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1 GENERAL

1.1 REQUIREMENTS INCLUDED

- .1 Furnish all labour, material, services and equipment necessary to carry out and complete excavation work and shoring, as indicated on the drawings and as hereinafter specified.
- .2 The Work shall include, but shall not necessarily be limited to:
  - .1 Bulk excavation of Site to elevations indicated.
  - .2 Removal of any existing site services, foundations, footings, paving, curbs and any other appurtenances as indicated and as discovered.
  - .3 Removal of non-contaminated excavated materials and all debris, rubbish and vegetation from the Site and transportation to permitted disposal area(s) or dump sites.
  - .4 Removal, stockpiling on site, and loading into trucks of any contaminated soil discovered during excavations.
  - .5 Providing, maintaining, and removing temporary roads and access ramp within the excavation.
  - .6 Dewatering collection, including site grading, trenching and berming.
  - .7 Dewatering of excavations including temporary sediment control ponds including all pumping equipment and piping and maintenance of such sediment control pumping as required by the City and LEED® sedimentation control.
- .3 The work under this section also includes supply and installation of bulk excavation shoring and underpinning an temporary sediment control facility, as indicated on the Excavation Shoring Drawings and as specified herein.**
- .4 Bulk excavation shall be carried out to comply with Excavation Shoring Drawings and shall be coordinated with the required excavation shoring installations.
- .5 Bulk Excavation shoring and underpinning details and Shoring Notes and Specifications and temporary sediment control details and General Notes on the Excavation Shoring Drawings form an integral part of this specification section and shall be read in conjunction therewith.**

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1.2 RELATED REQUIREMENTS

- .1 Section 01 33 02: Green Building Information Submittal Form.
- .2 Section 01 35 18: LEED® Requirements and Procedures.
- .3 Section 01 74 20: Waste Management and Disposal.
- .4 Section 02 32 00: Geotechnical Investigation Report.
- .5 Section 31 23 23: Backfill (Future Contract).

1.3 EROSION & SEDIMENTATION CONTROL - LEED® PREREQUISITE – SUSTAINABLE SITES

- .1 **The Contractor is reminded that requirements for erosion and sedimentations control as defined by LEED® and summarized in Section 01 35 18, form a Prerequisite for this project. Failure to comply will risk appropriate legal action by the City.**
- .2 **Prior to commencing work the Excavation and Shoring Subcontractor shall prepare and submit for review and approval by the Consultant and Geotechnical Engineer, a site plan and written procedures approach, outlining methods to minimize dust, controlling water run-off from the site, avoiding dirty water or silt entering the City storm waster system, and preventing all vehicles from tracking materials off site.**

1.4 SUBMISSION – PROPOSED PROCEDURES

- .1 Submit to the Geotechnical Engineer and the Consultant, a proposed bulk excavation and shoring schedule and procedures for review, prior to commencing work on the Site.
- .2 Do not proceed with any stage of the bulk excavation or shoring until written confirmation is provided by the Geotechnical Engineer that the proposed methods and sequencing for bulk excavation and shoring are in general agreement with the intent of the Geotechnical Engineer's design for excavation and shoring.

1.5 CODES AND STANDARDS

- .1 Perform excavating to B.C. Building Code 2006, City Regulations and WorkSafe BC regulations, as applicable.
- .2 During excavation and final clean up, observe all anti-dust, air pollution and noise regulations of the City of Vancouver and stage operations in accordance with these regulations.
- .3 Comply with City Noise/Construction By-Law regulations.
- .4 Comply with City regulations for cleaning of vehicle tires exiting the site and keeping City streets and sidewalks clean at all times.
- .5 Comply with Section 01 35 18 - LEED® Requirements and Procedures and Section.

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1.6 EXAMINATION OF SITE

- .1 Visit and examine the site and note all visible characteristics and features affecting the work of this section.
- .2 Check all existing visible conditions. Report any unsatisfactory conditions to the Consultant prior to commencing excavation.
- .3 Before commencing bulk excavation check status of existing services still in operation with utilities "hot-line".

1.7 GEOTECHNICAL INVESTIGATION REPORT

- .1 A geotechnical investigation report of the site accompanies the Bid Documents, **for information only**.

1.8 VERIFY DIMENSIONS

- .1 Existing elevations, dimensions and existing features shall be verified before laying out work. Starting work shall be held to imply that the Contractor has verified them and found them to be correct. Any additional costs arising out of any rectifications due to the Contractor's failure to verify existing conditions shall be borne by the Contractor.

1.9 PERMITS AND DEPOSITS

- .1 The Contractor shall obtain and pay for Excavation and Shoring Permits and all Damage and Crossing deposits as required by the City, and shall also obtain and pay for a Temporary Encroachment Permit, if required, and other permits or licenses required for Excavation and Shoring.
- .2 The Contractor shall make a record and take digital photographs of any damage to adjoining streets, sidewalks, boulevards, etc. existing prior to commencement of the Work.
- .3 Damage deposits made to the City by the Contractor shall not relieve the Contractor of his responsibility to provide adequate protection to prevent damage to City property. Charges against the damage deposits as a result of the Contractor's activities will be deducted by the City from monies due to the Contractor.

1.10 ENVIRONMENTAL SITE ASSESSMENT REPORT

- .1 An environmental assessment of the site has been done. Copy of the report accompanies the Bid Documents. The report is for information only.
- .2 If any contaminated or hazardous materials present on the site are encountered (any soil containing any contaminated or hazardous materials is referred to collectively herein as "Hazardous Substances"), excavate, remove and dispose of such Hazardous Substances at such location and in such manner required by the applicable Provincial regulations. After prior approval of the Consultant, the Contractor will be entitled to a Change Order to adjust the schedule and the contract price in an amount as agreed between the Contractor and the City.

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1.11 EXCAVATION AND SHORING REVIEWS

- .1 GeoPacific Consultants Ltd. has been retained by the Owner as the Geotechnical Engineer to review the bulk excavation and to design and review the shoring of the bulk excavation.
- .2 As such, the Geotechnical Engineer shall periodically observe the performance of the Work and the stability of the excavation faces as the work progresses, and shall confirm bearing capacity of the soils at footing locations, and review seepage conditions.
- .3 The Geotechnical Engineer has the authority in an emergency to stop the progress of the Work whenever, in his opinion, such stoppage may be necessary to ensure the safety of life, the Work or adjoining property. This includes authority to make changes in the Work.
- .4 Where actual soils conditions warrant addition, or deletion of excavation to that indicated, as determined by the Geotechnical Engineer, then such excavation shall be considered as an addition, or deletion as applicable to the contract, and the contract price shall be adjusted, utilizing unit prices stated in the tender.
- .5 The Geotechnical Engineer or his authorized representative shall be the sole judge to decide on questions arising on actual soils conditions encountered, on excavation procedures, on shoring, or protection to be provided and on any other matter concerning the excavation, or shoring, his decision shall be final.
- .6 Cooperate with the Geotechnical Engineer and allow free and unobstructed access to the site at all times.
- .7 The Geotechnical Engineer will sign a letter of assurance and hand the letter to the City for forwarding to the City Engineering Department together with two (2) sealed copies of a drawing showing a plan of the maximum extent of the excavation, (on the Site and on the City property) as well as complete details of proposed shoring and anchors.

1.12 STREET REPAIRS

- .1 Repair all streets, sidewalks, and curbs damaged during the Work by excavation equipment or activities to City standards.

1.13 STREET MAINTENANCE

- .1 Be responsible for the cleaning of vehicle tires exiting from the site and/or cost of street and sidewalk cleaning, for the duration of this contract in accordance with City regulations.
- .2 Refer also to Clause 3.12 – Erosion and Sedimentation Control.

1.14 DUST CONTROL

- .1 Be responsible for the adequate control of dust for the duration of the Work. Such control shall be to the approval of the City and shall be adequate to avoid inconvenience and complaints from the City, or from adjoining property holders.

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1.15 SITE ACCESS AND TRAFFIC

- .1 If required obtain and pay for any permits and/or approvals from the City and other authorities having jurisdiction for proposed haul routes to the disposal or landfill sites. Comply with all requirements of the City and other authorities for such routing.
- .2 Be responsible for traffic control at the site to the satisfaction of the City and other regulatory authorities at the area of the Site and provide all necessary barricades and flagpersons.
- .3 Provide and maintain adequate warning signs, flashing lights, barricades, etc., at the Site, as required by the City.
- .4 Access to the site and egress for trucks and equipment shall be controlled by the Contractor.

1.16 EXISTING UNDERGROUND SERVICES

- .1 Prior to commencing the Work, establish in coordination with the Geotechnical Engineer, the Consultant, the City and other applicable authorities and/or utility companies the location and state of use of existing buried utility or service lines shown on the Contract Documents within the area of the Site, including service entry points. Mark these locations clearly on Site and prevent accidental disturbance during the work.
- .2 Costs and damages incurred by the Contractor causing disturbance of existing utilities and service lines required to remain in operation shall be borne by the Excavation and Shoring Subcontractor.
- .3 Any utility or service discovered during excavation and not indicated on the Contract Documents, which is presently in use, or not definitely established as abandoned but which must be moved or otherwise disturbed, shall be referred to the City and the applicable utility owner so that they can carry out necessary removal.
- .4 Any damage done, settlement or collapse to services caused by inadequate measures being taken by the Contractor to prevent same, shall be made good immediately, at no additional cost to the Owner.

2 PRODUCTS

2.1 MATERIALS

- .1 Materials for the temporary roads within excavation and temporary ramp access shall be as required to adequately carry intended equipment and truck loads and minimize ramp maintenance and street cleaning.
- .2 Provide suitable road mulch or other granular material for ramp(s) and road surface within the excavation.
- .3 Lean Mix Concrete – 5 MPa at 28 days.
- .5 Shot crete, soil anchors and grout – Refer to Excavation Shoring Drawings.

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### 3 EXECUTION

#### 3.1 SEQUENCE OF BULK EXCAVATION AND SHORING

- .1 Carry out bulk excavation progressively to allow for installation of excavation shoring and underpinning. Provide stable excavation faces during all excavation work.
- .2 Phase bulk excavation to allow for progressive construction of shoring and underpinning.

#### 3.2 SITE CLEARING

- .1 Clear site of all remaining surface debris.
- .2 Remove existing foundation walls, retaining walls and footings.
- .3 Break-up and remove any existing asphalt paving, concrete slabs on grade, concrete paving, concrete sidewalks and curbs within the site.
- .4 Remove any abandoned power poles, concrete bases and other concrete appurtenances within the site.
- .5 Recycle existing bricks left on site and all asphalt surfacing and concrete materials in accordance with Section 01 74 20 – Waste Management and Disposal.

#### 3.3 BULK EXCAVATION

- .1 Refer to Excavation Shoring Drawings and carry out bulk excavation progressively as required by such drawings to allow for installation of shoring.
- .2 Prior to commencing excavation:
  - Ensure all existing services to the site have been disconnected.
  - Verify documented permission has been obtained by the City from adjacent property Owners prior to conducting any work on such properties.
  - Notify the Geotechnical Engineer and the Consultant two (2) working days before commencing bulk excavation.
- .3 Coordinate bulk excavation with the excavation shoring installations.
- .4 Excavate to elevations, cross-sections and dimensions indicated on the drawings.
- .5 Unless noted otherwise final elevations of bottom of bulk excavations shall be to underside of new building concrete slabs on grade as indicated. Final elevations shall be to within plus 1" or minus 1" of required elevations for bulk excavation.
- .6 Remove any existing abandoned underground service lines encountered on site during excavation, as indicated and/or as discovered. Preserve and protect any water, sewer or electrical services encountered at the perimeter of the site.

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3.3 BULK EXCAVATION (Continued)

- .7 Remove existing concrete, footings, foundation walls, bases, slabs, and other obstructions below grade encountered during excavation.
- .8 At the cut face, phase operations so that a stable slope is maintained as the bulk excavation progresses. The Geotechnical Engineer will examine the excavation as it progresses and will design any additional support work that may be required to maintain a stable excavation.
- .9 Where excavation to final grade is to be carried out during wet weather conditions or left open for a period of several days or more place a lean mix concrete of unconfined compressive strength of at least 5 MPa at 28 days and at least 2" thick over exposed subgrade area for footings. Remove any loosened, softened, or otherwise disturbed portion of the subgrade and replace with lean mix concrete.
- .10 Where over excavation of post glacial soils is required fill with 5 MPa lean mix concrete.
- .11 Remove all boulders encountered during excavation. Boulders one (1) cubic yard and under in size shall be included as part of this contract. Removal of boulders over one (1) cubic yard in size shall be defined as rock excavation and will be paid for at unit price stated in the Bid. (Refer to clause 3.5.2 and 3.6.)
- .12 Be totally responsible for safety during excavation work and meet the requirements of all regulatory bodies.
- .13 No additional compensation will be paid by the City for any changes due to deterioration or over-excavation of excavations caused by activities or neglect of the Contractor.
- .14 Level and clean excavation bottoms free from loose material and debris on completion of the Work.
- .15 Protect excavations against freezing. If frozen material occurs, it shall be removed and backfilled by the Contractor with mass concrete of strength approved by the Structural Engineer at no additional cost to the Owner.

3.4 BULK EXCAVATION SHORING AND UNDERPINNING

- .1 Install excavation shoring systems and underpinning in accordance with Excavation Shoring Drawings.
- .2 Carry out installation of shoring and underpinning progressively as required by Excavation Shoring Drawings and to accommodate bulk excavation.
- .3 Unless noted otherwise shoring faces shall be to within plus 1" or minus 1" of the vertical.

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### 3.5 ROCK EXCAVATION

- .1 Excavate all rock to produce clean undisturbed surfaces.
- .2 Rock excavation shall be defined as material exceeding one (1) cubic yard in volume including sandstone, shale or conglomerate that cannot be ripped by a D-9 tractor with a single shank ripper in open excavation or that cannot be removed by a Cat 345 B/C hydraulic backhoe with ripper in detailed excavation. Glacial till, hardpan, frozen material and any material that can be loosened with a jack hammer and/or the above equipment shall not be defined as rock. This classification does not include materials that can be removed by means other than drilling and blasting or drilling and wedging, but which for reasons of economy, the Excavation and Shoring Subcontractor chooses to remove by drilling and blasting.
- .3 Rock excavation as defined in 3.5.2 will be paid for at unit prices stated in the bid.
- .4 Rock will be stripped for measurement before excavating and no rock excavated or loosened before measurement will be allowed or paid for as rock. Measurement, and payment therefore, will be the number of cubic yards required to bring the excavations to the required elevations.
- .5 Mass excavation in rock shall be "bank measure", i.e. the volume as it exists in the ground, not the truck volume. The face of the excavation shall be measured vertically, with no slope allowance.
- .6 A land surveyor licensed to practice in B.C. will be employed by the City to measure volume of rock as defined before excavation in rock is started.

### 3.6 MEASUREMENT AND PAYMENT FOR ROCK

- .1 State in the tender a unit cost per cubic yard for excavating in and removing rock as defined above under clause 3.5.2, inclusive of all profit, overhead, taxes, supervision, loading, transportation costs and dumping. Rock as defined above and encountered in the excavation will be paid for at the unit rate stated in the tender. Unit prices stated shall exclude HST.
- .2 Rock excavation shall be measured in accordance with Canadian Institute of Quantity Surveyors Method of Measurement.

### 3.7 BLASTING

- .1 **Blasting shall only be permitted where approved in writing by the Geotechnical Engineer.**
- .2 **Provide a blasting plan to the Consultant and Geotechnical Engineer for review prior to commencing any blasting.**
- .3 **Prior to blasting, submit to the Consultant and Geotechnical Engineer a written proposal of operations for rock removal indicating types and quantities of explosives to be used; loading charts and drill hole patterns; type of blasting caps / method of detonation;**



3.7 BLASTING (Continued)

**blasting techniques; blast protection measures for items such as fly rock; vibration and dust and noise control; schedule time for blasting; and other pertinent details.**

- .4 **Notify the Consultant, and Geotechnical Engineer 24 hours prior to commencement of any blasting. Drilling, blasting and the use, hauling and storage of explosives and accessory equipment shall be done strictly by bonded operators.**
- .5 Conform with blasting requirements of Canadian Construction Safety Code, City and WorkSafe BC applicable regulations.
- .6 Be totally responsible for safety on the Site and meet the requirements of all regulatory bodies, with respect to blasting.
- .7 Retain qualified, licensed explosives expert to supervise and program Work, to determine precautions, preparation and blasting techniques, and to supervise and report on drilling of blast holes and line drilling operations. Pay all costs for such services.
- .8 Assume full responsibility and pay all costs for claims arising from the handling and use of explosives related to this project, notwithstanding approval to proceed.
- .9 Ensure the safety of the public and property at all times during blasting operation.
- .10 When blasting operations are required, it will be necessary to perform these operations under controlled techniques so as to limit the intensity of the ground vibrations at the nearby buildings to prevent any possibility of damage to the buildings and to minimize adverse affects upon people and equipment within the buildings.
- .11 Post guards, sound warnings and display signs when blasting is scheduled to take place in accordance with applicable regulations.
- .12 Any floaters or layers of rock extending across the property line shall be cut by drilling and wedging or by carefully controlled blasting procedures.
- .13 Be responsible for and take all necessary precautions, and pay all costs to prevent blasting activities from causing damage to adjoining buildings, sidewalks, streets, lanes, surroundings, and services; including temporary removal and replacement of utilities.
- .14 Where pockets are formed by blasting below the required bottom elevations, and where such pockets will not drain, provide ditching to a free outlet, and at fill pockets to required elevation with concrete of strength approved by the Structural Consultant.
- .15 It will be necessary to perform blasting operations under controlled techniques so as to limit the intensity of the ground vibrations at nearby buildings to prevent any possibility of damage to the buildings and to minimize adverse affects upon people and equipment within the adjacent buildings.

3.7 BLASTING (Continued)

- .16 Blasting procedures shall be followed which will protect personnel and property from any possible damage. Extreme care shall be exercised with the use of mats and other safeguards as required so as not to scatter loose rock that would cause damage to adjacent property. Take every precaution to protect the public and workers from any injury or harm which might arise from the use of explosives. Only workers thoroughly experienced in handling explosives shall be permitted to supervise, handle, haul, load and shoot explosives.
- .17 In addition to the general requirements set out above, appropriate blasting procedures shall be followed when blasting rock within the excavation to limit the peak ground motion velocities at adjacent structures to 1" per second.
- .18 All blasts shall be monitored by the Contractor. During the initial stages of blasting and in conjunction with the Geotechnical Engineer, a monitoring relationship formula shall be developed between peak particle velocity, distance and maximum explosive charge per delay. The work shall be so organized that blasts more distant from the adjacent structures of concern are to be initially monitored.
- .19 All vibration / seismographic monitoring records obtained during the course of blasting shall be provided to the Geotechnical Engineer in a timely fashion.

3.8 RAMP(S) AND ROAD SURFACES

- .1 Provide and maintain temporary ramp(s) and road surfaces within the excavations. Use suitable gravel road base material for ramp travel surfaces. Maintain ramp surface until completion of the bulk excavation.
- .2 Leave temporary ramp in place on completion of excavation.
- .3 State in the Bid the amount of monies to be added to the tender price for the removal of the temporary ramp at the direction of the Contractor.**

3.9 EROSION AND SEDIMENTATION CONTROL

- .1 The Contractor is reminded that the requirements for erosion and sedimentation control as defined by LEED® and summarized in Section 01 35 18, form a Prerequisite for this project. Failure to comply will risk appropriate legal action by the City.
- .2 An Erosion and Sedimentation Control Plan shall be prepared by the Contractor to meet LEED® Prerequisite requirement and the requirements of the City of Vancouver. Submit the Plan to the Geotechnical Engineer, and the Consultant for review prior to proceeding.
- .3 Provide the temporary sediment control facility on site as required by City guidelines and in strict accordance with plans, details and general notes for such facility as indicated on the Excavation Shoring drawings.

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3.9 EROSION AND SEDIMENTATION CONTROL (Continued)

- .4 Provide all necessary pumping equipment and piping and pump out or otherwise remove continuously all water that may accumulate in excavations during the progress of the work into the sediment control pond. Do not divert water onto adjacent property or directly into existing storm drains.
- .5 Maintain existing storm drains and water from any source which hinders the satisfactory prosecution of the work or which otherwise adversely affects the quality of the Work shall be diverted or removed by temporary drains and pumping into the control pond.
- .6 Comply also with the guidelines of the City for erosion control as specified on Excavation Shoring Drawing No. G-SP3.

3.10 DISPOSAL OF EXCAVATED MATERIALS

- .1 Refer to Section 01 74 20 –Waste Management and Disposal and comply with requirements for waste management and disposal.
- .2 Remove all non-contaminated excavated materials from the site and the property. Remove all debris and all rubbish from the site. Transport all such excavated materials and debris to permitted dump or disposal areas. Excavated materials or debris shall not be left on the site or adjoining property.
- .3 Remove any contaminated soil discovered during excavations in accordance with B.C. Environmental Management Act and BC Hazardous Waste Regulations.

3.11 CLEAN UP

- .1 Promptly, as the work proceeds and on completion, clean up and remove from the Site any debris or rubbish resulting from the Work in accordance with Section 01 74 20.
- .2 On completion of the excavation work subgrade level(s) shall be left clean for later operations.

3.12 UNIT PRICES

- .1 Submit unit prices as listed in the Bid Form for excavation and shoring.
- .2 Each unit price will be used for payment of work additional to the contract and work deleted from the contract. Unit prices quoted shall remain in force until date of Substantial Performance of the Work.

3.12 UNIT PRICES (Continued)

- .3 Unit prices shall include supply, conveyance and delivery to the project site, unloading, installation and all overhead, profit and taxes, excluding HST.
- .4 Work will be measured by the City appointed land surveyor, whose decision shall be final.
- .5 Excavation and fill quantities will be measured as bank measure and unit prices shall include loading, removal from site, transportation and dumping at permitted landfill or disposal area as required.

END OF SECTION 31 23 00