BUILDING A WORLD OF DIFFERENCE

Sanitary Conveyance and Treatment Improvements – Western Regional: Progressive Design-Build Project

Clint Wilson, P.E.

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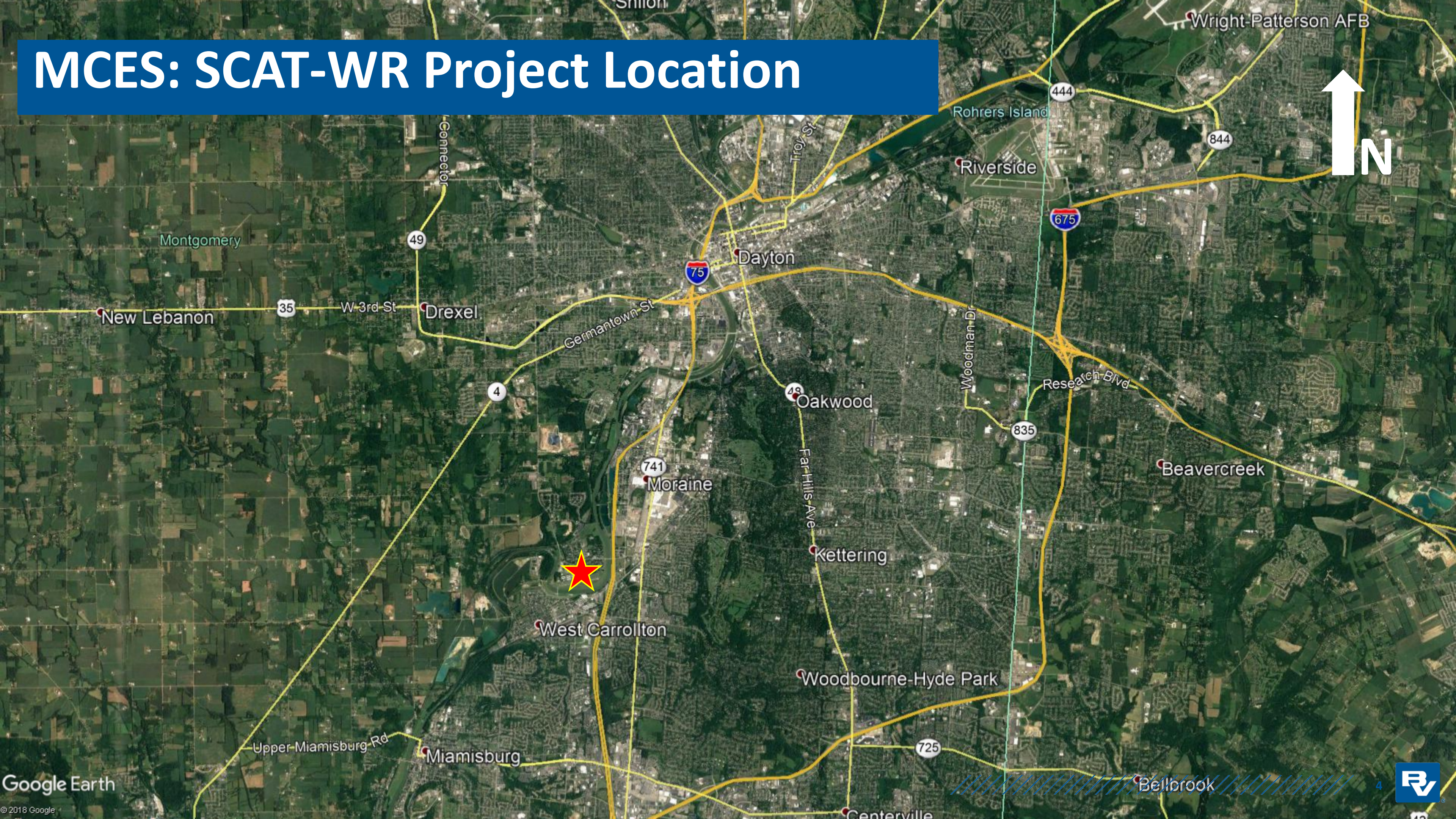
Presentation Overview

- Project Introduction
- Alternatives Analysis
  - Alignment Analysis
  - Geological/Hydrogeologic Conditions
  - Construction Methods
- Alternative Project Delivery
- Project Update
- Conclusion

PROJECT INTRODUCTION

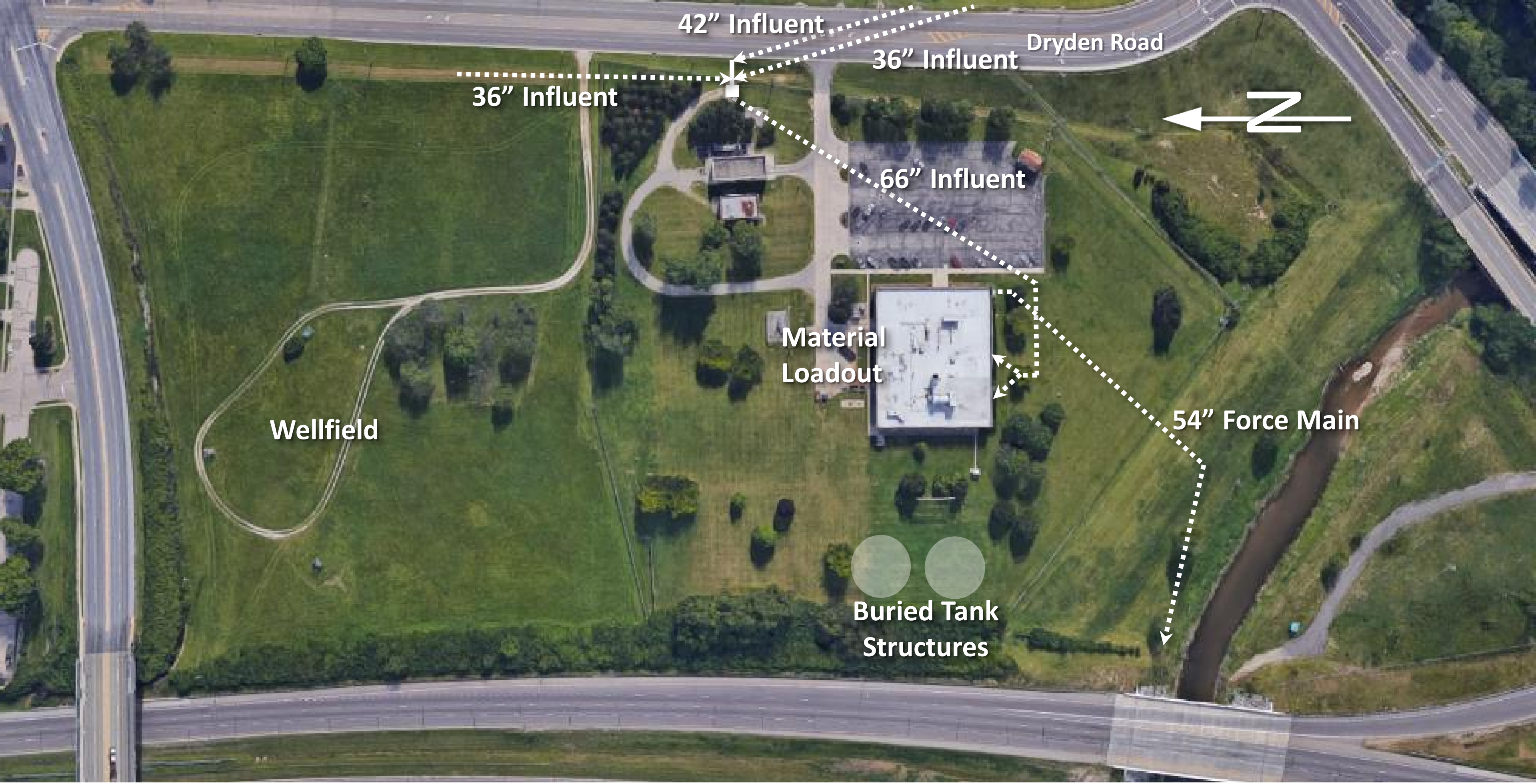
MCES: SCAT-WR Project Location



MCES: SCAT-WR Project Location

Dryden Rd. Pretreatment Facility

- Constructed in 1970s
- Environmental Laboratory
- Coarse and Fine Screening
- 60 MGD Capacity
- 5 Horizontal Centrifugal and 1 Dry-pit Submersible Pumps
- Services southern portions of Montgomery County
- Two miles of 54” Forcemain to WRWRF



42” Influent
36” Influent
Dryden Road
36” Influent
N
66” Influent
Material
Loadout
Wellfield
54” Force Main
Buried Tank
Structures

CURRENT DRYDEN PTP PROCESS

Coarse Screens

Fine Screens

Grit Removal

Pumping

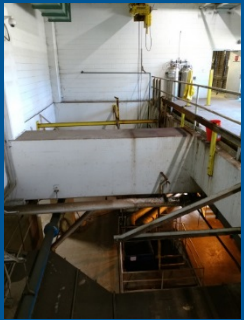
Force Main

Hopper

Screw Conveyors

Drag Out Conveyor

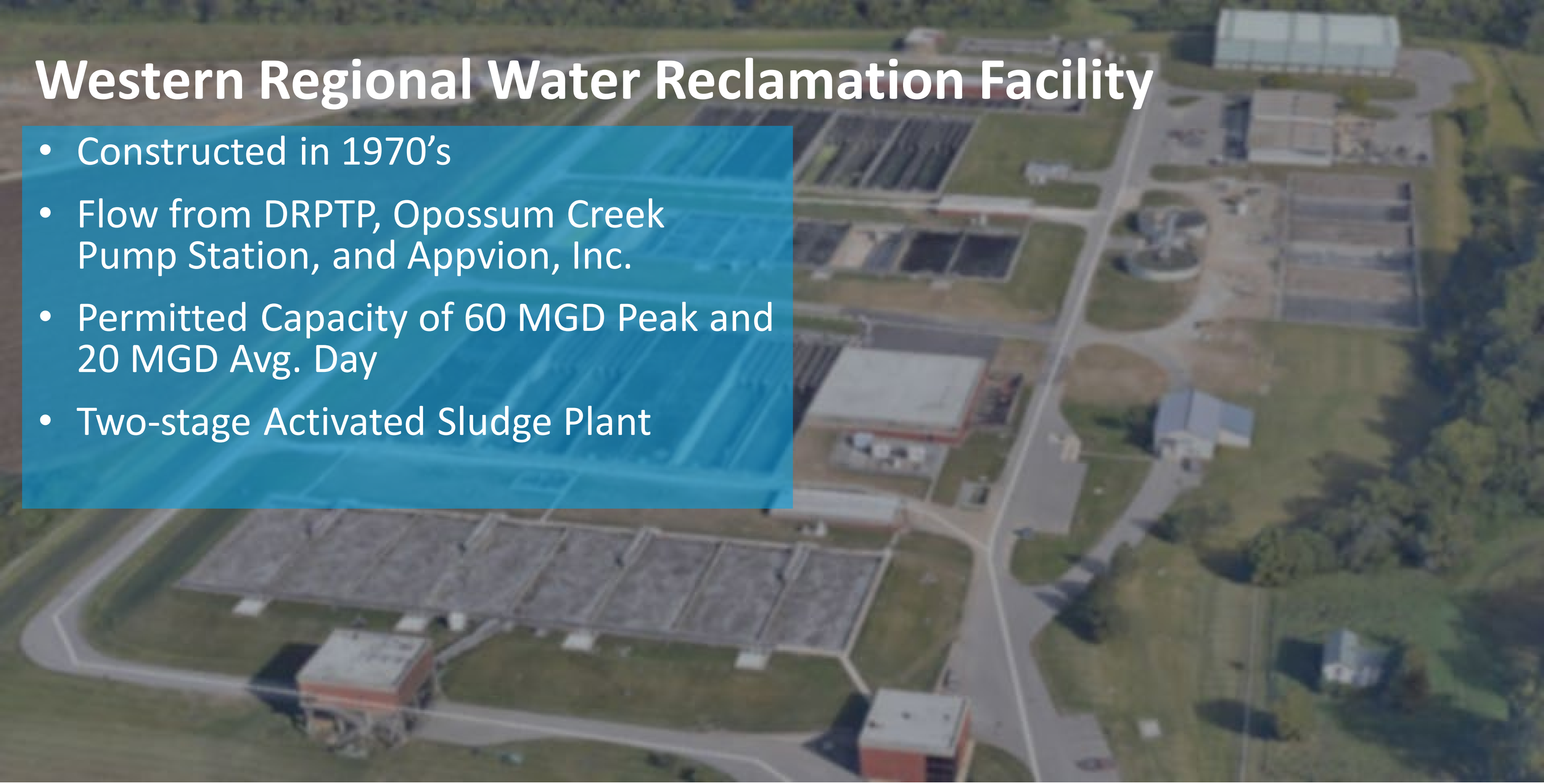
Compactor



Hopper Lift

Disposal

Western Regional Water Reclamation Facility

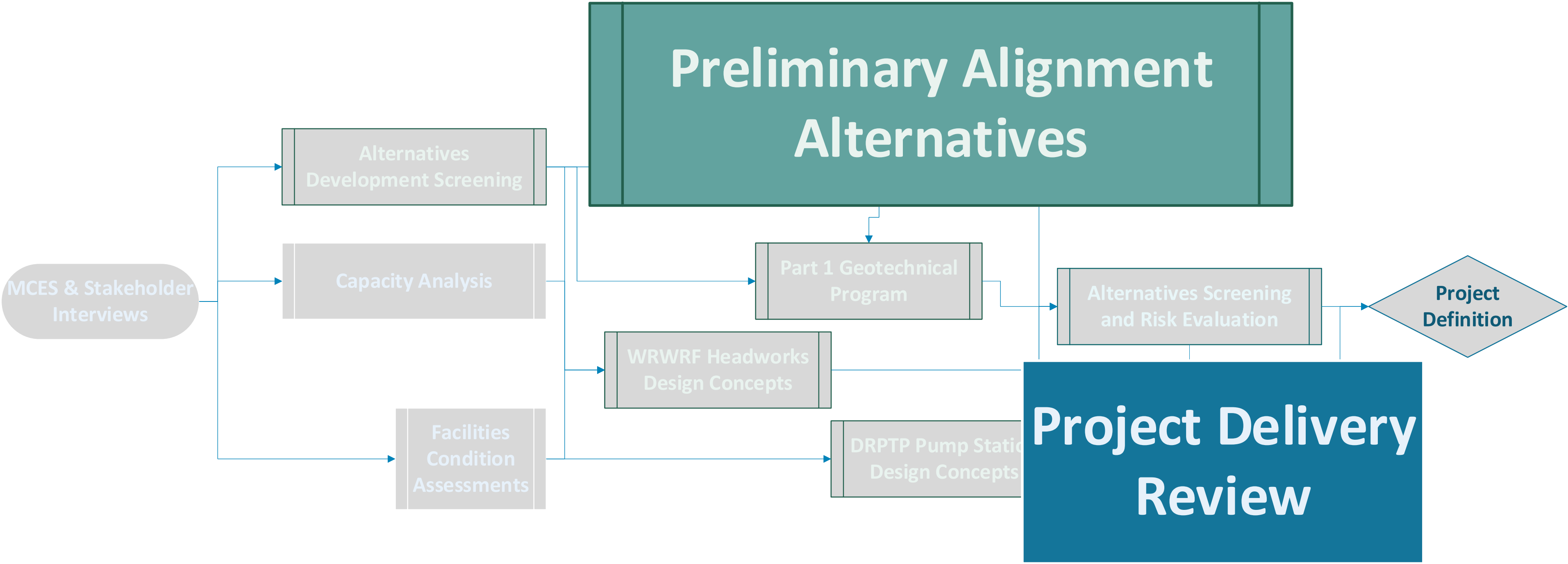


- Constructed in 1970’s
- Flow from DRPTP, Opossum Creek Pump Station, and Appvion, Inc.
- Permitted Capacity of 60 MGD Peak and 20 MGD Avg. Day
- Two-stage Activated Sludge Plant


Tertiary Filters and Chlorine Contact Tank
Second Stage Clarifiers
Second Stage Aeration
First Stage Clarifiers
First Stage Aeration
Opossum Creek Screen Building
Aerobic Digesters
Solids Thickening
Drain Pump Station

ALTERNATIVES ANALYSIS

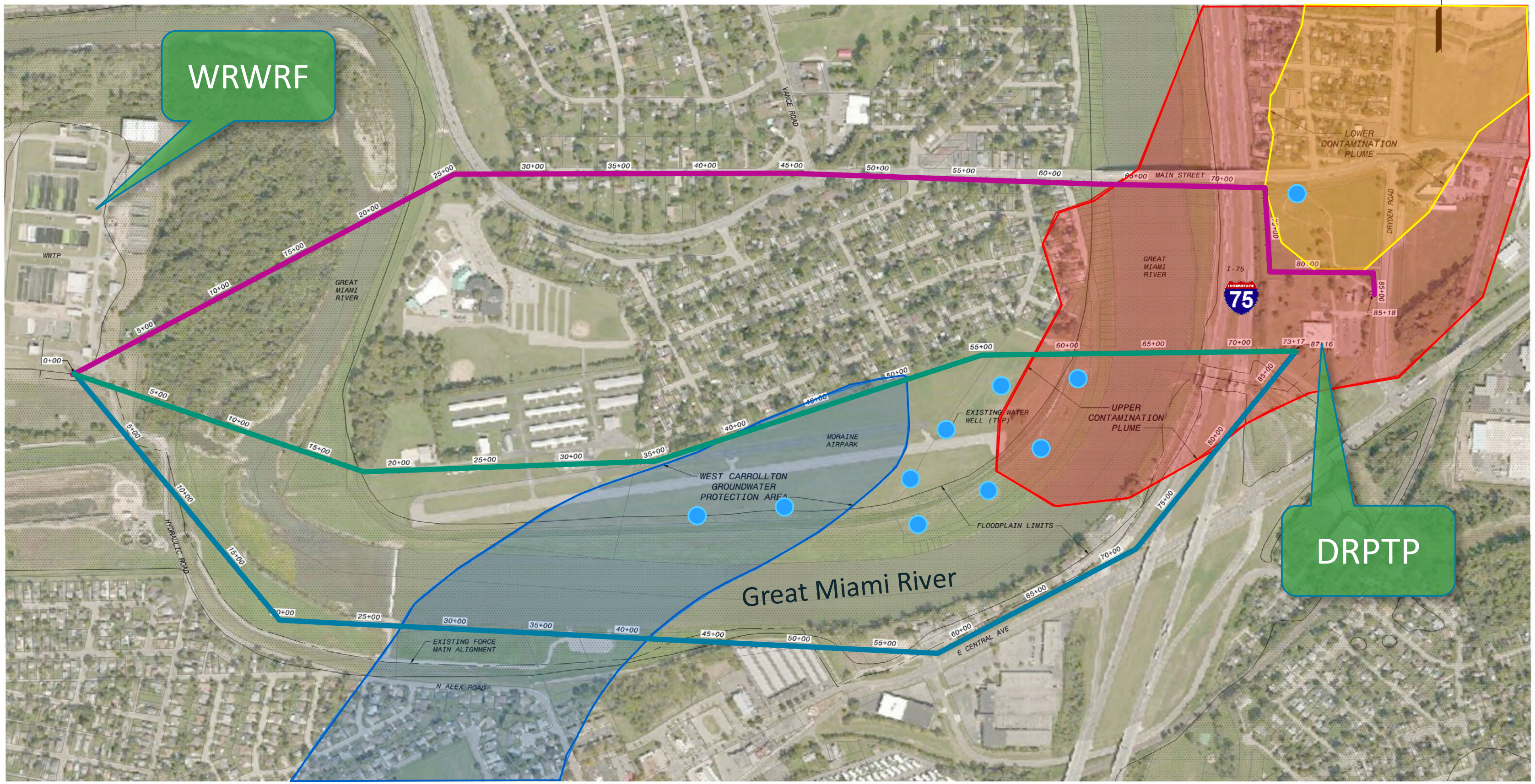
Project Workflow Model



Alignment Alternatives Analysis

Evaluation Criteria:

- Geotechnical Consideration
- Community Impacts
- R/W & Easements
- Impacts to Existing Infrastructure
- Well Fields and Source Water Protection Areas
- Constructability and Construction Risk
- Environmental, Archeological, and Historical
- Regulatory Requirements
- Schedule and Construction Duration
- Operation & Maintenance
- Cost
- Delivery Approach



300' 150' 0 300' 600'
HORIZONTAL SCALE 1"=300'

PRELIMINARY - NOT FOR CONSTRUCTION

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DRYDEN ROAD PUMP STATION
ALIGNMENT ALTERNATIVES

CIVIL
PLAN AND PROFILE
OVERALL SITE PLAN

DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE:

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PROJECT
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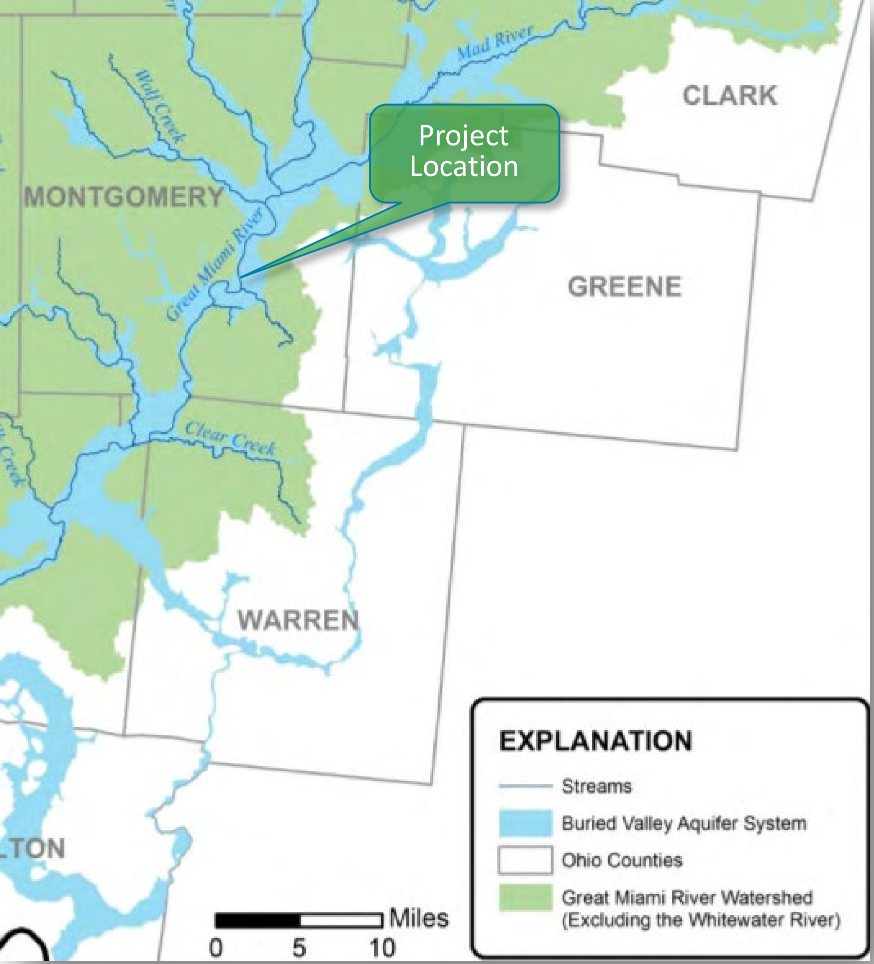
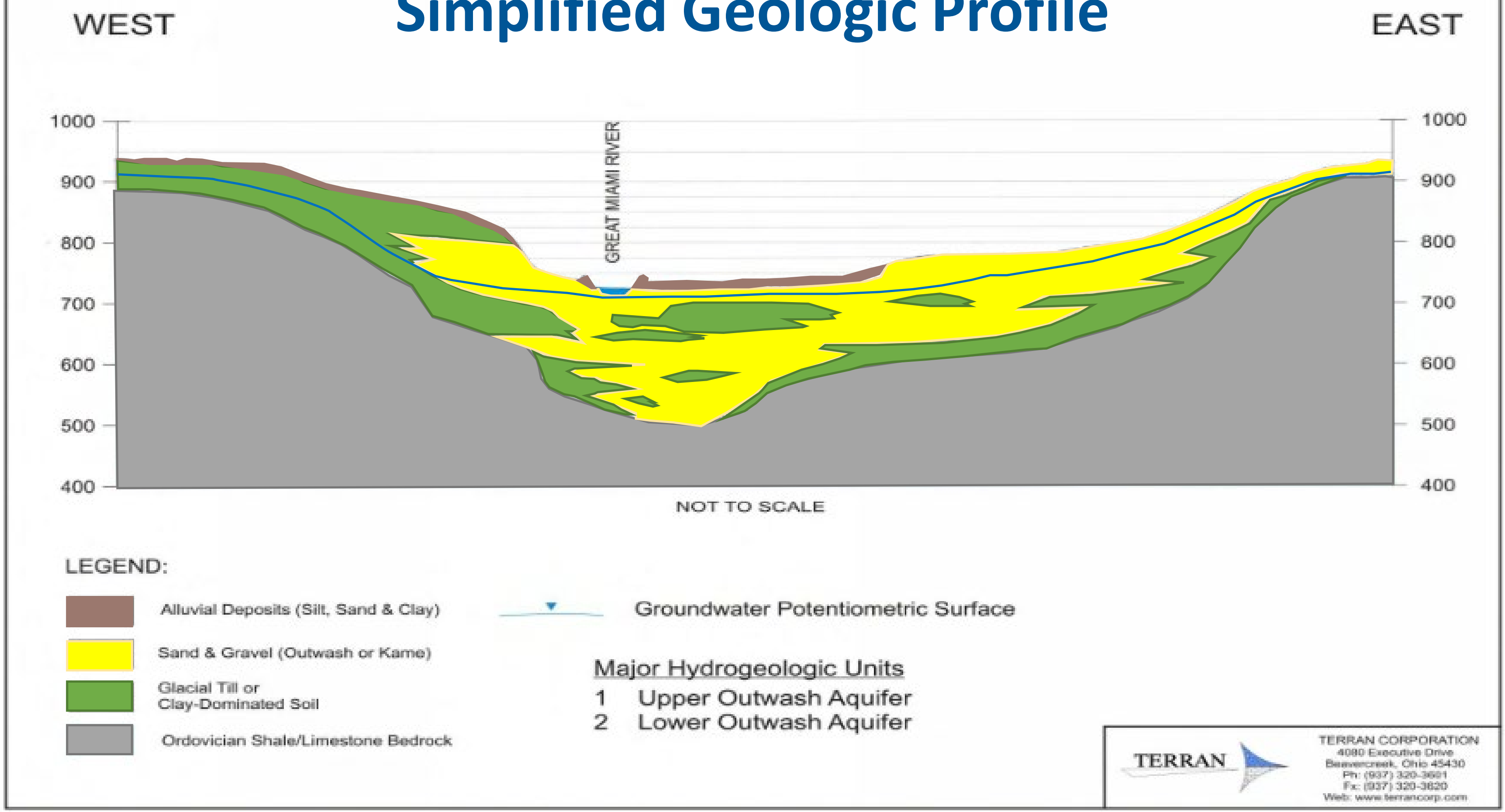


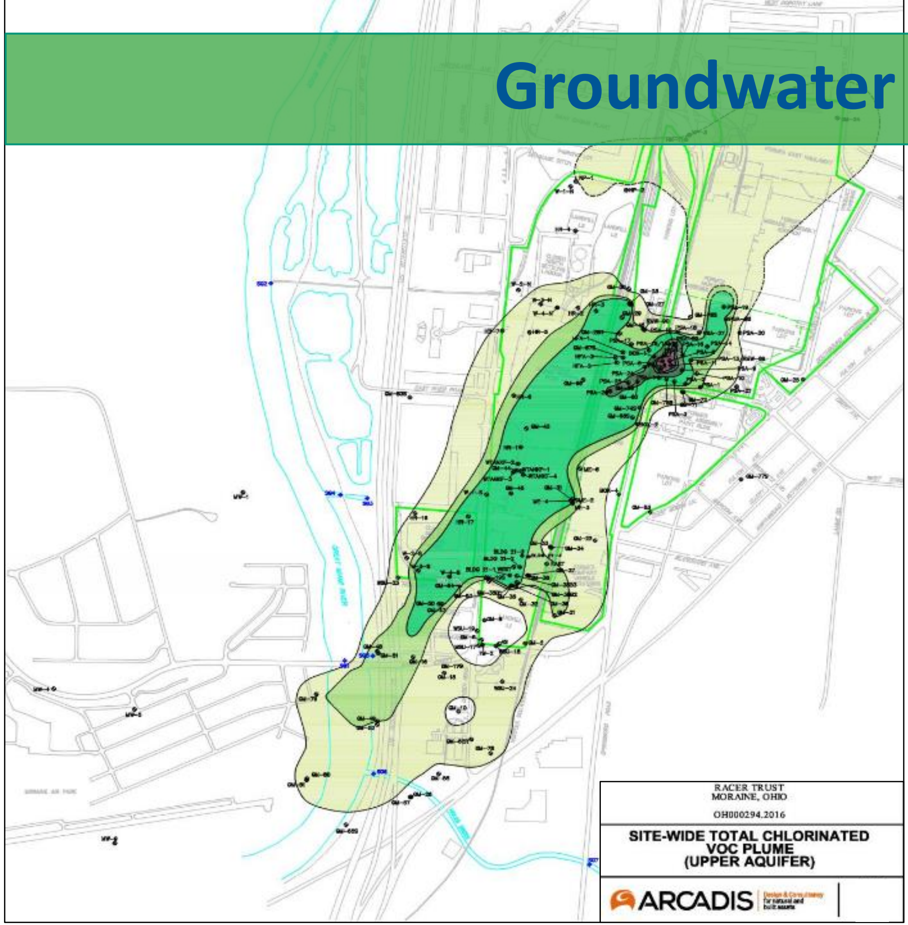
Geotechnical & Hydrogeological Conditions

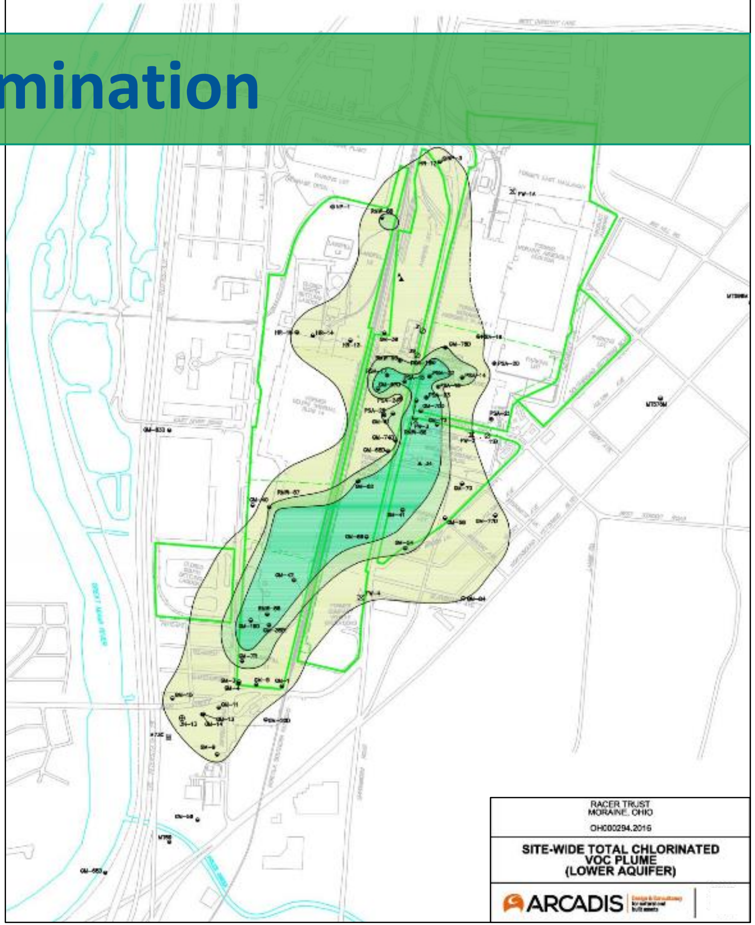
- Fill
- Alluvium
  - Fine to coarse grained soils deposited from flooding
- Glacial Till
  - Lenses of silts and clays
- Glacial Outwash
  - Sand
  - Gravel
  - Cobbles and boulders

Simplified Geologic Profile

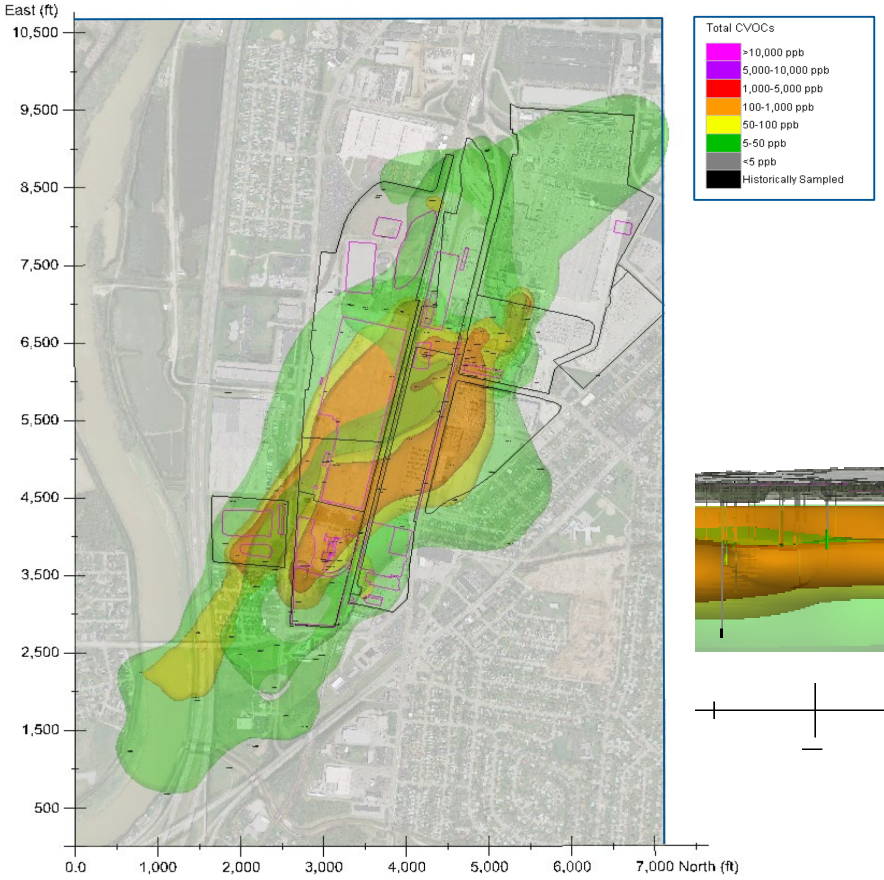


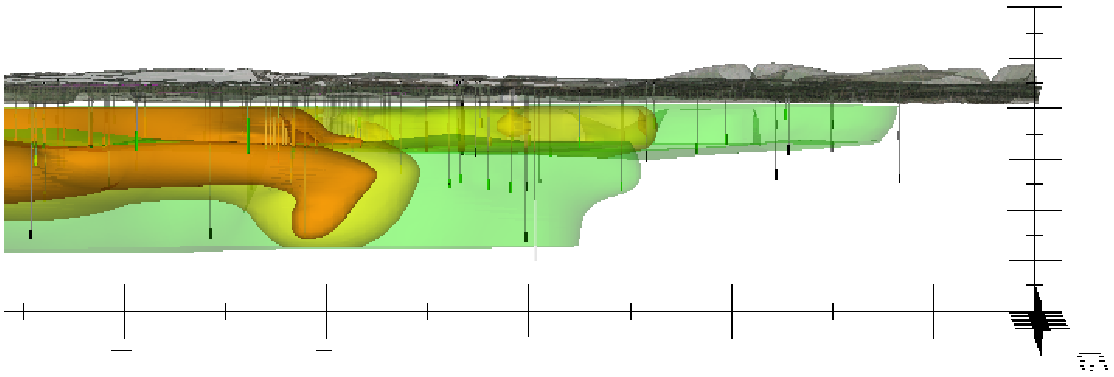
Groundwater Contamination





3D Groundwater Model





Conveyance Construction Method Alternatives

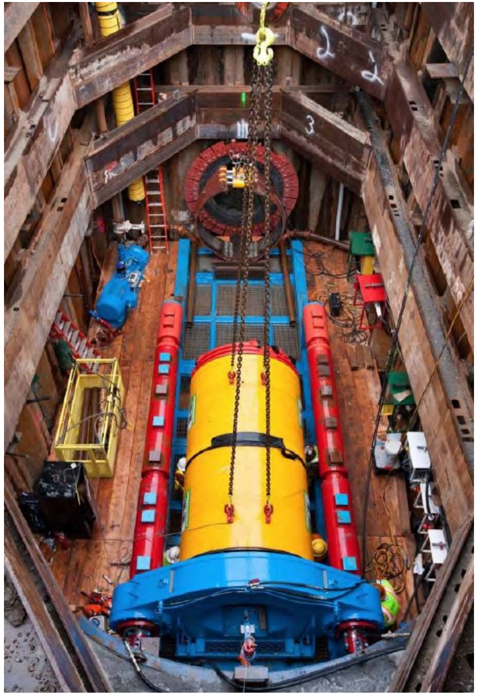
- **FORCE MAIN**
  - Likely Dual 36” Diameter due to Wide Flow Rate Range
  - Likely installed using HDD and Open Cut techniques
  - Requires Air Release Valves
- **Conventional Gravity Sewer**
  - Diameter Dependent on Slope
  - Significant Obstacles, May Prove Impractical
- **GRAVITY MICROTUNNEL**
  - 72” OR 84”
  - Slurry Construction
  - Approximately 40 – 55 ft. Below Grade
- **Large Diameter Tunnel**
  - 12 – 14 ft. Finished Diameter
  - 65 – 80 ft. Below Grade
  - Provides 4 – 6 MG of Storage

Construction Methods:

Horizontal Directional Drilling

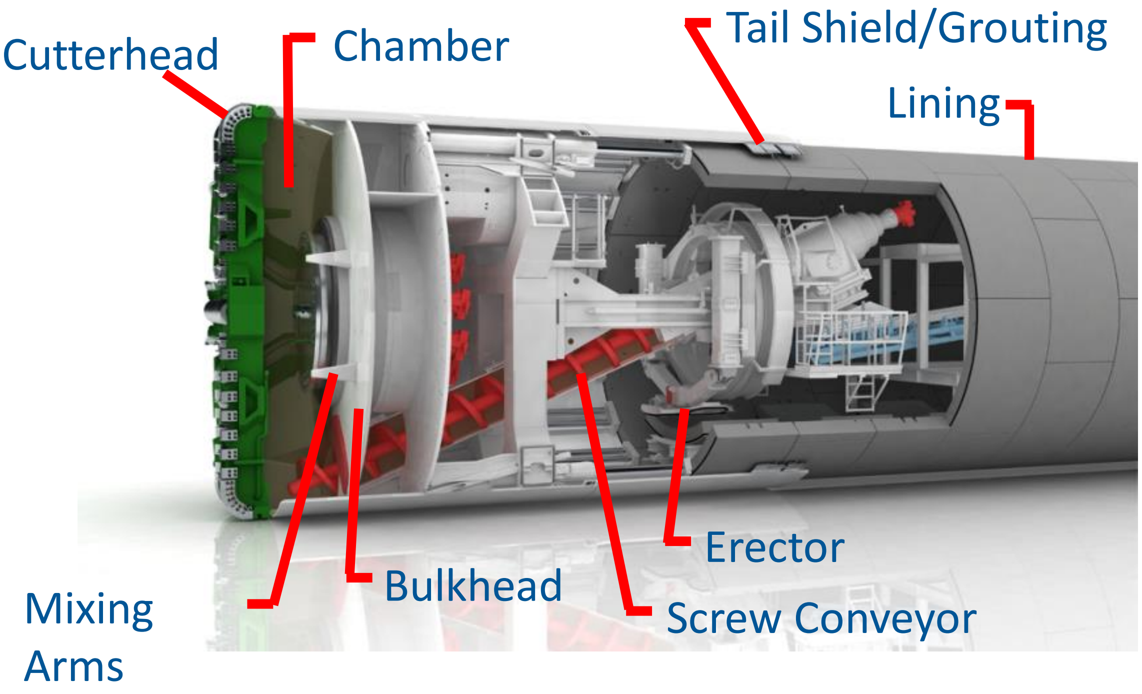
Open-Cut

Microtunneling



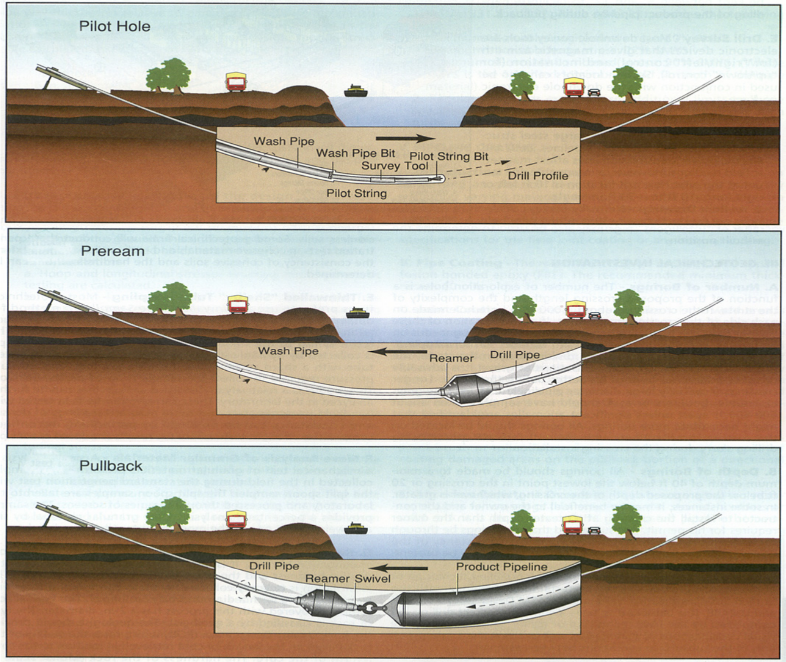
Construction Methods:

EPB TBM



Construction Methods: FORCE MAIN – Horizontal Directional Drilling (HDD

The HDD Process



Design Criteria:

- **Cover**: 15-20 feet
- **Curvature/Radii**: 600 feet (100*nominal dia. drill pipe)
- **Entry angle of pipe:** 8-20°
- **Exit angle of pipe:** 5-12°

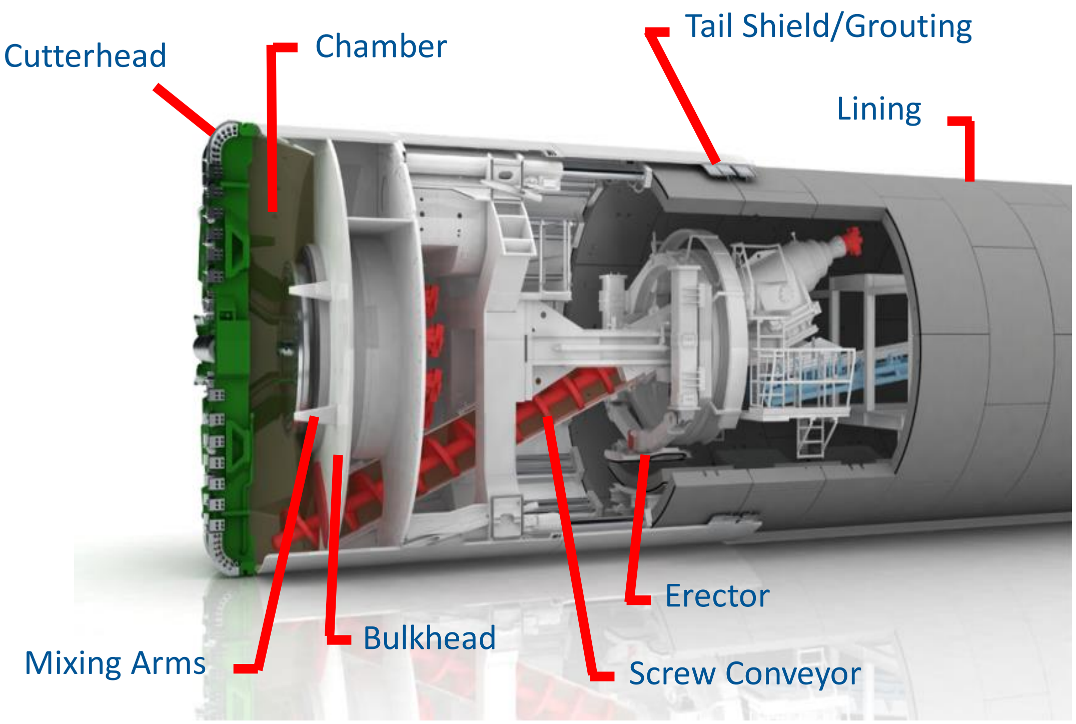
Construction Methods:
MICROTUNNEL

Design Criteria:

- Closed Face/Slurry
- Wide Range in Soil Materials (Proficient in Clean Sands/Gravels)
- Capable of Counterbalancing Hydrostatic/Earth Pressures

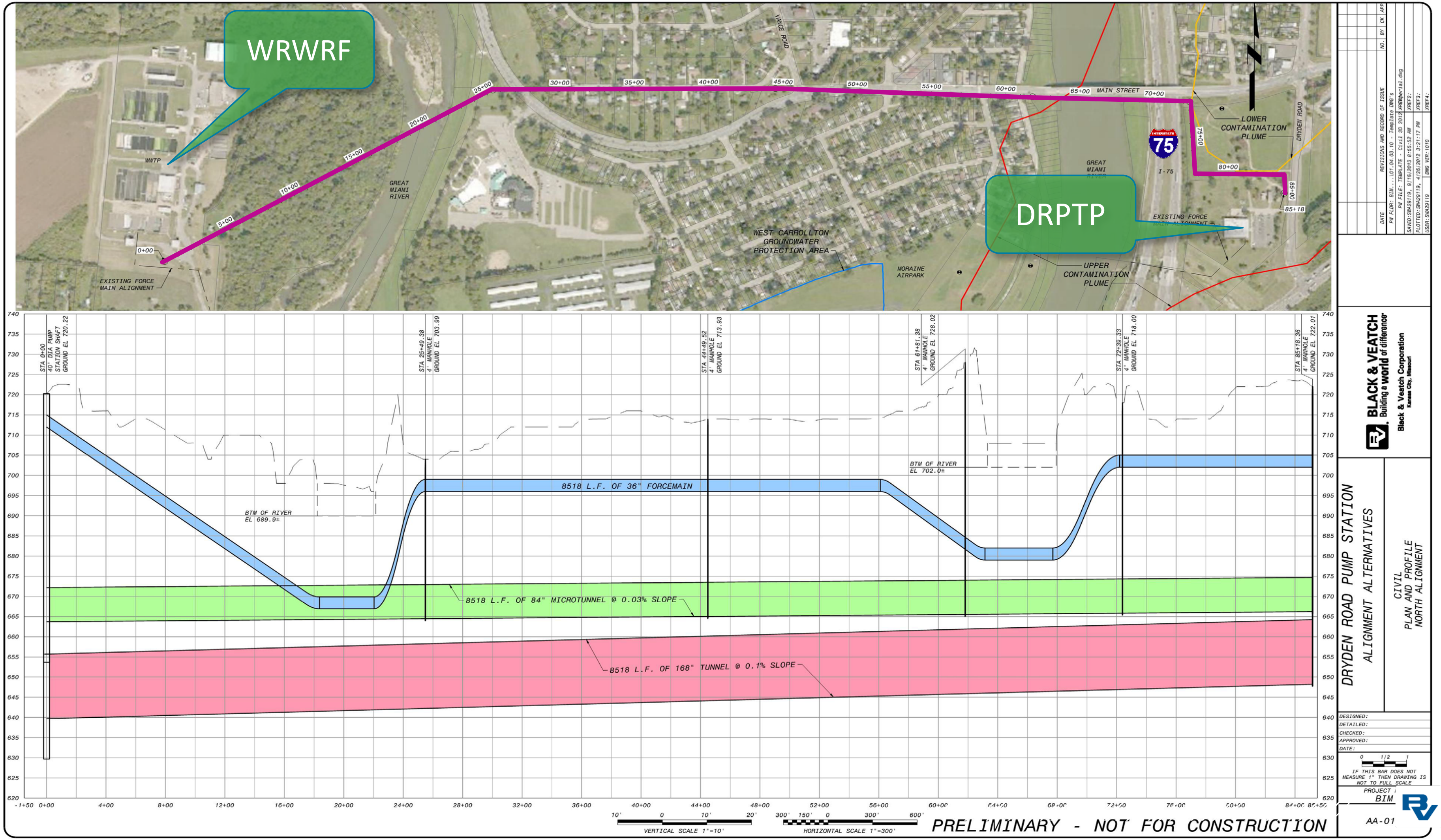
- **Max Drive Lengths: ~**2,000 ft
- **Cover**: 2 tunnel diameters
- **Curvature/Radii**: min. 1,150 ft (400 ft with jack control)
- **Working Shafts:** Water tight

Construction Methods: EPB or SLURRY TBM



Design Criteria:

- Suitable Ground – Firm, Raveling, Running, Flowing, Squeezing
- Large Hydrostatic Heads
- Most Proficient in Fine Grained Soils that are Readily Plasticized
- Coarse Grained Soils Require Polymer Foams
- Employs 1-Pass Tunneling with Pre-Cast Concrete Segments
- 84-inch to 40+ feet
- Shallow Horizontal & Vertical Curves
- Grades up to 5%
- Pipe Jacking Capabilities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50+00
55+00
60+00
65+00
MAIN STREET
70+00
75+00
80+00
85+00
85+18
VANCE ROAD
DRYDEN ROAD
GREAT MIAMI RIVER
LOWER CONTAMINATION PLUME
UPPER CONTAMINATION PLUME
WEST CARROLLTON GROUNDWATER PROTECTION AREA
MORAINE AIRPARK
I-75
75
EXISTING FORCE MAIN ALIGNMENT
STA 0+00 40' DIA PUMP STATION SHAFT GROUND EL 720.22
STA 25+49.38 4' MANHOLE GROUND EL 703.99
STA 44+49.52 4' MANHOLE GROUND EL 713.93
STA 61+81.38 4' MANHOLE GROUND EL 728.02
STA 72+39.33 4' MANHOLE GROUND EL 718.00
STA 85+18.36 4' MANHOLE GROUND EL 722.01
BTM OF RIVER EL 689.9±
BTM OF RIVER EL 702.0±
8518 L.F. OF 36" FORCEMAIN
8518 L.F. OF 84" MICROTUNNEL @ 0.03% SLOPE
8518 L.F. OF 168" TUNNEL @ 0.1% SLOPE
VERTICAL SCALE 1"=10'
HORIZONTAL SCALE 1"=300'
PRELIMINARY - NOT FOR CONSTRUCTION
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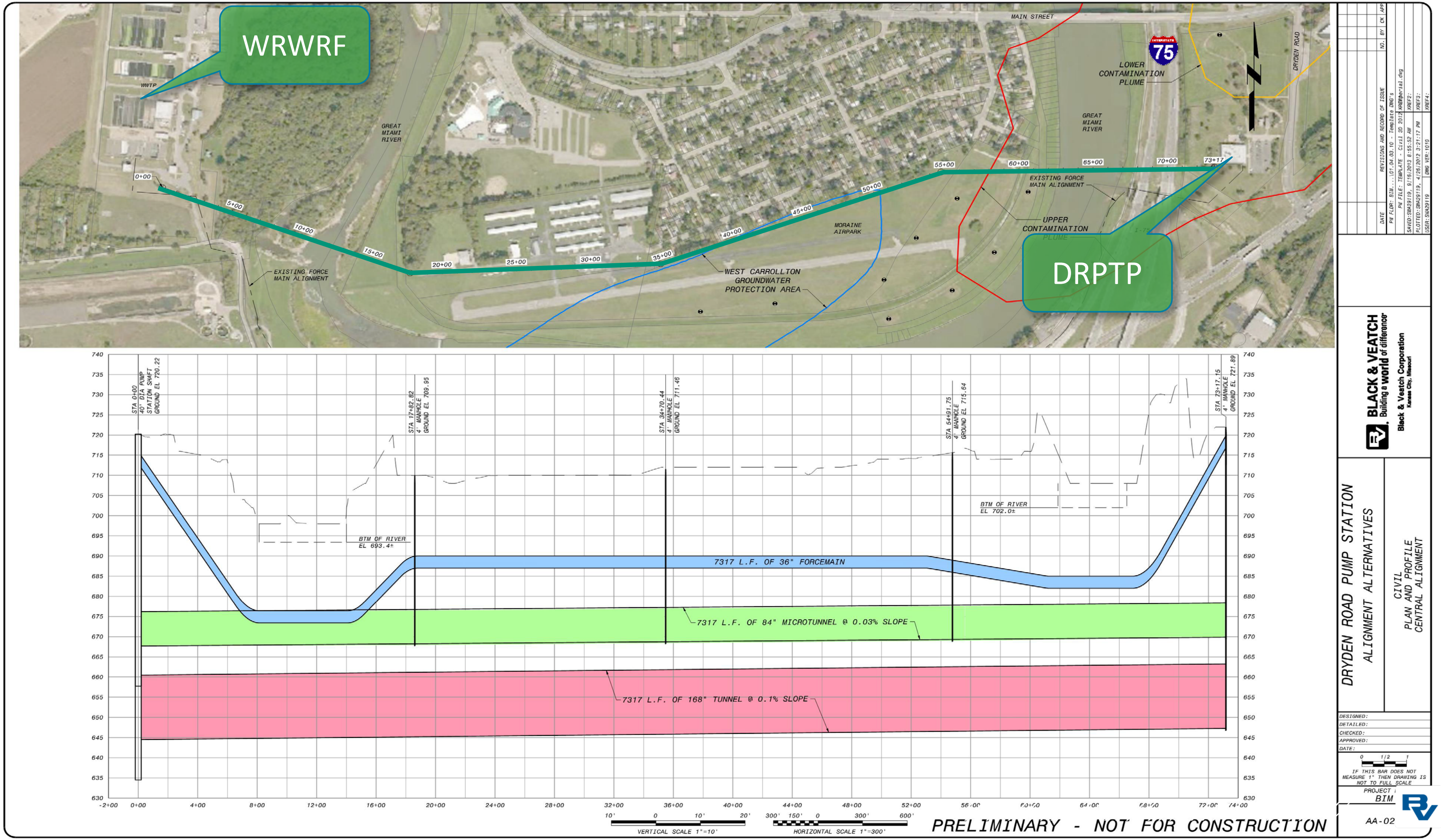
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MAIN STREET
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LOWER CONTAMINATION PLUME
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MORAINE AIRPARK
WEST CARROLLTON GROUNDWATER PROTECTION AREA
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45+00
50+00
55+00
60+00
65+00
70+00
73+17
STA 0+00 40' DIA PUMP STATION SHAFT GROUND EL 720.22
STA 17+82.82 4' MANHOLE GROUND EL 709.95
STA 34+70.44 4' MANHOLE GROUND EL 711.46
STA 54+91.75 4' MANHOLE GROUND EL 715.64
STA 73+17.15 4' MANHOLE GROUND EL 721.89
BTM OF RIVER EL 693.4±
BTM OF RIVER EL 702.0±
7317 L.F. OF 36" FORCEMAIN
7317 L.F. OF 84" MICROTUNNEL @ 0.03% SLOPE
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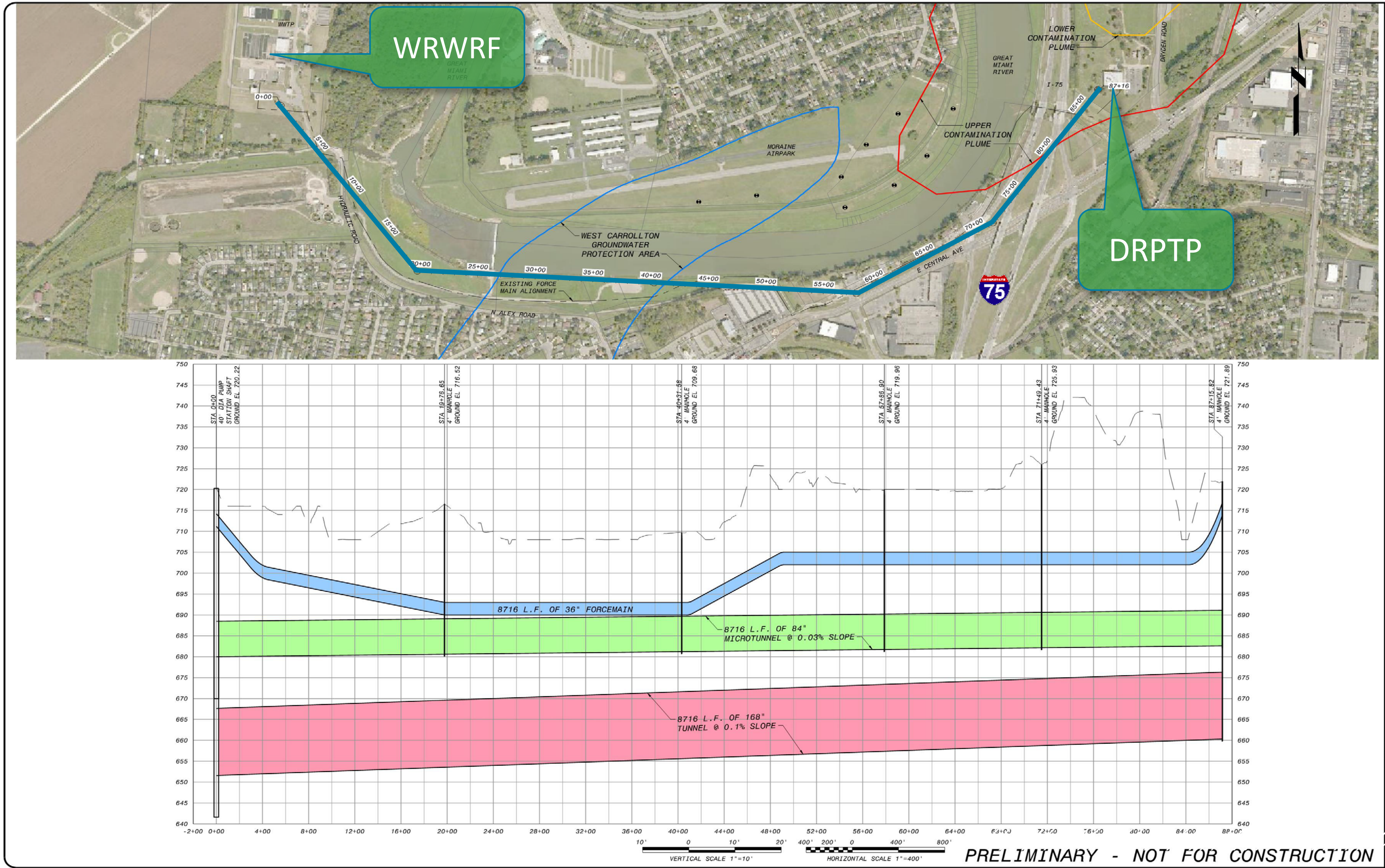

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ALIGNMENT ALTERNATIVES

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PLAN AND PROFILE
SOUTH ALIGNMENT

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DATE:

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PROJECT
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Conveyance Alignment Alternatives

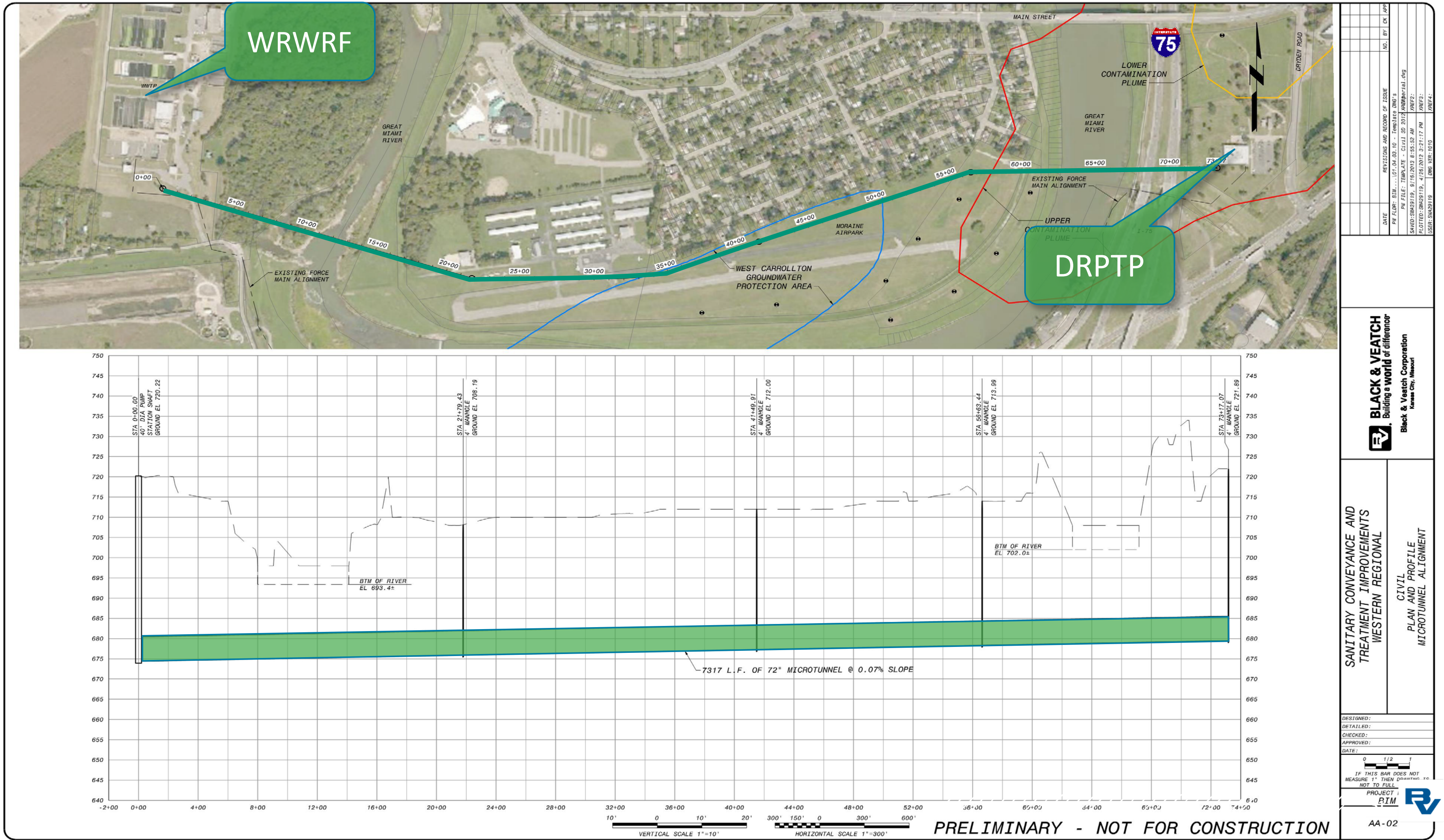
Alignment	Conveyance Type	Geotechnical Considerations	Community Impacts	R/W & Easements	Impacts to Existing Infrastructure	Well Fields and Source Water Protection Areas	Constructability and Construction Risk	Environmental Archeological Historical	Regulatory Requirements	Schedule and Construction Duration	Operation & Maintenance	Cost	Delivery Approach	Total
		Evaluation Criteria												
	Weighted Factor	5	8	5	6	6	10	2	4	9	6	8	3	
North	Force Main	2	2	3	2	3	1	2	2	3	2	2	3	157
	Gravity Micro Tunnel	2	2	3	2	3	3	3	2	2	3	2	3	176
	Gravity Large Diameter Tunnel	2	3	3	3	3	3	3	3	1	3	1	2	187
Central	Force Main	2	3	3	2	2	3	2	2	3	2	3	3	[illegible]
	Gravity Micro Tunnel	2	3	3	2	2	3	3	2	3	3	3	3	195
	Gravity Large Diameter Tunnel	2	3	3	3	2	3	3	3	2	3	1	2	[illegible]
South	Force Main	2	1	2	1	1	2	2	2	3	2	2	3	177
	Gravity Micro Tunnel	2	1	2	2	1	2	3	2	2	3	1	3	[illegible]
	Gravity Large Diameter Tunnel	2	3	1	2	1	3	3	3	1	3	1	2	146

Alternative Project Delivery

Dryden Replacement Project Components

- Conveyance (72” Microtunnel)
- Pumping & Headworks at WRWRF
- New Environmental Laboratory, located at Spaulding
- Abandonment of Miami Shores Well Field
- Demolition or Abandonment of Existing DRPTP

Project Bundles Dependent on Delivery Methods



WRWRF
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DRPTP
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SANITARY CONVEYANCE AND TREATMENT IMPROVEMENTS WESTERN REGIONAL
CIVIL PLAN AND PROFILE MICROTUNNEL ALIGNMENT
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PROJECT
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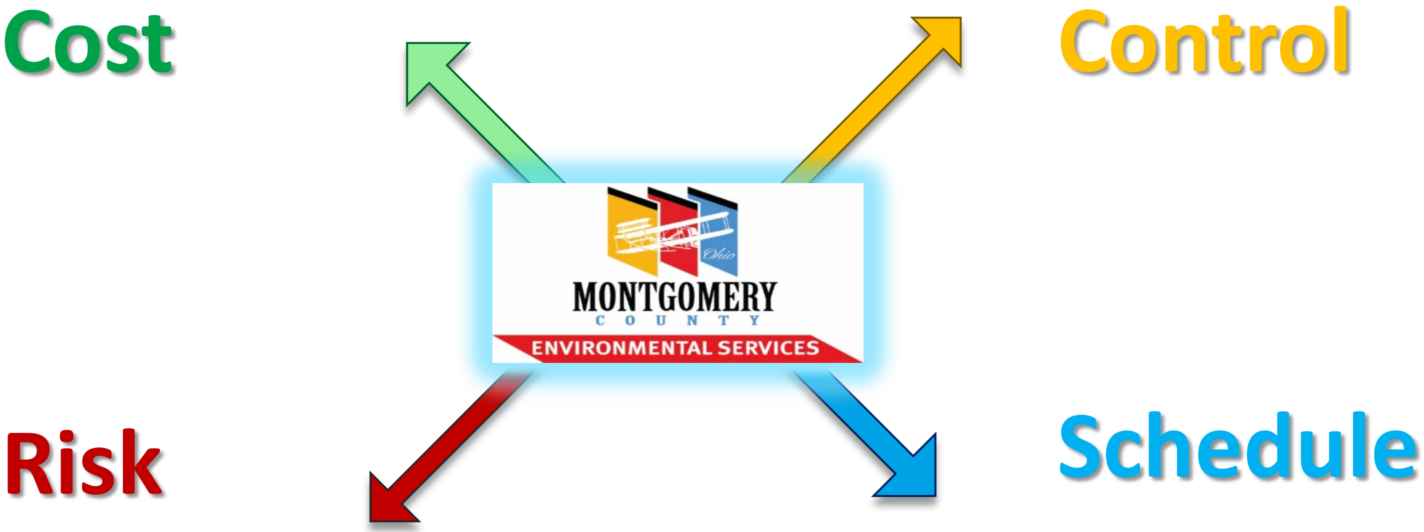
Project Influences and Reactions



Cause and Effect

CAUSE	POTENTIAL EFFECTS
Reduce Cost	*Lengthen Schedule, Increase Risk, Reduce Control*
Reduce Schedule	*Increase Cost, Increase Risk, Reduce Control*
Reduce Risk	*Increase Cost, Lengthen Schedule, Reduce Control*
Increase Control	*Increase Cost, Lengthen Schedule, Increase Risk*

Control = Quality?

Most Common Delivery Methods

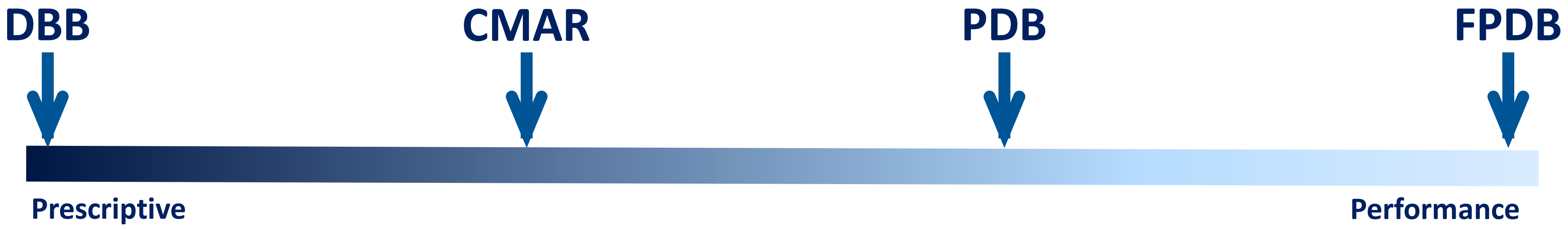
- Design-Bid-Build (Traditional)
- Fixed Price Design-Build
- Progressive Design-Build
- Construction Management at Risk

Alternative Delivery (Collaborative Delivery)

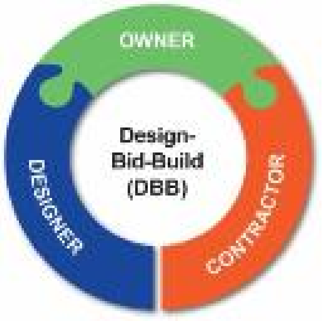
Others: Design-Build-Operate
Design-Build-Finance-Operate-Maintain

Prescriptive Versus Performance Approach

- Delivery methods offer varying degrees of control
- Level of trust should be greater with less Prescriptive approaches
- Performance basis = Speed



Delivery Models



Increasing Collaboration

Project Deliver Summary

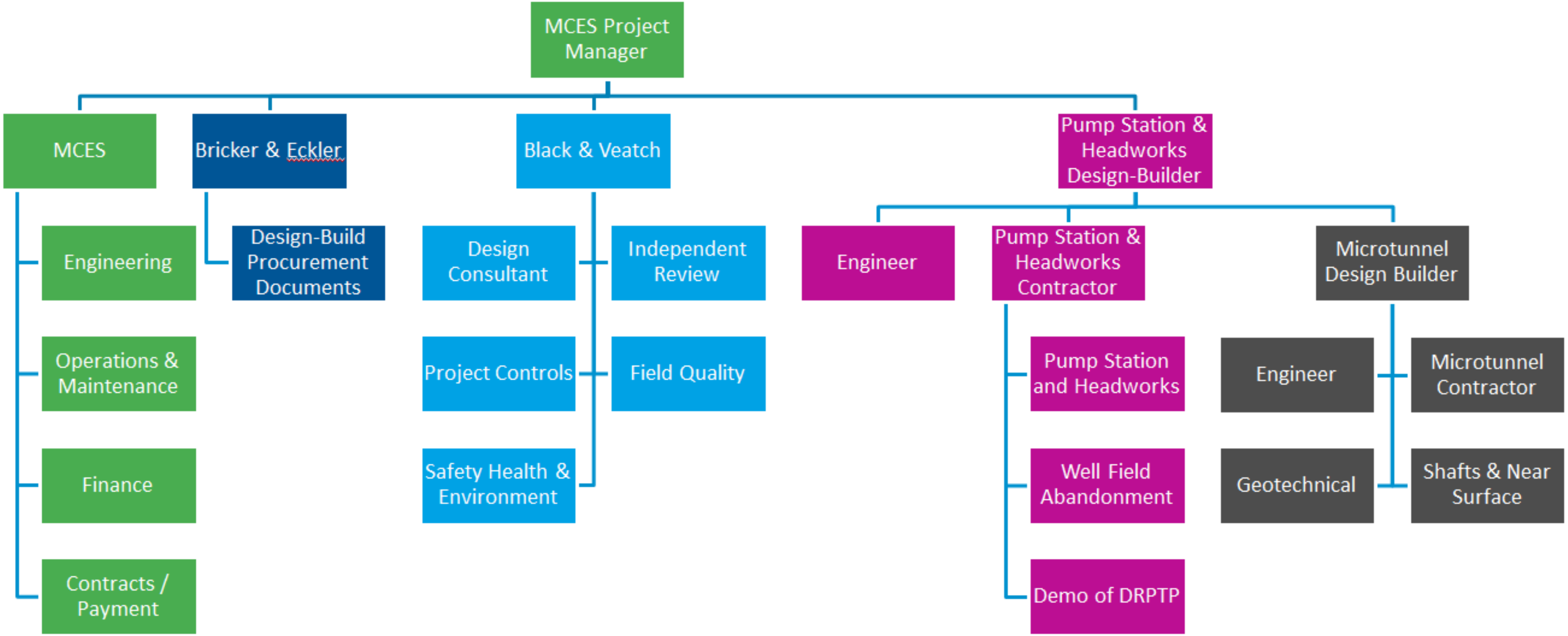
Delivery Method	Advantages	Disadvantages
Design-Bid-Build	Most Owner Control Predictable Final Costs Competitively Bid Engineer Represents Owner's Interests Process Well Understood	Longest Schedule Most Risk to Owner Subject to Change Orders Least Control Over Contractor Selection No Contractor Input to Design
Fixed Price Design-Build	Single Contract Shortest Schedule Cost Established Early	Least Owner Control Over Design Subject to Change Orders
Progressive Design-Build	Single Contract Shorter Schedule Than CMAR and DBB Qualifications-Based Selection	Pace of decision making process Owner's resources needed
Construction Management at Risk	CM/GC Selected Based on Qualifications Cost Updated Throughout Design Construction Can Begin Before Design Completed Control Over Contractor Selection	Owner Responsible for Gaps in Design Longer Schedule Than FPDB or PDB

MCES Project Delivery Requirements

- Single Contract
- Streamlined Procurement Process
- Lower Risk
- Cost Stability (GMP)
- Quals Based Selection
- Collaborative Project

Progressive Design Build

MCES Alternative Project Delivery Team



SCAT-WR Project Update

- DB selected; contract under negotiation
- NTP: Beginning of Q3 2019
- Estimated Project Cost $70M
- Expected Project Completion: Q1 2023

Questions?