Geotechnical Summary Report
Third Runway Embankment and MSE Retaining Walls
Seattle-Tacoma International Airport

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Prepared for
The Port of Seattle
for Presentation to
The U.S. Army Corps of Engineers

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1.1 Project Overview

The proposed Third Runway will be constructed in part on an embankment of compacted earth fill, so that the new runway elevation matches the existing airfield. Part of the runway will also be located on native soils near the south end of the existing airfield.

To accommodate the slope of the existing terrain, the new embankment will vary up to a maximum fill thickness of about 165 feet. The new embankment is being constructed as a zoned earth fill, with specific types of soil materials and compaction requirements used in different areas to provide necessary stability, drainage and settlement characteristics. Overall, the new embankment will include about 17,000,000 cubic yards of compacted earth fill. Approximately 3,000,000 cubic yards will be excavated onsite, leaving 14,000,000 cubic yards of fill to be imported.

The new embankment will be constructed on the west side of the existing airfield, see Figure 1. New embankment side slopes will have an average inclination of 2H:1V. Three retaining walls will be used to limit the extent of embankment slope from impacting sensitive portions of Miller Creek and adjacent tributary wetlands. These walls will have exposed faces that range up to maximum heights of 50 to 135 feet above ground.

The proposed retaining walls will be constructed of "mechanically stabilized earth" using engineering techniques more than 30 years old that use steel or other material to reinforce soil (FHWA 2001). The Port of Seattle evaluated eight types of retaining wall, and more than 60 wall and slope geometric arrangements before selecting the proposed MSE walls for the project. The methods and results of that evaluation are presented in the report entitled: *Draft Evaluation of Retaining Wall/Slope Alternatives to Reduce Impacts to Miller Creek Embankment Station 174+00 to 186+00, Third Dependent Runway,* that was prepared for the Port by HNTB Corporation, Hart Crowser, Inc., and Parametrix in April 1999. Note that the documents cited herein are listed in the bibliography at the end of this report (e.g., see HNTB, Hart Crowser, and Parametrix 1999).

The specific type of MSE walls being designed for the Third Runway utilize strips of steel layered in the compacted soil fill, and a relatively thin reinforced concrete facing to form a near vertical retaining wall face. MSE walls have been used around the world, with exposed face heights of up to 140 feet. This type of wall provides the advantages of very good seismic performance along with being very cost-effective. The completed walls will not impede groundwater seepage, or reduce base flow to the wetlands and Miller Creek, as discussed

are subject to liquefaction. The anticipated subgrade improvements range from about 15 to 20 feet below the existing ground surface, based on information from the existing borings.

The Port reviewed nine different methods for subgrade improvement (Hart Crowser 2000g) and selected two preferred alternatives: 1) removal and replacement with compacted structural fill, or 2) stone columns. Relative feasibility, including the degree of ground improvement, constructability, quality assurance, and cost were considered for the Third Runway project., as well as potential post-construction effects on base flow to Miller Creek and adjacent wetlands (Hart Crowser 2000p).

Final selection of the removal and replacement method was made by the Port after stone column field tests were accomplished as part of the Phase 4 construction in 2001. These tests included collection of SPT and CPT data, accomplished before and after installation of more than 100 stone columns in four test patterns. The tests indicated that it would be difficult to obtain the same degree of construction quality assurance with the stone column method as with the remove and replace method. The remove and replace method was selected because it would achieve better construction reliability.

The Port has successfully monitored embankment construction to date, using the same type of soils and methods of construction that are planned for the remainder of the embankment. Construction specifications allow different types of soil materials to be used in different parts of the embankment, with appropriate moisture content limits, lift thickness, and compacted density specified to achieve a consistent quality earth fill. Compaction control and other fill quality tests are based on Federal Aviation Administration specifications (P-152) that have been modified to reflect local soil conditions.

Backfill for the subgrade improvement areas will utilize very densely compacted granular fill, compacted to 95 percent of the modified Proctor maximum density per ASTM method D 1557. The Port utilizes full-time construction inspection and services of a testing lab, field results are reviewed by both HNTB and Hart Crowser to verify conformance to the specifications.