BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of Duquesne Light Company filed Pursuant to 52 Pa. Code Chapter 57, Subchapter G, for Approval of the Siting and Construction of the 138 kV Transmission Lines Associated with the Brunot Island - Crescent Project in the City of Pittsburgh, McKees Rocks Borough, Kennedy Township, Robinson Township, Moon Township, and Crescent Township, Allegheny County, Pennsylvania.	:	A-2019-3008589
Application of Duquesne Light Company under 15 Pa.C.S. § 1511(c) for a Finding and Determination That the Service to be Furnished by the Applicant through Its Proposed Exercise of the Power of Eminent Domain to Acquire a Certain Portion of the Lands of George N. Schaefer of Moon Township, Allegheny County, Pennsylvania for the Siting and Construction of Transmission Lines Associated with the Proposed Brunot Island - Crescent Project Is Necessary or Proper for the Service, Accommodation, Convenience, or Safety of the Public.	:	A-2019-3008652

DIRECT TESTIMONY AND EXHIBITS OF MICHAEL LICHTE, P.E.

ON BEHALF OF THE
ALLEGHENY COUNTY SANITARY AUTHORITY

DECEMBER 9, 2020

ALKAZAN
STATEMENT
1

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

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DIRECT TESTIMONY OF MICHAEL LICHTE
ON BEHALF OF ALLEGHENY COUNTY SANITARY AUTHORITY

I. INTRODUCTION

Q. Please state your name and occupation.

A. My name is Michael Lichte, P.E. I am the Manager of Planning at the Allegheny County Sanitary Authority ("ALCOSAN").

Q. Please summarize your educational background and professional experience.

A. My educational background and professional experience are summarized and outlined in Exhibit A. I have over 25 years of experience in the field of civil engineering, focusing

heavily on water and wastewater projects. I have served as the Manager of Planning in the Regional Conveyance Department at ALCOSAN since 2008. The Regional Conveyance Department oversees the day to day operation of approximately 90 miles of Interceptor Sewers and over 300 Regulator Structures.

I am actively involved in the ongoing planning activities associated with the Clean Water Plan, and I oversee planning activities associated with the ACT 537 program. I also manage several interceptor repair and rehabilitation contracts. Prior to joining ALCOSAN, I served as the Director of Engineering and Construction for the Pittsburgh Water and Sewer Authority.

Q. What is your educational background?

A. I received a Bachelor's Degree in Aquatic Environments from Allegheny College in 1986 and a Master of Science in Civil Engineering from the University of Pittsburgh in 1992. I am a licensed professional Engineer in the State of Pennsylvania and a member of the American Society of Civil Engineers and the Water Environment Federation.

Q. Please state on whose behalf you are testifying.

A. I am testifying on behalf of the Allegheny County Sanitary Authority in this proceeding before the Pennsylvania Public Utility Commission ("PUC" or "Commission"). The Allegheny County Sanitary Authority is a political subdivision of the Commonwealth of Pennsylvania with administrative offices located at 3300 Preble Avenue Pittsburgh, Pennsylvania 15233. In 1946, ALCOSAN was created under Pennsylvania's Municipal Authorities Act to design, construct, and operate an interceptor system and treatment plant for residential, commercial, and industrial wastewater. ALCOSAN provides wastewater treatment services to 83 communities, including the City of Pittsburgh.

Q. What is ALCOSAN's interest in this proceeding?

A. ALCOSAN has wastewater facilities that are located along portions of Duquesne Light Company's ("Duquesne") proposed route parallel to Chartiers Creek and further downstream. ALCOSAN has existing and planned facilities in the vicinity of Duquesne's planned transmission route. Given ALCOSAN's need to protect its existing and planned facilities in order to continuously and adequately continuing providing wastewater service, ALCOSAN has a substantial interest in the outcome of this proceeding.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the factual context and events starting with the Consent Decree which ALCOSAN entered into with the United States Environmental Protection Agency ("EPA") and the adverse impact Duquesne Light Company's ("Duquesne") proposed transmission facilities may have on ALCOSAN's existing and planned wastewater facilities if the PUC approves Duquesne's amended application without modification.

As explained subsequently, whether the proposed transmission facilities will impact ALCOSAN's existing and planned wastewater facilities depends on the specific placement and design characteristics of Duquesne's final project plan. ALCOSAN seeks to collaborate with Duquesne regarding that final project plan to ensure that both organizations can continue to provide safe, adequate, and reliable service to their customers.

Q. Are you sponsoring any exhibits as part of your Direct Testimony?

A. Yes. I am sponsoring the following exhibits:

- Exhibit A (Michael Lichte, P.E., Resume and Biography)
- Exhibit B (GIS Maps Overlaying ALCOSAN's existing and planned facilities with Duquesne's existing and proposed facilities) (Contains Confidential and Critical Energy Infrastructure Information)
- Exhibit C (Preliminary Basis of Design Report, Section 1 – Executive Summary)

Q. How is the remainder of your Direct Testimony organized?

A. The remainder of my Direct Testimony is organized as follows:

- Section II – Provides the background facts regarding the Consent Decree and Modified Consent Decree which ALCOSAN entered into with the Environmental Protection Agency and Commonwealth of Pennsylvania Department of Environmental Protection ("PA DEP") ("Consent Decree").
- Section III – Provides ALCOSAN's understanding of Duquesne's proposal that led to ALCOSAN filing its Petition to Intervene in this proceeding on September 18, 2020.
- Section IV – Highlights potential overlap and concerns between Duquesne's proposed facilities and ALCOSAN's existing and planned facilities around Chartiers Creek and further downstream.
- Section V – Highlights potential overlap and concerns between Duquesne's proposed facilities and ALCOSAN's existing facilities in Sheradan Park.
- Section VI – Provides my recommendation and conclusion.

Q. Please summarize your Direct Testimony and your recommendation in this proceeding.

A. ALCOSAN does not oppose the need for the Project but is concerned that the proposed route of the Project will overlap with ALCOSAN's existing facilities and the ability of ALCOSAN to construct its future wastewater treatment facilities, with potential adverse impacts to safe and reliable operations, the health and safety of the public and the environment. The adverse impact could occur if heavy pads or other transmission equipment are placed above ALCOSAN's underground facilities or if a transmission line is placed directly over an area where ALCOSAN will be using or staging above ground equipment such as large cranes that are needed, at times, for ALCOSAN's construction or maintenance activities. If these details are not adequately coordinated between Duquesne and ALCOSAN, ALCOSAN's ability to fulfill its existing operations and obligations under the Consent Decree could be impaired. ALCOSAN has reached out to Duquesne to discuss ALCOSAN's concerns regarding the proposed route and has relayed ALCOSAN's desire to collaborate and work with Duquesne to ensure that the parties coordinate on the completion of both projects – Duquesne's proposed transmission line and ALCOSAN's planned facilities. ALCOSAN respectfully recommends that the PUC consider ALCOSAN's concerns and Consent Decree obligations in reaching a decision on Duquesne's application. As a condition of approval of Duquesne's application, ALCOSAN requests the PUC to require Duquesne to site its transmission line in a manner that does not interfere with ALCOSAN's existing wastewater facilities or ALCOSAN's planned facilities under the Consent Decree.

II. BACKGROUND ON THE CONSENT DECREE ALCOSAN ENTERED INTO WITH THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY AND PROCEDURAL HISTORY

Q. What is the background of the Consent Decree?

A. In 2019, ALCOSAN submitted its Clean Water Plan ("CWP") to Federal, State, and local regulators in response to requirements set forth in a 2008 Consent Decree. The CWP provides a comprehensive wet weather plan for reducing sewage overflows and attaining water quality (WQ) for the region that includes an Interim Wet Weather Plan ("IWWP") which serves as the basis for an affordable regional solution through 2036. Following CWP submission, ALCOSAN and the regulators filed a Modified Consent Decree on September 19, 2019. On May 14, 2020, the federal court approved a Department of Justice motion which addressed public comments, approved the Clean Water Plan, and entered the Modified CD. To satisfy the requirements of the ALCOSAN Modified Consent Decree, a Basis of Design Report ("BODR," attached hereto as Exhibit C) for the Regional Conveyance Facilities was prepared by the ALCOSAN Preliminary Planning team. The BODR further defines the proposed work for the recommended IWWP Regional Tunnel and Near Surface Conveyance Facilities, and contains design criteria, considerations, and assumptions to refine the project budget and support final design. The BODR submission also includes sections in response to the "Existing Sewer Consolidation/Conveyance System Improvement" report, which response is presented in Section 10.4 of the BODR for the Ohio River Tunnel Segment, Section 11.4 for the Allegheny River Tunnel Segment, and Section 12.4 for the Monongahela River Tunnel Segment.

Q. When did ALCOSAN begin planning the proposed facilities that may be adversely impacted by Duquesne's proposed transmission facilities, should the PUC approve Duquesne's proposal without modification?

A. ALCOSAN has been involved in evaluating and planning the improvement and redesign of ALCOSAN's wastewater facilities since the mid-2000s. ALCOSAN's work has been

ongoing since the initial Consent Decree that was signed in 2008. Among other things, ALCOSAN hired basin planners around 2007-2008. The Preliminary Planning effort for preliminary and conceptual design began in 2017, three years prior to the execution of the Modified Consent Decree. The Preliminary Planning effort (*i.e.*, outside the fence work) focused on developing a Basis of Design Report for the Regional Conveyance Tunnel system and associated consolidation sewers, shafts, regulators, and other appurtenant structures and facilities. Meanwhile, the Basis of Design for the Tunnel Dewatering Pump Station (TDPS) and other Wastewater Treatment Facilities (*i.e.*, inside the fence work) is being completed by the ALCOSAN Wastewater Treatment Plant ("WWTP") Program Manager. To support the development of the Preliminary Planning BODR, extensive alternatives and costing analysis began in 2017 which built upon the findings of the Clean Water Plan. The primary goal of the ALCOSAN Preliminary Planning project effort was to analyze, optimize, and recommend the CSO controls within the framework of the IWWP and Consent Decree in preparation for final design. The BODR further advances the proposed improvements, layouts, concepts, and recommendations summarized in previous ALCOSAN wet weather planning efforts into a 20% preliminary design. An overview map of the Proposed IWWP Regional Conveyance Facilities CSO Controls by the Preliminary Planning team is included in Figure 1-2 of Exhibit C.

III. ALCOSAN'S UNDERSTANDING OF DUQUESNE'S PROPOSAL

Q. What is your understanding of Duquesne's Proposal?

A. ALCOSAN's understanding is that Duquesne's proposed transmission line route, proposed use of its easements, and proposed exercise of the power of eminent domain could impact ALCOSAN's existing and planned wastewater facilities. ALCOSAN also understands that

the PUC's determinations in this proceeding, including approval of the proposed route in the Application, may adversely impact ALCOSAN's existing operations and obligations under a Consent Decree entered into with the EPA and PA DEP. In addition, it is ALCOSAN's understanding that 1) Duquesne's proposed new tower, transmission lines, and related constructions may have easement impacts on ALCOSAN's facilities; 2) Duquesne's proposed transmission siting route may adversely impact the construction of ALCOSAN's planned facilities and obligations in the preliminary basis of design report under the Consent Decree, and 3) Duquesne's proposed future structure locations may overlap with ALCOSAN's existing and future wastewater treatment facilities, with potential adverse impacts to safe and reliable operations, the health and safety of the public and the environment, and ALCOSAN's obligations under the Consent Decree.

Q. Have Duquesne and ALCOSAN both finalized their engineering plans for the projects and determined the exact location of their future facilities?

A. No. Because the exact placement of Duquesne's future facilities and ALCOSAN's future facilities has not been completely finalized, ALCOSAN is highly concerned that the final plans for both ALCOSAN and Duquesne could overlap, especially in light of certain easements and the ability of Duquesne to exercise eminent domain. Specifically, ALCOSAN is concerned that Duquesne could site its transmission lines and pads on ground that is directly above existing wastewater pipes and facilities. Additionally, because ALCOSAN's construction equipment will need a certain level of clearance, ALCOSAN is concerned that the transmission lines could impede the ability of ALCOSAN to use construction equipment to construct its planned facilities.

Q. How do you understand Duquesne's Proposal will likely impact ALCOSAN's existing and planned facilities?

A. The location of the Duquesne's proposed facilities may impact Tunnel and Shaft Construction and ALCOSAN's planned facilities at Crivelli (near Parcel 43-L-130) near Chartiers Creek and the intersection of Chartiers Avenue and West Carson Street. The location of Duquesne's proposed facilities may also impact, limit the access and maintenance to existing facilities in Sheraden Park (through Parcel 43-P-1-0-1). Facilities are shown as being constructed overtop of the ALCOSAN Interceptor Sewer.

Q. Outside of this PUC proceeding, has ALCOSAN reached out to Duquesne to express ALCOSAN's concerns? Please explain.

A. Yes. ALCOSAN contacted the engineering team at Duquesne to express ALCOSAN's concerns, particularly as it relates to the Consent Decree and ALCOSAN's existing and planned wastewater facilities and infrastructure. ALCOSAN has shared documents with Duquesne and requested documents and engineering plans and drawings from Duquesne to enable both parties to understand the extent of overlap of planned facilities and the possible actions that may be taken to mitigate or avoid such overlaps in the interest of public health and safety. Duquesne has provided some information to ALCOSAN outside the PUC discovery process and Duquesne has served responses and requested documents to ALCOSAN's discovery requests in the PUC proceeding.

Q. Does ALCOSAN desire to work with Duquesne to ensure both ALCOSAN and Duquesne can complete their respective projects?

A. Yes. ALCOSAN desires to maintain an ongoing dialogue and collaborative relationship with Duquesne to ensure completion of both projects.

IV. POSSIBLE OVERLAP BETWEEN DUQUESNE'S PROPOSED FACILITIES AND ALCOSAN'S EXISTING AND PLANNED FACILITIES AROUND CHARTIERS CREEK.

Q. Where is there possible overlap between Duquesne's proposed facilities and ALCOSAN's existing and planned facilities?

A. The location of the Duquesne's proposed facilities may impact Tunnel Boring Machine Construction and ALCOSAN's planned facilities at Parcels 43-L-130 and Parcel 43-L-150 near Chartiers Creek and the intersection of Chartiers Avenue and West Carson Street.

Q. Please explain ALCOSAN's proposed Tunnel Boring Machine Construction.

A. ALCOSAN's BODR includes the Ohio River Tunnel (ORT) preliminary design which is based on an 18-foot diameter tunnel that is approximately 24,180 lineal feet or 4.6 miles long. The length of the Chartiers Creek (CC) river crossing is approximately 4,500 lineal feet, and Saw Mill Run (SMR) river crossing is approximately 1,590 lineal feet. The Saw Mill Run Tunnel (SMRT) and Chartiers Creek Tunnel (CCT) are both 14-foot-diameter tunnels. Figure 1-4 of Exhibit C displays the proposed facilities for the ORT segment. A proposed 8-foot-diameter dewatering tunnel is 907 lineal feet and conveys flow from the ORT-O27-DS drop shaft to the dewatering pump station located at the ALCOSAN Wastewater Treatment Plant. A 34-foot diameter work shaft at ORT-O27-DS will need to be constructed to a depth of 154.8 feet. This shaft will be constructed to facilitate connections to the existing system as well as to remove the TBM at the end of Tunnel construction. Constructing this shaft will require the use of cranes and other heavy equipment to support excavation and mining. Following TBM removal, the shaft will be re-purposed as a drop shaft to facilitate wet weather conveyance of flows to the Wastewater Treatment Plant for ultimate treatment and disposal.

Q. How exactly could Duquesne's proposed facilities overlap with ALCOSAN's proposed Tunnel Boring Machine Construction?

A. Huge cranes will be necessary for excavation and removal of rock. ALCOSAN needs to ensure that its cranes during the construction phase have sufficient clearance to operate.

Q. Does ALCOSAN own any property in this vicinity?

A. Yes, ALCOSAN has had longstanding, historical easements in this vicinity, including a Right-of-Way grant from the 1955 that grants ALCOSAN a perpetual right of way for sewer pipelines and necessary connections and appurtenances. ALCOSAN has also been in the process of acquiring two parcels owned by Crivelli Limited Partnerships (Parcels 43-L-130 and Parcel 43-L-150) near Chartiers Creek and the intersection of Chartiers Avenue and West Carson Street. Closing on the sale of the property from Crivelli to ALCOSAN occurred on November 30, 2020. Recently, ALCOSAN learned of easements on the Crivelli property that were recently acquired by Duquesne in October 2020. ALCOSAN is in the process of reviewing those easements to evaluate the impact of those easements on ALCOSAN's planned facilities. ALCOSAN needs to ensure that its cranes during the construction phase have sufficient clearance (from the transmission lines) to operate. The ability of ALCOSAN to carry out its construction depends on the exact siting of Duquesne's transmission lines within its easement. ALCOSAN believes that both Duquesne and ALCOSAN could cooperate and coexist in the same space; however, the ability to do so depends on the exact siting of Duquesne's transmission lines.

Q. Have Duquesne and ALCOSAN discussed the possible overlapping facilities?

A. Yes. Some limited and very preliminary discussion has occurred.

V. POSSIBLE OVERLAP BETWEEN DUQUESNE'S PROPOSED FACILITIES AND ALCOSAN'S EXISTING FACILITIES AT SHERADAN PARK.

Q. Beyond Chartiers Creek, is there any other possible overlap of facilities?

A. Yes, near Sheraden Park (Parcel 43-P-1-0-1, which is land and property owned by ALCOSAN). Facilities are shown as being constructed overtop of ALCOSAN's existing Chartiers Creek Interceptor in Sheraden Park.

Q. Does ALCOSAN have existing sewer lines and facilities in Sheradan Park in Pittsburgh?

A. Yes. ALCOSAN's existing Chartiers Creek Interceptor Sewer flows through Parcel 43-P-1-0-1, which is owned by ALCOSAN.

Q. What are Interceptor Sewer flows?

A. An Interceptor Sewer is a major sewer conveyance line that intercepts flow from municipal trunk lines and transports the sewage to the Wastewater Treatment Facility for treatment.

Q. Is Duquesne proposing transmission facilities in the vicinity of ALCOSAN's existing sewer lines in Sheradan Park?

A. Yes. It is my understanding that Duquesne may be proposing to locate certain transmission lines and pads over or near ALCOSAN's existing sewer lines in Sheradan Park.

Q. What are your concerns with Duquesne's proposed facilities in Sheraden Park?

A. ALCOSAN is concerned about ongoing access for operation, cleaning, bypass pumping, and maintenance. ALCOSAN is also concerned about the proposed foundations and pads potentially being placed near or on top of existing interceptor facilities. Without detailed

drawings of foundations or pads, ALCOSAN is concerned that the sewer may be point loaded or undergo settlement due to dead and live loads that are currently not defined. In other words, ALCOSAN has not seen any detailed foundation plans from Duquesne and ALCOSAN has structural concerns with the proposed use of foundations or pads.

Q. Have Duquesne and ALCOSAN discussed the possible overlapping facilities?

A. Yes.

Q. How have Duquesne and ALCOSAN agreed to address these overlaps?

A. Some limited and preliminary discussions have occurred.

VI. RECOMMENDATION

Q. In your opinion, how should the PUC address ALCOSAN's concerns?

A. As discussed earlier, ALCOSAN does not oppose the need for Duquesne's project. As a municipal utility, ALCOSAN understands the importance of providing safe and reliable service to its customers. ALCOSAN also understands the need for a utility to upgrade its facilities. At this time, ALCOSAN does not believe that the general transmission siting route proposed by Duquesne needs to be altered. However, ALCOSAN's review of Duquesne's most recent plans indicate that Duquesne's proposal could overlap and interfere with ALCOSAN's existing and planned facilities near Chartiers Creek as well as ALCOSAN's facilities in Sheradan Park. Therefore, as a condition of the PUC's approval of Duquesne's amended application, ALCOSAN requests the PUC to require Duquesne to site its transmission line in a manner that does not interfere with ALCOSAN's existing wastewater facilities or ALCOSAN's planned facilities under the Modified Consent Decree and Preliminary Basis of Design Report (Exhibit C).

Q. Does this conclude your testimony?

A. Yes. However, I reserve the right to amend or update my testimony should new information become available in this proceeding.

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EXHIBITS
OF
MICHAEL LICHTE

ON BEHALF OF THE
ALLEGHENY COUNTY SANITARY AUTHORITY

DECEMBER 9, 2020

Exhibit A

Docket Nos. A-2019-3008589 and A-2019-3008652

alcosan allegheny county sanitary authority ™

BIOGRAPHY

Michael Lichte, P.E.
Manager of Planning

Mike Lichte, has been in his current position as Manager of Planning in the Regional Conveyance Department at ALCOSAN since 2008. The Regional Conveyance Department oversees the day to day operation of approximately 90 miles of Interceptor Sewers and over 300 Regulator Structures.

Mike's efforts include the current, on-going planning activities associated with the regional wet weather control plan. In addition, Mike oversees planning activities associated with the ACT 537 program and manages several interceptor repair and rehabilitation contracts.

Mike has over 25 years of experience in water and wastewater projects. In his former position with the Pittsburgh Water and Sewer Authority, Mike was the Director of Engineering and Construction.

Mike received a Bachelor's Degree in Aquatic Environments from Allegheny College in 1986 and a Master of Science in Civil Engineering from the University of Pittsburgh in 1992. Mike is a licensed professional Engineer in the State of Pennsylvania and a member of the American Society of Civil Engineers and the Water Environment Federation.

Resume

Michael Lichte, P.E., M.ASCE
4119 Gladstone Street, Pittsburgh, PA 15207

EDUCATION

- M.S. in Civil Engineering, 1990-1992, University of Pittsburgh, Pittsburgh, PA
- B.S. in Aquatic Environments, 1982-1986, Allegheny College, Meadville, PA

EMPLOYMENT

Manager of Planning, 2008 to 2019, Allegheny County Sanitary Authority (ALCOSAN)

Managed Preliminary Planning Consultant tasked with developing Basis of Design documents for the ALCOSAN Clean Water Plan. Management of three Basin Planning consultants whose task was to develop a planning level model and conduct alternatives analysis for the Clean Water Plan. Managed the Authority's Chapter 94 Planning Module Review Program. Prepared and managed numerous contracts for over 30 flap gate replacements. Cured in Place Pipe Lining of over four miles of Saw Mill Run Interceptor. Replacement of the PLC and Level control panels at five sewage Pump Stations.

Director of Engineering and Construction, 2005-2008, Pittsburgh Water and Sewer Authority (PWSA)

Managed a $50 million capital program and the distribution of funds to individual capital projects. Managed a Department of 18 engineers, managers and administrative support staff.

Acting Executive Director, 2007 to 2008, Pittsburgh Water and Sewer Authority (PWSA)

On an interim basis, directed operations of the PWSA for the City of Pittsburgh. Management of a system of 83,000 customer accounts with revenues exceeding $120 million. Coordinated and participated with the Authority Board and Mayors Office on water and sewer issues facing the City. Oversaw day to day operations and customer service as well as ongoing O&M and capital projects. Oversaw budgeting for ongoing operations as well as bond issuance for capital projects. Negotiated bulk water and sewer rates with customer municipalities. Prepared for and conducted Board meetings for the Pittsburgh Water and Sewer Authority.

Senior Project Management Engineer, 2005, Pittsburgh Water and Sewer Authority (PWSA)

Managed a variety of capital projects for the PWSA. Participated with local development agencies such as the Urban Redevelopment Authority, and the Sports and Exhibition Authority on joint capital construction projects. Managed engineering consultant budgets, developed capital contracts and monitored project schedules.

Environmental Compliance Coordinator, 1999-2004, Pittsburgh Water and Sewer Authority (PWSA)

Prepared an NPDES Permit for the City of Pittsburgh Water Treatment Plant. Participated in Consent Order and Agreement Negotiations on behalf of the City of Pittsburgh and PWSA concerning Combined and Sanitary Sewage Overflows. Managed capital projects for the PWSA including the Nine Mile Run Trunk Sewer rehabilitation (Open trenching and CIPP) and Streets Run Trunk Sewer Rehabilitation

(CIPP). Repair and Gunite of a 120 inch Sewer underneath PNC Park. Managed Nine Mile Run CSO and Sewer Improvement Study.

Environmental Health Engineer, 1996-1999, Allegheny County Health Department (ACHD)

Performed regulatory oversight of drinking water, wastewater and solid waste facilities within Allegheny County. Performed routine treatment plant and facility inspections. Review of Chapter 94 Wasteload Management Reports, Act 537 Facility Plans and Corrective Action Plans (CAPs).

Project Engineer, 1996, Advanced Technology Systems (ATS), Monroeville, PA

Project Engineer, 1994-1995, Universal Systems & Technology, Inc., Fairfax, VA

Hydrologist 1993-1994, U.S. Geological Survey, Water Resources Division, Harrisburg, PA

Research Assistant 1990-1992, University of Pittsburgh, School of Engineering, Pittsburgh, PA

Hydrologic Technician 1987-1990, U.S. Geological Survey, Water Resources Division, Pittsburgh, PA

Biological Aide 1986-1987, U.S. Army Corp of Engineers, Pittsburgh District, Warren, PA

Professional Achievements: Licensed Professional Engineer in the Commonwealth of Pennsylvania

Memberships: American Society of Civil Engineers (ASCE), Water Environment Federation (WEF)

Publications/Proceedings

- An Integrated Asset Management Platform to Support Sewer Regionalization in Allegheny County, Pennsylvania; Michael Lichte, P.E., ALCOSAN, Andrew Burton, AECOM; WEFTEC October 2017.
- The City of Pittsburgh's Largest Asset Management Initiative and Condition Assessment Program Ever. M. Lichte, R. Rudolph, Hazen and Sawyer; B. Hutton, J. Stoss, Pittsburgh Water and Sewer Authority Water Environment Federation (WEF) Collection Systems 2008 Conference Proceedings
- Development of Manhole and Catch Basin Inlet Condition Assessment Criteria for the City of Pittsburgh's Collection System, Roy S. Rudolph, Hazen and Sawyer, P.C.; Lauren E. Terpak, Metcalf & Eddy, Inc.; Robert Hutton, Michael D. Lichte, Pittsburgh Water and Sewer Authority, Water Environment Federation WEF Collection Systems 2008 Conference Proceedings
- Quality Control and Assessment of the Calibration of a Model of the City of Pittsburgh Sewer System. J. M. Maslanik, Chester Engineers; M. D. Lichte, B. M. Body, R. Pinheiro Water Environment Federation, WEF Collection Systems 2008 Conference Proceedings

Exhibit B

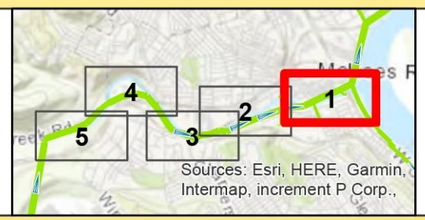
PUBLIC VERSION

Document Path: U:\Rep\Conveyt\GIS\2021\WcMapWorkingMaps\DLC_CrescentTransmissionLine_DLC_11x17_01082021.mxd Map generated in ArcGIS 10.7.0 for general ALCOSAN reference use only. 08/26/2020 A.K.

alcosan
allegheny county sanitary authority

DLC Notice of Filing Brunot Island with DLC Crescent Transmission Line

Page 1



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1 inch = 200 feet

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Feet

- DLC ENS Area
- DLC Transmission Mains
- Existing Access Shaft
- Existing Regulator
- Existing Manhole
- Existing Outfall
- Proposed Drop Shaft
- Proposed Ohio River Tunnel Alignment
- Proposed Consolidation Sewer
- Proposed Tunnel Adit
- ALCOSAN Sewers
- Existing Municipal Sewers

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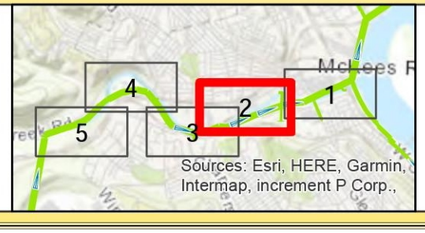
DLC Notice of Filing Brunot Island with DLC Crescent Transmission Line

Page 2



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DLC Notice of Filing Brunot Island with DLC Crescent Transmission Line

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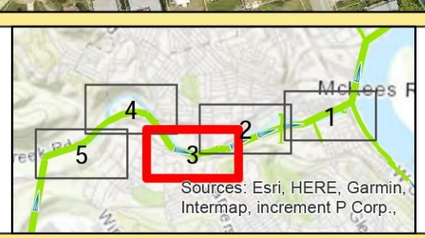

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DLC Notice of Filing Brunot Island with DLC Crescent Transmission Line

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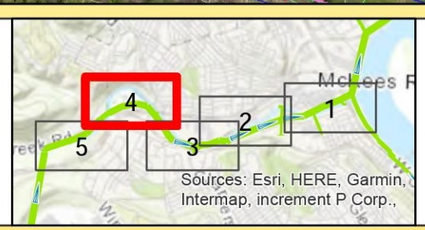

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1 inch = 200 feet

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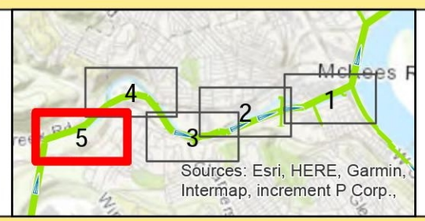
Feet

- DLC ENS Area
- DLC Transmission Mains
- Existing Access Shaft
- Existing Regulator
- Existing Manhole
- Existing Outfall
- Proposed Drop Shaft
- Proposed Ohio River Tunnel Alignment
- Proposed Consolidation Sewer
- Proposed Tunnel Adit
- ALCOSAN Sewers
- Existing Municipal Sewers

alcosan
allegheny county sanitary authority

DLC Notice of Filing Brunot Island
with DLC Crescent Transmission Line
Page 5



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- Existing Municipal Sewers

Exhibit C

Docket Nos. A-2019-3008589 and A-2019-3008652

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

In 2019, ALCOSAN submitted its Clean Water Plan (CWP) to Federal, State, and local regulators in response to requirements set forth in a 2008 Consent Decree (CD). The CWP provides a comprehensive wet weather plan for reducing sewage overflows and attaining water quality (WQ) for the region that includes an Interim Wet Weather Plan (IWWP) which serves as the basis for an affordable regional solution through 2036. Following CWP submission, ALCOSAN and the regulators lodged a Modified CD on September 19, 2019. On May 14, 2020, the federal court approved a Department of Justice motion which addressed public comments, approved the Clean Water Plan, and entered the Modified CD. To satisfy the requirements of the ALCOSAN Modified CD for the Preliminary Basis of Design Report (BODR) for the Regional Conveyance Facilities of the IWWP tunnels and near surface facilities, this report has been prepared by the ALCOSAN Preliminary Planning team. This BODR further defines the proposed work for the recommended IWWP Regional Conveyance Facilities, and contains design criteria, considerations, and assumptions to refine the project budget and support final design. This BODR submission also includes sections in response to the "Existing Sewer Consolidation/Conveyance System Improvement" report requested in Appendix Z. This is presented in Section 10.4 of the BODR for the Ohio River Tunnel Segment, Section 11.4 for the Allegheny River Tunnel Segment, and Section 12.4 for the Monongahela River Tunnel Segment. These sections will constitute the 'report' under the same cover as this BODR. The Preliminary Planning effort began in 2017, three years prior to the modified Consent Decree being entered. The Preliminary Planning effort focused on the Regional Conveyance Tunnel system and associated consolidation sewers, shafts, regulators, and other appurtenant structures and facilities while the Basis of Design for the Tunnel Dewatering Pump Station (TDPS) is being completed by the ALCOSAN WWTP Program Manager. This effort included the following activities to satisfy the requirements of the CWP and Modified CD:

- Value Engineering Review of the alternatives related to the potential expansion of the main pumping station from 480 million gallons per day (MGD) to 600 MGD
- Determination of the proposed regional tunnel extents, alignment, and proposed sizing
- Analysis of tunnel dewatering and wet weather pump station alternatives
- Geotechnical boring investigations and assessments
- Property evaluation and assessment
- Proposed regional tunnel system hydraulics and surge analysis
- Flow management and operational strategies, including the following:
    - Locations and feasibility of the regional tunnel cross-connections
    - Cost-effective improvements to optimize the existing proposed regional tunnel storage and conveyance capacities
    - New and existing proposed regional tunnel Operation and Maintenance (O&M) and dual tunnel system optimization strategies
- Evaluation of construction packaging and project delivery alternatives
- Preparation of a geotechnical data report (GDR)

- Development of a consolidation sewer and tunnel project schedule
- Proposals for solids and floatables control at consolidation sewer combined sewer overflow (CSO) outfall locations
- Consideration of the flow reduction plans submitted by the Customer Municipalities in early 2020 in response to an information request to determine whether elements of the proposed conveyance system improvements could be eliminated or reduced in size
- Identification of potential future flow reductions that should be evaluated as part of the adaptive management provisions of the Modified CD and ALCOSAN's goal to maximize the use of cost-effective source reduction in coordination with Customer Municipalities

The results of these activities are detailed in various sections of the BODR and summarized in this Executive Summary. To support the development of the BODR, extensive alternatives and costing analysis began in 2017 which built upon the findings of the Clean Water Plan. The primary goal of the ALCOSAN Preliminary Planning project effort was to analyze, optimize, and recommend the CSO controls within the framework of the IWWP and CD in preparation for final design. This BODR further advances the proposed improvements, layouts, concepts, and recommendations summarized in previous ALCOSAN wet weather planning efforts into a 10% to 20% preliminary design. An overview of the Proposed IWWP Regional Conveyance Facilities CSO Controls by the Preliminary Planning team is included in **Figure 1-2**. This report is prepared in coordination with the Preliminary Planning 20% Drawings included as **Appendix A**. More context on the Preliminary Planning project background, evaluations performed by the Preliminary Planning team, proposed changes to the IWWP, and recommendations for regional conveyance facilities improvements are summarized in **Section 2** of the BODR. A separate report will be submitted to formally propose revisions to the IWWP to meet the relevant requirements in Paragraph 67 of the Modified CD.

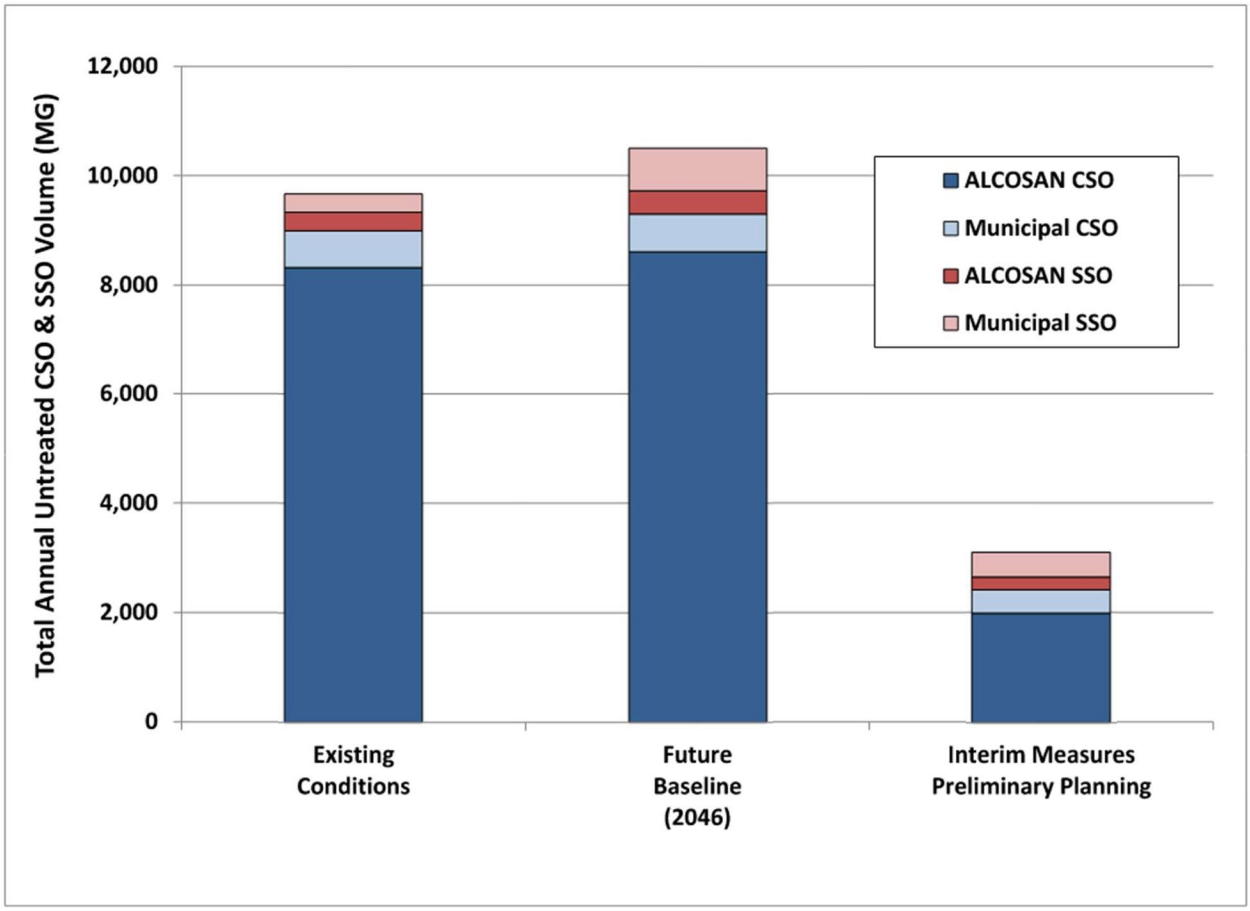
1.2 SYSTEMWIDE HYDRAULIC AND OPERATIONAL DESIGN CONSIDERATIONS

Section 3 provides the hydraulic basis of design for the proposed structures as well as the system overflow performance criteria that was used to develop the preliminary design basis. Annual CSO volume is estimated based on hydrologic and hydraulic (H/H) modeling of ALCOSAN's Typical Year (TY) rainfall for Future Baseline conditions and the IWWP scenarios to quantify CSO control performance. The approved CWP, also known as the Selected Plan, is based on a CSO control demonstration approach to not preclude attainment with WQ standards in ALCOSAN receiving waters during the TY, while SSOs are controlled to a 2-year level of control. The approved IWWP represents a subset of the Selected Plan and was estimated to result in less than 2,700 million gallons (MG) of CSO remaining during the TY. In addition, specific outfalls in the ALCOSAN collection system discharge directly into sensitive areas as defined in Appendix C of the Modified CD. These outfalls are required to be fully controlled in the TY, except for A-67 which is allowed one activation in the TY.

Peak TY flow rates from the Systemwide Selected Plan model were used to develop design flows for the sizing of regulators, inflow control gates/coarse screens, and consolidation sewers. The flow rates from this model include proposed municipal improvements and future wastewater flow projections to reflect the year 2046 conditions. The 5-year, 24-hour design storm was selected to evaluate the performance of proposed regulator structures, drop shafts, and tunnel gate operations for an event greater than the typical year storm events.

Figure 1-1 presents the modeled annual CSO and SSO volumes after implementation of the revised IWWP, projecting the same or better system-wide performance as the unmodified IWWP. The total annual untreated ALCOSAN and municipal CSO discharge volume is estimated to decrease from 9.3 to 2.5 BG, resulting in a total reduction of nearly 6.8 BG. The revised IWWP also provides equivalent performance regarding discharges to sensitive areas.

Figure 1-1: Annual Overflow Volume Performance



Wet weather flow conveyed from proposed regulators via the near surface consolidation sewers will be conveyed to the deep regional tunnels through drop shafts. Drop shaft sizing is based on the Peak TY flows at each location. Several acceptable types of drop shaft designs will meet the hydraulic needs at

each shaft location. The greatest cost benefit may be realized if the final drop shaft type selection is based on a more detailed analysis of the criteria included in this section, taking into account additional site-specific information to be gathered during final design. Near surface consolidation sewers convey wet weather flow from proposed regulators to the proposed drop shafts. Consolidation sewers were generally sized with a full pipe capacity of at least 115% of the peak TY design flow to account for head losses.

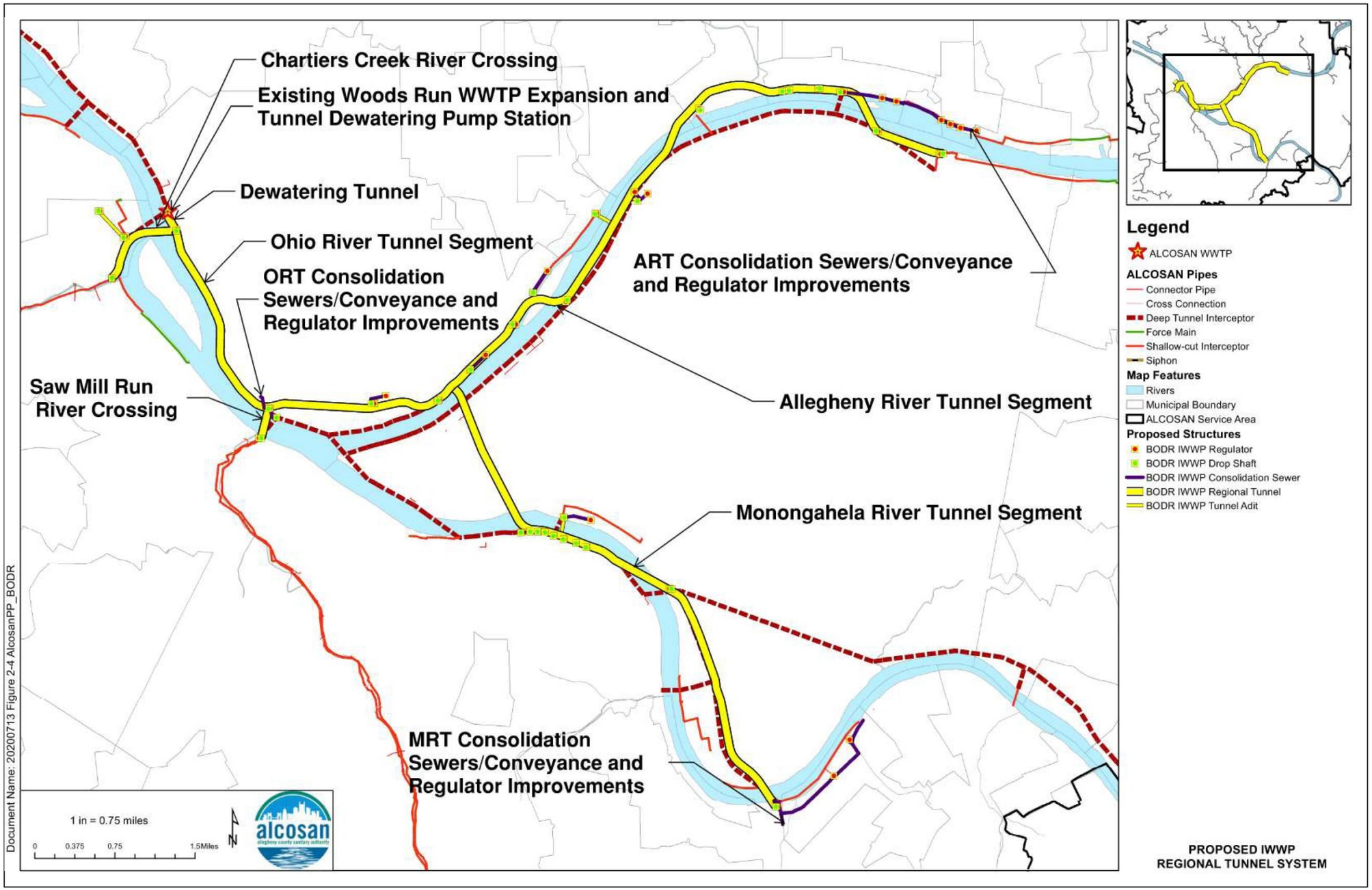
Simulations were performed with 14-, 16-, and 18-foot-diameter tunnels to determine conveyance and storage capacity during a selected typical year storm event, and the 5-year, 24-hour design storm event. In general, the analysis shows that the 14-foot-diameter tunnel has insufficient conveyance capacity and is therefore not recommended. A 16-foot diameter tunnel required active control for all connections into the tunnel. This alternative provides limited flexibility for control of additional outfalls in the future if needed. An 18-foot-diameter tunnel requires active control only at selected outfalls while providing more flexibility for control of future flows and improved filling characteristics. Based on the transient simulations, the 18-foot-diameter tunnel is being used as the basis of design for the proposed regional tunnel system except for the 14-foot-diameter Chartiers Creek and Saw Mill Run Tunnels. Additional improvements should be considered to reduce peak flow rates into the tunnel, such as source reduction/green infrastructure (GI), particularly along the Allegheny River Tunnel (ART). Since the Monongahela River Tunnel (MRT) has significantly fewer high peak rate outfalls, it is recommended that a 16-foot-diameter tunnel be fully evaluated for the MRT by the final designer.

Under normal operating conditions, the TDPS will only operate during wet weather conditions. The TDPS will have a peak pumping capacity of 120 MGD and will start pumping as flows are delivered to the pump station. The tunnel is a dynamic storage tunnel which means that flow is anticipated to be pumped out of the tunnel during wet weather events continually and not just after a storm event has ended. Therefore, the TDPS capacity and operation have a significant impact on the sizing of the proposed regional tunnel. The TDPS will dewater the remaining wet weather volume captured in the tunnel within 48 hours from the end of tunnel inflow. As discussed in **Section 2**, at the time of this report, ongoing coordination with the ALCOSAN Wastewater Treatment Plant (WWTP) Program Manager (PM), who is responsible for the basis of design of the TDPS, on the design parameters and operations of the TDPS is continuing. Additional coordination between the TDPS design team will be required throughout the design of the proposed regional tunnel.

To support maintenance of the existing interceptor system, the proposed tunnel system has been configured to divert dry weather flow from the proposed pick up points to the regional tunnel. During this maintenance mode of operation, this procedure will reduce flow to the existing interceptor and facilitate O&M activities on the existing interceptor system. Additional O&M assumptions and protocols for the proposed wet weather system are reported in **Section 3**. This includes the O&M needs for the regional tunnel drop shaft design to meet hydraulic and ventilation performance of the shaft to convey

wet weather flow to the tunnel; tunnel inflow gate operation and surge and transient condition mitigation analyses; and odor control considerations for the proposed tunnel and consolidation sewers. The control of sediment and grit was also analyzed in terms of management in the proposed tunnel and how to accommodate maintenance of sediment deposits in the existing deep tunnel interceptor. The recommended approach is to provide grit management of the existing and proposed systems independently, while allowing for the intermittent cross connection of flows between the two for maintenance purposes. However, due to site constraints, grit management for select DSI outfalls should be evaluated to determine if proposed regulators are capable of incorporating grit management without the need for separate grit pits. The proposed approach includes two access shafts on the existing interceptor to provide cleaning of areas of significant debris deposition, 11 access shafts on the proposed tunnel, 12 preventive near surface grit pits, and the opportunity for intermittent diversion of dry weather flow from the existing interceptor to the proposed tunnel at each IWWP drop shaft location.

Figure 1-2: Proposed IWWP Regional Conveyance Facilities CSO Controls



1.3 SYSTEMWIDE OVERVIEW OF GEOTECHNICAL CONDITIONS

Section 4 includes an overview of the subsurface conditions in the vicinity of the proposed IWWP Regional Conveyance Facilities tunnels, as well as a summary of the geotechnical investigations conducted by the Preliminary Planner to support the preliminary design of the IWWP tunnel facilities.

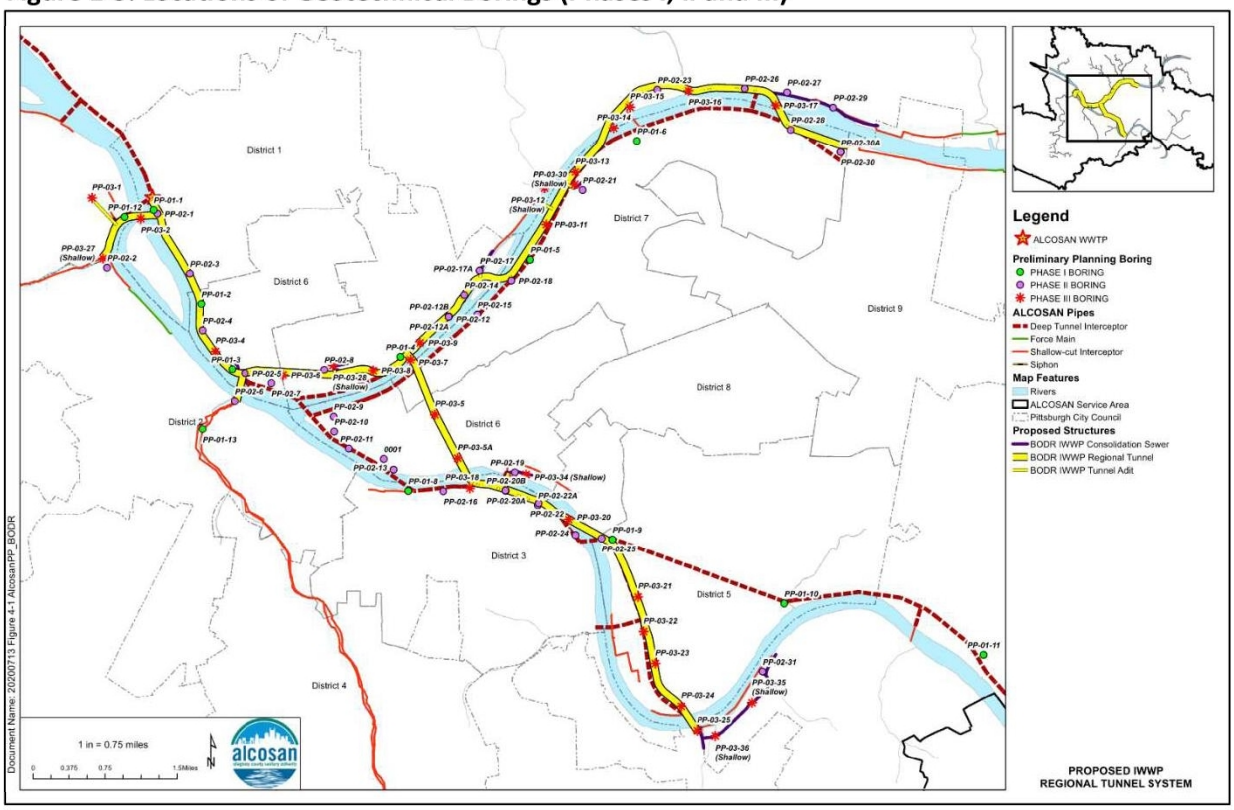
The Preliminary Planning team completed two comprehensive geotechnical investigations to support the preliminary design of the proposed regional tunnel. These efforts were preceded by an initial 12 geotechnical borings that represented Phase I of the program, completed in 2018 by the Clean Water Program Director. Phase II was completed by the Preliminary Planner and consisted of 32 borings, while the Phase III program consists of 30 borings. Selection of the surface locations for the Phase II and Phase III borings was based on the information obtained in the prior phase(s) and also strategic locations to obtain data for the alignment development for the proposed tunnels. Locations of all three phases of the geotechnical boring program are displayed in **Figure 1-3**. The vertical depth of the deep borings was determined primarily based on the proposed depth of the tunnel which is approximately 100 to 300 feet. The shallow borings conducted around proposed near surface regional conveyance infrastructure were typically 60 to 70 feet deep. Soil and rock properties data obtained from the geotechnical investigation formed a refined geologic stratigraphy for areas of the proposed tunnel. Select boreholes also had observation wells and vibrating wire piezometers (VWPZ) installed to collect data on the groundwater elevations. Additional testing included Acoustic Televiewer (ATV), Optical Televiewer (OTV) downhole geophysical testing, and Packer Testing at select boring locations for Phases II and III.

In addition to the Preliminary Planning investigation, several historical projects in the area provided information on completed geotechnical investigations and have data available for reference. The original ALCOSAN Interceptor system, constructed in the late 1950s, consisted of deep tunnel and shallow cut conveyance pipe ranging in size from 36 to 120 inches. Borings from this original construction cover many of the same areas as the investigations for this project, however, all these borings were terminated before reaching the proposed depths of the new alignment. An "Existing Deep Tunnel Construction Summary Report" was completed in 2018 by ALCOSANs Program Director and provides valuable insight of the tunneling challenges during the original construction of the existing ALCOSAN interceptor system. This data was used to help fill in the gaps between borings and help further classify rock in the project area. Recent projects, such as the North Shore Connector Tunnel and State Route 28 improvement, provide more detailed information within a smaller project area. Most of the historical borings were not drilled to depths within the tunnel horizon, however, this data is still useful for soil data as well as further understanding the top of rock profile along the tunnel alignment.

The results of the Phase 1 subsurface exploration, field testing, and laboratory testing programs for the planning and design of the Wet Weather Program is included in **Appendix B** of this report. Details of the procedures used for conducting field work and laboratory testing as well as the results of the subsurface investigations and laboratory testing completed for this project are presented in a report entitled, *"Task*

4.2 Preliminary Planning Geotechnical Data Report" hereinafter referred to as the GDR and included as **Appendix E**. Further discussion of the engineering properties of the soil and rock, in addition to their impacts on design and construction, can be found in the Geotechnical Design Memorandum (GDM) included as **Appendix F**.

Figure 1-3: Locations of Geotechnical Borings (Phases I, II and III)



1.4 SYSTEMWIDE OVERVIEW OF ENVIRONMENTAL CONDITIONS

Implementation of the IWWP relies on the ability to acquire and access a variety of properties within the corridors of the proposed regional tunnel system and near surface consolidation systems. In support of potential property access needs for IWWP construction, an environmental screening (ES) was conducted for the IWWP tunnel corridor along the Allegheny, Monongahela, and Ohio Rivers. **Section 5** summarizes the initial environmental surveys completed to evaluate the historical uses of properties within the proposed footprint of the IWWP tunnel corridor and determine recognized environmental conditions (RECs) on those properties. The screening also included the corridors along the supplemental conveyance lines and supporting structures in the vicinity of the deep tunnel alignment, including the sites proposed for interim drop shaft locations that were identified for the project at the time of the analysis. A full summary of the ES results is documented in the *"Environmental Screening Report (ESR)*," dated May 8, 2018 and "*Environmental Screening Addendum Report,"* dated March 2020 by Rhea Engineers and Consultants, Inc. included in **Appendix G**.

The objective of the ES was to identify RECs along the project corridor, as well as potential RECs from offsite sources that may adversely affect the project area and require additional investigation or study. A summary of all sites of concern is include in **Section 5**. Most of the REC sites are adjacent to or in the areas of a proposed excavation-related activity (e.g., drop shaft locations). Based on the increased amount of subsurface disturbance anticipated during these activities, a greater likelihood of encountering subsurface contamination exists. The site reconnaissance performed as part of the ES did not identify additional sites of concern. No indications of large-scale, previous spills, or hazardous material usage or disposal were identified within the project area. No pits, ponds, lagoons, or other indications of buried or large-scale hazardous material were identified during reconnaissance of the project area.

Site-specific interviews and regulatory file review were not completed as part of the scope of the ES effort. ALCOSAN has retained the assistance of two property consultants to conduct environment surveys as well as provide all services in conjunction with the acquisition of property. The property acquisition effort will be carried forward into final design. The findings of subsequent interviews and regulatory file review may alter the ranking or REC classification of a site.

As portions of the IWWP advance, it is recommended that the ES be reevaluated, and subsequent Phase I Environmental Site Assessments be completed prior to property acquisition. The applicable American Society for Testing and Materials (ASTM) standard (E 1527-13) requires a reevaluation of site conditions if a Phase I report (Environmental Site Assessment) is older than 180 days (6 months). As the program moves into construction, final design documents are recommended to contain language to address how construction would be impacted in the event that potentially hazardous materials are encountered, an odor is identified, or significantly-stained soil is visible. Documents should reference and/or follow all applicable regulations regarding discovery and response for hazardous materials encountered during the construction process.

1.5 ELECTRICAL POWER REQUIREMENTS

Section 6 provides considerations for electrical power requirements of the Tunnel Boring Machine(s) (TBM) temporary power feeds as well as for any active control gates recommended in the system. Temporary power requirements for the TBM assume each tunnel segment will be constructed in a single drive. The temporary power requirement will be dictated by the TBM excavation needs. The expected electric service needs for each launch site is included in **Table 1-1**. The final designer shall confirm the electric service needs, available capacity, and requirements to bring the required power to the site.

Table 1-1: TBM Site Expected Temporary Electrical Service Needs	
Tunnel Segment	Preliminary Temporary TBM Power Estimate
Ohio River Tunnel (ORT)	8,100 kilovolt-amp (kVA)
Allegheny River Tunnel (ART)	8,500 kVA
Monongahela River Tunnel (MRT)	8,500 kVA

Operation of the tunnel system requires inflow control gates at selected connection points to the tunnel that close when the level in the tunnel reaches certain critical elevations. These gates prevent the tunnel from overfilling and provide protection from surge propagation by ensuring the tunnel fills from the downstream end of the system. Level sensors will be installed at key locations along the tunnel alignment to monitor the levels within the tunnel and send signals to the control gates to close once critical elevations are exceeded. Following construction of the proposed tunnel, power will be required for automated gates and gate control structures. The control gates will be hydraulically operated; however, the hydraulic pumps will require power. A hydraulic power system should be supplied as a packaged unit including the pumps, gate actuators, power, and control panels. Gate control structures and level sensor controls will be powered with a 240/120-volt, 1-phase, secondary metered electrical service.

1.6 MECHANICAL DESIGN

Section 7 includes an overview of the proposed mechanical systems for the IWWP Regional Conveyance Facilities, including gates, control vaults, and screening facilities. Inflow control gates will be stainless steel slide gates sized to the diameter of the proposed consolidation sewer conveying flow to the regional tunnels in the regulator structures. Control vaults are recommended at selected locations throughout the proposed tunnel to house the power, mechanical, and control devices necessary for monitoring and remote operation of the system. The vaults are proposed to be below grade, constructed of cast in place (CIP) concrete, and will be equipped with watertight hatches or floor doors. The proposed coarse screens in the regulator structures are to be manually cleaned bar racks. The bar rack opening sizing is a balance between protecting the downstream tunnel from large, heavy debris that will be more difficult to remove from the tunnel, and not creating a nuisance operational condition with potential blinding of the screens during wet weather. A 6-inch opening dimension is recommended.

1.7 INSTRUMENTATION AND CONTROL

Section 8 summarizes the instrumentation and control standards and design assumptions used for the IWWP Regional Conveyance Facilities tunnel monitoring and control gate operation. Monitoring and transfer of systemwide data necessary for the control of each gate structure will be provided through ALCOSAN's Supervisory Control and Data Acquisition (SCADA) system. Two bubbler level transmitters, each one with a dip tube, will provide tunnel water level elevations at specific drop shaft locations along the tunnel alignment. The SCADA system shall transmit the tunnel levels to all gate control sites. The

tunnel levels would then be transmitted from the control gate Programmable Logic Controller (PLC) to the WWTP. Once a critical high-level elevation (preset "close" level) from any one of the four level sensors is exceeded, the PLC will send a signal to the all control gates to close. See **Section 3.3.2** for the preset "close" and "open" set points.

1.8 RISK MANAGEMENT

Section 9 contains an overview of the risk management process for identification, evaluation, risk register scheduling, and implementation and organization for potential risks that could impact design, construction, and operation of the IWWP tunnel system. The risk management process for the IWWP Regional Conveyance Facilities Improvements has been prepared through a review of comparable programs within the industry and previous ALCOSAN project risk registers. The program-specific guidelines developed for the IWWP Regional Conveyance Facilities improvements outlined in the BODR include Identification and Organization of Risks, Risk Assessment Guidelines, Risk Management Strategies, and Sample Risk Control Measures.

Categories of risks for the IWWP Regional Conveyance Facilities improvements are included in **Section 9** along with defining the general areas of impact for the risk. A Severity of Impact score is assigned for each risk as well as identifying a Likelihood of Occurrence. A risk ranking score is calculated by taking the product of the scores for Likelihood of Occurrence and Severity of Impact. This ranking is used in conjunction with the risk profile to determine the risk management strategy and any control strategies within the risk register, and to prioritize the program risks. A series of sample risk control measures are identified in **Section 9,** as well as the basis for the initial risk register. A preliminary planning level risk register applicable to the tunnel systems has been prepared and can be found in **Appendix H**. The risk register should be updated by the final designers as the design progresses. It will also be important that the risk register is maintained and updated all the way through the construction phase of each tunnel segment.

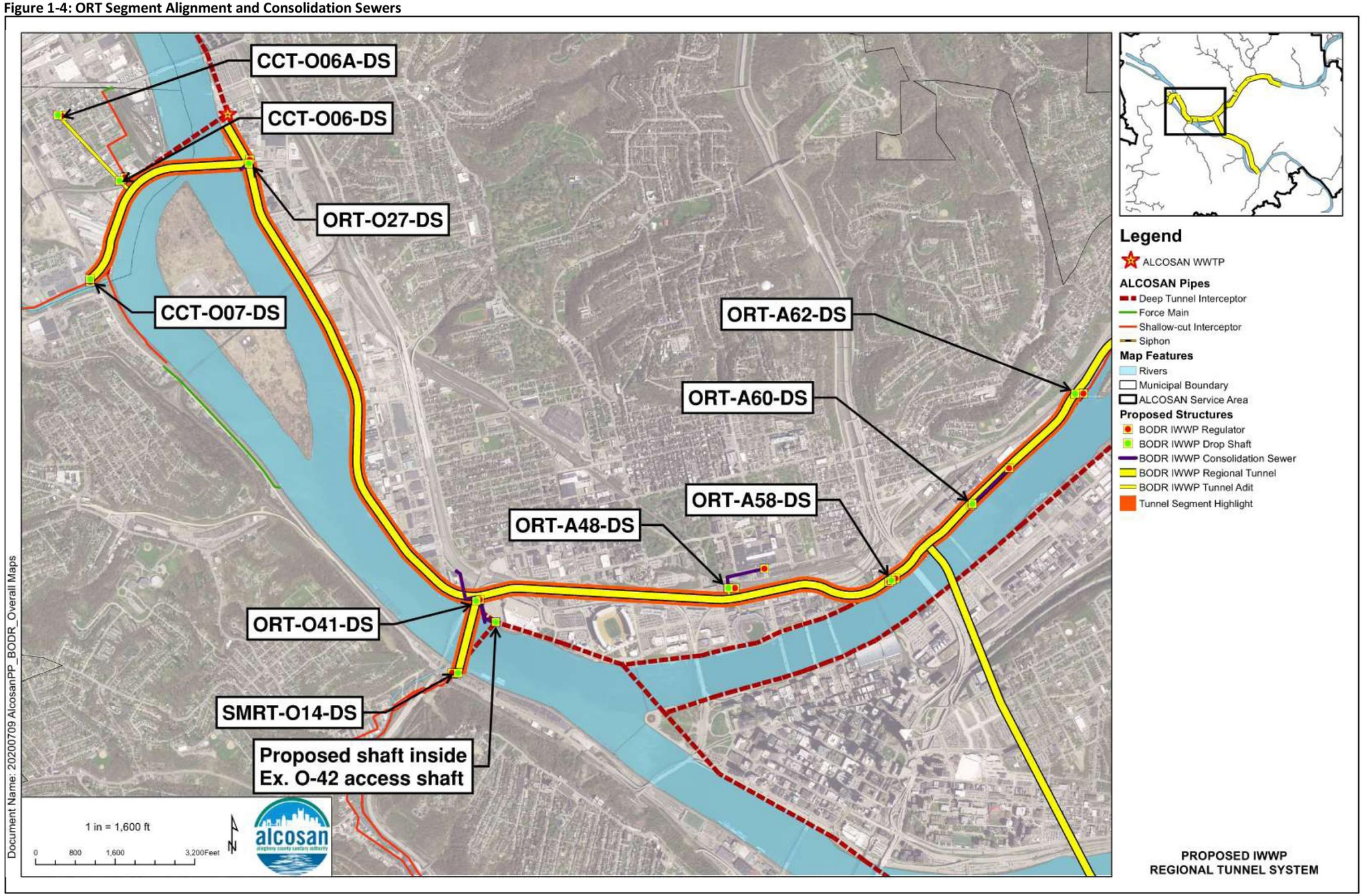
1.9 OHIO RIVER TUNNEL SEGMENT

Section 10 describes the consolidation and conveyance sewer improvements and tunnel facilities proposed to control overflows from outfalls along the ORT segment of the IWWP Regional Conveyance Facilities. This section includes detailed summaries of the geotechnical conditions; significant environmental conditions; existing sewer consolidation/conveyance improvements including detailed site plan figures; considerations for excavation/ground support/ground control during construction; summaries of each proposed drop shaft; considerations for TBM launch and retrieval shafts and additional tunnel design and construction considerations. In addition, community stakeholders and public impacts of the ORT are identified.

The ORT preliminary design is based on an 18-foot diameter tunnel that is approximately 24,180 lineal feet or 4.6 miles long, compared to 10,100 feet in the CWP. The length of the Chartiers Creek (CC) river

crossing is approximately 4,500 lineal feet, and Saw Mill Run (SMR) river crossing is approximately 1,590 lineal feet. The Saw Mill Run Tunnel (SMRT) and Chartiers Creek Tunnel (CCT) are both 14-foot-diameter tunnels. **Figure 1-4** displays the proposed facilities for the ORT segment. A proposed 8-foot-diameter dewatering tunnel is 907 lineal feet and conveys flow from the ORT-O27-DS drop shaft to the dewatering pump station.

Figure 1-4: ORT Segment Alignment and Consolidation Sewers



1.10 ALLEGHENY RIVER TUNNEL SEGMENT

The consolidation and conveyance sewer improvements and tunnel facilities proposed to control overflows from outfalls along the ART segment of the IWWP Regional Conveyance Facilities are summarized in **Section 11**. This section includes detailed summaries of the geotechnical conditions; significant environmental conditions; existing sewer consolidation/conveyance improvements including detailed site plan figures; considerations for excavation/ground support/ground control during construction; summaries of each proposed drop shaft; considerations for TBM launch and retrieval shafts and additional tunnel design and construction considerations. In addition, community stakeholders and public impacts of the ART are identified.

The ART preliminary design is based on an 18-foot-diameter tunnel that is approximately 28,550 lineal feet or 5.4 miles long, compared to 41,200 lineal feet (7.9 miles) in the CWP. **Figure 1-5** displays the proposed facilities for the ART segment.

1.11 MONONGAHELA RIVER TUNNEL SEGMENT

Section 12 provides the consolidation and conveyance sewer improvements and tunnel facilities proposed to control overflows from outfalls along the MRT segment of the IWWP Regional Conveyance Facilities. This section includes detailed summaries of the geotechnical conditions; significant environmental conditions; existing sewer consolidation/conveyance improvements including detailed site plan figures; considerations for excavation/ground support/ground control during construction; summaries of each proposed drop shaft; considerations for TBM launch and retrieval shafts and additional tunnel design and construction considerations. In addition, community stakeholders and public impacts of the MRT are identified.

The MRT preliminary design is based on an 18-foot-diameter tunnel that is approximately 28,040 lineal feet or 5.30 miles, compared to 23,000 feet in the IWWP. **Figure 1-6** displays the proposed facilities for the MRT segment. Although an 18-foot-diameter tunnel is currently recommended, given the smaller inflows in the MRT, a 16-foot-diameter or smaller tunnel should be evaluated during the adaptive management phases of the IWWP.

Figure 1-5: ART Segment Alignment and Consolidation Sewers

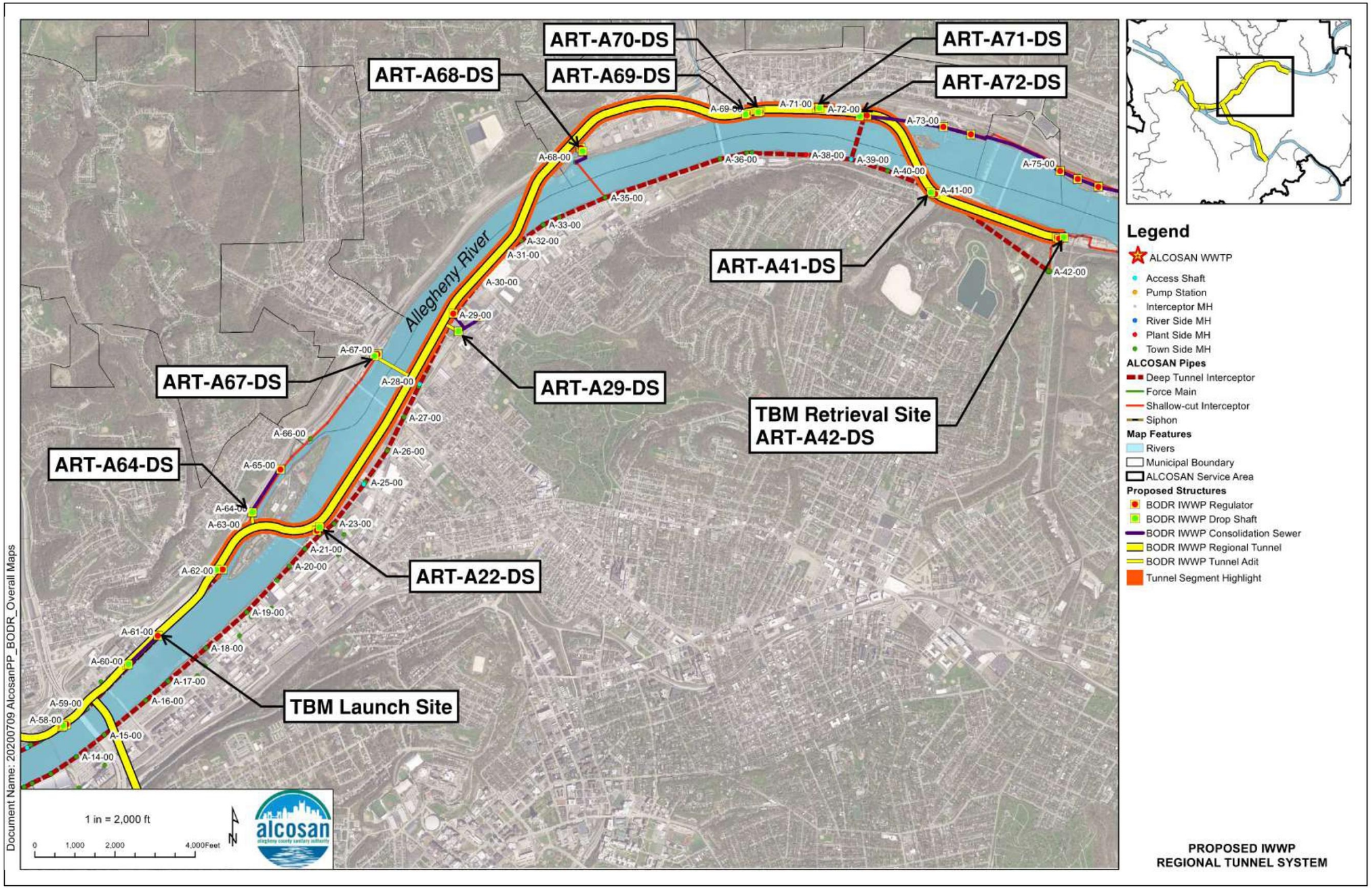
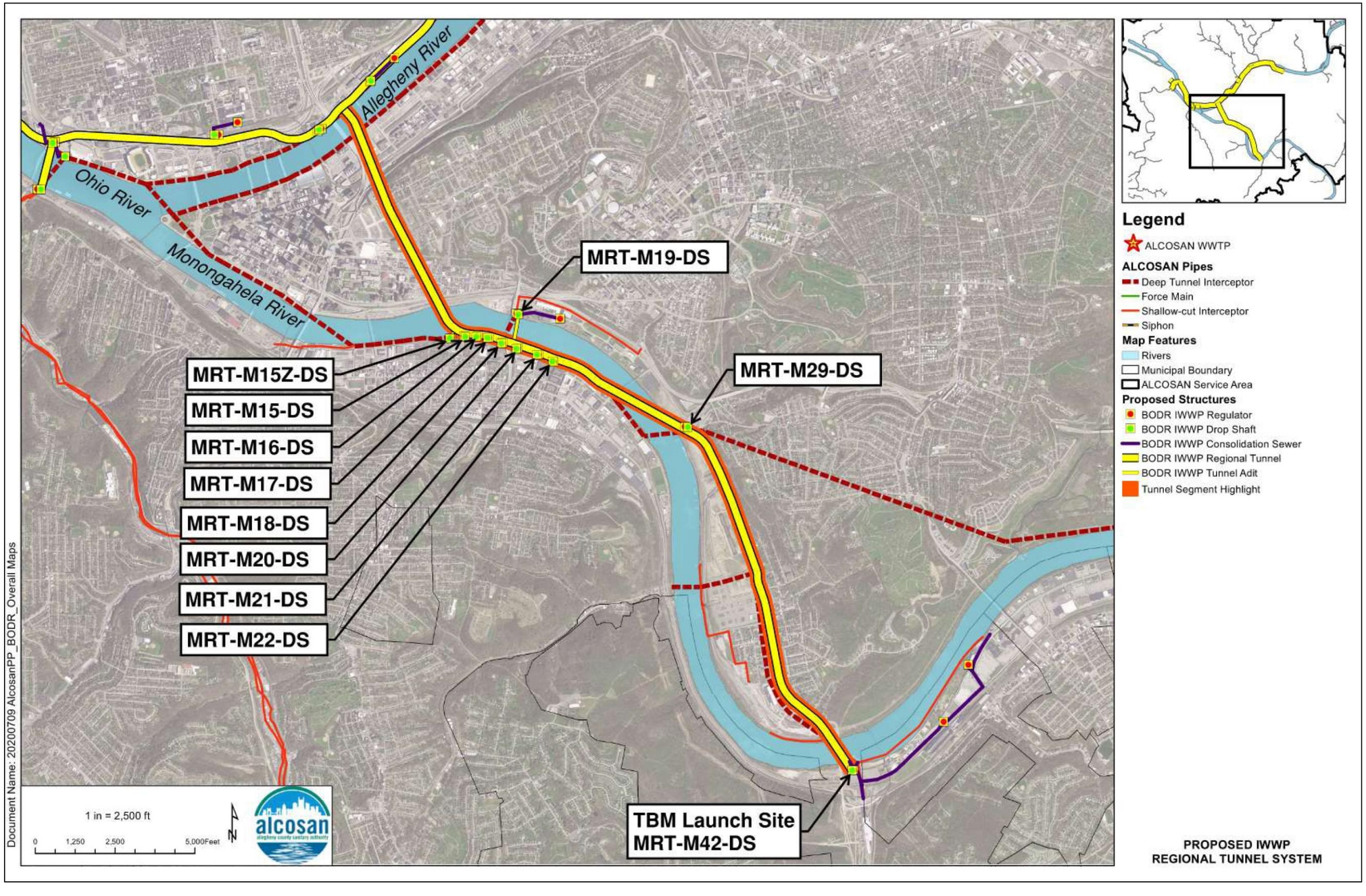


Figure 1-6: MRT Segment Alignment and Consolidation Sewers



1.12 SURVEY AND BASE MAPPING

Section 13 summarizes the available base mapping that was used to develop the drawings included with this BODR. Existing base maps included in **Appendix A** or in support of this BODR have been developed utilizing Geographic Information System (GIS) source data either publicly available or from ALCOSAN. To facilitate a future survey to support final design of proposed IWWP facilities, ALCOSAN has installed 16 survey monuments approximately 1 mile apart along the riverfronts that can be tied into the existing survey control located on the ALCOSAN WWTP property. Final design will require survey and updated base mapping using various sources of data such as field surveying, aerial photogrammetric products, and GIS information.

1.13 STRUCTURAL DESIGN

Section 14 describes the preliminary structural design criteria, assumptions and analysis intended to guide the design of proposed structural elements of the IWWP Regional Conveyance Facilities. Applicable codes and standards are identified to apply to the design, construction quality control, and safety of all work. Structures should be designed in accordance with engineering principles based on applicable references and codes for the Pittsburgh, PA, region. Final design methods and assumptions will be confirmed by the future tunnel designer's lead structural engineers. In addition, this section summarizes the material properties and design load assumptions that should be considered for structural design. Floor, Wall and Roof Slab thicknesses and rebar detailing were not defined for the purposes of the BODR and will need to be determined during final design.

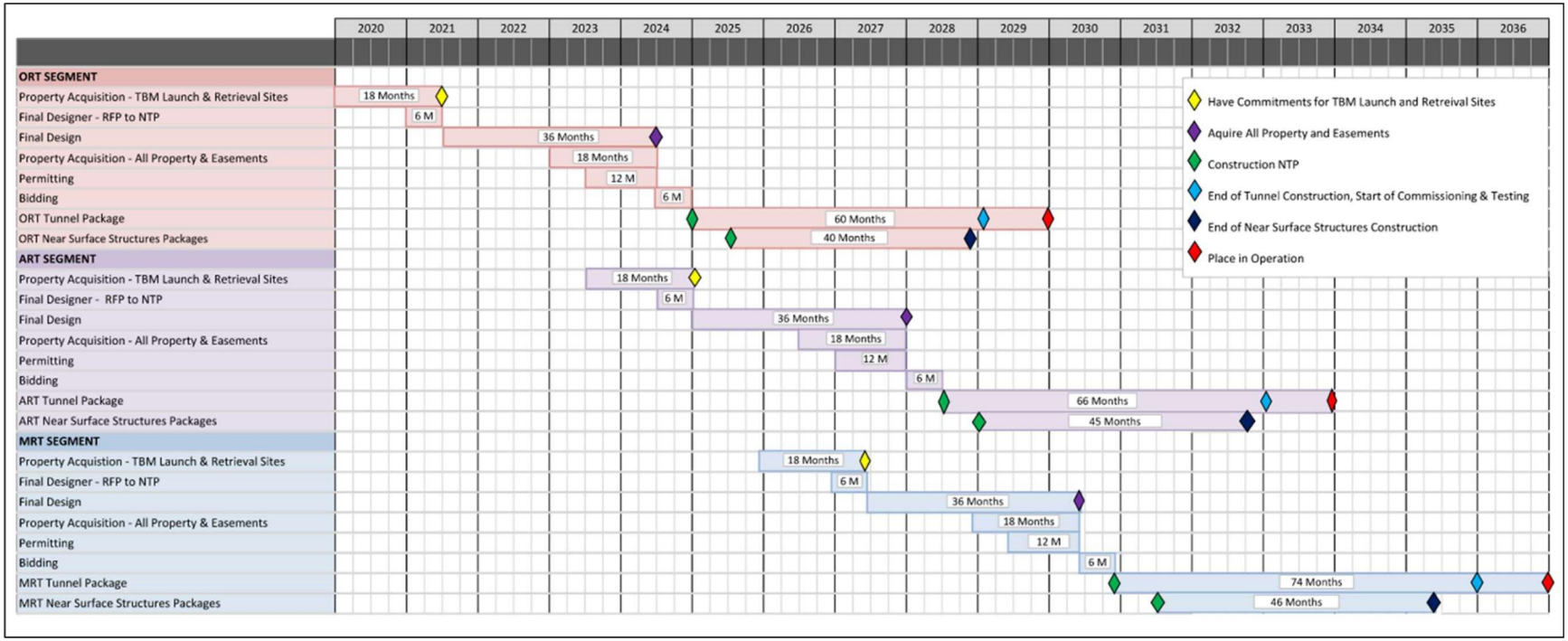
1.14 PERMITTING REQUIREMENTS

Section 15 summarizes the available information regarding permits for design and construction of the IWWP Regional Conveyance Facilities. Permitting will be required for each location where construction activities are proposed to take place, including any construction staging areas. It is anticipated that permits will be required from the Pennsylvania Department of Environmental Protection (PADEP), United States Army Corps of Engineers (USACE), City of Pittsburgh, Allegheny County, various local municipalities, various railroads, and the Pennsylvania Department of Transportation (PennDOT). A detailed permit summary table is provided in **Section 15** that provides context for the potential permit types, basic submission requirements, and typical processing times. The specific needs and advanced agency coordination for permitting will need to be considered as final design advances.

1.15 PROJECT SCHEDULE, SEQUENCING, AND CONTRACT PACKAGING

Section 16 describes the project scheduling and contract packaging assumptions and summarizes the impacts on the schedule included in Appendix Z of the Modified CD relative to the WWP tunnel segments and consolidation sewers/conveyance improvements. Due to the modifications proposed to the IWWP improvements, revisions to the milestone dates established in the Modified CD will need to be implemented. **Figure 1-7** presents the recommended proposed regional tunnel conveyance facility milestone schedule based on the Preliminary Planning IWWP revisions. Should any changes occur to the project scope, design, or construction schedule, the overall project schedule should be reevaluated.

Figure 1-7: Recommended IWWP Regional Conveyance Facilities Implementation Schedule



1.16 ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

The Engineer's Opinion of Probable Construction Cost (EOPCC) is summarized in **Section 17**, which also provides an overview of the assumptions and methodology used for development of these costs. Technical Memoranda have been developed for the preliminary EOPCC for each segment of the proposed tunnels in the IWWP. Structures that are included the EOPCC can be grouped into four general categories: near surface facilities, drop shafts, adits, and storage tunnels. **Section 17** also includes estimated capital costs which are the EOPCC plus engineering and implementation costs, excluding property and easement acquisition costs. With respect to base construction costs, the general layout and overall level of design for the proposed tunnel have advanced to a level that a bottom-up estimate approach was deemed appropriate. A bottom-up estimate explicitly takes into account labor, equipment, material, and indirect costs, including contractor overhead and profit, as well as production rates for the various construction activities. This type of estimate is considered to be an Association for the Advancement of Cost Estimating (AACE) Class III estimate with an expected accuracy range of +20% to -15%. The base construction cost estimates are in May 2020 dollars. The output of these estimates includes not only an estimated construction cost, but also an estimate of the overall construction duration which can be used for construction scheduling and monthly progress payments for cash flow purposes.

The ORT segment includes the ORT, CCT, SMRT, a total of 10 drop shafts, 4 of which are planned to be constructed within TBM launch or retrieval shafts, 6 adits and near surface facilities associated with 13 Points of Connection. The ART segment includes the ART, a total of 11 drop shafts, 1 of which is planned to be constructed within a TBM retrieval shaft, 10 adits and near surface facilities associated with 20 Points of Connection. The MRT segment includes the MRT, a total of 11 drop shafts, 1 of which is planned to be constructed within a TBM launch shaft, 10 adits and near surface facilities associated with 14 Points of Connection.

The construction contract packaging used to develop the base construction cost estimate assumed each tunnel segment along with shafts and adits will be in one construction contract and the near surface facilities construction will be in a series of packages. **Table 1-2** summarizes the EOPCC for each assumed tunnel package for all three segments. The total EOPCC for the IWWP is $1,257.6 M.

Table 1-2: Summary of IWWP Engineer's Estimate of Probable Construction Cost*

Tunnel Segment	Construction Cost (2020 $M)
ORT	$410.8
ART	$439.2
MRT	$407.6
Total	**$1,257.6**

1.17 FUTURE CONSIDERATIONS

Design of the IWWP conveyance systems will be advanced by others following procurement by ALCOSAN of the Tunnel Program Manager and tunnel design teams. **Section 18** contains general future considerations for the advancement of the conveyance system designs. In addition, this section contains site-specific considerations for the ORT, ART, and MRT improvements described in **Sections 10**, **11**, and **12,** respectively.

Some noteworthy aspects of future consideration include:

Property Acquisition

The site layouts and construction budget estimates of the proposed facilities identified in the basis of design (BOD) drawings and described in this report have been developed with the assumption that easements and acquisitions of required property will be obtained. If these properties are not available, or determined to be unattainable, feasible alternative sites have been identified in the alternative evaluation summarized in the Flow Group Alternatives Evaluation Summary Technical Memorandums.

While the Preliminary Planning team has developed conceptual layouts of the facilities proposed on these sites for this report, it is anticipated that the layouts and impacted parcels may change as the locations of proposed regulators and sewer alignments are advanced during final design of the near surface facilities. Therefore, acquisition and gathering of easements for these facilities are planned to occur during final design. Acquisition, easement, or general agreement for use of tunnel construction sites is required prior to final design commencing.

Municipal Flow Reduction and Adaptive Management

As described in Appendix Z of the Modified CD, flow reduction studies submitted by ALCOSAN's Customer Municipalities shall be taken into consideration to "determine whether the proposed tunnel system could be eliminated or reduced in size." In December 2019, ALCOSAN requested copies of any source reduction studies and other relevant information regarding flow reduction from Customer Municipalities in the form of a fillable information request form/survey. ALCOSAN will continue requesting updated source reduction information on an annual basis and evaluate opportunities for downsizing grey infrastructure while advancing tunnel design. However, further coordination with the municipalities on the projects where reductions have yet to be determined is needed as the tunnel design progresses. Since the CD requires municipal commitments to flow reduction before it can propose reductions to grey infrastructure facilities, ALCOSAN's on-going coordination with municipalities includes discussion of flow reduction agreements.

Point of Connection Optimization

During development of the preferred layouts and alignments, several areas were identified where the Preliminary Planning team recommended improvements that differed from those included in the CWP. These alternatives included regrouping or separation of POCs in consolidated flow groups in the CWP. While the CWP proposed to control these flow groups based on the basin planner determination that

these groupings were the most cost-effective means to control the outfalls, the Preliminary Planning evaluations determined that a number of outfalls can be controlled more cost-effectively with individual connections to the proposed tunnel rather than the consolidated flow groups in the CWP. The evaluations also determined that controls for several outfalls are no longer needed to achieve equivalent or better systemwide performance than the IWWP described in the CWP. These include outfalls with low overflow volumes and/or a high cost per gallon of overflow reduction. The Modified CD includes provisions for making certain revisions to the IWWP. Accordingly, a separate IWWP revisions proposal document will be prepared and submitted for agency review and approval.

Green Infrastructure/Source Control

A main goal of the Modified CD was to provide a flexible CWP implementation framework that fully embraces adaptive inclusion of green stormwater infrastructure (GSI) and source reduction. A GSI/source control (SC) PM has been retained to facilitate this effort. The Preliminary Planning team and GSI/SC PM coordinated on the evaluation and identification of potential GSI improvements that could be implemented to either eliminate or downsize proposed elements of the IWWP. During the Preliminary Planning work, 12 IWWP POCs were identified to be investigated further under ALCOSAN's GSI/SC Program as having potential to reduce wet weather flows using source control. Of these 12, 4 POCs were identified as needing further information to determine if separation could eliminate the drop shafts to the proposed regional tunnels. These 12 potential GSI improvements were further evaluated under the ALCOSAN Green Revitalization of our Waterways (GROW) Program and are a subject of ongoing ALCOSAN workshops with customer municipalities to assess the level of municipal interest and implementation commitment.

Additional future considerations highlighted in **Section 18** include:

- Flow Monitoring/Modeling Considerations
- Geotechnical Program Considerations
- Grit and Sediment Management
- Regional Conveyance Tunnel Facility, WWTP, and TDPS Design Coordination
- Regionalization
- Recommendations for Property Consultants
- Other ALCOSAN Capital Improvement Project and Operations & Maintenance Considerations
- Municipal Improvements/Planned Projects
- Third-Party Projects
- Coordination with Existing Utilities