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Geotechnical Engineers
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E-1487-02

August 2, 1994

WAM Enterprises
280 Seafirst Financial Center
West 601 Riverside
Spokane, Washington 99201

Attn: Mr. Walt Miller, President

INTERIM REPORT; RESULTS OF PRELIMINARY SUBSURFACE EXPLORATIONS; PROPOSAL FOR ADDITIONAL EXPLORATIONS AND GEOTECHNICAL ENGINEERING STUDIES, PROPOSED NEW FAITH BIBLE CHURCH, SPOKANE, WASHINGTON

This letter presents interim results of preliminary subsurface explorations for the proposed new Faith Bible Church, to be located on a 20 acre site just north of the intersection of Cora Avenue and Stevens Street in Spokane, Washington. It also includes our proposal for conducting additional subsurface explorations and geotechnical engineering studies.

SITE HISTORY

We understand that the proposed Faith Bible Church site and adjacent areas were formally used for many years as a source for gravel and sand borrow. A series of large borrow pits was excavated to about 60 to 70 feet deep in this area. The City of Spokane used the pits from 1953 until 1954 for the disposal of solid wastes. In the 1950s and 1960s the pits were partially filled by others with demolition debris, soil, and trash. In the early 1970s, the filling was completed to the existing surface grade. In 1974 a trailer park was constructed over much of the site.

PREVIOUS STUDY

In 1991, Gifford Consultants, Inc. conducted subsurface explorations and made a preliminary geotechnical engineering assessment of the site. Results of this work were presented in a letter report of September 27, 1991 to Great Western Savings Bank. Subsurface explorations included making four hollow-stem auger borings and eleven backhoe test pits. Studies included

reviewing previous environmental reports, and analyzing data contained on USGS topographic maps.

The explorations encountered up to about 60 ft. of very loose to dense existing FILL soil, overtop of the native gravelly SAND. The fill consisted of gravelly sand to sandy gravel and contained cobbles, boulders and variable quantities of trash and debris. Based on this information, we concluded that new buildings constructed overtop of the existing FILL and supported on shallow footings could experience substantial differential settlement. Based on these explorations which were about 150 to 300 ft. apart, we also concluded that there were two areas on the site, one located near the center and one on the east end, where it appeared that the existing FILL was probably less than about 10 feet thick.

RECENT SUBSURFACE EXPLORATIONS

The proposed new church building outline was recently staked by the project surveyor in the central part of the site in an area where we originally believed the on-site FILL was less than about 10 feet thick. On July 13, 1994, we made nine exploratory test pits in the general area of the proposed building. Eight of the test pits were located near the building corner stakes and one was located in the interior in the south half of the building. The pits ranged from eight to fifteen feet deep. Depths were limited in six of the pits because of caving of the sidewalls. All test pits encountered loose existing FILL, varying in thickness from one to greater than fifteen feet. Only one of the test pit excavations completely penetrated the FILL.

The existing FILL had variable composition, ranging from slightly sandy gravel to slightly silty sand and contained variable amounts of debris, including fragments of glass, ceramic, metal, concrete, and brick.

Six of the nine test pits had to be terminated at a depth of about eight to ten feet because of caving, and two of the test pits were terminated at a depth of fourteen to fifteen feet because of the depth limitations of the backhoe. Undisturbed native soil was only encountered at one test pit at a depth of one foot below the surface.

CONCLUSIONS

Based on the results of the recent explorations, we believe that the existing FILL in the central part of the site is thicker than what we originally thought based on the 1991 exploration data. Current data suggests that the area underneath much of the proposed building outline at its present location is probably underlain by existing FILL that is greater than 10 feet thick. Consequently, in our opinion, there is a substantial risk that foundation settlement will occur under the effect of new building loads.

To minimize foundation settlement risk for new structures over deep fill site conditions, there are several options that can be considered:

- In-place improvement of the relative density of the existing FILL.
- Constructing deep foundations supported on competent native soils below the existing FILL.
- Removing the existing FILL and replacing it with compacted Structural Fill.

In-place improvement of loose soil can be accomplished by procedures such as grouting, vibro-replacement (stone columns), deep dynamic compaction (DDC), and preloading. Grouting fills the voids and increases relative density by welding the mass together. Vibro-replacement rearranges the existing particles and adds granular material to take up the volume loss. DDC rearranges particles by imparting a large amount of surface energy. Preloading simulates the weight of the proposed new building and forces potential settlements to occur before the actual building loads are applied.

In our opinion, this site is probably not suitable for grouting, since in existing FILL soils it is difficult to control where the grout penetrates. It is also difficult to predict grout quantities required and, therefore, the costs are hard to control.

Vibro-replacement methods can be effective in medium to coarse grained fill soils such as are present at this site. In this process of soil improvement, the loose, granular soils are rearranged into a more dense configuration, under the influence of a poker type vibrator, usually accompanied by water jetting. The void created by rearrangement of the particles is filled with sand or gravel, which under the action of the vibrator, are

forced into the existing FILL soils. The process is repeated on a grid pattern under the entire building footprint area.

Deep Dynamic Compaction is a method of improving and densifying soil by repeatedly dropping a heavy weight on a grid pattern from a large crane. In our opinion, this method would also probably be effective in improving the relative density of the existing FILL at this site. It was previously used at the Washington Department of Transportation site, approximately 3/4 of a mile southeast of the Faith Bible Church site, to improve loose existing FILL soils. The method requires care to control flying debris, and off-site vibrations can be annoying and potentially damaging to neighboring buildings.

The preload method of soil improvement involves constructing a surcharge fill to simulate the weight of the new building and force settlement to occur before the actual building loads are applied. In granular soils, the induced settlements are relatively rapid. The method requires monitoring the settlement that occurs during surcharge fill placement and rebound that occurs during surcharge removal. Preloading was used successfully at the Group Health Riverfront Medical Center site approximately one and one half miles south of the Faith Bible Church site.

Deep foundation methods can include driven or auger cast piling. Unless the loose surface subgrade is separately treated, such as with preloading or removal and replacement, the first floor of a pile-supported structure would also probably have to be structurally supported to minimize potential slab settlement.

Removing existing fill and replacing it with compacted Structural Fill is an often used method for improving site foundation bearing conditions. At this site, however, because of the local presence of relatively high amounts of debris, much of the existing FILL would not be suitable for reuse as replacement Structural Fill; therefore, a considerable volume of import fill would be required.

No matter which method is used to limit foundation settlement, it will be necessary to conduct additional explorations to better assess the thickness of the existing FILL beneath the proposed new building footprint. We believe that hollow-stem auger borings would be the best method to accomplish the additional exploration.

PROPOSED ADDITIONAL EXPLORATIONS AND STUDY

We propose to conduct a subsurface exploration program consisting of seven hollow-stem auger borings. Each boring will extend through the existing fill and about five feet into the underlying native soil. We estimate that the boring depths will average about 20 to 25 feet. We propose to accomplish the drilling work with a CME-75, truck-mounted, hollow-stem auger drill rig. Soil samples will be obtained at 2.5 to 5.0 feet intervals, using a standard split-spoon drive sampler, in general accordance with ASTM Test Designation D 1586.

The field work will be performed under the direction of our geological engineer who will collect representative samples and prepare descriptive logs of the borings. Soil samples will be sealed to preserve moisture and will be transported to our laboratory where we anticipate that testing will consist of verifying field classifications and conducting selective moisture content and gradation tests.

After the completion of the explorations and laboratory testing, we propose to meet with you to present the results of the explorations and our assessment of the relative advantages and disadvantages of each alternative method of limiting foundation settlements at this site. Based on the results of this meeting we will prepare a report to provide written recommendations for design and construction. Our report will include information and recommendations for the following:

- Site Preparation Work; including stripping and grading recommendations, temporary and permanent excavation slopes, fill slope recommendations and assessment of possibility for reuse of on-site soils for Structural Fill purposes.

- Soil Improvement; design and construction details for the preferred soil improvement method; recommended monitoring requirements.

- Foundation Recommendations; foundation types, allowable bearing pressure, bearing stratum, estimated foundation settlements, and foundation construction considerations.

- Earth Pressure Recommendations; passive, active, and at-rest pressures and footing sliding resistance for elements of foundations and walls below grade.

- Fill Material Recommendations; including specifications for Structural Fill, wall backfill, drainage material, and compaction recommendations.
- Groundwater and Drainage Recommendations.
- Pavement Recommendations; subsurface drainage, subbase preparation, paving materials, flexible pavement design considerations.

Our final report will include a plot plan showing the locations of the current and previous borings and test pits, copies of the boring and test pit logs, and plots of the appropriate laboratory test data. Five copies of our report will be provided.

SCHEDULE

We are prepared to begin the exploration work as soon after your authorization as the drilling equipment can be mobilized. Normally this is about one or two weeks. We estimate that the field work could be accomplished in about two and one-half days. Laboratory testing could take an additional two to three days. We believe we could be prepared to meet with you and present the preliminary exploration results and discuss soil improvement methods about one week after completion of the laboratory testing. We estimate that our report could be completed and delivered to you within about two weeks after a soil improvement method is selected. Preliminary verbal recommendations can be provided to you and the Structural Engineer as soon as they are developed from our studies. In this way, the foundation design can proceed on a timely basis and not be contingent upon receipt of our final report.

ESTIMATED COSTS

Our costs to date for the recent test pit explorations and this interim report are about $2,000. We propose to perform the additional work described above on a time-and-expense basis and in accordance with the terms of the attached Agreement for Professional Services. We estimate that the total cost of the additional work described could range from $7,800 to $8,800. We agree to perform the work described for $8,100 and not to exceed this amount without your additional authorization. This cost includes approximately $2,700 for drilling services, $1,300 for field engineering services, $400 for laboratory testing, and $3,700 for engineering analysis and report.

Since the geotechnical investigation work proposed above will be done before the Structural Engineer's foundation plan and the Civil Engineers grading plan are finalized, some additional geotechnical consulting services may be needed after the explorations and report are completed in order to provide more specific design and construction recommendations such as analyses for specific foundation design. In our opinion, it would be reasonable to assume that these additional services could range from $500 to $1,000, in addition to the cost of the explorations and report described above. This cost is not included in this proposal but you are advised that it may be necessary.

AUTHORIZATION

If the work described above meets with your approval, please sign in the space provided and return one copy of this letter, which will then serve as your authorization for us to proceed.

We appreciate your confidence in our firm and the opportunity to work with you on this project. If you have any questions or comments on the results of the recent explorations, or wish to discuss the scope of the proposed additional work or estimate of costs please contact me or Allen Gifford.

Sincerely,

GIFFORD CONSULTANTS, INC.

Grant R. Cummings, P.E. P.G.
Geological Engineer

by G.R.C.

Allen B. Gifford, P.E.
President

Enclosure: Agreement for Professional Services SM-94
Cost Estimate

I accept the above conditions and authorize the work to proceed.

NAME_____

SIGNATURE_____

TITLE_____

ORGANIZATION_____

ADDRESS_____

DATE_____ PHONE_____

GIFFORD CONSULTANTS, INC.
STANDARD AGREEMENT FOR PROFESSIONAL SERVICES

Attachment to and part of E-1487-02

Date August 2, 1994

1.0 STANDARD OF CARE • QUALIFICATIONS • RISKS

Gifford Consultants, Inc. will conduct the services described in the attached proposal and under this agreement in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. Under no circumstances is a warranty, express or implied, made in connection with providing geotechnical engineering services.

All work will be performed by qualified personnel under the supervision of a Registered Professional Engineer.

Subsurface conditions may vary from those observed at locations where borings, surveys, or explorations are made and may also change with time. Our data interpretations and recommendations will be based solely on information available to us at the time of our work. Test borings, test pits and geophysical methods are an accepted and informative means of subsurface exploration. However, they cannot indicate with absolute certainty the full nature of the subsurface conditions between and below the exploration points. Despite the use of due professional care, these limitations will result in some level of uncertainty and risk regarding the interpretation of site subsurface conditions.

2.0 BASIS OF CHARGES AND COMPENSATION

2.1 Direct Labor Costs

Compensation will be determined on the basis of time-and-expenses expended on the project. Fees for services including travel time by professional, technical and clerical personnel will be computed by multiplying 2.4 times the payroll cost charged to the project. Payroll cost will include 29 percent for payroll taxes and employee benefits. Staff time spent in depositions, trial preparation, court or hearing testimony will be billed at the standard rates plus 20 percent.

2.2 Reimbursable Expenses

Expenses other than salary costs that are directly attributable to the professional services for this project such as but not limited to, out-of-town travel and living expenses, equipment rental, phone, fax, reproduction, film and photo processing, subcontract laboratory testing, subconsultant services and job related shipping charges and supplies, will be invoiced at our cost plus 10 percent. When we engage a subcontractor for drilling, or other site exploration work or testing, we will invoice for the subcontract services plus 10 percent. If explorations are conducted using Gifford Consultants, Inc. equipment, a separate invoice will be provided for those services without additional markup. Other Gifford Consultants, Inc. owned equipment that may be used, such as nuclear densometers, hand drilling equipment, etc., will be invoiced using our current equipment rate schedule at prices specified in the proposal. Laboratory tests using our equipment will be billed at: (a) the personnel labor rate plus $2/hour laboratory equipment use fee, or (b) current unit lab test prices specified in the proposal.

2.3 Billings and Payment

Invoices for services will be submitted monthly. Payment will be due upon receipt of the invoice unless otherwise agreed to in writing. Interest at the rate of 1-1/2 percent per month will be added to unpaid accounts due over 30 days. Expenses incurred in collecting delinquent accounts, including but not limited to attorney's fees, court costs and related fees, will be paid in addition to the delinquent account.

3.0 WORK SCHEDULE DELAYS

The work will be performed in general accordance with the schedule outlined in the attached proposal. Neither party shall hold the other responsible for damages or delay in performance caused by weather and other acts of God, strikes, lockouts, accidents or other events beyond the control of the other or the other's employees and agents.

4.0 SITE ACCESS • CLIENT FURNISHED DATA • SITE DISTURBANCE

You are responsible to provide us with a description of the property, its location, and the location of any underground utilities, facilities, or structures which could impact our work. You must also advise us of the location and nature of any known or suspected hazardous materials that may exist on the property. You agree to provide us with applicable permits and right of entry on the land and to be responsible for the propriety of the time, place and manner of our entry to the site where we are to make explorations.

You agree to provide us with a plan showing the location of existing underground utilities and buried structures, such as sewer, electric, etc. We and our subcontractors will use reasonable care and dligence to avoid contact with these underground facilities as they are shown on the plan. You will hold us and our subconsultants and subcontractors barmless, defend and indemnify us from any loss resulting from inaccuracy of the plans or lack of plans relating to the location of underground structures and/or utilities.

We will take reasonable precautions to minimize damage to the site from the use of equipment, but have not included in our proposed fee the cost of restoration to original conditions. A separate cost proposal will be provided if you require additional site restoration.

5.0 DISCOVERY OF UNANTICIPATED HAZARDOUS MATERIALS

The discovery of unanticipated hazardous materials constitutes a changed condition mandating a renegotiation of the scope of work, or termination of services. You agree that the discovery of unanticipated hazardous materials may make it necessary for us to take immediate measures to protect health and safety. We agree to notify you immediately when unanticipated hazardous materials or suspected hazardous materials are encountered. You agree to compensate us for any equipment decontamination or other costs incident to the discovery of unanticipated hazardous materials. You agree to waive any claim against us and to the maximum extent permitted by law agree to defend and indemnify and save us harmless from any claim, liability and defense cost for injury or loss arising from our discovery of unanticipated hazardous materials or suspected hazardous materials including but not limited to any costs created by delay of the project and any costs associated with possible reduction of the property's value. Gifford Consultants, Inc. agrees to notify you when unanticipated hazardous materials or suspected hazardous materials are encountered. You agree to make any disclosures required by law to the appropriate governing agencies. You also agree to hold Gifford Consultants, Inc. harmless for any and all consequences of disclosures made by us which are required by governing law. You will also be responsible for the ultimate disposal of any samples we secure which are found to be contaminated.

6.0 SAMPLE DISPOSAL • RETENTION

Non-hazardous samples will be discarded 60 days after submission of our final report, unless you advise us to deliver them to you at your expense or store them for an agreed storage charge. Samples containing hazardous materials that are regulated under Federal, State or local environmental law will be returned to you at your expense.

ESTIMATE OF COSTS

Additional Explorations and Geotechnical Engineering Studies

Faith Bible Church Site

1.0 FIELD EXPLORATIONS

1.1 Drilling Services (Seven Borings, Approx. 170 LF Total)

Job Preparation	1 MH	$ 40
Mobilization	1 HR	120
Drilling & Sampling	18 HRS	2160
Moving/Cleanup	2 HRS	240
Misc. (bits, teeth, etc.)	EST.	100
Extra Travel	1 MH	40
		$2,700

1.2 Field Engineering/Geology

Job Preparation & Planning	2 MH	$ 90
Boring/Test Pit Layout	1 MH	45
Utility Check	1 MH	45
Boring/Test Pit Logging	20 MH	900
Travel	3 MH	135
Support Vehicle	30 MI	15
Misc. (sample containers, photos, etc.)	LS	40
		$1,270

2.0 LABORATORY TESTING

2.1 Index Testing (Approx. 60 split-spoon samples)

Visual Classifications (ASTM D 2488)	3 MH	$ 105
Moisture Contents (ASTM D 2216)	3 MH	105
Gradations (ASTM D 422)	5 MH	175
		$ 385

3.0 ENGINEERING

3.1 Data Analysis

Field Data Analysis	6 MH	$ 360
Laboratory Data Analysis	2 MH	120
Engineering Analysis/Recomm.	20 MH	1200
Meetings	4 MH	240
		$1,920

3.2 Report

Engineering Report	12	MH	$ 720
Drafting	10	MH	350
Clerical	6	MH	210
Engineering Mgmt. & Review	4	MH	340
Misc. (computers, reprod., etc.)		EST.	120
			$1,740

TOTAL ESTIMATED COST $8,015

ESTIMATED COST RANGE $7,200 - $8,800

USE **$8,100**