January 27, 2016
Job No. 003-020-15

State of Utah – DFCM
Suite 4110 State Office Building
Salt Lake City, Utah 84114

Attention: Mr. Jim Russell, Assistant Director

Ladies and Gentlemen:

Re: Report
Geotechnical Review
Proposed West Prison Relocation Site
I-87/7200 West
Salt Lake City, Utah

1. GENERAL

Since submittal of our September 15, 2015[1] review report, the "West" site within the I-80/7200 West overall site in Salt Lake City, Utah has been selected for the proposed prison. In our September 15, 2015 review study, two sites which were labeled as the "East" and "West" sites both at the I-80/7200 West overall site were being considered.

Subsequent to selection, we have performed an additional review of the preliminary geotechnical investigation for the "West" expanded site and have sat in on other meetings with you and other consultants during which the overall concept for the proposed facility was discussed. Based upon further review and the team discussions, the aspects of the overall development were discussed. A general summary of the originally proposed construction is well summarized on Page 5 of the August 3, 2015[2] report for the "West" Site. For clarity, this summary table is presented on the following page.

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1 "Report, Geotechnical Review, Proposed Prison Relocation Sites, I-80/7200 West, Salt Lake City, Utah", G[2] Job No. 003-019-15, Dated September 15, 2015.

2 "Preliminary Geotechnical Investigation, I-80/7200 West Expanded, State of Utah Prison Relocation Commission, Salt Lake City, Utah," Epic Job Number: 15-MGT-004.01, Dated August 3, 2015. ("West" Site)

Building Type	Number of Floors	Construction	Max. Strip Load	Max. Spot Load	Max. Slab Load
Housing Units	2	10-inch precast all with a 8-inch CMU grout filled interior wall with a height of approximately 24 feet and approximately 45-foot roof spans	15 kips	150 kips	150 psf
Administration	2 to 3	8-inch CMU walls or precast walls and approximately 45-foot roof spans	20 kips	200 kips	150 psf
Warehouse	1	8-inch CMU walls or precast walls with approximately 45-foot roof spans, high ceilings, industrial racks and forklifts traffic	12 kips	100 kips	250 psf

A few aspects of the table primarily with regard to loading in our opinion should be modified. Specifically, for the administration and warehouse structures anticipated construction in the area would have structures imposing significantly lower wall loads. In particular, wall loads of less than approximately 25 percent of those quoted appear to be more realistic. Maximum column and floor slab loads; however, appear to be applicable. With regard to the housing units, loads imposed will be very much dependent upon the type of construction selected and in particular whether or not precast units will be utilized. Precast units could impose the two-level loads down through bearing walls to a continuous base slab-foundation system such as a thin mat. This in our opinion would be geotechnically preferable since it would be much more tolerant of static and dynamic settlements and would impose relatively low uniform loads upon the soils (below the preconsolidated pressure of the clays).

Site development will also require that the majority of the campus be blanketed with a surficial fill layer to obtain desired overall site grade (above Great Salt Lake level) and equally important to provide a stable base for subsequent construction activities. We strongly recommend that the thickness of surficial fill be held to a minimum yet provide minimums for geotechnical stability and flooding potential. Flooding potential to a great extent can be controlled to specified level by utilizing the West Desert pumping system. This level in the near future must be defined.

Floor slab loading associated with all the structures, except possibly the warehouse, will be low typical of office loading. Therefore, the total areal loads imposed by the basic site grading fill, approximately one to one and one-halt feet of additional fill to raise the building floor slab levels plus the floor slab loading itself will be well below the preconsolidation pressures exhibited by the fine-grained cohesive soils. Therefore, preloading the proposed building sites will not be required. Minimizing the amount of site grading fill height will also greatly reduce the amount of granular fill import required.

2. FOUNDATIONS

2.1 GENERAL

At this time, it is our opinion that the proposed facilities can be supported upon conventional spread and continuous wall foundations. To aid in developing preliminary cost estimates, it must be anticipated that all of the conventional footings will be underlain by approximately two feet of granular structural fill which may consist of granular site grading fill and/or replacement fill. This is the foundation system that has been used at the Salt Lake International Center except for the recently constructed FBI building where rammed aggregate piers/Geopiers® were require beneath the more heavily loaded wall and column foundations. It should be noted that utilizing rammed aggregate piers/Geopiers® is not excessively expensive. In addition their installation is relatively fast.

2.2 MAT FOUNDATION

As a possible option to improving the subsurface soils beneath conventional foundations through the utilization of rammed aggregate piers/Geopiers®, thin mats imposing relatively low uniform pressures on the subsurface sequence may be considered.

2.3 PILE FOUNDATIONS

At this time, there appears to be no justification for utilizing deep pile or drilled pile foundations.

2.4 WICK DRAINS

Available information indicates that earthwork, floor slab, and foundation loadings will not exceed the preconsolidation pressure of the deeper site soils. Therefore, preloading and the utilization of wick drains will not be required.

3. GEOSEISMIC SETTING

3.1 GENERAL

As of July 2013, the State of Utah has adopted the International Building Code (IBC) 2012. The IBC 2012 code determines the seismic hazard for a site based upon 2008 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

The structures must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2012 edition.

3.2 FAULTING

Based on our review of available literature, no active faults pass through or immediately adjacent to the site. The nearest known active fault is the Granger fault which is located approximately one mile east of the "East" site and three miles east of the "West" site. The Wasatch fault zone further to the east will control ground motion and is considered capable of generating earthquakes as large as magnitude 7.0.

3.3 SOIL CLASS

For dynamic structural analysis and where liquefaction will not be a major factor, Site Classes D or E as defined in Table 20.3-1, Site Classification, of ASCE 7-10 April 6, 2011 can be utilized.

Some of the random saturated soils could liquefy during the design seismic event. According to the IBC 2009 Table 1613.5.2, "Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils..." are designated under Site Class F. The potential settlements due to liquefaction can be generally controlled to a range of one to two inches by installing rammed aggregate/Geopiers®. This magnitude of settlement can typically be tolerated by an adequately designed structure to provide life safety and full functionally within a short period of time. Under this condition liquefaction-induced settlements would be deep and it may be possible to utilize Site Classes E or D.

3.4 GROUND MOTIONS

The IBC 2012 code is based on 2008 USGS mapping, which provides peak values of short and long period accelerations (S_S, S_1) for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for this site for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the last column. Based on the site latitude and longitude (40.806 degrees north and 112.087 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T Seconds	**Site Class B-C Boundary [mapped values] (% g)**	**Site Class D [adjusted for site class effects] (% g)**
Peak Ground Acceleration	48.5	48.5
0.2 Seconds, (Short Period Acceleration)	S_S = 118.1	S_{MS} = 121.3
1.0 Seconds (Long Period Acceleration)	S_1 = 45.4	S_{M1} = 70.2

The IBC 2012 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (S_{MS} and S_{M1}) for the MCE event by two-thirds (⅔).

3.5 LIQUEFACTION

The site is located within an area that has been identified by Salt Lake County as having "high" liquefaction potential. Preliminary analysis indicates that the potential for liquefaction is relatively high but also localized. Our experience, however, indicates that the magnitude of liquefaction-induced settlements provided in the preliminary reports and the concern of lateral spread although present are over emphasized. The liquefaction associated with near-surface soil can be drastically reduced by soil improvement, such as installing rammed aggregate/Geopiers®. Ground rupture is not anticipated to be a high concern.

The available data indicates that in areas the liquefaction potential is low. Therefore, the selection of locations of primary facilities across the site will be very important.

4. FINAL GEOTECHNICAL STUDY

The preliminary geotechnical report dated August 3, 2015 of the selected site contains some very important information primarily related to the subsurface conditions as they prevail to liquefaction potentials. With the available data, it may be possible to select portions of the overall presently selected "West" site which will be less susceptible to liquefaction potential and therefore required remediation. In any case, it is our opinion based upon the experience and available data that most any location selected could be remediated to a point where the site would be considered acceptable.

In the period of time between submittal of our initial report September 15, 2015, there have been numerous meetings with members of the State, selected contractors, and engineers during which the proposed building concept was discussed in detail. The directions and conclusions developed in these meetings are invaluable in developing a final geotechnical study scope. Of significant importance is whether or not the actual location of the primary prison facilities can be located on the fairly large site to minimize liquefaction mitigation and the fine-tuning of the building types, one- to two-stories possibly three-story loads, and most important realistic projections as to the required long- and short-term performance of various facilities under static and dynamic earthquake loading.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

Gordon Geotechnical Engineering, Inc.

William J. Gordon, State of Utah No. 146417
Professional Engineer

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Addressee (3 + email)