

# DAILY JOURNAL OF COMMERCE

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## UW science building has firm underpinnings

*Creating the perfect hole for the building's foundation required a combination of shoring and dewatering systems.*

By JEFF GRIEDER  
Malcolm Drilling Co.

The University of Washington began construction on the Bioengineering-Genome Sciences Building in October 2003, a project that will provide much needed space for classrooms, offices and laboratories.

When finished in spring 2006, the project will consist of two four-story structures totaling 297,000 square feet located between Pacific Avenue and Boat Street. Both building wings will have extensive underground mechanical, storage, vivarium and loading dock areas.

Malcolm Drilling Co. of Kent was awarded one of the first subcontracts for the project: \$1.8 million for excavation and dewatering of the site. Malcolm's contract was for supplying and installing the conventional soldier pile, tieback and timber lagging shoring system, as well as vacuum wellpoint and deep well dewatering systems.

### Soldier piles

Malcolm started soldier pile installation Oct. 1 on the north half of the site. The shoring design, by ABKJ of Seattle, consisted of steel soldier piles drilled to depths of up to 65 feet below grade that were backfilled with a structural concrete toe. Lean concrete was used to backfill the portion that was faced with timber lagging during excavation. The soldier piles were installed with the help of a track-mounted Watson 3100 drill rig.

The soils on the site were silty sand and gravel. Groundwater was found at about 25 feet below grade, so the drilling was completed under a water head and the concrete backfill of the soldier piles was placed using tremie methods and a pump.

A plume of hydrocarbon contamination discovered by consultant GeoEngineers of Redmond presented a challenge for the site work. Special precautions were taken during shoring and excavation because of the contamination, and all contaminated materials were hauled off site for treatment and disposal.



Photos courtesy of Malcolm Drilling Co.  
**Excavation depths reached 55 feet at the north end of the hole for the UW Bioengineering-Genome Sciences Building.**

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Excavation started after the steel soldier piles were in place, with crews installing timber lagging between the soldier piles as work proceeded.

High-capacity tieback anchors were needed to support the soldier piles due to excavation depths reaching 55 feet. The anchors were installed at predetermined elevations using a Klemm 806-3 drill rig to make 6-inch-diameter holes up to 70 feet in length.

Anchors constructed with multiple post-tensioning strands were inserted and grouted into the holes. Every anchor was tested and tensioned to a lock-off load once the grout cured.

After completion of a row of anchors, the excavation and lagging then proceeded to the next level of tiebacks.

The completed shoring wall has an exposed face area of over 43,000 square feet. Due to the complex design of the basement structure, the shoring system had to have a number of different walls and benches to provide general contractor Hoffman Construction with an unobstructed hole for constructing foundations and basement walls.

## **Dewatering system**

The other part of Malcolm's contract was for installing a dewatering system for the entire site.

The system consisted of two separate dewatering techniques. First, a vacuum wellpoint dewatering system was installed in the northern part of the site, where the deepest excavation was made. The system consisted of 70 specially designed vacuum wells installed at an angle through the shoring wall. The wellpoints were installed from inside the excavation at an elevation just above the static groundwater level.

A 40-horsepower vacuum pump was used to extract groundwater from the soils once all the wellpoints were installed. The collected water was routed through on-site storage tanks for testing prior to disposal into the sanitary sewer system. The vacuum wellpoint system will remain in operation until the underground structure is completed and backfilled, in about nine months.

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### **The dirt team**

Malcolm Drilling, excavation and dewatering contractor

Stoneway Concrete, concrete and cement supply

Appleby NW, soldier beam fabrication

Skyline Steel, steel supplier

Contech Systems, tieback anchor supplier

Matheus Lumber Co., timber lagging supplier

Rain for Rent, storage tanks

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The dewatering of the southern portion of the site was treated differently due to the shallower excavation depth and lower groundwater elevation. For this end of the site, 16 dewatering wells with submersible pumps were installed around the perimeter of the site. Each well was connected to a common header pipe and the discharge water was routed to the on-site storage tanks.

Installation of shoring and dewatering systems took four months, and the dewatering system will remain in operation for about nine months.



**Soldier piles were installed with the help of a track-mounted Watson 3100 drill rig.**

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This project is an example of how well a combined scope of shoring and dewatering can benefit the general contractor and owner financially and provide a high-quality product.

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*Jeff Grieder is Northwest area chief engineer for Malcolm Drilling Co.*