

Project Name

Landfill Closure Plan

Client

Confidential

Services Provided

Geotechnical investigation, analysis and recommendations for the usage of stabilized dredge for grading and capping of the landfill

Project Description

The landfill facility ceased to receive solid waste on December 31, 1999 and since then has implemented several environmental and engineering controls. In the Closure Plan, the Client requested from the NJDEP to use a capping system including stabilized dredge material as the low permeability barrier layer. Closure activities will allow the City to follow through with redevelopment of the site into a golf course/open space.



SAI was the primary consultant for the project and provided the Closure/Post Closure Plan, which included the use of Stabilized Dredge Material (SDM) for grading and capping the Landfill. The geotechnical analysis provided included stability analysis, settlement analysis, specifications for the SDM material, instrumentation including inclinometers, construction oversight and monitoring, and field and laboratory testing of SDM material.

Approach

The geotechnical report provided an evaluation of the Landfill's existing condition, as well as the proposed final grading condition. The landfill was up to 80 ft high, with 3 horizontal to 1 vertical side slopes. The final cover was proposed to consist of up to 18 feet of SDM covered with 1 foot of sand drainage layer, and 1 foot of topsoil.

It was proposed that the dredge material be stabilized by adding Portland cement mixed with other additives. A literature review of project histories using amended dredge was performed. Also, to evaluate the properties of the material to be used at the site, laboratory testing was performed on SDM samples prepared in the laboratory prior to construction.

Stability analyses were performed for different cross-sections to represent the variation in the landfill grading and the subsurface soil characteristics from one location to another. Slope stability analyses were carried out for all cross-sections considering the existing and proposed conditions. The corresponding factors of safety (FS) considering both static and seismic slope failure were determined. The computer program GEO-SLOPE was used to carry out the calculations required for the slope stability analyses. The software uses the limit equilibrium theory to compute the factor of safety of earthen and/ or rock slopes. The program has the ability to model heterogeneous soil types, complex stratigraphic and slip surface geometry, and variable pore-water conditions using a large selection of methods including Morgenstern-Price, Jumbo, and Bishop Methods.



Landfill Closure Project History – Continued

Slope stability analysis was conducted to determine the maximum volume of Stabilized Dredge Material that could be placed on the top and side slopes of the landfill without causing static slope failure. The Factor of Safety (FS) against sliding due to the placement of the new material was determined. In areas where FS values were found to be less than 1.5 the height of the dredge material and/ or the side slopes were modified until FS values of approximately 1.5 or higher were achieved.

Seismic Stability analysis was also performed. Pseudo-Static analysis was carried out utilizing the slope stability computer program. In addition, a permanent Seismic Deformation Analysis was performed using simplified design charts. The yield acceleration required was determined using a trial and error procedure in which the seismic coefficient was varied until the minimum factor of safety obtained was equal to 1.0. The deformation analysis was carried out to ensure that deformations during an earthquake event are not excessive and do not exceed 1 foot.

Veneer stability along the landfill side-slopes was evaluated assuming that the height of the slope between any two surface water drainage channels does not exceed 32 feet. The veneer stability analysis was carried out for a 3H:1V slope and was performed between the SDM and the sand drainage layer, as well as between the dredge and a 6 inch sand layer which was placed on top of the waste as temporary cover.

