

Project Update: Water Resources

Southwest Light Rail Transit: Kenilworth Shallow LRT Tunnels Water Resources Evaluation

DRAFT

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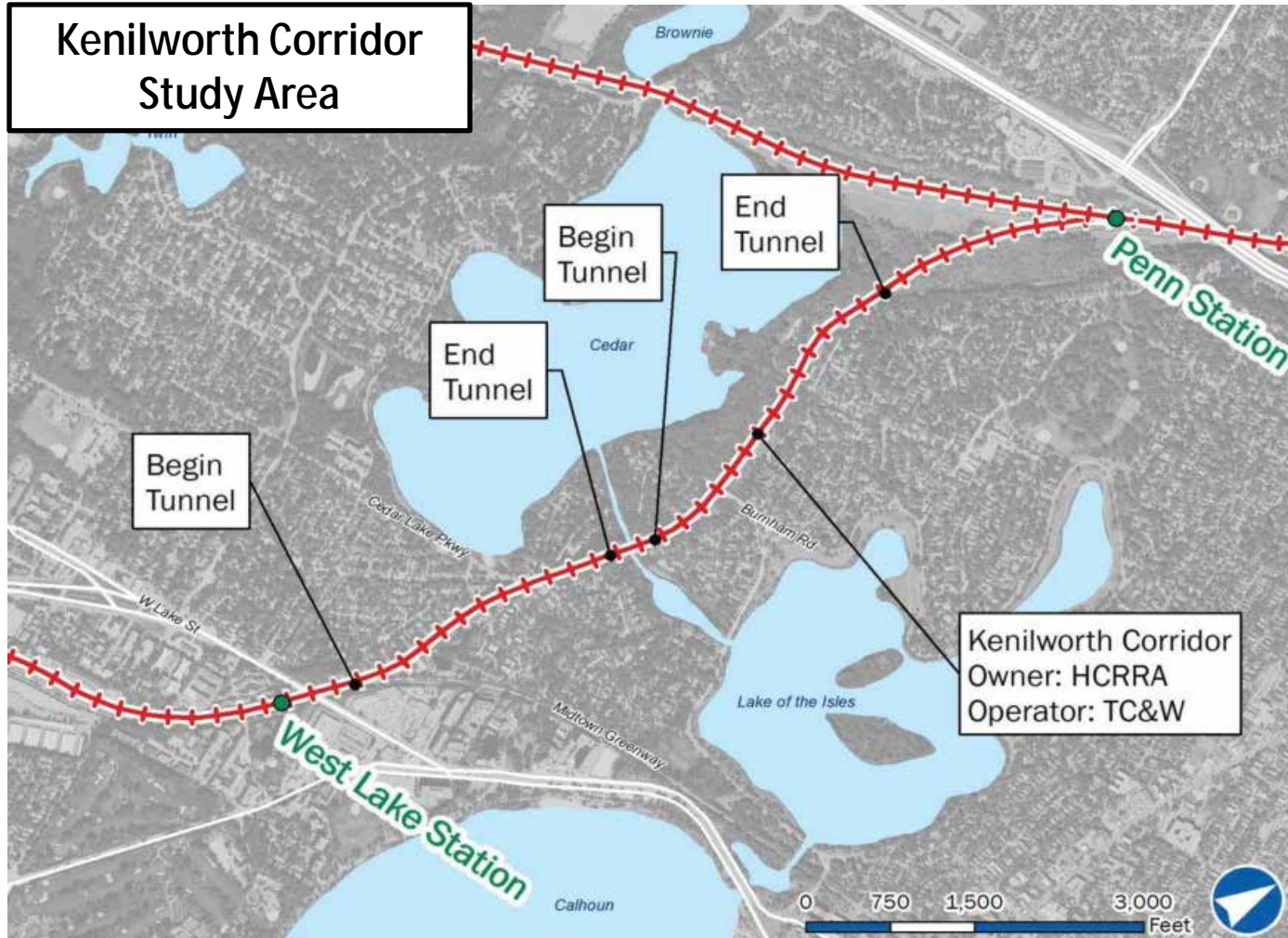
- Serving Minnesota since 1913
- 4,300 Employee Owners (EOs)
- 75 Local EOs



Bloomington, MN Office



- Background
 - Scope
 - Team
 - Project Understanding
- Approach
- Evaluation/Key Findings
- Recommendations



- Conduct an independent engineering evaluation and technical review
 - Kenilworth Shallow LRT Tunnel Basis of Design Report – Draft (BODR)
 - September 4, 2013 SWLRT Project Office (SPO) letter to Minnehaha Creek Watershed District (MCWD)
 - September 10, 2013 MCWD response letter to SPO
 - September 9, 2013 Wenck Associates, Inc., letter to MCWD
 - SWLRT Water Resources Monitoring Program (WMP)
 - Phase I Environmental Site Assessment

- Address the following:
 - Potential Impacts to Groundwater Elevation
 - Potential Impacts to the Chain of Lakes 'Water Budget'
 - Potential Impacts to Groundwater flow between Cedar Lake and Lake of the Isles
 - Reasonability of Leakage Rates for Permanent Sheet Piling and Waterproofing Systems
 - Reasonability of Construction and Operation Methods to Manage Water in the Project Area
 - Reasonability of the Stormwater Infiltration Design to Address the Potential of Discharging Warmer Water in the Winter
 - Any other potential Impacts to Water Resources in the area



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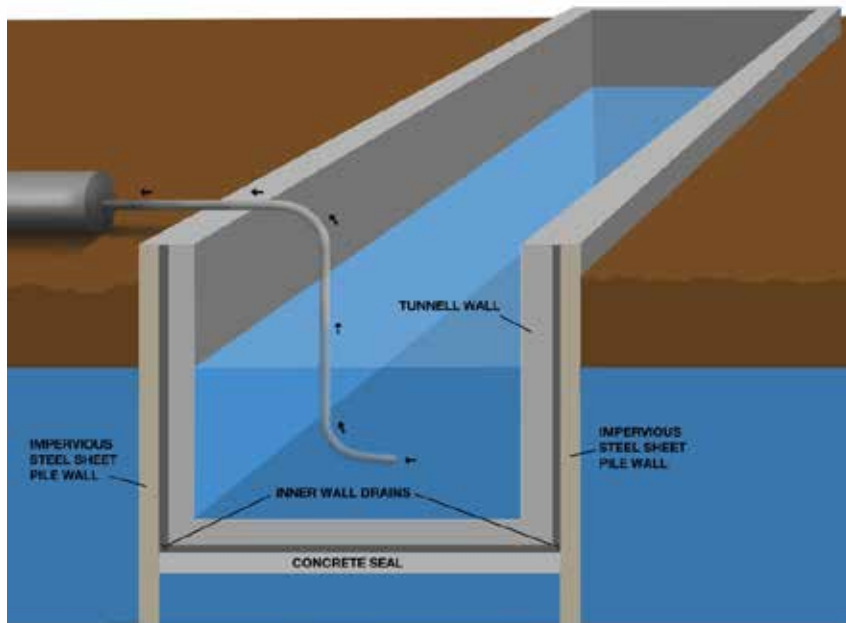
Cathy Stott, PE, PG



Rick Besancon, PE

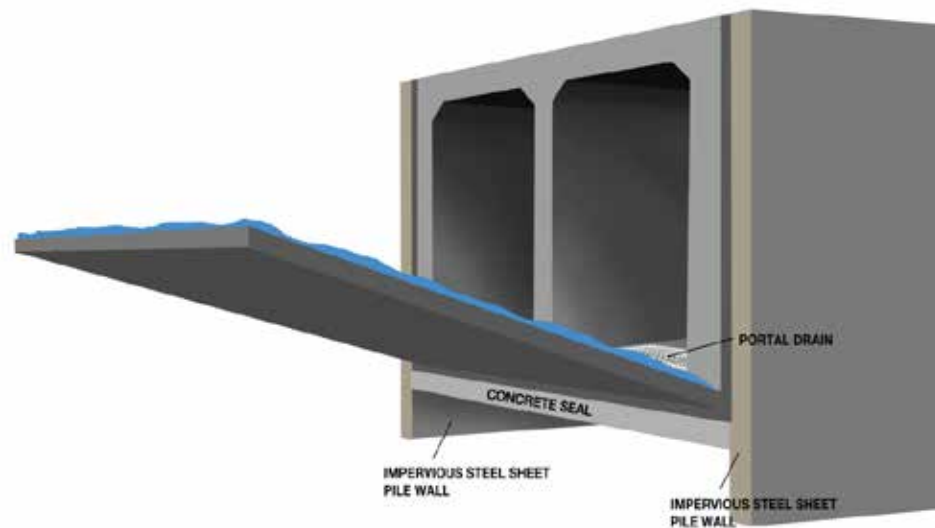


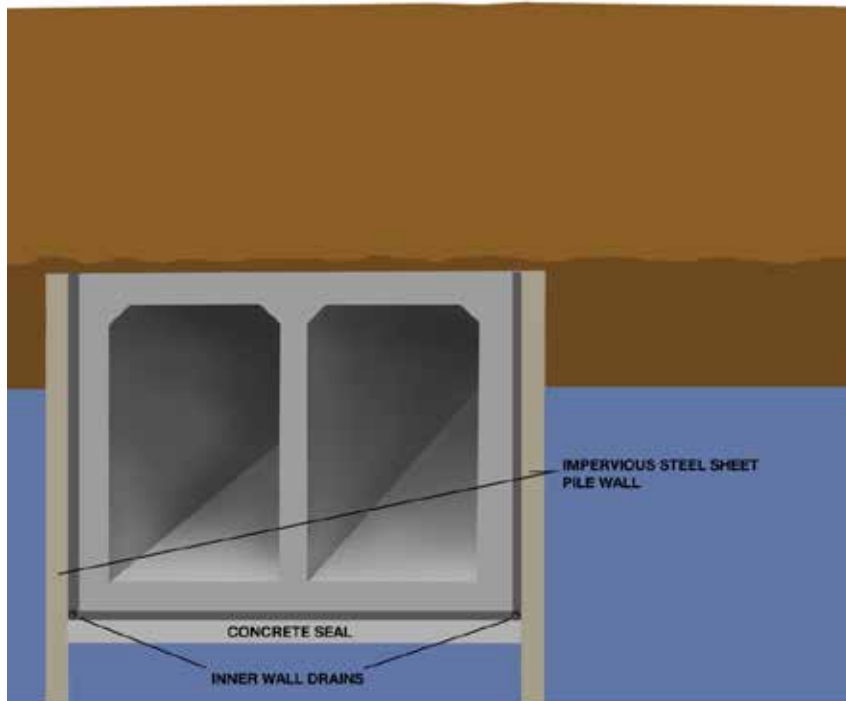
Greg Howick, PhD



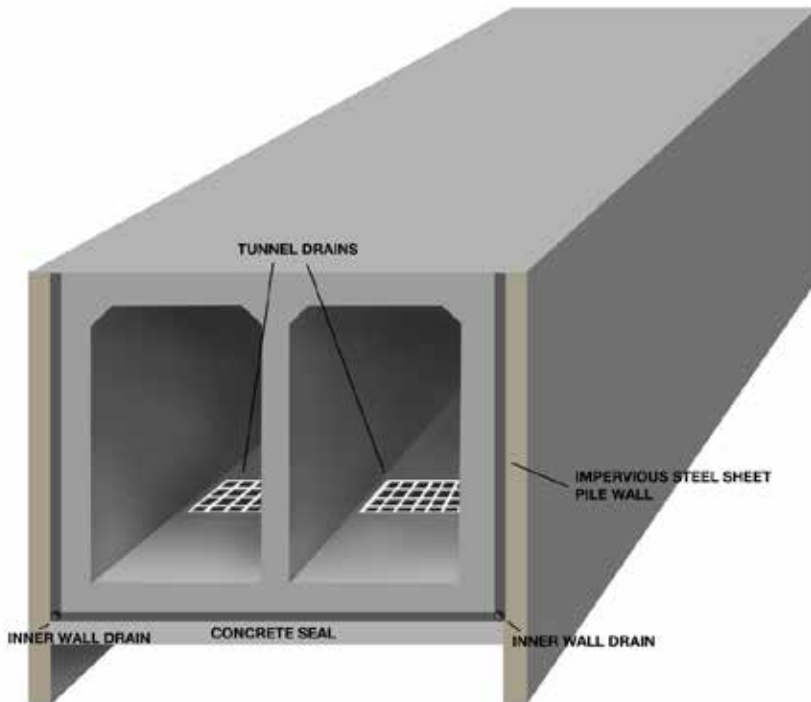
- 150-foot long x 37-foot wide cells
- Impervious Steel Sheet Pile Wall
- Concrete seal at base installed prior to any pumping
- Discharges to
 - Temporary Treatment Facilities (Chain of Lakes)
 - Underground Infiltration Chambers (groundwater)

- Portal Water Control System
 - Collects stormwater and snowmelt
 - Discharges to Underground Infiltration Chambers
 - Groundwater recharge
 - Overflows to storm sewer and chain of lakes





- Inner Wall Water Control System
 - Collects groundwater that may seep through sheet pile wall and concrete seal
 - Discharges to Underground Infiltration Chamber (groundwater)



- Tunnel Water Control System
 - Collects groundwater that may seep through tunnel walls and floor, stormwater and snowmelt
 - Discharges to sanitary sewer system

- Regulatory Requirements
 - MN Department of Natural Resources (DNR)
 - MN Pollution Control Agency (MPCA)
 - Minnehaha Creek Watershed District (MCWD)
- Surface and ground water monitoring plan
 - Quantity
 - Quality
- Plan for:
 - Establishing baseline conditions
 - Detecting changes
 - Corrective action, if necessary

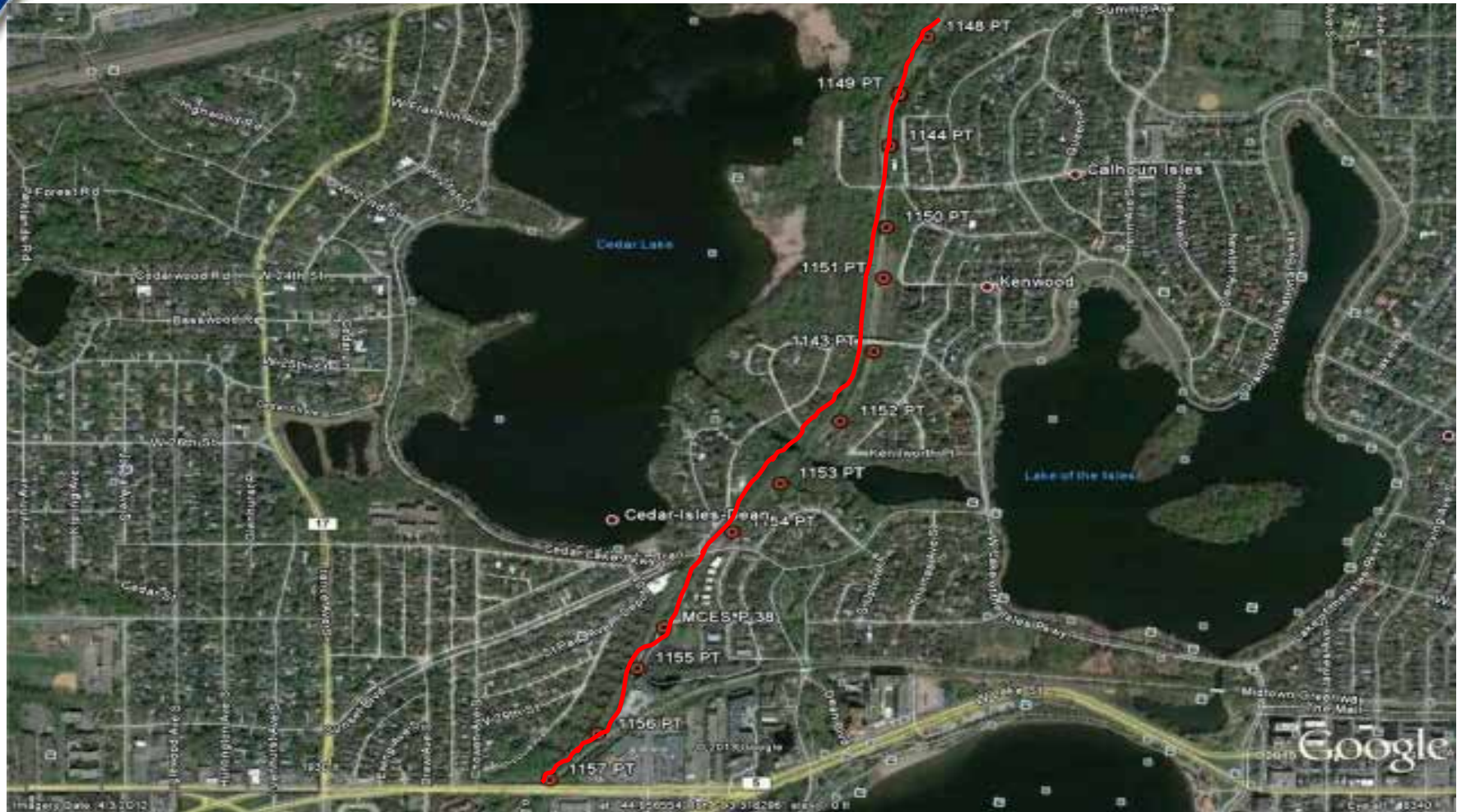
- Researched and Gathered Information
- Attended the following Meetings:
 - Project Kick-Off Meeting – December 10, 2013
 - Project Technical Meeting – December 19, 2013
 - Town Hall Meetings
 - Minneapolis – January 7, 2014 and St. Louis Park – January 9, 2014
 - Evaluation Specific Topics:
 - Dewatering impact: thermal, biological and groundwater
 - Contamination from disrupted soils
 - Climate change and design storms
 - Decision criteria: water quality and groundwater and surface water levels
 - 1800 West Lake Street apartment complex dewatering impacts and challenges

- Conducted a Review Charrette
 - Identified the specific statements/conclusions
 - Listed and reviewed:
 - specific data and assumptions
 - potential sources of uncertainty, seasonality, safety factors, sensitivity to change, etc.
 - Suggested alternative lines of evidence
- Documented Findings

Potential Impacts to Groundwater Elevation

1. Hydrogeology

- Fluvial deposits of sand and gravel
- A buried swamp deposit
- Areas of man-placed fill
- Underlain by a thick, coarse sand aquifer
- Difficult to conclusively determine groundwater flow patterns
- Recommendation
 - Additional piezometers (Lateral and Nested)
 - Seasonal water level data



Potential Impacts to Groundwater Elevation

2. Due to Pumping or Leakage into the Tunnels

- Proposed construction method would isolate groundwater from the tunnel
- Proposed method does not include active dewatering
- Not analogous to 1800 West Lake Street
- Should have little or no impact to water level near the tunnels (provided the leakage rates in the BODR are not exceeded)
- Recommendation
 - Remove the term 'dewatering' from BODR

3. Due to Blockage of Groundwater Flow

- Alluvial aquifer should be able to easily transmit groundwater under the tunnel system
- Groundwater flow system has not been fully characterized.

- Potential Impacts to the Chain of Lakes 'Water Budget'
 - Relatively small portion of the overall water budget leaves the system via sanitary sewer
 - Recommendation
 - Comprehensive Sanitary Sewer Capacity Analysis
- Potential Impacts to Groundwater flow between Cedar lake and Lakes of the Isles
 - Cedar Lake, Lake of the Isles are equalized by the channel
 - No hydraulic driver for groundwater flow across Kenilworth Corridor from one lake to another

- Reasonability of Leakage Rates for Permanent Sheet Piling and Waterproofing Systems
 - Proposed construction method should adequately address provided the assumed seepage rates are not exceeded
 - Errors in the calculations
 - Recommendation
 - Revise calculations and clearly state assumptions and input values

- Reasonability of the Storm Water Infiltration Design to Address the Potential of Discharging Warmer Water in the Winter
 - Proposed underground infiltration chamber adequately addresses thermal concern
 - Recommendations
 - Include Stormwater pre-treatment devices
 - Design underground infiltration chambers to handle 100 year design storm event, instead of 50 year design storm event

- Other Potential Impacts to Water Resources
 - Potential For Groundwater Contamination
 - Chlorides
 - Phase I identified 'High Risk' areas
 - Recommendations
 - Investigate snow and ice best management practices
 - Conduct a Phase II investigation
- Water Resources Monitoring Program Assessment
 - Preliminary, does not include sufficient detail for final design
 - Determine key monitoring locations
 - Define parameter and threshold criteria
 - Monitor infiltration chamber system
 - Sample and analyze groundwater for hydrocarbons, chlorides, other potential contaminants

- Additional lateral and nested piezometers
- Seasonal water level data.
- Revise the BODR, removing the term “dewatering”
- Provide a comprehensive stand alone water resources section
- Complete a comprehensive capacity analysis for sanitary and storm sewer systems
- Design the underground infiltration chambers for the 100-year design storm event

- Incorporate stormwater pre-treatment devices in the design
- Complete a Phase II investigation
- Revise the WMP document
 - Determine key monitoring locations
 - Define parameter and threshold criteria
 - Monitor infiltration chamber system
 - Sample groundwater quality nears the chambers and sites in the corridor away from the chambers
- Sample and analyze groundwater for hydrocarbons, chlorides, other potential contaminants