

## 1. INTRODUCTION

This report describes proposed improvements to residuals handling at the Columbia Boulevard Wastewater Treatment Plant (CBWTP) in Portland, Oregon. It describes the historical approach to residual handling at the now decommissioned Tipping Berm as well as the current approach at the Interim Residuals Handling Pad (IRHP). It identifies design alternatives for a new facility, completes an analysis of those alternatives, and selects a preferred alternative using a defined set of criteria. This report also includes a 30 percent design of the preferred alternative.

The City of Portland Bureau of Environmental Services (BES) partnered with the University of Portland Capstone Team Feel the Berm (Team) to complete an evaluation of residuals handling at the CBWTP. The team was assisted by University of Portland Faculty Advisor Niki Schulz, BES Industry Advisor Dr. Heather McKenna, and CBWTP Operations and Maintenance Supervisor Bill Sterling.

Residuals themselves are the product of digester cleanings at the CBWTP, stormwater cleanings, and sanitary cleanings. The cleanings are transported to the residuals handling facility in Vactor trucks and are comprised primarily of water. Historically, a Tipping Berm was used to facilitate the collection, storage, and transfer to disposal of residuals. The Tipping Berm was abandoned and now the IRHP is used to handles residuals, but the IRHP is itself inadequate to meet the needs of BES.

In collaboration with BES, the Team produced design alternatives for a new residual handling facility. Alternatives themselves were evaluated through a set of criteria, with a Pushing Berm proving to best meet client needs. A 30 percent level design of the Pushing Berm was completed, including drawings, calculations, and cost estimation. Team Feel the Berm designed a concrete pad and retaining wall, drainage system, embedded heating system, overhead structures, and proposed odor control recommendations for the new facility.

## EXECUTIVE SUMMARY

The City of Portland tasked Team Feel the Berm with a project to develop options to optimize the solid residual handling process at the Columbia Boulevard Wastewater Treatment Plant and further develop one option. Solid residuals are soil-like

materials that come from cleaning plant equipment and sewer/stormwater pipes across the city. The team assessed technologies, processes and developed a preliminary facility design based on the city's top priorities. This project has potential to be innovative and affect wastewater treatment plants nationwide as very few include a solids residual handling facility.

The City of Portland currently operates the Columbia Boulevard Wastewater Treatment Plant located in northern section of Portland, Oregon, between the Columbia River Slough and North Columbia Boulevard. It is the largest wastewater treatment plant in Oregon receiving an average of 66 million gallons of wastewater every day.

The Interim Residuals Handling Pad at the treatment plant has been granted temporary permission to operate by the Department of Environmental Quality. Intense physical labor, foul odor, and process inefficiency are a few major problems that result from the utilization of the residuals handling pad. The residuals handling pad consists of a large concrete pad that is sectioned off into four holding bays using concrete ecology blocks. The handling process involves the containment of solid residuals in one of the four holding bays, where they drain of excess liquid. Residuals at the handling pad include waste from plant equipment cleanings, sanitary sewer cleanings, and stormwater sewer cleanings. After residuals have been dried, they are transported into large containers by front loaders. Once a container reaches the maximum allowable weight, it is hauled off-site by a contractor.

Team Feel the Berm developed the Pushing Berm as a proposed replacement to the interim facility. The Pushing Berm is a two-tiered structure with four concrete bays that combines aspects of the interim facility with additional features to dry, handle, and transport the residuals. The sloped bays on the upper level contain heated coils embedded in the concrete to promote evaporation to dry the residuals. The dried residuals are then pushed toward the berm with a front loader and deposited into the containers on the lower level. The filled containers are then hauled off-site by a contractor. The Pushing Berm also features an overhead structure to shield the residuals from the elements. Additionally, the team recommended the incorporation of an odor control system to treat foul odor produced at the facility.

Based on the preliminary cost estimate developed by the team, construction of the Pushing Berm is expected to cost approximately \$580,000. The primary advantages of the proposed replacement include safety features to protect operators, improved drying time of the residuals, and simple maintenance. A potential barrier to proceeding with the Pushing Berm design is the cost of construction, likely to be funded using public taxes.