitoring subheading.
Section 3.2.3 – Operational Protocols: Monitoring		
19	Are there specific monitoring forms? If so, please include in the plan	The CWECF Daily Field Sheet is included in Appendix E.
20	Continuous monitoring / alarm systems at both the OECF and CEECF should be considered for replacement instead of daily inspections.	30-minute readings of temperature and DO will be recorded using an Onset HOBO Probe in the collection tanks at both the CEECF and OECF. These data are downloaded and reviewed regularly to identify any water quality related issues with the operation of the facilities. Daily inspections by operation staff are an important component of maintaining the proper functioning of each facility, and Exelon does not believe discontinuing these procedures would be appropriate.
Section 3.2.3 – Operational Protocols: Inspection		
21	Page 12 states: if an inspection suggests that any structure or flow component is not performing properly and no alarm has been triggered, verification of this potential deviation will be performed as described above and corrective action will be taken as soon as possible. The plan should define this process.	Items such as faulty or incorrectly positioned attraction flow hoses or components such as a spray bar incorrectly spraying water due to blockages of the holes, etc. are examples of items included in the visual inspection. These items are not identifiable by the alarm system and must be covered during the daily inspections. Observed anomalies are recorded on the Daily Field Sheet. The CWECF Daily Field Sheet is included in Appendix E.

	Comment	How Addressed
22	Alarms are mentioned but not discussed in enough detail.	Text has been added to Section 3.2.3 (Monitoring).
23	Please reference or clarify use, operation, etc. of alarms.	Refer to text in Section 3.2.3 (Monitoring).
24	What defines a failed inspection?	The term failed inspection refers to when a facility is not operating as intended. This term and Section 3.6.2 have been revised for clarity.
Section 3.2.3 – Operational Protocols: Maintenance		
25	Will the CEECF ramp be accessible for daily clearing obstructions?	The ramp will be accessible; however, very few obstructions are anticipated to be found near the ramp area due to trash racks preventing debris from entering through the gravity feed line and no debris are expected to enter the stilling basin due to the elevation of the EFL walls that surround it.
26	Is there a process or specific procedure for scrubbing the collection tank?	Scrubbing the tanks is performed with water, a brush, and scouring pad. No chemicals are used.
27	What triggers a determination that the ramp needs to be cleaned?	The ramp will need to be cleaned if debris block or hinders passage of eels at the entrance or on the ramp.
28	Are there specific maintenance logs/sheets?	The Daily Field Sheet is used to record all information including any issues that might be observed. There is also a weekly calibration sheet that is used to verify that the eel ramp equipment is working properly.
29	Are they provided in this plan and where will they be stored?	Data sheets are in Appendix E. They are stored in files at Normandeau's office and data are digitized.
30	Is anyone qualified to conduct the monitoring and maintenance activities or will this be a requirement?	The eel ramps are checked daily by experienced personnel. If a new employee is used to assist with the ramp checks, that employee is always teamed and trained by an experienced member of the maintenance staff.
Section 3.3 – Holding (Conowingo West Eel Collection Facility)		
31	Include a reference that all eels transferred to holding tanks will be recorded on the daily inspection sheet.	This reference has been added.

	Comment	How Addressed
32	Maryland is concerned that the plan continues to recommend holding eels for seven days until water temperatures exceed 28°C on consecutive days. Eels in crowded conditions can become stressed and develop fungus, as has been observed. Eels should be transported within 48 hours of capture. A recommended alternative would be the transportation and stocking to the Conowingo Pond and Lake Aldred eels that, held 48 hours, when the number held does not meet the threshold for stocking at upriver locations.	Health of eels in holding is a top priority. The Muddy Run Eel Passage Plan call for weekly transport, but EPAG agreed that transports should occur twice per week starting in mid-June and continue through September 15. Daily transports are conducted pre-emptively before water temperatures exceed 28°C or eels become crowded. SRBC has traditionally suggesting stocking locations and the locations are approved by EPAG. Alternative stocking approaches can be discussed during annual meetings with EPAG and MDE. Exelon would propose 100 eels in holding over a 48-hour period as a threshold to determine transport to Conowingo Pond and Lake Aldred versus locations further upstream.
Section 3.3.2 – Operational Protocols		
33	What is the QA/QC process associated with the inspection sheets such that holding time and temperatures are met for transport?	The CWECF is maintained daily and decisions to transport are made in real-time based on eel condition, environmental conditions, and the number of eels in holding. A transport vehicle is on-site to facilitate the ability to conduct transports as needed.
	Section 3.3.2 – Operational Protocols / Monitoring	
34	What defines continuous? Operation is noted later as 24 hours a day 7 days a week. This implies that monitoring will be conducted non-stop during the collection season/operation.	Flow, DO, and temperature are monitored and recorded continuously at the CWECF holding tanks. These meters are in place throughout the entire collection season and operate 24/7.
35	2nd Paragraph: Please reference and maintain/update a contact list including operational personnel in the plan.	Contact lists are updated regularly and will be distributed to resource agencies, Station staff, and contractors each season.
36	4th Paragraph: Is there an elevated concentration that will trigger an alarm or just the minimum?	The upper DO threshold is 20 ppm. This has been added to the text.
37	Section 3.3.2 – Operational Protocols / Inspection Once per day? Continuous measurements on other systems and only daily for holding tanks? Please clarify.	Eel tanks are typically checked every morning. Continuous measurements of temperature, flow and DO are recorded for the holding tanks, as well as the collection tank.
Section 3.4.1 – Design		

	Comment	How Addressed
	Conowingo West Eel Collection Facility	
38	How often is the water quality probe calibrated and maintained?	Water quality data are downloaded weekly. The probe is checked weekly versus a calibrated meter, and then the probe is calibrated, as necessary.
39	Where are the calibration and maintenance forms located in this plan? *GLOBAL note for calibration forms as it is discussed in other sections of the plan*	This form has been added to Appendix E.
40	Appendix F references engineering drawings for transport facility. Are there drawings for the 19-L buckets and enclosed transport tank?	There are no engineering drawings for the 19-L buckets or the smaller enclosed transport tank. Pictures of these have been provided in Appendix F.
	Octoraro Creek Eel Collection Facility	
41	The holding tank has a capacity of 3,140 eels. The transport truck for more than 150 eels is a 250 liter tank which can transport 2,500 eels. In 2021, more than 2,500 eels were collected on July 13 – 3,474, 14 – 4,738 and 15 – 6,168. The plan should describe operations when more eels are collected in a single day than the holding tank or the transport tank can accommodate.	Under these circumstances, multiple trips to transport eels from the OECF to the CWECF holding tanks are made. This has description has been included in text in Section 3.4.1.
42	How are the 19-L buckets loaded and transported?	The 19-L buckets are manually loaded into a custom-made bucket holder that keeps the buckets from tipping over during transport via a small cart.
	Conowingo East Eel Collection Facility	
43	How are 19-L buckets transported?	A small cart will be used to transport buckets or the 250-L transport tank from the EFL area to the CWECF holding tanks.
44	What are the plans to transport eels from CEECF to CWECF if a significant number of eels are collected? All in the 19-L bucket?	All the eels will be transported in the 19-L buckets or the 250-L transport tank with supplied oxygen.
Section 3.4.2 Operation Protocols Monitoring (1st Paragraph):		
45	Will this be an area of concern if the capacity of the holding tanks are continuously met and/or water temperatures exceed 28-degrees C?	Daily transports will occur if water temperatures exceed 28°C, and multiple daily transports could occur if holding capacity is expected to be exceeded at the CWECF.

	Comment	How Addressed
46	How are oxygen levels monitored and maintained?	At the CWECF, oxygen levels are continuously monitored by a probe. The results are automatically sent to a control panel, which is connected to the Conowingo control room. At the OECF, oxygen levels and water temperature are monitored with an Onset HOBO Probe. Oxygen levels are maintained at the CWECF and will be maintained at the CEECF with an oxygen bottle, regulator, and micro-pore diffuser. Currently, there is no oxygen bottle at OCEF, but there are two battery-powered bubblers that provide DO augmentation to the collection tank. Oxygen levels in the transport tank are maintained with oxygen bottle, regulator, and diffuser.
47	What is the calibration program for monitoring these levels?	Probes (CWECF and transport tank) and Onset HOBO Probes (OECF) are checked and calibrated weekly, and data, where applicable, are downloaded weekly.
48	Section 3.4.2 Operation Protocols Temperature Please provide additional detail on how the temperature will be monitored.	During transport events, water temperature is monitored with the same meter used to monitor DO; the probe measures both parameters.
49	Section 3.4.2 Operation Protocols Dissolved Oxygen Regarding prior note on calibration protocols – this should be addressed in the plan.	See response to Comment # 47.
50	Section 3.4.2 Operation Protocols Inspection (1st Paragraph) Please reference and provide an inspection check list.	Refer to Transport Data Sheet in Appendix E.
Section 3.4.2 Operation Protocols Inspection (2nd Paragraph)		
51	How and where is this data recorded - data logger or field form?	Refer to Transport Data Sheet in Appendix E.
52	Please define the criteria for passing inspection. This is a vague statement.	The first sentence under Inspection has been changed to read, “Prior to each trip, the transport truck and associated equipment will be inspected to confirm that all equipment is operating as intended.”
	Section 3.4.2 Operation Protocols Maintenance	
53	What is defined as the facility? Conowingo?	The term “facility” has been edited to “CWECF”.

	Comment	How Addressed
54	Clarify the meaning here. Are you saying all tanks will be cleaned weekly?	All tanks that are in use will be cleaned at least weekly.
55	Section 3.4.2 Operation Protocols American Eel Counting (1st Paragraph) Is it determined or recorded?	The text has been revised to use the term "recorded."
Section 3.4.2 Operation Protocols American Eel Counting (2nd Paragraph)		
56	What does this evaluation consider?	Mortality is not an evaluation but rather a determination. The term has been changed in the text.
57	Will all deceased eels float to the top of the tank or remain in the tank after release?	Freshly dead eels sink. They are removed by netting. Only when a small proportion of eels are left in the holding tank are they flushed. All eels are checked prior to loading into transport tank.
58	At the release site how long is the area inspected to evaluate for mortality?	The stocking location is monitored until the water returns to pre-stocking conditions (i.e. water and sediment have settled following stocking). Most eels will seek cover as soon as they are stocked. Eels that have died will be visible lying belly-up and motionless on the stream bottom. Dead eels are retrieved by the stocking crew when access allows.
59	Is the mortality evaluation process defined or is it subjective depending on the transport staff?	The word evaluated has been changed to "determined". An eel is either "alive "or "dead", hence there is no subjectivity.
60	Section 3.6 – Emergency Response Protocols Maryland advises that if 95% survival is not achieved then modifications are deemed necessary.	As stated in the plan, Exelon will meet with resource agencies to develop appropriate modifications for the facilities, if the survival goal is not met. In previous years of operation of the CWECF and OECF facilities, Exelon has met the 95% survival standard each year.
	Section 3.6.1 – Alarms and Contacts	
61	The contact list should be maintained, updated and provided in this plan.	Contact lists are updated regularly and will be distributed to resource agencies, Station staff, and contractors each season.
62	Is temperature included in the alarm system process?	There is no temperature alarm, as temperature cannot be adjusted. However, temperature is monitored continuously and recorded. Eel condition and daily water temperature are used to inform the transport schedule.

	Comment	How Addressed
Section 3.6.2 – Failed Inspections (2nd Paragraph)		Section 3.6.2 has been renamed Inspection Response, which is more accurate than Failed Inspections Protocols.
63	All inspections, passed or failed will be recorded how?	Notes detailing the issue will be recorded in the Comments section of the Daily Field Sheet or the Transport Sheet.
64	Where are the forms/sheets documenting the inspections?	The forms are included in Appendix E.
Section 3.7 – Quality Assurance and Quality Control		
65	A QA/QC plan should be developed and included as an appendix.	The QA/QC measures related to the eel program are described throughout Section 3 of this document for each facility, and inspection forms and data sheets are included as Appendices.
66	Please define training requirements and how training records will be maintained.	Supervising biologist train new staff members, who are subject to internal review. Most of the training is hands-on. A new or inexperienced staff member never leads the daily crew. Additionally, all operating personnel are required to read and understand the Conowingo Fishway Operation and Maintenance Plan.
67	Table 3.5-1: In support of stocking locations, consider adding written directions and/or maps from Conowingo Dam to each of the stocking locations. In the event a new driver is needed how will they locate the site?	All “drivers” are biologists with several seasons of experience. Maps are no longer required as most cell phones have apps for directions and rerouting capabilities when a specific road is closed due to accidents, etc.
68	Section 4 – Implementation Schedule We believe the second sentence should be both CWECF and CEECF.	This sentence has been revised for clarity. It is only referring to the CWECF. The CEECF will begin operation one year after the EFL modifications are complete.
Section 6 – Reporting and Meetings		
70	Plan should identify (and be updated) as to which emails and staff receive these reports.	Confidential contact lists including Exelon staff, consultants, and resource agencies, are kept separately from this publicly accessible report. Contact lists are updated regularly.

	Comment	How Addressed
71	Daily reports should include alarms, maintenance and cleaning operations that occurred if any	It is preferable to detail these issues if they occur in a section of the annual report. Exelon does notify the resource agencies when there is an issue with any of the eel ramps by email. The daily emails should be succinct and brief unless an unexpected situation arises.
72	Section 6.1.2 - Annual Reports Draft reports for the CWECF and CEECF are proposed to be submitted on December 1 (up to Sept 15) and December 31 (16th to end of season). Final report filing dates are February 15. While time may be short between the end of the eel passage season and December 1, it is much preferable that there be only one report for the season.	The Muddy Run Pumped Storage Project License Appendix A requires Exelon to submit draft annual reports to resource agencies for the CWECF and OECF summarizing eel facility data by December 10 each year and final reports to FERC by January 15. MDE, PADEP, SRBC, and USFWS were consulted regarding draft report submission during a meeting on October 1, 2020. Exelon stated at that time that providing a quality draft report by December 10 that covers the longer MDE-defined season at CWECF is not feasible and proposed submitting only one draft report at a later date. However, PADEP and USFWS agreed that a draft report must still be submitted by December 10 per the Muddy Run License. They acknowledged that including additional data from operations through mid-November was not feasible and it was agreed that additional September 16 through early November data should be added to the report later as an addendum. The addendum will not include additional biological data. MDE asked if the interim draft would be provided to them and Exelon agreed that all eel facility interim draft reports would be provided to all resource agencies.
Appendix I - Agency Consultation Records		

	Comment	How Addressed
73	General Comments #4 The recommended shakedown period was not intended for ramp efficiency (efficiency test) but to see if eels were attracted into the EFL and then to the ramp location. With additional attraction flow (See comment 1a below) a shakedown period will still be necessary. Tweaks are standard practice as indicated by the many tweaks and upgrades at the CWEFC and the shakedown periods for the rebuilt east and west fish lifts. Maryland would again strongly recommend a period of time when tweaks and upgrades be made and this time period not counted towards a fully functioning CEEFC evaluation period.	The CEECF is an experimental ramp. Exelon is proposing to begin operation of the ramp as outlined in this Plan. Adjustments to the attraction flow and other operational parameters can be considered at annual EPAG meetings, as necessary, after the initial installation and operation of the CEECF is evaluated.
74	General Comments #8 Maryland disagrees with Exelon in that ramp efficiency testing technology is not available. Determining the efficiency of an eel ramp is feasible and has been done at a number of other projects. As Exelon described, a ramp efficiency test is simple. Enclose a known number of eels at the bottom of the ramp, which has been cleared of eels, and count the number in the capture/holding tank at the top over a fixed period such as 6, 12, 18, 24, etc. hours. Ramp efficiency has been evaluated on three ladders at the Woronoco project (FERC # 2631) on the Westfield River in Massachusetts (Woronoco 2010 & 2012), at the Lawrence dam (FERC # 2800) on the Merrimack River in Massachusetts (Normandeau 2015), and on the Messalonskee Stream in Maine (Hickey 2012). In all cases, eelway efficiency was determined. At Woronoco the results were 99% in 96 hours at the North Ladder, 93% at the Middle Ladder in 66 hours, and 100% at the South Ladder in 18 hours. At the Lawrence Dam results after 36 hours were 55% and 32%. At the Automatic project on the Messalonskee Stream 97% efficiency was reported on the Enkamat side and 90% efficiency on the Plinko side. No times were reported. Exelon states that where ramp efficiency tests have been done the results are mixed. That is true in that in the above projects two had high efficiencies and one was poor. Exelon expressed concern that eels infiltrating the eelway might affect the result as happened at Lawrence. The report surmises that eels at Lawrence may have infiltrated the ramp due to gaps in the wooden channel where sections were joined or were not detected under the substrate which was not checked prior to the tests. Infiltration would not be an issue at the ramps at Conowingo as they are aluminum trays with a climbing material where all eels in the ramp could be observed and removed prior to the test. Any concerns with shutting down the west ramp could be mitigated by installing a temporary ramp or scheduling the test when eels movement is expected to be low.	Exelon would prefer to complete attraction efficiency and ramp efficiency testing using a single, proven technology. Proven technology for attraction efficiency (such as appropriately sized tags) is not available. Discussion of technological developments will continue at annual EPAG meetings with resource agencies. Regarding ramp efficiency only, Exelon will draft a study plan for an efficiency test in 2022, as suggested by MDE. The draft study plan will be provided to EPAG members and USFWS and will be implemented following approval of this Plan.

	Comment	How Addressed
75	Specific Comments 1a Maryland disagrees with the proposed attraction flow for the eel ramp (70 gpm) which results in 0.16 cfs. This ramp must attract eels away from the flow from the turbines and leakage from the spill and into the EFL; 70 gpm is virtually no attraction flow and therefore must be increased to a flow such that eels are attracted into the EFL.	The CWECF currently operates with the same attraction flow as proposed for the CEECF. The CWECF must also attract eels away from turbines and up the riprap on the streambank. In 2021, over 580,000 eels (as of September) were captured at the CWECF. The CEECF is an experimental ramp. Exelon is proposing to begin operation of the ramp with the 265 L-per-minute (70-gpm) attraction flow. Adjustments to the attraction flow can be considered annually at EPAG meetings, as necessary, after the initial installation and operation of the CEECF is evaluated.
76	Specific Comments 1b Night time observations are reasonable as a means of observing eels in the EFL to note concentration locations and to compare observations with captures.	Exelon is proposing that the need for nighttime observations be discussed after initial installation and operation of the CEECF. The scope and level of effort for any nighttime observations can be discussed annually at EPAG meetings and implemented accordingly.
77	Specific Comments 2a Closing diffusers would direct flow to the open channel providing a stronger signal in the open channel to guide eels to the ramp.	Exelon is proposing to begin the initial operation of the CEECF with the diffusers opened. Alternative diffuser gate settings can be considered annually at EPAG meetings, as necessary, after the initial installation and operation of the CEECF is evaluated.
78	Specific Comments 2b As noted above, 70 gal/min is insufficient to attract eels into the EFL. It is concerning that Exelon has proposed an eelway with no attraction flow beyond ramp and side splash flows.	The CWECF currently operates with the same attraction flow as proposed for the CEECF. The CWECF must also attract eels away from turbines and up the riprap on the streambank. In 2021, over 580,000 eels were captured at the CWECF by early September. The CEECF is an experimental ramp. Exelon is proposing to begin operation of the ramp with the 265 L-per-minute (70-gpm) attraction flow. Adjustments to the attraction flow can be considered annually at EPAG meetings, as necessary, after the initial installation and operation of the CEECF is evaluated.

	Comment	How Addressed
79	Specific Comment 2c That there is no provision in settlement to include bar racks is does not justify rejecting them. Many modifications to both fishways have been included as designs are developed. Adding slots for bar racks is a less than minor modification to protect eels from snakeheads and other invasives lying in wait in the EFL.	Predators will be excluded from the diffuser pits and above the crowder screen hoist by grating with 7/8-inch opening. This grating opening may change depending on the final design of the EFL modifications. Exelon will consider the need for additional predator exclusion devices (i.e., bar racks on the C gate entrance) as part of the EFL modification design process for American Shad and river herring. Any design must consider worker safety and access constraints during installation and removal of the bar racks.