

The I-35 Stormwater Storage Project as you have never seen it before!

Remember, an heavy storm events on Minnesota's I-35 West in Minneapolis have caused flooding so intense within the existing stormwater tunnels that, in addition to road closures, manhole lids have blown off into onto the interstate.

The original, 50-year old tunnel system was designed to carry stormwater runoff from the highway and the surrounding neighborhoods. As development within the 3,100-acre surface (12,5 kilometers square meter) drainage area has continued, the volume of water for the storage tunnels to handle has increased.

As part of a great team effort to mitigate flooding incidents, the Minnesota Department of Transportation contracted the Brierley Associates, Barr Engineering and TKDA Team to design a new, underground stormwater storage facility solution featuring six interlocking diaphragm walls. The Kraemer/Nicholson Joint Venture would then take over the construction phase of the project through the CMGC Project Delivery Process, which includes multiple techniques along a busy, three-lane interstate with some challenging ground conditions.

Let's Drilldown into the I-35 Stormwater Storage Project.

Permanent soil nail wall

Our crew experienced the legendary cold of Minnesota's winter while installing the project's soil nail walls.

We installed 611 linear feet of permanent and 396 linear feet of temporary soil nail wall by the open-to-traffic, north-bound lanes of I-3W5W.

The soil nail wall was integral in maintaining the stability of the noise wall, which mitigates residential disturbance during and after construction.

Additionally, the soil nail wall contributes to the stability of adjacent utilities that reside along 2nd Avenue.

The permanent wall, when finished, will be covered with a final cast-in-place concrete finish face. The temporary sections will be backfilled to original grade.

Designing MN-DOT's I-35 storm water storage facility

Over the past several decades, I-35W at 42nd Street, a major interstate artery in Minneapolis, has experienced flooding during intense storm events.

Additional stormwater storage requirements prompted the Minnesota Department of Transportation (MnDOT) to hire Barr/Brierley/TKDA Engineering to develop flood-risk-reduction concepts. Complex hydraulic modeling, the need to understand ground conditions, and a restricted surface workspace posed challenges.

The limited footprint and high groundwater conditions meant that the solution might require deep structures, such as tunnels and/or shaft-type construction.

Barr provided geotechnical data of the underlying soil and bedrock conditions; accurate hydraulic modeling; and constructible concepts that not only met the hydraulic objective but also considered the challenging geologic conditions.

A complicated site

The team had quite a few challenges on their hands. Constructing a large, underground system in a confined urban area, with three active lanes of highway and high water table complicating the geology is no easy task!

The CM/GC process

The Construction Manager / General Contractor (CM/GC) project delivery method allows an owner to engage a construction manager during the design process to provide constructability input. In this case, Nicholson and Kraemer were able to start design discussions with the client a year before construction started.

The Construction Manager is generally selected on the basis of qualifications, past experience or a best-value basis. During the design phase, the construction manager provides input regarding scheduling, pricing, phasing and other input that helps the owner design a more constructible project.

The CMGC process, allows for KNJV to provide pricing and schedule information at 30%, 60%, and 90% design in collaboration with two independent estimating teams.

Ultimately, at 100% design, the KNJV provided final pricing which led to agreement on final cost and schedule, allowing for significant value to the owner.

Kraemer/Nicholson JV awarded contract

The KNJV Team was awarded the contract for MN-DOT's I-35 Stormwater Storage project early in 2020. The contract includes the construction of six independent diaphragm wall shafts that will be connected, designed by Barr/ Brierley.

The KNJV was also awarded an Early Work Package (WP1) in 2019 that included creating the working platform at the highway level for the current work (WP2). The first work package included the installation of a permanent soil nail wall, design and installation of a temporary soil nail wall, sheet pile driving, common excavation and travel course/pad installation. It also enabled the project team to build the D-Wall in one season, which eliminated a winter shut down would be required and significant costs to have the delay.

Monitoring and instrumentation

The I-35 project is employing a large number of sensors and site monitoring to allow for near-real time observation of the project. The site includes over 300 physical sensors (strain gages, piezometers, earth pressure cells, and inclinometers) and over 90 monitoring prisms that are being monitored through two automated total stations.

Shaft construction

The KNJV is constructing six independent shafts connected in series, designed by Barr/Brierley, that will capture up to 4.5 million gallons (17 million litres) of storm water overflow.

The final diaphragm wall design included six, unreinforced independent shafts spaced two feet apart. The team installed 112,870 square feet of diaphragm wall in total. The six shafts are interconnected by passages that allow for hydraulic equalization between the cells as well as equipment.

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