FOUNDATION INVESTIGATION

STATE OF NEVADA, DEPARTMENT OF HIGHWAYS

BELLEVUE ROAD GRADE SEPARATION H-1261

SPROUT ENGINEERS & ASSOCIATES INC.

RENO, NEVADA SEATTLE, WASHINGTON JACKSON, WYOMING

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September 18, 1967
Job No. W-2195-F

Mr. John Bawden, State Highway Engineer
STATE OF NEVADA
Department of Highways
Carson City, Nevada

Subject: Foundation Investigation
Bellevue Grade Separation

Dear Mr. Bawden:

We are submitting herewith eight copies of the Foundation Report for the proposed Bellevue Grade Separation, H-1261.

The report presents the results of the study and recommendations for foundation design. Piles are being recommended for foundation support.

We wish to thank you for the opportunity to prepare this report - please feel free to call on us for any discussion or to answer any questions which may arise.

Sincerely,

SPROUT ENGINEERS & ASSOCIATES, INC.

Richard W. Arden
Registered Civil Engineer
No. 1643

RWA:ca

FOUNDATION INVESTIGATION

BELLEVUE ROAD GRADE SEPARATION H-1261

STATE OF NEVADA, DEPARTMENT OF HIGHWAYS

Presented herein are the results of a foundation study that was conducted at the site of the proposed Bellevue Road Grade Separation H-1261, during the later part of August 1967. This investigation was conducted in accordance with the agreement between the State of Nevada, Department of Highways and Sprout Engineers & Associates, Inc. for the purpose of establishing the foundation design for the above structure.

SCOPE

The scope of the study consisted of field investigation, supported by laboratory testing as required to adequately determine the physical and mechanical properties of the soils encountered with respect to bearing capacity, settlement and foundation conditions pertinent to the design of the project. The results of the foundation investigation, laboratory testing - which form the basis of our recommendations, are presented in this report.

SITE CONDITIONS

The site for the Bellevue Road Grade Separation is located near the easterly end of Bellevue Road in Washoe Valley, Nevada. Bellevue Road forms the main access to the Bellevue Subdivision from existing

U. S. Highway 395. The road at the site has been built up approximately one foot (1'), with imported material. The surrounding area is relatively flat and subject to inundation from Washoe Lake.

GEOLOGICAL CONDITIONS

The Bellevue Road Grade Separation structure site lies on the east edge of an alluvial fan extending eastward from Musgrove Canyon in the Carson Range.

This fan and others surrounding Washoe Valley are coalesced with subsequent erosion and recent silt deposition have formed mature topography.

Washoe Valley, very likely represents a down-faulted block or Graben, which is geomorphically a small basin having no recent surface drainage outlets.

Rock units in the Carson Range consist of principally Quartz, Monzonite, Granodiorite with some Andesite, Dacite and Rhyolite. The maturity of the soil profile suggests in-place decomposition of the fan material which has been accelerated due to high moisture content prevalent year around. Recent glacial activity undoubtedly has contributed a portion of the fine fraction found in the bore holes.

For the most part, the coarse grains are principally silicious and therefore, stable to a degree from further disintegration. All the material encountered was generally the same, with the only change being color and grain size. No rocks or pebbles were found in the bore holes and undoubtedly some washing of the material and a certain degree of

sorting has occurred during fluctuation of Washoe Lake.

STRUCTURAL CONSIDERATIONS

The Bellevue Road Grade Separation consists of a two-span reinforced continuous structure to carry traffic over the new alignment of U. S. Highway 395. Approach fills will be approximately twenty feet (20') high and the maximum footing elevation is 5026. The span lengths are 116 feet, which will result in high foundation loads.

DISCUSSION

The soils encountered at the maximum footing elevation were loose to slightly compact, moist to wet sandy silt. This material has a bearing value of about one (1) ton per square foot, with settlement of about one inch (1"). The physical characteristic of this material remained the same to an elevation of 5021, where the sandy silt changes to a compact brownish-grey sand. At this particular elevation, a bearing value of two (2) tons per square foot can be used for foundation support. This would place the bottom of the footings approximately six feet (6') below the water table, which would result in some construction problems. It would also necessitate extending the footings five feet (5') below the maximum elevation. Considering these two factors, it is being recommended that piles be used as foundation support. The piles will act primarily as friction-piles, inasmuch, as material with adequate end bearing characteristics was not encountered within sixty feet (60') of the surface.

The approach fills can be adequately supported on the existing

soil with very little settlement expected. Due to the granular nature of the underlying soil, the majority of this settlement will take place during the construction period. The existing ground should be compacted using a vibratory roller prior to the placement of any fill and then all approach fills should be compacted to at least 95% of maximum density, as determined by AASHO T 180-57.

FOUNDATION RECOMMENDATIONS

1. All piers and abutments should use piles for foundation support. Piles should be driven in accordance with recommendations set forth in the Tabular Summary of Foundation Recommendations, Plate 1, of this report.

2. It is recommended that twelve and three-fourths inch (12-3/4") O.D. pipe piles be used at a design load of forty (40) tons per pile. Pipe piles should be driven closed end with closure plates flush with the O.D. of the pipe. Piles should have sufficient wall thickness to withstand the driving conditions without damage to the pipes.

3. Piles should be driven through holes made in the approach fills. Care should be taken to keep large rock out of the abutment fills where piles are to be driven.

4. Load tests, other than those conducted by Pile Driving Formula are not considered necessary.

5. Care should be taken in the construction of the approach fills and the existing ground should be compacted with a vibratory roller prior to the placing of any fill.

The following plates and appendix are attached and complete this report.

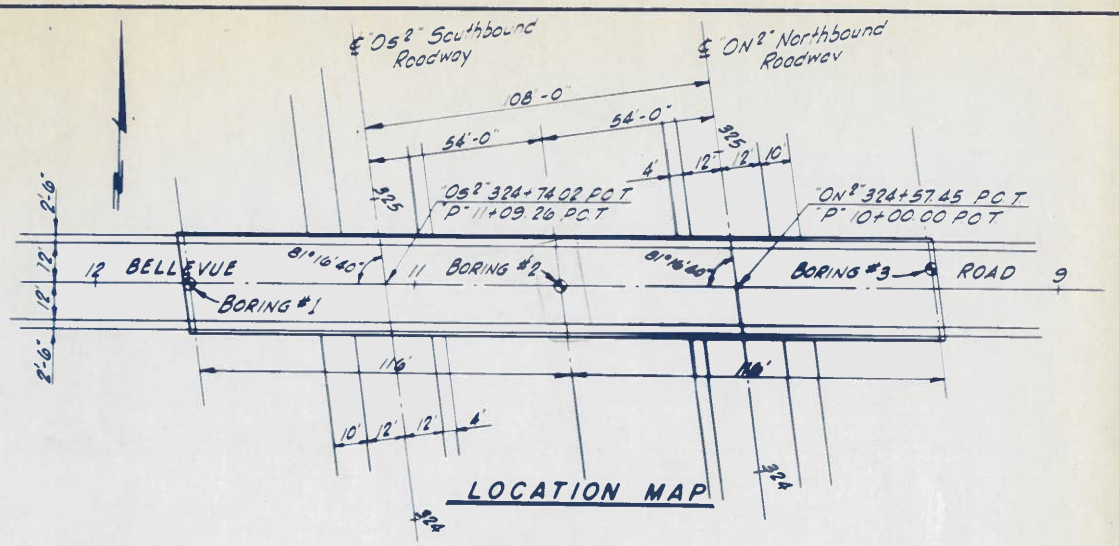
Plate 1	Tabular Summary of Foundation Recommendations
Plate 2	Log of Borings
Appendix I	Exploration and Laboratory Testing

TABULAR SUMMARY OF FOUNDATION RECOMMENDATIONS

BELLEVUE ROAD GRADE SEPARATION - H-1261

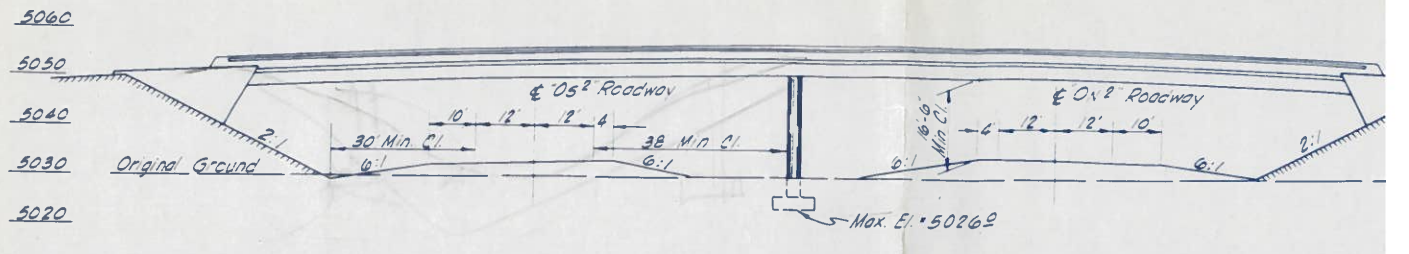
Support Station	Recommended Support Type	Estimated Pile Tip Elevation	Safe Allowable Design Load	Alternate Support Type & Safe Allowable Design Load	Elevation	Special Considerations
11 + 70.63	12-3/4" OD Pipe	4995 ±	40 Ton	Spread Footing 2 Tons Per Square Foot	5021	Drive through holes made in fill.
1054.63	12-3/4" OD Pipe	4995 ±	40 Ton	Spread Footing 2 Tons Per Square Foot	5021	None
9 + 38.63	12-3/4" OD Pipe	4995 ±	40 Ton	Spread Footing 2 Tons Per Square Foot	5021	Drive through holes made in fill.

FED. ROAD REG. NO.	STATE	PROJECT NO.
7	NEVADA	

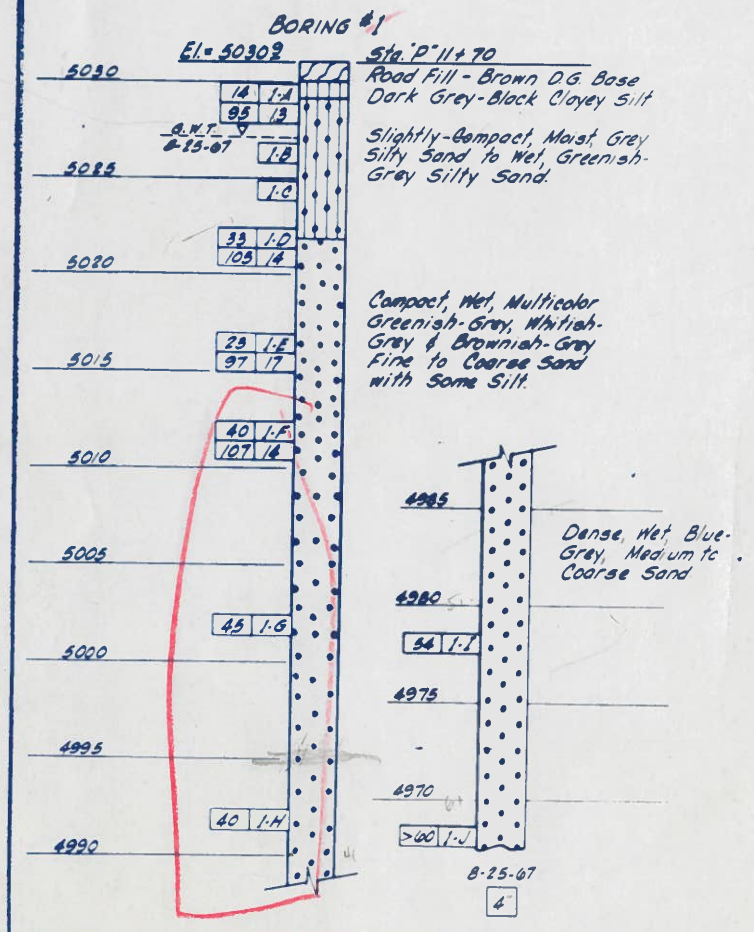


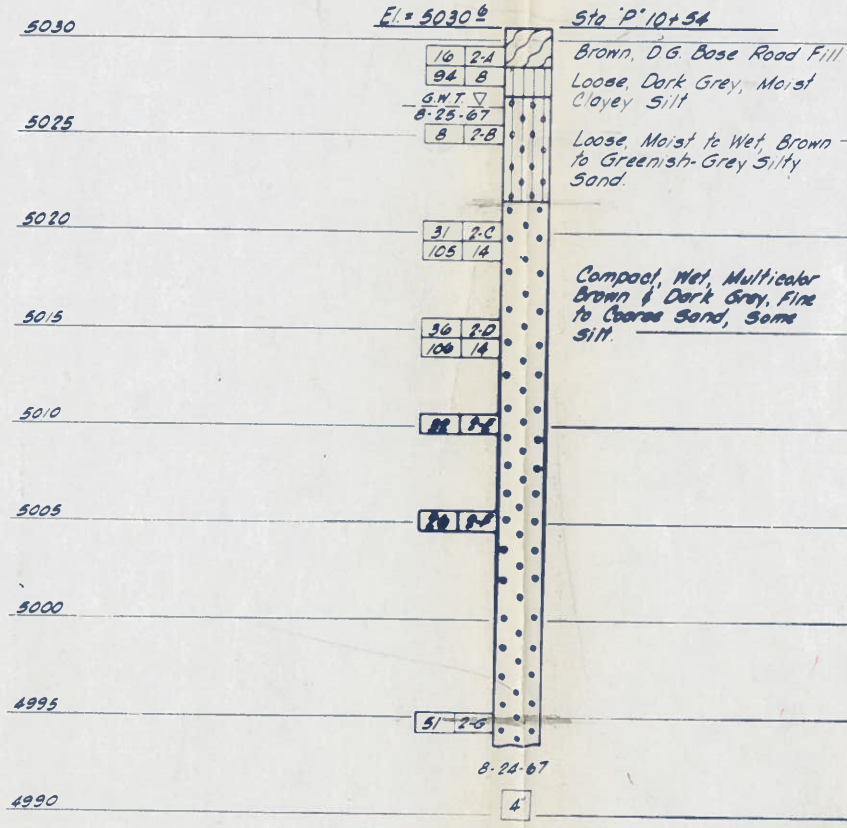
LOCATION MAP

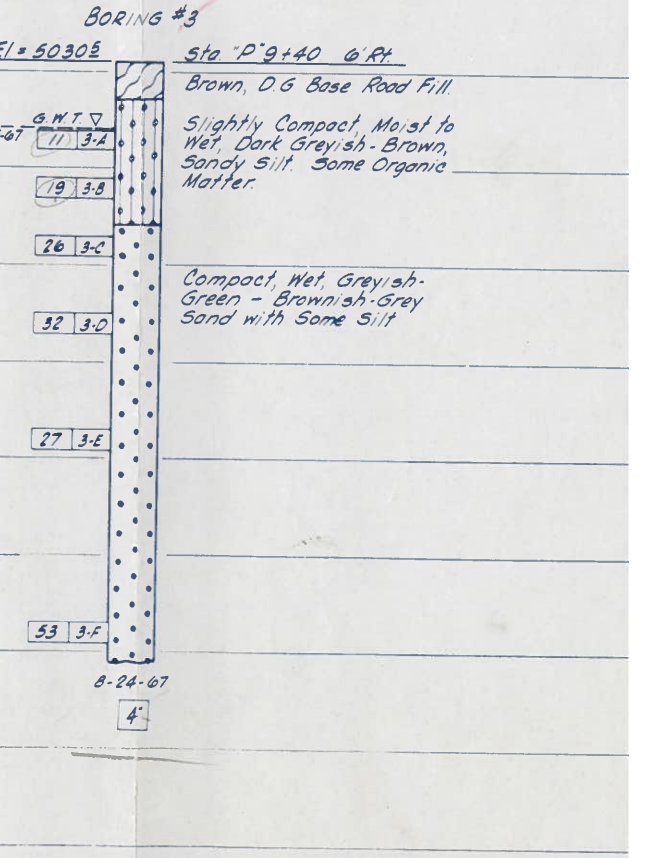
LOCATION MAP



SECTION







PROFILES

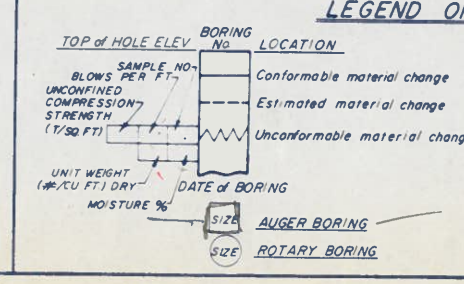
BRIDGE DEPARTMENT
DESIGN | DRAWING | TRACING | BY | DATE | CHECKED BY | DATE

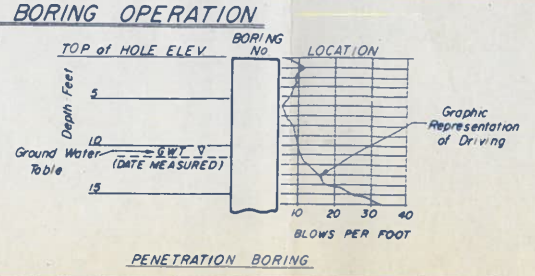
APPROVED:

LEGEND OF SOILS

- Well-graded gravels or gravel-sand mixtures - Little or no fines.
- Poorly-graded gravels or gravel-sand mixtures - Little or no fines.
- Silty gravel-sand-silt mixtures.
- Clayey gravels, gravel-sand-clay mixtures.
- Well-graded sands or gravelly sands - Little or no fines.
- Poorly-graded sands or gravelly sands - Little or no fines.
- Silty sands, sand-silt mixtures.
- Clayey sands, sand-clay mixtures.
- Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts.
- Sandy clays, silty clays, lean clays.
- Organic silts and organic silt-clays of low plasticity.
- Inorganic silts, micaceous or diatomaceous fine sand or silty soils.
- Inorganic clays of high plasticity, fat clays.
- Organic clays of medium to high plasticity, organic silts.
- Peat and other highly organic soils.
- Fill material.

LEGEND OF BORING OPERATION





DEPARTMENT OF PUBLIC WORKS

LOG

SPROUT ENGINEERING
950 INDUSTRIAL ROAD
SPARKS, NEVADA

APPENDIX I

EXPLORATION AND LABORATORY TESTING

EXPLORATION

The site was explored on August 24 and 25, 1967, by drilling three (3) test holes with a Test Borer Soil Sampling Drill Rig. The locations of these test borings are shown on the Log of Borings, Plate 2, of this report. The maximum depth of boring was sixty feet (60') below the surface. Samples of the various soils encountered were obtained with Split Spoon Sampler (2" O.D. and 1-3/8" I.D.). The sampler was driven eighteen inches (18") into undisturbed soil using a 140-pound weight dropping thirty inches (30"). The number of blows required to drive the sampler twelve inches (12") was recorded and is shown on the Log of Borings.

Samples representing the various soils encountered were taken to the Laboratory for examination and testing.

LABORATORY TESTING

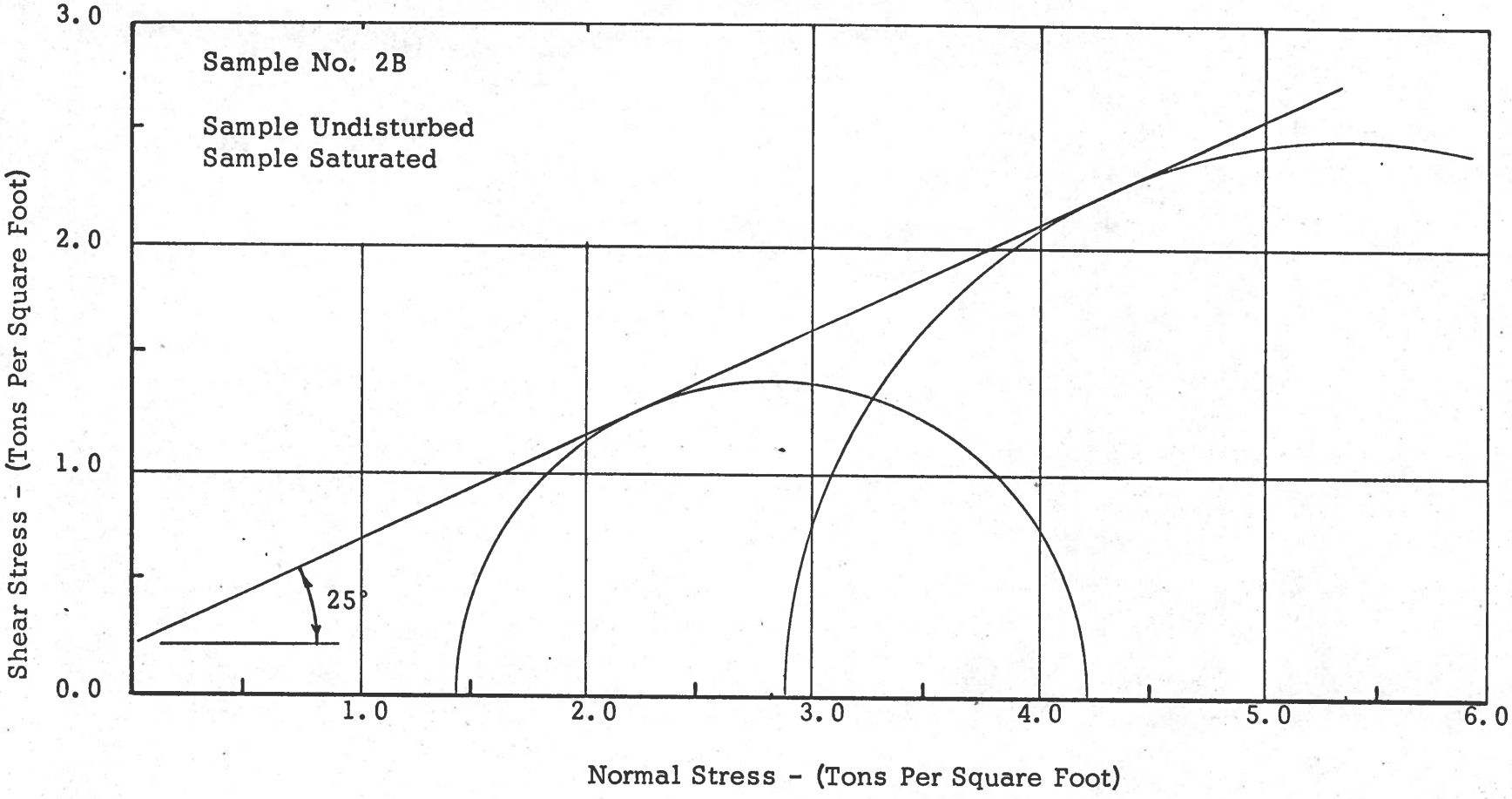
Samples of the different soils encountered were tested in the Laboratory for grain-size distribution and plasticity characteristics. The moisture contents and dry densities were determined from core samples. These values were used with strength tests and other data in calculations of bearing capacity and settlement. The results of these tests are shown on the Log of Borings and Appendix II.

Consolidation Tests were not performed because of the granular nature of the material encountered at the recommended footing elevations.

Tri-Axial Shear Test was performed on undisturbed sample to determine the shearing strength and supporting capacity of the soil. These tests were made using different normal stresses so as to plot the Mohr Circle Envelope. From these tests, the cohesion and angle of internal friction were determined. The results of these tests are included in the report.

The Standard Penetration Tests were correlated with strength tests and settlement studies, along with established empirical data in order to determine the relative density and supporting capacity of the soils.

TRI-AXIAL SHEAR TEST



STATE OF NEVADA, DEPARTMENT OF HIGHWAYS

BELLEVUE ROAD GRADE SEPARATION H-1261

Job No. W-2195-F

TEST RESULTS

SIEVE ANALYSIS and ATTERBERG LIMITS

Sample Number	Percent Passing 4	40	200	Liquid Limit	Plastic Index
1D	96	38	5	25	N. P.
2A	99	51	13	17	N. P.
2D	97	52	10	24	N. P.