Brunner Island, LLC
REGULATORY DELIVERABLE
SUBMITTAL COVER SHEET

Date:	March 6, 2020	**Transmittal No.:**	BI-29-2020-03-06-v.1
DOCUMENT DESCRIPTION:		Work Plan - Closed Ash Basin 5 Abatement and Pyrite Tomb Area and Bottom Ash Processing Area	
CONSENT DECREE REFERENCE:		Paragraph No.:	29
BRIEF DESCRIPTION OF OUTLINED REQUIREMENT:		Within 120 days of entry of this Consent Decree, Brunner shall submit a work plan, for Department approval, for any additional assessment and recommended abatement actions for the northern portion of Ash Basin 5, including the Pyrite Tomb and the bottom ash processing area.	

RECIPIENT(S):	
NAME:	ORGANIZATION:
Anthony Rathfon	PA DEP Waste Management Program
Mary Greene (via ftp: mgreene@environmentalintegrity.org)	EIP
Griffin Bird (email: gbird@environmentalintegrity.org)	EIP
Thomas Weissinger	Talen Energy
Brunner Island, LLC Contact Name:	Marcia Thiess
Brunner Island, LLC Contact Phone:	(717) 268-1531
Mailing Address: Brunner Island, LLC P. O. Box 221 York Haven, PA 17370	Street Address: Brunner Island, LLC 1400 Wago Road Mt. Wolf, PA 17347

WORK PLAN
CLOSED ASH BASIN 5 ABATEMENT
PYRITE TOMB AREA AND
BOTTOM ASH PROCESSING AREA
BRUNNER ISLAND, LLC
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

Prepared by:

V.F. Britton Group, LLC
326 Conestoga Road
Wayne, PA 19087
610-964-1462

Prepared for:

Brunner Island, LLC
1400 Wago Road
York Haven, PA 17370

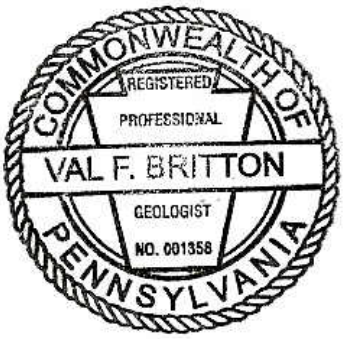
March 4, 2020

Certification

I, Val F. Britton, being a Registered Professional Geologist, in accordance with the Pennsylvania Professional Geologist's Registration, do hereby certify to the best of my knowledge, information, and belief, that this Work Plan is true and correct and has been prepared in accordance with generally accepted good geological practices.

Signature: _____

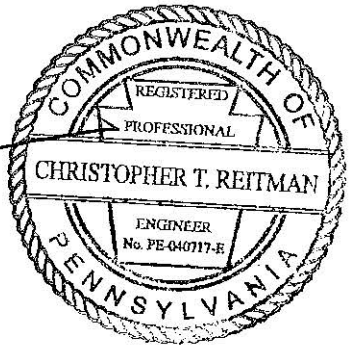
Date: March 4, 2020



I, Christopher T. Reitman, being a Registered Professional Engineer, in accordance with the Pennsylvania Professional Engineer's Registration, do hereby certify to the best of my knowledge, information, and belief, that the general specifications in this Work Plan are correct and have been proposed in accordance with generally accepted good engineering practices.

Signature: _____

Date: March 4, 2020



On July 31, 2019, a Consent Decree (CD) was lodged with the United States District Court for the Middle District of Pennsylvania, memorializing a settlement among Brunner Island LLC (Brunner), Talen Energy Corporation, the Pennsylvania Department of Environmental Protection, and three Citizens Groups. The CD was approved and entered by the Court on November 8, 2019. The CD, as noted in Paragraph 29, requires that Brunner develop a work plan for abatement actions for the northern portion of closed Ash Basin 5 (Basin 5) associated with the Pyrite Tomb and the Bottom Ash Processing Area.

In response to the CD, the V.F. Britton Group, LLC has developed this work plan, on behalf of Brunner Island, LLC, outlining the scope of work for abatement actions for the northern portion of Basin 5 associated with the Pyrite Tomb and the Bottom Ash Processing Area.

PADEP has raised specific concerns with levels of groundwater contaminants outside of the northeastern Basin 5 berm in monitoring well MW-8-4. The PADEP believes that the Pyrite Tomb is the source of this groundwater degradation. Additionally, PADEP raised specific concerns with levels of contaminants outside of the northwestern Basin 5 berm in monitoring well MW-8-5A and MW-8-5B. The PADEP believes that the residual waste in Basin 5 associated with the Bottom Ash Processing Area is the source of these groundwater impacts.

Based on historical assessment and site characteristics, Brunner Island is proposing to install a groundwater recovery system along the northeastern and northwestern side of Basin 5 to reduce the levels of groundwater contaminants outside of Basin 5 in these areas. Based on groundwater modeling analyses, five recovery wells will be placed along the outside of the Basin 5 berm proximate to the Pyrite Tomb area and four recovery wells will be placed along the outside of the Basin 5 berm proximate to the Bottom Ash Processing Area. The targeted locations and depths of the proposed recovery wells will effectively recover dissolved coal ash constituents in the groundwater and treat the groundwater in the existing on-site treatment facility. A discharge piping alignment will be installed from the recovery well locations to the treatment facility. Bottom ash will be excavated from the surface of the bottom ash processing area and either beneficially used offsite or placed within Brunner's Disposal Area 8 Class 2 Residual Waste Landfill.

Once this Work Plan is approved by the PADEP, appropriate permit applications will be prepared and submitted. The contractor selection process and ultimate site work will begin upon issuance of required permit(s).

Table of Contents

1.0 Background

1.1 General

The Brunner Island facility is an electrical generating facility that commenced operations in the early 1960s on Brunner Island and Lows Island adjacent to the western bank of the Susquehanna River near York Haven, Pennsylvania. As part of the power generation process, coal ash has been deposited in impoundments (ash basins), including closed Ash Basin 5 (Basin 5). As discussed in Section 2.4, concentrations of dissolved coal ash constituents have been identified in monitoring wells MW-8-4, MW-8-5A and MW-8-5B; PADEP believes that these impacts are the result of potential migration from the Pyrite Tomb Area and the Bottom Ash Processing Plant respectively.

On July 31, 2019, a Consent Decree (CD) was lodged with the United States District Court for the Middle District of Pennsylvania, memorializing a settlement among Brunner Island LLC (Brunner), Talen Energy Corporation, the Pennsylvania Department of Environmental Protection, and three Citizens Groups. The CD was approved and entered by the Court on November 8, 2019. The CD requires that Brunner complete a work plan for abatement actions for the northern portion of Basin 5 associated with the Pyrite Tomb Area and the Bottom Ash Processing Area.

Paragraph 29 from the CD states: "*Within 120 days of entry of this Consent Decree, Brunner shall submit a work plan, for Department approval, for any additional assessment and recommended abatement actions for the northern portion of Basin 5, including the Pyrite Tomb and the bottom ash processing area*". In response to this requirement, the V.F. Britton Group, LLC has developed this work plan, on behalf of Brunner Island, LLC, outlining the scope of work for proposed abatement actions for the northern portion of Basin 5 in both the Pyrite Tomb Area and the Bottom Ash Processing Area.

1.2 History

Basin 5 began receiving waste materials including fly ash, bottom ash, and mill rejects in 1973. In 1988 the basin ceased receiving waste and was retired. From 1988 to 1992, bottom ash reclamation operations were conducted on the northern portion of Basin 5. In 1998, a closure plan modification was approved by PADEP which permitted the construction of a pyrite tomb on the northeast corner of Basin 5.

The Pyrite Tomb was constructed using moisture-conditioned fly ash with two percent added lime and was designed to receive mill rejects excavated from Basin 4S. In 2006, a permit modification was approved to construct the Bottom Ash Processing Area including the concrete troughs on the northwest corner of Basin 5. The Bottom Ash Processing Area continues to receive bottom ash for processing. Additionally, a laydown area, composting area, Area 8 landfill, and a railroad spur have been permitted and constructed on Basin 5.

2.0 Site Characteristics

2.1 Closed Ash Basin 5

Closed Basin 5 is located in the southern portion of Brunner Island between Basin 4S to the north and Basin 6 to the south. Basin 5 was used for the disposal of both fly ash and bottom ash. Basin 5 is approximately 94 acres in area and contains approximately 5,428,800 cubic yards of ash material. It is an impoundment that was constructed directly on top of the consolidated bedrock and was contained within constructed earthen perimeter berms. Within the footprint of Basin 5, the native unconsolidated overburden sediments (clay, silts, sands, and gravels) overlying the bedrock were removed and used for the construction of the perimeter earthen berms. In 1988 Basin 5 was taken out of service and in the following years a two-foot thick vegetated soil cover was placed over the top of Basin 5 ash, as required by the approved closure plan for the basin.

Subsequent to Basin 5 closure and with approval from PADEP, the Pyrite Tomb and the Bottom Ash Processing Area were constructed within the footprint of closed Basin 5. The construction details associated with the Pyrite Tomb are discussed below in Section 2.2 and the details of the Bottom Ash Processing Area are discussed in Section 2.3.

2.2 Pyrite Tomb

Pyrite Tomb Structure

The Pyrite Tomb was constructed in 1998 in the northeast corner of Basin 5 to receive mill reject material (pyrite) from Basin 4S. The Pyrite Tomb is approximately 4.5 acres in area. The Pyrite Tomb was constructed using moisture-conditioned, 2% lime-stabilized fly ash designed to entomb and buffer pyrites. The tomb is comprised of 2-foot-thick side walls, 2-foot-thick cap, and a 7-foot-thick base. The cap of the tomb is sloped and overlain with a 6-inch layer of coarse bottom ash to facilitate drainage off the tomb. Figure 1 provides a plan view of the Pyrite Tomb area and Figure 2 provides a hydrogeologic cross-section through the Pyrite Tomb Area. The Pyrite Tomb structure extends down into closed Basin 5 to an elevation of 270 feet (NAVD 88).

As shown on Figure 2, a leachate collection sump was installed in the layer of ash material that forms the foundation for the Pyrite Tomb structure. This collection sump is located below the layer of stabilized ash material that encases the mill reject materials and is attached to a monitoring pipe (standpipe) so that leachate that is generated from the Pyrite Tomb can be collected and assessed. Based on monitoring data from the standpipe, it is apparent that very little water (leachate) is generated by the Pyrite Tomb.

PADEP has expressed concern that the fluctuating water table in Basin 5 is resulting in the potential leaching of material from the Pyrite Tomb. Monitoring well MW-4-10 is located just north of the Pyrite Tomb and is the closest well to the Pyrite Tomb standpipe (see Figure 1). Based on historic water level measurements in monitoring well MW-4-10, one of the highest water level elevation recorded in this specific well was 271.63 feet (NAVD

88); however, based on the historic water level measurements, the average groundwater elevation is approximately 266.50 feet (NAVD 88) in well MW-4-10.

Based on a groundwater model in association with the highest groundwater level in MW-4-10 (271.63 feet NAVD 88), a groundwater elevation high of 273.63 feet NAVD 88 was projected directly under the Pyrite Tomb. Although this projected groundwater elevation (273.63 feet-NAVD 88) would be in contact with the bottom of the 2% lime Stabil-Fill material (elevation 273.00 feet-NAVD 88), the groundwater elevation is well below the mill reject material (elevation 280 feet-NAVD 88) itself, therefore, the water table is not in direct contact with the mill reject material.

Groundwater movement past the Pyrite Tomb is to the northeast toward the Discharge Channel and the Susquehanna River. Accordingly, monitoring well MW-PT-1 is directly down-gradient of the Pyrite Tomb. MW-8-4 is somewhat cross-gradient of the Pyrite Tomb and, as a result, is not the most ideal location to monitor groundwater quality associated with the Pyrite Tomb.

Pyrite Tomb Leachate Monitoring

Depths-to-water and pH of water within the pyrite tomb standpipe (see Figure 2) are monitored monthly. Water from the Pyrite Tomb standpipe is purged quarterly. The information related to monthly monitoring and quarterly purging is provided within the quarterly groundwater reports that are submitted to PADEP for Basin 5 (Talen Energy, Quarterly Groundwater Reports, Quarterly submittals to PADEP). Purged water is taken to the wastewater treatment plant. The pH of the water in the standpipe suggests that pyrites are not negatively impacting the water or groundwater.

2.3 Bottom Ash Processing Area

As part of the Basin 5 closure, soil material was placed over the ash within Basin 5, capping the underlying ash and limiting infiltration into the basin. The Bottom Ash Processing Area was constructed on top of this soil cap.

Coal ash (bottom ash) continues to be actively processed proximate to the northwest corner of Ash Basin 5 in an area referred to as the Bottom Ash Processing Area. Figure 3 provides a general layout of the Bottom Ash Processing Area and Figure 4 provides a hydrogeologic cross-section through the Bottom Ash Processing Area.

Once constructed and during the operation of the Bottom Ash Processing Area, bottom ash accumulated in the Process Area from the active operations. As a result, a layer of bottom ash currently exists overlying the soil cover on Basin 5. The thickness and associated volume of this material was evaluated with test pits in 2019 and determined to range in thickness from 5.2 feet in the central portion and thin out to less than 0.1-foot thickness at the perimeters. The average bottom ash thickness is 2.5 feet. Based on calculations, approximately 42,500 cubic yards of bottom ash material exists at the processing area. Figure 5 provides a bottom ash volume estimation based on the 2019 test pit data.

Based on observations during the 2019 evaluation of the bottom ash thickness and volume, it was noted that the bottom ash was very dense and relatively dry over the entire Bottom Ash Processing Area. The cover material underlying the bottom ash material observed during the test pit evaluation generally consisted of dense red clay with intermittent gravel-size limestone (likely relic road/parking lot base).

Bottom ash will be removed from the surface of the Bottom Ash Process Area. To facilitate the ongoing Bottom Ash Process Area operations, a portion of the bottom ash area consisting of the concrete troughs, access road, and minimal operational work area directly surrounding the troughs will remain in place. It is estimated that 3,857 cubic yards of bottom ash will remain in place and will not be part of the removal process (see Figure 5). The ash remaining in place is less than 10% of the total ash being removed from the Bottom Ash Processing Area.

The bottom ash removed from the Bottom Ash Process Area will either be used for beneficial use offsite or will be placed within Brunner's Disposal Area 8 Class II Residual Waste Landfill. Brunner is working with an ash marketing company to try to secure a vendor for offsite beneficial use of this material and plans to provide that material for beneficial use as soon as arrangements are made with such an appropriate vendor.

The bottom ash is to be removed off of the underlying Basin 5 soil cap. Visible bottom ash that will not be beneficially used is to be placed in the Disposal Area 8 landfill. The soil cap in this area was originally graded to drain to the west into the perimeter ditch and following bottom ash removal, this site is to continue to drain to that general direction. The cap is to be maintained with a minimum two-foot thickness and additional fill may be required to maintain the minimum thickness. Following bottom ash removal, the site will be stabilized with vegetation or stone.

2.4 Groundwater Characteristics

The groundwater potentiometric surface within closed Basin 5 (Pyrite Tomb Area and Bottom Ash Processing Area) is within the ash material and flows from a central northwest to southeast trending groundwater divide outward to both the west (toward Black Gut Creek) and to the east toward the Discharge Channel and the Susquehanna River (see Figure 2 and 4, respectively). Both the eastern and western edges of Basin 5 are contained by a compacted earthen berm consisting of silty clay with relatively low hydraulic conductivity. As a result, groundwater movement is directed into the shallow fractured bedrock underlying the berm material where it migrates under the berm into the native sand and gravel zone outside of the berm and ultimately into Black Gut Creek to the west and the Discharge Channel and the Susquehanna River to the east. Monitoring wells have been strategically placed and screened in the sand and gravel zone and the bedrock zone on the outside of the Basin 5 berm to intercept potential dissolved coal ash constituents migrating from the interior of Basin 5.

Monitoring well MW-8-4 is screened in the sand and gravel zone southeast of the Pyrite Tomb (see Figure 2). Dissolved coal ash constituents in this well have raised specific

concerns from the PADEP that the Pyrite Tomb is the source of the dissolved constituents in MW-8-4. Monitoring wells screened in the sand and gravel zone (i.e. MW-8-5A) and the bedrock (i.e. MW-8-5B), on the western side and outside of the Basin 5 berm are strategically placed to intercept potential dissolved coal ash constituents migrating from the interior of Basin 5 outward toward Black Gut Creek (see Figure 4).

3.0 Proposed Work Plan

Based on available historical assessment and site characteristics, no further site assessment is deemed to be necessary. Based on the available water quality data, Brunner Island is proposing to install a groundwater recovery system along both the northeastern side of closed Ash Basin 5 (Pyrite Tomb Area) and the northwestern side of Basin 5 (Bottom Ash Processing Area) to diminish elevated levels of groundwater contaminants outside of Basin 5 in these areas (Talen Energy, Quarterly Groundwater Reports, Quarterly submittals to PADEP). Based on groundwater modeling analyses, five recovery wells will be placed along the outside of the northeastern side of Basin 5 (Pyrite Tomb Area) and an additional four recovery wells will be placed along the outside of the northwestern side of Basin 5 (Bottom Ash Processing Area). The locations and depths of the recovery wells are intended to effectively recover dissolved coal ash constituents in the groundwater and treat the groundwater in the existing on-site treatment facility. Details of the location and construction of the groundwater recovery systems are discussed below in Sections 3.2 and 3.3.

3.1 Preliminary Tasks

Geophysical Utility Survey

A geophysical utility survey has been completed in the general recovery well system location in conjunction with review of site construction plans provided by Brunner (Rettew, 2019, Subsurface Utility Report). No underground or overhead utilities are anticipated to cause an issue during the recovery well system construction activities. As discussed below, prior to construction, the recovery well location will be marked in the field. A final review and inspection of the location will be completed, and approval will be required by Brunner.

Health and Safety Plan

A site-specific health and safety plan (HASP) will be completed which meets the requirements of applicable federal, state and local regulations. In particular, the HASP will meet requirements promulgated by the United States Occupational Safety and Health Administration (OSHA) set forth at 29 C.F.R. § 1910.120 (Hazardous Waste Operations and Emergency Response). The HASP will apply to all contractors and subcontractors performing activities pursuant to the Work Plan.

As part of implementation of the HASP, consultants and any subcontractor field personnel will be required to attend tailgate meetings (on days during which site activities occur) provided by the consultant to ensure that the daily field activities are coordinated and that daily chemical/physical hazards and personal protective equipment (PPE) requirements are reviewed. The consultant shall maintain the control copy of the HASP on-site during all field work. The HASP is expected to include a summary of all potential work-specific hazards, PPE requirements, plant-specific safety procedures (such as sign-in logistics and emergency meeting locations), emergency contacts, routes to the nearest hospital, and safety data sheets for materials that may be used or encountered during the work.

Contractor Selection

Upon receipt of all project permits, the construction specifications will be made available for bidding purposes. Brunner will select the successful bidder.

3.2 Placement of Groundwater Recovery Wells

As discussed in Section 2.4, groundwater flows from a central northwest to southeast trending groundwater divide outward to both the west (toward Black Gut Creek) and to the east toward the Discharge Channel and the Susquehanna River. Due to the low permeability of the berm material surrounding the ash within closed Basin 5, groundwater is forced through the fractured rock under the berm material and into the sand and gravel zone on both the eastern side, discharging to the Discharge Channel and the Susquehanna River and the western side discharging to Black Gut Creek. The Basin 5 groundwater movement was simulated with a groundwater model (MODFLOW and MODPATH), allowing groundwater recovery locations to be effectively placed.

Based on the results of the groundwater modeling, five recovery wells will be strategically placed to intercept the migration of dissolved coal ash constituents under the berm material on the northeastern side of Basin 5 (Pyrite Tomb Area). The simulated groundwater zone of capture and the associated well locations are shown on Figure 6. The recovery wells are designated as PTR-A, PTR-B, PTR-C, PTR-D, and PTR-E. Figure 7 provides a hydrogeological cross section showing the general recovery well locations.

Based on the results of the groundwater modeling, four additional recovery wells will be strategically placed to intercept the migration of dissolved coal ash constituents under the berm material on the northwestern side of Basin 5 (Bottom Ash Processing Area). The simulated groundwater zone of capture and the associated well locations are shown on Figure 8. The wells are designated as PAR-A, PAR-B, PAR-C, and PARR-D. Figure 9 provides a hydrogeological cross section showing the general recovery well relative locations.

Based on the groundwater modeling, 20-foot length screen intervals from 255 feet above mean sea level (NAVD 88) to 235 feet (NAVD 88) provide the most effective recovery zone. Average pumping rates for the wells range from an anticipated 2.5 gallons per minute (gpm) to 4.0 gpm. A summary of anticipated specific pumping rates for the northeastern side of Ash Basin 5 (Pyrite Tomb area) are provided on Figure 6 and the proposed recovery well specifications are provided on Table 1. A summary of anticipated specific pumping rates for the northwestern side of Basin 5 (Bottom Ash Processing Area) are provided on Figure 8 and the proposed recovery well specifications are provided on Table 2.

3.3 Recovery Well Installation

General

Five recovery wells (PTR-A through PTR-E) are proposed to be installed on the northeastern portion of closed Basin 5 to reduce levels of groundwater contaminants outside of Basin 5 in this area. The proposed recovery well locations are provided on Figures 10 (topographic map) and an associated cross section is provided on Figure 7. Given their locations, the five recovery wells in tandem are expected to reduce the eastern migration of dissolved constituents. Figure 12 provides the proposed recovery well specifications.

Four recovery wells (PAR-A through PAR-D) are proposed to be installed on the northwestern portion of Basin 5 to reduce the migration of groundwater contaminants outside of Basin 5 in this area. The proposed recovery well locations are provided on Figures 11 (topographic map) and an associated cross section is provided on Figure 9. Given their locations, the four recovery wells in tandem are expected to reduce the western migration of dissolved constituents. Figure 12 provides the proposed recovery well specifications.

Well Construction Specifications

It is anticipated that each of the recovery wells will be installed to a final depth elevation of approximately 235 feet NAVD-88 with a 20-foot screen length with the intent to intercept the groundwater movement in the shallow fractured bedrock under the berm material. The majority of the recovery well screen will be in the bedrock material.

It is anticipated that the wells will be installed using air rotary drilling methods. Initially a 10-inch diameter steel casing will be installed into the fractured rock material to prevent the collapse of the overburden material. Drilling will then continue into the fractured rock material to the final well depth. The recovery wells will be constructed with 6-inch diameter PVC casings and well screens. Each of the well screens will be set in a sand pack that will extend up to 1 foot above the top of the screen. A 1-foot thick bentonite seal will be placed on top of the sand pack and the remainder of the annular space will be grouted with a bentonite and cement slurry. The recovery wells will have the 10-inch diameter steel casing extend two to three feet above the ground surface and will be fitted with a pitless adapter for pump connections. The steel protective casings will be fitted with tight caps and locking covers. Drilling operations will be overseen and logged by a Pennsylvania licensed geologist. Although soil core samples will not be collected due to the drilling methodology, all attempts will be made to log the geologic material that is encountered during the drilling activities. Construction logs will also be completed. Table 1 provides a summary of the recovery well specifications for the wells on the northeastern side of closed Ash Basin 5 (Pyrite Tomb Area) and Table 2 provides a summary of the recovery well specifications for the wells on the northwestern side of Basin 5 (Bottom Ash Processing Area).

All drill cuttings (non-ash) will be neatly deposited on the soil surface in a manner that prevents sediment transport to surface water or placed in Disposal Area 8 if deemed necessary. If necessary, to prevent sediment transport, the drill cuttings will be staged on plastic sheeting or in drums prior to placement in Area 8. The contractor will assure that the cuttings are properly handled, and the site is restored to its original appearance.

Recovery well locations will be appropriately marked with signage in the field for identification. Additionally, any necessary well protection (i.e. bollards) will be installed to prevent damage to the wells from traffic.

Well Development

At the completion of well installation activities, each of the new recovery wells will be developed to clear the well screens of turbidity and prepare the wells for efficient groundwater recovery. It is anticipated that the well development process will be completed with an electric submersible pump. Water quality will be monitored during the development process to assure the well has been adequately developed. Well development water will be discharged in a manner that allows it to directly infiltrate back into the subsurface (as opposed to running off to surface water) at the locations where the recovery wells are installed.

Well Elevation Survey

The nine new recovery wells will be surveyed by a Pennsylvania licensed professional land surveyor to obtain horizontal coordinates and vertical elevations for the new wells, in accordance with Brunner requirements. The top of the inner PVC casing at the identified black mark on the north side of the inner casing, the top of the protective steel casing, and the ground surface will be surveyed to approximately 1/100 of a foot at each monitoring well location. The surveyor will need to take care in assuring that the survey is tied to the existing surveyed well locations to avoid errors.

3.4 Pump and Pump Control Installation

Pump Installation

Figure 13 provides a general conceptual design of the recovery well pump control systems. A 4-inch diameter electric (~230 volt) stainless-steel submersible pump is expected to be installed in each recovery well with an intake height of approximately three feet above the bottom of the well. The pump will be fitted with a check valve and have the capacity to lift a 60-foot head of water at a pumping rate of no less than 15 gpm. This will provide the necessary power to push the water through the proposed discharge piping system and into the existing treatment system.

Flexible or solid 1.25-inch diameter to 2.0-inch diameter pipe will be connected from the pump to the pitless adapter. The pitless adapter will be connected to a 2.0-inch diameter discharge pipe that will lead into the pump control system vault (discussed below).

Electrical lines for the pump will exit the well head and will be directed into the pump control system vault through PVC electrical conduit. The pump installations will be completed by licensed pump installers and/or electricians.

Pump Controls

Based on the groundwater model capture zone simulation, specific drawdown water elevations inside the recovery wells will be required to maintain the desired groundwater capture zone. These elevations will be refined in the field once the recovery system is installed and the system is initially balanced (discussed in Section 3.6). To assure these elevations are maintained, pressure transducers (or equivalent) will be used to control the pump activity. The transducers will be appropriately placed within the water column to accurately sense the water elevations (see Figure 12).

The pressure transducer will be connected to a pump controller that will turn the pump on and off as necessary to maintain the effective zone of capture. The pump controller along with other necessary recovery well equipment will be housed in a locking waterproof control vault located near the recovery well. Additionally, the discharge pipe from the pitless adapter on the recovery well casing will lead into the vault with necessary valves to manipulate the flow of water from the recovery system. Equipment associated with the discharge pipe will include a flow meter (flow rate and totalizer), valves to allow the bypass of the discharge water to the discharge pipe alignments, and check valves to prevent the water in the piping alignment from backing up into the vault area. Discharge piping inside the vault will be insulated and the vault will have a waterproof heater/thermostat to prevent freezing of the lines in the cold seasons. Figure 13 provides the general vault specifications and recovery well controls. Bypass valves will allow periodic cleaning of the recovery well system (discussed in Section 3.7).

Power will be supplied to each vault from the proximate plant areas. All equipment installation will be completed by a licensed electrician. The pump system will be connected to a warning light (or equivalent) placed on the exterior of the vault that will flash should the pump system malfunction. Additionally, an optional wireless data transmission system may be fitted to each recovery well system to transmit flow rates and volumes.

Dependent on-site conditions, the vault systems may either be aboveground or below ground and several recovery pump systems may be contained within a single vault system. The final system configuration will be based on field conditions including potential flooding areas, access, and subsurface moisture.

Discharge water leaving the control vault will enter the discharge piping alignment that leads to the existing water treatment plant (discussed below in Section 3.5).

3.5 Discharge Piping Alignment

An existing and permitted wastewater treatment plant (Auxiliary Waste Water Plant - AWWP) is located in the central portion of Ash Basin 4S and will be the discharge point for groundwater generated from the recovery well systems. Figure 14 provides the anticipated discharge piping alignment from the Pyrite Tomb and Bottom Ash Processing Area recovery well systems. It should be noted that several alignment options exist, and the final alignment will be based on field conditions, safety factors, worst-case weather factors, and site logistics.

Groundwater conveyance piping will transfer the pumped groundwater from the well (pitless adapter) to the well control vault and then ultimately to the Auxiliary Waste Water Plant (AWWP). The groundwater conveyance pipe will be sized during the design phase to accommodate the anticipating pumping rate from each proposed well. The pipe will be sized to provide adequate scour velocity (> 2 feet per second) to minimize the accumulation of solids in the piping over time. The pipe will also be sized to provide efficient pump operation without excessive friction losses that will require a larger pump motor output (higher operating cost) and higher-pressure ratings for the piping itself (higher material cost). This will be achieved by maintaining the water velocity in the pipe below 5 feet per second (FPS) under anticipated operating conditions. The final pipe size(s) determined in the Design may be biased outside of the 2-5 FPS range depending on the length of the pipe that is affected, compatibility of connections and fittings, and contingency operating conditions (i.e., low-flow contingency versus maximum flow contingency).

Piping will be compatible with long term exposure to the known chemical contaminants and below grade installation (typically 36-inches minimum to get below the frost line). Materials such as fusion welded HDPE or solvent welded PVC are appropriate for the majority of the groundwater conveyance piping. Both of these materials are generally inert. Fusion welded HDPE installation is more specialized, but it can result in significantly fewer joints. The pressure rating (PVC Schedule or HDPE standard dimension ratio) will be determined as part of the Design based on the system curve and pump curve developed for each well/system. The total system pressure will remain below the working pressure of the specified pipe. Each piping run will be pressure tested to identify leaks before being buried. The test procedures, pass/fail requirements, and repair/retest procedures will be identified in the contractor bidding packages.

Materials such as galvanized steel may also be utilized in limited applications (vertical in-well piping, short runs of horizontal piping from pitless adapter to control vault, etc.). Any exterior above grade piping runs will be insulated and heat traced to protect the piping from damage during freezing conditions and idle periods of operation (for necessary maintenance, for example).

For the Pyrite Tomb Recovery (PTR) wells (PTR-A through PTR-E) provided on Figure 6, the anticipated pumping rate varies from 2.5 to 4.0 gallons per minute (GPM) as shown on the table provided on Figure 6; with a combined anticipated output of approximately 16 GPM. Each well has a desired maximum pumping rate of 10 GPM (see Figure 12). This

would typically allow the use of a 0.75-inch to 1-inch nominal pipe diameter from each individual well. If a combined header pipe is used, the size could range from a nominal 1.5-inch diameter (16 GPM) to as much as 3.5-inch to 4-inch diameter (60 GPM). Individual piping runs from each well to the AWWP influent tank(s) could range from approximately 1,200 feet (PTR-A) to 1,800 feet (PTR-E) for each run.

For the Process Area Recovery (PAR) wells (PAR-A through PAR-D) provided on Figure 8, the anticipated pumping rate is approximately 3.5 GPM from each well; 14 GPM combined. This would result in similar pipe sizes as anticipated for the PTR wells. Pipe runs from an individual well would be approximately 0.75-inch to 1-inch nominal diameter. A combined header might be 1.5-inch diameter.

The Design will identify the piping sizes, material specifications, installation and testing procedures. The Design will also provide construction detail drawings for the pipe trench and other aspects of the piping installation, as deemed necessary. The pipe trench itself will typically have a depth of 36-inches plus the diameter of the pipe. For a single pipe trench, the width will be approximately 30 inches. The pipe will be centered in the trench and the signal conduit/wire will be offset 12 inches to one side of the pipe(s) and the power supply conduit/cable will be offset 12 inches to the other side or the pipe(s). Power cable and conduit will be buried a minimum of 24 inches below grade and will be overlain by plastic marking tape at a depth of approximately 12 inches above the conduit. The trench will be approximately three inches wider than the power and signal conduit/cables. The width of the trench will vary/increase if multiple pipe runs are used in the same trench.

3.6 System Start Up

Once the recovery well systems are completed, appropriately connected to the discharge piping alignment, and successfully tested the systems will be activated. Water levels in the recovery wells will be monitored. Alternate recovery wells within the system will be deactivated to evaluate the capture zone effect from the neighboring recovery well(s) allowing the system to be balanced to help assure that the zone of capture will be maintained. Pump controls will be adjusted to help maximize the efficiency of the recovery well system and the zone of groundwater capture.

3.7 Operation and Maintenance

During the initial 6 months of operation of the recovery well system, inspection for potential fouling (i.e. iron build-up, sedimentation, turbidity, etc.) will be completed. Additionally, flow rates and well efficiency will be evaluated. Based on the recovery well system observations, adjustments may be made to the system to help assure peak performance.

The pump systems will be inspected on a quarterly basis. It is anticipated that flow rate and flow volume records will be manually recorded on a quarterly basis. As an option, wireless data transmitters can be installed on each pump control system and continuous data can be recorded. System operation data will be evaluated on a quarterly basis.

Should system operation data suggest a recovery well issue (poor recovery rates, etc.), the specific recovery well system will be observed, and necessary maintenance will be performed (i.e. pump replacement, well screen surging and cleaning, etc.). Quarterly operation records and maintenance records will be kept.

3.8 Documentation

At the completion of construction of the recovery well system for the Pyrite Tomb Area and the Bottom Ash Processing Area outlined in this Work Plan, documentation of all the activity will be completed inclusive of all quality control measures. The document will include photo-documentation, figures, tables, PE-sealed as-builts, well logs, survey data, and text describing the completed remedial action. It is anticipated that as part of this documentation package, a PADEP Form 19R will be completed and sealed by a Professional Geologist and Engineer at the completion of the project.

4.0 Anticipated Schedule

Based on the scope of work presented in the Work Plan, the anticipated schedule is provided as Figure 15.

Based on the anticipated schedule, upon PADEP approval of the Work Plan, preparation of necessary permit applications will begin. For the purposes of this Work Plan, it is anticipated that permit applications will be necessary for a Residual Waste Closure Plan Modification, a Water Quality Management Permit (WQMP) modification, and potentially a Susquehanna River Basin Commission (SRBC) docket change. It is anticipated that a Residual Waste minor permit application would take approximately 60 days to complete and a major permit application, if required, would take approximately 180 days to complete. It is anticipated that a WQMP modification application would require approximately 120 days to complete and the (SRBC) docket application, if required, will take approximately 90 days to complete.

Upon issuance of the final permits by the PADEP and potentially the SRBC, the contractor bidding process will begin.

The removal of bottom ash material from the Bottom Ash Process Area will be completed upon successfully finding an appropriate vendor for offsite beneficial use of the material. The removal of the bottom ash will be completed as soon as arrangements are made with an appropriate vendor. Talen doesn't anticipate a need for a permit modification to remove material from the Bottom Ash Processing Area. If no appropriate beneficial use vendor is found, the ash will be placed within Disposal Area 8.

.

5.0 References

Rettew, 2019, Subsurface Utility Engineering Job Completion Report, Brunner Island Power Plant, York Haven, Pennsylvania, Rettew Field Services, Inc.

Talen Energy, Quarterly Submittal, Quarterly Groundwater Report, Basin No. 5, Disposal Area 8, and Pyrite Tomb Area Brunner Island, LLC.

TABLES

TABLE 1

Anticipated Recovery Well Specifications
Basin 5 - Pyrite Tomb Area
Brunner Island, LLC
East Manchester Township
York County, Pennsylvania

Recovery Well ID	X Coordinate (State Plane)	Y Coordinate (State Plane)	Ground Elevation (Feet - NAVD 88)	Total Depth (Feet)	Screen Length (Feet)	Casing Length (Feet)	Diameter (Inches)	Bottom of Well Elevation (Feet NAVD 88)	Top of Screen Elevation (Feet NAVD 88)	Anticipated Pumping Rate (GPM)
PTR-A	2265501	277970	285	50	20	30	6	235	255	2.5
PTR-B	2265635	277902	278	43	20	23	6	235	255	2.5
PTR-C	2265692	277772	272	37	20	17	6	235	255	4.0
PTR-D	2265767	277670	270	35	20	15	6	235	255	2.5
PTR-E	2265802	277564	272	37	20	17	6	235	255	4.0

NOTES:

1) Table provides anticipated recover well specifications. Field and subsurface conditions may alter recovery well specifications.

2) Recovery pump intake placement is anticipated to be three feet from the bottom of recovery well.

3) The intention is to screen the fractured bedrock zone directly below the eastern berm of Basin 5.

4) Anticipated pumping rates are based on groundwater model analyses.

TABLE 2

Anticipated Recovery Well Specifications
Basin 5 - Bottom Ash Processing Area
Brunner Island, LLC
East Manchester Township
York County, Pennsylvania

Recovery Well ID	X Coordinate (State Plane)	Y Coordinate (State Plane)	Ground Elevation (Feet - NAVD 88)	Total Depth (Feet)	Screen Length (Feet)	Casing Length (Feet)	Diameter (Inches)	Bottom of Well Elevation (Feet NAVD 88)	Top of Screen Elevation (Feet NAVD 88)	Anticipated Pumping Rate (GPM)
PAR-A	2264396	277057	290	55	15	40	6	235	250	2.5
PAR-B	2264462	276895	290	55	15	40	6	235	250	2.5
PAR-C	2264587	276721	288	53	15	38	6	235	250	3.0
PAR-D	2264642	276556	288	53	15	38	6	235	250	4.0

NOTES:

1) Table provides anticipated recover well specifications. Field and subsurface conditions may alter recovery well specifications.

2) Recovery pump intake placement is anticipated to be three feet from the bottom of recovery well.

3) The intention is to screen the fractured bedrock zone directly below the western berm of Basin 5.

4) Anticipated pumping rates are based on groundwater model analyses.

FIGURES

EXPLANATION

- APPROXIMATE CENTERLINE OF BASIN 5 BERM
- MUNICIPAL SEWER LINE
- ELECTRIC/COMMUNICATION LINE
- EXTENT OF PYRITE TOMB
- MONITORING LOCATION (EXISTING)

NOTES

1. BASE MAP AERIAL PHOTOGRAPH IS FROM PEMA 2018.
2. BASE PLAN BY CDI/L.R. KIMBAL – 2019 TOPOGRAPHICAL MAPPING – TALEN ENERGY CORPORATION, PPL DRAWING NO. E376179 (SHEET 1 REV. 9)
3. CROSS SECTION PROVIDED ON FIGURE 2.

N

APPROXIMATE SCALE (FEET)

0 100 200 400

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

CLOSED ASH BASIN 5 PYRITE TOMB AREA GENERAL LAYOUT PLAN

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB

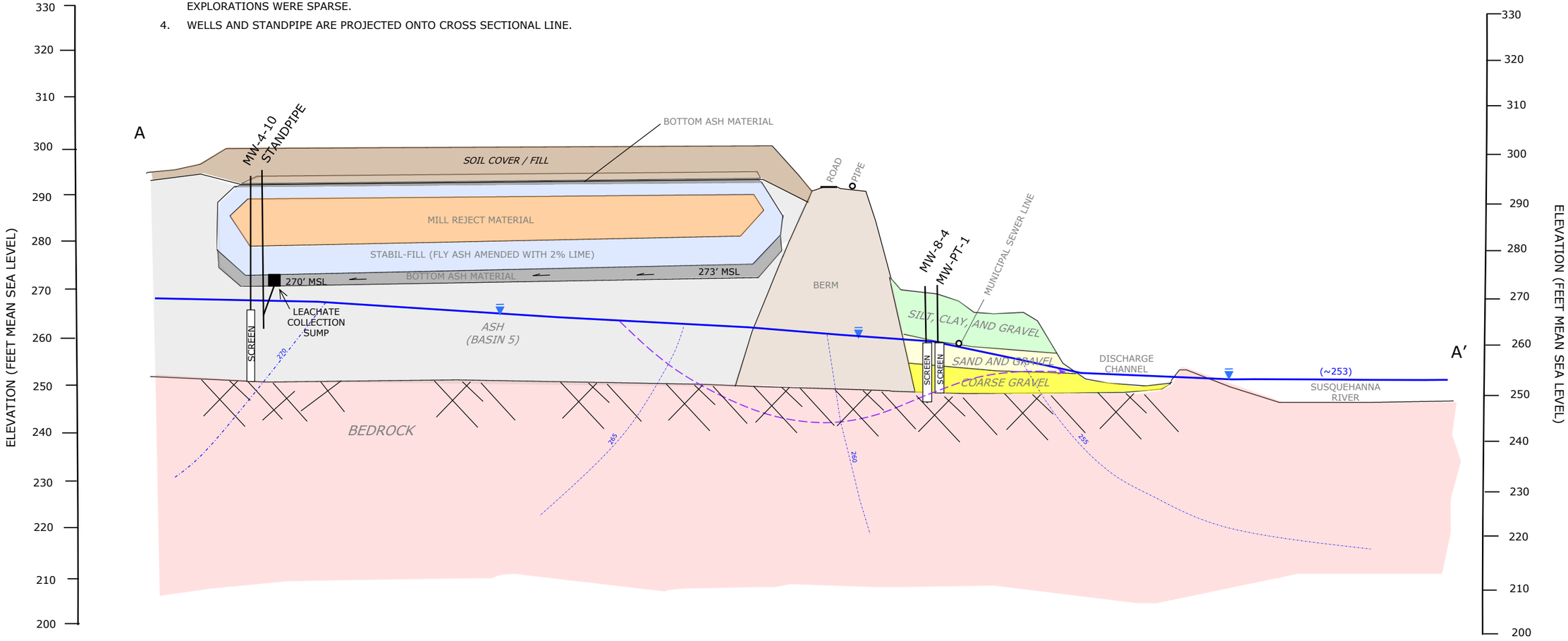
DATE 03-04-20

FIGURE NUMBER
1

NOTES

1. VERTICAL EXAGGERATION IS 5X
2. LINE OF HYDROGEOLOGIC CROSS-SECTION IS PROVIDED ON FIGURE 1.
3. CONTACTS OF GEOLOGIC UNITS ARE ESTIMATED IN SOME AREAS WHERE EXPLORATIONS WERE SPARSE.
4. WELLS AND STANDPIPE ARE PROJECTED ONTO CROSS SECTIONAL LINE.

LOOKING NORTH



APPROXIMATE SCALE (FEET)

0 100 200 400

ESTIMATED FLOW PATH BASED ON ARSENIC CONCENTRATIONS AND POTENTIOMETRIC SURFACE.

264 LINE OF EQUIPOTENTIAL (FT/MSL)

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

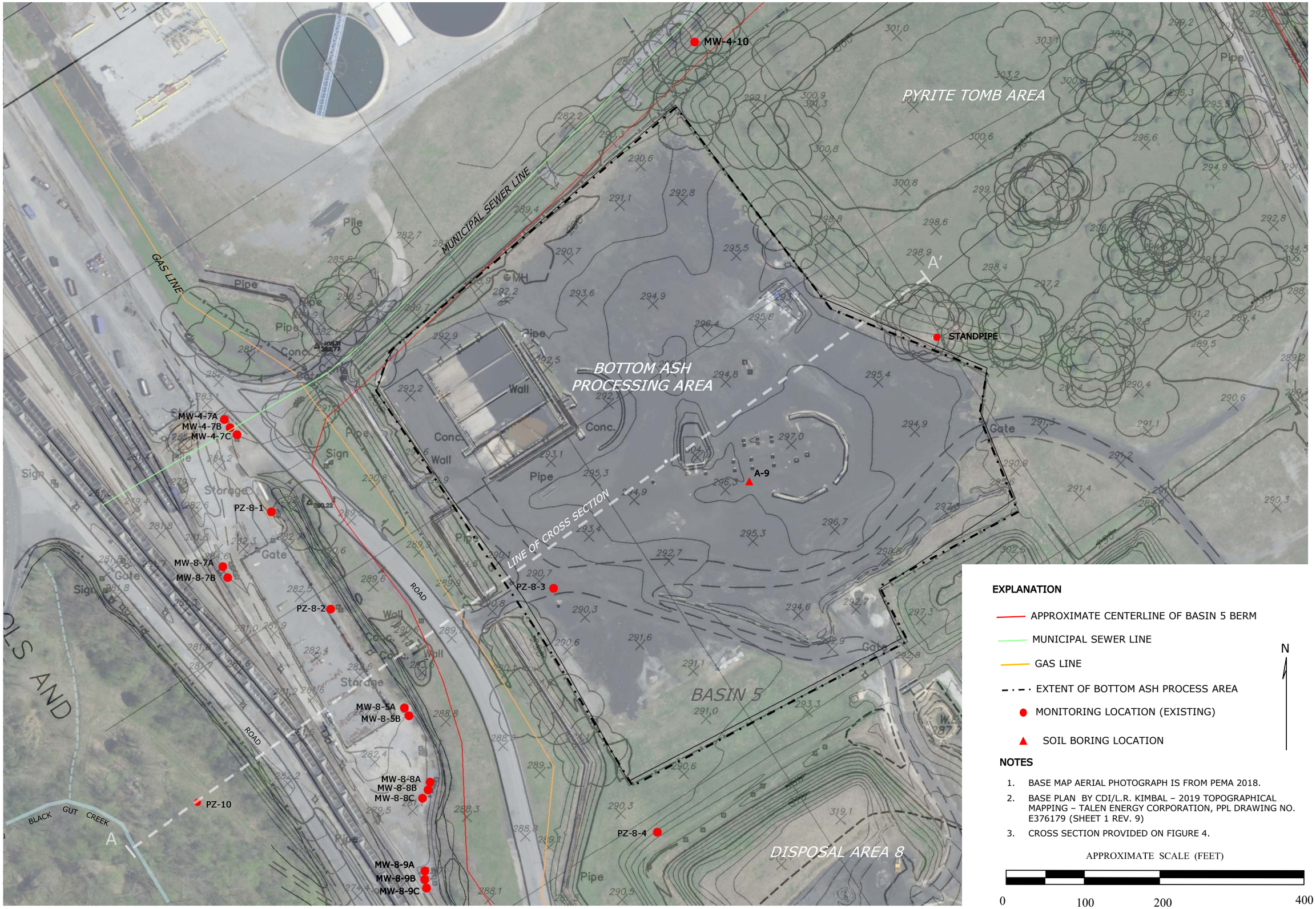
HYDROGEOLOGICAL CROSS SECTION PYRITE TOMB AREA

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB

DATE 03-04-20

FIGURE NUMBER
2



EXPLANATION

- APPROXIMATE CENTERLINE OF BASIN 5 BERM
- MUNICIPAL SEWER LINE
- GAS LINE
- EXTENT OF BOTTOM ASH PROCESS AREA
- MONITORING LOCATION (EXISTING)
- SOIL BORING LOCATION

N

NOTES

1. BASE MAP AERIAL PHOTOGRAPH IS FROM PEMA 2018.
2. BASE PLAN BY CDI/L.R. KIMBAL – 2019 TOPOGRAPHICAL MAPPING – TALEN ENERGY CORPORATION, PPL DRAWING NO. E376179 (SHEET 1 REV. 9)
3. CROSS SECTION PROVIDED ON FIGURE 4.

APPROXIMATE SCALE (FEET)

0 100 200 400

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

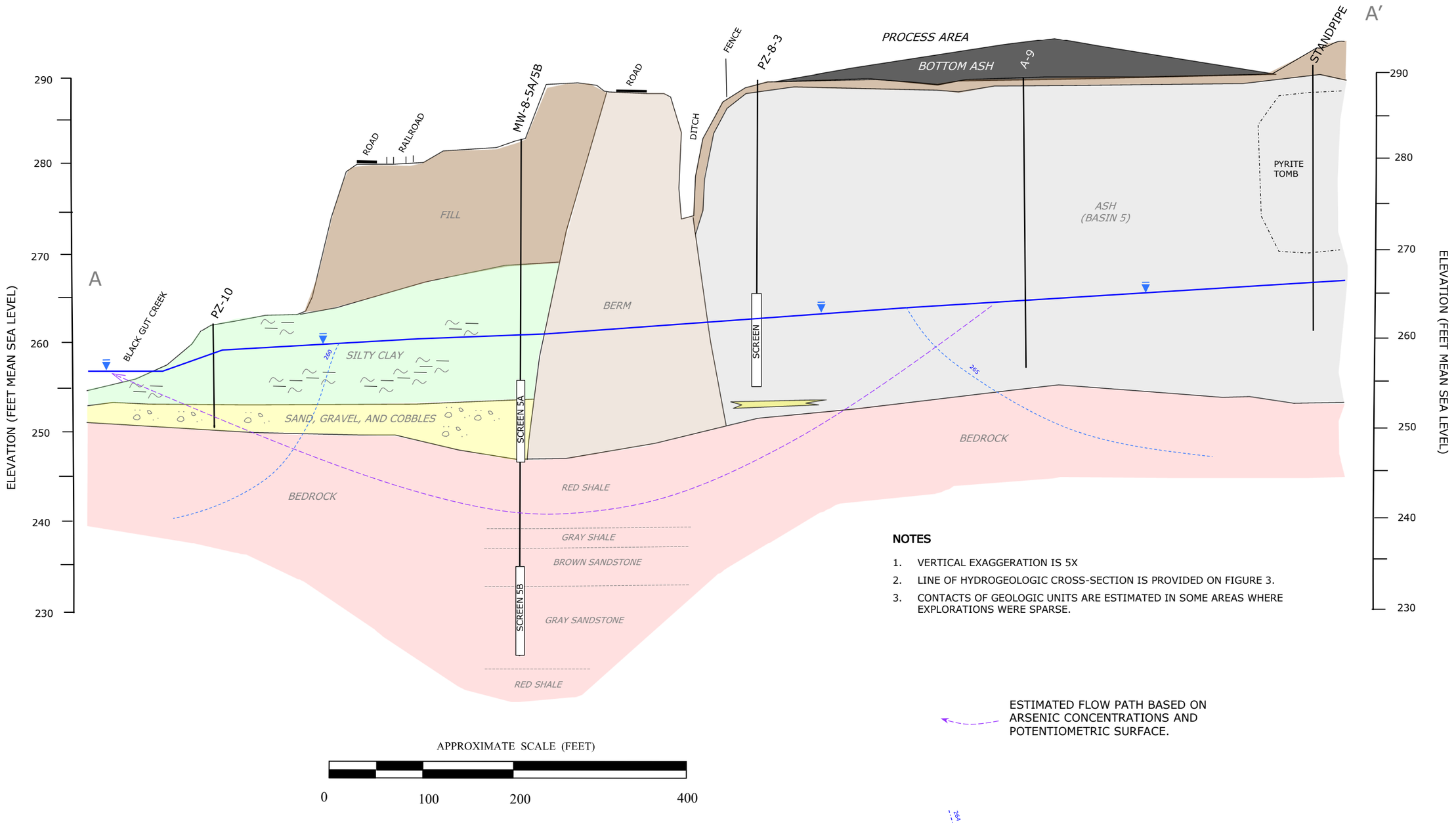
CLOSED ASH BASIN 5
BOTTOM ASH PROCESSING AREA
GENERAL LAYOUT PLAN

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY: VFB
DATE: 03-04-20

FIGURE NUMBER
3

LOOKING NORTHWEST



NOTES

1. VERTICAL EXAGGERATION IS 5X
2. LINE OF HYDROGEOLOGIC CROSS-SECTION IS PROVIDED ON FIGURE 3.
3. CONTACTS OF GEOLOGIC UNITS ARE ESTIMATED IN SOME AREAS WHERE EXPLORATIONS WERE SPARSE.

ESTIMATED FLOW PATH BASED ON ARSENIC CONCENTRATIONS AND POTENTIOMETRIC SURFACE.

LINE OF EQUIPOTENTIAL (FT/MSL)

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

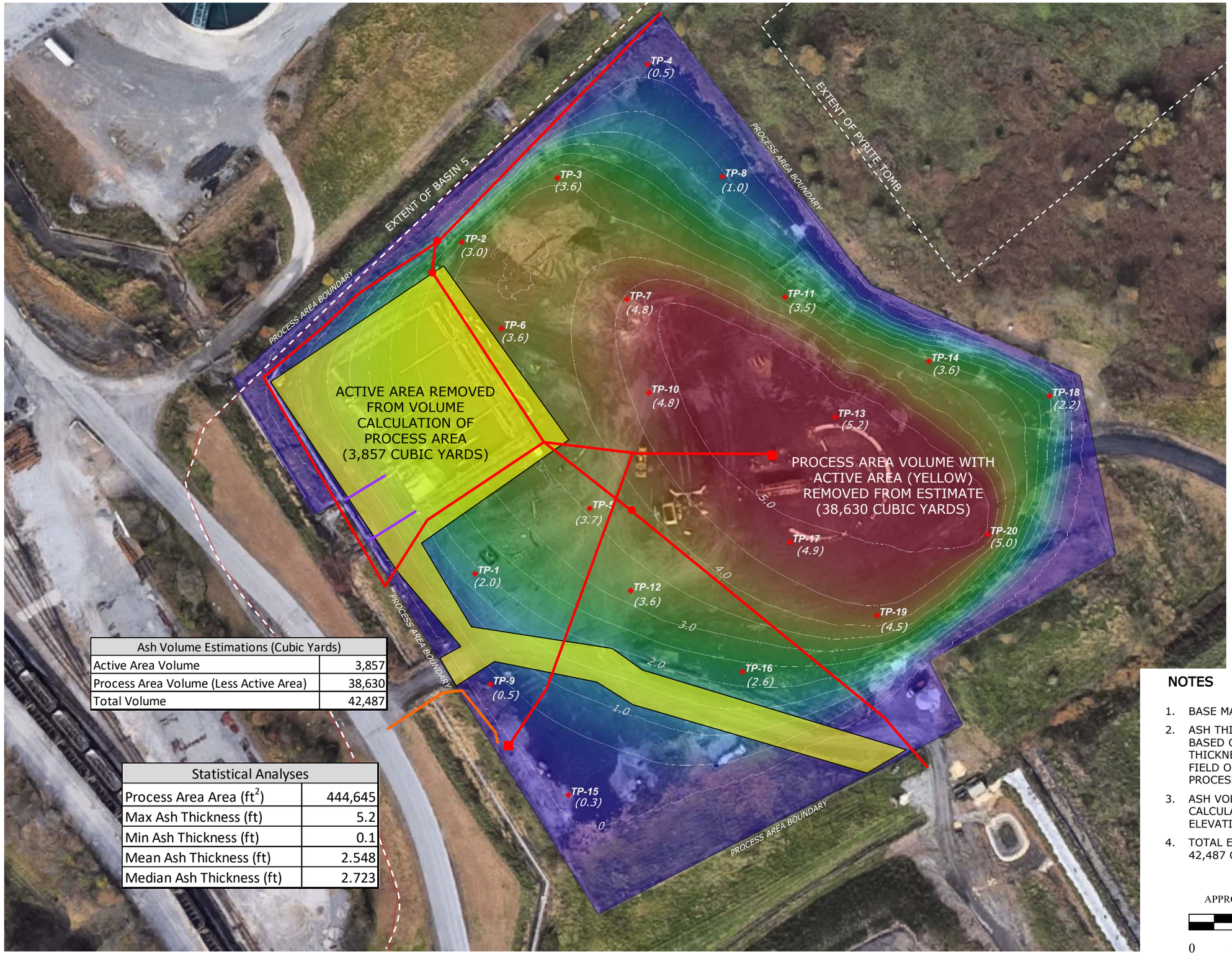
HYDROGEOLOGICAL CROSS SECTION BOTTOM ASH PROCESSING AREA

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB

DATE 03-04-20

FIGURE NUMBER
4



Ash Volume Estimations (Cubic Yards)	
Active Area Volume	3,857
Process Area Volume (Less Active Area)	38,630
Total Volume	42,487

Statistical Analyses	
Process Area Area (ft^2)	444,645
Max Ash Thickness (ft)	5.2
Min Ash Thickness (ft)	0.1
Mean Ash Thickness (ft)	2.548
Median Ash Thickness (ft)	2.723

N

ASH THICKNESS (FEET)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

EXPLANATION

- *TP-18 (2.0)* TEST PIT LOCATION, ASH THICKNESS (FEET)
- *5.0* ASH THICKNESS CONTOUR (FEET)
- ELECTRIC LINE
- COMMUNICATION LINE
- UNKNOWN LINE
- ELECTRIC JUNCTION BOX
- ELECTRIC MANHOLE

NOTES

1. BASE MAP FROM GOOGLE EARTH.
2. ASH THICKNESS CONTOURS ARE BASED ON INTERPRETATION OF ASH THICKNESS AT TEST PIT LOCATION AND FIELD OBSERVATIONS OF EDGE OF PROCESS AREA.
3. ASH VOLUME IS BASED ON COMPUTER CALCULATION BETWEEN TOPOGRAPHIC ELEVATION AND TOP OF BASIN 5.
4. TOTAL ESTIMATED ASH VOLUME IS 42,487 CUBIC YARDS.

APPROXIMATE SCALE (FEET)

0 50 100 200

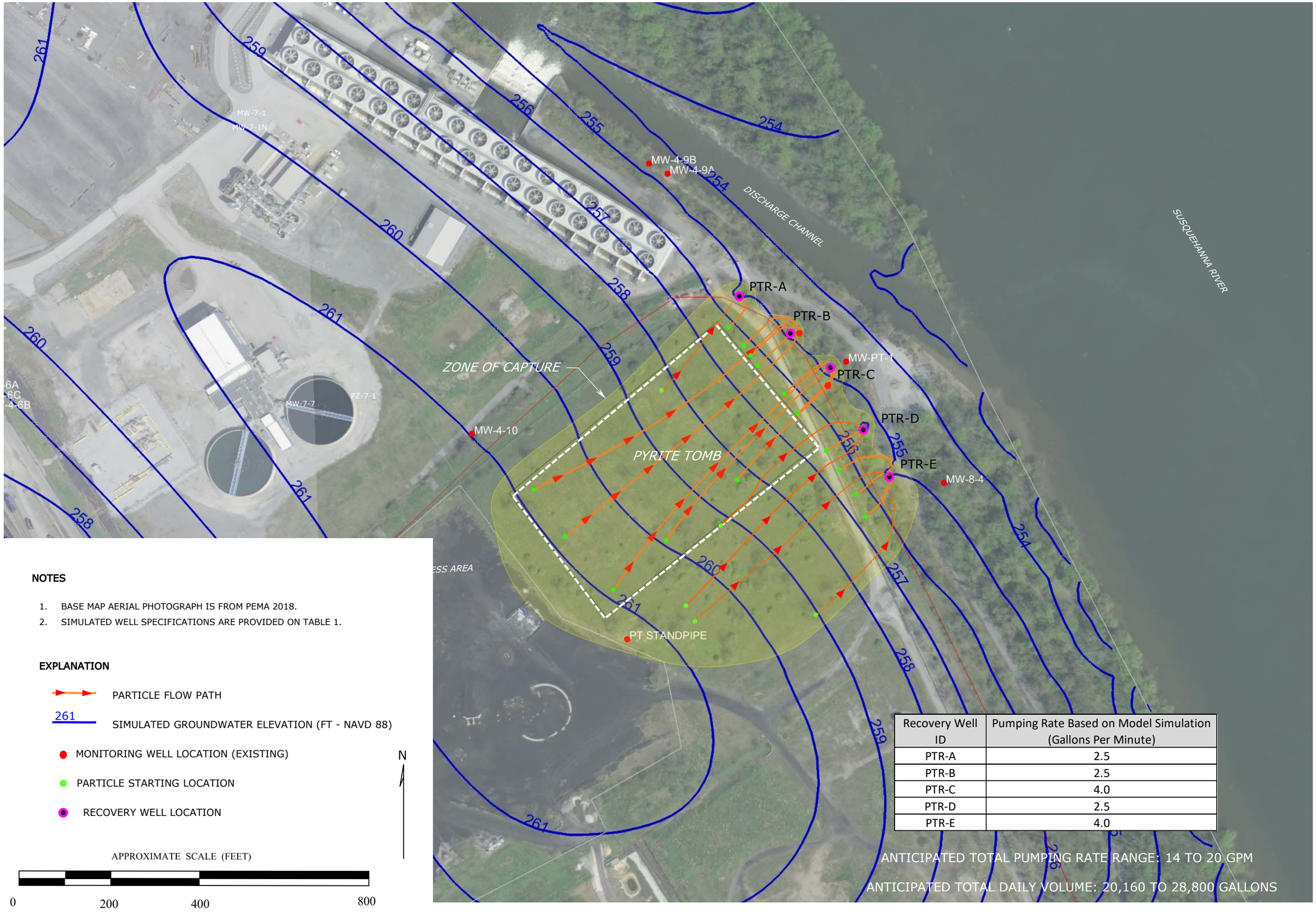
V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

BOTTOM ASH PROCESSING AREA ASH VOLUME ESTIMATION

PROJECT LOCATION
CLOSED ASH BASIN 5 WORK PLAN
BRUNNER ISLAND, LLC
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB
DATE 03-04-20

FIGURE NUMBER
5



NOTES

1. BASE MAP AERIAL PHOTOGRAPH IS FROM PEMA 2018.
2. SIMULATED WELL SPECIFICATIONS ARE PROVIDED ON TABLE 1.

EXPLANATION

- PARTICLE FLOW PATH
- 261 — SIMULATED GROUNDWATER ELEVATION (FT - NAVD 88)
- MONITORING WELL LOCATION (EXISTING)
- PARTICLE STARTING LOCATION
- RECOVERY WELL LOCATION

N

APPROXIMATE SCALE (FEET)

0 200 400 800

Recovery Well ID	Pumping Rate Based on Model Simulation (Gallons Per Minute)
PTR-A	2.5
PTR-B	2.5
PTR-C	4.0
PTR-D	2.5
PTR-E	4.0

ANTICIPATED TOTAL PUMPING RATE RANGE: 14 TO 20 GPM

ANTICIPATED TOTAL DAILY VOLUME: 20,160 TO 28,800 GALLONS

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

CLOSED ASH BASIN 5 PYRITE TOMB AREA GROUNDWATER MODEL CAPTURE ZONE

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB

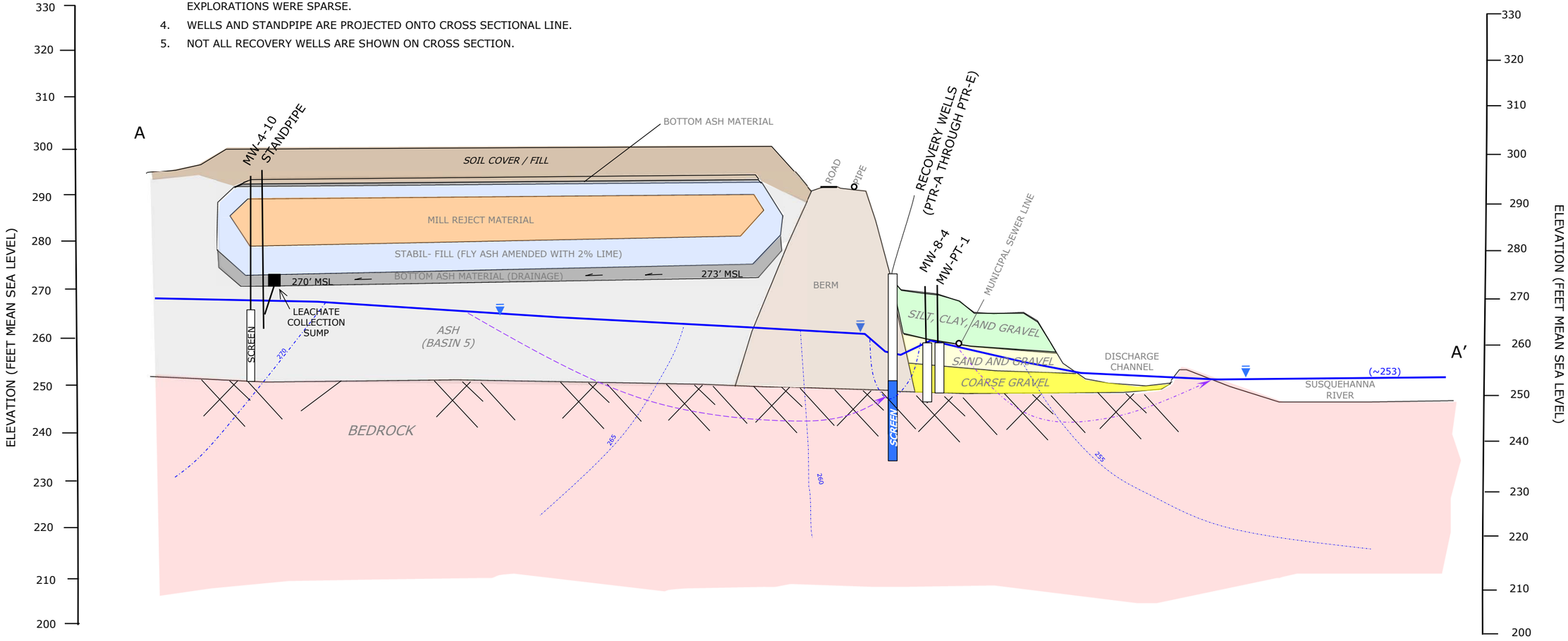
DATE 03-04-20

FIGURE NUMBER
6

NOTES

1. VERTICAL EXAGGERATION IS 5X
2. LINE OF HYDROGEOLOGIC CROSS-SECTION IS PROVIDED ON FIGURE 5.
3. CONTACTS OF GEOLOGIC UNITS ARE ESTIMATED IN SOME AREAS WHERE EXPLORATIONS WERE SPARSE.
4. WELLS AND STANDPIPE ARE PROJECTED ONTO CROSS SECTIONAL LINE.
5. NOT ALL RECOVERY WELLS ARE SHOWN ON CROSS SECTION.

LOOKING NORTH



APPROXIMATE SCALE (FEET)

0 100 200 400

ESTIMATED FLOW PATH BASED ON ARSENIC CONCENTRATIONS AND POTENTIOMETRIC SURFACE.

LINE OF EQUIPOTENTIAL (FT/MSL)

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

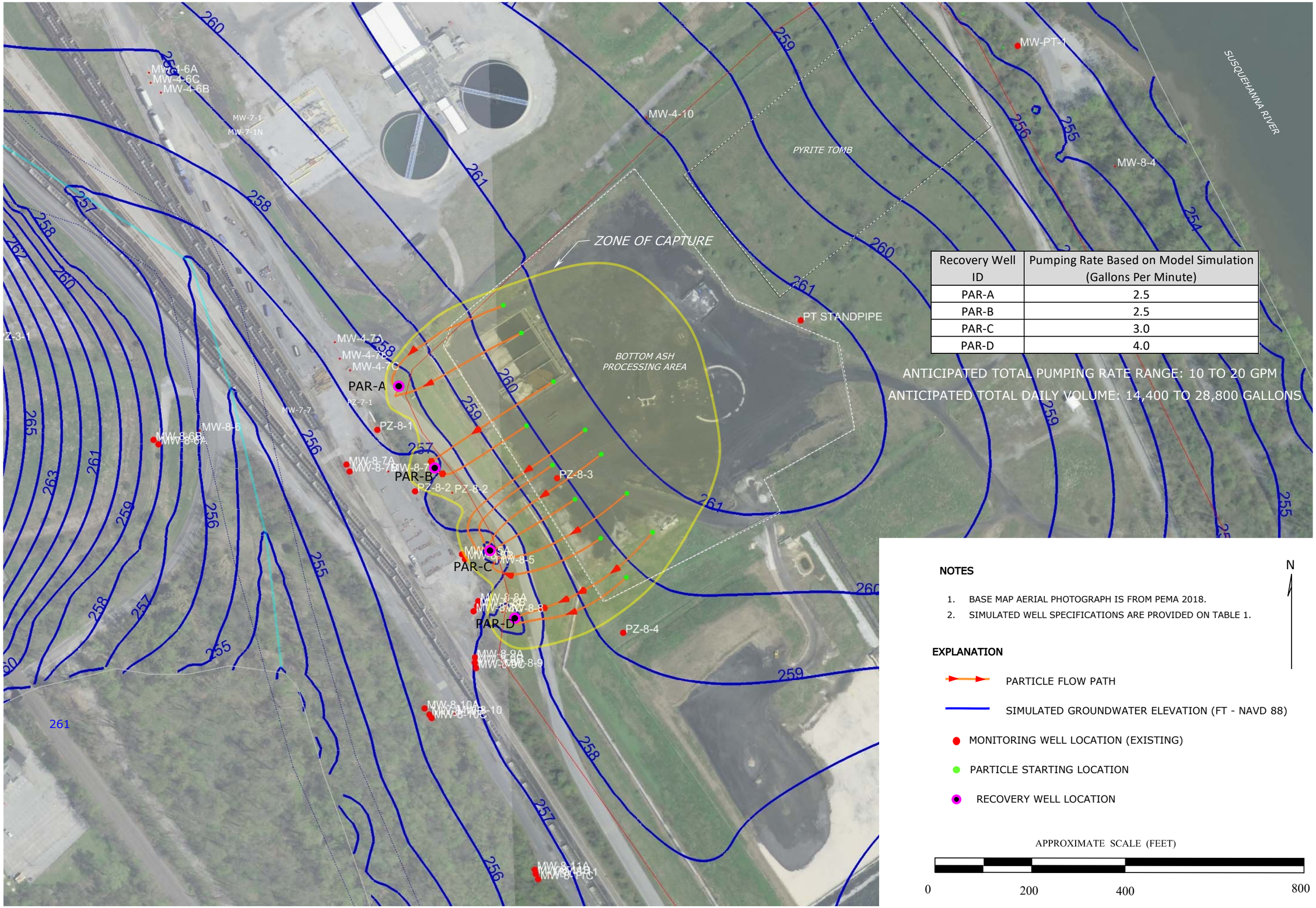
HYDROGEOLOGICAL CROSS SECTION PYRITE TOMB AREA WITH RECOVERY WELLS

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB

DATE 03-04-20

FIGURE NUMBER
7



Recovery Well ID	Pumping Rate Based on Model Simulation (Gallons Per Minute)
PAR-A	2.5
PAR-B	2.5
PAR-C	3.0
PAR-D	4.0

ANTICIPATED TOTAL PUMPING RATE RANGE: 10 TO 20 GPM

ANTICIPATED TOTAL DAILY VOLUME: 14,400 TO 28,800 GALLONS

NOTES

1. BASE MAP AERIAL PHOTOGRAPH IS FROM PEMA 2018.
2. SIMULATED WELL SPECIFICATIONS ARE PROVIDED ON TABLE 1.

EXPLANATION

- PARTICLE FLOW PATH
- SIMULATED GROUNDWATER ELEVATION (FT - NAVD 88)
- MONITORING WELL LOCATION (EXISTING)
- PARTICLE STARTING LOCATION
- RECOVERY WELL LOCATION

N

APPROXIMATE SCALE (FEET)

0 200 400 800

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

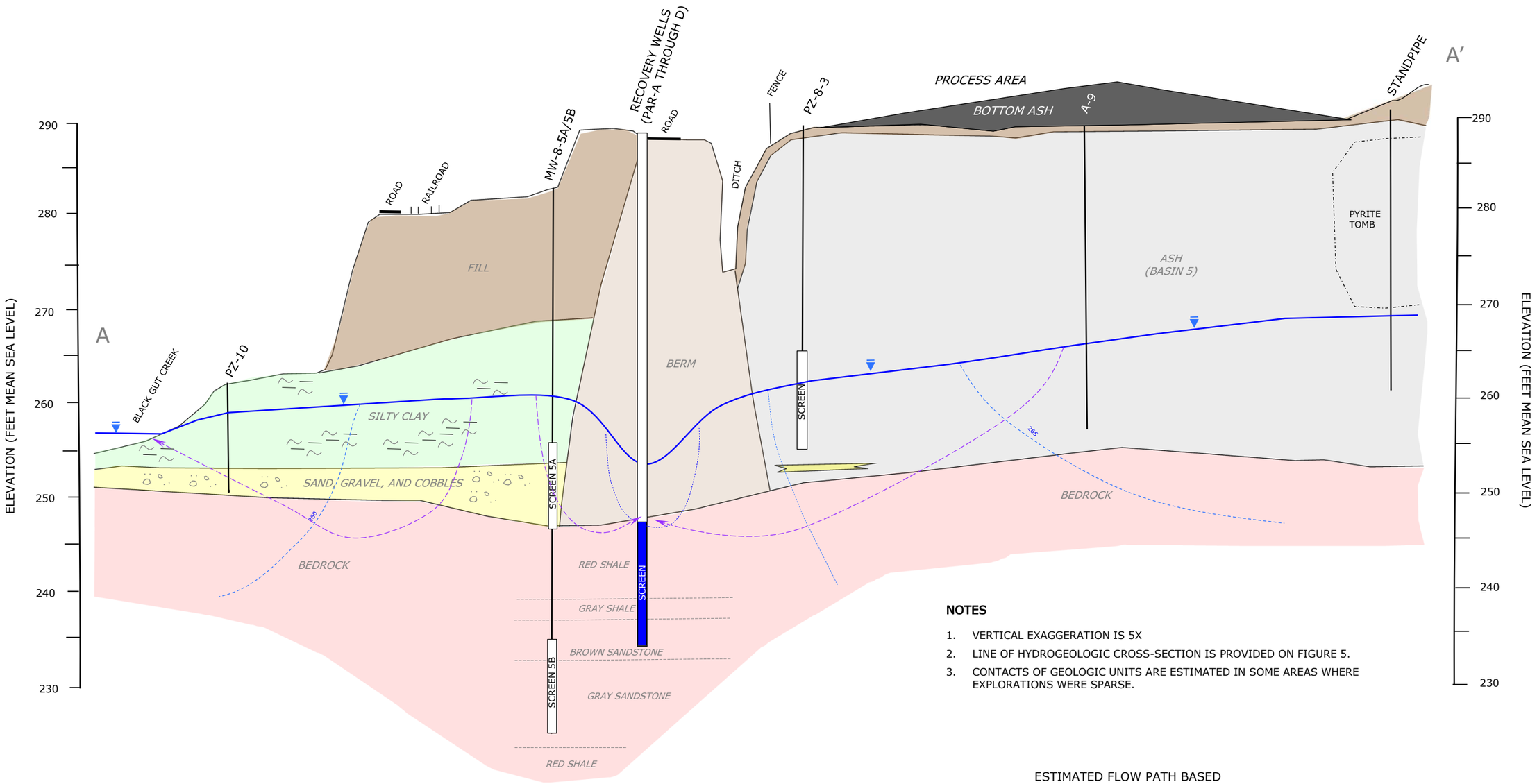
CLOSED ASH BASIN 5
BOTTOM ASH PROCESSING AREA
GROUNDWATER MODEL
CAPTURE ZONE

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB | DATE 03-04-20

FIGURE NUMBER
8

LOOKING NORTHWEST



NOTES

1. VERTICAL EXAGGERATION IS 5X
2. LINE OF HYDROGEOLOGIC CROSS-SECTION IS PROVIDED ON FIGURE 5.
3. CONTACTS OF GEOLOGIC UNITS ARE ESTIMATED IN SOME AREAS WHERE EXPLORATIONS WERE SPARSE.

APPROXIMATE SCALE (FEET)

0 100 200 400

ESTIMATED FLOW PATH BASED POTENTIOMETRIC SURFACE.

264 LINE OF EQUIPOTENTIAL (FT/MSL)

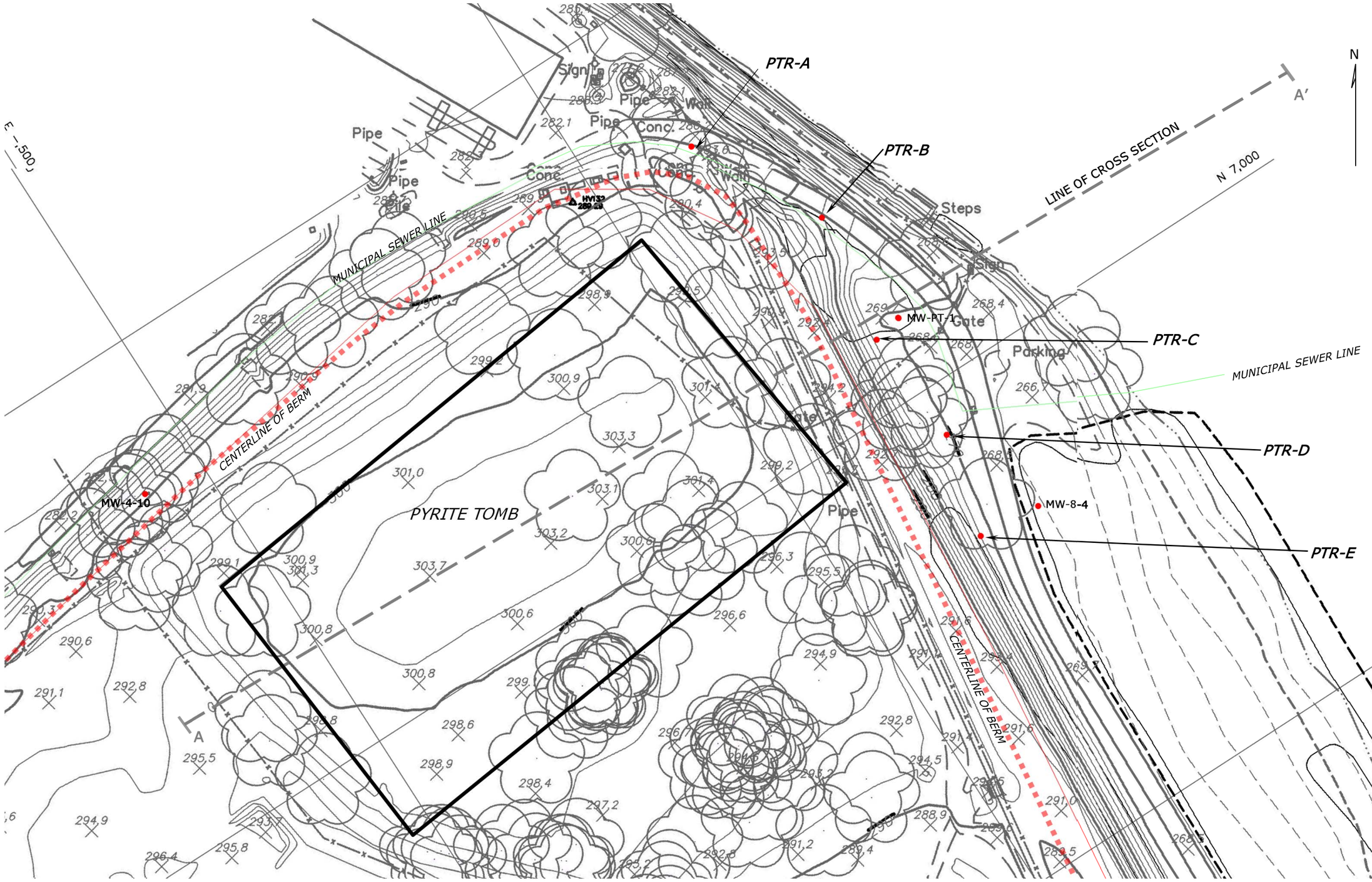
V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

HYDROGEOLOGICAL CROSS SECTION BOTTOM ASH PROCESSING AREA WITH PROPOSED RECOVERY WELLS

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB | DATE 03-04-20

FIGURE NUMBER
9



NOTES:

1. BASE PLAN BY CDI/L.R. KIMBAL – 2019 TOPOGRAPHICAL MAPPING – TALEN ENERGY CORPORATION, PPL DRAWING NO. E376179 (SHEET 1 REV. 9)
2. CROSS SECTION SHOWN ON FIGURE 4.

APPROXIMATE SCALE (FEET)

0 100 200 400

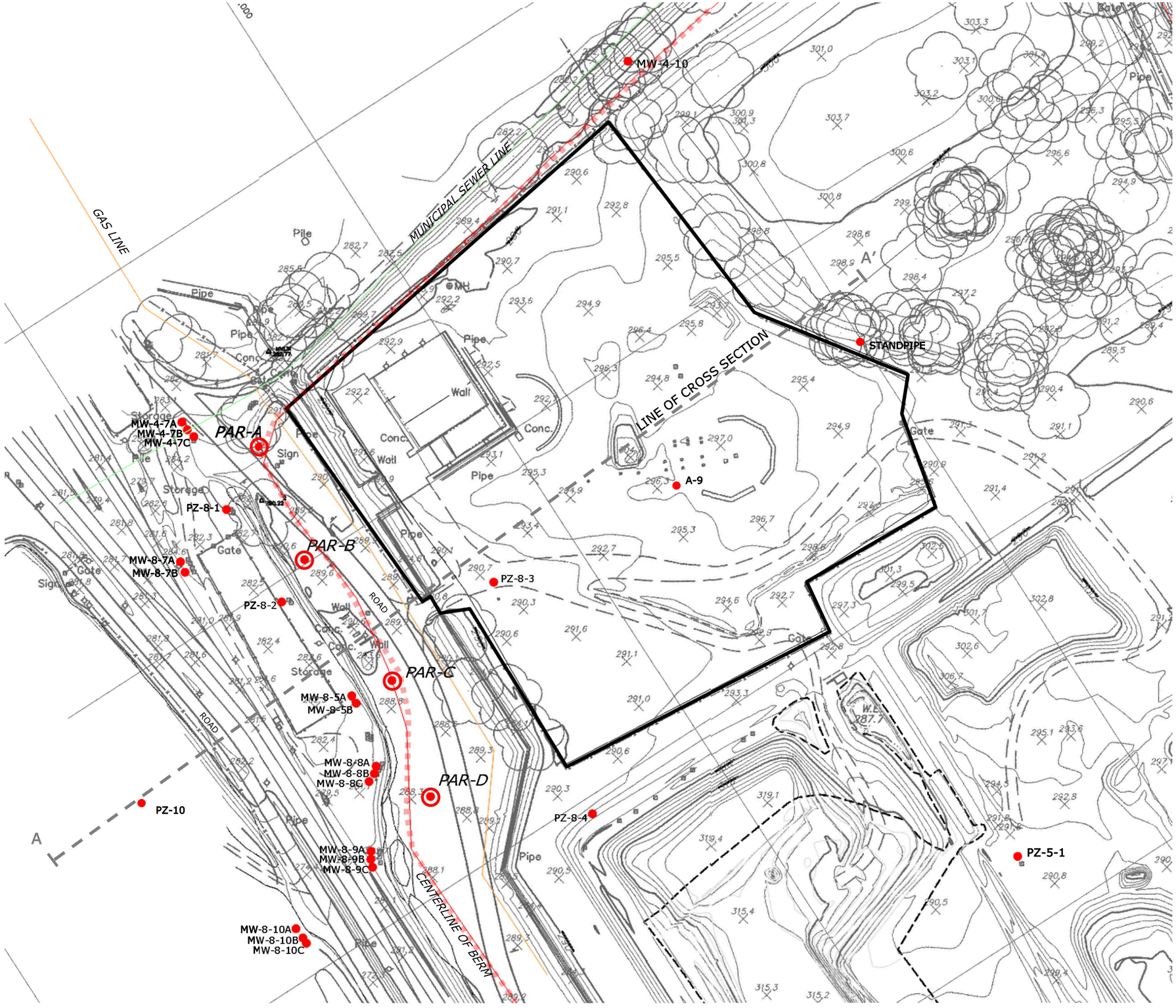
V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

CLOSED ASH BASIN 5
PYRITE TOMB AREA
PROPOSED
RECOVERY WELL LOCATIONS

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB | DATE 03-04-20

FIGURE NUMBER
10



N

NOTES:

1. BASE PLAN BY CDI/L.R. KIMBAL – 2019 TOPOGRAPHICAL MAPPING – TALEN ENERGY CORPORATION, PPL DRAWING NO. E376179 (SHEET 1 REV. 9)
2. CROSS SECTION SHOWN ON FIGURE 4.

APPROXIMATE SCALE (FEET)

0 100 200 400

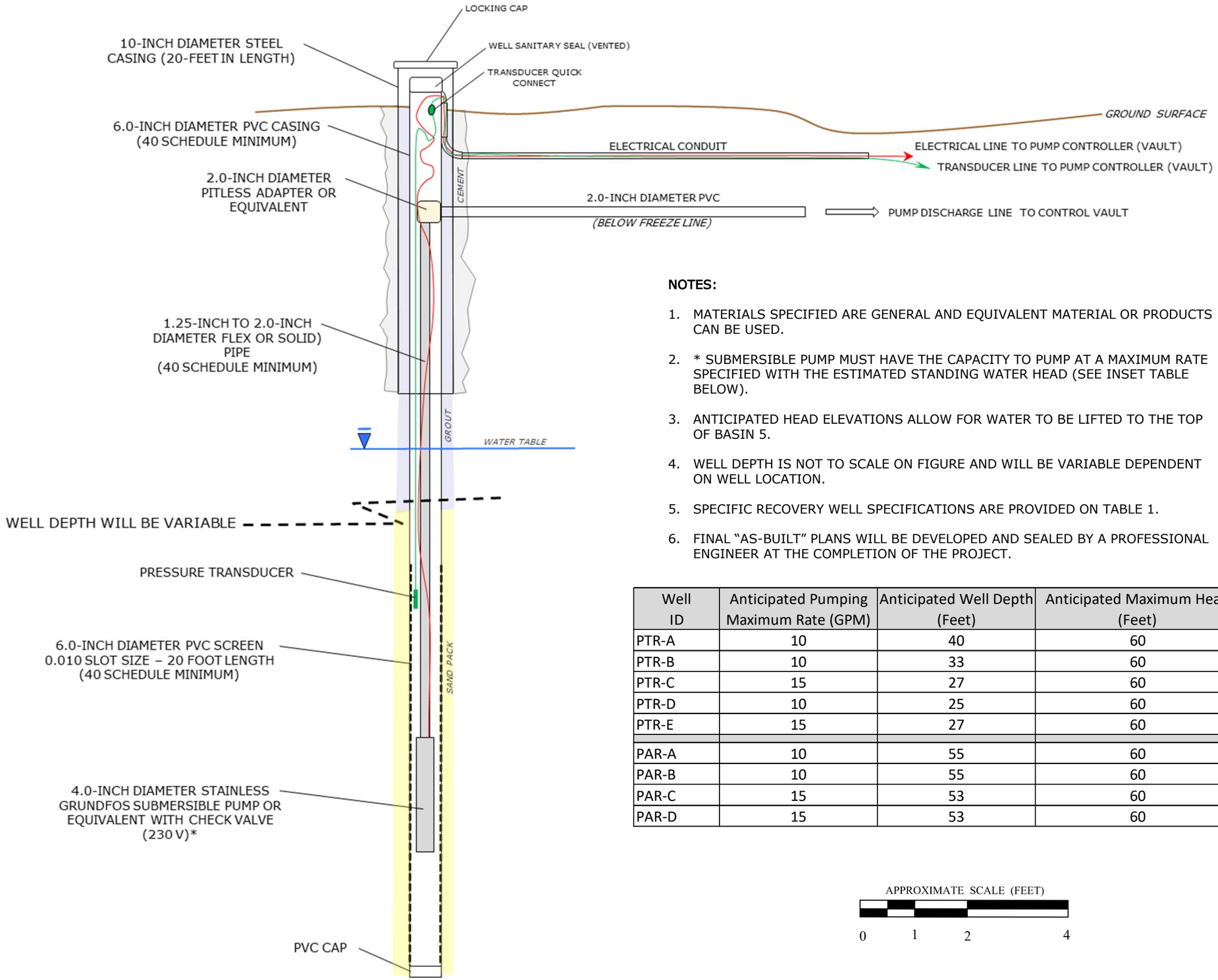
V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

CLOSED ASH BASIN 5 BOTTOM ASH PROCESSING AREA PROPOSED RECOVERY WELL LOCATIONS

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB | DATE 03-04-20

FIGURE NUMBER
11



NOTES:

1. MATERIALS SPECIFIED ARE GENERAL AND EQUIVALENT MATERIAL OR PRODUCTS CAN BE USED.
2. * SUBMERSIBLE PUMP MUST HAVE THE CAPACITY TO PUMP AT A MAXIMUM RATE SPECIFIED WITH THE ESTIMATED STANDING WATER HEAD (SEE INSET TABLE BELOW).
3. ANTICIPATED HEAD ELEVATIONS ALLOW FOR WATER TO BE LIFTED TO THE TOP OF BASIN 5.
4. WELL DEPTH IS NOT TO SCALE ON FIGURE AND WILL BE VARIABLE DEPENDENT ON WELL LOCATION.
5. SPECIFIC RECOVERY WELL SPECIFICATIONS ARE PROVIDED ON TABLE 1.
6. FINAL "AS-BUILT" PLANS WILL BE DEVELOPED AND SEALED BY A PROFESSIONAL ENGINEER AT THE COMPLETION OF THE PROJECT.

Well ID	Anticipated Pumping Maximum Rate (GPM)	Anticipated Well Depth (Feet)	Anticipated Maximum Head (Feet)
PTR-A	10	40	60
PTR-B	10	33	60
PTR-C	15	27	60
PTR-D	10	25	60
PTR-E	15	27	60
PAR-A	10	55	60
PAR-B	10	55	60
PAR-C	15	53	60
PAR-D	15	53	60

APPROXIMATE SCALE (FEET)

0 1 2 4

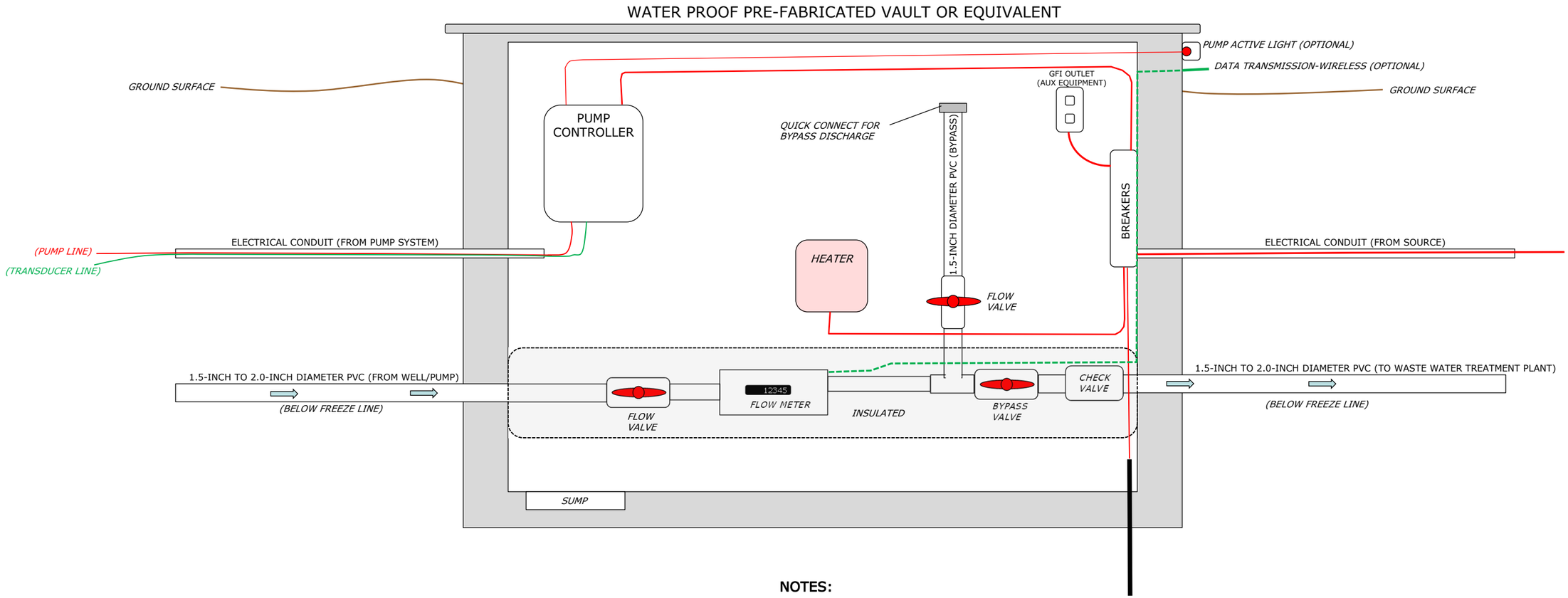
V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

RECOVERY WELL SPECIFICATIONS (PROPOSED)

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB | DATE 03-04-20

FIGURE NUMBER
12



APPROXIMATE SCALE (FEET)

0 1.0 2.0 4.0

NOTES:

1. MATERIALS SPECIFIED ARE GENERAL AND EQUIVALENT MATERIAL OR PRODUCTS CAN BE USED.
2. PUMP IS CONTROLLED BY THE TRANSDUCER AND A SPECIFIED GROUNDWATER ELEVATION THAT IS TO BE MAINTAINED FOR THE CAPTURE ZONE.
3. DEPENDENT ON FINAL LOCATION, VAULT(S) MAY EITHER BE IN-GROUND OR ABOVEGROUND.
4. OPTIONAL CONFIGURATIONS FOR RECOVERY PUMP CONTROL VAULTS EXIST; A SINGLE LARGE VAULT CONTAINING ALL FIVE PUMPS, SEVERAL GROUPS OF VAULTS CONTAINING TWO OR MORE PUMP CONTROLS, OR A SINGLE VAULT FOR EACH PUMP SYSTEM. OPTIONS WILL BE PROVIDED TO CONTRACTORS FOR BIDDING PURPOSES.
5. FIGURE PROVIDES A GENERAL CONFIGURATION OF A CONTROL SYSTEM FOR THE RECOVERY PUMP SYSTEMS. CONTRACTORS INSTALLING SYSTEM WILL BE REQUIRED TO FOLLOW ALL APPLICABLE CODES.
6. FINAL "AS-BUILT" PLANS WILL BE DEVELOPED AND SEALED BY A PROFESSIONAL ENGINEER AT THE COMPLETION OF THE PROJECT.

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

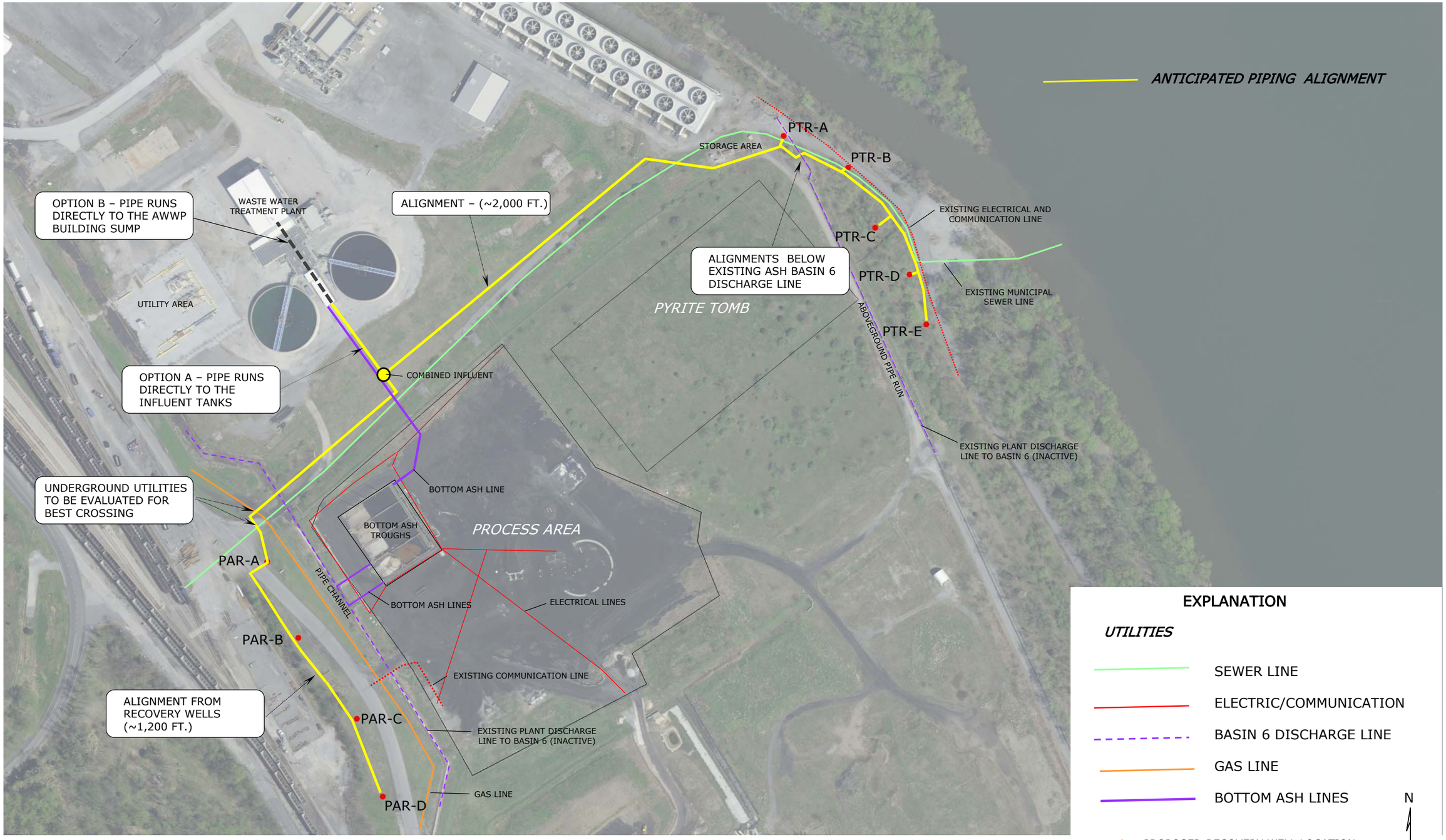
GENERAL VAULT SPECIFICATIONS RECOVERY WELL CONTROLS (PROPOSED)

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB

DATE 03-04-20

FIGURE NUMBER
13



NOTES:

1. FINAL PIPING ALIGNMENT WILL BE DETERMINED BASED ON FINAL UTILITY SURVEY AND APPROVAL FROM BRUNNER ISLAND, LLC.
2. ALL PIPING WILL BE INSTALLED AT A DEPTH TO PREVENT FREEZING AND IN ACCORDANCE TO LOCAL CODES AND REGULATIONS.
3. FIGURE BASED ON PIPING ALIGNMENT PROVIDED BY AGC/GANNET FLEMING.
4. FINAL "AS-BUILT" PLANS WILL BE DEVELOPED AND SEALED BY A PROFESSIONAL ENGINEER AT THE COMPLETION OF THE PROJECT.

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

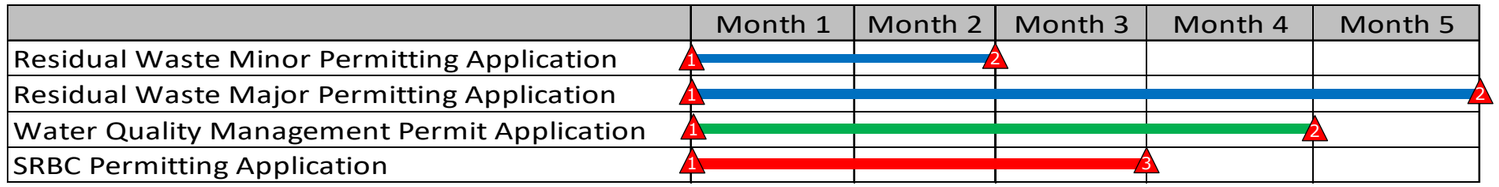
ANTICIPATED DISCHARGE PIPING ALIGNMENT (GROUNDWATER RECOVERY WELLS)

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB
DATE 03-04-20

FIGURE NUMBER
14

PERMIT APPLICATION PREPARATION AND SUBMITTAL



1 PADEP WORK PLAN APPROVAL (PERMIT SCHEDULE BEGINS UPON FORMAL APPROVAL OF THE WORK PLAN BY THE PADEP).

2 SUBMITTAL OF PERMIT APPLICATION TO PADEP.

3 SUBMITTAL OF APPLICATION TO SRBC (CONSUMPTIVE WATER USE MITIGATION).

PROJECT ACTIVITIES

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month18	Month 19
Contractor Bidding Process *	4																		
Contractor Selection																			
Contractor Lead Time																			
Health and Safety Plan																			
Utility Clearance (Final)																			
Pre-Construction Inspection																			
Well Installations																			
Pump System Installations																			
Discharge Piping																			
System Start Up																			
Site Restoration																			
Post Construction Documentation																			
Form 19R Submittal																			5

4 PADEP AND SRBC APPROVAL OF FINAL PERMIT APPLICATIONS.

5 SUBMITTAL OF FORM 19R TO PADEP.

* CONTRACTOR BIDDING PROCESS INCLUDES DEVELOPMENT OF FINAL DESIGN FOR BIDDING PURPOSES.

NOTES:

ALL SITE CONSTRUCTION ACTIVITIES ARE PRONE TO SEVERE WEATHER CONDITIONS OR SITE CONDITIONS THAT MAY DELAY THE SCHEDULE.

V. F. Britton Group, LLC
ENVIRONMENTAL AND HYDROGEOLOGIC CONSULTING
326 Conestoga Road Wayne, PA 19087
215-870-5881
val@vbritton.com www.vbritton.com

ANTICIPATED SCHEDULE
CLOSED ASH BASIN 5 ABATEMENT

PROJECT LOCATION
BRUNNER ISLAND, LLC
CLOSED ASH BASIN 5 WORK PLAN
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

DRAWN BY VFB
DATE 03-04-20

FIGURE NUMBER
15