FINAL MEMORANDUM State of Alaska

Department of Transportation & Public Facilities
Design and Engineering Services – Southcoast Region
Preconstruction / Materials

TO: Christopher Goins, P.E.
Project Manager

Date: December 4, 2017

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PROJECT NO: Z676220000

RE: JNU: Mendenhall Loop Road Capacity Improvements Project
Geotechnical Recommendations Memorandum

INTRODUCTION

The following report presents the geotechnical recommendations for the Mendenhall Loop Road Capacity Improvements project. A geotechnical investigation was completed April 3 through 9, 2017, by DOWL under the field supervision of engineering geologist Paul Pribyl. The subsurface exploration consisted of 48 test borings. The goals of the geotechnical investigation were to gather data on the existing pavement section within Mendenhall Loop Road (MLR), determine groundwater elevations, determine subsurface material properties for potential reuse, and gather data for design of light pole and bus stop foundations.

Subsurface conditions across the site consist of existing roadway embankments overlying native deposits of glacier outwash and alluvial sand and gravel. Site conditions observed during the current exploration are consistent with the as-builts of previous projects conducted within the project limits, known site geology, and previous subsurface explorations completed in the project vicinity.

Supplementary reports, such as the Geology Data Report (GDR) and Draft Pavement Recommendations Memorandum (PRM), have been prepared separately and should be referenced for additional project information.

It is assumed that the project will be constructed following the guidelines and requirements in the Alaska Department of Transportation and Public Facilities Standard (DOT&PF) Specifications for Highway Construction, 2017 Edition, except where omissions or additions are noted.

The recommendations contained herein are based on professional judgment using experience and the data collected during the site exploration and soil laboratory tests. These recommendations generally are not the only design options available; there may be several acceptable alternatives. The collection of additional data, or a change in the improvement plans, could provide information which would alter some or all of the interpretations and recommendations expressed herein.

PROJECT DESCRIPTION

DOT&PF plans to improve and reconstruct approximately 1.8 miles of MLR from Nancy Street to Back Loop Road in Juneau, Alaska. The project will:

- Construct roundabouts at three locations: Stephen Richards Memorial Drive, Floyd Dryden Access Road, and Mendenhall Boulevard/Valley Boulevard,
- Reconfigure turn lanes including construction of median islands,
- Replace/improve pavement structural section(s),
- Implement minor adjustments to alignment and profile,
- Upgrade multi-use pathway and bike lanes,
- Upgrade drainage and lighting, and
- Increase access control for private driveways where possible along MLR.

GENERAL EARTHWORK

Clearing and Grubbing

All surface organic material should be removed in the areas of new road embankments and pedestrian path pavement sections before placing embankment or pavement section fill. Organic materials are not reusable as embankment fill and should be wasted off-site. Organics encountered during the geotechnical field investigation were generally limited to plant litter and topsoil 6 inches to 1 foot thick adjacent to the roadway and pedestrian path. However, organics may be present in greater quantities within the undeveloped areas at the locations of the planned roundabouts.

Cobbles and Boulders

Cobbles were encountered across the project limits within the native sands and gravels during the subsurface investigation. No boulders were encountered during drilling but could exist in areas where cobbles were encountered. The contractor should be prepared for the removal of such oversized material during excavations. Cobbles, and possibly boulders, will likely be encountered during installation of the light pole foundations.

Frozen Soils

Do not place fill, construct embankments, or lay asphalt pavement over frozen soils or soils containing visible ice. Do not backfill with frozen soils. If frozen soils are encountered, Standard Specification 203-3.03 should be followed to avoid creating thaw unstable embankments.

Soils were encountered within the test boring conducted within Stephen Richards Memorial Drive (JNU17-TH017) containing visible ice to less than 5 percent by volume at a depth of 1.25- to 4.25-feet. Similarly, ice coatings on particles to less than 5 percent by volume were observed at STA 77+28, 7’R (JNU17-TH033) at a depth of 1-foot to 2.5-feet. These soils may be left in place. No pavement distress was observed that could be attributed to frost action and because of the coarse granular nature of the materials the frozen soil appeared to be ice poor with visible ice only filling existing voids. The moisture content of 8% indicates unsaturated conditions and implies the soil is thaw stable.

Drainage

Drainage ditches should be designed to a minimum of two feet, and three feet where possible, to maintain a water elevation that will help drain roadway subsurface materials. Surface water runoff should be redirected away from any planned structures with grading and curb and gutters.

Dewatering

If water is present in excavations, it will be necessary to dewater excavations until they are backfilled above the water table. Dewatering will likely be necessary during excavation and placement of the light pole foundations.

ROAD EMBANKMENT AND MATERIAL REUSE

The new embankment should be designed and constructed using procedures that account for anticipated increased traffic loads during the life of the road.

The road embankment should have finished side slopes no steeper than 2H:1V.

The existing pavement is suitable for reuse as Recycled Asphalt Pavement (RAP) within a new pavement binder course layer, Crushed Aggregate Base Course (CABC) layer, or RAM layer provided it's processed to meet the requirements of Subsection 703-2.17.

The existing base, subbase, and subgrade generally contain excess fines to meet the specifications for Selected Material Type A or B. The existing base material contains 7 to 16 percent fines with an average of 11 percent. The existing subbase and subgrade generally contain 6 to 12 percent fines with an average of 9 percent. However, the material beneath MLR has been shown to be generally non- to low-frost susceptibility.

The existing roadway and path do not show signs of distress attributable to frost action and the road section and subgrade materials have performed well beneath the existing road. The material nearly meets the specifications for Selected Material Type B and meets the requirements for Selected Material Type C. The material has low moisture content indicating sufficient drainage. Based on these reasons, it is not necessary to remove and replace the existing subbase and subgrade beyond that required for the pavement structural section. As the material may have some frost susceptibility, a reduced supporting capacity during the frost-melting period (spring) should be assumed in the pavement design.

Excavated base, subbase, and subgrade may be suitable for reuse as subbase within the embankment structural section or as fill beneath the structural section in areas of embankment expansion provided it is structurally adequate. The material would also be suitable for use behind retaining walls.

If the material is determined to be structurally adequate for reuse, a specification for a Selected Material Type D could be developed to incorporate the existing material into the design and for quality control during construction. A recommended specification is presented below.

> Type D. Usable excavation consisting of sand, gravel, rock, or combinations thereof containing no muck, peat frozen, material, roots, sod, or other deleterious matter and is compactable under the provisions of Subsection 303-3.04. Meet the following gradation as tested by ATM 304:

Sieve	Percent Passing by Weight
No. 200	0-15% determined on the minus 3-inch portion of the sample

Additional Overexcavation

Silty sand with 18 percent silt and a moisture content of 15 percent was encountered in test boring JNU17-TH029 in the vicinity of the Floyd Dryden intersection, (Station 71+38, 34' L) at depth of two-and-half to five-and-half feet. Groundwater was present as shallow as depth of two-and-a-half feet to four feet in this area.

Due to the high silt content, frost susceptibility, high groundwater table, and potentially high maintenance costs of repairs within the proposed Floyd Dryden roundabout, this material should be removed and replaced with Selected Material, Type A, to a depth of four feet below final grade to promote drainage and provide a capillary break from the groundwater surface. The Selected Material, Type A, thickness should taper at 4H:1V to meet the pavement section to reduce differential frost movement.

This overexcavation and replacement should occur from Station 70+50 to 72+00 within the project left side of the Floyd Dryden roundabout. A cross section should be added to the Floyd Dryden typical sheet to show the 4H:1V taper and overexcavation limits. The removed material is not suitable for reuse within the pavement section and should be wasted off site or used in landscaping areas.

FOUNDATION RECOMMENDATIONS

Shallow foundations are feasible for both the bus stop shelters and light pole foundations. Encountered organics during exploration consisted of plant litter and topsoil in the upper 0.5-foot to 1-foot at some locations. If these materials are present at the location of the planned structures, they must be removed from beneath the foundations and should not be used as backfill. Soils that are disturbed, pumped, or rutted by construction activity should be redensified, if possible, or completely removed and replaced with Selected Material Type A or B.

A slab-on-grade foundation is suitable to support the bus stop shelters. The concrete slab should be underlain by at least 2 feet of Selected Material Type A. The upper 6 inches of fill should not contain any particles larger than 2 inches in diameter to facilitate fine grading.

Precast concrete bases are suitable to support the light poles. The light pole base dimensions are 3-foot diameter by 6-foot length and should be founded 6-feet (+/- 2 inches) below the ground surface. The depth to groundwater must be greater than 1.5-feet below the ground surface. The bases can be founded on native sand and gravel. The bottom of the excavation should be redensified following excavation and prior to placing the bases in the excavation and backfilling. The excavation can be backfilled with Selected Material Type A or B, or compactable existing material.

It is anticipated that dewatering will be necessary for installation and backfill of some of the light pole foundations. Once the light pole locations and elevations are determined, the bottom of excavation elevation can be compared with groundwater elevations provided within the GDR in order to determine which excavations will need dewatering.

LIMITATIONS

This memorandum has been prepared for the exclusive use of DOT&PF Design and Engineering Services for the Mendenhall Loop Capacity Improvements project in Juneau, Alaska. If there are significant changes in nature, design or location of these activities, we should be notified so that we may review our conclusions and recommendations in light of the proposed changes and provide written modification or verification of the changes.

As the project proceeds, please contact us with any questions or concerns.

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