

Cultural Resources Assessment for the Skagit Valley Family YMCA, Mount Vernon, Skagit County, Washington

FINAL VERSION

January 2017



Prepared for:

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ASM Project Number 27570

APPENDIX B
Geotechnical Boring Memo

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To: Pete Carletti/Carletti Architects
From: J. Gordon, PE 
Date: November 7, 2011
File: 20295-001-00
Subject: Preliminary Findings and Conclusions
Mount Vernon Skilled Nursing Facility – Eagle Health Care

The purpose of this memorandum is to present our preliminary findings and conclusions for the above referenced project.

Exploration Program

We completed six borings on November 1 and have finished most of our laboratory testing program. The locations of the borings were similar to those proposed by Pat Severin of Sound Development, with the exception that we moved B-6 to the “middle” of the site (see marked up figure attached to e-mail). Depending on conditions encountered during drilling, the borings were completed to 11½ to 36½ feet below existing ground surface (bgs). B-1 was completed to 31½ bgs to look at potential settlement of native soils, B-6 was completed to 36½ to confirm the soil profile encountered at depth in B-1.

Subsurface Conditions

- As expected, fill soils were observed across the site. The fill depth was the thinnest in the southeast portion of the site at B-2 where approximately 2½ feet was encountered, and the thickest at B-4 in the northern portion of the site where approximately 6 feet was encountered.
 - The fill consisted of loose to medium dense silty sand and medium stiff to stiff silt.
 - The fill encountered appears to have moderate density (compaction). We did not observe evidence of organics or deleterious materials.
 - The moisture content in the upper portion was noted to be 18-20 percent. Although over-optimum, this moisture content suggests it would respond to additional compaction.
 - We observed a ½-foot to 1-foot thick relict topsoil horizon at two locations. This layer did not appear to have sufficient organic matter to represent a significant concern for long-term settlement.
- The underlying native soils consisted of stiff to very stiff silt/clay (Recessional Marine Drift) over dense sand (Advance Outwash). At B-1, which was accomplished outside of the fill prism, we observed about 2½ feet of topsoil and weathered soil over the stiff silt and dense sand. At B-6, which was completed deeper to correlate with B-1, we observed a similar profile.
- Groundwater was encountered at depth below any anticipated project excavations.

Preliminary Earthwork and Foundation Recommendations

We understand that the project will be a one-story, wood framed building with a slab on grade. Therefore, we are assuming lightly loaded exterior continuous footings and light to moderately loaded interior column footings (less than 75 kips, with two-thirds dead load component). Based on a finished floor at Elevation 52 feet, it appears that the southeast corner of the building will be near existing site grades, with an increasing fill thickness required to the northwest. The northwest corner of the building will require a significant fill prism approaching 15 feet high.

We provide the following preliminary conclusions for design and construction:

- It appears that the fill had a moderate level of compaction. It appears to be generally adequate for support of the proposed project, considering it is lightly loaded.
- Stripping will be less than 6 inches because the sod layer over the fill is not significant (1-4 inches thick). Stripping will be greater, up to 1 foot, outside of the existing fill prism in the northwest corner. Structural fill can be placed over the existing fill soils. The existing slopes should be terraced (benched) to place new structural fill. We recommend that the native soil subgrade and the existing fill subgrade be compacted to a dense and unyielding condition. The subgrade should be evaluated during construction to determine if soft spots exist that cannot be compacted and require nominal overexcavation (expected to be limited to 2 feet).
- Site development will require an increasing thickness of fill to the northwest. A large new fill prism will be required at the northwest corner of the building because the proposed building extends beyond the existing fill prism.
 - Some settlement will occur from this fill placement. We estimate that up to ½ inch to 1 inch may occur as the new fill thickens to the west, with most of the settlement occurring at the northwest corner. Most of the settlement will occur shortly after placement. We recommend that the fill placement occur in advance of construction as much as possible. We suggest placing a hub on top of the 15-foot fill prism as soon as the fill is completed, and monitoring weekly for a month. Construction can still occur during this time.
 - We recommend that the top 2 feet of structural fill brought to the site consist of a select sand and gravel borrow. The existing fill soils, while moderately compacted, will be very susceptible to disturbance during wet weather and it is our experience that about 2 feet of select material will provide a good working surface to facilitate construction.
 - Where existing fill soils are at the subgrade surface, we recommend a minimum 12 inches of select sand and gravel as a working surface/capillary break. It should be recognized that the 12-inch thickness will not likely provide a stable subgrade for repeated construction traffic, and suggest 18-24 inches for haul roads. Where new fill will be less than 18 inches thick, we recommend using a geotextile separation fabric between the subgrade and imported granular soils.
- Based on the borings, we conclude that the existing fill soils will provide adequate support for the lightly loaded continuous spread footings (in areas that do not require new fill). We recommend that the footing subgrades on existing fill be carefully evaluated during construction, and these footing subgrades be compacted with a backhoe-mounted vibratory plate (hoepack).
- We should review the isolated column loads for the project. If they are on the order of 30 kips or less (with two-thirds dead load component), our preliminary conclusion is that compacting the subgrade fill soils as described will be sufficient. However, for dead loads in excess of this value, we recommend that at least 2 feet of structural fill be placed under all isolated column footings. This could require overexcavation where the footings will be founded directly on the existing fill soils. New structural fill can serve this purpose.
- We assume that the design floor load will be typical (100psf) with no warehouse type loading. In this case, the compacted existing fill soils or newly placed structural fill will provide adequate subgrade support. We recommend at least 12 inches of select sand and gravel as a capillary break over the existing fill soils. If select sand and gravel is used for the upper 2 feet of structural fill as

recommended, this could serve as a capillary break provided that construction traffic does not contaminate it with fines.

The site soils are primarily silt/clay, and some silty sand. Although the existing fill soils appear to have undergone moderate compaction, the soils are not as firm as the native soils. Therefore, the subgrade soils will be very susceptible to disturbance when wet, even with a nominal capillary break. Typical earthwork precautions will be appropriate for earthwork during the dry summer months. We recommend including a contingency for overexcavation of unsuitable soils if encountered. If grading must occur during the wet season, the on-site soils will not respond to compaction when wet, and a contingency should also be included for overexcavation and placement of additional select sand and gravel base layer to support construction equipment.

We trust this memorandum provides sufficient preliminary information to support appropriate conversations and decision making regarding the next steps for the project. Please call me at 360-647-1510 if you have questions.



25' STORMWATER EASEMENT PER MV SP MV-8-94

20' SANITARY SEWER EASEMENT PER MV SP MV-8-94

TOE PROP FILL
TOP PROP FILL
TOE EX FILL

241,121 sq.ft.
5.54 acres

PROP BLDG
PF = 52.0'

TEST HOLES

SEE SITE CONDITIONS NOTE THIS PAGE

EXISTING CHURCH

EXIST. STOP SIGN

199,577 sq.ft.
4.58 acres

10' UTILITY EASEMENT
SP MV-8-94

$\Delta 91^{\circ}50'56''$
 $L=40.08$
 $R=25.00$

10' UTILITY EASEMENT
SP MV-8-94
481.70

SSM
RIM ELEV = 39.00
IE CENTER FLOW LINE = 28.86

HONG ROAD

FAVORITE ROAD

APPENDIX C
STP Results for the Skagit Valley YMCA Project

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STP #	Depth (cmbs)	Sediment Description
1	0-30	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	30-65	Gray brown silty clay with orange patches, unsorted pebbles and cobbles
	65-90	Very compact gray silty clay with orange organic material, 5% gravel, water at 90 cmbs
2	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-90	Very compact gray silty clay with orange patches, 5% gravel
3	0-20	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	20-40	Dark brown sandy clay, 25% unsorted pebbles and cobbles
	40-90	Very compact gray silty clay with orange organic material, 5% gravel
4	0-23	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	23-38	Dark brown sandy clay, 25% unsorted pebbles and cobbles
	38-80	Very compact gray silty clay with orange organic material, 5% gravel, water at 80 cmbs
5	0-25	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	25-44	Dark brown sandy clay, 25% unsorted pebbles and cobbles
	44-80	Very compact gray silty clay with orange patches, 10% gravel
6	0-20	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	20-70	Very compact gray silty clay with orange organic material, 30% unsorted gravel, thick clear glass fragment, white glazed ceramic
7	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles, clear bottle glass fragment
	10-40	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
8	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-50	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
9	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-50	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, white ceramic fragment
10	0-60	Gray brown compact silty clay, <5% unsorted gravel
	60-75	Angular gravel in a gray brown silty clay, water
11	0-30	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	30-60	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, water at 60 cmbs
12	0-20	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	20-60	Very compact dark brown sandy clay, 40% unsorted pebbles and large cobbles
	60-65	Extremely compact gray sandy clay, 3-% unsorted pebbles and cobbles, water at 65 cmbs (auger failed)
13	0-30	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	30-80	Very compact dark brown sandy clay, 40% unsorted pebbles and large cobbles
	80-95	Gray silty clay, water at 80 cmbs (auger failed)

STP #	Depth (cmbs)	Sediment Description
14	0-25	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	25-50	Very compact dark brown sandy clay, 40% unsorted pebbles and large cobbles, large cobbles at 40 cmbs
	50-60	Very compact gray silty clay with orange organic material, 20% gravel, large cobble at 60 cmbs (auger failed)
15	0-30	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	30-90	Brown sandy clay, 10% pebbles and cobbles, charcoal
	90-150 (Auger)	Gray sandy clay, 5% angular pebbles, wet
16	0-30	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	30-45	Very compact dark brown sandy clay, 40% unsorted pebbles and large cobbles
	45-75	Compact brown sandy clay, 10% unsorted pebbles and cobbles
	75-90	Gray sandy clay, 10% unsorted pebbles, wet (auger failed)
17	0-30	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	30-55	Very compact dark brown sandy clay, 40% unsorted gravel, large cobbles at 55 cmbs
18	0-70	Very compact gray silty clay with orange organic material, 5% gravel, water at 70 cmbs
19	0-17	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	17-30	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
20	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-40	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
21	0-15	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	15-50	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, concrete pipe fragment, rusted modern nail
22	0-15	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	15-50	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
23	0-80	Very compact gray silty clay with orange organic material, 5% gravel, water at 80 cmbs
24	0-50	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	50-60	Angular gravel in brown sandy clay matrix, water at 60 cmbs
25	0-20	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	20-50	75% unsorted angular pebbles and very large cobbles, wood debris, water at 50 cmbs
26	0-25	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	25-70	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, water at 70 cmbs
27	0-15	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	15-50	Brown sandy clay, 75% unsorted pebbles and cobbles, water at 50 cmbs
28	0-25	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	25-50	Very compact gray silty clay with orange organic material, 5% gravel
	50-55	Angular gravel, water at 50 cmbs
29	0-25	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	25-45	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, rusted modern nail

STP #	Depth (cmbs)	Sediment Description
30	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-45	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, plastic fragment
31	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-20	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, large cobbles at 20 cmbs
32	0-50	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	50-80	Very compact gray silty clay with orange organic material, 5% gravel, water at 80 cmbs
33	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-60	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
34	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-40	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
35	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-60	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, large cobble at 60 cmbs
36	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-40	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles
37	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-60	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, water at 60 cmbs
38	0-10	Gray-brown silty clay, 10% unsorted pebbles and cobbles
	10-70	Very compact brown sandy clay, 40% unsorted pebbles and large cobbles, rusted modern nail, black plastic bag material at 65 cmbs

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