

Project Name

Civil Engineering & Geotechnical Services for Redevelopment on former Meadowlands Landfills

Client

New Jersey Meadowlands Commission/American Home Assurance

Services Provided

- Analysis, design and evaluation of various engineering controls
- Ground improvement
- Geotechnical work and site grading
- Groundwater modeling & design of groundwater control systems
- Stormwater Management system design
- Grading, soils analysis, stability analysis, evaluation of nearby construction on landfill stability
- Design of sheet pile systems
- Design of capping systems for different landfills
- Preparation of Construction Drawings and Technical Specifications for landfill closure
- Evaluation of feasibility of installing solar collection systems on top of closed landfills
- Application for and receipt of various federal, state and local permits and certifications



Project Description

According to the NJDEP, there are six existing, partially-closed landfills in the Meadowlands area of New Jersey that need to be closed completely. These landfills cover a total area of approximately 700 acres. SAI was retained to perform the evaluation and design of the different engineering controls that need to be constructed as part of the closure activities for three of these landfills -- Avon, Rutherford East and North Node West. The work included grading the sites, designing various engineering control systems (such as stormwater management, leachate collection, gas management, containment, and capping systems), preparing construction drawings and technical specifications, and applying for a variety of required permits.

Approach

SAI began the project with a site reconnaissance to assess the current state of the landfills. This effort involved the following tasks:

- evaluation of the integrity of the constructed portions of the various engineering controls;
- analysis and design for the additional or modified engineering controls;
- analysis of the stability of the side slopes of the landfills;
- analysis of the stability and settlement of existing nearby structures, in light of proposed construction activities (primarily two 72-inch aqueduct pipes and NJ Transit main line tracks); and



- monitoring the lateral and vertical movement of the landfills' side slopes and along existing structures.

One of the major tasks was to grade the landfills to promote runoff and reduce water percolation through the waste. To accomplish this, SAI designed systems to address landfill capping, stormwater management, leachate management, and gas management.

In some areas, processed dredge material (PDM) was placed to act as a low permeability layer. SAI evaluated the integrity of that material, using Standard Penetration Test (SPT) borings to collect undisturbed Shelby tube samples. To determine the soil physical characteristics, Atterberg Limits, Gradation Analysis, and Natural Moisture content tests were conducted. Soil permeability was evaluated by conducting the Flexible Wall Permeameter Test on undisturbed Shelby Tube samples. All tests were performed according to ASTM Standards.

SAI also designed different cap systems for the different landfills. The cap system includes a low permeability barrier layer, utilizing PDM or geomembrane. It also includes a drainage layer, using natural sand or geocomposite.

Several aspects of the landfills were analyzed to ensure their performance and stability. The landfills were graded to promote runoff. Global slope stability and veneer stability of soil and geosynthetic cover systems were performed. The slope stability analysis was performed using the computer program X-STABL. (This program performs a two-dimensional limit equilibrium analysis to compute the Factor of Safety for a layered slope according to the general limit equilibrium method, Janbu's Generalized Procedure of Slices, Simplified Bishop, and Simplified Janbu.) In addition, the veneer stability of each component of the linear system was evaluated, including the stability of the geomembrane/subgrade soil interface and the geocomposite/geomembrane interface, using the interfacial friction angle between the different materials.

To ensure the performance and stability of existing adjacent structures, slope stability and settlement analyses were performed. Anticipated additional stresses in nearby pipes and railroad tracks caused by differential settlement were also addressed.

SAI designed different capping systems for the different landfills. Each capping system includes a low permeability barrier layer, utilizing PDM or geomembrane. It also includes a drainage layer, using natural sand or geocomposite. In some areas PDM was placed to act as a low permeability layer. SAI evaluated the integrity of the PDM using Standard Penetration Test borings to collect undisturbed Shelby tube samples. To determine the physical characteristics of the soils, Atterberg Limits, Gradation Analysis and Natural Moisture content tests were conducted. Soil permeability was evaluated by conducting the Flexible Wall permeameter Test on undisturbed Shelby Tube samples. All tests were performed according to ASTM standards.

Finally, SAI addressed the feasibility of using the closed landfills to support installations of solar panels to generate electricity for the area. A decision on the solar panels has not yet been reached.

### Project Impacts

This project is ongoing. However, upon its completion, SAI will have helped the state of New Jersey resolve a decades-old environmental problem, and will once again have worked to create developable real estate in one of the most populated areas of the country.