

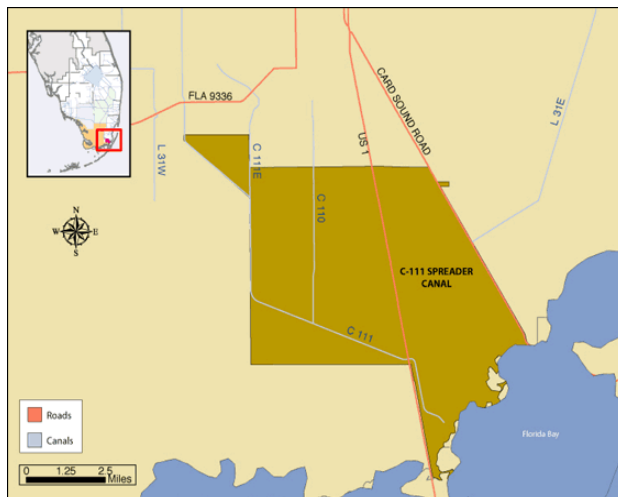
C-111 SPREADER CANAL PHASE I DESIGN

CLIENT	South Florida Water Management District (SFWMD)
LOCATION	Homestead, Florida
VALUE	\$ 494,000
DATE	March 2008 - July 2009
SAFETY	Zero OSHA Recordables



Dredging, Surveying, Endangered Species Survey & Monitoring

Under our General Engineering and Professional Services (GEPS) Indefinite Delivery / Indefinite Quantity (ID/IQ) contract, with the South Florida Water Management District (SFWMD), NorthStar has provided engineering design services for the C-111 Spreader Canal Phase 1 project and is currently providing Engineering During Construction (EDC) services throughout the duration of construction. This SFWMD Everglades Restoration Resource Area project is located in southern Miami-Dade County, Florida, in an area bounded by Everglades National Park, the Florida City-Homestead area, and Manatee Bay. The Project is being implemented under the South Florida Water Management District's Everglades Comprehensive Everglades Restoration Program, (CERP) in cooperation with the U.S. Army Corps of Engineers (USACE).



As a component of the Comprehensive Everglades Restoration Program, (CERP), the C-111 Spreader Canal Project has a goal of improving the Everglades wetlands condition by establishing more natural water flows in Taylor Slough, which feeds flows from southeastern Florida to the Everglades. At present, floodwaters from the Miami/Dade County area are routed via manmade canals to Florida Bay, depriving the Everglades of needed water. The purpose of the C-111 Spreader Canal Project is to move this water west into the Everglades. This, in turn, will also improve the timing, distribution, salinity level and quality of

water in Florida Bay. It is estimated that about 252,000 acres of wetlands and coastal habitat may be enhanced by the proposed project.

The C-111 Spreader Canal Project creates a nine-mile hydraulic ridge adjacent to Everglades National Park that will restore water flows within Taylor Slough to patterns which resemble historic conditions prior to construction of the flood control canals throughout South Florida. NorthStar was tasked with the design of key components of the project currently being constructed, including the following:

- 590-acre above-ground detention area in the Frog Pond Detention Area.
- Approximately 8,000 feet of 80 foot wide above grade concrete lined channels.
- Approximately 4 miles of 100 foot to 125 foot wide unlined, above grade, unlined channels.
- Approximately 10 miles of earthen levees ranging in width from 60 feet to 70 feet.
- Two 225 cubic feet per second pump stations to pump water out of the C-111 canal to the Aerojet Canal Extension and Frog Pond Detention Area.
- Six articulating concrete block (ARB) weirs ranging in width from 300 feet to 400 feet.
- Two 8'x10' cast-in-place concrete culverts.
- 13 earthen plugs in the C-110, Aerojet and L-31E canals.
- 3-gate spillway water control structure with 2,400 cfs flow capacity.

In future phases, the project will also begin restoration of the Southern Glades and Model Lands with an operable flow control structure in the lower C-111 canal, incremental operational changes at the S-18C structure, a plug at S-20A, and operational changes at the S-20 structure.

During the engineering design phase NorthStar provided SFWMD with 30, 60, and 90 percent complete documents including drawings for the conceptual, preliminary, and final design phases. The design reports were reviewed by the SFWMD, Florida Department of Environmental Protection (FDEP), the U.S. Army Corps of Engineers (USACE), and various other stakeholders. All comments generated by public agency review were posted on the Dr. Checks electronic review system, which NorthStar provided responses to electronically via the Dr. Checks web portal.

Key elements of the services that NorthStar has provided to SFWMD for the design and construction of the C-111 Spreader Canal Project include:



- Geotechnical investigation. Data of soil layers and classifications, gradation (to evaluate suitability for embankment materials), consolidation, percolation rate, hydraulic conductivity and ground water table were obtained.
- Land Surveying work. Topography, ROW and Boundary survey were performed to provide necessary information for modeling and design purpose.
- Hydrologic and hydraulic modeling using ICPR Percpack 3.1 software as well as HEC-RAS and SWMM. The modeling results were the basis for civil design. The modeling scenarios include storm water under different event (25-yr/24-hr, 100-yr/24-hr, 100-yr/72-hr and Possible Maximum Precipitation-PMP) coupled with pumped water in dry or wet season (reflecting different groundwater table). Water mounding analysis and seepage analysis were conducted as well. The model development such as basins and sub-basins, node-link diagram was presented in GIS map.
- Civil Design. Engineering design of the two 225 cubic foot per second pump stations for the Frog pond (North Component) and Aerojet Canal (South Component), associated conveyance channels, the 590 acre detention facility, box culverts, control weirs, water control structure, emergency spillways and plugs. NorthStar provided all necessary plans and specifications for these structures.
- Construction Management. NorthStar is currently providing Engineer During Construction (EDC) support on the project. In this capacity we are overseeing the work of three (3) separate contractors whose combined bids totaled \$25M to build the project. We participated in pre-construction meetings, attend bi-weekly progress meetings, maintain two full time engineers on site for construction observation and review all submittals provided by the contractors to ensure all work conforms to the construction documents.
- Engineering Design During Construction. NorthStar has provided additional design during construction services to SFWMD to make modifications to the original accepted design in response to additional property that was acquired by SFWMD after the original contract had gone to bid. By providing the additional design during construction services, NorthStar has been able to eliminate approximately 2,200 feet of levees and above grade unlined channel from the Aerojet Canal Extension contract while still meeting all of the projects objectives, resulting in an approximate \$700,000 savings to SFWMD as a contract deduct. Also associated with the modification to the original Aerojet Canal Extension design, NorthStar has provided additional engineering analysis and modeling to prepare a corrective action plan to prevent phosphorous laden sediment present in the recently acquired segment of the project from being transported downstream to the C-111 canal and ultimately Manatee Bay.



Functioning as an augmentation of SFWMD staff, this project and its work scope directly reflects the competence of NorthStar personnel in our ability to successfully, accurately, economically and with utmost quality provide USFW with wetland habitat restoration services including Civil Design, Geotechnical, Environmental, Water Resources, Land Surveying, Mapping, Construction Management, Wetlands Ecology and Permitting. NorthStar has completed all design tasks under this project within the timeframe and budget constraints established by the SFWMD.