GeoEngineers

June 3, 2008

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Attention: Petur Sim

Subject: Report
Geotechnical Engineering Services
Bellingham International Airport Binding Site Plan
Bellingham, Washington
File No. 0307-066-00

INTRODUCTION AND SCOPE

This letter report presents GeoEngineers' conceptual-level geotechnical engineering considerations for the Binding Site Plan for the Bellingham International Airport "site". We understand that David Evans & Associates (DEA) is preparing the Binding Site Plan for the Port of Bellingham (POB).

Our scope of services included reviewing available geologic maps, reviewing existing geotechnical reports with pertinent information for the site available in GeoEngineers' files, and providing preliminary geotechnical considerations for commercial site development. Our specific scope of services is described in our mutual services agreement with DEA for the project dated May 19, 2008.

SITE CONDITIONS

Site Description

The Bellingham International Airport site is located in the northwest portion of the City of Bellingham. The site is bounded by Interstate 5 to the north and east, Airport Drive and Marine Drive to the south, and Wynn Road to the west. The site is generally level.

Much of the site has been cleared for the airport runways and industrial development, although some areas of heavily wooded and thick vegetation remain. Existing structures are typically low-rise one- to two-story buildings and warehouses.

Geology/Hydrogeology

We reviewed a U.S. Geologic (USGS) map for the project area, "Geologic Map of Western Whatcom County, Washington" by Easterbrook (1976). This map indicates the site is underlain by Bellingham (glaciomarine) Drift. Glaciomarine drift (GMD) consists of unsorted, unstratified silt and clay with varying amounts of sand, gravel, cobbles, and occasional boulders. Glaciomarine drift is derived from sediment melted out of floating glacial ice that was deposited on the sea floor. This material locally contains shells, wood, and large erratics (very large boulders) can be present sporadically or even in a

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large cluster. Glaciomarine drift was deposited during the Everson Interstade approximately 11,000 to 12,000 years ago while the land surface was depressed 500 to 600 feet from previous glaciations.

The upper 5 to 15 feet of this unit in upland areas is typically stiff to very stiff. This is generally attributed to desiccation, although some consolidation from ice contact loading may have occurred. The stiff layer possesses relatively high shear strength and low compressibility characteristics. The stiff layer typically grades with depth to medium stiff or even soft, gray, clayey silt or clay with varying amounts of sand and gravel. In contrast to the upper portion of this unit, the medium stiff to soft glaciomarine drift possesses relatively low shear strength and moderate to high compressibility characteristics.

Significant ground modification occurred during airport construction during the 1940s. The airport area is known to have areas with significant depths of organic soil including isolated peat bogs. Original vegetation and topsoil were oftentimes buried and some peat bogs were buried as well. Significant fill depths have been documented. In most cases, the on-site native silt and clay were used as borrow material for the fill.

"Perched" groundwater conditions can develop where the relatively impermeable, undisturbed GMD prevents vertical infiltration and lateral groundwater migration occurs within surficial weathered or fill soil horizons. Also, saturated sand lenses can occur within the GMD that can have seepage. Groundwater conditions should be expected to vary as a function of season and precipitation and other factors. However, the regional groundwater table is deep below the site.

GEOTECHNICAL REPORT REVIEW

GeoEngineers has provided geotechnical engineering services on many different projects at and near the Bellingham International Airport. Review of these reports and familiarity with the site conditions provided the basis for the conceptual-level geotechnical considerations presented in the next section of this report. A summary of our geotechnical reports completed near the airport are as follows:

- "Geotechnical Engineering Services, Proposed ARFF Airside Access Road, Bellingham International Airport, Bellingham, Washington," dated May 28, 2008.
- "Geotechnical Engineering Services, West Bakerview Road- POB Parking Area Development, Bellingham, Washington," dated May 1, 2008.
- "Geotechnical Engineering Services, Proposed Eye Clinic Bellingham, Washington," dated January 16, 2007.
- "Geotechnical Engineering Services Report, 2007 Terminal Apron and Taxiway Improvements, Bellingham International Airport, Bellingham, Washington," dated October 4, 2006.
- "Geotechnical Engineering Services, Proposed Taxiway Improvements, Bellingham International Airport, Bellingham, Washington," dated October 29, 2006.
- "Geotechnical Engineering Services, Proposed Bakerview Manufacturing Facility Expansion, Bellingham, Washington," dated April 8, 2004.
- "Geotechnical Engineering Services, Proposed Federal Express Building at the Bellingham International Airport (BIA), Bellingham, Washington," dated September 25, 2002.
- "Geotechnical Engineering Services, BIA Vault Project, Bellingham, Washington," dated November 25, 2002.

- "Geotechnical Engineering Services, Borrow and Fill Areas for Runway 16 Safety Area Improvements, Bellingham International Airport, Bellingham, Washington," dated December 18, 2001.
- "Geotechnical Engineering Services, Proposed "Future" Building, Airport Industrial Park Bellingham, Washington," dated July 14, 2000.
- "Geotechnical Engineering Services for the 75-Foot Tall Air Traffic Control Tower (ATCT) at the Bellingham International Airport," dated November 17, 1993.

CONCEPTUAL-LEVEL GEOTECHNICAL CONSIDERATIONS

It is our understanding that continuing light industrial or commercial development is planned at the airport. At the time of this report, infrastructure, building size, type, location, and use are unknown; therefore only conceptual-level geotechnical considerations have been provided in this report. A summary of predesign geotechnical considerations in regard to development at the site is provided in the following sections.

SEISMIC DESIGN

General

The site is located within the Puget Sound region, which is seismically active. Seismicity in this region is attributed primarily to the interaction between the Pacific, Juan de Fuca and North American plates. Local design practice in Puget Sound and local building codes include the possible effect of large earthquakes (Richter magnitude 6 to 7) from local known faults, and very large (Richter Magnitude 8 to 9) subduction earthquakes in the design of structures. There are no known faults near the site and no known risk of surface rupture.

For planning purposes, projects designed utilizing 2006 International Building Code (IBC) should be preliminarily classified as Site Class E as defined in the IBC. This preliminary site classification is based on the fact that the GMD typically grades to medium stiff to soft with depth and it extends very deep below the site.

Liquefaction Potential

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in the development of excess pore pressures in saturated soils and subsequent loss of strength. This can result in consolidation and/or lateral spreading of the affected soils with accompanying surface subsidence and/or heaving. In general, soils which are susceptible to liquefaction include loose to medium dense clean to silty sands which are saturated (i.e., below the water table).

Based on our knowledge of deep site conditions from other projects in the immediate site vicinity and review of geologic maps, the site is underlain at depth by medium stiff clay. It is our opinion that the foundation soils for the proposed structures are generally not susceptible to liquefaction.

FOUNDATION CONSIDERATIONS

In general, near-surface undisturbed inorganic native soils at the site consist of stiff to very stiff silt and clay, and provide suitable shallow foundation support for light to moderately loaded building foundations, typical of one to two story structures. Allowable bearing pressures on the order of 2,000 to 4,000 pounds

per square foot (psf) are typical for conventional shallow spread footings on the stiff to very stiff clay or on structural fill extending to the stiff clay soils. For planning purposes, we recommend that fill soils and relict topsoil be completely removed from all foundation areas of future buildings.

If the volume of fill, organic, or otherwise unsuitable native soils is significant such that complete removal is unfeasible, then some form of ground improvement or alternative foundation type will likely be required. Successful ground improvement methods that have been employed at or near the airport include trench excavations below footings backfilled with controlled density fill (CDF), intermediate depth ground improvement such as with Geopiers™ foundation systems, or construction with deep foundation elements such as driven piles or auger cast piles. The latter options may also be appropriate if the proposed structures extend higher than two-stories, have large foundation loads, extend a significant depth below grade, or are sensitive to differential settlement.

Building specific conclusions and recommendations, including settlement estimates, can be provided when building type, loads and other design considerations are known for the projects and site specific explorations are complete. Typically, a test pit exploration program is sufficient for the low-rise structures. Borings will be required for tall or heavily loaded structures.

BUILDING SLAB-ON-GRADE CONSIDERATIONS

We anticipate that conventional slab-on-grade construction will be appropriate for new structures at the site. In most areas, the slab subgrades will likely consist of either the stiff native clay or existing fill soils. Ground improvements will be appropriate if unsuitable fill and/or organic fill soils are present in slab-on-grade areas. We recommend that slab-on-grade for new structures be supported on a layer of capillary break material over a suitably prepared subgrade.

Specific recommendations regarding the thickness of the capillary break and the preparation of the slab-on-grade support will be required once finished floor elevations are established.

PAVED AREAS

It is expected that typical pavement sections will be feasible on this site. The native soils consist of clay that is relatively impermeable and very susceptible to disturbance when wet. The natural moisture content of the soils is typically wet of optimum. They are susceptible to frost heave if the subgrade soils become saturated and then freeze. As such, a gravel base on the order of 8 to12 inches thick is typically appropriate below pavement sections. Including a layer of geotextile fabric between the clayey native subgrade and gravel base will help stabilize the subbase, prevent intrusion of the clay soils and provide better long-term pavement performance. It is our experience that advantages gained from the fabric are well worth the relatively low cost.

Prior to placement of subbase materials, all pavement subgrade soils should be proof rolled and all unsuitable or yielding soils should be removed or repaired per the geotechnical site representative prior to placing gravel base. We recommend that the gravel base not be placed over the native soils until a weather window will allow paving to occur without inclement weather, even in the summer time.

DRAINAGE AND STORMWATER CONSIDERATIONS

The glaciomarine drift has a very low permeability. A seasonally perched groundwater condition occurs in the winter. The airport has a history of ponded surface water conditions in the winter. All new buildings should include footing drains. Pavement edge drains have been included in new airport runway

construction which has helped alleviate some of the ponded surface water. It may be appropriate to include interceptor drains or edge drains in other parking areas for site developments.

Based on our review of existing site information, the site soils are not suitable for on-site disposal (i.e. infiltration) of stormwater because the permeability of the clay does not allow for infiltration. With appropriate moisture conditioning, the onsite soils are typically suitable for construction of stormwater detention ponds and pond berms.

SITE PREPARATION AND EARTHWORK

We recommend that fill, topsoil, sod, or organic layers be stripped from pavement and building areas. We recommend using lightweight construction equipment to perform the stripping and keeping construction equipment off the stripped subgrades as much as possible during the wet season or when the subgrade is wet. The clayey glaciomarine drift expected at the site, and fill soils derived from onsite sources, is highly moisture sensitive and easily susceptible to disturbance by construction equipment during wet weather. Achieving compaction specifications will be difficult if not impossible during wet conditions. Whenever feasible, we recommend that project planning schedule site earthwork during the dryer summer months to minimize grading costs.

The on-site soils can be excavated using conventional earthmoving equipment, however, excavation of the stiff to very stiff native silt and clay is more efficient with larger horsepower equipment.

Prior to placement of structural fill, capillary break, or gravel base, we recommend that the subgrade be compacted to a firm, nonyielding condition. Scarification and aeration of the subgrade soils may be needed to achieve adequate compaction. If appropriate the subgrade may be proofrolled with a loaded 10-yard dump truck during dry weather. Any soft, loose, pumping, or otherwise unsuitable areas should be repaired or removed and replaced with structural fill. The depth of overexcavation should be determined by the geotechnical engineer's representative.

The glaciomarine drift is a suitable source for structural fill during dry weather. However, compaction to 95 percent of the MDD can be difficult without significant aeration and drying time. The material usually has a natural moisture content above the optimum value for compaction. Portions of this material may compact to 90 percent without significant aeration. However, this material is generally not suitable below footing subgrades and imported granular fill will be necessary.

ADDITIONAL SERVICES

Our conceptual geotechnical considerations are preliminary in nature and are not sufficient for use in design of foundations and other development elements. We recommend that site specific geotechnical engineering studies, including an appropriate subsurface exploration and laboratory soil testing program, be performed during the design phase of future building projects at the site.

LIMITATIONS

This letter report has been prepared for the Port of Bellingham, David Evans & Associates, and authorized representatives for the site identified above. Our letter report and findings are not intended for use by other parties and are not applicable to other sites.

Our services were provided to assist in evaluating conceptual-level geotechnical considerations at the site identified in this letter report. This letter report is based on our review of existing geotechnical

engineering reports and geologic maps. Subsurface exploration was not performed for this study. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this letter report. Our letter report, findings and interpretations should not be construed as a warranty of the subsurface conditions. The findings of this letter report may be affected by the passage of time and subsequent land use at the site.

Within the limitations of scope, schedule and budget, our services have been accomplished in accordance with generally accepted environmental practices followed in this area at the time this letter report was prepared. No warranty or other conditions, express or implied, should be understood.

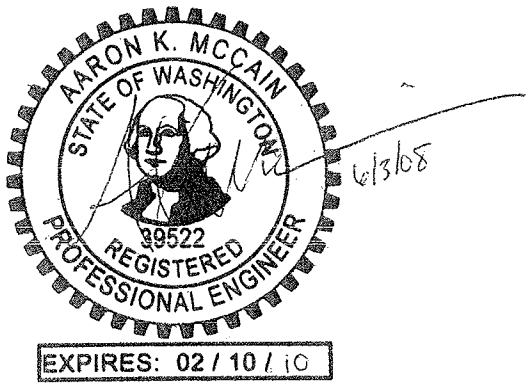
We trust this letter report serves your present needs. Please call if you have questions.

Sincerely,

GeoEngineers, Inc.

Aaron K. McCain
Senior Geotechnical Engineer

J. Robert Gordon, PE
Principal



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