



SCOPE OF WORK

Construction of Phase 1 Cement-Bentonite Seepage Barrier L-31N Canal, Miami-Dade County Florida

Prepared on behalf of the Miami-Dade Limestone Products Association by
MacVicar, Federico & Lamb, Inc./AMEC-BCI Engineers & Scientists, Inc.

Background

Recent investigations by the U.S. Geological Survey documented the distinct layering within the Biscayne Aquifer, with highly conductive horizontal flow zones separated by much denser limestone strata. One of the high flow layers is the Miami Limestone, which makes up the top 10 to 15 feet of the aquifer. Other high flow zones exist in the underlying Fort Thompson formation. The upper layers of porous rock appear to transmit much of the water from the wetlands within the adjacent Everglades National Park (ENP) to the L-31N Canal.

The goal of the Phase 1 seepage barrier is to document, in the field, the performance of a partially penetrating flow barrier in reducing groundwater interception by the canal. The test will consist of constructing a flow barrier in a narrow trench excavated through the Miami Limestone and Upper Ft. Thompson formations of the aquifer just west of the L-31N Canal. The test barrier will start just south of Tamiami Trail (US Highway 41) and proceed south for two miles, as shown on the project plans.

General Test Description

The seepage barrier, consisting of a cement-bentonite (CB) slurry wall 2-miles long will be constructed in a 32-inch wide trench excavated to a depth of 35 feet below ground surface using a large chain-type trenching machine. After the trench is excavated, it will be backfilled with excavated sand and rock fragments (4 inches maximum dimension). Using a track hoe, the trench will be re-excavated in panels and simultaneously backfilled with CB slurry prepared in a mixing plant and pumped to the trench location.

In order to ensure that the barrier is homogeneous and consistent throughout the full depth, an air lift pump will be utilized behind the track hoe to clean the bottom of the trench of any sediment. In addition, the CB mix will utilize approximately 35% more bentonite and cement than a conventional mix for similar geologic conditions. Further, the Quality Control/Quality Assurance program will be considerably more extensive than normally employed, involving closely-spaced probing of slurry depth, and frequent testing and sampling of the slurry to confirm that project specifications are met throughout the entire depth of the barrier wall.

The Project will be constructed and completed in accordance with the plans and specifications prepared by AMEC-BCI Engineers and Scientists, Inc. (Engineer of Record for the Slurry Wall), which are attached to this Scope of Work as **Appendices A and B**, respectively. The Owner of the Project is the Miami Dade Limestone Products Association, Inc. (MDLPA) and the Project Engineer of Record is MacVicar Federico & Lamb, Inc.

Compliance with SFWMD Right-Of-Way Permit

The project will be constructed adjacent to the L-31N levee, south of Tamiami Trail (US Highway 41), on property owned by the South Florida Water Management District (SFWMD). A right-of-way permit has been issued by SFWMD for access to the site to construct the Project. The permit is part of the plans and specifications for the Project, and the Contractor shall comply with all provisions of the permit.

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The rock formations will be excavated using an Austin Trencher Model AT-750 double chain trenching machine (or equivalent), modified to excavate up to 40 feet below ground surface. Specifications for the AT-750 are shown in **Appendix C**. As the 32-inch wide trench is excavated to a bottom depth of 35 feet, the sand and rock fragments will be discharged onto the work platform adjacent to the machine. A bulldozer following the trencher will backfill the trench with the excavated material.

The trench will be excavated by H.L. Chapman Pipeline Construction, Inc. of Leander, Texas. It will take approximately 3 months to excavate the 2-mile long trench along the center line of the wall alignment shown on the project plans.

The Trenching Contractor's Scope of Work includes the following items:

1. Coordinate with SFWMD regarding the General and Special Conditions of the Right-of-Way Permit.
2. Excavate Phase 1 trench 32 inches in width, 35 feet in depth, and 2 miles in length along the alignment staked by others.
3. Place excavated material on work platform adjacent to trench for utilization by CB Wall Contractor.
4. Perform trench excavation work in accordance with Project Plans and Specifications.

Construction of the CB slurry wall will follow closely behind the trenching operation, and will be completed in approximately 5 months; that is, 2 months after the trenching is complete. The CB wall contractor is Geo Solutions, Inc. (GSI) of New Kensington, Pennsylvania.

Preparatory site work by GSI will include installation of silt fences and runoff control berm; grading and stabilization of work platforms on both sides of the canal; and removal of the 1000 foot long by 18 feet deep test CB wall constructed in 2009. The excavated material will be placed in haul trucks and disposed off-site by others.

The CB wall construction will utilize a track hoe to re-excavate the backfilled trench in progressive panels, which will be simultaneously backfilled with CB slurry prepared in a mixing plant and pumped to the trench location. The CB slurry consists of a viscous mixture of Wyoming bentonite and Portland cement in water.

GSI plans to mobilize the mixing plant on the east side of the L-31N canal, where the right-of-way is considerably wider and will facilitate delivery of materials and equipment, as well as avoiding interference with the trenching and wall construction activities. A double-walled floating pipeline will extend from the mixing station across the L-31N canal to the wall construction area.

The CB wall construction will include several special procedures in order to ensure that the barrier is homogeneous and consistent throughout the full depth. It will include an air lift system on a trolley that will follow the track hoe and clean the bottom of the trench of any sediment. In addition, the CB mix will contain 117 lbs. bentonite and 364 lbs. cement per cubic yard of mix, which is approximately 35% more bentonite and cement than a conventional mix for similar geologic conditions.

Further, the Quality Control/Quality Assurance program will be considerably more extensive than normally employed, involving closely-spaced, repeated probing of slurry depth, and frequent sampling and testing of the slurry to confirm that project specifications are met throughout the entire depth of the barrier wall. A description of the QA/QC Plan is in **Appendix D**.

A list of the major equipment items to be furnished by the CB wall contractor is provided in **Appendix E**.

The CB Wall Contractor's Scope of Work includes the following items:

1. Coordinate with SFWMD and Owner's Representative regarding the General and Special Conditions of the Right-of-Way Permit.
2. Implement safety and access controls.
3. Implement site security and fencing as needed.
4. Provide office space if needed by Contractors.
5. Install silt fences adjacent to the L-31N canal extending beyond the boundaries of the work areas.
6. Grade and stabilize work platforms on both sides of the canal and construct a runoff control berm adjacent to the silt fences.
7. Layout trench alignment and install survey controls.
8. Remove the 1000 ft long x 18 feet deep test CB wall constructed in 2009, and place the excavated material in haul trucks for off-site disposal.
9. Construct CB slurry wall in accordance with plans and specifications.
10. Implement and maintain the Quality Control Program throughout construction.

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11. Load haul trucks for disposal of excess soils, slurry materials, empty bags, and other wastes.
12. Cleanup and restore all work areas.
13. Grade and re-vegetate site in accordance with plans and specifications.
14. Complete an as-built survey of the slurry wall alignment, including major project features.

The Owner will provide the following items to facilitate the work:

1. Permits required to access and utilize the site
2. Access to water from adjacent canal
3. Portland cement for CB slurry, delivered and blown into Contractor's silo.
4. Engineering Representative and Full-time Technician to implement and maintain Quality Assurance Program and to conduct additional sampling and testing.