REV YOUR ENGINES!
Protecting Our Waterways

The DigIndy Tunnel Program

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Presentation by:

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Presentation Overview

• Combined and Separated Sewer Systems History
• Combined Sewer Overflow (CSO) Regulations
• Indianapolis’ CSO Problem
• Indianapolis’ Consent Decree / Long Term Control Plan Solution
• Geotechnical Program
• Dig Indy Tunnel System Update
The Problem: Indy’s Combined Sewer Overflows
Combined Sewer Systems

Regulations:
• Clean Water Act (1972)
• Combined Sewer Overflow Policy (1994)
  & Minimum Controls Policy (1995)
• Financial Capability Guidance (1997)
• Water Quality Standards Guidance (2001)

Challenges:
• Significant capital costs for compliance
• CSO communities have higher wastewater rates
• Low income affordability
• Uncertain closure with U.S. EPA

Solutions & Benefits:
• Consent Decree (CD):
  • Agreement between City of Indianapolis, Citizens, U.S EPA and IDEM (2005)
  • All parties agreed that the LTCP process, per CSO Policy and Indiana law, was followed
• Benefits: Cleaner waterways, public health/recreation and development along waterways
Indy’s Combined Sewer Overflows

- CSO Discharge Points (134)
- CSO Discharge Area (55 square miles)
- CSO Discharge Locations
  - White River  Fall Creek
  - Pogues Run  Pleasant Run
  - Eagle Creek
- CSO Frequency:
  - 60+/- times in a typical year
- CSO Discharge Volumes:
  - (Historically) ~5-6 billion gallons - typical year
  - (Currently) DRTC & Eagle Creek Deep Tunnel are now capturing up to 1 billion gallons more raw sewage per year
We Are Not Alone

Over 100 Indiana Cities / Towns

Close to 800 U.S. Cities
Sustainable Solutions – Indy’s CSO LTCP Overview

- Multi-Faceted CSO Long Term Control Plan:
  - Using Existing System Capacity
  - Expanding / Upgrading Advanced Wastewater Treatment Plants
  - Constructing New Storage and Conveyance
Overview of the DigIndy System

- Six deep rock tunnel segments
- 28 miles of deep rock tunnel
- 250 feet deep
- 20-foot bore
- 12-inch concrete liner
- 18-foot finished tunnel
- 270+ million gallons
- 13 years to construct
- Completed by 2025
Deep Tunnel Components
Consent Decree Milestones

- 12/31/2017 – Deep Rock Tunnel Connector ✔
- 12/31/2017 – DRTC Pump Station ✔
- 12/31/2018 – Eagle Creek Deep Tunnel ✔
- 12/31/2021 – White River Tunnel ✔
- 12/31/2021 – Lower Pogues Run Tunnel ✔
- 12/31/2021 – Upper Pogues Run CSO Abatement ✔
- 12/31/2025 – Fall Creek Tunnel ✔
- 12/31/2025 – Pleasant Run Tunnel ✔
Geotechnical Program Summary
Geotechnical Investigations

- Over 350 borings drilled up to 300 feet below the ground surface
- Vertical and inclined deep rock borings performed
- Piezometers and cluster monitoring wells set in vertical borings
- Sampling and testing of physical rock and soil characteristics
- Soil and groundwater environmental screening and sampling
- Hydraulic packer testing of bedrock permeability
Summary of Geotechnical Findings

- Rock Quality Designation (RQD) indicates bedrock is sound and relatively consistent, and not heavily fractured.
- Unconfined Compressive Strength (UCS) averaged 9,000 to 10,000 pounds per square inch (psi).
- Tunneling-Related Rock Testing
  - Drilling Rate Index – High to Extremely High (66 to 82)
  - Bit Wear Index – Very Low to Extremely Low (6 to 12)
Illustrative Representation of Indianapolis’ Geology
Fall Creek Drop Shaft FC-06
Fall Creek CCS Phase I
Meridian Street
Diversion Structure
How deep is “Deep”?

- Statue of Liberty, New York, NY: 284 ft. tall
- Soldiers and Sailors Monument, Indianapolis, IN: 305 ft. tall

Citizens’ Tunnel Depth: 250 ft.
DRTC Pump Station

- Construction Start – April 2014
- Operation – December 2017
- Current Construction Costs - ~$75M
DRTC Pump Station Cavern

- 100 feet long
- 60 feet wide
- 75 feet high
- Domed Arch Ceiling
- 700+ Rock Bolts
- 90+ Blasts to Excavate
Pump Station Elevator and Stair Tower

Finished Floor to Cavern Floor

- 266.83 feet
- 22-1/2 flights of stairs
- 495 individual steps
- 3 safety breathing equipment cabinets
Deep Rock Tunnel Connector

- **Fall Creek Deep Tunnel**
  - 1.8 miles of 18-foot finished diameter tunnel
  - 12 drop shafts
  - 4,400 feet of 24-inch to 108-inch diameter consolidation sewers

- **White River Deep Tunnel**
  - 3.8 miles of 18-foot finished diameter tunnel
  - 7 drop shafts
  - 4,800 feet of 24-inch to 108-inch diameter consolidation sewers

- **Lower Pogues Run Deep Tunnel**
  - 1.5 miles of 18-foot finished diameter tunnel
  - 3 drop shafts
  - 1,400 feet of 72-inch to 144-inch diameter consolidation sewers

- **Pleasant Run Deep Tunnel**
  - 2.3 miles of 18-foot finished diameter tunnel
  - 10 drop shafts
  - 16,600 feet of 24-inch to 72-inch diameter consolidation sewers

- **Eagle Creek Deep Tunnel**
  - 1.7 miles of 18-foot finished diameter tunnel
  - 1 drop shaft
  - 3,800 feet of 48-inch diameter consolidation sewers

- **Deep Rock Tunnel Connector and Pump Station**
  - 1.6 miles of 18-foot finished diameter tunnel to Southport AWTP
  - 9 drop shafts
  - 90 mgd tunnel pump station at Southport AWTP

*citizens energy group*

*2019 NSSGA AGG1 AGGREGATES ACADEMY & EXPO*
The Deep Rock Tunnel Connector & Eagle Creek Deep Tunnel

- First two legs of Citizens’ 28-mile deep tunnel system
- 9.6 miles long
- 250 feet deep
- 20´ bore diameter
- 12´´ thick concrete liner
- 18´ finished diameter
- $220,000,000
- Construction complete, December 2017
DRTC – TBM Fun Facts

- 16 trailing gear decks
- 39 disc cutters (19” dia.) – 280 lbs each
- Cutter head - 92.5 tons
- Entire TBM - 450 tons
- Eight (8) 450hp electric motors
- Cutter head turns at ~ 8rpm
- Cutter head torque - 2,405,737 ft-lbs
- Gripper pads exert up to 7M lbs of force against the rock
- Cutter head exert up to 3M lbs of thrust at the face
- One foot of mined rock = approx. 20 yd³ of rock spoils
Launch Shaft
Eagle Creek Tunnel

FALL CREEK DEEP TUNNEL
- 3.8 miles of 18-foot finished diameter tunnel
- 11 drop shafts
- 4,500 feet of 72-inch to 108-inch diameter consolidation sewers

WHITE RIVER DEEP TUNNEL
- 5.8 miles of 18-foot finished diameter tunnel
- 7 drop shafts
- 4,800 feet of 42-inch to 108-inch diameter consolidation sewers

LOWER POUGUES RUN DEEP TUNNEL
- 5.3 miles of 18-foot finished diameter tunnel
- 5 drop shafts
- 4,700 feet of 72-inch to 108-inch diameter consolidation sewers

PLEASANT RUN DEEP TUNNEL
- 7.3 miles of 18-foot finished diameter tunnel
- 10 drop shafts
- 10,600 feet of 48-inch to 72-inch diameter consolidation sewers

EAGLE CREEK DEEP TUNNEL
- 1.7 miles of 18-foot finished diameter tunnel
- 1 drop shaft
- 2,800 feet of 48-inch diameter consolidation sewers

DEEP ROCK TUNNEL CONNECTOR AND PUMP STATION
- 7.6 miles of 18-foot finished diameter tunnel to Southport AWTP
- 3 drop shafts
- 90 mgp tunnel pump station at Southport AWTP
Unique Spoils
DRTC – TBM World Records

- Most Feet Mined - One Day
  409.89 feet
- Most Feet Mined - One Week
  1,690.04 feet
- Most Feet Mined - One Month
  5,755.15 feet
DRTC – Break Through
Concrete Lining - Formwork
DRTC Completed Tunnel
What’s Next?
Two Down – Four to Go

- White River Tunnel - 2021
- Lower Pogues Run Tunnel - 2021
- Fall Creek Tunnel - 2025
- Pleasant Run Tunnel - 2025
White River & Lower Pogues Run

- 3rd and 4th legs of DigIndy system
- 7.8 miles feet of rock tunnel
- Construction began September 2016
- First segment of White River Tunnel and all Lower Pogues Run tunnel mining is complete
- $200,000,000 contract value
- December 31, 2021
• Deep Rock Tunnel Connector & Pump Station and Eagle Creek Deep Tunnel
  • Designer – AECOM
  • Construction Administrator – AECOM
  • Tunnel Contractor – Shea Kiewit JV
  • Pump Station Contractor – Renda Southland JV

• White River, Lower Pogues Run, Fall Creek and Pleasant Run Tunnels
  • Designer – Black & Veatch
  • Construction Administrator – AECOM
  • Tunnel Contractor – Shea Kiewit JV
  • Consolidation Sewer Contractor(s) - TBD