REQUEST FOR QUOTATIONS

Title: **Additional Geotechnical Services – Trouton Pit, South, Westminster Arena**

Reference No.: **1220-040-2016-062**

(General Services)

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REQUEST FOR QUOTATIONS

1. INTRODUCTION

The City of Surrey (the "City") invites contractors to provide a quotation on the form attached as Schedule B to Attachment 1 (the "Quotation") for the supply of the goods (if any) and/or services described in Schedule A to Attachment 1 (the "Goods and Services"). The description of the Goods and Services sets out the minimum requirements of the City. A person that submits a Quotation (the "Contractor") should prepare a Quotation that meets the minimum requirements, and may as it may choose, in addition, also include goods, services or terms that exceed the minimum requirements.

2. ADDRESS FOR DELIVERY

A Quotation should be labelled with the Contractor's name, RFQ title and number. A Quotation should be submitted in the form attached to this RFQ as Schedule B – Quotation.

The Contractor may submit a Quotation either by email or in a hard copy, as follows:

(a) Email

If the Contractor chooses to submit by email, the Contractor should submit the Quotation electronically in a single pdf file to the City by email at: purchasing@surrey.ca

PDF emailed Quotations are preferred and the City will confirm receipt of emails. Note that the maximum file size the City can receive is 10Mb. If sending large email attachments, Contractors should phone to confirm receipt. A Contractor bears all risk that the City's equipment functions properly so that the City receives the Quotation.

(b) Hard Copy

If the Contractor chooses NOT to submit by email, the Contractor should submit one original unbound Quotation and one (1) copy (two (2) in total) which should be delivered to the City at the office of:

Name: Richard D. Oppelt, Purchasing Manager
at the following location:

Address: Surrey City Hall
Finance & Technology Department – Purchasing Section
Reception Counter, 5th Floor West
13450 – 104 Avenue, Surrey, B.C., Canada, V3T 1V8

3. DATE

The City would prefer to receive Quotations on or before **June 2, 2016.** The City's office hours are 8:30 a.m. to 4:00 p.m., Monday to Friday, except statutory holidays.

4. INQUIRIES

All inquiries related to this RFQ should be directed in writing to the person named below (the "**City Representative**"). Information obtained from any person or source other than the City Representative may not be relied upon.

Name:	Richard D. Oppelt, Purchasing Manager
E-mail:	purchasing@surrey.ca
Reference:	1220-040-2016-062

5. ADDENDA

If the City determines that an amendment is required to this RFQ, the City's Representative will issue a written addendum by posting it on the BC Bid Website at www.bcbid.gov.bc.ca (the "BC Bid Website") and the City Website at www.surrey.ca (the "City Website") that will form a part of this RFQ. It is the responsibility of Contractor to check the BC Bid Website and the City Website for addenda. The only way this RFQ may be added to, or amended in any way, is by a formal written addendum. No other communication, whether written or oral, from any person will affect or modify the terms of this RFQ or may be relied upon by any Contractor. By delivery of a Quotation, the Contractor is deemed to have received, accepted and understood the entire RFQ, including any and all addenda.

6. NO CONTRACT

This RFQ is simply an invitation for quotations (including prices and terms) for the convenience of all parties. It is not a tender and no obligations of any kind will arise from this RFQ or the submission of Quotations. The City may negotiate changes to any terms of a Quotation, including terms in Attachment 1 and Schedules A and B and including prices, and may negotiate with one or more Contractors or may at any time invite or permit the submission of quotations (including prices and terms) from other parties who have not submitted Quotations.

7. ACCEPTANCE

A Quotation will be an offer to the City which the City may accept at any time by signing the copy of the Quotation and delivering it to the Contractor. A Quotation is not accepted by the City unless and until both the authorized signatory and the purchasing representative have signed on behalf of the City. Delivery of the signed Quotation by the City may be by fax or pdf email.

8. CONTRACTOR'S EXPENSES

Contractors are solely responsible for their own expenses in preparing and submitting Quotations, and for any meetings, negotiations or discussions with the City or its representatives and consultants, relating to or arising from the RFQ. The City will not be liable to any Contractor for any claims, whether for costs, expenses, losses or damages, or loss of anticipated profits, incurred by the Contractor in preparing and submitting a Quotation, or participating in negotiations for a contract, or other activity related to or arising out of this RFQ.

9. CONTRACTOR'S QUALIFICATIONS

By submitting a Quotation, a Contractor represents that it has the expertise, qualifications, resources, and relevant experience to supply the Goods and Services.

10. CONFLICT OF INTEREST

A Contractor must disclose in its Quotation any actual or potential conflicts of interest and existing business relationships it may have with the City, its elected or appointed officials or employees. The City may rely on such disclosure.

11. SOLICITATION OF COUNCIL MEMBERS, CITY STAFF AND CITY CONSULTANTS

Contractors and their agents will not contact any member of the City Council, City staff or City consultants with respect to this RFQ, other than the contact person named in Section 4, at any time prior to the award of a contract or the cancellation of this RFQ.

12. CONFIDENTIALITY

All Quotations become the property of the City and will not be returned to the Contractor. All Quotations will be held in confidence by the City unless otherwise required by law. Contractors should be aware the City is a "public body" defined by and subject to the *Freedom of Information and Protection of Privacy Act* of British Columbia.

13. SIGNATURE

The legal name of the person or firm submitting the Quotation should be inserted in the Quotation. The Quotation should be signed by a person authorized to sign on behalf of the Contractor and include the following:

(a) If the Contractor is a corporation then the full name of the corporation should be included, together with the names of authorized signatories. The Quotation should be executed by all of the authorized signatories or by one or more of them provided that a copy of the corporate resolution authorizing those persons to execute the Quotation on behalf of the corporation is submitted;

(b) If the Contractor is a partnership or joint venture then the name of the partnership or joint venture and the name of each partner or joint venturer should be included, and each partner or joint venturer should sign personally (or, if one or more person(s) have signing authority for the partnership or joint venture, the partnership or joint venture should provide evidence to the satisfaction of the City that the person(s) signing have signing authority for the partnership or joint venture). If a partner or joint venturer is a corporation then such corporation should sign as indicated in subsection (a) above; or

(c) If the Contractor is an individual, including a sole proprietorship, the name of the individual should be included.

ATTACHMENT 1

DRAFT QUOTATION AGREEMENT

Title: **Additional Geotechnical Services – Trouton Pit, South Westminster Arena**

Reference No.: **1220-040-2016-062**

FOR THE SUPPLY OF GOODS AND SERVICES

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DRAFT QUOTATION AGREEMENT

DRAFT QUOTATION AGREEMENT

Reference RFQ Title: Additional Geotechnical Services – Trouton Pit, South Westminster Arena

THIS AGREEMENT dated for reference this _____ day of _____, 201_.

AGREEMENT NO. 1220-040-2016-062

BETWEEN:

CITY OF SURREY
13450 - 104 Avenue
Surrey, B.C., Canada, V3T 1V8

(the "**City**")

AND:

_____
(Insert Full Legal Name and Address of Contractor)

(the "**Contractor**")

WHEREAS the City wishes to engage the Contractor to provide Goods and Services and the Contractor agrees to provide Goods and Services.

THEREFORE in consideration of the payment of one ($1.00) dollar and other good and valuable consideration paid by each of the parties to the other (the receipt and sufficiency of which is hereby acknowledged) the City and the Contractor agree as follows:

1. DEFINITIONS AND INTERPRETATION

1.1 In these General Terms and Conditions:

(a) "Agreement" means this agreement and all schedules attached hereto;
(b) "City" means the City of Surrey;
(c) "Contractor" means a contractor whose Quotation has been accepted by the City and who is providing the Goods and Services under this Agreement;
(d) "Disbursements" means the actual out-of-pocket costs and expenses as identified in Section B to Attachment 1, which the Contractor incurs in providing the Goods and Services;
(e) "Fees" means the price set out in Section B to Attachment 1, for the provision of the Goods and Services, unless otherwise agreed by the parties in writing, and includes all taxes;
(f) "Goods" means the equipment or materials (if any) as described generally in Schedule A, to Attachment 1, including anything and everything required to be done for the fulfilment and completion of this Agreement;
(g) "Indemnitees" has the meaning described in Section 11.2;
(h) "RFQ" means the Request for Quotations;

(i) "Services" means the services as described generally in Schedule A, to Attachment 1 including anything and everything required to be done for the fulfilment and completion of this Agreement; and
(j) "Term" has the meaning described in Section 3.1;

1.2 This Agreement may be modified only by express and specific written agreement. In the event of a conflict between the provisions of any documents listed below, then the documents shall govern and take precedence in the following order:
(a) this Agreement;
(b) Addenda (if any);
(c) the RFQ; and
(d) other terms, if any, that are agreed to by the parties in writing.

1.3 The following attached Schedules are a part of this Agreement:

Schedule A – Specifications of Goods & Scope of Services; and
Schedule B – Quotation.

2. GOODS AND SERVICES

2.1 The Contractor covenants and agrees with the City to provide the Goods and Services in accordance with this Agreement. The Goods and Services provided will meet the specifications and scope set out in Schedule A, to Attachment 1, and as described in Schedule B, to Attachment 1.

2.2 The City may from time to time, by written notice to the Contractor, make changes in the specifications of Goods and scope of Services. The Fees will be increased or decreased by written agreement of the City and the Contractor according to the rates set out in Schedule B, to Attachment 1.

2.3 The Contractor will, if required in writing by the City, provide additional goods or services. The terms of this Agreement will apply to any additional goods or services, and the fees for additional goods or services will generally correspond to the fees as described in Schedule B, to Attachment 1. The Contractor will not provide any additional goods or services in excess of the specification of Goods and scope of Services requested in writing by the City.

2.4 The Contractor will perform the Services with that degree of care, skill and diligence normally provided by a qualified and experienced practitioner performing services similar to the Services, and on the understanding that the City is relying on the Contractor's experience and expertise. The Contractor represents that it has the expertise, qualifications, resources, and relevant experience to supply the Goods and Services.

Engineers proposed to perform the geotechnical services required must be qualified professional engineers registered with the Association of Professional Engineers and Geoscientists of BC.

2.5 The Contractor will deliver the Goods free and clear of all liens and encumbrances in the manner and to the destination stipulated. In the event of the Contractor's failure to meet this condition, the Contractor will, on written notice from the City, forthwith return all monies paid by the City on account of the Goods and in addition the City may by written

notice terminate this Agreement without liability, and in such event, in addition to the above, the Contractor will be liable for any and all expenses or losses incurred by the City resulting from such failure.

3. TERM

3.1 The Contractor will provide the Goods and Services for the period commencing on June 7, 2016 and terminating on July 8, 2016 (the "Term").

4. TIME

4.1 Time is of the essence.

5. FEES AND DISBURSEMENTS

5.1 The City will pay the Fees and Disbursements to the Contractor in accordance with this Agreement. Payment by the City of the Fees and Disbursements will be full payment for the Goods and Services and the Contractor will not be entitled to receive any additional payment from the City.

5.2 For greater certainty, costs of general management, non-technical supporting services and general overhead are deemed to be covered by the Fees and will not be subject to additional payment by the City. The Fees shall also include without limitation all costs of boxing, packing, crating, and loading and unloading the Goods at the prescribed destination.

6. PAYMENT

6.1 Subject to any contrary provisions set out in Schedule B, to Attachment 1, the Contractor will submit a monthly invoice to the City requesting payment of the portion of the Fees and Disbursements relating to the Goods and Services provided in the previous month. Invoices must include the Contractor's name, address and telephone number, the City's purchase order number <insert purchase order or contract reference number> , the Contractor's invoice number, the names, charge-out rates and number of hours worked in the previous month of all employees of the Contractor that have performed Services during the previous month; the percentage of Services completed and Goods delivered at the end of the previous month; the total budget for the Goods and Services and the amount of the budget expended to the date of the invoice; taxes (if any); and grand total of the invoice.

6.2 The Contractor will on request from the City provide receipts and invoices for all Disbursements claimed.

6.3 If the City reasonably determines that any portion of an invoice is not payable, then the City will so advise the Contractor.

6.4 The City will pay the portion of an invoice which the City determines is payable within 30 days of the receipt of the Invoice, except the City may hold back from payments 10% of the amount the City determines is payable to the Contractor until such time as the Contractor provides its final report to the City; and

6.5 If the Contractor offers the City a cash discount for early payment, then the City may, at the City's sole discrection, pay the portion of an Invoice which the City determines is payable at any time after receipt of the Invoice.

Invoices will be submitted by the Contractor by mail to:

Name: _____

Address: _____
_____
_____

6.6 Unless otherwise provided, all dollar amounts referred to in this Agreement are in lawful money of Canada.

6.7 If the Contractor is a non-resident of Canada and does not provide to the City a waiver of regulation letter, the City will withhold and remit to the appropriate governmental authority the greater of:
(a) 15% of each payment due to the Contractor; or
(b) the amount required under applicable tax legislation.

7. USE OF WORK PRODUCT

7.1 The Contractor hereby sells, assigns and transfers to the City the right, title and interest required for the City to use and receive the benefit of all the reports, drawings, plans, designs, models, specifications, computer software, concepts, products, designs or processes or other such work product produced by or resulting from the Services rendered by the Contractor. This section does not give the City the right to sell any such work product to any third party and the City may sell the work product only with the prior approval of the Contractor. The Contractor may retain copies of the work product.

8. PERSONNEL AND SUBCONTRACTORS

8.1 The Contractor will provide only personnel who have the qualifications, experience and capabilities to provide the Goods and perform the Services.

8.2 The Contractor will provide the Goods and Services using the personnel and sub-contractors as may be listed in the Quotation, and the Contractor will not remove any such listed personnel or sub-contractors from the Services without the prior written approval of the City.

8.3 If the City reasonably objects to the performance, qualifications, experience or suitability of any of the Contractor's personnel or sub-contractors then the Contractor will, on written request from the City, replace such personnel or sub-contractors.

8.4 Except as provided for in Section 8.2, the Contractor will not engage any personnel or sub-contractors, or sub-contract or assign its obligations under this Agreement, in whole or in part, without the prior written approval of the City.

8.5 The Contractor will preserve and protect the rights of the City with respect to any Services performed under sub-contract and incorporate the conditions of this Agreement into all

sub-contracts as necessary to preserve the rights of the City under this Agreement. The Contractor will be as fully responsible to the City for acts and omissions of sub-contractors and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by the Contractor.

9. LIMITED AUTHORITY

9.1 The Contractor is not and this Agreement does not render the Contractor an agent or employee of the City, and without limiting the above, the Contractor does not have authority to enter into any contract or reach any agreement on behalf of the City, except for the limited purposes as may be expressly set out in this Agreement, or as necessary in order to provide the Goods and Services. The Contractor will make such lack of authority clear to all persons with whom the Contractor deals in the course of providing the Goods and Services. Every vehicle used by the Contractor in the course of providing the Goods and Services shall identify the Contractor by name and telephone number.

9.2 The Contractor is an independent contractor. This Agreement does not create the relationship of employer and employee, a partnership, or a joint venture. The City will not control or direct the details, means or process by which the Contractor performs the Services. The Contractor will determine the number of days and hours of work required to properly and completely perform the Services. The Contractor is primarily responsible for performance of the Goods and Services and may not delegate or assign any Services to any other person except as provided for in section 8.4. The Contractor will be solely liable for the wages, fringe benefits, work schedules and work conditions of any partners, employees or sub-contractors.

10. CONFIDENTIALITY AND DISCLOSURE OF INFORMATION

10.1 Except as provided for by law or otherwise by this Agreement, the Contractor will keep strictly confidential any information supplied to, obtained by, or which comes to the knowledge of the Contractor as a result of the provision of the Goods or performance of the Services and this Agreement, and will not, without the prior express written consent of the City, publish, release, disclose or permit to be disclosed any such information to any person or corporation, either before, during or after termination of this Agreement, except as reasonably required to complete the Goods and Services.

10.2 The Contractor acknowledges that the City is subject to the *Freedom of Information and Protection of Privacy Act* of British Columbia and agrees to any disclosure of information by the City required by law.

10.3 The Contractor agrees to return to the City all of the City's property at the completion of this Agreement, including any and all copies or originals of reports provided by the City.

11. WARRANTIES

11.1 The Contractor warrants that the Goods shall be free from defects in design, materials, workmanship and title, shall conform in all respects to the terms of this Agreement, shall be fit and suitable and perform satisfactorily for the purposes and under the conditions made known to the Contractor by the City or which were reasonably inferable. The Goods shall be at least equal to the higher of national standards or codes (such as, by way of illustration, CSA or ASTM), or standards and codes customarily applicable at the place

where the City will use the Goods. The Goods shall be of the best quality, if no quality is specified. This general warranty is independent of and without prejudice to any specific warranty or service guarantee offered by the Contractor or third party manufacturer or supplier of the Goods in connection with the purpose for which the Goods were purchased. The Contractor shall assign to the City any warranty or service guarantee offered by a third party manufacturer or supplier of the Goods. Notwithstanding this assignment, if at any time up to one year from the date of delivery or installation (if applicable) the City determines the Goods or any part do not conform to these warranties, the City shall notify the Contractor within a reasonable time after such discovery, and the Contractor shall then promptly correct such nonconformity at the Contractor's expense. Goods used to correct a nonconformity shall be similarly warranted for one year from the date of installation. The Contractor's liability shall extend to all liabilities, losses, damages, claims and expenses incurred by the City caused by any breach of any of the above warranties.

11.2 The Contractor warrants and guarantees that Goods and Services delivered under this Agreement do not infringe any valid patent, copyright or trademark, foreign or domestic, owned or controlled by any other corporation, firm or person, and agrees to indemnify and save harmless the City and all of its elected and appointed officials, officers, employees, servants, representatives and agents (collectively the "Indemnitees"), from and against any and all claims, demands, causes of action, suits, losses, damages and costs, liabilities, expenses and judgments (including all actual legal costs) by reason of any claim, action or litigation arising out of any alleged or actual infringement of any patent, copyright or trademark, foreign or domestic, relating to the Goods and Services supplied under this Agreement.

12. INSURANCE AND DAMAGES

12.1 The Contractor will indemnify and save harmless the Indemnitees from and against all claims, demands, causes of action, suits, losses, damages and costs, liabilities, expenses and judgments (including all actual legal costs) for damage to or destruction or loss of property, including loss of use, and injury to or death of any person or persons which any of the Indemnitees incur, suffer or are put to arising out of or in connection with any failure, breach or non-performance by the Contractor of any obligation of this Agreement, or any wrongful or negligent act or omission of the Contractor or any employee or agent of the Contractor.

12.2 The indemnities described in Sections 11.2, 12.1 and 18.3 will survive the termination or completion of this Agreement and, notwithstanding such termination or completion, will continue in full force and effect for the benefit of the Indemnitees.

12.3 The Contractor will, without limiting its obligations or liabilities and at its own expense, provide and maintain throughout this Agreement the following insurances in forms and amounts acceptable to the City from insurers licensed to conduct business in Canada:

(a) commercial general liability insurance on an occurrence basis, in an amount not less than five million ($5,000,000) dollars inclusive per occurrence against death, bodily injury and property damage arising directly or indirectly out of the work or operations of the Contractor, its employees and agents. The insurance will include cross liability and severability of interests such that the coverage shall apply in the same manner and to the same extent as though a separate policy had been issued

to each insured. The insurance will include, but not be limited to: premises and operators liability, broad form products and completed operations, owners and contractors protective liability, blanket contractual, employees as additional insureds, broad form property damage, non-owned automobile, contingent employers liability, broad form loss of use, personal injury, and incidental medical malpractice. The City will be added as additional insured;

(b) automobile liability insurance on all vehicles owned, operated or licensed in the name of the Contractor in an amount not less than three million ($3,000,000) dollars per occurrence for bodily injury, death and damage to property;

(c) professional errors and omissions liability insurance in an amount not less than two million ($2,000,000) dollars insuring all professionals providing the Services from liability resulting from errors or omissions in the performance of the Services; and

(d) contractors' equipment insurance in an all risks form covering construction machinery and equipment used for the performance of the Services.

12.4 The Contractor will provide the City with evidence of the required insurance prior to the commencement of this Agreement. Such evidence will be in the form of a completed certificate of insurance acceptable to the City. The Contractor will, on request from the City, provide certified copies of all of the Contractor's insurance policies providing coverage relating to the Services, including without limitation any professional liability insurance policies. All required insurance will be endorsed to provide the City with thirty (30) days advance written notice of cancellation or material change restricting coverage. To the extent the City has an insurable interest, the builder's risk policy will have the City as first loss payee. The Contractor will be responsible for deductible amounts under the insurance policies. All of the Contractor's insurance policies will be primary and not require the sharing of any loss by the City or any insurer of the City.

12.5 The Contractor acknowledges that any requirement by the City as to the amount of coverage under any policy of insurance will not constitute a representation by the City that the amount required is adequate and the Contractor acknowledges and agrees that the Contractor is solely responsible for obtaining and maintaining policies of insurance in adequate amounts. The insurance policy coverage limits shall not be construed as relieving the Contractor from responsibility for any amounts which may exceed these limits, for which the Contractor may be legally liable.

12.6 The Contractor shall place and maintain, or cause any of its sub-contractors to place and maintain, such other insurance or amendments to the foregoing policies as the City may reasonably direct.

12.7 The Contractor hereby waives all rights of recourse against the City for loss or damage to the Contractor's property.

13. CITY RESPONSIBILITIES

13.1 The City will, in co-operation with the Contractor, make efforts to make available to the Contractor information, surveys, and reports which the City has in its files and records that relate to the Goods and Services. The Contractor will review any such material upon which the Contractor intends to rely and take reasonable steps to determine if that

information is complete or accurate. The Contractor will assume all risks that the information is complete and accurate and the Contractor will advise the City in writing if in the Contractor's judgment the information is deficient or unreliable and undertake such new surveys and investigations as are necessary.

13.2 The City will in a timely manner make all decisions required under this Agreement, examine documents submitted by the Contractor and respond to all requests for approval made by the Contractor pursuant to this Agreement.

13.3 If the City observes or otherwise becomes aware of any fault or defect in the delivery of Goods or the provision of Services, it may notify the Contractor, but nothing in this Agreement will be interpreted as giving the City the obligation to inspect or review the Contractor's performance with regards to delivering Goods or the performance of the Services.

14. DEFICIENCIES

14.1 The City shall have a reasonable time to inspect and to accept the Goods and Services. The City may reject any Goods or Services not in accordance with this Agreement, whether due to damage resulting from improper packing, loading, unloading or otherwise. The City shall notify the Contractor of rejection of the Goods whereupon the Goods will be held subject to the disposition by the Contractor. Any costs or expenses incurred by the City as a result of the rejection of the Goods or Services are, immediately upon written demand by the City, payable by the Contractor, and may be set off against any payments owing by the City to the Contractor.

14.2 The City may hold back from payments otherwise due to the Contractor up to 150% of a reasonable estimate, as determined by the City, on account of deficient or defective Goods or Services. This holdback may be held, without interest, until replacement Goods are received or such deficiency or defect is remedied.

15. DEFAULT AND TERMINATION

15.1 In the event the Contractor does not deliver the Goods or perform the Services by the date specified in this Agreement, then:

(a) the City reserves the right to terminate this Agreement, in whole or in part, and in the event of such termination no payment will be owing by the City on account of this Agreement and the Contractor will be liable for any and all expenses or loss resulting from such failure or delay and will return all monies paid by the City; or

(b) if the City does not terminate this Agreement for late delivery or performance, the City may deduct and setoff from any payments owing to the Contractor all additional costs the City reasonably incurs on account of the late delivery or performance.

15.2 The City may by written notice at any time cancel this Agreement with respect to Goods which, as of the date of cancellation, have not been shipped.

15.3 The City may at any time and for any reason by written notice to the Contractor terminate this Agreement before the completion of all the Goods and Services, such notice to be determined by the City at its sole discretion. Upon receipt of such notice, the Contractor will perform no further Goods and Services other than the work which is reasonably

required to complete the Goods and Services. Despite any other provision of this Agreement, if the City terminates this Agreement before the completion of all the Goods and Services, the City will pay to the Contractor all amounts owing under this Agreement for Goods and Services provided by the Contractor up to and including the date of termination, plus reasonable termination costs in the amount as determined by the City in its sole discretion. Upon payment of such amounts no other or additional payment will be owed by the City to the Contractor, and, for certainty, no amount will be owing on account of lost profits relating to the portion of the Goods and Services not performed or other profit opportunities.

15.4 The City may terminate this Agreement for cause as follows:

(a) If the Contractor is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of its insolvency, or if a receiver is appointed because of its insolvency, the City may, without prejudice to any other right or remedy the City may have, terminate this Agreement by giving the Contractor or receiver or trustee in bankruptcy written notice; or

(b) If the Contractor is in breach of any term or condition of this Agreement, and such breach is not remedied to the reasonable satisfaction of the City within 5 days after delivery of written notice from the City to the Contractor, then the City may, without prejudice to any other right or remedy the City may have, terminate this Agreement by giving the Contractor further written notice.

15.5 If the City terminates this Agreement as provided by Section 15.4 then the City may:

(c) enter into contracts, as it in its sole discretion sees fit, with other persons to complete the Goods and Services;

(d) withhold payment of any amount owing to the Contractor under this Agreement for the performance of the Goods and Services;

(e) set-off the total cost of completing the Goods and Services incurred by the City against any amounts owing to the Contractor under this Agreement, and at the completion of the Goods and Services pay to the Contractor any balance remaining; and

(f) if the total cost to complete the Goods and Services exceeds the amount owing to the Contractor, charge the Contractor the balance, which amount the Contractor will forthwith pay.

16. CURING DEFAULTS

16.1 If the Contractor is in default of any of its obligations under this Agreement, then the City may without terminating this Agreement, upon 5 days written notice to the Contractor, remedy the default and set-off all costs and expenses of such remedy against any amounts owing to the Contractor. Nothing in this Agreement will be interpreted or construed to mean that the City has any duty or obligation to remedy any default of the Contractor.

17. DISPUTE RESOLUTION

17.1 The parties will make reasonable efforts to resolve any dispute, claim, or controversy arising out of this Agreement or related to this Agreement ("Dispute") using the dispute resolution procedures set out in this section.

17.2 Negotiation: The parties will make reasonable efforts to resolve any Dispute by amicable negotiations and will provide frank, candid and timely disclosure of all relevant facts, information and documents to facilitate negotiations.

17.3 Mediation: If all or any portion of a Dispute cannot be resolved by good faith negotiations within 30 days, either party may by notice to the other party refer the matter to mediation. Within 7 days of delivery of the notice, the parties will mutually appoint a mediator. If the parties fail to agree on the appointment of the mediator, then either party may apply to the British Columbia International Commercial Arbitration Centre for appointment of a mediator. The parties will continue to negotiate in good faith to resolve the Dispute with the assistance of the mediator. The place of mediation will be Surrey, British Columbia. Each party will equally bear the costs of the mediator and other out-of-pocket costs, and each party will bear its own costs of participating in the mediation.

17.4 Litigation: If within 90 days of the request for mediation the Dispute is not settled, or if the mediator advises that there is no reasonable possibility of the parties reaching a negotiated resolution, then either party may without further notice commence litigation.

18. WCB AND OCCUPATIONAL HEALTH AND SAFETY

18.1 The Contractor agrees that it shall, at its own expense, procure and carry, or cause to be procured, carried and paid for, full Workers' Compensation Board coverage for itself and all workers, employees, servants and others engaged in or upon any work or service which is the subject of this Agreement. The Contractor agrees that the City has the unfettered right to set off the amount of the unpaid premiums and assessments for the Workers' Compensation Board coverage against any monies owing by the City to the Contractor. The City shall have the right to withhold payment under this Agreement until the Workers' Compensation Board premiums, assessments or penalties in respect of the work done or service performed in fulfilling this Agreement have been paid in full.

18.2 The Contractor shall provide the City with the Contractor's Workers' Compensation Board registration number and a letter from the Workers' Compensation Board confirming that the Contractor is registered in good standing with the Workers' Compensation Board and that all assessments have been paid to the date thereof prior to the City having any obligations to pay monies under this Agreement.

18.3 Without limiting the generality of any other indemnities granted by the Contractor in this Agreement, the Contractor shall indemnify and hold harmless the City, its elected and appointed officials, employees and agents, from all manner of claims, demands, costs, losses, penalties and proceedings (including all actual legal costs) arising out of or in any way related to unpaid Workers' Compensation Board assessments owing from any person or corporation engaged in the performance of this Agreement or arising out of or in any way related to the failure to observe safety rules, regulations and practices of the Workers' Compensation Board, including penalties levied by the Workers' Compensation Board.

18.4 The Contractor agrees that it is the "prime contractor" for the work as defined in the *Workers' Compensation Act,* R.S.B.C. 1996, c. 492 as amended and will ensure compliance with the *Workers Compensation Act* and Regulations in respect of the workplace. Without limiting its responsibilities under the legislation, the Contractor will coordinate the activities of employers, workers and other persons at the workplace relating to occupational health and safety. The Contractor shall have a safety program acceptable

to the Workers' Compensation Board, shall provide first aid services, and shall ensure that all Workers' Compensation Board safety rules and regulations are observed during the performance of this Agreement, not only by the Contractor, but by all sub-contractors, workers, material personnel and others engaged by the Contractor in the performance of this Agreement. The prime contractor shall appoint a qualified coordinator for the purpose of ensuring the coordination of health and safety activities for the workplace. Prior to commencement of Construction, the Contractor shall complete and file a "Construction Notice of Project" with the Workers' Compensation Board and shall provide a copy of the same to the City confirming that the Contractor shall be the prime contractor responsible for coordination of safety and health under Part 3 of the *Workers' Compensation Act* and Part 20 of the WCB Occupational Health and Safety Regulations. That person will be the person so identified in this Agreement, and the Contractor will advise the City immediately in writing if the name or contact number of the qualified coordinator changes.

18.5 The Contractor will ensure compliance with and conform to all health and safety laws, by-laws or regulations of the Province of British Columbia, including without limitation any regulations requiring installation or adoption of safety devices or appliances.

18.6 The Contractor shall fulfill all its duties, obligations, and responsibilities in such a manner that it ensures the safety of the public and in accordance with the safety regulations of the Workers' Compensation Board and shall install signs and barriers as required to ensure the safety of the public and of its employees in the use of the City facilities.

18.7 The Contractor understands and undertakes to comply with all the WCB Occupational Health and Safety Regulations for hazardous materials and substances, and in particular with the "Workplace Hazardous Materials Information System (WHMIS)" Regulations. All "Material Safety Data Sheets (MSDS)" shall be shipped along with the Goods, materials, products and any future MSDS updates will be forwarded.

19. BUSINESS LICENSE

19.1 The Contractor will obtain and maintain throughout the term of this Agreement a valid City of Surrey business license.

20. GENERAL PROVISIONS FOR GOODS

20.1 Documentation for shipments of Goods from outside Canada shall be provided by a Contractor by airmail and shall include all documents as required by law or customary practice. All packages shall be marked as follows:

"Upon arrival, please contact customs broker:
Livingston International Inc.
Telephone: +1-604-685-3555
Fax: +1-604-605-8231
Email: cst19@livingstonintl.com"

20.2 If this Agreement pertains to the fabrication, assembly or other processing of the Goods, representatives of the City shall be permitted free access at all reasonable times for the purpose of inspection, testing or obtaining information as to the progress of the fabrication, assembly or processing.

20.3 The City may require that shop drawings be submitted by the Contractor for review prior to the delivery of the Goods. The City may require that a qualified registered professional engineer stamp and approve a shop drawing prior to submission. Any review of shop drawings by the City will not relieve the Contractor from its obligation to deliver Goods in full compliance with all requirements of this Agreement.

21. COMPLIANCE

21.1 The Contractor will provide the Services in full compliance with all applicable laws, building codes and regulations.

21.2 The Contractor will, as a qualified and experienced practitioner, interpret applicable codes, laws and regulations applicable to the performance of the Services. If an authority having jurisdiction imposes an interpretation which the Contractor could not reasonably have verified or foreseen prior to entering into this Agreement, then the City will pay the additional costs, if any, of making alterations so as to conform to the required interpretation.

22. JURISDICTION OF COUNCIL AND NON-APPROPRIATION

22.1 Nothing in this Agreement limits or abrogates, or will be deemed to limit or abrogate, the jurisdiction of the Council of the City in the exercise of its powers, rights or obligations under any public or private statute, regulation or by-law or other enactment.

22.2 The Contractor recognizes and agrees that the City cannot make financial commitments beyond the City's current fiscal year. The City will annually make bonafide requests for appropriation of sufficient funds to cover all payments covered by this Agreement. If City Council does not appropriate funds, or appropriates insufficient funds, the City will notify the Contractor of its intention to terminate or reduce the services so affected within 30 days after the non-appropriation becomes final. Such termination shall take effect 30 days from the date of notification, shall not constitute an event of default and shall relieve the City, its officers and employees, from any responsibility or liability for the payment of any further amounts under this Agreement.

23. WAIVER

23.1 Any failure of the City at any time or from time to time to enforce or require the strict keeping or performance of any of the terms and conditions contained in this Agreement shall not constitute a waiver of the terms and conditions and shall not affect or impair the terms or conditions in any way or the City's right at any time to avail itself of any remedies as the City may have for any breach of the terms and conditions.

24. APPLICABLE LAW

24.1 This Agreement shall be governed by and construed in accordance with the laws of the Province of British Columbia. The City and the Contractor accept the jurisdiction of the courts of British Columbia and agree that any action under this Agreement shall be brought in such courts.

25. NOTICES

25.1 Any notice, report or other document that either party may be required or may wish to give to the other must be in writing, unless otherwise expressly provided for, and will be deemed to be validly given to and received by the addressee:

(a) by hand, on delivery;
(b) by facsimile, on transmission; or
(c) by mail, five calendar days after posting.

25.2 The addresses for delivery will be as shown in the Quotation. In addition, the City may give notice to the Contractor by email at the Contractor's email address as shown in the Quotation, which email will be deemed to be validly given and received by the Contractor on transmission. The Contractor may not give notice to the City by email.

26. MERGER AND SURVIVAL

26.1 The representations, agreements, covenants and obligations set out in this Agreement shall survive the delivery of the Goods and performance of the Services and payment of the Fees and Disbursements.

27. ENTIRE AGREEMENT

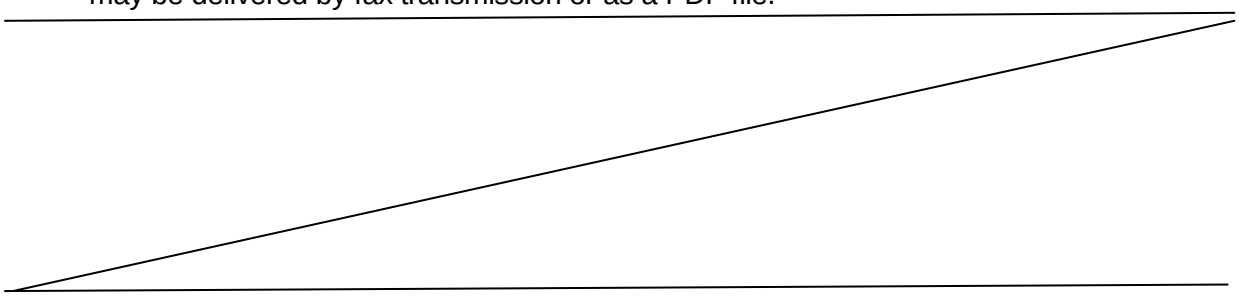
27.1 This Agreement, including the Schedules and any other documents expressly included by reference in this Agreement, contains the entire agreement of the parties regarding the provision of the Goods and Services, and no understandings or agreements, oral or otherwise, exist between the parties except as expressly set out in this Agreement. This Agreement supersedes and cancels all previous agreements between the parties relating to the Goods and Services.

27.2 In the event that the Contractor issues an invoice, packing slip, sales receipt, or any like document to the City, the City accepts the document on the express condition that any terms and conditions in it which constitute terms and conditions which are in addition to or which establish conflicting terms and conditions to those set out in this Agreement are expressly rejected by the City.

28. SIGNATURE

28.1 This Agreement shall be signed by a person authorized to sign on behalf of the Contractor.

28.2 This Agreement may be executed in or one or more counterparts all of which when taken together will constitute one and the same Agreement, and one or more of the counterparts may be delivered by fax transmission or as a PDF file.



29. ENUREMENT

29.1 This Agreement shall enure to the benefit of and be binding upon the respective successors and permitted assigns of the City and the Contractor.

IN WITNESS WHEREOF the parties hereto have executed this Agreement on the day and year first above written.

CITY OF SURREY

by its authorized signatory(ies):

(Signature of Authorized Signatory)	(Signature of Authorized Signatory)
(Print Name and Position of Authorized Signatory)	(Print Name and Position of Authorized Signatory)

<< NAME OF CONTRACTOR>

I/We have the authority to bind the Contractor.

(Legal Name of Contractor)

(Signature of Authorized Signatory)	(Signature of Authorized Signatory)
(Print Name and Position of Authorized Signatory)	(Print Name and Position of Authorized Signatory)

SCHEDULE A

SPECIFICATIONS OF GOODS AND SCOPE OF SERVICES

1. INTRODUCTION

The City of Surrey (the "City") invites Quotations from experienced and qualified Contractors for the provision of everything required including all skilled labour, tools, materials, equipment for Additional Geotechnical Services and any other requirements as detailed on the map/drawings attached as Schedule A-1 referenced as the following:

Geotechnical Investigation Location Plan, Trouton Pit Development, Surrey, B.C. Thurber Engineering Ltd., Drawing #14-81-76A-1, dated for reference May 08, 2015

2. PLACE OF THE WORK DESCRIPTION

The Place of the Work is a triangular vacant lot bounded by 110th Avenue to the north, private property to the west and a Metro Vancouver right-of-way along the southeast in which there is a sewer main and a pedestrian walking trail. The Place of the Work has previously been cleared and fill placement has occurred in stages between the late 1980's and 2014. The exact footprint of the arena at the Place of the Work has yet to be determined though would be likely completed during the initial stages of the conceptual design.

3. TIME FRAMES & ADDITIONAL INFORMATION

The Contractor will provide its best professional advice and consultation in a timely and complete manner. The Contractor is expected to start immediately with the site investigation and to provide a comprehensive geotechnical report with information, data, and recommendations which must be completed no later than July 8, 2016.

4. SCOPE OF SERVICES

Refer to Schedule A -1 shows the approximate area of the investigation and the test hole locations; North Surrey Arena Proposed Test Pile Program.

Place of the Work location: Trouton Pit, 12870 – 110th Avenue, Surrey, B.C,

The scope of Services shall, at a minimum include the following tasks:

GEOTECHNICAL / GEOLOGICAL/ HYDROGEOLOGICAL ENGINEERING SERVICES

Under this Task the Contractor will conduct geotechnical, geological, & hydrogeological studies to characterize geotechnical site conditions and provide analysis and conclusions in support of project designs.

Refer to Schedule A-2 for the Geotechnical Investigation Report.

SCHEDULE A1

NORTH SURREY ARENA PROPOSED TEST PILE PROGRAM

THURBER ENGINEERING LTD.

MEMORANDUM

To: Alan Nicholson
Turnbull Construction Project Managers Ltd.

Date: May 26, 2016

From: David J. Tara, P.Eng.
(Reviewed by Paul Evans, P.Eng.)

File: 11623

NORTH SURREY ARENA
PROPOSED TEST PILE PROGRAM

As requested, Thurber Engineering Ltd. (Thurber) has prepared this DRAFT Work Plan for the proposed test pile program. It is a condition of this memorandum that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. INTRODUCTION

The City of Surrey (City) plans to redevelop the former Trouton Pit site for the North Surrey Arena. The new arena will be delivered as a Design-Build (DB) project. As described in our May 26, 2015 report, the site has been partially developed by placement of mineral soil fill and woodwaste. The fill ranges from very loose to compact and is underlain by a sequence of (1) interlayered peat and organic silt, (2) fine sand, (3) marine silt over (4) till-like soil at depth.

The DB proponents have requested that test piles be installed, subjected to high-strain dynamic testing and that at least one pile be subjected to a static loading test. Below we provide guidance for the proposed test pile program.

2. PROPOSED WORK PLAN

2.1 General

The proposed piles will comprise driven 406 mm outside diameter by 12.7 mm thick wall steel pipe piles. The test piles will require 25 mm thick end plates that do not protrude beyond the pile perimeter. Given the anticipated embedment depth, we expect that the piles will be installed in segments and field spliced. All splices must include backing plates and welds must be full penetration to develop the full strength of the pile cross section. The test piles may be installed by vibratory or impact driving to the first splice and by impact driving below. For installation, it is anticipated that a minimum 30 kN ram will likely be required. For discussion purposes, it should be assumed that the piles will be installed to a penetration resistance in the range of 10 blows per 25 mm or more.

The locations of the three test piles are shown schematically on the attached Figure 1. The three locations are defined as northwest, central and southeast. High-strain dynamic testing will be required at end of initial drive (EOID) and at beginning of restrike (BOR) nominally 28 days later

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for all three piles. As shown on Figure 1, a static loading test must be completed at the central location. The BOR test at this location must not occur until after the static loading test to avoid damaging the soil/pile bond. Additional details regarding the piles and testing requirements are provided in Table 1 below.

Table 1. Test Pile Locations and Testing Requirements

Location	Approximate Depth to Till-like Soil [m]	Minimum Hammer Size for EOID Testing [kN]	Waiting Period for BOR Test [days]	Hammer Size for BOR Testing [kN]
Northwest	30	45	28	45 to 60
Central	25			
Southeast	20			

For the purposes of the testing program, pile embedment into the till-like soil is expected to be in the range of 4 to 8 m. The actual embedment will vary. For high-strain dynamic testing, a minimum stickup of 2 m above the granular pad or fill layer will be required. Accordingly, delivered pile lengths must be at least 10 m greater than shown in the table to allow for some flexibility in the testing program. For high-strain dynamic testing at both EOID and BOR, a drop hammer capable of developing a rated energy of at least 135 kJ should be used for testing.

At the central location, a static loading test is required. Currently, the target test load of the static test is 4500 kN. It is anticipated that the reaction load will be made up using a number of piles (at least 4) installed open ended driven into the till-like soil at depth to achieve uplift resistance. In the case that the reaction piles cannot be installed a significant distance into the till-like soil, it is expected that the uplift resistance of a 406 mm diameter pile would be limited to about 300 to 450 kN after excess pore pressures generated during driving have dissipated. Accordingly, up to about 14 – 406 mm piles may be required to complete the static loading test where uplift resistance cannot be developed in the till-like soil. Other pile sizes and methodologies of developing the required uplift resistance will be considered. The Contractor will be responsible for the design and construction of the reaction frame for the loading test.

To reduce the effect of the reaction piles on the load-movement response of the test pile, the reaction piles must be installed at a reasonable separation from the test pile. While ASTM D1143 suggests a minimum clear spacing of 5 diameters based on the largest diameter pile, this requirement may be waived provided that the reaction pile head movements are monitored during the testing program to allow the influence of the reaction piles to be separated out.

Full setup of shaft resistance of a closed end 406 mm diameter pile in the anticipated soil conditions is expected to require about 150 days. Therefore, it is expected that pore pressures may still be somewhat elevated in close proximity to the test pile at the time of the static loading test. During installation, the reaction piles may core or plug depending on the pile diameter. If a 406 x 12.7 mm pile cores, set up of a single pile would typically require about 20 days. If the same

size pile plugs during installation, setup would be similar to that of a closed end pile. Driving multiple piles in close proximity to one another will cause elevated pore pressures to a significant distance beyond the group. To partially mitigate the effects of pore pressures on the test and reaction piles (reduced uplift resistance), the separation distance between the test pile and reaction piles should be in the range of 10 to 15 diameters which is essentially 4 m or more.

The static loading test should be conducted in general accordance with ASTM D1143 "Quick Load Test Method". The number of load increments to failure must be at least 25 and preferably in the range of 35 to 40. The incremental loads must be equal and the duration of each increment must also be equal and in the range of 10 to 15 minutes. Calibrated jacks and load cells will be required. At a minimum, vertical movement of the test pile and reaction piles must be measured and recorded to the nearest 0.25 mm.

2.2 Contractor Responsibilities

The Contractor is responsible for providing a drop hammer/pile driving equipment for installation of the test and reaction piles and completion of the dynamic loading tests. The Contractor is responsible for design, fabrication and installation of the reaction frame and conducting the static loading test. This will include provision of personnel and all equipment necessary to complete the static loading test. The Contractor will need to supply swamp pads to access the southeast test location if the Contractor determines this is necessary. The Contractor will need to include an allowance of 2.5 hours to complete each of the EOID and BOR tests.

The Contractor must provide calibration certificates for all jacks and load cells used. All testing data (loads and movements) must be provided in an Excel spreadsheet in a format that is acceptable to Thurber.

2.3 Owner Responsibilities

Currently, it is envisioned that the City will construct a 900 mm thick gravel access road to the northwest and central test locations. A gravel pad will be constructed at the central location to facilitate construction and completion of the static loading test.

On behalf of the City, Thurber will provide personnel to witness and log the installation of the test piles and to conduct vibration monitoring at the nearby Metro Van sewer. It should be noted that the DB proponents will be invited to witness the static loading test at their discretion.

Thurber will provide high strain dynamic testing equipment for the high strain dynamic loading tests (this will include pairs of strain gauges and accelerometers attached to the test piles). On completion of the dynamic loading tests, Thurber will select representative signals and will conduct the signal matching analyses.

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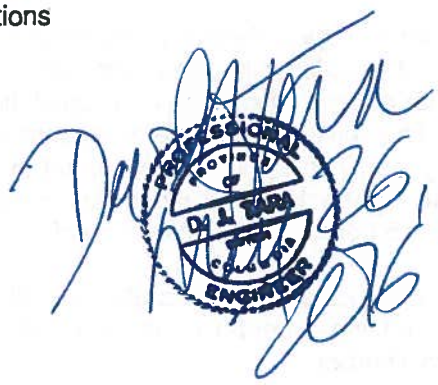
On completion of the testing program, Thurber will prepare a summary report for use by the DB proponents. The report will include pile installation records, a summary of vibration monitoring data and the results of the high strain dynamic and static loading tests.

3. VALUE ADDED OPTIONS

Consideration will be given to value added options such as instrumenting and monitoring strain gauges and telltales installed in the test pile at the central location, alternative reaction systems provided it can be shown that they will work or similar. Contractors are encouraged to approach this project creatively in an effort to control costs and meet schedule requirements.

We trust that this is sufficient for your current needs. Please contact us if you have any questions or wish to discuss.

Attachments: Statement of Limitations and Conditions
Figure 1. Test Pile Plan



THURBER

STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

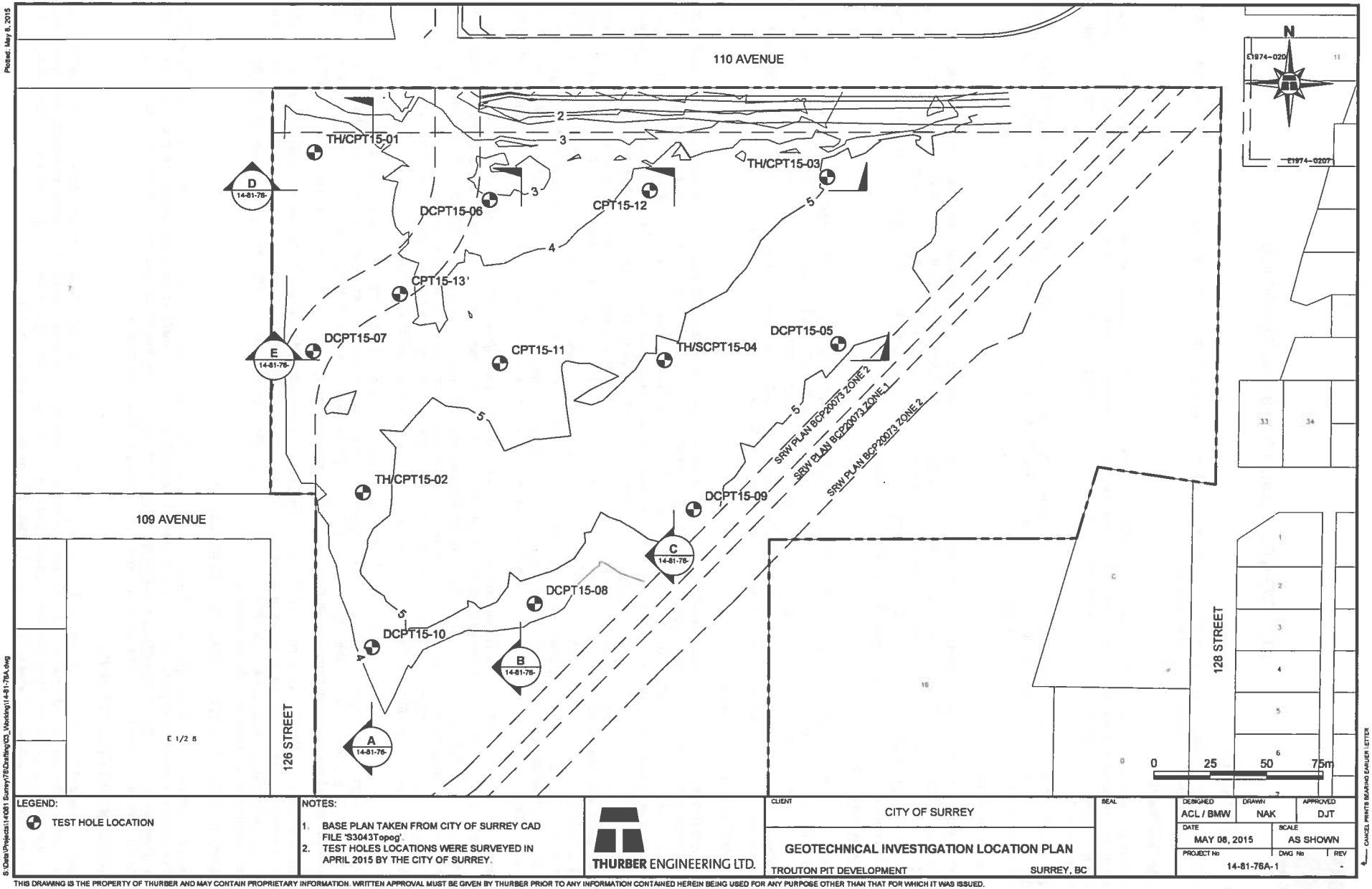
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

HKH/LG_Dec 2014



SCHEDULE A2

GEOTECHNICAL INVESTIGATION REPORT

THURBER ENGINEERING LTD.

May 26, 2015 File: 14-81-76A

City of Surrey
13450 104th Avenue
Surrey, B.C. V3T 1V8

Attention: Mr. Scott Groves, P.Eng.
Manager

TROUTON PIT - 12870 110 AVENUE, SURREY, B.C.
GEOTECHNICAL INVESTIGATION REPORT

Dear Scott:

As requested, Thurber Engineering Ltd. (Thurber) has carried out a geotechnical investigation at the above property. This report summarizes the results of our investigation and provides a geotechnical overview of some design issues.

It is a condition of this letter that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. PROJECT DESCRIPTION AND BACKGROUND

We understand that the City of Surrey (Surrey) proposes to construct an ice arena at the Trouton Pit site (Site). Surrey intends to use the design-build (DB) process to deliver the project and requires a geotechnical baseline report to provide to the DB proponent teams to assist them in preparation of their DB bids.

The property is owned by Surrey and is located at 12780 110th Avenue in Surrey, B.C. roughly between 125 and 128 Street. The Site is a triangular vacant lot bounded by 110th Avenue to the north, private property to the west and a Metro Vancouver right-of-way along the southeast in which there is a sewer main and a pedestrian walking trail. The Site has previously been cleared and fill placement has occurred in stages between the late 1980s and 2014 resulting in site grades that generally vary between El. 4.2 and 5.7 m, but can be as low as 3.2 m in the southwest corner.

We understand that the layout of the arena and adjacent parking has not been fixed at this time and will likely be established by the successful DB proponent. Flood control level (FCL), the underside of floor slab, will likely be set at about El. 5.0 m with the parking lot area grades being lower.

Our scope of work on this project comprises a geotechnical investigation and preparation of a geotechnical baseline report that includes an overview of potential geotechnical issues to consider for design and construction. We understand that detailed geotechnical investigation and design will be carried out by the successful proponent's geotechnical engineer. Assessment

of potential soil or groundwater contamination will be issued in a separate report and is not addressed within this document.

2. PROGRAM OF WORK

Our program of work comprised a desktop study, geotechnical investigation and laboratory testing, engineering assessment and reporting.

2.1 Review of Available Information

We reviewed available geological mapping, aerial photographs and geotechnical information in our files.

2.2 Geotechnical Investigation

The geotechnical investigation was completed between March 2 and 11, 2015. The investigation included cone penetration test (CPT), seismic cone penetration test (SCPT), dynamic cone penetration testing (DCPT) profiling and auger test holes. The test hole locations are provided in Table 1 and shown on the attached Dwg. 14-81-76A-1. A summary of in-situ testing and advanced laboratory testing is provided in Tables 2 and 3, respectively.

Six CPTs (CPTs 15-01, -02, -03, -11, -12 and -13) and one SCPT (SCPT 15-04) were advanced to depths of about 26 to 40 m. The CPT obtains information on tip resistance, sleeve friction and pore water pressure which can be correlated to soil properties and delineation of the soil stratigraphy. The SCPT obtains the same information as the CPT, with the addition of the in-situ measurement of shear wave velocities. Shear wave velocities are directly related to the in-situ shear stiffness of the soil and can be used to evaluate elastic parameters for deformation analyses and are required to carry out a site specific response analysis (SSRA). A SSRA may be required if the site is classified as Site Class F.

Four solid stem auger test holes (THs 15-01 to -04) were advanced to depths of about 20 to 31 m adjacent to CPT and SCPT locations. Six DCPTs (THs 15-05 to -10) were advanced to depths of about 16 to 41 m. The DCPT cone is similar in shape and size to the standard penetration test (SPT) split spoon sampler and is driven using the same hammer energy. The DCPT provides a qualitative measure of in-situ soil density and strength and is useful for identifying stiffness and strength contrasts within and between different strata.

At TH15-04, four field vane shear tests were completed in a separate hollow stem auger hole. The tests were done between about 7 and 18 m depth using a Nilcon field vane to correlate the soil strength with the CPT results. Collection of Shelby tube samples was attempted at TH15-04 at about 10.7 and 13.7 m depth. At about 10.7 m depth, no sample recovery was achieved. At about 13.7 m depth, the soil had heaved by about 1.5 m into the hollow stem auger once the rods had been pulled out.

The soil and groundwater conditions in the test holes were logged in the field by an experienced geotechnical engineer and disturbed samples were be collected at regular intervals and returned to our Vancouver laboratory for testing.

All samples were subjected to routine water content testing and visual classification in our laboratory. Gradation analyses were carried out on select samples from the fill and lower granular layers, and Atterberg limits on select samples of the silt.

A standpipe piezometer was installed at TH15-04 with the screen between about 4.6 and 6.1 m depth. Additional monitoring wells were installed as part of the environmental investigation.

All other test holes were sealed with bentonite chips and/or grouted in general accordance with B.C. Groundwater Protection Regulations.

3. FINDINGS

3.1 Desktop Study

3.1.1 Surficial Geology

The surficial geology provided on the Geological Survey of Canada Surficial Geology Map, "Surficial Geology Map, New Westminster, British Columbia, Map 1484A" indicates that the Site is underlain by two different units. The northwestern portion is underlain by postglacial bog, swamp and shallow lake deposits consisting of peat up to 14 m thick, in part overlying Fraser River overbank sandy to silt loam and channel fill of sandy to silt loam. The southeastern portion near the Metro Vancouver sewer right-of-way is underlain by pre-Vashon Quadra fluvial channel fill and floodplain deposits consisting of crossbedded sand containing minor silt and gravel lenses and interbeds, as well as Quadra marine interbedded fine sand to clayey silt.

3.1.2 Aerial Photographs

The aerial photographs from UBC Geographic Information Centre in Vancouver, BC and from the Corporation of Surrey's online mapping tool (COSMOS) were reviewed as part of our *"Phase 1 Preliminary Site Investigation"* report for the Site. The photographs indicate that fill placement started between 1986 and 1991 at the center of the site and remained unchanged until about 2006 when additional fill was placed throughout the Site up to about 2014.

3.1.3 Historical Information

Thurber has experience at the Trouton Pit site since the early 1990 when there was a proposal to develop the Site as a Park and Ride by BC Transit. At that time, Thurber drilled 16 test holes and provided recommendations for development for the proposed facility. The 1990 investigation for BC Transit indicated that the soil profile at the Site generally comprised up to 5.3 m of mineral soil and woodwaste fill overlying about 0.6 to 7.1 m of soft peat over generally

at least 3.0 m of silt and organic silt. The peat and organic silt were generally interbedded. Compact, fine sand was encountered below the silt in the northwest corner of the Site. Dense to very dense, till-like soil was encountered in two of the test holes at about 10 and 11 m depth along the southeast property line. Dense soils were not encountered elsewhere on the Site within the depth of investigation which was typically to depths between about 9 and 12 m.

The Park and Ride development did not proceed and the Site was subsequently filled from about 2004 until 2014. The origin of the fill is unknown, but it is presumably from excavations across the Lower Mainland. The sourcing of fill materials was managed by Surrey's Real Estate and Services Department with fill placement overseen by Delcan Corporation (now Parsons Canada Ltd.). It should be noted that detailed construction records, including as-built drawings and soil compaction records, were unavailable for our review.

Records available in our files indicate that site grades were generally between about El. 3.7 and 4.7 m in December 2006 based on Delcan's "*Site Grading Plan and Drainage*" drawing. At that time the proposed site grades varied from about El. 6.0 m in the southwest corner to El. 4.5 m in the northwest corner with grades generally sloping at about 0.5% in the northwest direction. The drawings indicate that the design preload surcharge was to be about 0.7 m above proposed grades.

A survey of the Site completed in early January 2011 and April 2015 indicated that fill had been generally placed to between about El. 4.2 and 5.7 m. Settlement gauges were installed during fill placement, but no records of settlement or fill placement history were provided.

The Site experienced failures during fill placement in 2006, April 2009, April 2011, August 2012 and March 2013. The majority of the fill failures were observed along the southeast edge of the Site, particularly the south corner of the Site where site grades remain low. Some of the fill failures were inspected by Thurber, though no site specific geotechnical investigation was completed for any of the failures.

We understand that placement of the existing fill was completed in 2014 and that Surrey has since used the Site for temporary storage of fill materials sourced from miscellaneous sites across the municipality including excavation spoil from ditch clean-outs, water line break repairs, etc. We further understand that stockpiles of spoil remain on the site.

3.2 Soil Conditions

The results of the investigation and laboratory testing are presented on the enclosed test hole logs in Appendix A with test hole locations shown on Dwg. 14-81-76A-1. The enclosed test hole logs provide a complete, detailed description of the conditions encountered in the investigation and must be used in preference to the generalized description given below.

Based on the geotechnical investigation, the soil conditions generally comprised the following sequence:

Thickness (m)	Soil Description
2.7 to 5.2	Mineral soil fill
0 to 1.7	Woodwaste fill
4.1 to 14.1	Interlayered peat and organic silt
0 to 18	Fine sand with some silt
5.4 to 14.5	Marine silt
-	Very dense till-like soils

A plan showing approximate elevation contours of the top surface of the till-like soils is shown on Dwg. 14-81-76A and simplified soil stratigraphy cross-sections for the site on Dwgs. 14-81-76A-3, -4 and -5.

3.2.1 Mineral Soil Fill and Woodwaste

Mineral soil fill comprising very loose to compact sand, silt and gravel was encountered at the existing ground surface. Based on field observations, no to minimal compaction was completed on the fill. The fill had fines contents in the range of 30% to 43%.

Woodwaste was marginally to partially decomposed and was encountered below the mineral soil fill. No large pieces of wood were observed in our investigation.

3.2.2 Interlayered Peat and Organic Silt

Below the fill, an interlayered deposit of fibrous peat and organic silt was encountered. This deposit was thinnest in the northwest corner.

Based on field vane shear tests and interpretation of CPT data using empirical correlations, the peak and remolded undrained shear strength of the peat was 63 and 17 kPa, respectively. For the organic silt, the peak undrained shear strength ranged from 19 to 30 kPa and remolded undrained shear strength ranged from 5 to 10 kPa. It should be noted that the peat at the location of the testing was fibrous and may not accurately represent the actual undrained shear strength. Sensitivity, defined as the ratio of peak and remolded undrained shear strength, of this deposit is estimated to be about 2.7 to 3.7. Moisture contents typically ranged from 130% to 444% in the fibrous peat and from 45% to 85% in the organic silt indicated that these materials are compressible.

3.2.3 Fine Sand

In the northwest portion of the site, a layer of fine sand with varying silt content was encountered below the interlayered peat and organic silt. Where encountered, the thickness of this layer varied from about 3 to 18 m. Based on CPT interpretation, the density of this material appears to be loose to compact in the upper portion, and compact to dense below, and as a result, zones of this layer may be susceptible to liquefaction.

Moisture contents typically ranged from 25% to 45% with higher values associated with higher fines content. Gradation analyses and fines content testing indicated that the fines content of this layer typically ranged from 12% to 18%. Within the deposit, occasional interbedded layers of sand and silt up to 2 m thick were encountered. Where measured, the fines content of this zone was about 47%.

3.2.4 Marine Silt

Below the interlayered silt and peat and/or the fine sand, silt with some clay was encountered. Limited strength testing comprising field vane shear tests and interpretation of CPT data suggests that this material is soft to firm. Moisture contents typically ranged from about 30% to 45%. Liquid and Plastic Limits typically ranged from 32% to 43% and 18% to 20%, The Plasticity Index was about 18 and Liquid Index 1.0.

3.2.5 Till-Like Soils

Below the marine silt, till-like soils are anticipated to comprise fine sandy silt with variable gravel and clay content. Sample recovery was poor when auger drilling through this unit. The depth to till-like soils varied between about 16.2 m (El. -10 m) and 40.8 m (El. -36 m).

3.3 Groundwater

The groundwater levels were generally observed between about El. 3 and 4.7 m. Groundwater levels can be expected to vary with rainfall, drainage and infiltration. The results of water level monitoring are provided in Table 4.

4. GEOTECHNICAL OVERVIEW

4.1 General

Based on available geotechnical information, the soil conditions are expected to comprise mineral soil and woodwaste fill overlying a sequence of highly compressible, interbedded peat/organic silt and silt over glacial till-like soils at depth. In the northwest portion of the site, potentially liquefiable sand was encountered between the interbedded peat/organic silt layer and underlying silt. The surface of the competent till-like soil is anticipated to vary between about El. -10 m near the southeast property line to El. -36 m towards the northwest corner of the site.

Based on these conditions, pile foundations terminated in the dense till-like soils will be required for support of the proposed building and floor slab loads. Building location will be important due to the high variability in the depth to till-like soils and potential liquefaction of sand in the northwest corner. Due to the high compressibility of the peat, organic silt and silt deposits and

potential liquefaction in the sand in a large seismic event, shallow foundations are not appropriate.

Special consideration will need to be given to site grades and transitions between grade-supported and pile-supported areas and facilities.

4.2 Existing Fill and Site Preparation

The Site has been previously developed by placement of about 2.7 to 5.2 m of mineral soil fill and 0.2 to 1.7 m of woodwaste. As mentioned above, fill placement has been conducted in stages (i.e. around 1990 and from about 2006 to 2014). The origin of the fill is unknown and construction records, including as-built drawings, soil compaction reports, were unavailable for our review. Based on our observations onsite, the surface of the fill was very loose/soft and wet, and compaction of the fill appeared to be minimal or was not completed.

This existing fill material is unsuitable for grade supported structures and/or pavement due to the high fines content and minimal compaction. Accordingly, it may be necessary to remove this unsuitable material prior to site development. If stripping is required, the unsuitable material will likely need to be subexcavated and replaced with properly compacted granular fill. For geotechnical design purposes, stripping and removal of unsuitable materials is not typically required under pile supported structures.

It is our understanding that the underside of the floor slab will be at about El. 5.0 m and that the parking lot may be lower. Existing site grades are typically about El. 5.1 m but vary between 4.2 and 5.7 m. There are also some low areas such as in the south corner of the site and near the site entrance onto 110th Avenue that are as low as El. 3.2 m.

4.3 Seismic Design

The peak ground acceleration (PGAs) for the Site were determined using the Natural Resource Canada (NRC) 2010 National Building Code of Canada online seismic hazard calculator, and are attached for reference. For the design of a 1:2475 year return period earthquake (2% probability of occurrence in 50 years), the NRC calculator provides a PGA of 0.505 g for firm ground Site Class C (i.e. firm ground or bedrock) with the results attached for reference.

The sand in the northwest quadrant of the Site may be susceptible to liquefaction and the thickness of peat and/or highly organic clays is greater than 3 m over the majority of the Site. As such, the soil profile corresponds to “other soils”, or Site Class F, as described in the 2012 BC Building Code (2012 BCBC).

The 2012 BCBC does not require site specific evaluation of the acceleration and velocity-based site coefficients (F_a and F_v) for Site Class F if a building’s fundamental period is less than 0.5 s. Accordingly, if the fundamental period of vibration of the contemplated building is less than 0.5 s, we expect that the Site can likely be classified as Site Class E. However, if the fundamental

period is greater than 0.5 s, the site corresponds to Site Class F and further seismic analysis, possibly including a site specific response analysis (SSRA), will be required. The Site Class is used to include the effects of possible amplification of the seismic design forces on conventional buildings.

4.4 Foundations

The proposed building type, an arena, is highly sensitive to total and differential settlements. As mentioned above, the underlying soil conditions comprise highly, compressible soils and the Site is likely experiencing on-going settlement. Long-term post-construction total and differential settlement will significantly exceed the allowable settlement limits. Further, the poor quality is unsuitable for support of spread footings. Therefore, the building structure and slab should be supported on piles terminated in till-like soils.

As shown in Dwg. 14-81-76A-2, the depth to till-like soils is shallowest along the southeast property line and slopes down towards the northwest corner. It would likely be prudent to situate the building where the depth to till-like soils is shallowest. We anticipate that typical pile sizes could vary from 324 to 610 mm diameter for steel pipe piles, which would typically have minimum wall thicknesses of 9.5 and 12.7 mm, respectively. Ideally, the length over diameter ratio (L/D) should be 50 or less and should preferably not exceed 100. We expect that piles up to about 610 mm in diameter could be driven close-ended to increase their capacity and limit their embedment into the till-like soils before sufficient resistance is achieved.

It should be noted that, although no cobbles or boulders were encountered in our investigation they may be present in the existing fill and should be considered during piling installation operations.

4.5 Settlement

Thick layers of peat, organic silt and silt encountered throughout the Site are likely experiencing consolidation (primary) and on-going settlement due to the high compressibility of the underlying soils. The Site will be subject to on-going settlement regardless of changes in grade. The thicknesses of the compressible deposits are such that the elevated pore pressures associated with primary consolidation can take years to dissipate. It is anticipated that the site grades in some areas will need to raised. Any increases in grade and/or any other additional surcharges or significant grade supported load will result in additional consolidation settlement and increases in the rate of settlement and, as a result, the site could experience higher long-term post-construction settlements than if there were no increases in grade.

The site likely is also experiencing different rates of settlement that could result in the development of differential settlements after construction throughout the Site and between grade supported and pile supported structures and other elements. This is not anticipated to substantially effect pile supported structures. However, differential settlements between grade supported and pile supported structures may have on-going maintenance requirements and the

design will need to detail the transitions between entrances and outside area to mitigate the effect of post-construction settlement. Differential settlements throughout the Site will also need to be considered for grade supported structures and areas to account for potential long-term issues such as drainage of the parking lot area.

All services/utilities below the building should be hung from the pile-supported slab. The design of the hangers for the utilities will need to carefully consider the potential loading from the pipes and overlying soil. Flexible connections should be provided at the building perimeter, preferably located below landscaping or similar to allow access for future maintenance and replacement, as the need arises.

Consideration should be given to provision of a settlement transition slab at entrances into the building. Details of the slab may involve the slab being supported on a pile supported grade beam at one end, and grade supported at the other. The slab would need to be designed to span between the supported ends. As the grade supported end settles, the slope of the slab will increase, but a lip would not form at the edge of the building. The grade supported end would need to consider the bearing capacity of the existing fill. Where poor quality fill is present, subexcavation and replacement will be required to improve support at the grade supported end of the slab.

4.6 Methane Mitigation

The Site is underlain by variable thicknesses of woodwaste and peat located below the groundwater table and several metres of site grading fill. Organic material will decompose anaerobically resulting in the generation of methane gas. Methane gas can become explosive if the gas is allowed to accumulate to concentrations between 5% and 15% in air. Furthermore, methane can present an air quality concern for building occupants, as it reduces the partial pressure of oxygen in the air. Methane could potentially enter the building through cracks or joints in slabs.

Due to on-going settlement, a void will form beneath the building floor slab. This void could provide areas where higher concentrations of methane could accumulate. As well, the use of piles could provide preferential paths for the flow and accumulation of methane. To mitigate the risk of accumulation, a methane gas venting system be required below the floor slab. A passive venting system may be adequate, which would generally comprise a series of perforated collector pipes just below the floor slab and surrounded by clear crush drain rock and possibly a filter fabric. The collected gas would then be conducted to the roof in solid riser pipes and vented to the atmosphere through wind turbines.

The mechanical design will need to ensure there is adequate exchange of air in the building to avoid methane accumulation inside the building and unventilated encloses spaces must be avoided.

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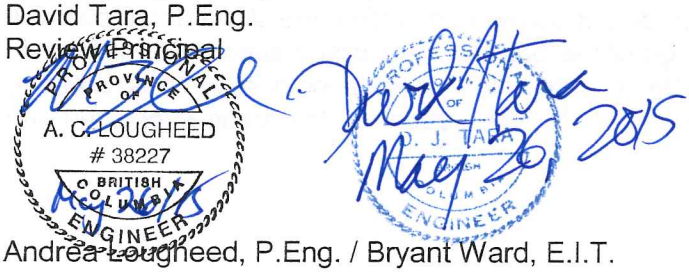
4.7 Storm water Treatment and Management

The building and parking areas will produce storm water runoff which will need to be disposed of to ensure proper site drainage. Onsite disposal using infiltration will not be feasible due to the high fines content in the existing fill and the high water table. As such, the storm water will need to be disposed of offsite.

5. CLOSURE

We trust that this information is sufficient for your needs. Should you require clarification of any item or additional information, please contact us at your convenience.

Yours truly,
Thurber Engineering Ltd.
David Tara, P.Eng.
Review Principal



Andrea Lougheed, P.Eng. / Bryant Ward, E.I.T.
Project Engineers

Attachments:
Table 1 – Test Holes Completed
Table 2 – Summary of In-Situ Testing
Table 3 – Summary of Laboratory Testing
Table 4 – Summary of Groundwater Monitoring Wells
Statement of Limitations and Conditions
Figures:
-Geotechnical Investigation Location Plan (Dwg. 14-81-76A-1)
-Till-Like Soils Contour Plan (Dwg. 14-81-76A-2)
-Soil Stratigraphy Cross-Sections (Dwg. 14-81-76A-3 to -5)
NBC Seismic Hazard Values

Appendices:
Appendix A: Thurber Investigation Results – Current Project

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TABLE 1 - TEST HOLES COMPLETED

Test Hole Number	UTM North	UTM East	Elevation (m)
TH15-01	5449951	509248	4.7
TH15-02	5449806	509261	4.7
TH15-03	5449947	509471	5.1
TH15-04	5449870	509401	5.1
TH15-05	5449871	509477	5.8
TH15-06	5449930	509325	3.2
TH15-07	5449861	509243	4.9
TH15-08	5449745	509335	5.4
TH15-09	5449794	509414	5.3
TH15-10	5449698	509282	4.6
TH15-11	5449858	509328	4.7
TH15-12	5449937	509395	4.2
TH15-13	5449776	509262	4.8
TH15-14*	5449905	509326	5.1
TH15-15*	5449927	509367	4.0
TH15-16*	5449848	509368	3.8
TH15-17*	5449794	509376	5.1
TH15-18*	5449833	509451	5.5
TH15-19*	5449902	509432	5.4
TH15-20*	5449818	509336	4.9
TH15-21*	5449905	509247	5.1
TH15-22*	5449776	509262	4.3

*Denotes environmental test holes which are detailed within Thurber's *"Stage 2 Preliminary Site Investigation – Trouton Pit Site, 12780 110 Avenue – Surrey, British Columbia"*.

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TABLE 2
SUMMARY OF AUGER DRILLING AND IN-SITU TESTING

Test Hole Number	Test Depth or Range (m)					
	Auger	CPT	SCPT	DCPT	Shear Vane	Pore Pressure Dissipation
TH15-01	0.0 – 30.5	0.0 – 30.0				
TH15-02	0.0 – 30.5	0.0 – 30.0				
TH15-03	0.0 – 27.5*	0.0 – 25.9*				
TH15-04	0.0 – 19.8		0.0 – 26.4*		7.0, 9.0, 12.2, 17.8	7.2, 11.2, 18.2, 26.4
TH15-05				0.0 – 16.4*		
TH15-06				0.0 – 36.8*		
TH15-07				0.0 – 40.9*		
TH15-08				0.0 – 22.3*		
TH15-09				0.0 – 16.6*		
TH15-10				0.0 – 20.9*		
TH15-11		0.0 – 34.8*				19.45, 34.8
TH15-12		0.0 – 29.1*				17.45, 29.15
TH15-13		0.0 – 39.5*				17.45, 21.45, 39.5

* Indicates refusal on dense soil

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TABLE 3
SUMMARY OF ADVANCED LABORATORY SOILS TESTING

Test Hole Number	Test Depth or Range (m)		
	Gradation Analysis	Fines Content/Passing #200	Atterberg Limits
TH15-01	0.9, 2.4, 18.9	9.8, 12.8, 23.5	29.9
TH15-02	0.9, 2.4,	18.9, 20.4	12.8, 17.7
TH15-03	0.0, 2.1, 3.7		19.2, 23.8
TH15-04		0.0, 4.0	14.6, 17.7

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TABLE 4
SUMMARY OF GROUNDWATER MONITORING WELLS

Test Hole Number	Ground El. (m)	Depth (Elevation) at Bottom of Well (m)	Date	Depth (Elevation) of Water (m)
TH15-01	4.7	3.6 (1.1)	Mar. 16, 2015	1.7 (3.0)
			Mar. 19, 2015	1.4 (3.3)
TH15-04	5.7	6.0 (-0.3)	Mar. 13, 2015	1.0 (4.7)
TH15-07 (Shallow)	4.9	3.2 (1.7)	Mar. 16, 2015	1.5 (3.4)
			Mar. 19, 2015	1.4 (3.5)
TH15-07 (Deep)	4.9	4.1 (0.8)	Mar. 16, 2015	1.5 (3.4)
			Mar. 19, 2015	1.4 (3.5)
TH15-11	4.7	3.0 (1.7)	Mar. 16, 2015	0.6 (4.1)
			Mar. 19, 2015	0.5 (4.2)
TH15-14	5.1	3.7 (1.4)	Mar. 16, 2015	1.2 (3.9)
			Mar. 19, 2015	1.1 (4.0)
TH15-18	5.5	4.4 (1.1)	Mar. 16, 2015	1.4 (4.1)
			Mar. 19, 2015	1.2 (4.3)
TH15-20	4.9	2.6 (2.3)	Mar. 16, 2015	1.5 (3.4)
			Mar. 19, 2015	1.0 (3.9)

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STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

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a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

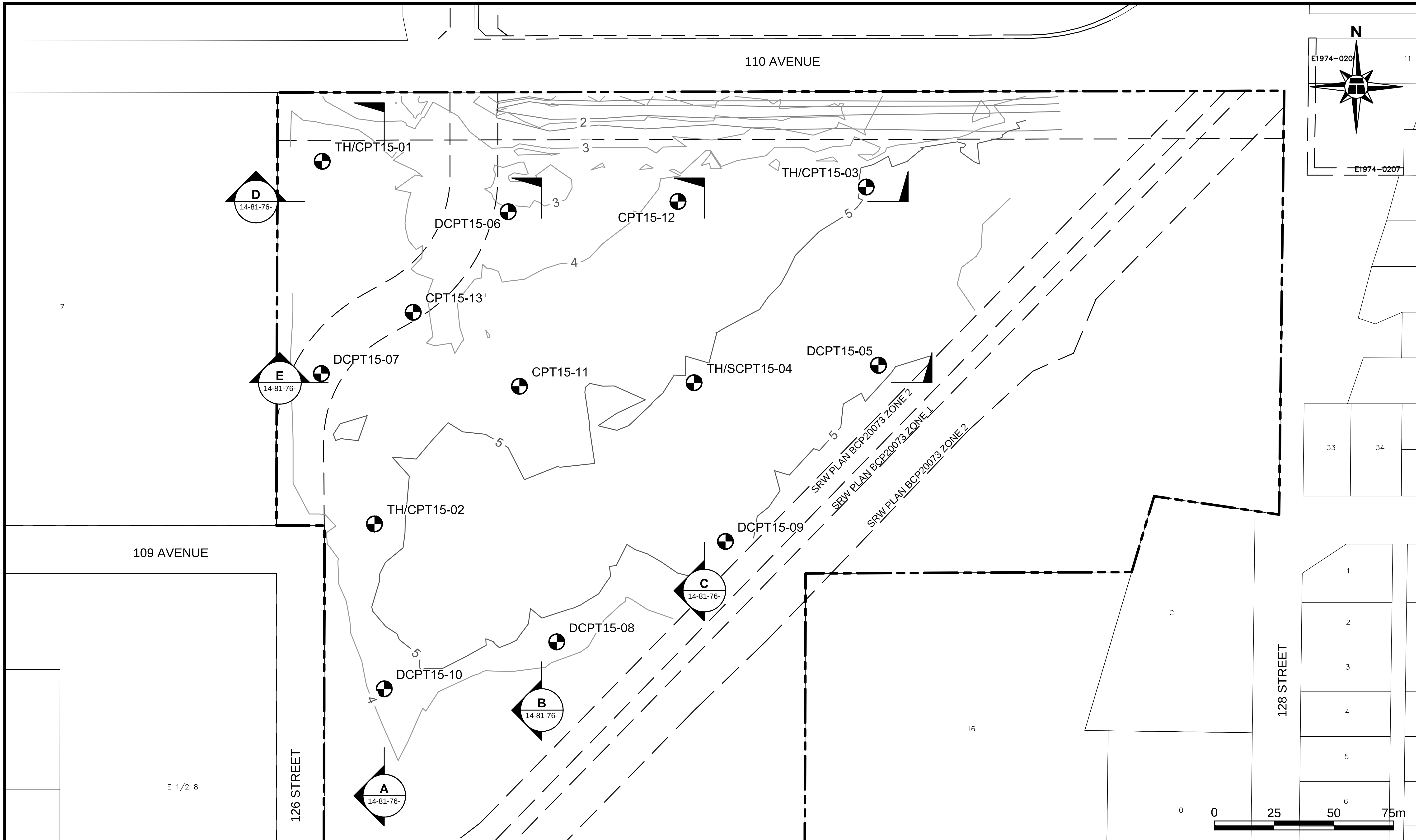
Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

HKH/LG_Dec 2014

Plotted: May 8, 2015



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LEGEND:

TEST HOLE LOCATION

NOTES:

1. BASE PLAN TAKEN FROM CITY OF SURREY CAD FILE 'S3043Topog'.
2. TEST HOLES LOCATIONS WERE SURVEYED IN APRIL 2015 BY THE CITY OF SURREY.

THURBER ENGINEERING LTD.

CLIENT: CITY OF SURREY

GEOTECHNICAL INVESTIGATION LOCATION PLAN

TROUTON PIT DEVELOPMENT — SURREY, BC

SEAL

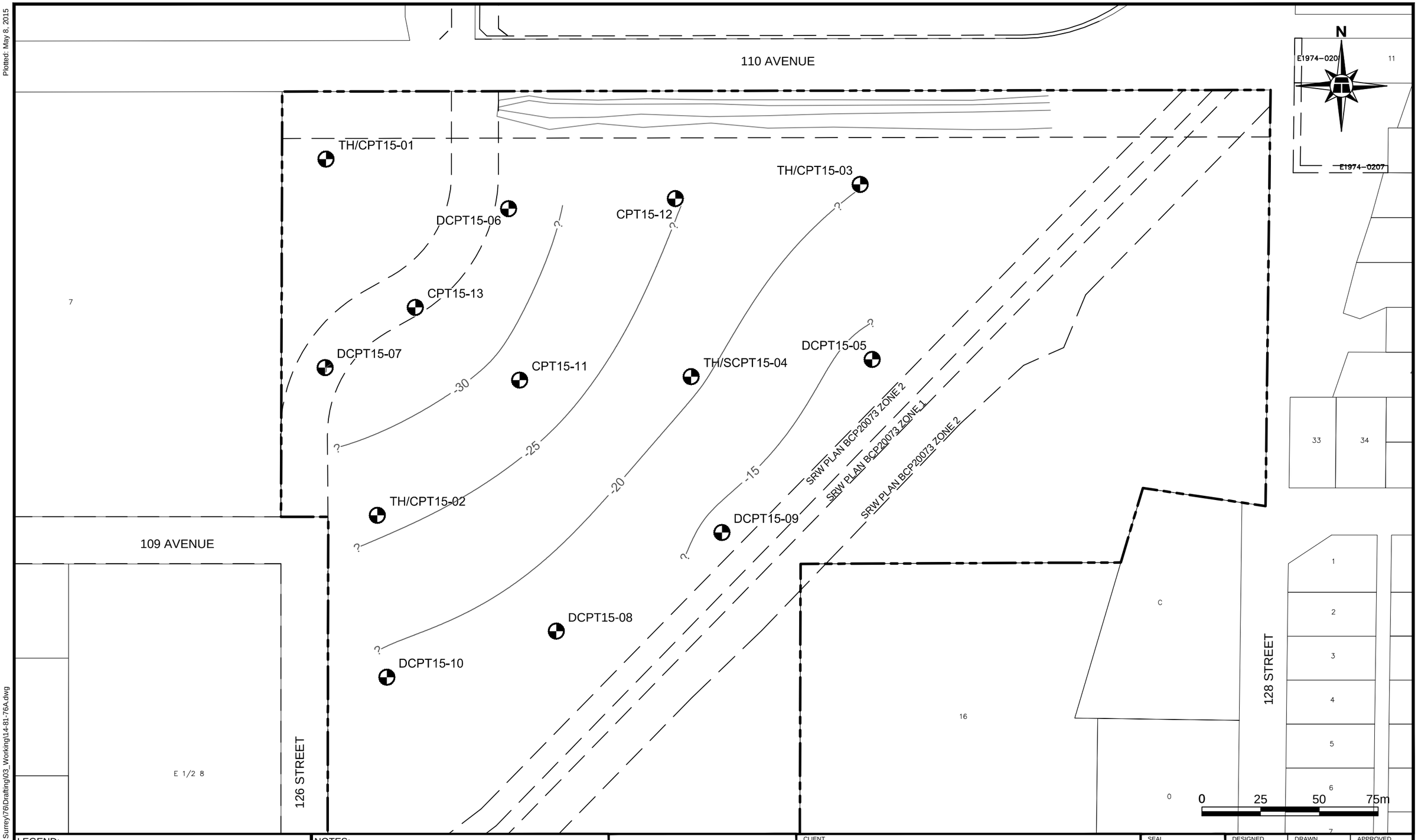
DESIGNED	DRAWN	APPROVED
ACL / BMW	NAK	DJT

DATE	SCALE
MAY 08, 2015	AS SHOWN

PROJECT No.	DWG. No.	REV.
14-81-76A-1		-

CANCEL PRINTS BEARING EARLIER LETTER

Plotted: May 8, 2015



LEGEND:

TEST HOLE LOCATION

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THURBER ENGINEERING LTD.

CLIENT: CITY OF SURREY

TILL-LIKE SOILS CONTOUR PLAN

TROUTON PIT DEVELOPMENT — SURREY, BC

SEAL

DESIGNED	DRAWN	APPROVED
ACL / BMW	NAK	DJT

DATE	SCALE
MAY 08, 2015	AS SHOWN

PROJECT No.	DWG. No.	REV.
14-81-76A-2		-

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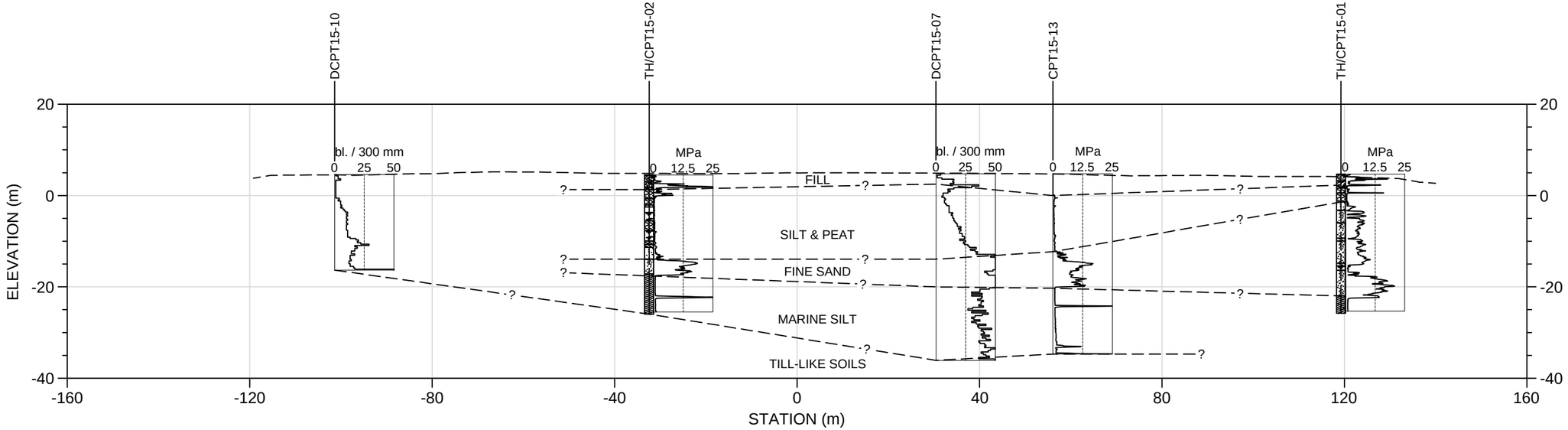
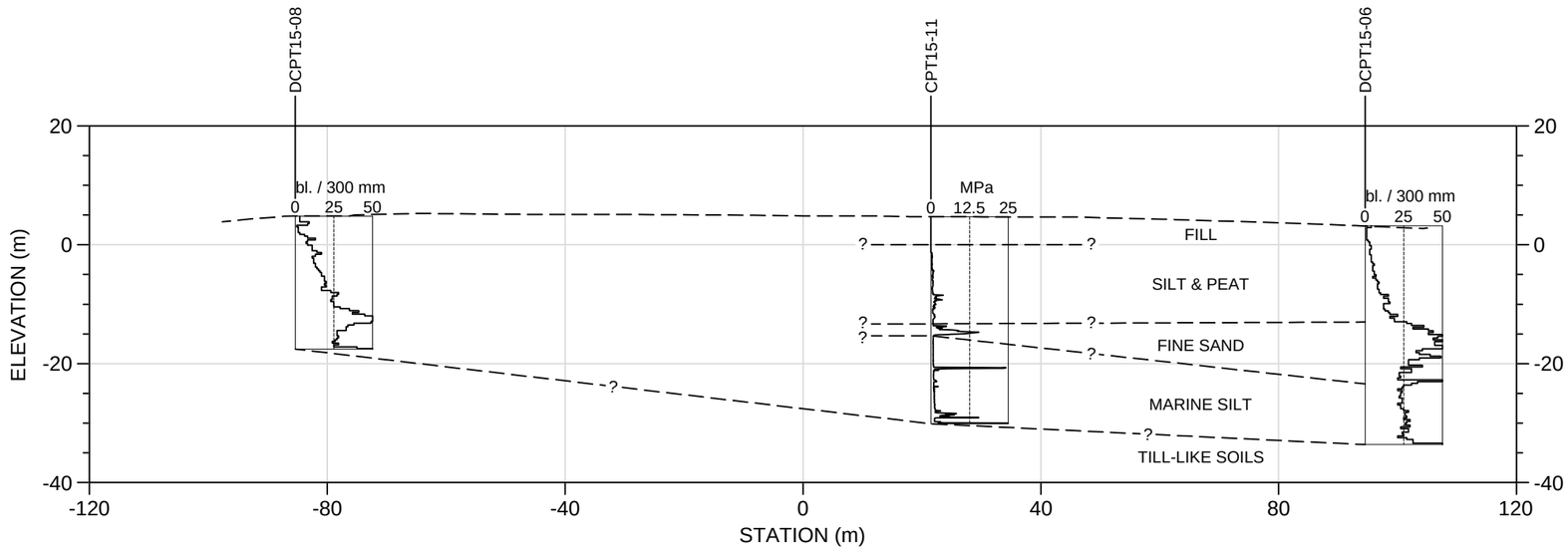
CANCEL PRINTS BEARING EARLIER LETTER

Plotted: May 8, 2015



SECTION A



SECTION B

0 10 20 30 40 50m

LEGEND:

NOTES:

THURBER ENGINEERING LTD.

CLIENT: CITY OF SURREY

CROSS-SECTIONS

TROUTON PIT DEVELOPMENT — SURREY, BC

SEAL

DESIGNED	DRAWN	APPROVED
ACL / BMW	NAK	DJT
DATE: MAY 08, 2015	SCALE: AS SHOWN	
PROJECT No.: 14-81-76A-3	DWG. No.: -	REV.:

CANCEL PRINTS BEARING EARLIER LETTER

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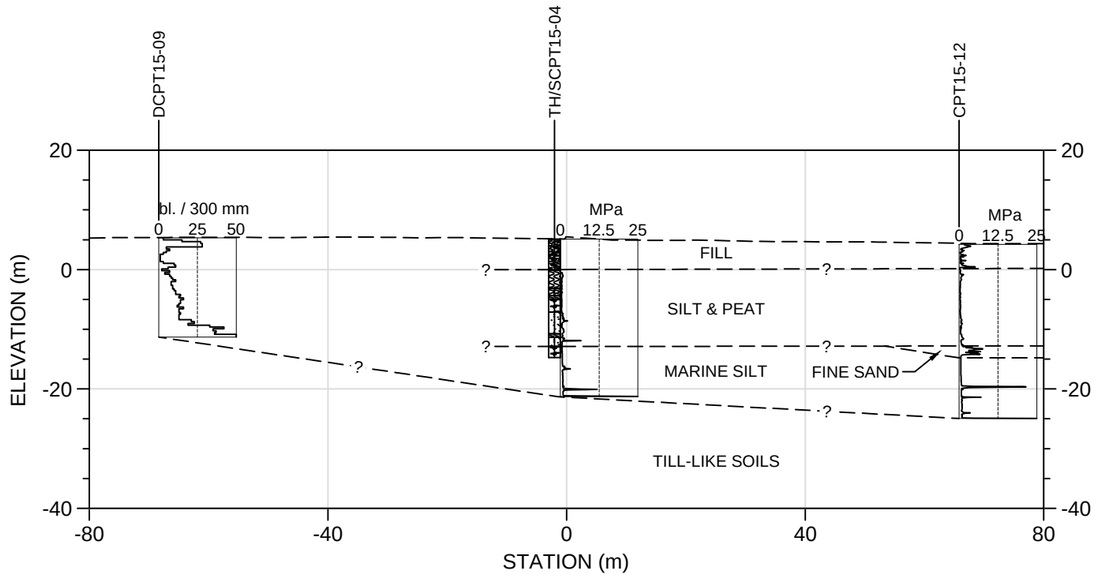
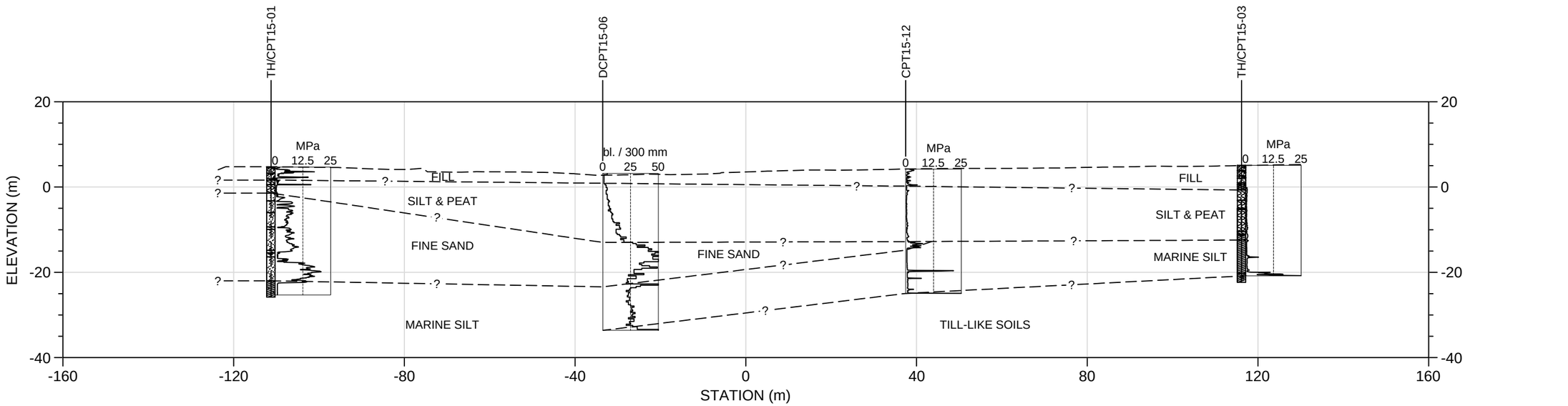
Plotted: May 8, 2015



SECTION C



SECTION D

0 10 20 30 40 50m

LEGEND:	NOTES:		CLIENT	SEAL	DESIGNED	DRAWN	APPROVED
		THURBER ENGINEERING LTD.	CITY OF SURREY		ACL / BMW	NAK	DJT
			CROSS-SECTIONS		DATE: MAY 08, 2015	SCALE: AS SHOWN	
			TROUTON PIT DEVELOPMENT SURREY, BC		PROJECT No.: 14-81-76A-4	DWG. No.: -	REV.:

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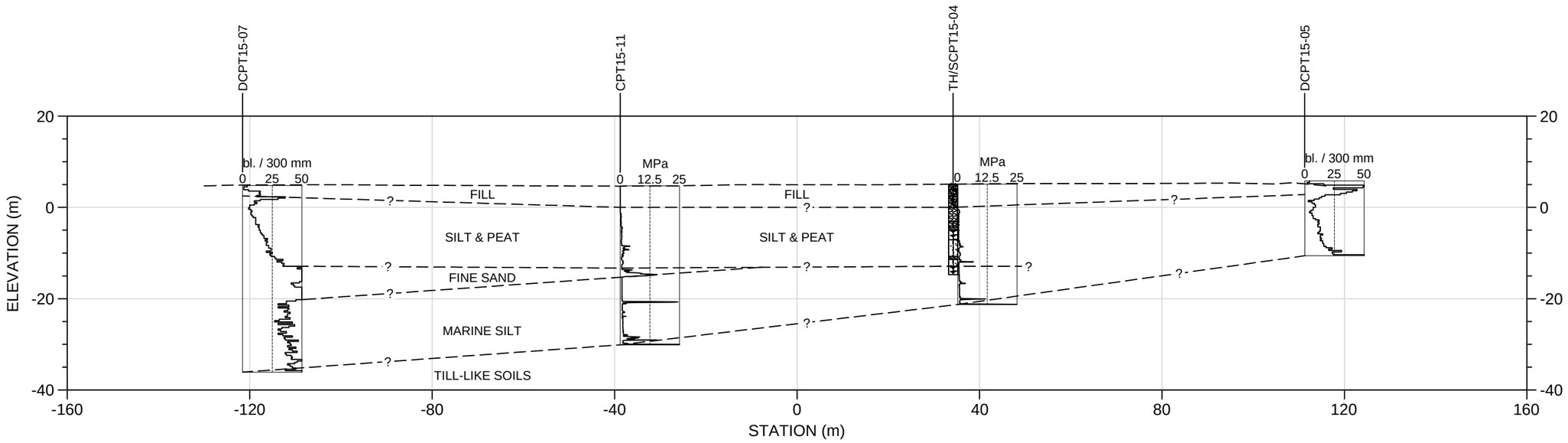
CANCEL PRINTS BEARING EARLIER LETTER

Plotted: May 8, 2015



SECTION E

0 10 20 30 40 50m

LEGEND:

NOTES:

THURBER ENGINEERING LTD.

CLIENT: CITY OF SURREY

CROSS-SECTIONS

TROUTON PIT DEVELOPMENT — SURREY, BC

SEAL

DESIGNED	DRAWN	APPROVED
ACL / BMW	NAK	DJT

DATE	SCALE
MAY 08, 2015	AS SHOWN

PROJECT No.	DWG. No.	REV.
14-81-76A-5		-

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CANCEL PRINTS BEARING EARLIER LETTER

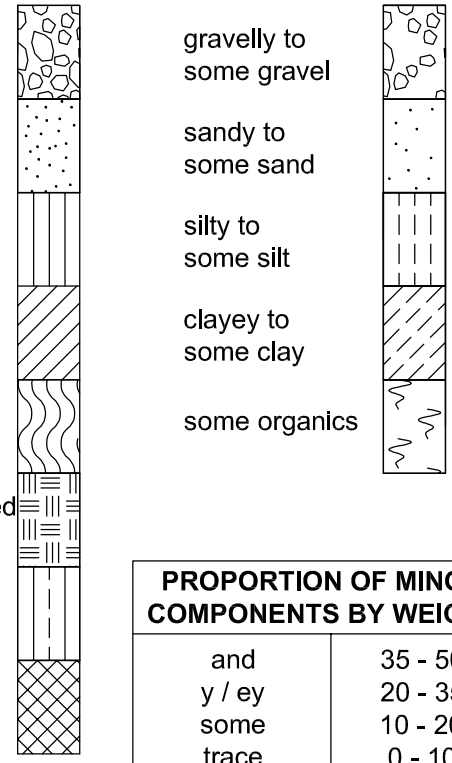
APPENDIX A

Thurber Investigation Results
(Current Project)

SYMBOLS AND TERMS
FOR SOIL DESCRIPTION AND TEST HOLE LOGS

BASIC SOIL SYMBOLS

Predominant Material	Secondary Material
GRAVEL	gravelly to some gravel
SAND	sandy to some sand
SILT	silty to some silt
CLAY	clayey to some clay
PEAT / ORGANICS	some organics
Undifferentiated BEDROCK	
ORGANIC SILT	
FILL / DEBRIS	

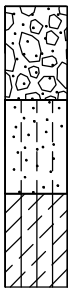


SYMBOL VARIATIONS - EXAMPLES (1)

SAND and GRAVEL

SAND, silty

SILT with some clay



PROPORTION OF MINOR COMPONENTS BY WEIGHT (2)	
and	35 - 50%
y / ey	20 - 35%
some	10 - 20%
trace	0 - 10%

DENSITY OF GRANULAR SOILS	
Description	SPT N (5) (6)
Very Loose	0 - 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	> 50

CONSISTENCY OF COHESIVE SOILS	
Description	Undrained Shear Strength (kPa) (6)
Very Soft	< 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	> 200

PENETRATION TESTS	
Dynamic Cone Penetration	
Standard Penetration	
Becker Closed Casing	
Becker Open Casing	
Bounce Chamber Pressure	

CLASSIFICATION BY PARTICLE SIZE				
		Size Range (6)		
			U.S. Standard Sieve Size	
Name		(mm) (3)	Retained	Passing
Boulders		> 200	8 inch	-
Cobbles		75 - 200	3 inch	8 inch
Gravel:	coarse	19 - 75	0.75 inch	3 inch
	fine	5 - 19	No. 4	0.75 inch
Sand:	coarse	2 - 5	No. 10	No. 4
	medium	0.4 - 2	No. 40	No. 10
	fine	0.075 - 0.4	No. 200	No. 40
Fines (Silt or Clay) (4)		< 0.075	-	No. 200

(1) Only selected examples of the possible variations or combinations of the basic symbols are illustrated.
(2) Example: SAND, silty, trace of gravel = sand with 20 to 35% silt and up to 10% gravel, by dry weight. Percentages of secondary materials are estimates based on visual and tactile assessment of samples.
(3) Approximate metric conversion.
(4) Fines are classified as silt or clay on the basis of Atterberg limits.
(5) SPT N values on test hole logs are uncorrected field values.
(6) Reference Canadian Foundation Engineering Manual 4th Edition, 2006.

THURBER

TH15-01

Sheet 1 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-01

LOCATION: See Dwg. 14-81-76A-1
N 5449951, E 509248

TOP OF HOLE ELEV: 4.7 m

METHOD: Solid Stem Auger

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 2/3, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: Disturbed, Undisturbed, No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): GASTECH reading, PID reading

DEPTH (m)	10 20 30 40 50 60 70 80 90 100	COMMENTS		SOILS DESCRIPTION	ELEVATION (m)
0–1	○ ▲ △		ML/SM	Grey, moist SILT and SAND with some gravel (FILL). - 100 mm thick lense of sand with traces of silt at 0.45 m depth.	4–3
1–2	○ ▲ △		ML/SM		3–2
3–4	327 ○		PT	Soft, brown, moist, fibrous PEAT with some silt and a trace of sand.	1–0
4–5	170 ○		OH/PT	Soft, light brown, moist SILT and fibrous PEAT with traces of sand, gravel and clay. - decomposing with a slight H2S-like odour below 4.5 m depth. - 200 mm thick lense of woodwaste at 5.5 m depth.	0–-1
6–7	○		ML	Soft, grey, wet SILT with some fine sand and traces of organics, clay and gravel.	-2–-3
8–9	○		SM	Grey, wet, silty, fine SAND to SILT and fine SAND with a trace of organics.	-4–-5
10–11	○ ▲		ML/SM		-6–-7
11–12	○		SM	Grey, wet, fine SAND with some silt and a trace of organics. - poor recovery between 11.6 and 12.2 m depth.	-7–-8
13–14	▲ ○		SM		-9–-10
14–15	○		ML/SM	Soft, grey, moist SILT and fine SAND with traces of clay and organics.	-10–-11
15–16				Grey, wet, fine SAND with some silt and a trace of organics.	-11–-12
16–17	○		SM		-12–-13
17–18	○		SP-SM		-13–-14
19–20	▲ ○ △		SM		-14–-15

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

Sheet 2 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-01

LOCATION: See Dwg. 14-81-76A-1
N 5449951, E 509248

TOP OF HOLE ELEV: 4.7 m

METHOD: Solid Stem Auger

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 2/3, 2015

FILE NO.: 14-81-76A

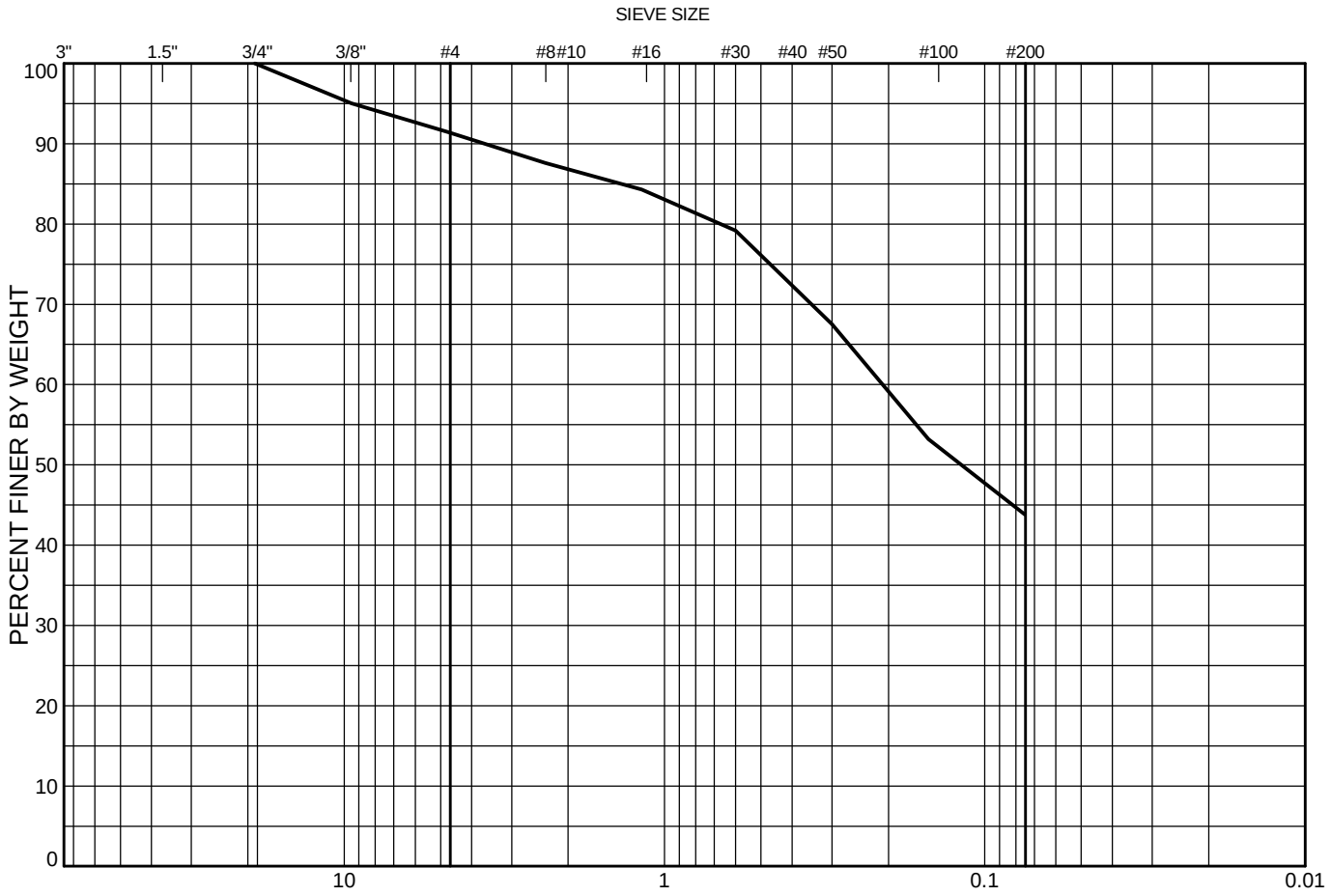
DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: Disturbed, Undisturbed, No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): GASTECH reading, PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS

DEPTH (m)		SOILS DESCRIPTION	ELEVATION (m)
20	ML	Grey, moist to wet, interlayered fine SAND and sandy SILT.	-16
21		Soft to firm, grey, moist SILT with some organics and traces of sand and clay.	
22	SM	Grey, moist to wet SAND with some silt to silty.	-17
23			-18
24	SP-SM		-19
25	SP-SM		-20
26			-21
27	ML	Grey, moist SILT with a trace to some clay and sand.	-22
28			-23
29	ML/CL		-24
30	CL		-25
31		End of hole at required depth. Hole open to 1.8 m upon completion of drilling. No water observed.	-26
32			-27
33			-28
34			-29
35			-30
36			-31
37			-32
38			-33
39			-34
40			-35

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB



Sample Location: **15-01**
Sample: 1
Sample Depth: 0.9 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Gravel	**8.5%**
Sand	**47.6%**
Fines	**43.8%**
Moisture Content	**9.1%**

D10	
D30	
D60	**0.208**
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	**100.0**
0.375	9.5	**95.0**
#4	4.75	**91.5**
#8	2.36	**87.6**
#16	1.18	**84.3**
#30	0.6	**79.2**
#50	0.3	**67.5**
#100	0.15	**53.2**
#200	0.075	**43.8**

Description:

Comments:

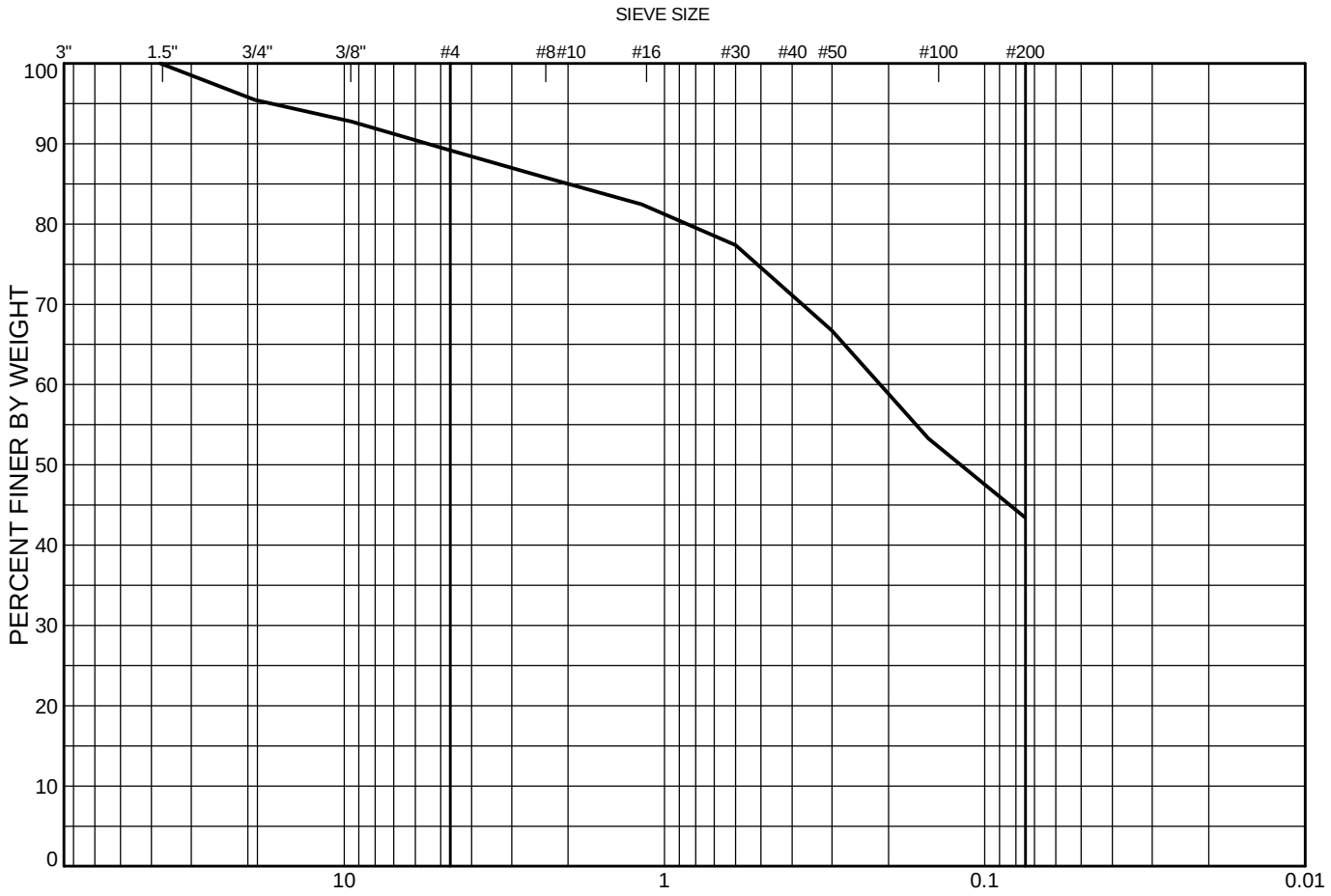
THURBER
Thurber Engineering Ltd.
#900 - 1281 West Georgia Street
Vancouver, BC V6E 3J7
Telephone: (604) 684-4384
Fax: (604) 684-5124

GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-01**
Sample: 2
Sample Depth: 2.4 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Description:

Comments:

Gravel	**10.7%**
Sand	**45.8%**
Fines	**43.5%**
Moisture Content	**10.8%**

D10	
D30	
D60	**0.212**
Cu	
Cc	

Sieve Size inches	Sieve Size mm	Percent Passing
3	75	
1.5	37.5	**100.0**
0.75	19	**95.5**
0.375	9.5	**92.8**
#4	4.75	**89.3**
#8	2.36	**85.8**
#16	1.18	**82.5**
#30	0.6	**77.4**
#50	0.3	**66.7**
#100	0.15	**53.3**
#200	0.075	**43.5**

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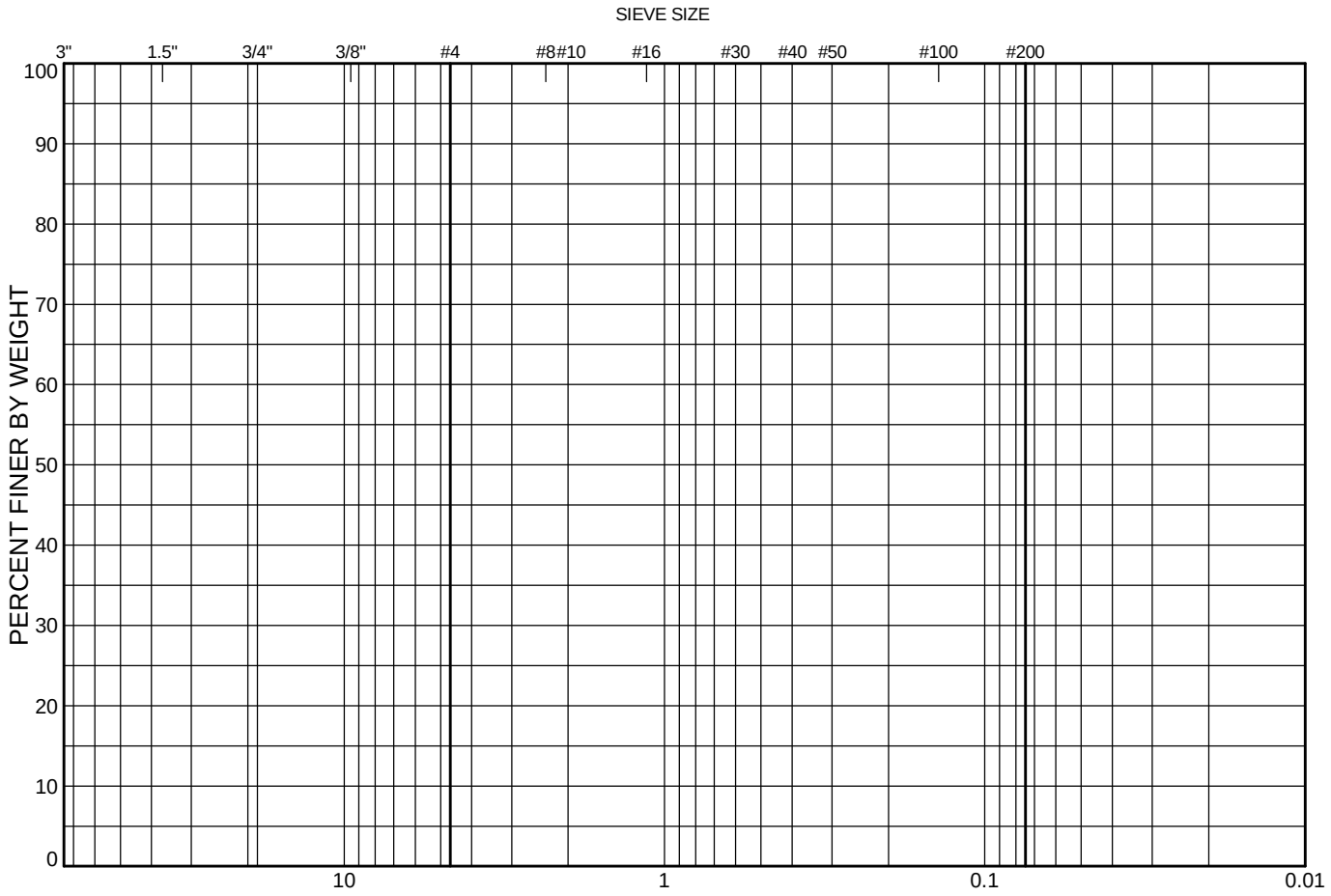
CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-01**
Sample: 7
Sample Depth: 9.8 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/SMP
Test Method: ASTM C136 and C117
Specification:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**46.3%**
Moisture Content	**26.4%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**46.3**

Description:

Comments:

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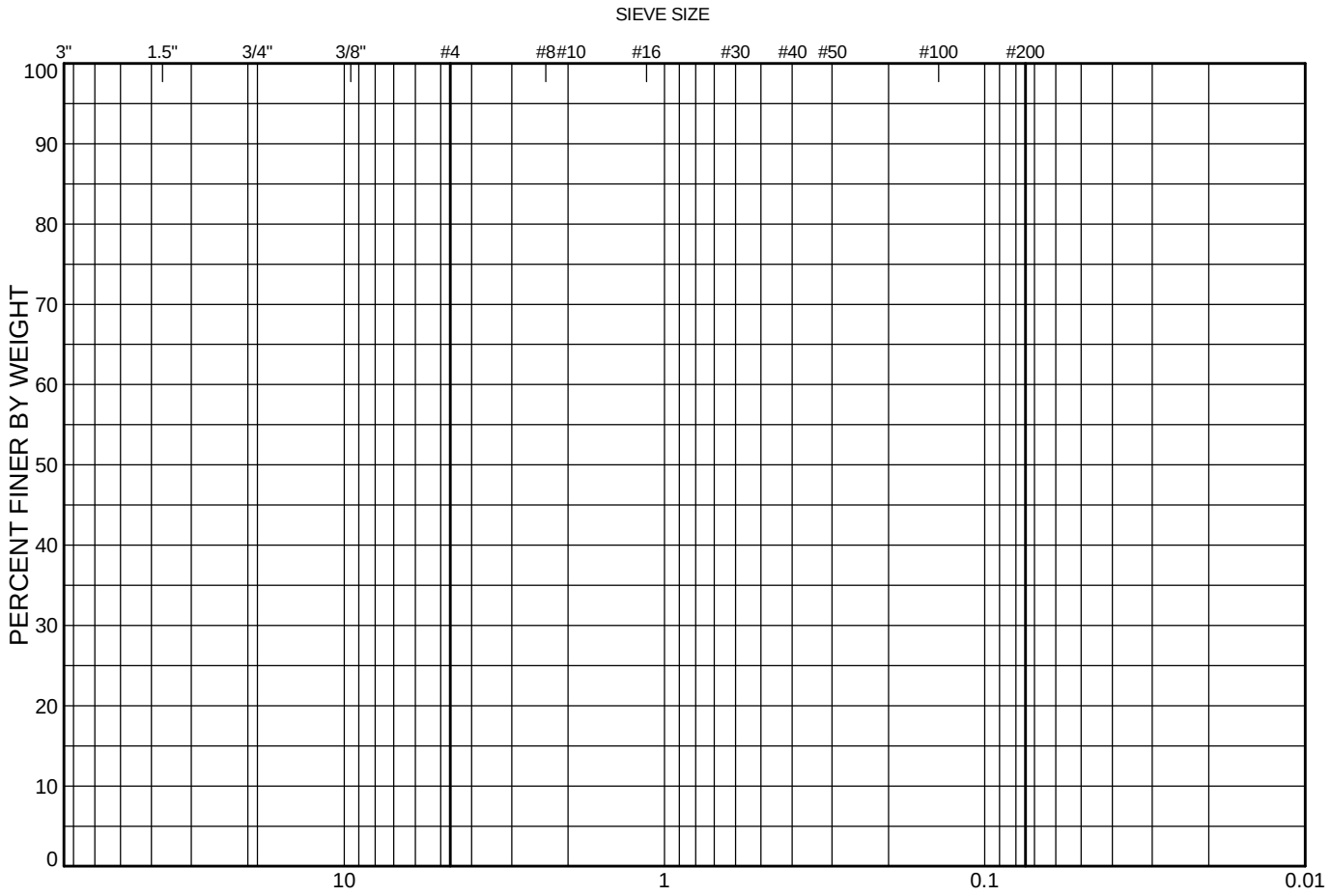
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-01**
Sample: 9
Sample Depth: 12.8 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/SMP
Test Method: ASTM C136 and C117
Specification:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**16.0%**
Moisture Content	**32.7%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**16.0**

Description:

Comments:

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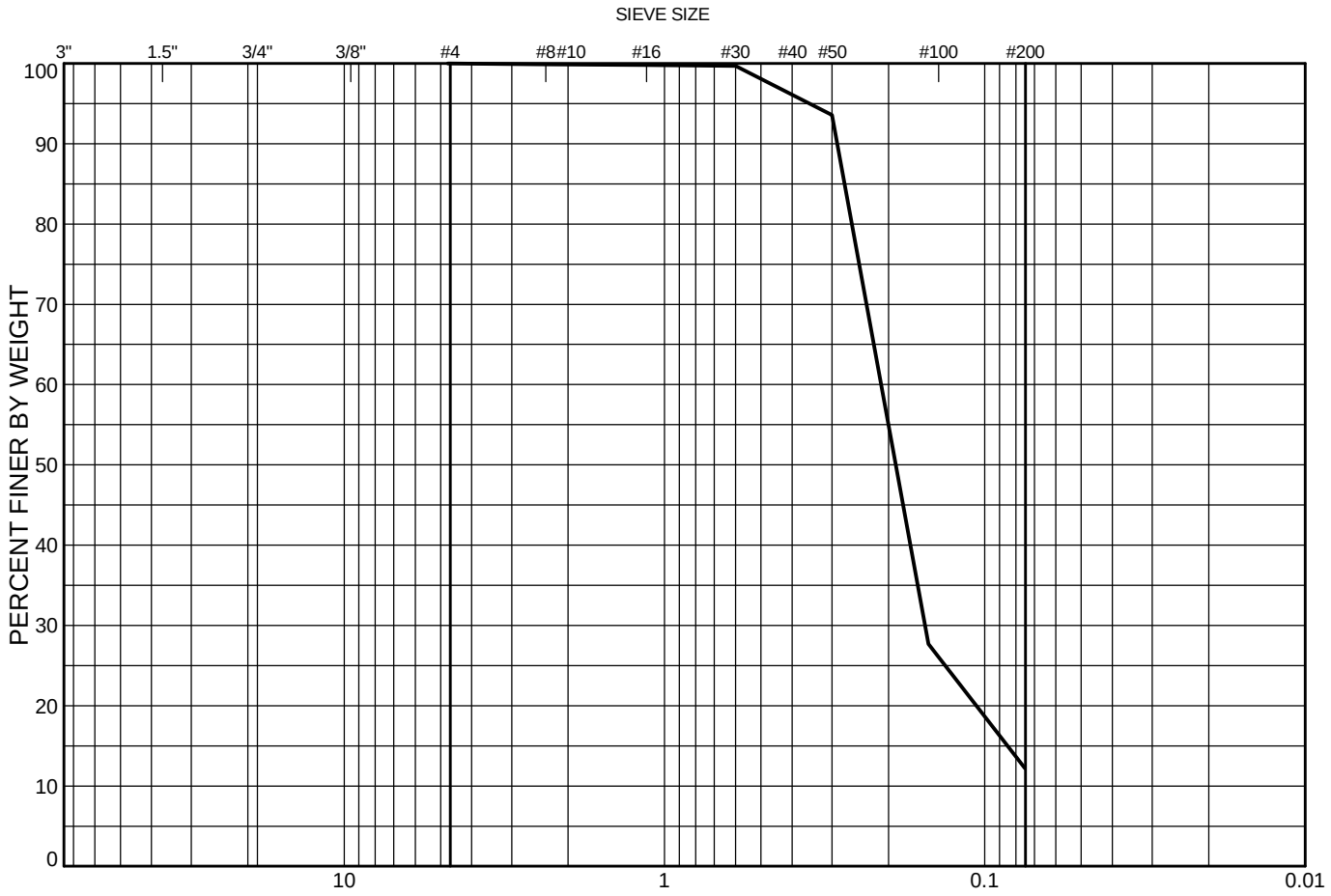
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



GRAVEL		SAND			SILT
coarse	fine	coarse	medium	fine	

Sample Location: **15-01**
Sample: 13
Sample Depth: 18.9 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Description:

Comments:

Gravel	**0.0%**
Sand	**87.8%**
Fines	**12.2%**
Moisture Content	**28.2%**

D10	
D30	**0.154**
D60	**0.211**
Cu	**3.10**
Cc	**1.65**

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	**100.0**
#8	2.36	**99.9**
#16	1.18	**99.8**
#30	0.6	**99.7**
#50	0.3	**93.6**
#100	0.15	**27.7**
#200	0.075	**12.2**

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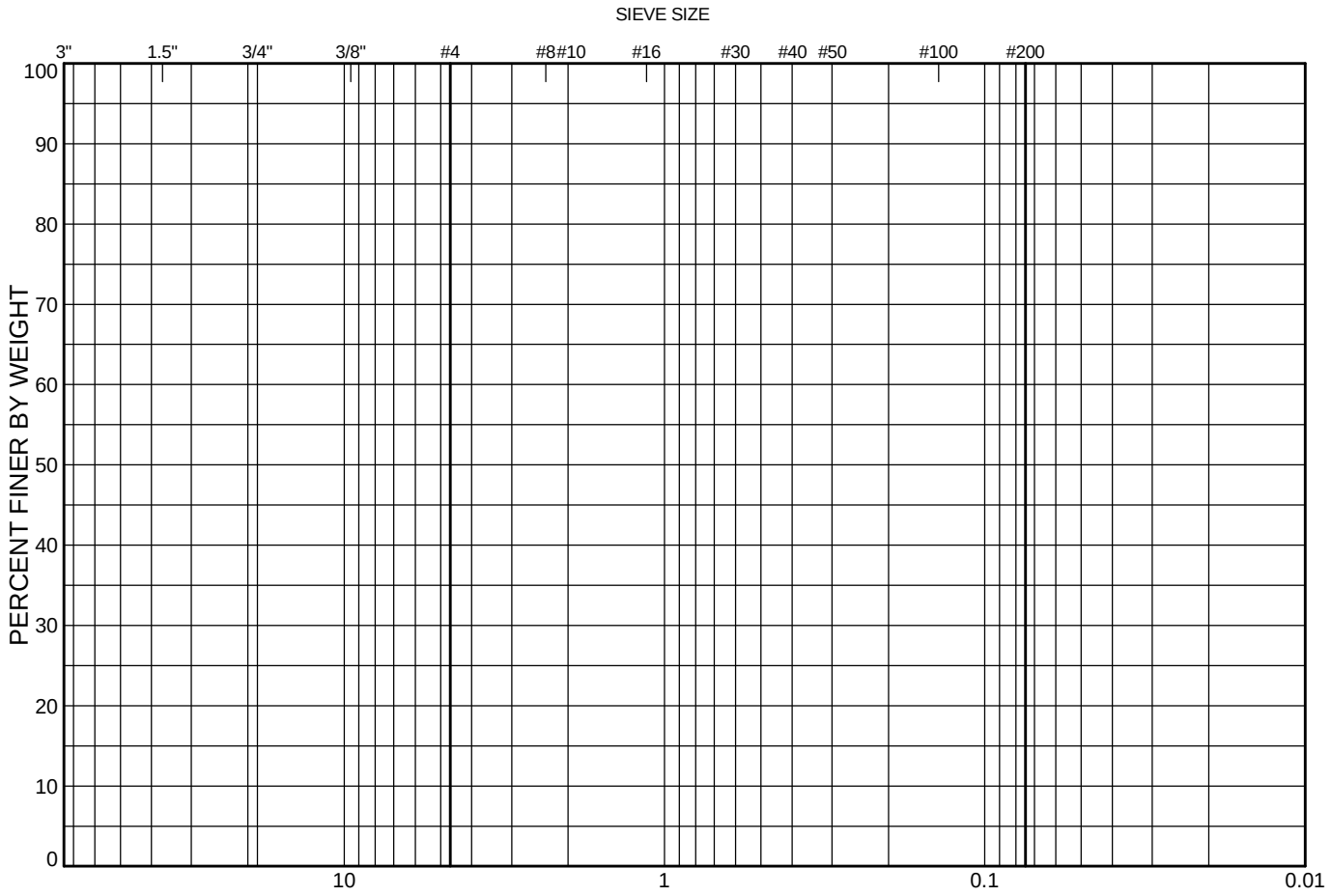
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



GRAIN SIZE IN MILLIMETRES

GRAVEL		SAND			SILT
coarse	fine	coarse	medium	fine	

Sample Location: **15-01**
Sample: 16
Sample Depth: 23.5 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/SMP
Test Method: ASTM C136 and C117
Specification:

Description:

Comments:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**10.9%**
Moisture Content	**22.9%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**10.9**

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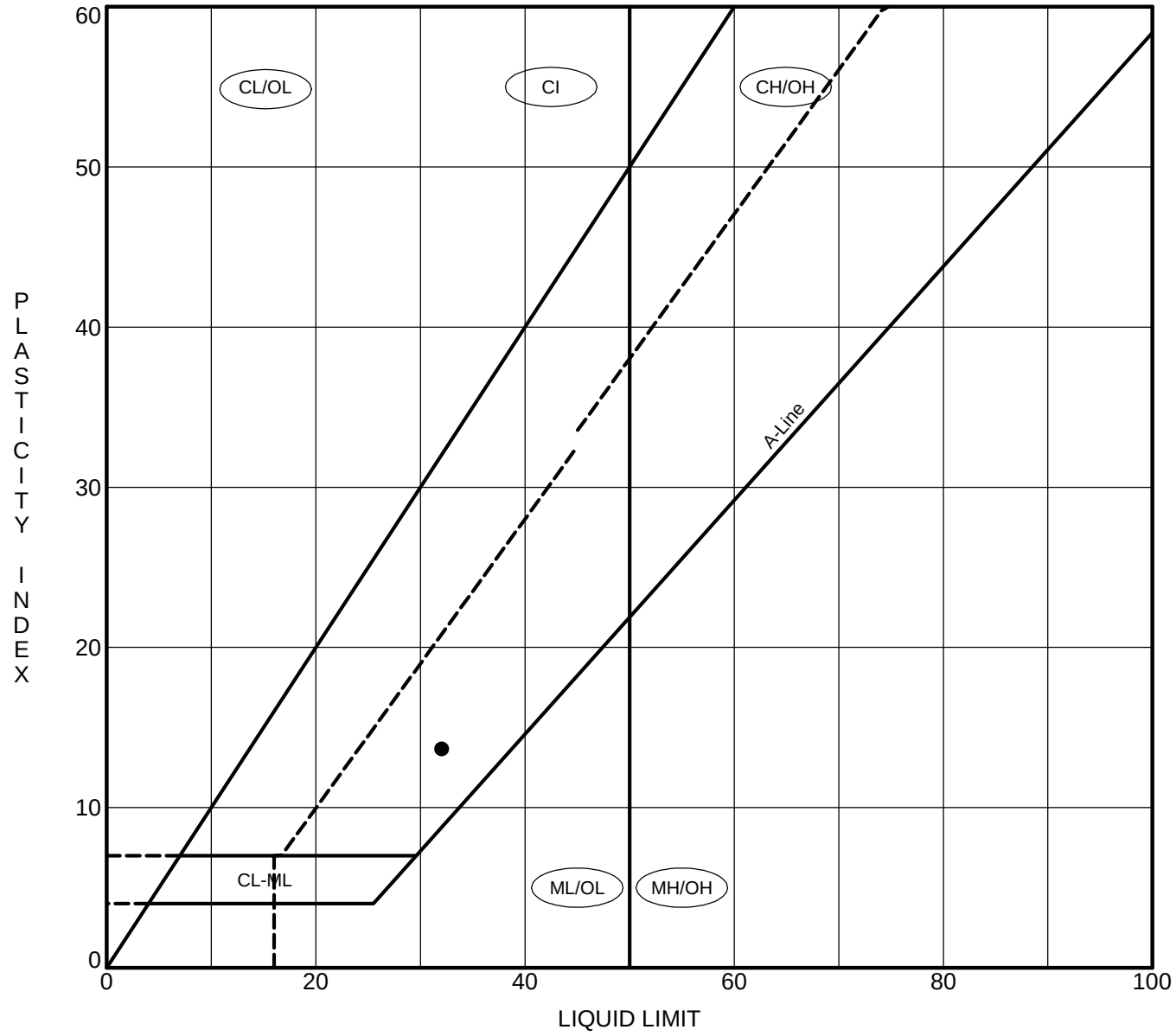
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



	Specimen Identification	LL	PL	PI	MC%	Classification
●	**15-01, Sa. 20 29.9 m**	**32**	**18**	**14**	**35.0**	

Thurber Engineering Ltd.

Telephone:
Fax:

THURBER

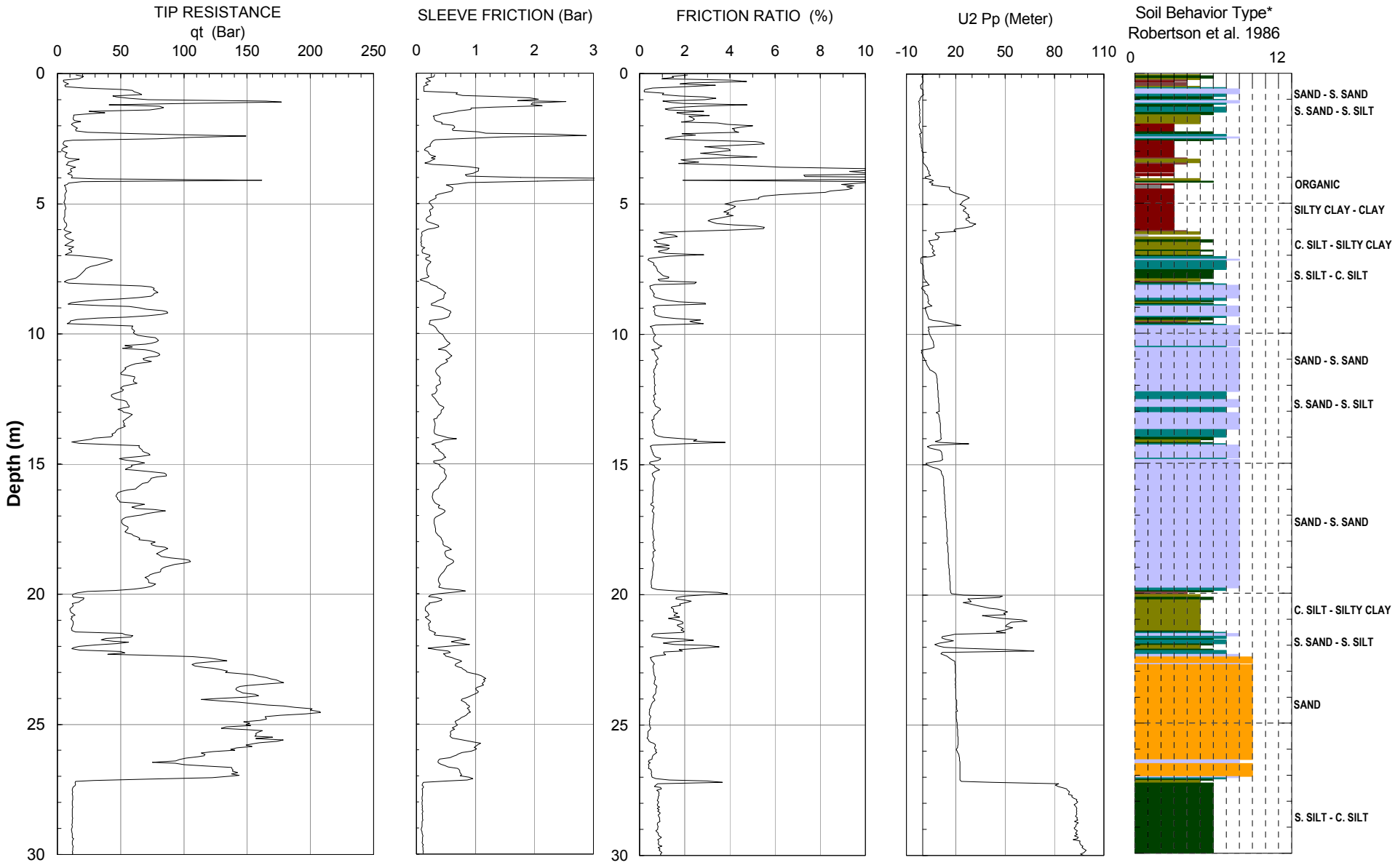
PLASTICITY CHART

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

ATTERBERG_LIMITS 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15 - 01 Cone ID: DPG1236 10 Ton	Date: March 2, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A	Schwartz SOIL TECH

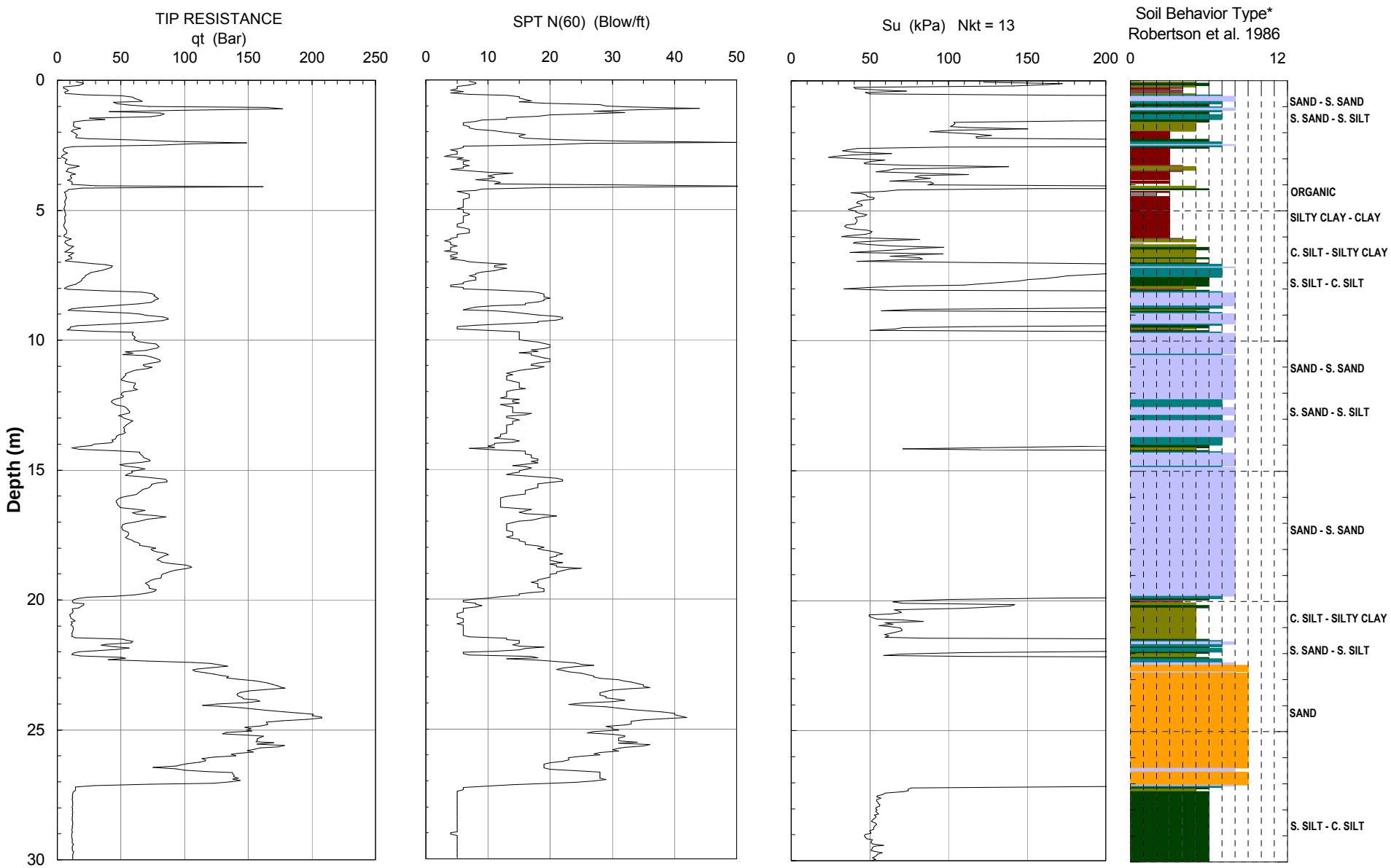


Maximum Depth = 30.00 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

THURBER **Thurber Engineering**	Operator: Schwartz Soil Technical Sounding: CPT15 - 01 Cone ID: DPG1236 10 Ton	Date: March 2, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A	Schwartz SOIL TECH



Maximum Depth = 30.00 meters

Depth Increment = 0.05 meters

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

TH15-02

LOG OF TEST HOLE

TEST HOLE NO. **15-02**

LOCATION: See Dwg. 14-81-76A-1
N 5449806, E 509261

TOP OF HOLE ELEV: 4.7 m
METHOD: Solid Stem Auger
DRILLING CO.: On-Track Drilling Inc.
INSPECTOR: BMW

THURBER

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

DATE: March 3, 2015
FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading

DEPTH (m)	COMMENTS		SOILS DESCRIPTION	ELEVATION (m)
0–1		SM/GM	Grey, wet, gravelly SAND and SILT with a trace of clay (FILL). - moist below 1.2 m depth.	4–3
1–3		ML/SM		3–2
3			Brown, moist, partially decomposed WOODWASTE.	2
3–4	436	PT	Soft to firm, brown, moist, fibrous PEAT with some silt and a trace of sand.	2–0
5–6	144	OH/PT	Soft, brown, moist SILT and fibrous PEAT with traces of sand and clay.	0–-1
6–7			Soft, brown, moist, fibrous PEAT.	-1–-2
7	134	PT	Soft, brown, moist SILT and fibrous PEAT.	-2
8–9		OH	Soft, grey, moist SILT with some organics and a trace of clay.	-3–-4
10	140	OH/PT	Soft, grey to brown, moist SILT and fibrous PEAT.	-5–-6
11–12		PT/OH		-6–-7
12–13		OL/ML	Soft, grey, moist SILT with some organics and traces of clay and sand.	-7–-8
14–15	147	OH/PT	Soft, brown, moist SILT and PEAT with a trace of clay.	-8–-10
15			Soft, brown, moist, fibrous PEAT.	-10–-11
16–17		ML	Soft to firm, grey, moist SILT with some sand and organics.	-11–-12
17–18	Sample was non-plastic	SM/ML	- sandy below 17.4 m depth.	-12–-13
19		SM	Grey, wet, fine SAND with some silt and a trace of organics.	-13–-14
20				-14–-15

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

Sheet 2 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-02

LOCATION: See Dwg. 14-81-76A-1
N 5449806, E 509261

TOP OF HOLE ELEV: 4.7 m
METHOD: Solid Stem Auger
DRILLING CO.: On-Track Drilling Inc.
INSPECTOR: BMW

THURBER

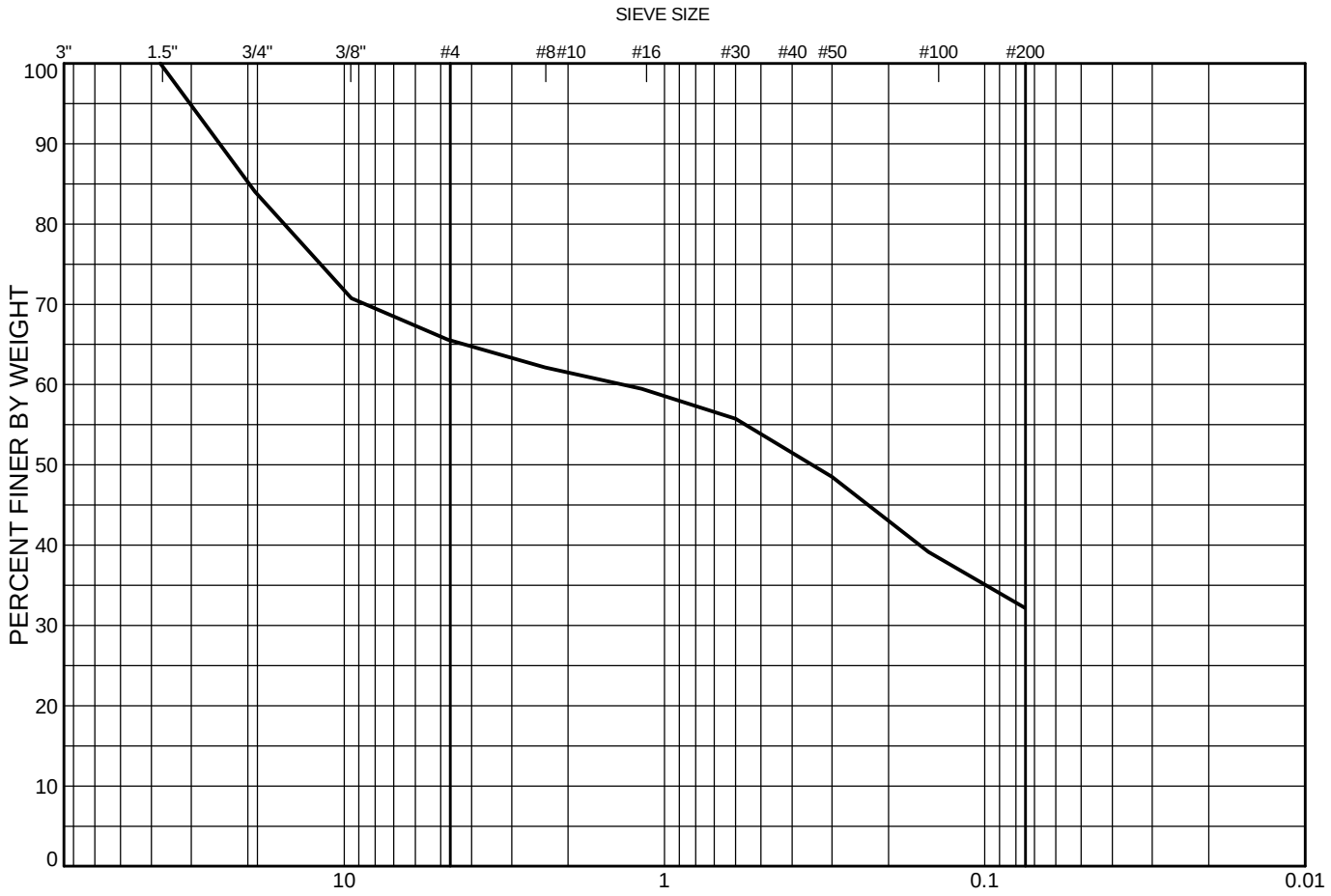
CLIENT: City of Surrey
PROJECT: Trouton Pit Development

DATE: March 3, 2015
FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: Disturbed, Undisturbed, No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): GASTECH reading, PID reading

DEPTH (m)	10 20 30 40 50 60 70 80 90 100	COMMENTS	SOILS DESCRIPTION	ELEVATION (m)
20	▲ ○		SM	Grey, wet, fine SAND with some silt and a trace of organics.	-16
21					
22	○		ML/CL	Grey, moist SILT with some clay and traces of sand and organics.	-17
23					-18
24	○		CL		-19
25					-20
26	○		CL		-21
27					-22
28	○		ML/CL		-23
29			ML/CL		-24
30	○				-25
31			ML/CL	End of hole at required depth. Open to 2.7 m upon completion of drilling. No water observed.	-26
32					-27
33					-28
34					-29
35					-30
36					-31
37					-32
38					-33
39					-34
40					-35

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB



Sample Location: **15-02**
Sample: 1
Sample Depth: 0.9 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Gravel	**34.4%**
Sand	**33.4%**
Fines	**32.2%**
Moisture Content	**12.3%**

D10	
D30	
D60	**1.351**
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	**100.0**
0.75	19	**84.0**
0.375	9.5	**70.7**
#4	4.75	**65.6**
#8	2.36	**62.1**
#16	1.18	**59.5**
#30	0.6	**55.7**
#50	0.3	**48.5**
#100	0.15	**39.1**
#200	0.075	**32.2**

Description:

Comments:

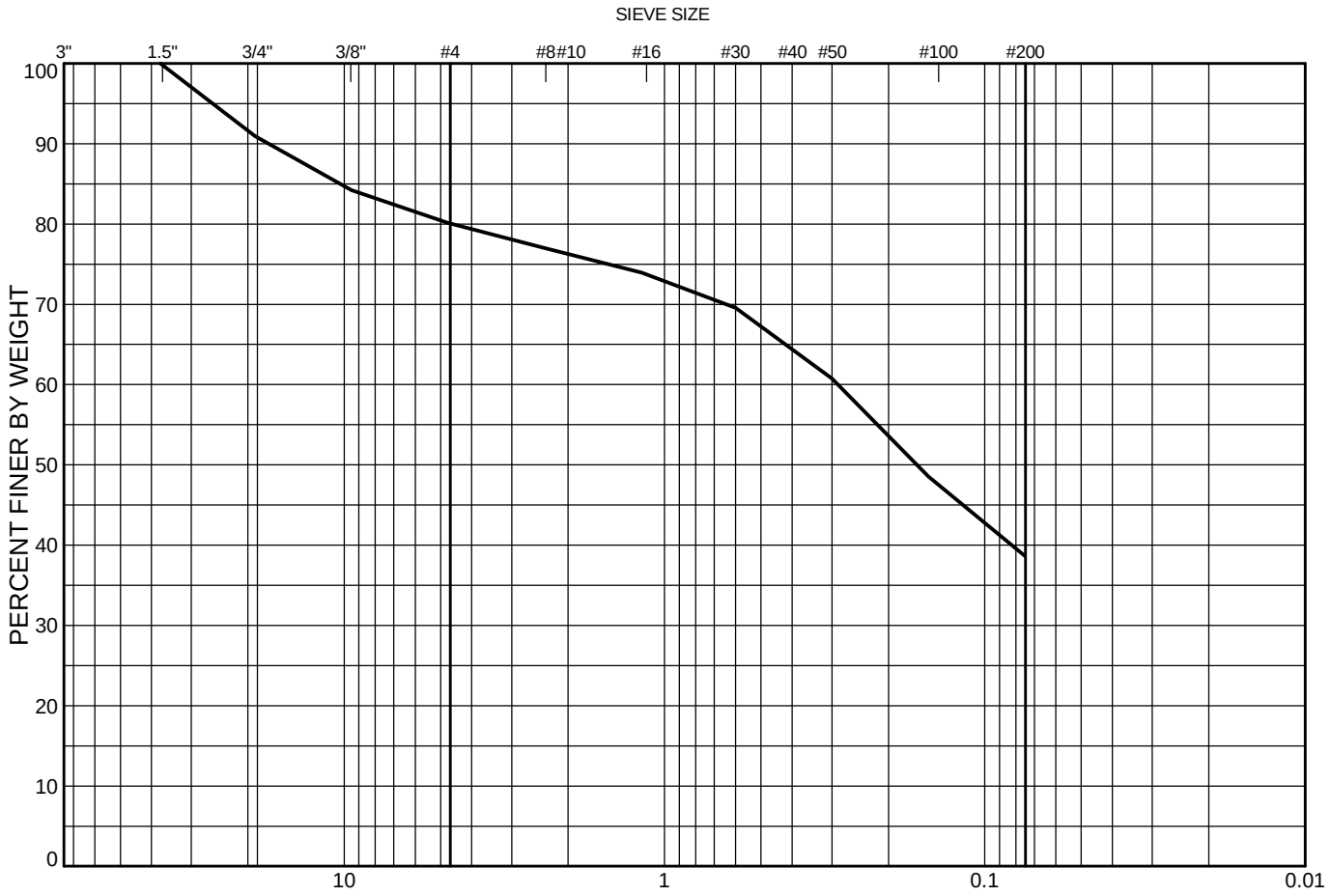
THURBER
Thurber Engineering Ltd.
#900 - 1281 West Georgia Street
Vancouver, BC V6E 3J7
Telephone: (604) 684-4384
Fax: (604) 684-5124

GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-02**
Sample: 2
Sample Depth: 2.4 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Description:

Comments:

Gravel	**19.8%**
Sand	**41.5%**
Fines	**38.7%**
Moisture Content	**9.6%**

D10	
D30	
D60	**0.288**
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	**100.0**
0.75	19	**90.9**
0.375	9.5	**84.2**
#4	4.75	**80.2**
#8	2.36	**77.0**
#16	1.18	**73.9**
#30	0.6	**69.6**
#50	0.3	**60.7**
#100	0.15	**48.6**
#200	0.075	**38.7**

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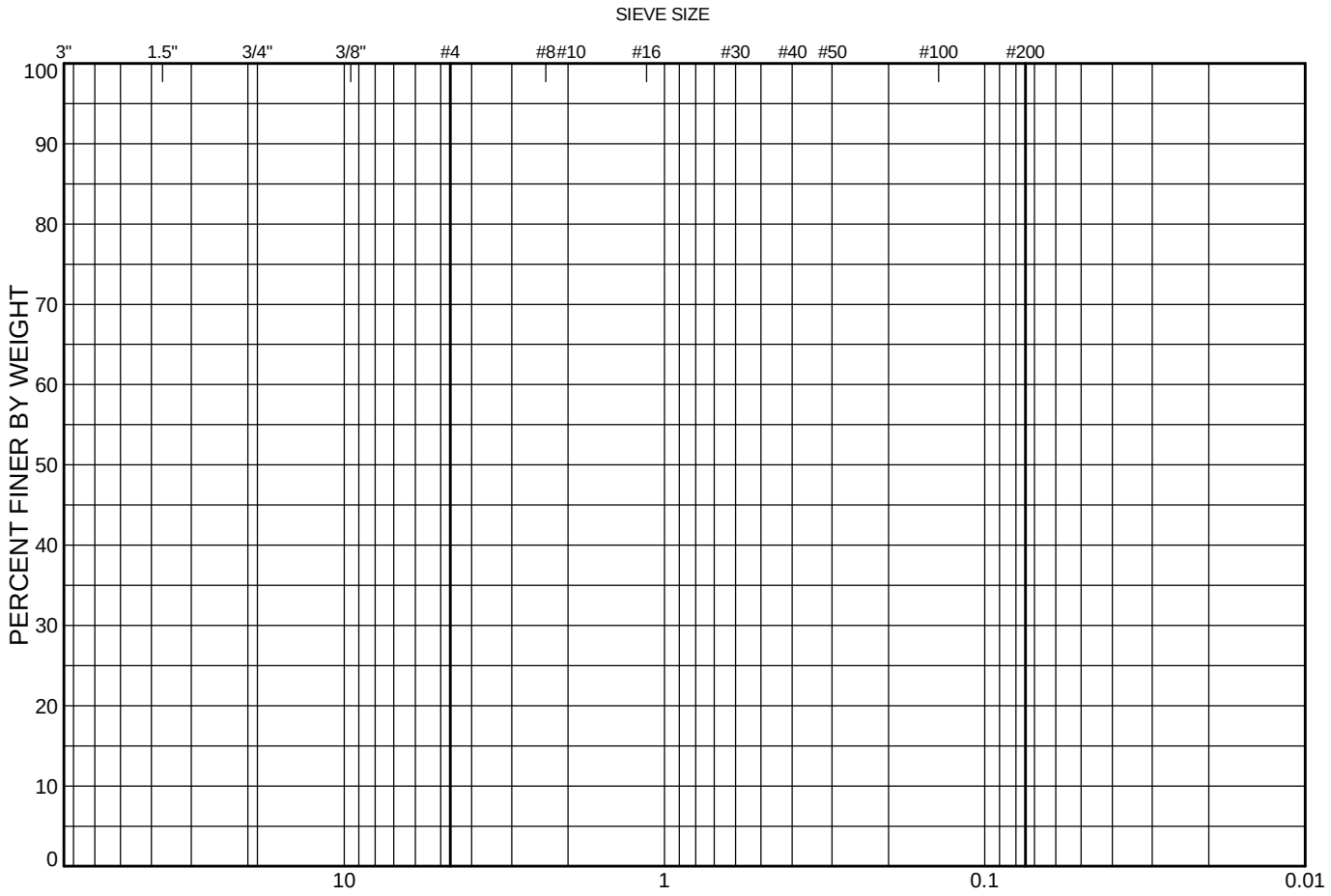
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-02**
Sample: 13
Sample Depth: 18.9 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/KYC
Test Method: ASTM C136 and C117
Specification:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**18.0%**
Moisture Content	**25.4%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**18.0**

Description:

Comments:

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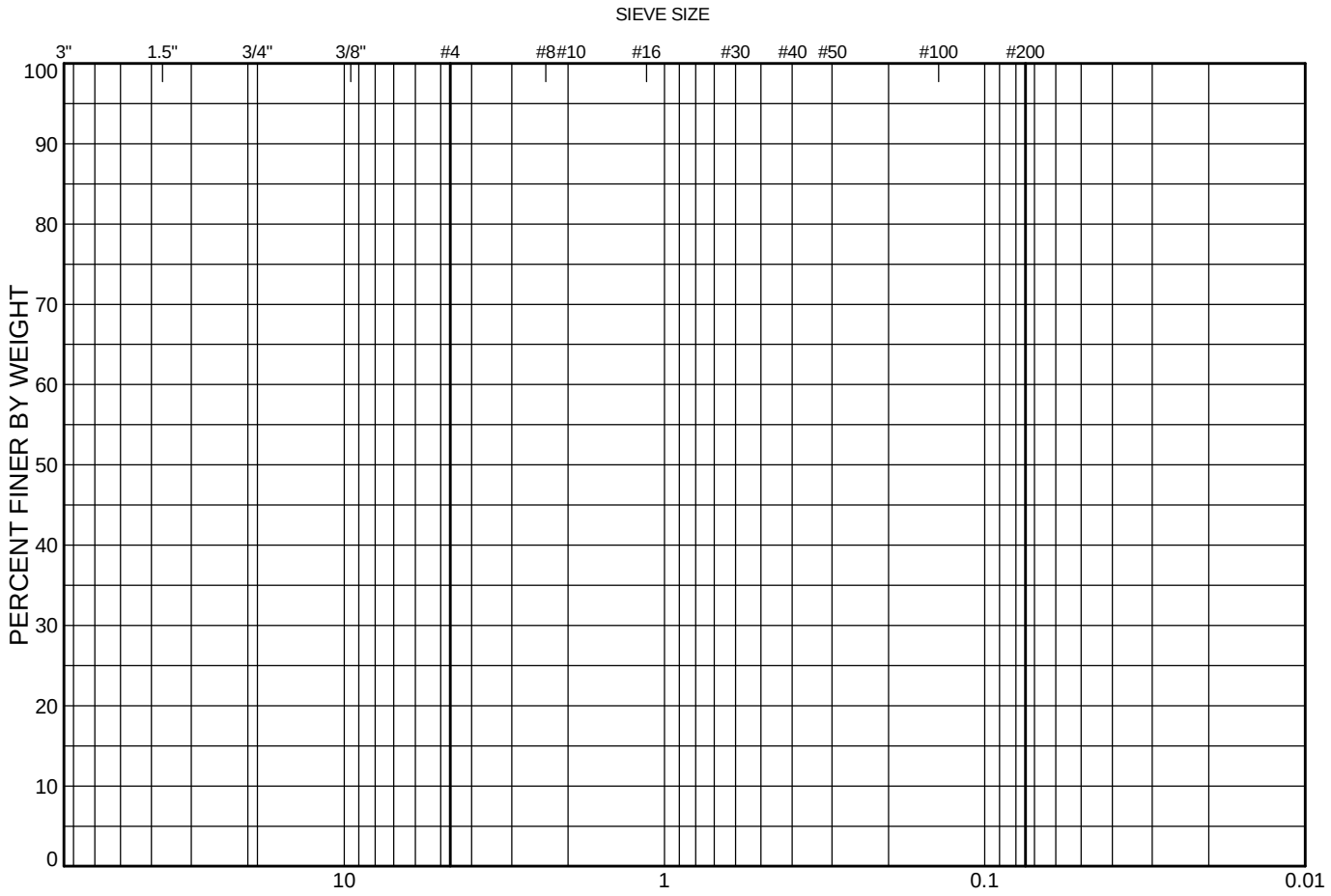
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-02**
Sample: 14
Sample Depth: 20.4 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/KYC
Test Method: ASTM C136 and C117
Specification:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**15.7%**
Moisture Content	**26.8%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**15.7**

Description:

Comments:

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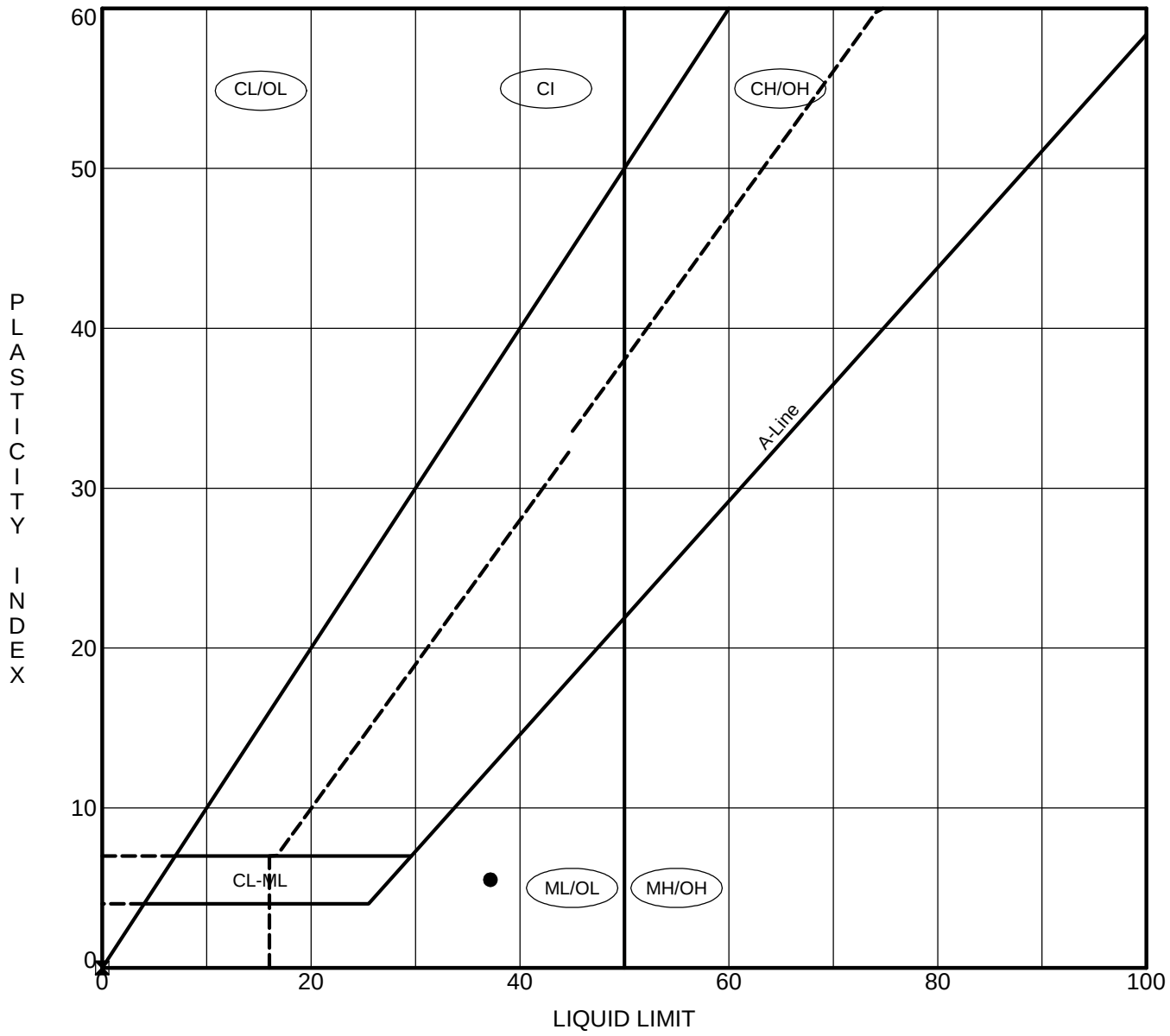
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



	Specimen Identification		LL	PL	PI	MC%	Classification
●	**15-02, Sa. 9**	**12.8 m**	**37**	**32**	**5**	**47.6**	
⊠	**15-02, Sa. 12**	**17.7 m**	**NP**	**NP**	**NP**	**35.7**	

THURBER

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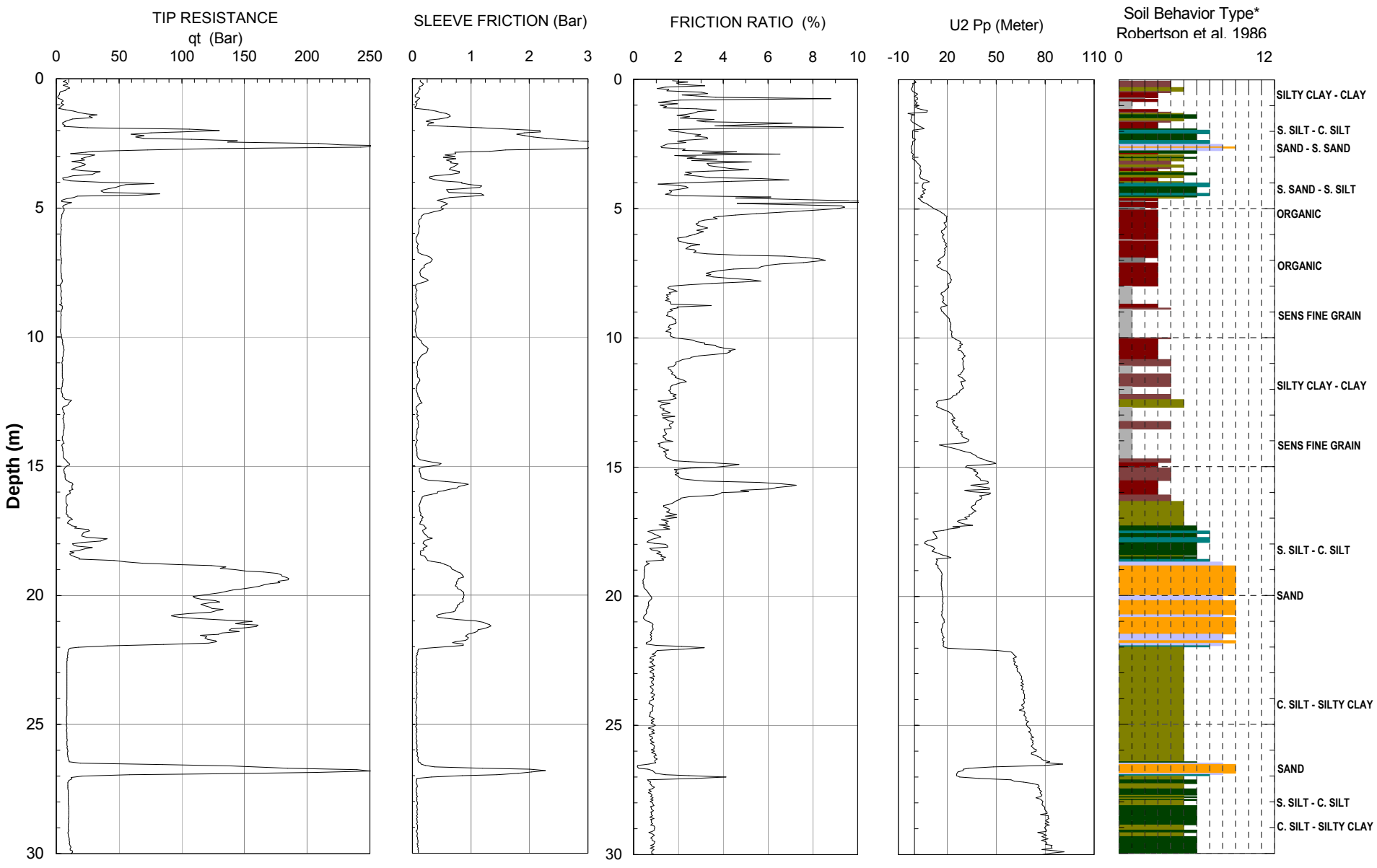
PLASTICITY CHART

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

ATTERBERG_LIMITS 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15 - 02 Cone ID: DPG1236 10 Ton	Date: March 2, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A	Schwartz SOIL TECH

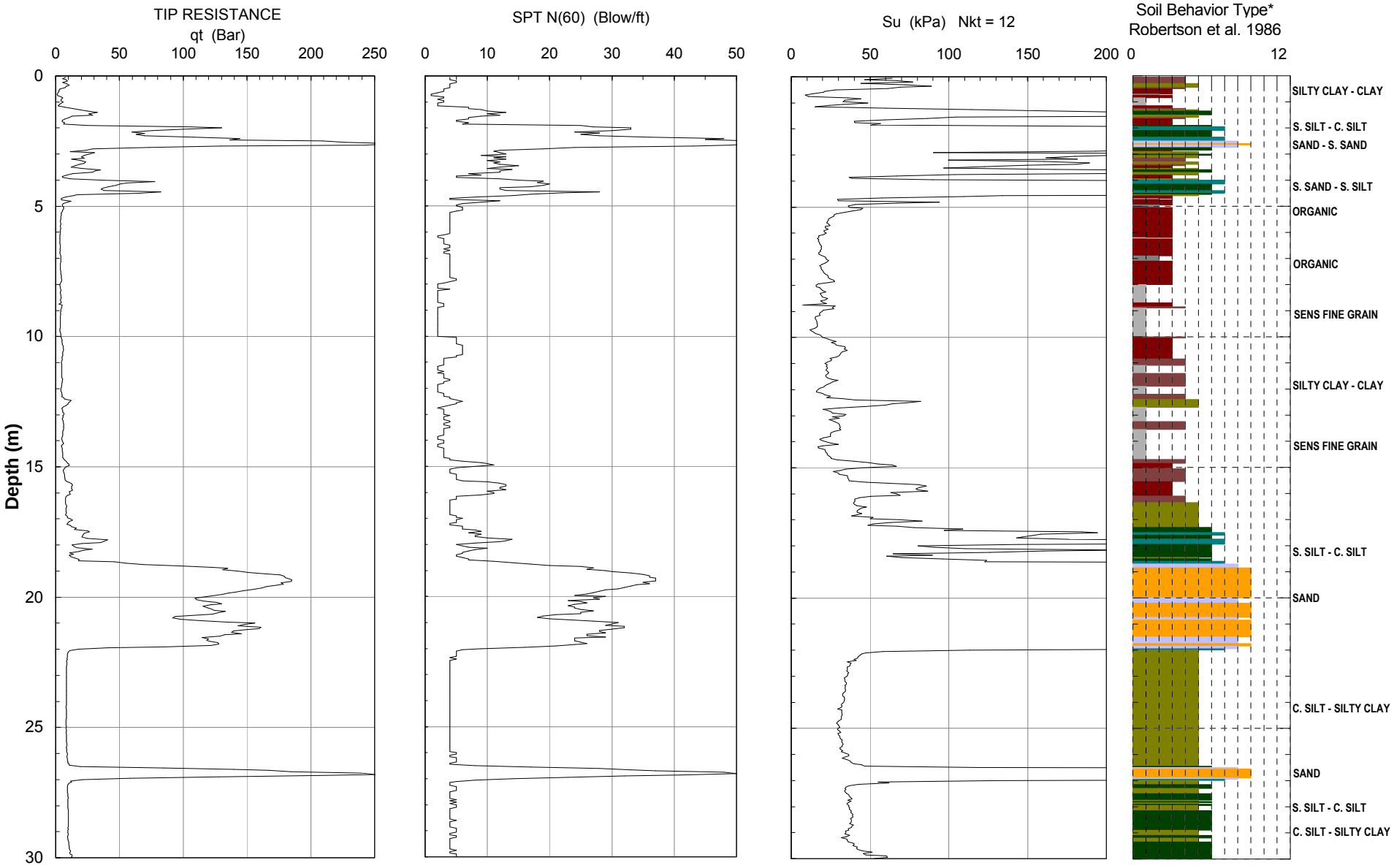


Maximum Depth = 30.00 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15 - 02 Cone ID: DPG1236 10 Ton	Date: March 2, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A	Schwartz SOIL TECH



Maximum Depth = 30.00 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

TH15-03

LOG OF TEST HOLE

TEST HOLE NO. **15-03**

LOCATION: See Dwg. 14-81-76A-1
N 5449947, E 509471

TOP OF HOLE ELEV: 5.1 m

METHOD: Solid Stem Auger

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 3, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: Disturbed, Undisturbed, No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): GASTECH reading, PID reading

DEPTH (m)	COMMENTS		SOILS DESCRIPTION	ELEVATION (m)
0		SM/GM	Grey to brown, moist, silty SAND and GRAVEL to SAND and SILT with some gravel (FILL).	4
1				
2		SM		3
3			Grey, wet SAND with some silt and traces of gravel and organics (FILL).	2
4		SM		1
			Soft to firm, brown, moist, marginally to partially decomposed WOODWASTE (FILL).	
5			Brown to red, moist WOODWASTE (FILL).	0
	253	WOOD		
6			Soft, brown, moist, fibrous PEAT.	-1
	354	PT		
7				-2
8				-3
		OH	Soft, grey to brown, moist SILT and PEAT with a trace of clay.	
9				-4
10		OH		
			Soft, brown, moist, fibrous PEAT.	-5
11			Soft, grey to brown, moist SILT and PEAT with a trace of clay.	-6
		OH		
12				-7
13		OL/ML		-8
14				-9
15		ML		-10
16	315	PT	Soft, brown, moist, fibrous PEAT.	-11
			Soft, grey to brown, moist SILT with some clay and organics.	
17				-12
18		CL	Grey, moist SILT with some clay and a trace of organics.	-13
19				-14
20		CL		

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

LOG OF TEST HOLE

TEST HOLE NO. 15-03

LOCATION: See Dwg. 14-81-76A-1
N 5449947, E 509471

TOP OF HOLE ELEV: 5.1 m

METHOD: Solid Stem Auger

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

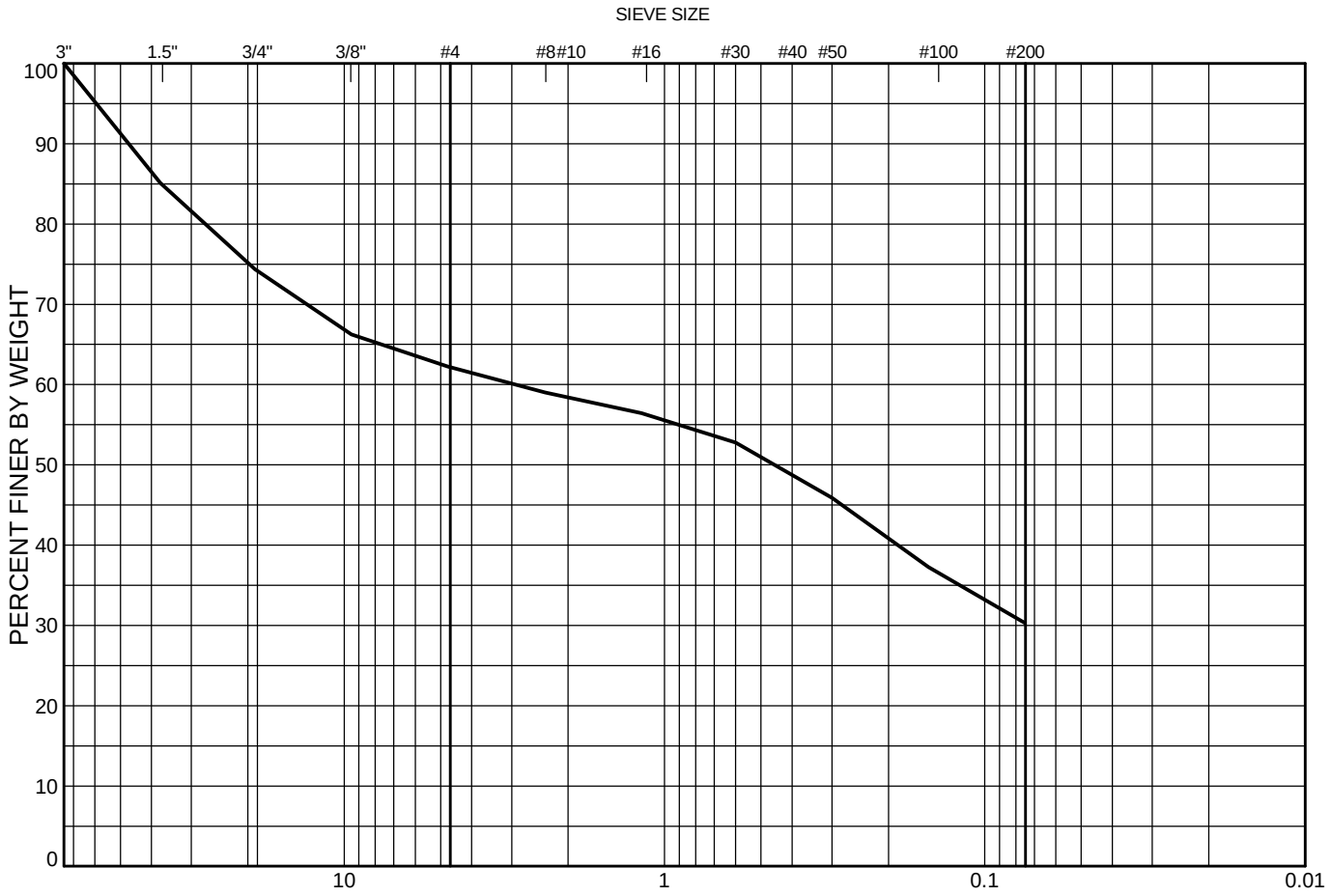
DATE: March 3, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit — Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading

DEPTH (m)	COMMENTS	SOILS DESCRIPTION	ELEVATION (m)
20		Grey, moist SILT with some clay and a trace of organics.	
21			-16
22	CL		-17
23			-18
24	CL		-19
25			-20
26	ML	Grey, wet, sandy SILT with some clay and traces of gravel and organics. - poor recovery below 26.2 m depth.	-21
27			-22
28		End of hole due to auger refusal. Hole open to 2.1 m upon completion of drilling. Water observed at 1.8 m.	-23
29			-24
30			-25
31			-26
32			-27
33			-28
34			-29
35			-30
36			-31
37			-32
38			-33
39			-34
40			

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB



Sample Location: **15-03**
Sample: 1
Sample Depth: 0.0 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Gravel	**37.7%**
Sand	**31.9%**
Fines	**30.3%**
Moisture Content	**10.6%**

D10	
D30	
D60	**2.915**
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	**100.0**
1.5	37.5	**85.1**
0.75	19	**74.4**
0.375	9.5	**66.3**
#4	4.75	**62.3**
#8	2.36	**59.0**
#16	1.18	**56.4**
#30	0.6	**52.8**
#50	0.3	**45.9**
#100	0.15	**37.3**
#200	0.075	**30.3**

Description:

Comments:

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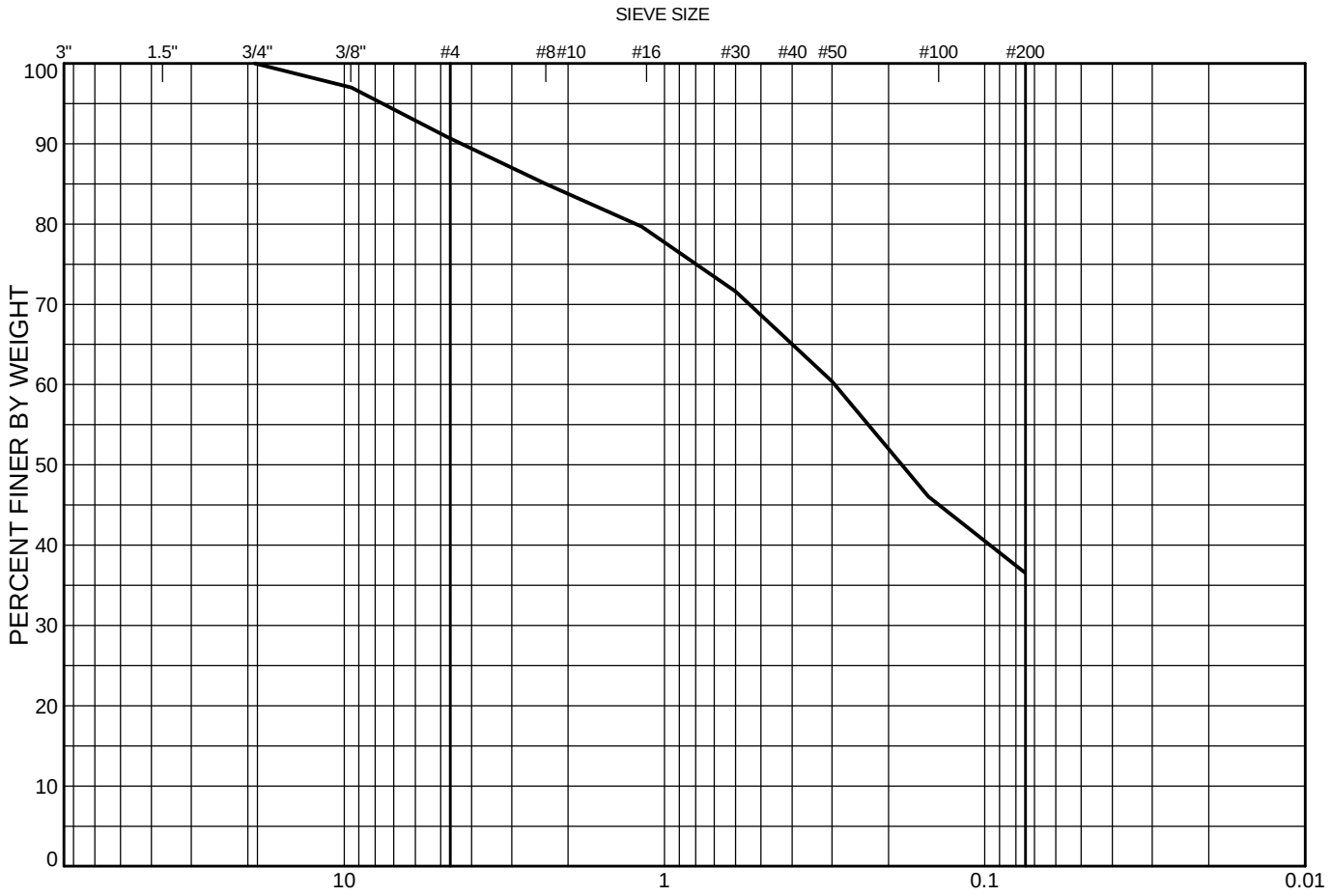
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-03**
Sample: 2
Sample Depth: 2.1 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Gravel	**9.2%**
Sand	**54.2%**
Fines	**36.6%**
Moisture Content	**11.6%**

D10	
D30	
D60	**0.294**
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	**100.0**
0.375	9.5	**97.0**
#4	4.75	**90.8**
#8	2.36	**85.0**
#16	1.18	**79.7**
#30	0.6	**71.6**
#50	0.3	**60.4**
#100	0.15	**46.0**
#200	0.075	**36.6**

Description:

Comments:

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GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB

Sample Location: **15-03**
Sample: 3
Sample Depth: 3.7 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 12, 2015
Tested By: KM
Test Method: ASTM C136 and C117
Specification:

Gravel	**3.2%**
Sand	**82.6%**
Fines	**14.2%**
Moisture Content	**22.9%**

D10	
D30	**0.161**
D60	**0.243**
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	**100.0**
0.375	9.5	**97.6**
#4	4.75	**96.8**
#8	2.36	**96.0**
#16	1.18	**95.2**
#30	0.6	**93.8**
#50	0.3	**75.3**
#100	0.15	**25.0**
#200	0.075	**14.2**

Description:

Comments:

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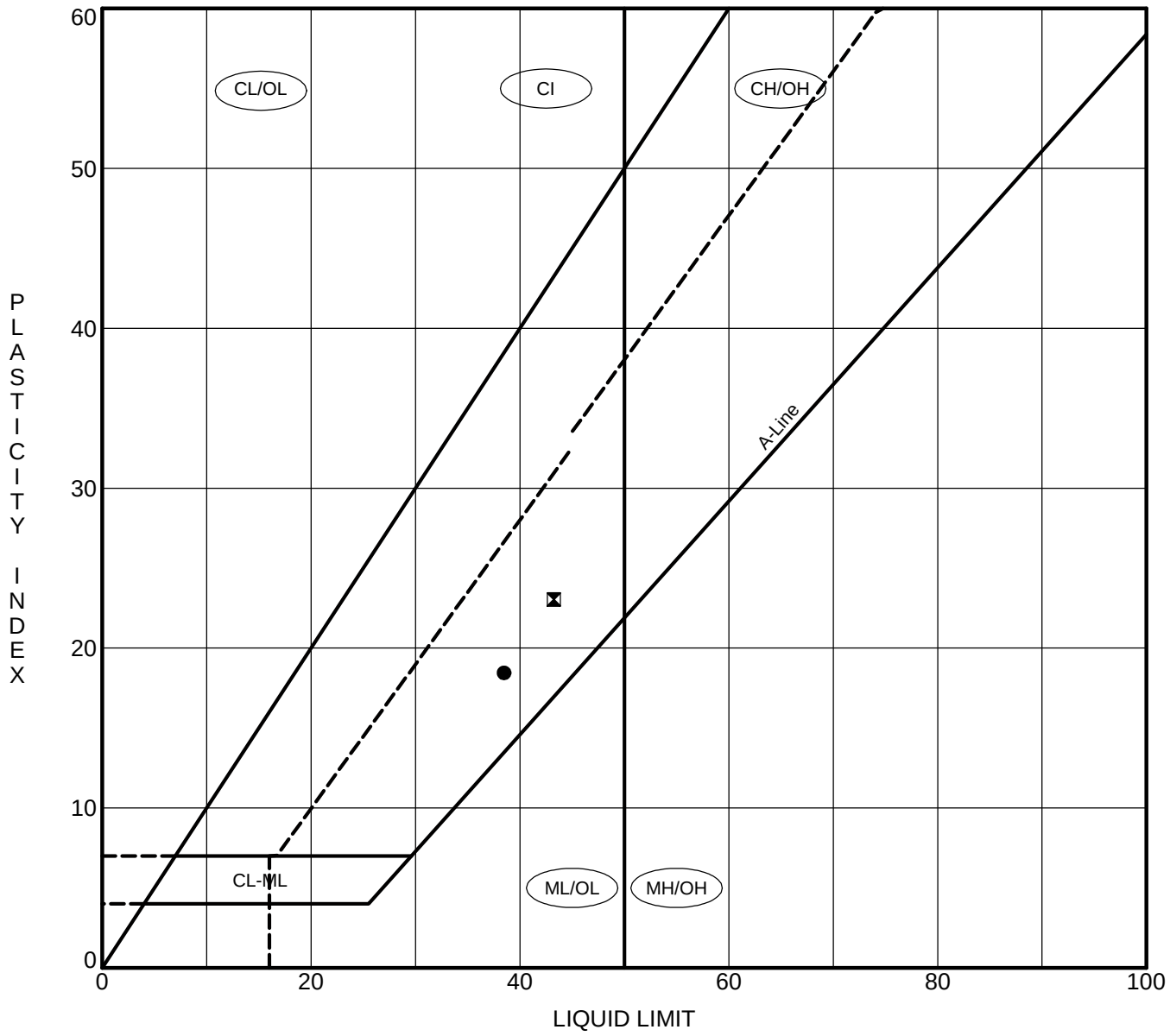
GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



	Specimen Identification		LL	PL	PI	MC%	Classification
●	**15-03, Sa. 13**	**19.2 m**	**38**	**20**	**18**	**39.4**	
⊠	**15-03, Sa. 15**	**23.8 m**	**43**	**20**	**23**	**44.2**	

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THURBER

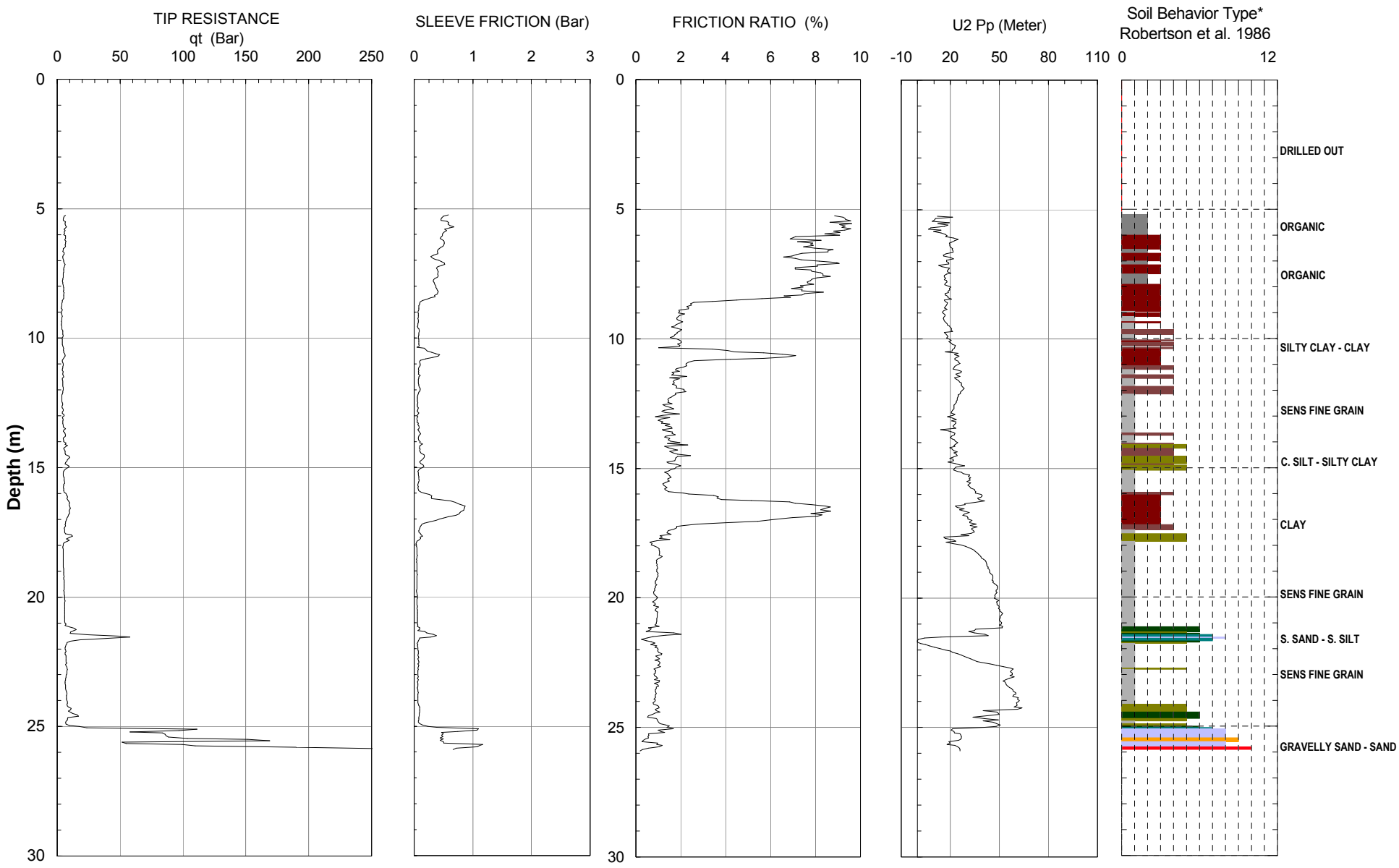
PLASTICITY CHART

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

ATTERBERG_LIMITS 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15 - 03 Cone ID: DPG1236 10 Ton	Date: March 2, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A

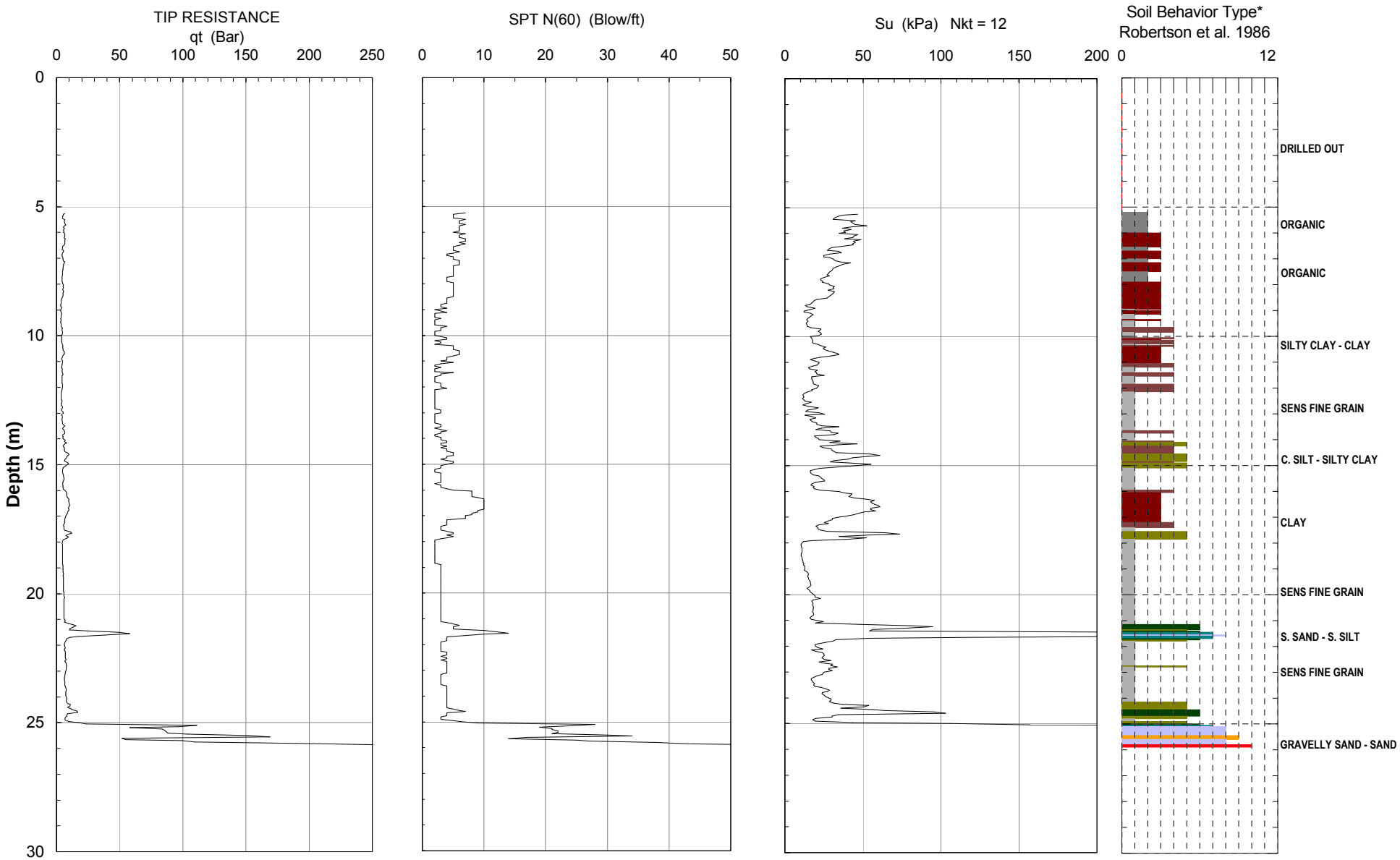


Maximum Depth = 25.90 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15 - 03 Cone ID: DPG1236 10 Ton	Date: March 2, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A	Schwartz SOIL TECH



Maximum Depth = 25.90 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

TH15-04

LOG OF TEST HOLE

TEST HOLE NO. 15-04

LOCATION: See Dwg. 14-81-76A-1
N 5449870, E 509401

TOP OF HOLE ELEV: 5.1 m

METHOD: Solid Stem Auger

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 3, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: Disturbed, Undisturbed, No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): GASTECH reading, PID reading

DEPTH (m)	COMMENTS		SOILS DESCRIPTION	ELEVATION (m)
0		GM/SM	Grey to brown, moist, silty SAND and GRAVEL to SILT, SAND and GRAVEL with a trace of organics (FILL).	4
1	Water level read from standpipe on March 12, 2015.			
2		SM		3
3				2
4		GM/SM		1
5	444	PT	Soft to firm, brown, fibrous PEAT with a trace to some silt.	0
6				-1
7	268	PT		-2
8				-3
9		OH	Soft to very soft, brown to grey, moist SILT and PEAT with some sand and a trace of gravel.	-4
10			Soft to firm, brown, moist, fibrous PEAT with a trace of silt.	-5
11		OH	Soft to very soft, brown to grey, moist SILT with some organics and a trace of sand.	-6
12				-7
13		ML	Grey, moist to wet SILT with some sand and traces of clay and organics.	-8
14				-9
15		ML		-10
16	264	PT	Brown, moist, fibrous PEAT with a trace of sand.	-11
17			Grey, wet SILT with some sand and traces of clay and organics.	-12
18	Sample was non-plastic	ML		-13
19			Grey, moist SILT with some organics and traces of clay and sand.	-14
20		ML/CL		

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

Sheet 2 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-04

LOCATION: See Dwg. 14-81-76A-1
N 5449870, E 509401

TOP OF HOLE ELEV: 5.1 m

METHOD: Solid Stem Auger

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

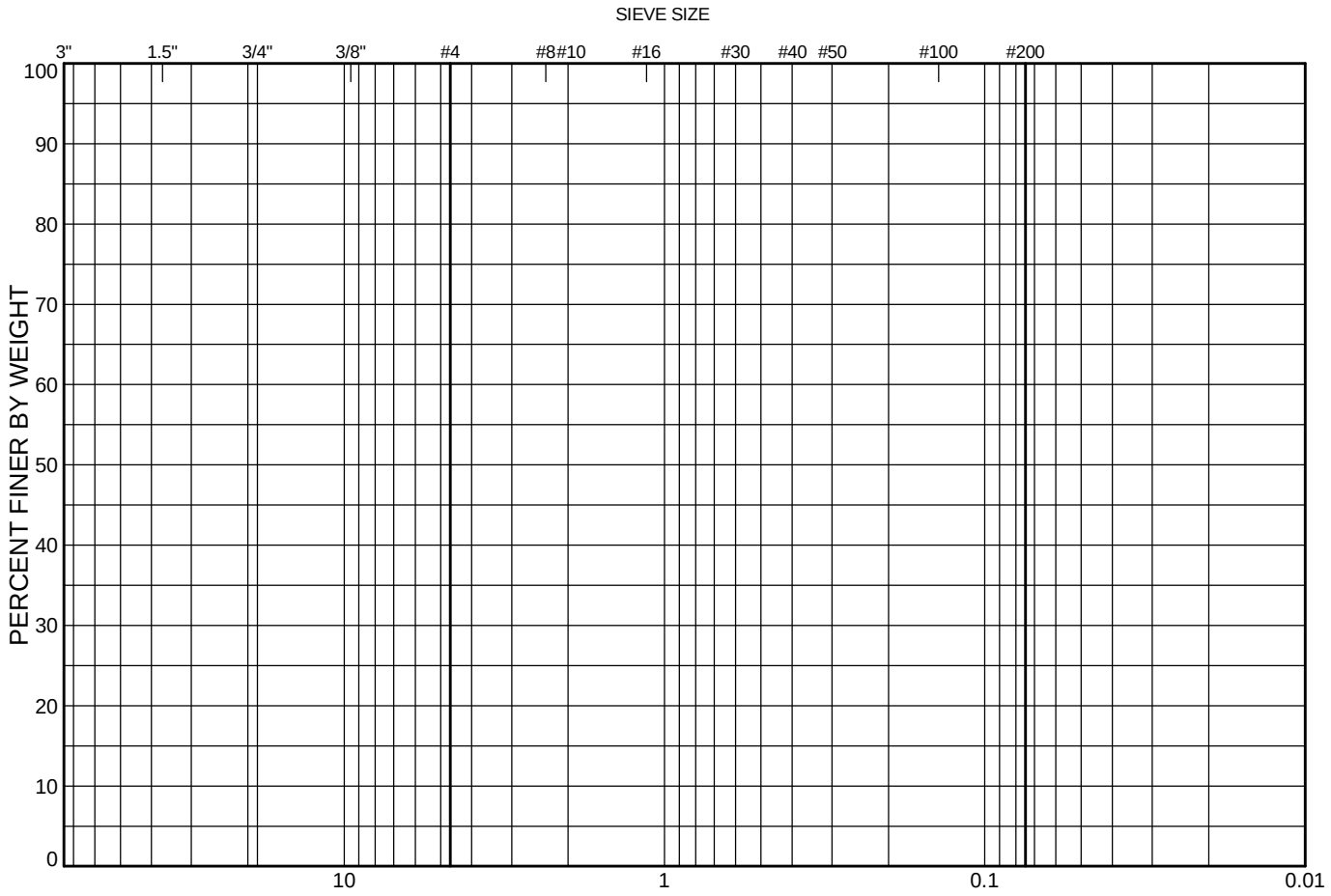
DATE: March 3, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): ■ GASTECH reading ⊠ PID reading

DEPTH (m)	10 20 30 40 50 60 70 80 90 100	COMMENTS	SOILS DESCRIPTION	ELEVATION (m)
20			End of hole at required depth.	
21			Open to 4.3 m upon completion of drilling.	-16
22			Water observed at 1.8 m.	-17
23				-18
24				-19
25				-20
26				-21
27				-22
28				-23
29				-24
30				-25
31				-26
32				-27
33				-28
34				-29
35				-30
36				-31
37				-32
38				-33
39				-34
40				

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB



Sample Location: **15-04**
Sample: 1
Sample Depth: 0.0 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/KYC
Test Method: ASTM C136 and C117
Specification:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**33.3%**
Moisture Content	**7.8%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**33.3**

Description:

Comments:

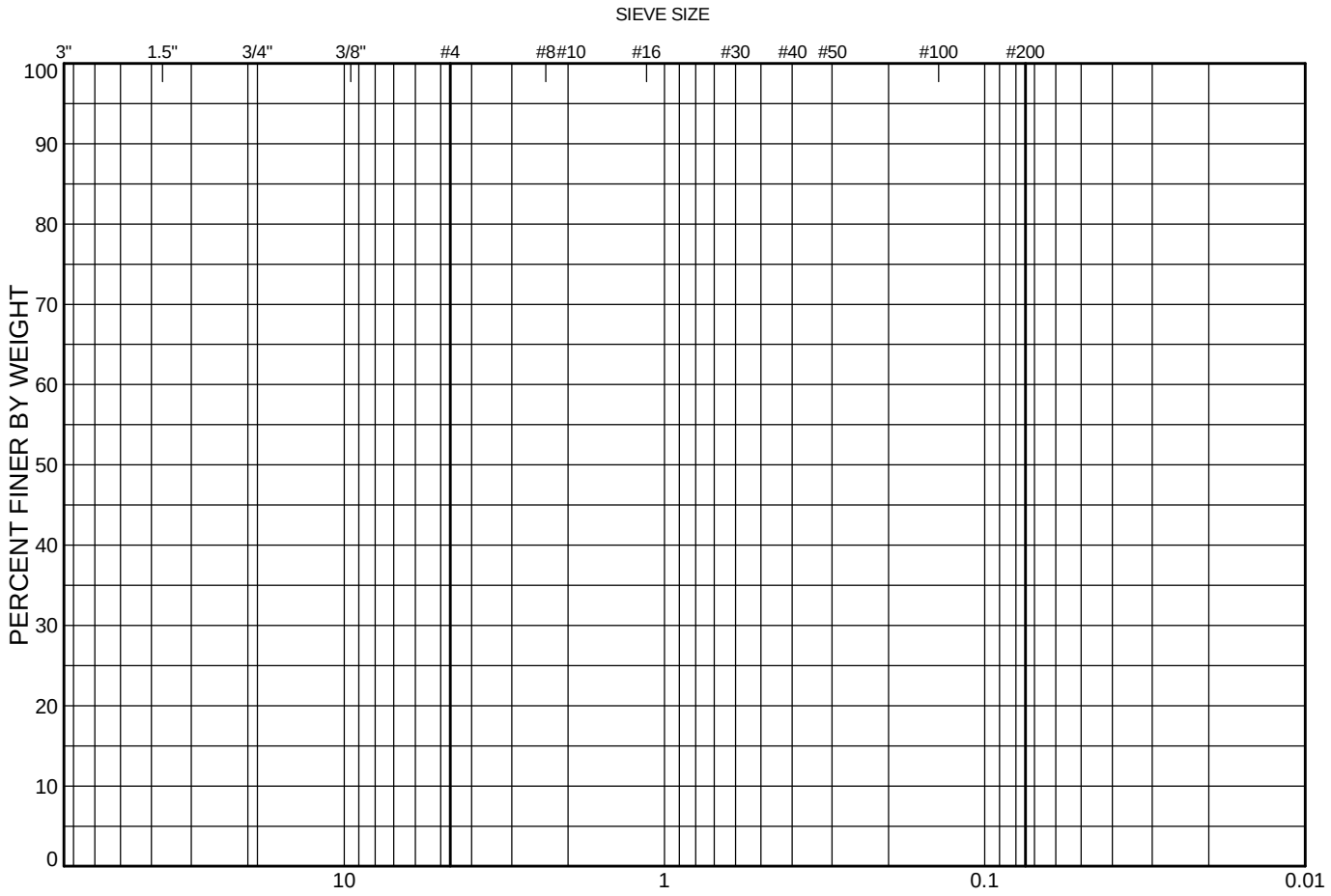
THURBER
Thurber Engineering Ltd.
#900 - 1281 West Georgia Street
Vancouver, BC V6E 3J7
Telephone: (604) 684-4384
Fax: (604) 684-5124

GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



Sample Location: **15-04**
Sample: 3
Sample Depth: 4.0 m
Date Sampled: Not Specified
Sampled By: BMW
Date Received: March 6, 2015
Date Tested: March 6, 2015
Tested By: KM/KYC
Test Method: ASTM C136 and C117
Specification:

Gravel	**0.0%**
Sand	**0.0%**
Fines	**34.2%**
Moisture Content	**12.3%**

D10	
D30	
D60	
Cu	
Cc	

Sieve Size		Percent Passing
inches	mm	
3	75	
1.5	37.5	
0.75	19	
0.375	9.5	
#4	4.75	
#8	2.36	
#16	1.18	
#30	0.6	
#50	0.3	
#100	0.15	
#200	0.075	**34.2**

Description:

Comments:

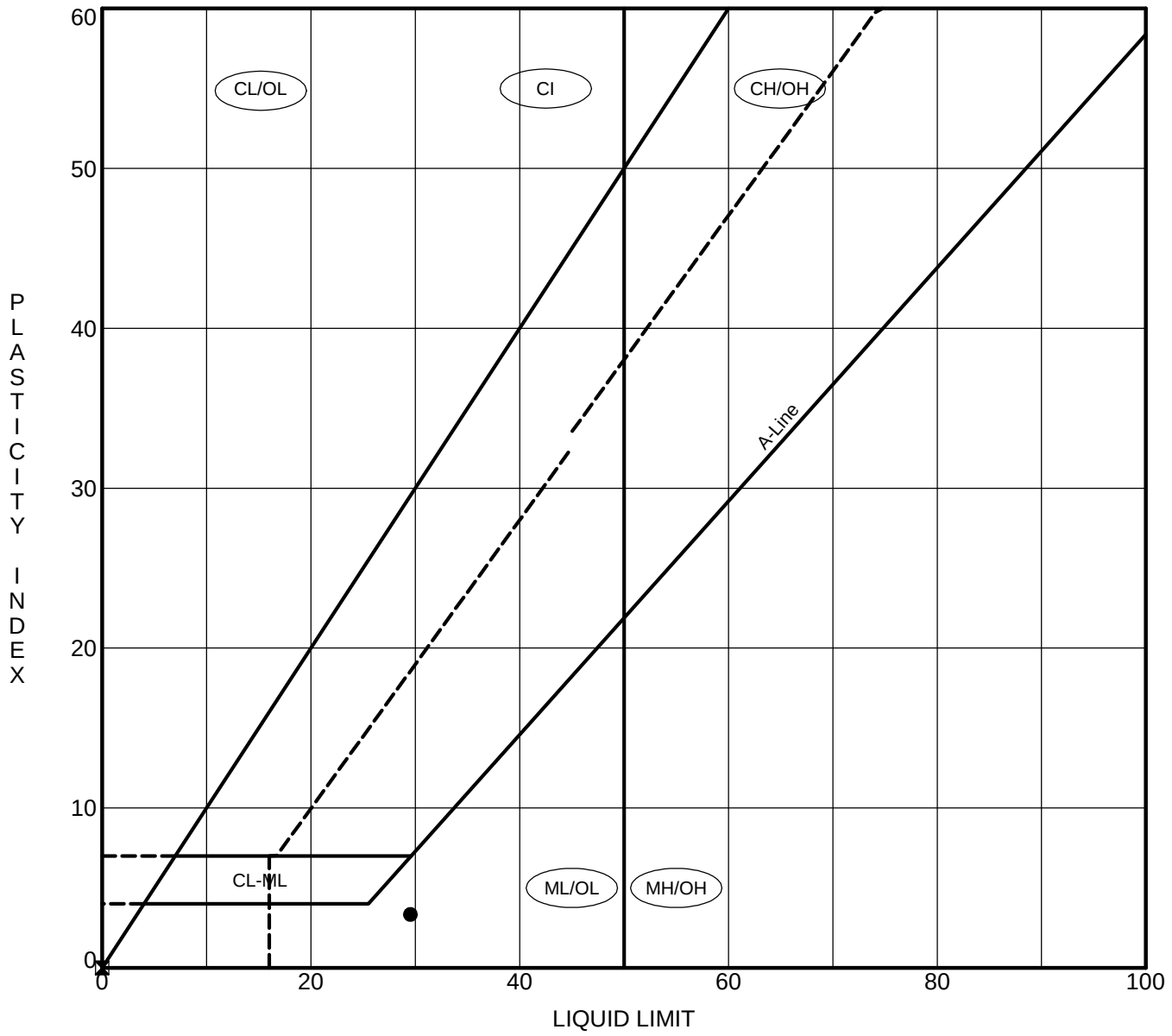
THURBER
Thurber Engineering Ltd.
#900 - 1281 West Georgia Street
Vancouver, BC V6E 3J7
Telephone: (604) 684-4384
Fax: (604) 684-5124

GRAIN SIZE DISTRIBUTION

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

GRAIN_SIZE 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB



	Specimen Identification		LL	PL	PI	MC%	Classification
●	**15-04, Sa. 10**	**14.6 m**	**30**	**26**	**4**	**37.8**	
⊠	**15-04, Sa. 12**	**17.7 m**	**NP**	**NP**	**NP**	**32.4**	

THURBER

Thurber Engineering Ltd.

Telephone:
Fax:

PLASTICITY CHART

CLIENT: City of Surrey
PROJECT: Trouton Pit Development

FILE NO.: 14-81-76A

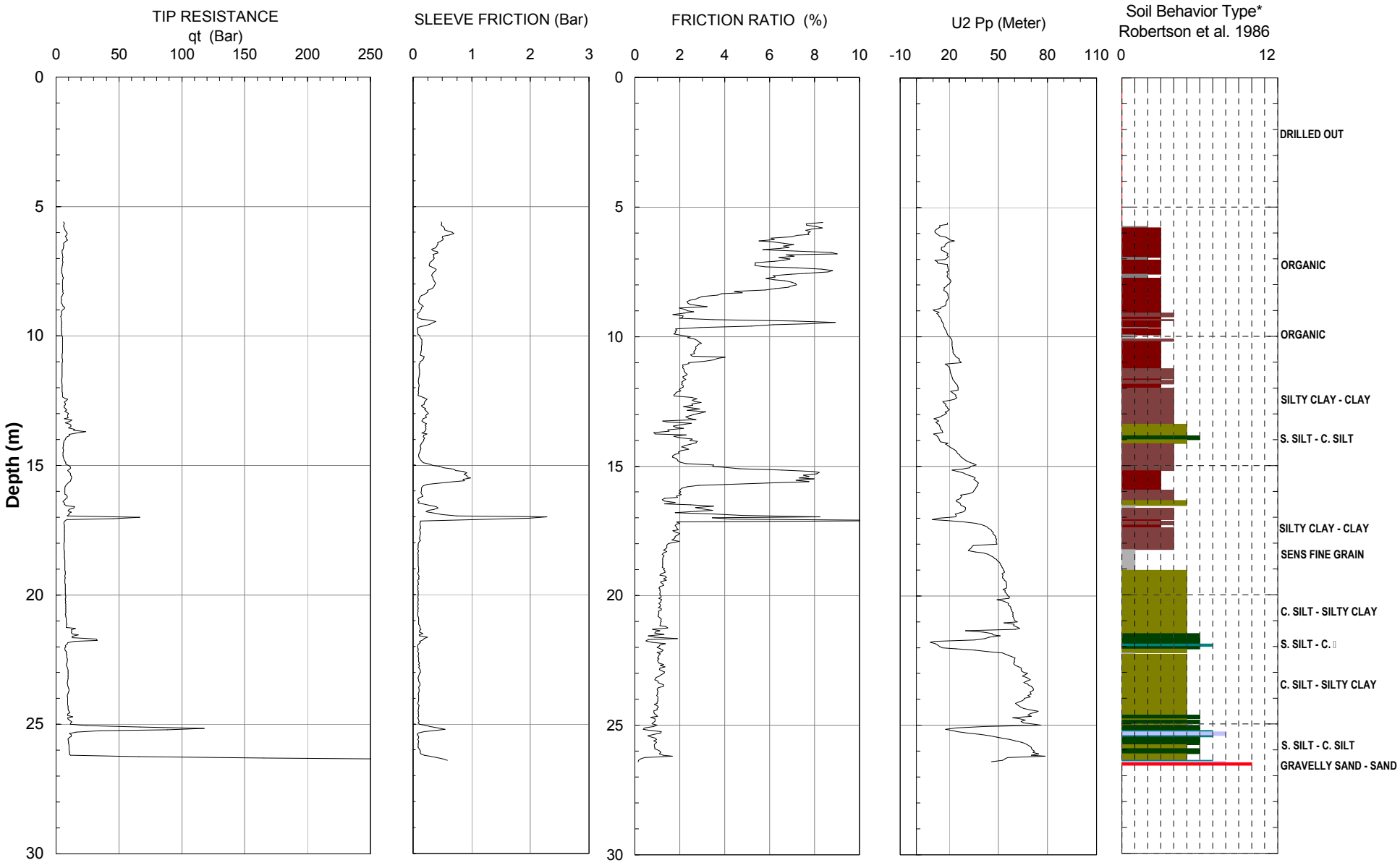
ATTERBERG_LIMITS 14-81-76A.GPJ CAN_LAB.GDT 4/17/15- THURBER BC.GLB

Thurber Engineering

Operator: Schwartz Soil Technical
Sounding: CPT15 - 04
Cone ID: DPG1236 10 Ton

Date: March 2, 2015
Site: Trouton Pit, Surrey
Thurber project no: 14 - 81 - 76A

Schwartz SOIL TECH

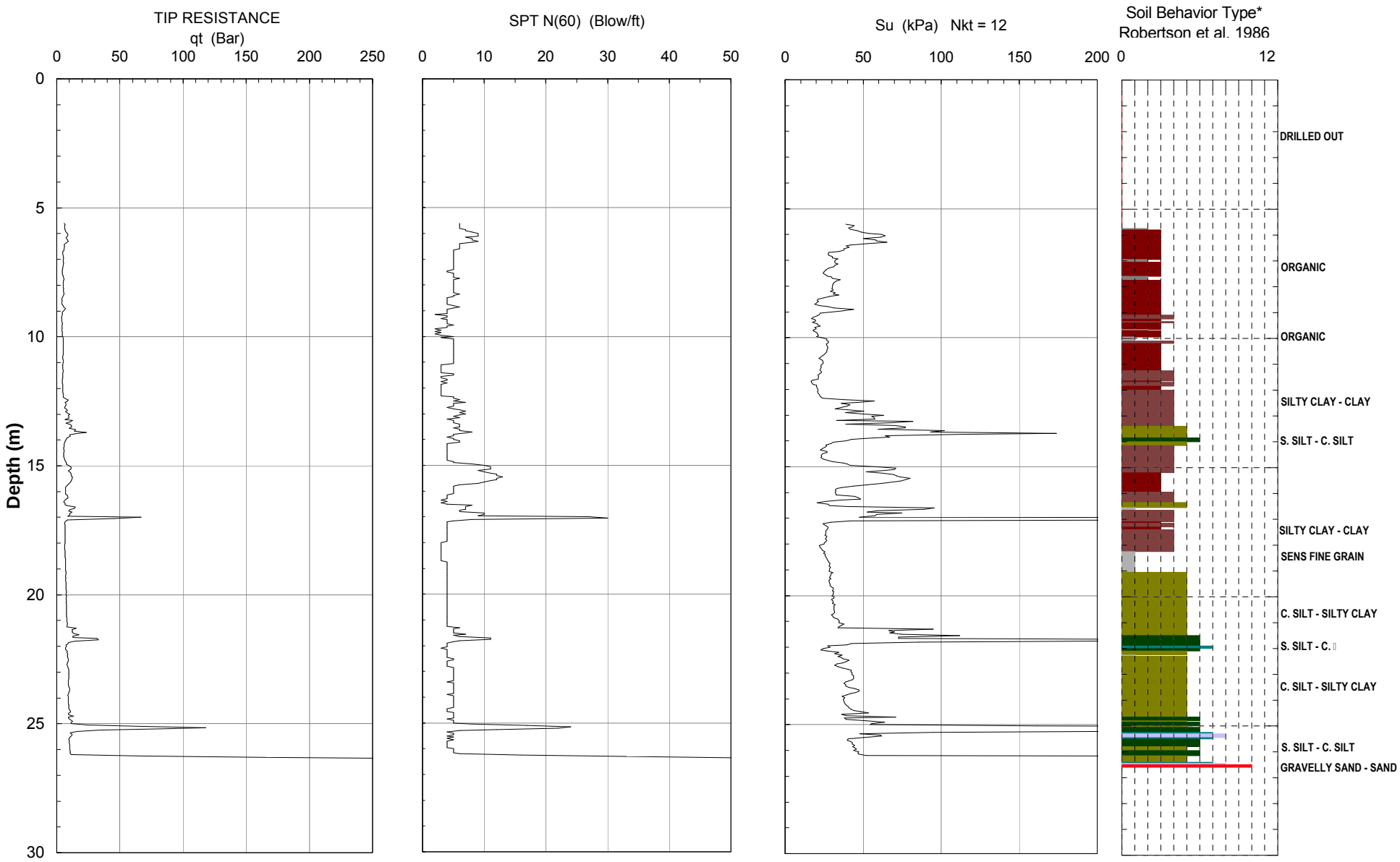


Maximum Depth = 26.40 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15 - 04 Cone ID: DPG1236 10 Ton	Date: March 5, 2015 Site: Trouton Pit, Surrey Thurber project no: 14 - 81 - 76A	Schwartz SOIL TECH



Maximum Depth = 26.40 meters

Depth Increment = 0.05 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
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6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Schwartz SOIL TECH

SHEAR WAVE VELOCITY DATA

Client: Thurber Engineering Ltd.
Test: CPT15 - 04
Site: Trouton Pit
Surrey, B.C.

Date: March 5, 2014
Cone ID: DPG1236 10 Ton
Source offset: 0.35 m
Source: Beam

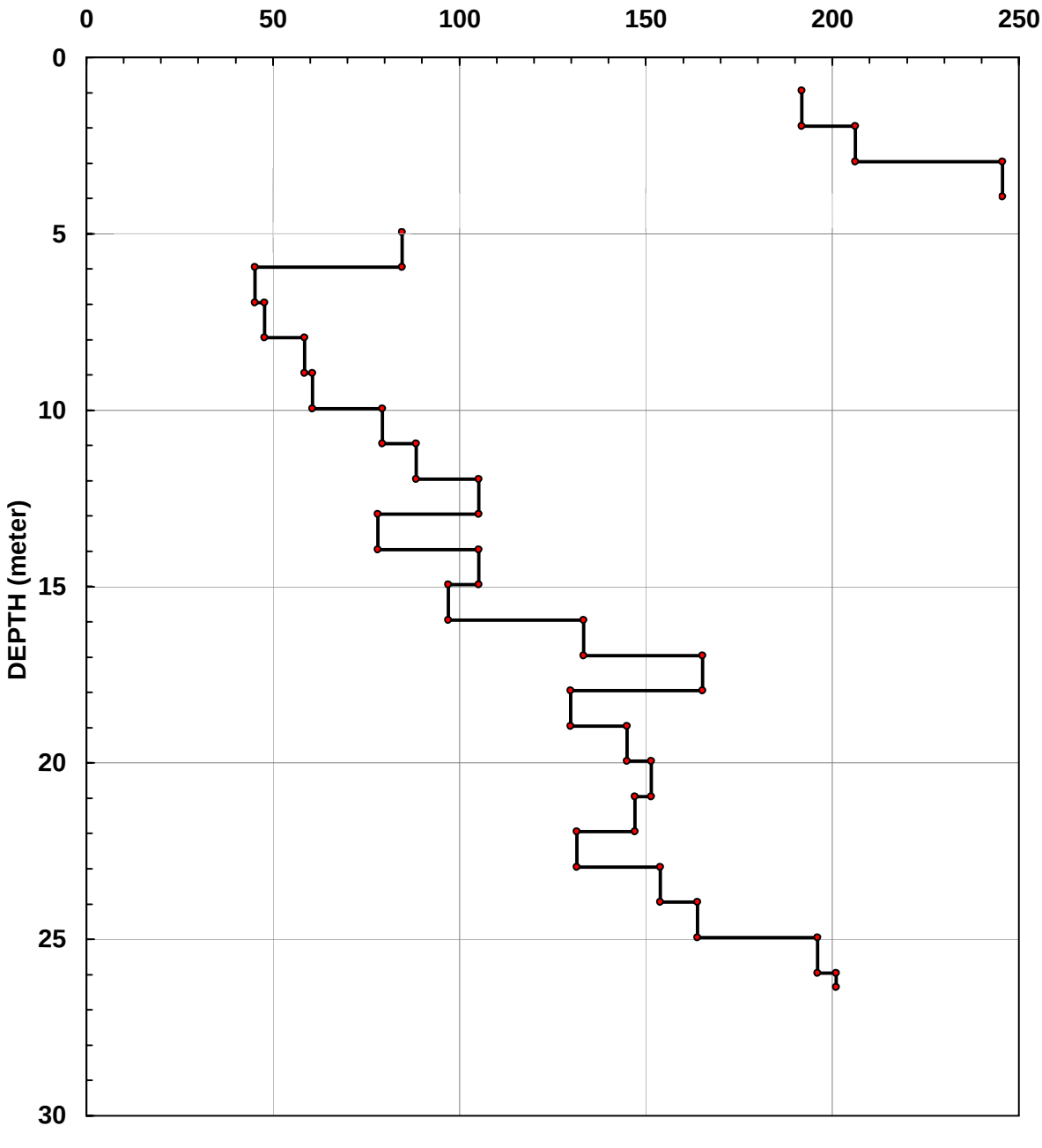
CONE TIP DEPTH (m)	GEOPHONE DEPTH (m)	INTERVAL VELOCITY (m/sec)
1.20	0.95	
		192
2.20	1.95	
		206
3.20	2.95	
		246
4.20	3.95	
		N/A
5.20	4.95	
		85
6.20	5.95	
		45
7.20	6.95	
		48
8.20	7.95	
		58
9.20	8.95	
		61
10.20	9.95	
		79
11.20	10.95	
		88
12.20	11.95	
		105
13.20	12.95	
		78
14.20	13.95	
		105
15.20	14.95	
		97
16.20	15.95	
		133
17.20	16.95	
		165
18.20	17.95	
		130
19.20	18.95	
		145
20.20	19.95	
		151
21.20	20.95	
		147
22.20	21.95	
		132
23.20	22.95	
		154
24.20	23.95	
		164
25.20	24.95	
		196
26.20	25.95	
		201
26.60	26.35	

Schwartz SOIL TECH

SHEAR WAVE VELOCITY PROFILE

Client:	**Thurber Engineering Ltd.**	**Date:**	**March 5, 2015**
Test:	**CPT15 - 04**	**Cone ID:**	**DPG1236 10 Ton**
Site:	**Trouton Pit**	**Source offset:**	**0.35 m**
	Surrey, B.C.	**Source:**	**Beam**

SHEAR WAVE VELOCITY - Vs (m/sec)



Schwartz SOIL TECH

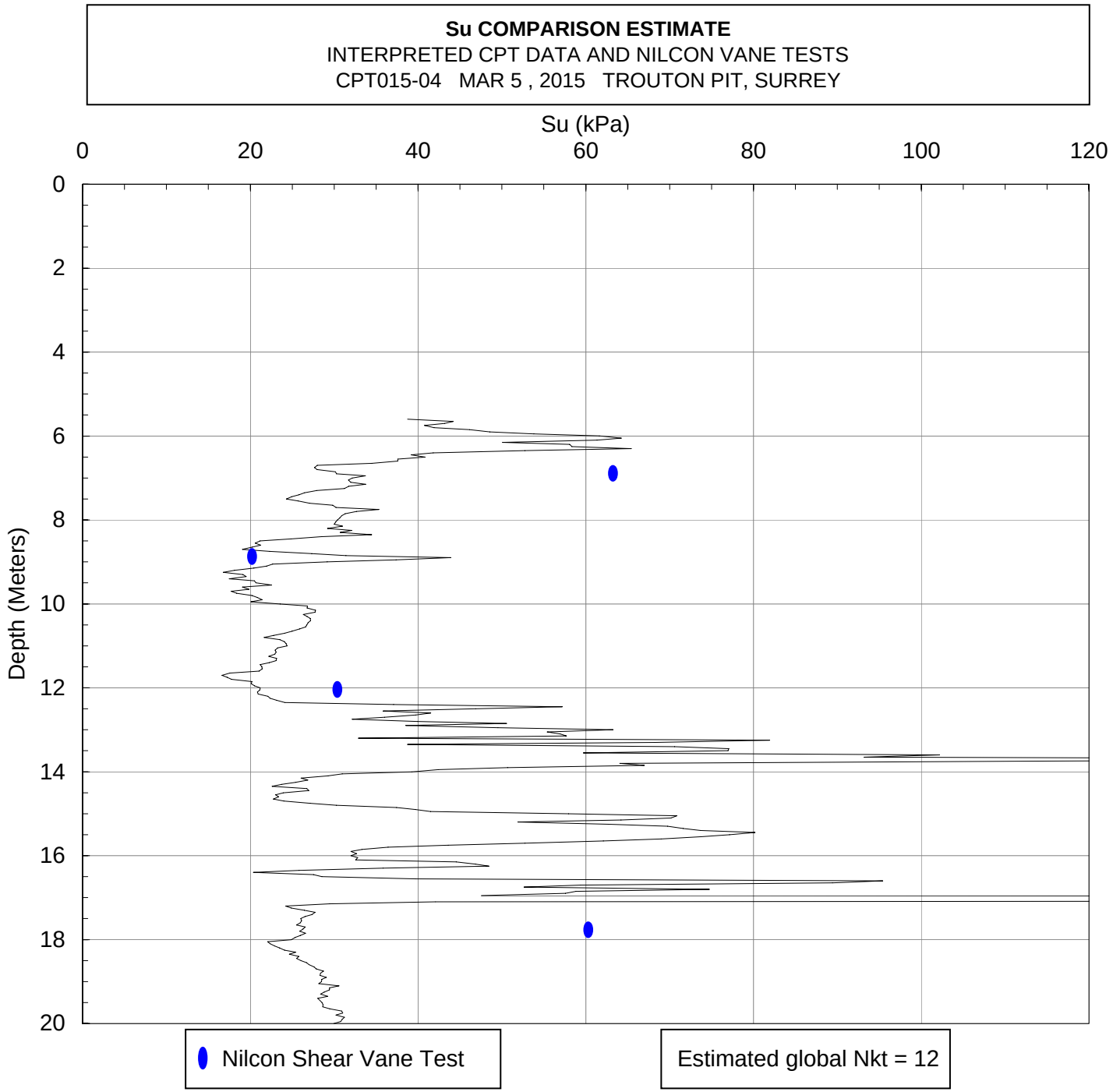
NILCON SHEAR VANE DATA TABLE

Testing date: March 5, 2015
Client: Thurber Engineering
Location: Trouton Pit, Surrey (Performed adjacent to CPT15 - 04)
Vane size: Medium — **Torque mechanism = Nilcon #79.212**
Vane diameter: 6.8 cm — **Torque mechansim calibration = 1.153**
Vane factor: 0.1 — **Conversion = 98.1**

Testing notes: Hollow stem augers were intially installed to 5.7 meter depth to case off the fill

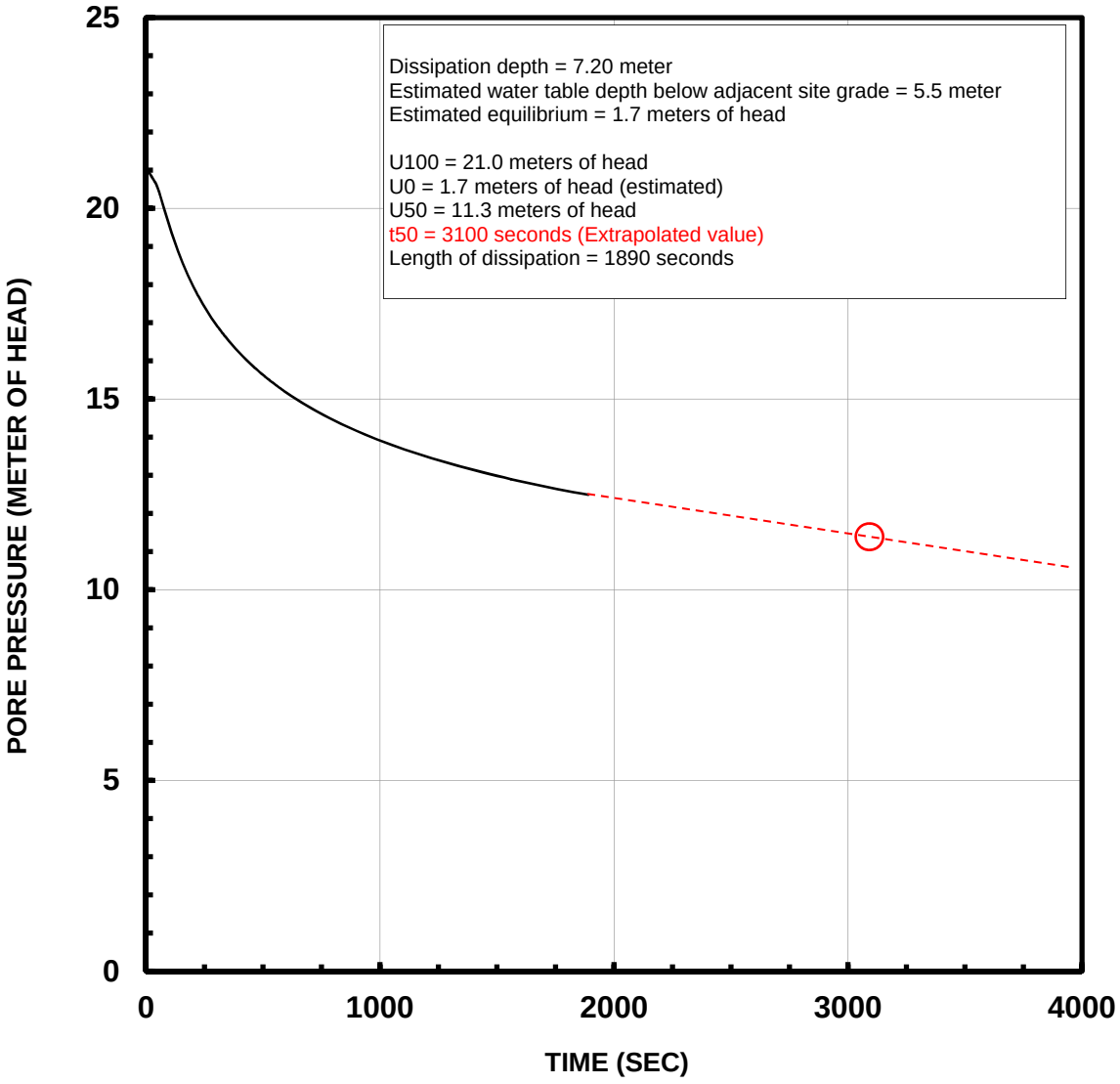
Calculation procedure:
Peak Su length = plot length in cm - rod friction length in cm
Peak Su = (Peak Su length in cm) x (Vane factor) x (1.1726) x (98.1)

VANE TEST NO	Adjacent to CPT15-04	VANE TIP DEPTH (m)	PEAK		RESIDUAL	REMOLDED	SENSITIVITY	NOTES
			Time to failure (secs)	Su (kPa)	Su (kPa)	Su (kPa)	Peak / Remolded	
1	CPT15 - 04	7.00	180	63	43	17	3.6	Medium Vane
2	CPT15 - 04	9.00	120	19	13	5	3.7	Medium Vane
3	CPT15 - 04	12.20	120	30	13	10	2.8	Medium Vane
4	CPT15 - 04	17.80	110	60	36	22	2.7	Medium Vane


Su COMPARISON ESTIMATE
INTERPRETED CPT DATA AND NILCON VANE TESTS
CPT015-04 MAR 5 , 2015 TROUTON PIT, SURREY
Su (kPa)
0
20
40
60
80
100
120
Depth (Meters)
0
2
4
6
8
10
12
14
16
18
20
Nilcon Shear Vane Test
Estimated global Nkt = 12

THURBER ENGINEERING

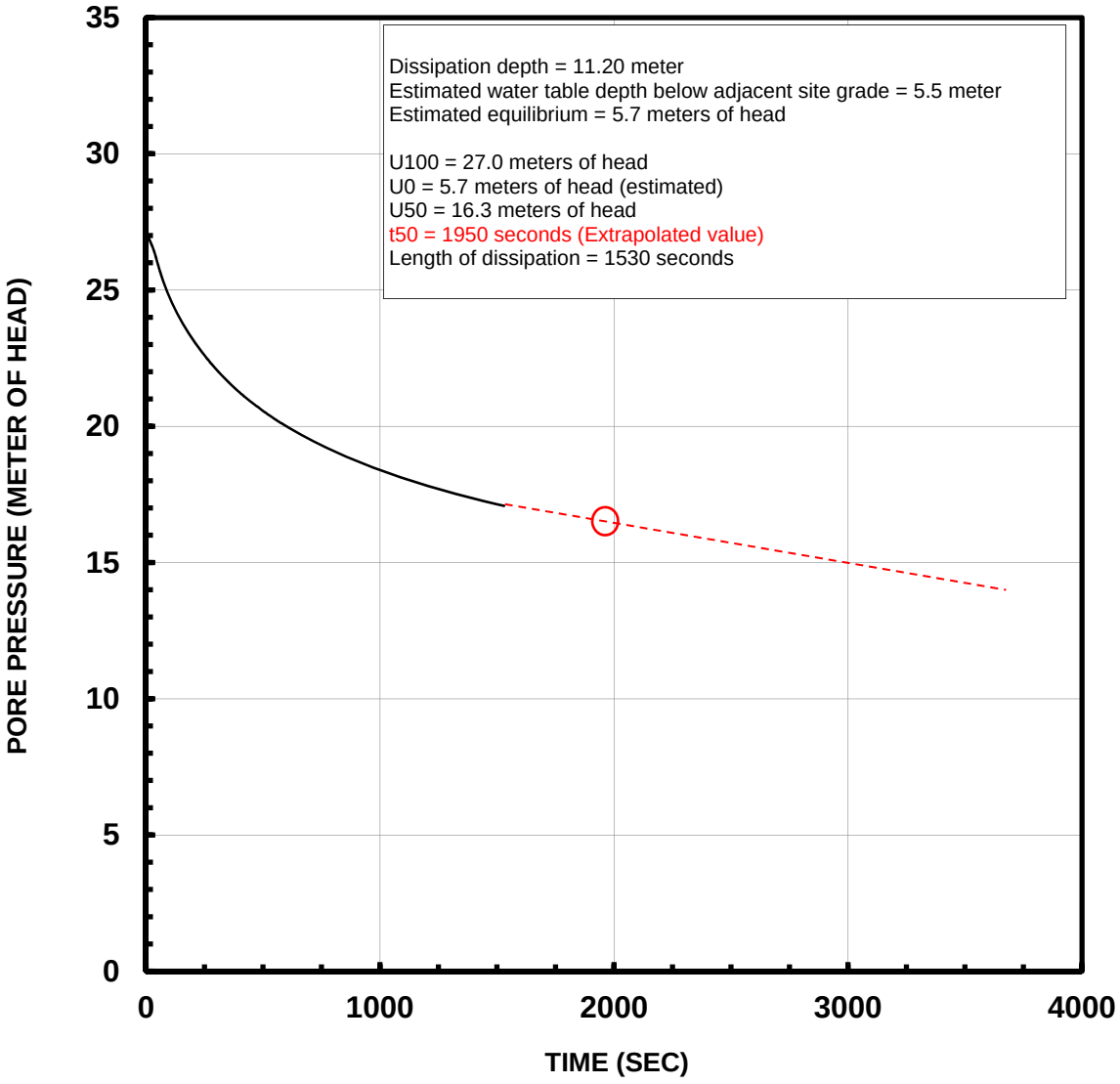
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 04 7.20 METER DEPTH
MARCH 05, 2015



Schwartz SOIL TECH

THURBER ENGINEERING

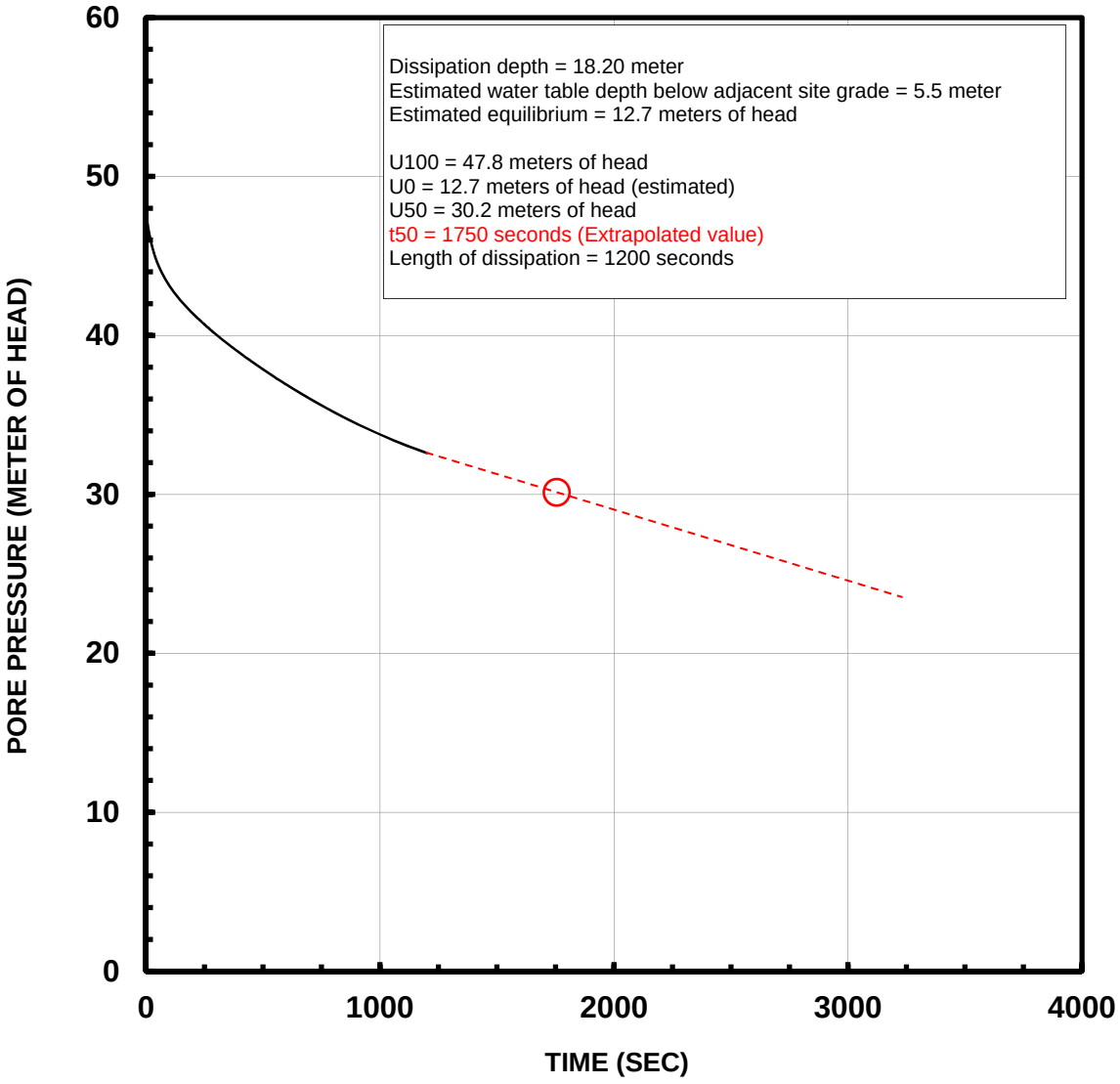
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 04 11.20 METER DEPTH
MARCH 05, 2015



Schwartz SOIL TECH

THURBER ENGINEERING

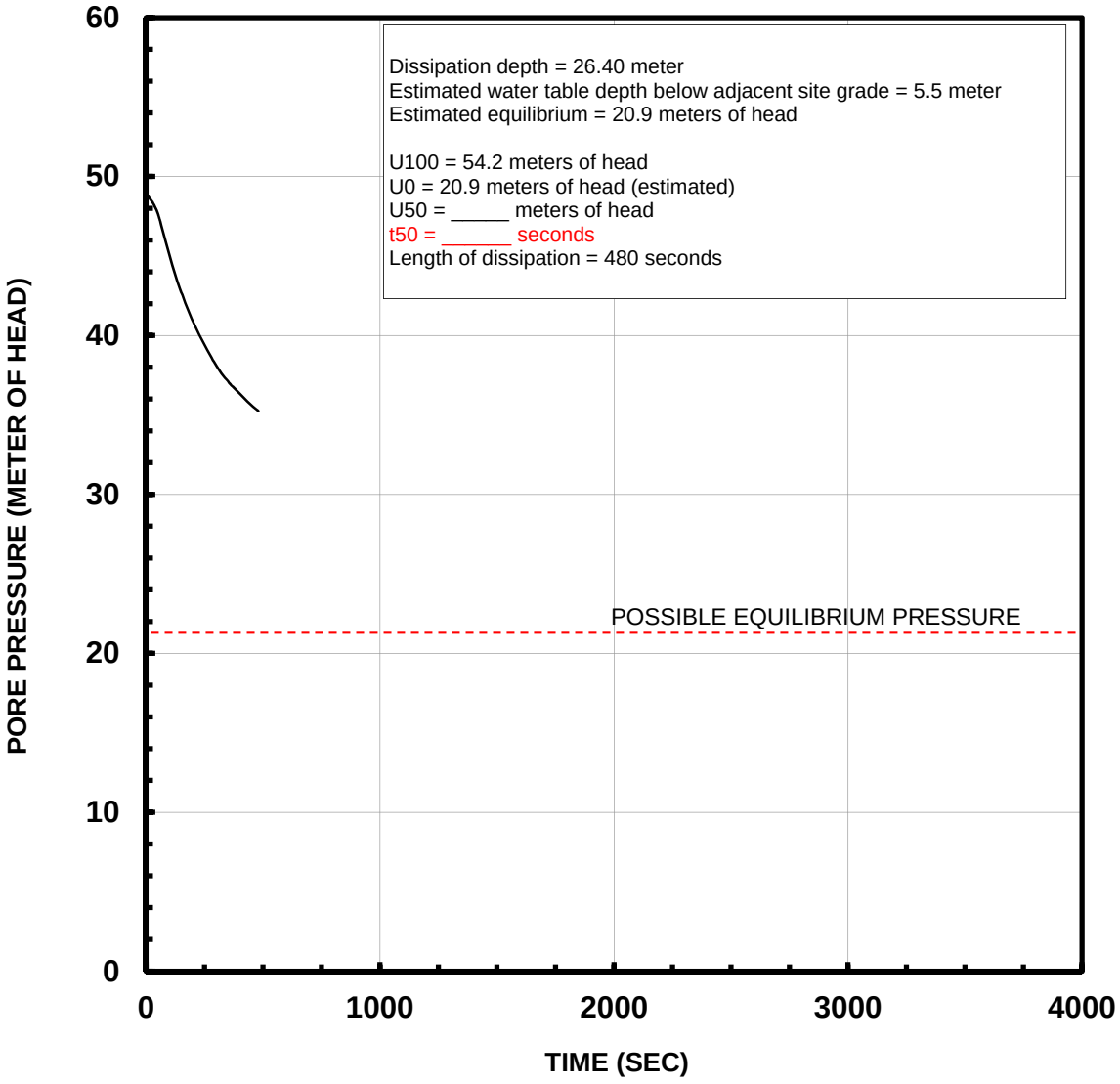
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 04 18.20 METER DEPTH
MARCH 05, 2015



Schwartz SOIL TECH

THURBER ENGINEERING

U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 04 26.40 METER DEPTH
MARCH 05, 2015



Schwartz SOIL TECH

TH15-05

Sheet 1 of 1

LOG OF TEST HOLE

TEST HOLE NO. 15-05

LOCATION: See Dwg. 14-81-76A-1
N 5449871, E 509477

TOP OF HOLE ELEV: 5.8 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A

DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit – Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS | SOILS DESCRIPTION

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

5 4 3 2 1 0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14

DCPT refusal
(100 bl./75 mm)

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

TH15-06

Sheet 1 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-06

LOCATION: See Dwg. 14-81-76A-1
N 5449930, E 509325

TOP OF HOLE ELEV: 3.2 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A

DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit — Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS

SOILS DESCRIPTION

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

3 2 1 0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14 -15 -16

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

Sheet 2 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-06

LOCATION: See Dwg. 14-81-76A-1
N 5449930, E 509325

TOP OF HOLE ELEV: 3.2 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): ■ GASTECH reading ⊠ PID reading

DEPTH (m) | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS | SOILS DESCRIPTION

DEPTH (m)	ELEVATION (m)
20	-17
21	-18
22	-19
23	-20
24	-21
25	-22
26	-23
27	-24
28	-25
29	-26
30	-27
31	-28
32	-29
33	-30
34	-31
35	-32
36	-33
37	-34
38	-35
39	-36
40	

DCPT refusal
(100 bl./250 mm)

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

TH15-07

Sheet 1 of 3

LOG OF TEST HOLE

TEST HOLE NO. 15-07

LOCATION: See Dwg. 14-81-76A-1
N 5449861, E 509243

TOP OF HOLE ELEV: 4.9 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

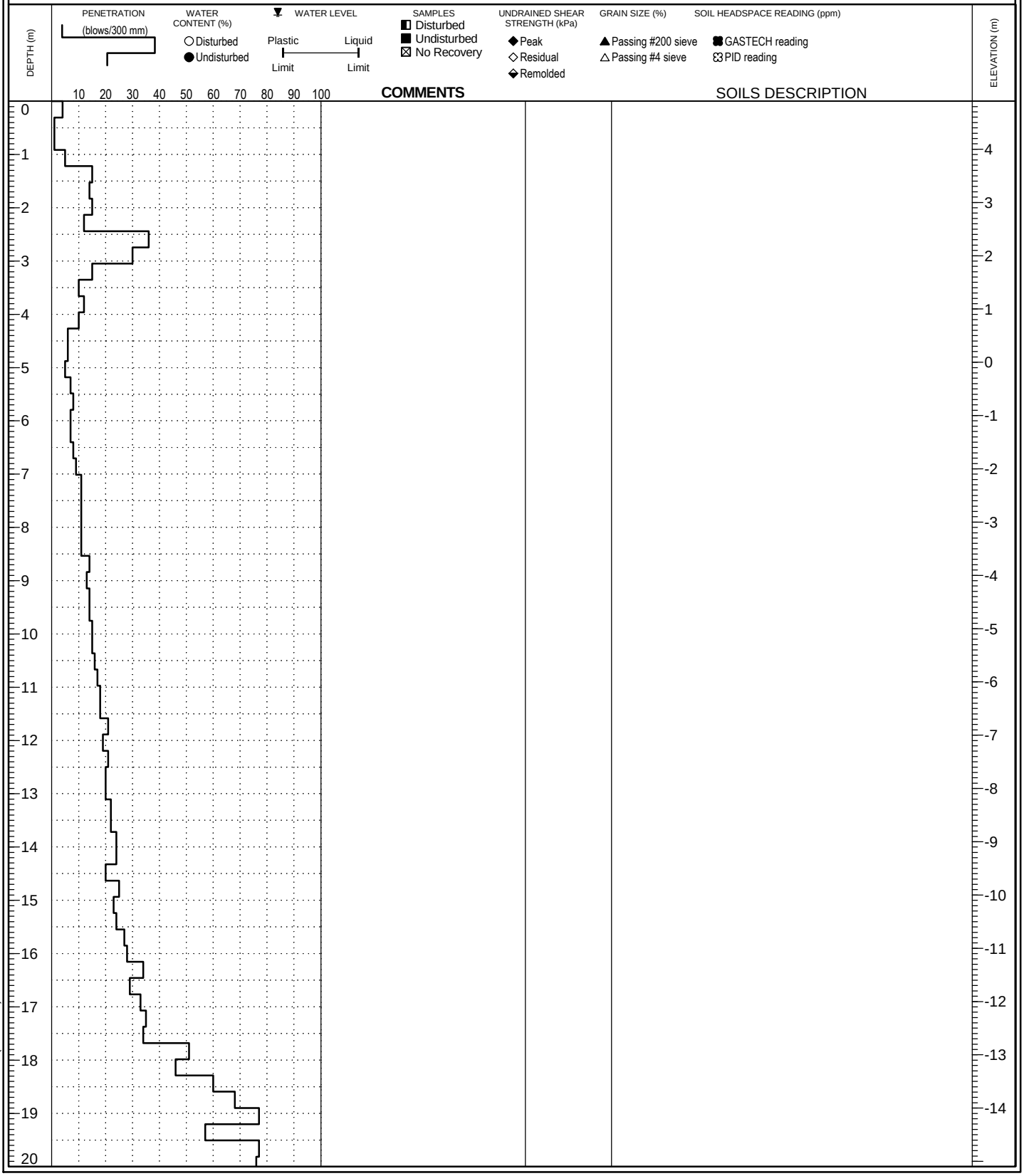
THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A



LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

LOG OF TEST HOLE

TEST HOLE NO. 15-07

LOCATION: See Dwg. 14-81-76A-1
N 5449861, E 509243

TOP OF HOLE ELEV: 4.9 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A

DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit — Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS | SOILS DESCRIPTION

DEPTH (m)	ELEVATION (m)
20	
21	-16
22	-17
23	-18
24	-19
25	-20
26	-21
27	-22
28	-23
29	-24
30	-25
31	-26
32	-27
33	-28
34	-29
35	-30
36	-31
37	-32
38	-33
39	-34
40	

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

LOG OF TEST HOLE

TEST HOLE NO. 15-07

LOCATION: See Dwg. 14-81-76A-1
N 5449861, E 509243

TOP OF HOLE ELEV: 4.9 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit — Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading

DEPTH (m)	10 20 30 40 50 60 70 80 90 100	COMMENTS	SOILS DESCRIPTION	ELEVATION (m)
40				
41		DCPT refusal (100 bl./50 mm)		-36
42				-37
43				-38
44				-39
45				-40
46				-41
47				-42
48				-43
49				-44
50				-45
51				-46
52				-47
53				-48
54				-49
55				-50
56				-51
57				-52
58				-53
59				-54
60				

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

TH15-08

Sheet 1 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-08

LOCATION: See Dwg. 14-81-76A-1
N 5449745, E 509335

TOP OF HOLE ELEV: 5.4 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

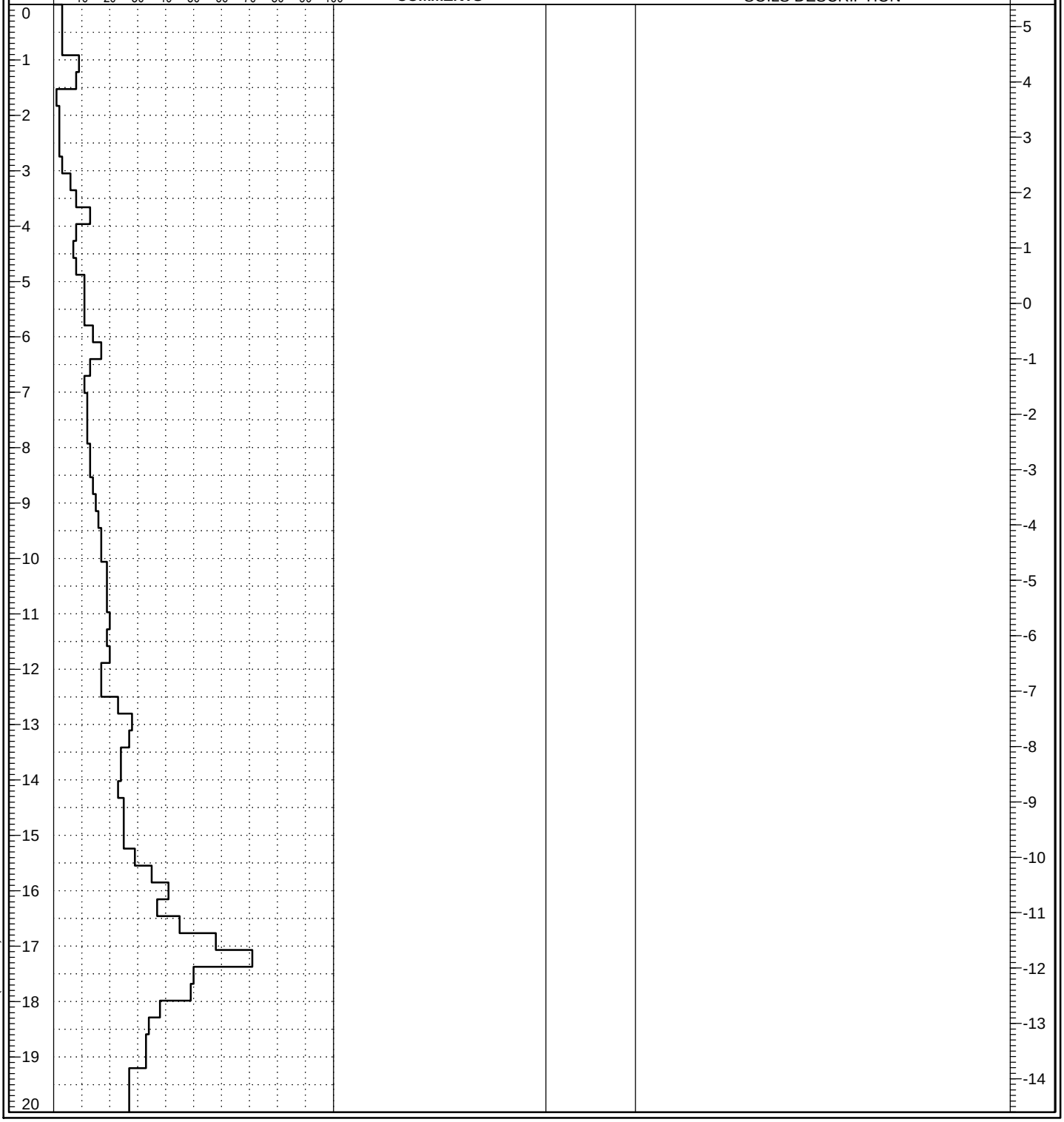
DATE: March 4, 2015

FILE NO.: 14-81-76A

DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit – Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS | SOILS DESCRIPTION



LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

LOG OF TEST HOLE

TEST HOLE NO. 15-08

LOCATION: See Dwg. 14-81-76A-1
N 5449745, E 509335

TOP OF HOLE ELEV: 5.4 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 4, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): ■ GASTECH reading ⊠ PID reading

DEPTH (m)	10 20 30 40 50 60 70 80 90 100	COMMENTS	SOILS DESCRIPTION	ELEVATION (m)
20				-15
21				-16
22		DCPT refusal (100 bl./100 mm)		-17
23				-18
24				-19
25				-20
26				-21
27				-22
28				-23
29				-24
30				-25
31				-26
32				-27
33				-28
34				-29
35				-30
36				-31
37				-32
38				-33
39				-34
40				

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

TH15-09

Sheet 1 of 1

LOG OF TEST HOLE

TEST HOLE NO. 15-09

LOCATION: See Dwg. 14-81-76A-1
N 5449794, E 509414

TOP OF HOLE ELEV: 5.3 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 6, 2015

FILE NO.: 14-81-76A

DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit – Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS | SOILS DESCRIPTION

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

5 4 3 2 1 0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14

DCPT refusal
(100 bl./150 mm)

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

TH15-10

Sheet 1 of 2

LOG OF TEST HOLE

TEST HOLE NO. 15-10

LOCATION: See Dwg. 14-81-76A-1
N 5449698, E 509282

TOP OF HOLE ELEV: 4.6 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 6, 2015

FILE NO.: 14-81-76A

DEPTH (m) | PENETRATION (blows/300 mm) | WATER CONTENT (%) ○ Disturbed ● Undisturbed | WATER LEVEL Plastic Limit — Liquid Limit | SAMPLES ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊠ PID reading | ELEVATION (m)

10 20 30 40 50 60 70 80 90 100

COMMENTS

SOILS DESCRIPTION

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

4 3 2 1 0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14 -15

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

LOG OF TEST HOLE

TEST HOLE NO. **15-10**

LOCATION: See Dwg. 14-81-76A-1
N 5449698, E 509282

TOP OF HOLE ELEV: 4.6 m

METHOD: Dynamic Cone Penetration Test

DRILLING CO.: On-Track Drilling Inc.

INSPECTOR: BMW

THURBER

CLIENT: City of Surrey

PROJECT: Trouton Pit Development

DATE: March 6, 2015

FILE NO.: 14-81-76A

PENETRATION (blows/300 mm) | WATER CONTENT (%): ○ Disturbed ● Undisturbed | WATER LEVEL: Plastic Limit — Liquid Limit | SAMPLES: ◧ Disturbed ■ Undisturbed ☒ No Recovery | UNDRAINED SHEAR STRENGTH (kPa): ◆ Peak ◇ Residual ◆ Remolded | GRAIN SIZE (%): ▲ Passing #200 sieve △ Passing #4 sieve | SOIL HEADSPACE READING (ppm): ■ GASTECH reading ⊠ PID reading

DEPTH (m)	10 20 30 40 50 60 70 80 90 100	COMMENTS	SOILS DESCRIPTION	ELEVATION (m)
20				-16
21		DCPT refusal (100 bl./200 mm)		-17
22				-18
23				-19
24				-20
25				-21
26				-22
27				-23
28				-24
29				-25
30				-26
31				-27
32				-28
33				-29
34				-30
35				-31
36				-32
37				-33
38				-34
39				
40				-35

LOG OF TEST HOLE (NO EST.) 14-81-76A.GPJ THURBER BC.GDT 5/8/15- THURBER BC.GLB

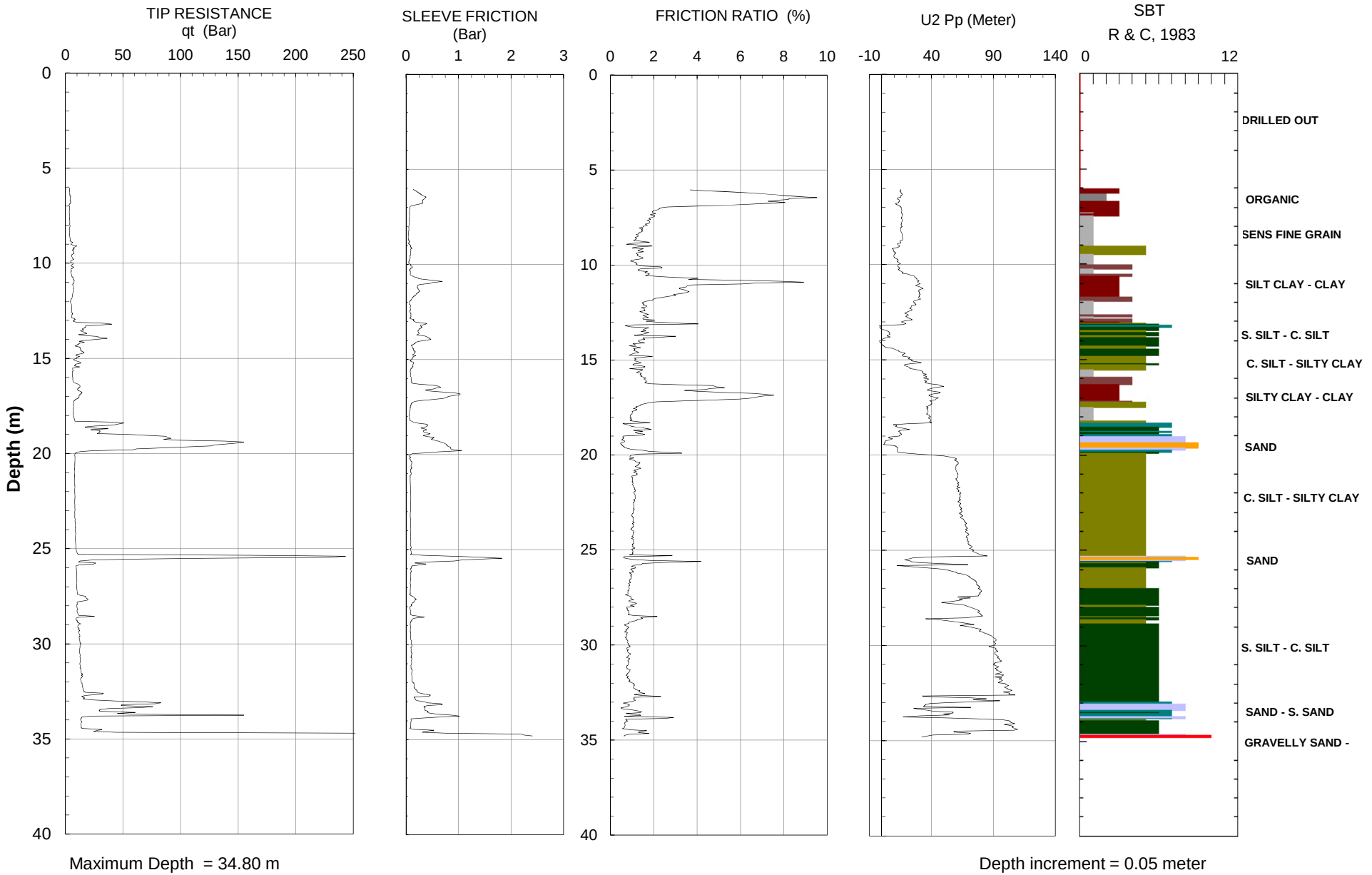
TH15-11

Thurber Engineering

Operator: Schwartz Soil Technical
Sounding: CPT15-11
Cone ID: DPG1236

Date: March 11, 2015
Site: Trouton Pit, Surrey
Thurber Job No: 14 - 81 - 76A

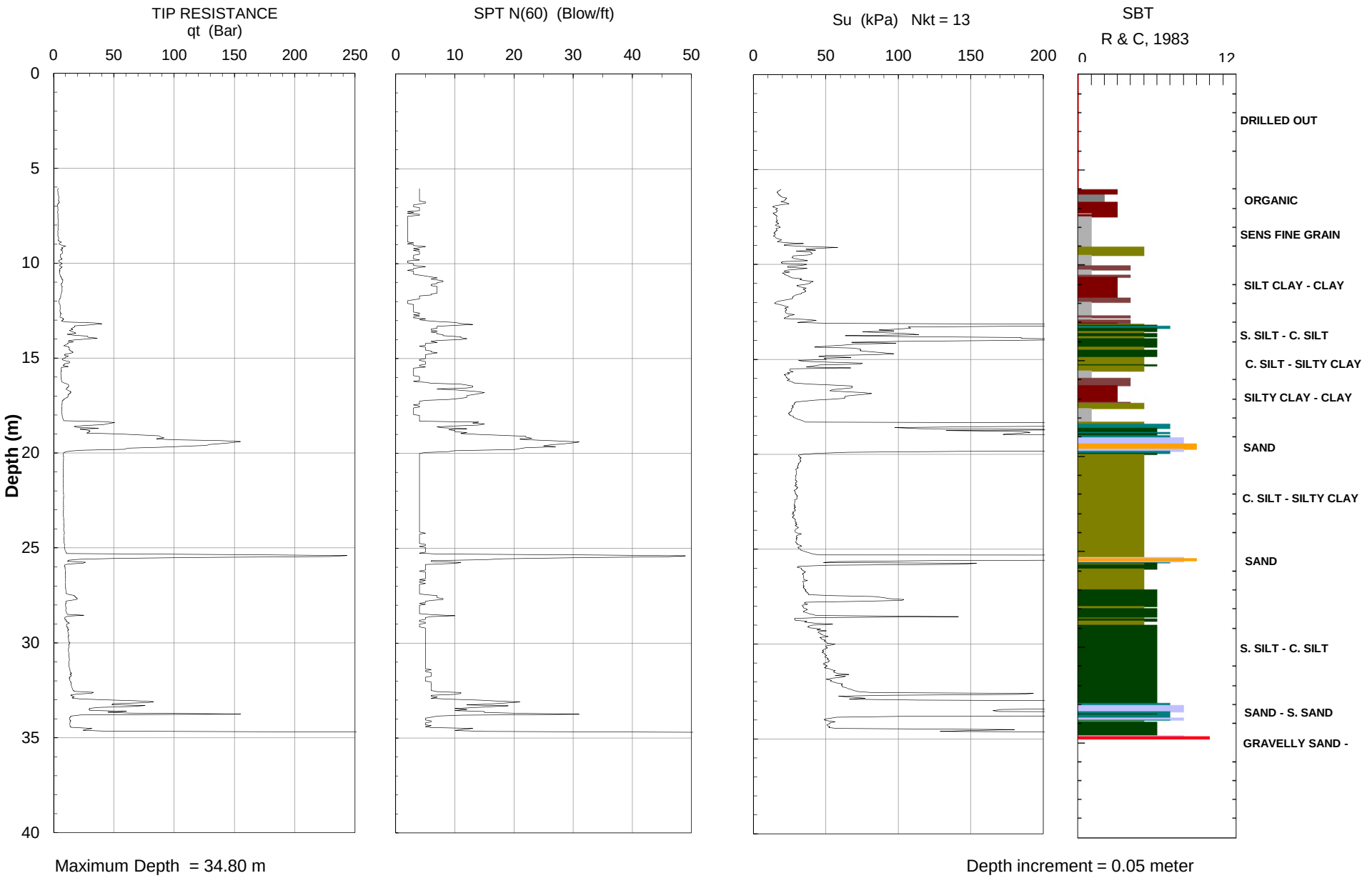
Schwartz SOIL TECH



Maximum Depth = 34.80 m

Depth increment = 0.05 meter

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15-11 Cone ID: DPG1236	Date: March 11, 2015 Site: Trouton Pit, Surrey Thurber Job No: 14 - 81 - 76A	Schwartz SOIL TECH

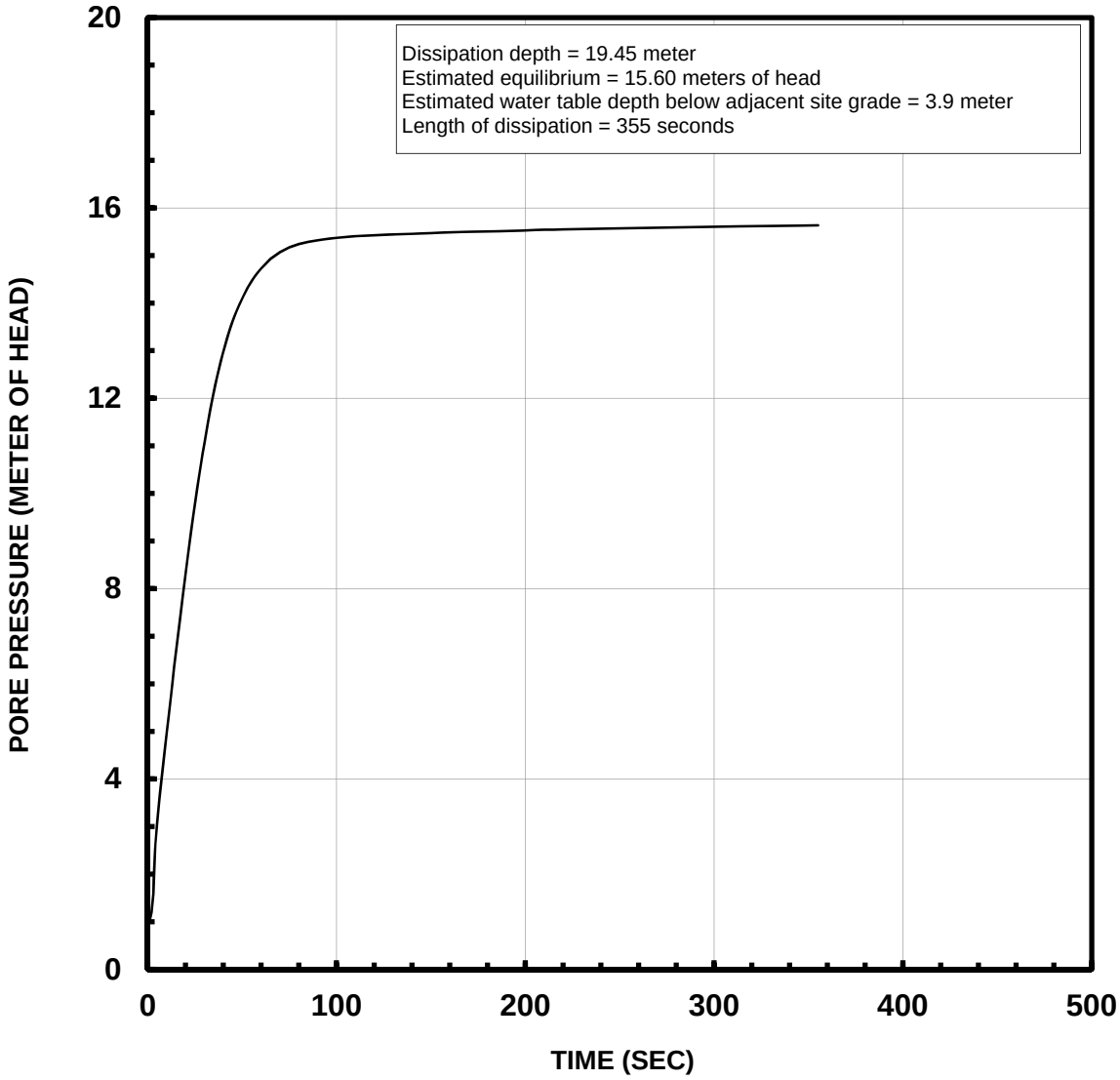


Maximum Depth = 34.80 m

Depth increment = 0.05 meter

THURBER ENGINEERING

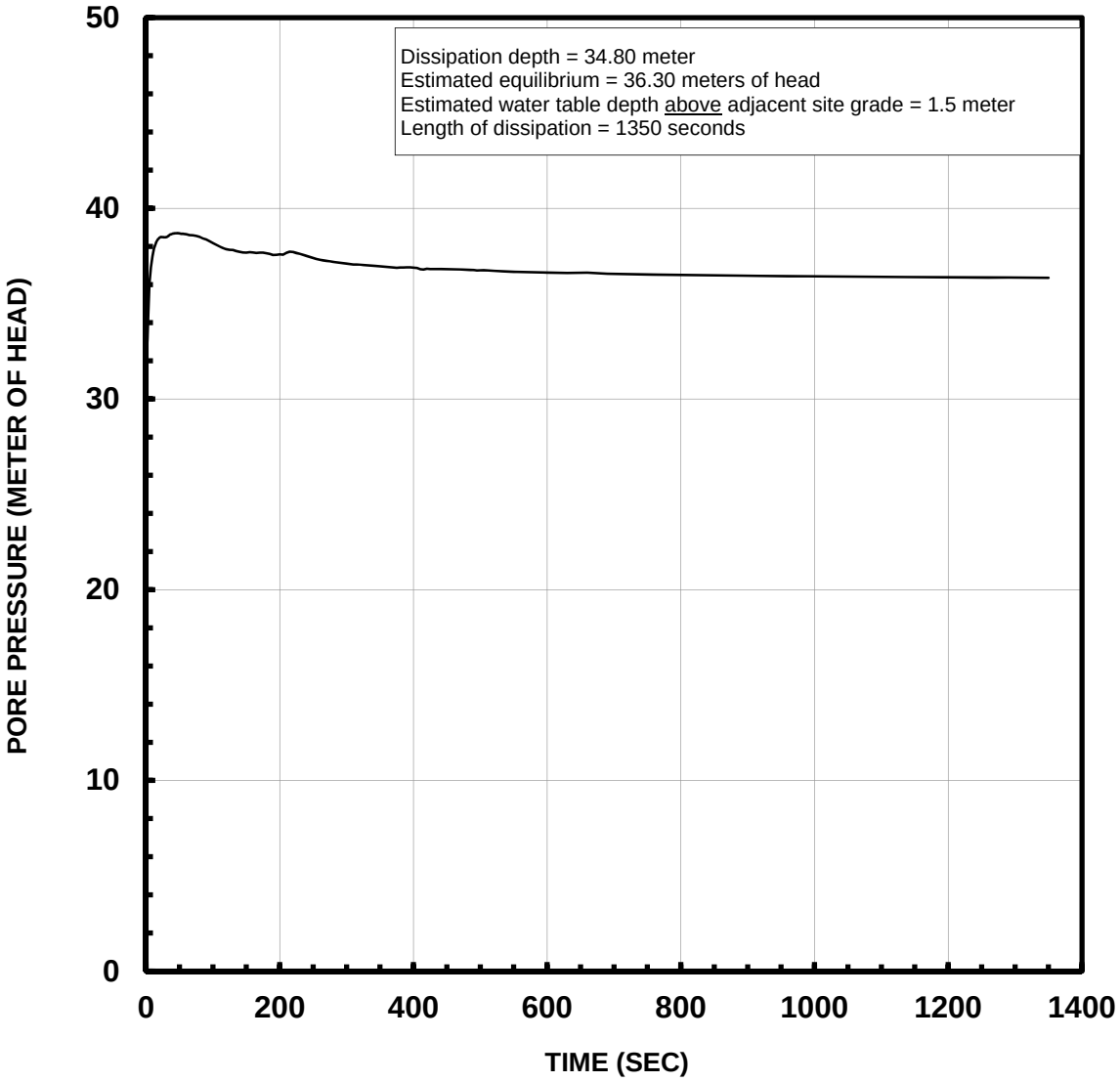
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 11 19.45 METER DEPTH
MARCH 11, 2015



Schwartz SOIL TECH

THURBER ENGINEERING

U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 11 34.80 METER DEPTH
MARCH 11, 2015



Schwartz SOIL TECH

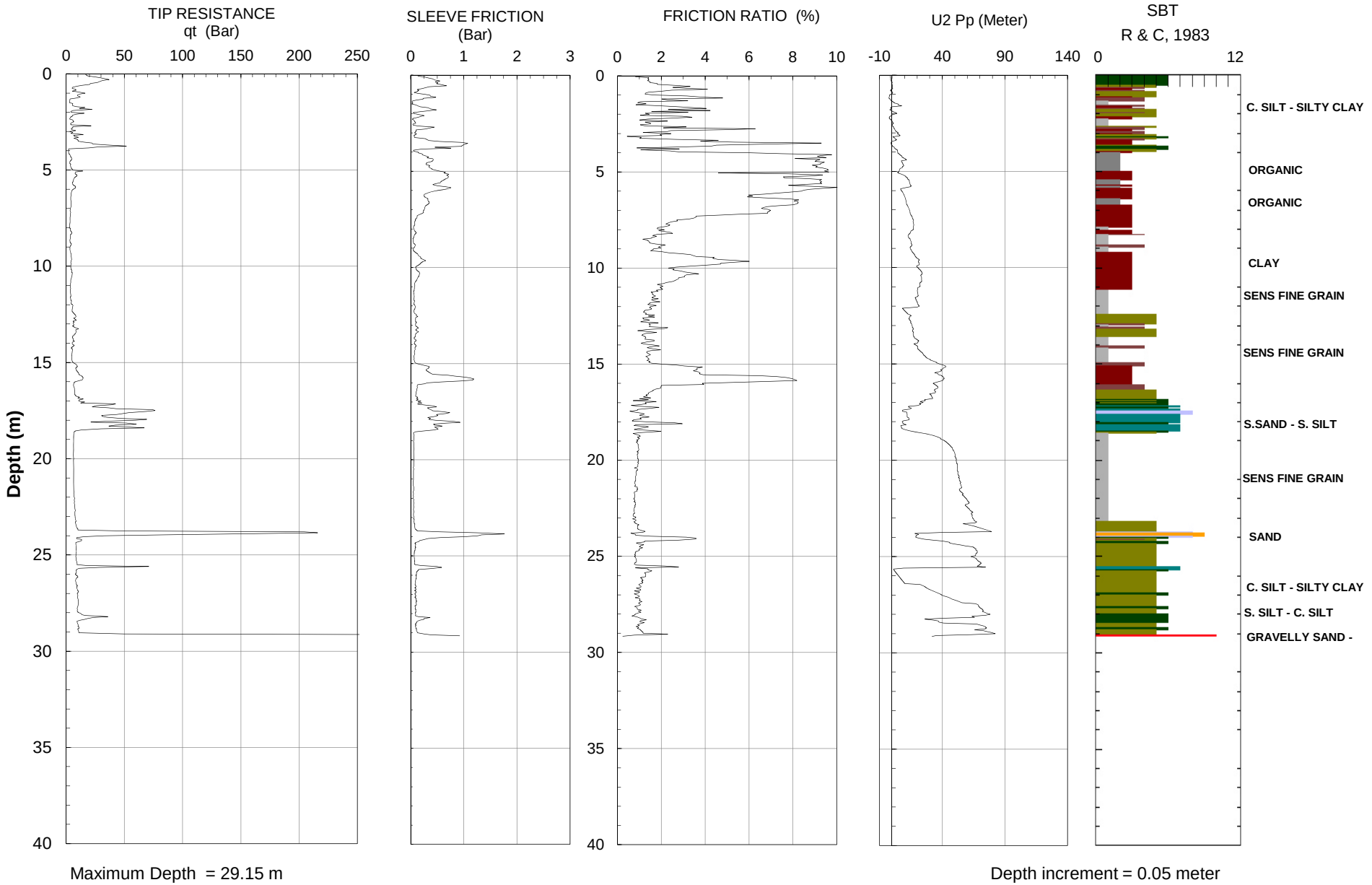
TH15-12

Thurber Engineering

Operator: Schwartz Soil Technical
Sounding: CPT15-12
Cone ID: DPG1236

Date: March 11, 2015
Site: Trouton Pit, Surrey
Thurber Job No: 14 - 81 - 76A

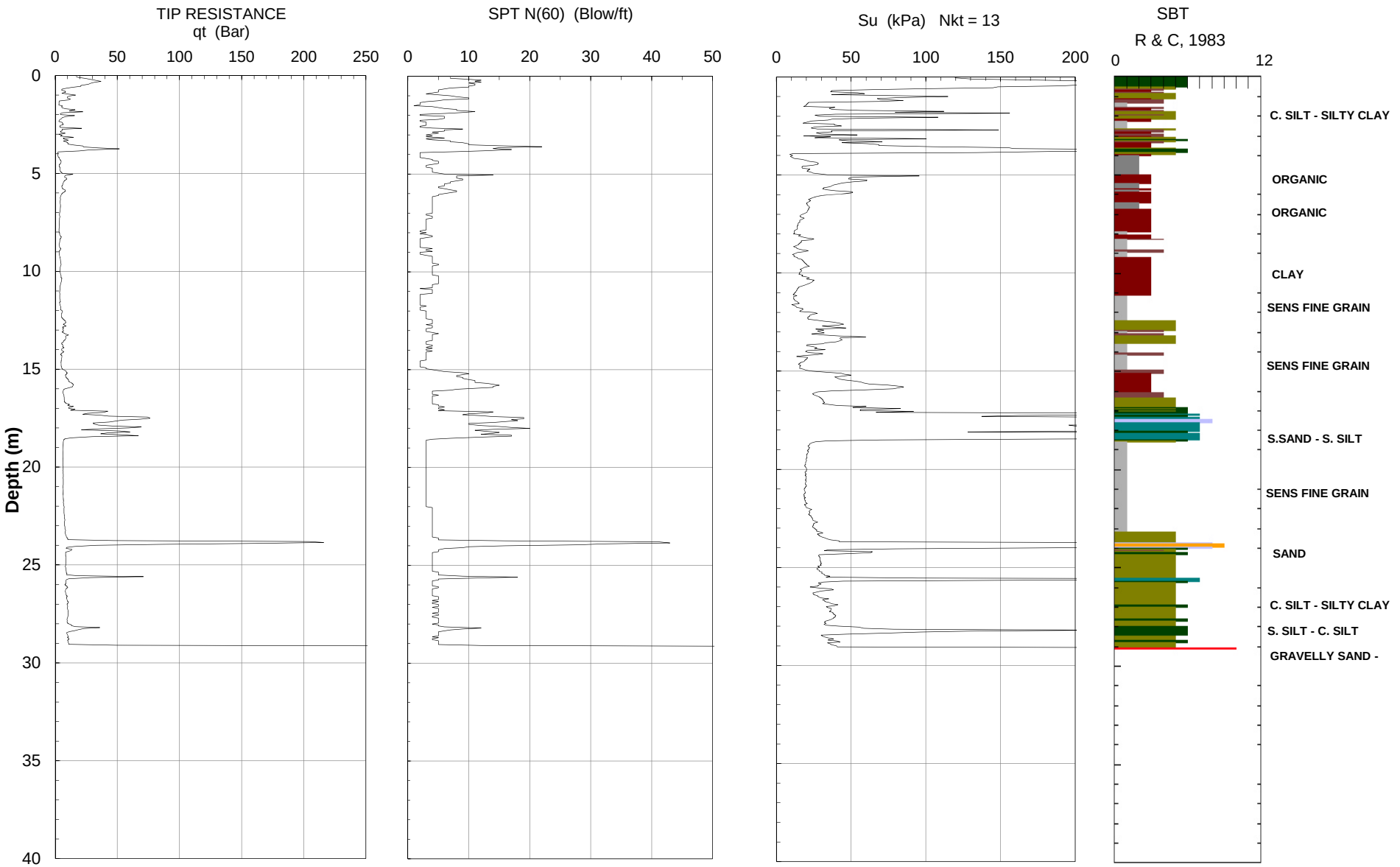
Schwartz SOIL TECH



Maximum Depth = 29.15 m

Depth increment = 0.05 meter

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15-12 Cone ID: DPG1236	Date: March 11, 2015 Site: Trouton Pit, Surrey Thurber Job No: 14 - 81 - 76A	Schwartz SOIL TECH

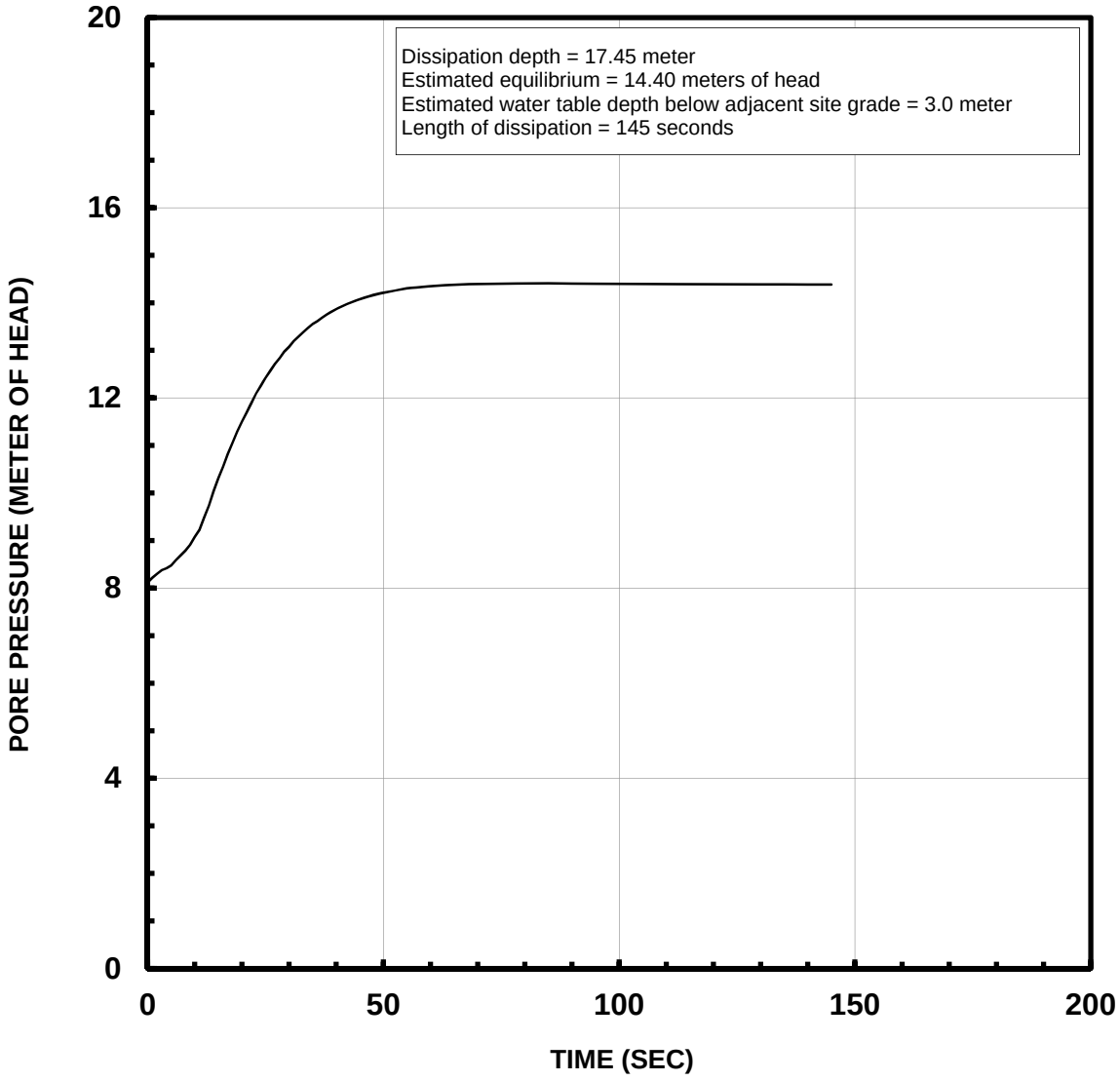


Maximum Depth = 29.15 m

Depth increment = 0.05 meter

THURBER ENGINEERING

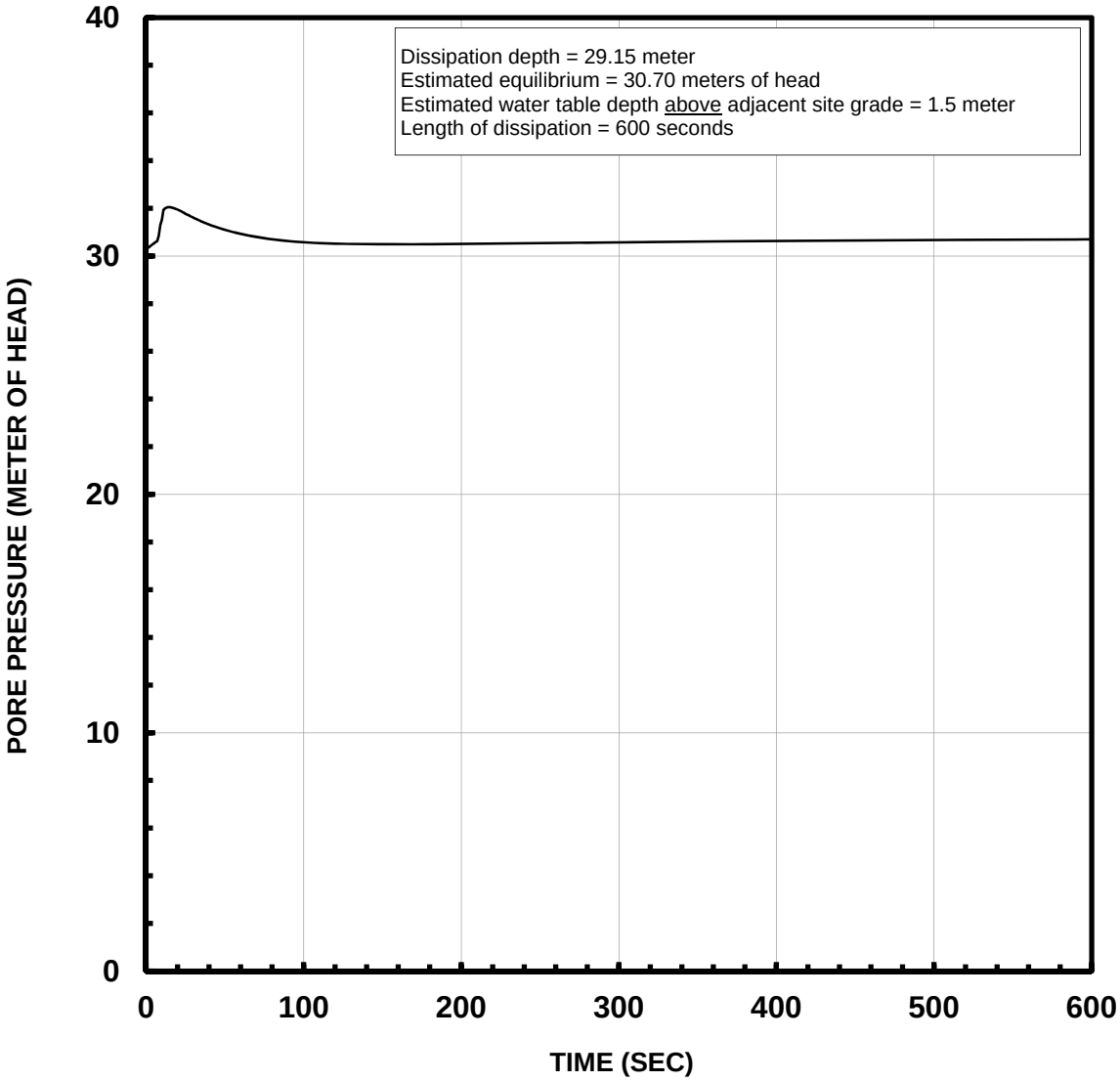
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 12 17.45 METER DEPTH
MARCH 11, 2015



Schwartz
SOIL TECH

THURBER ENGINEERING

U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 12 29.15 METER DEPTH
MARCH 11, 2015



Schwartz SOIL TECH

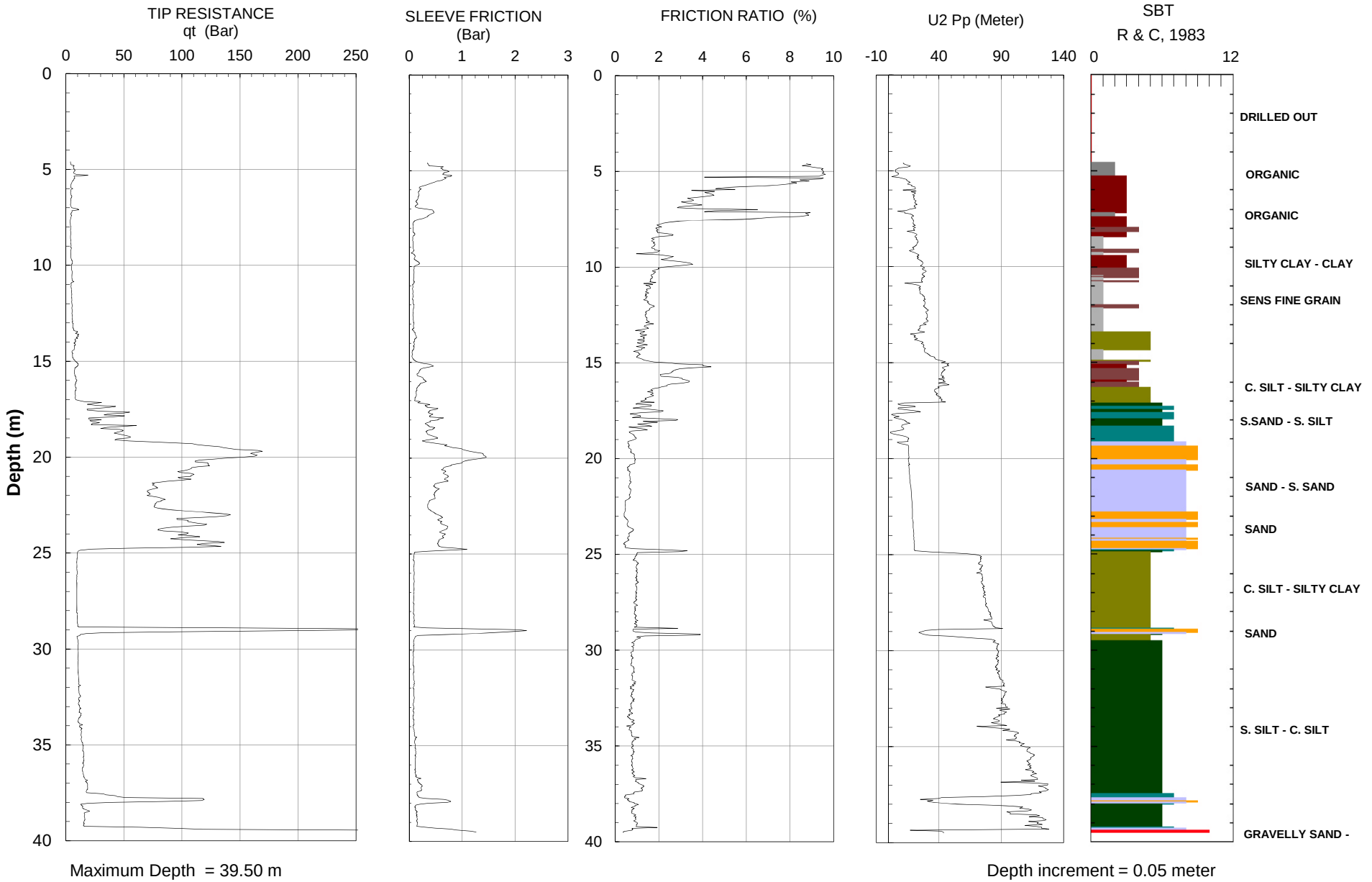
TH15-13

Thurber Engineering

Operator: Schwartz Soil Technical
Sounding: CPT15-13
Cone ID: DPG1236

Date: March 11, 2015
Site: Trouton Pit, Surrey
Thurber Job No: 14 - 81 - 76A

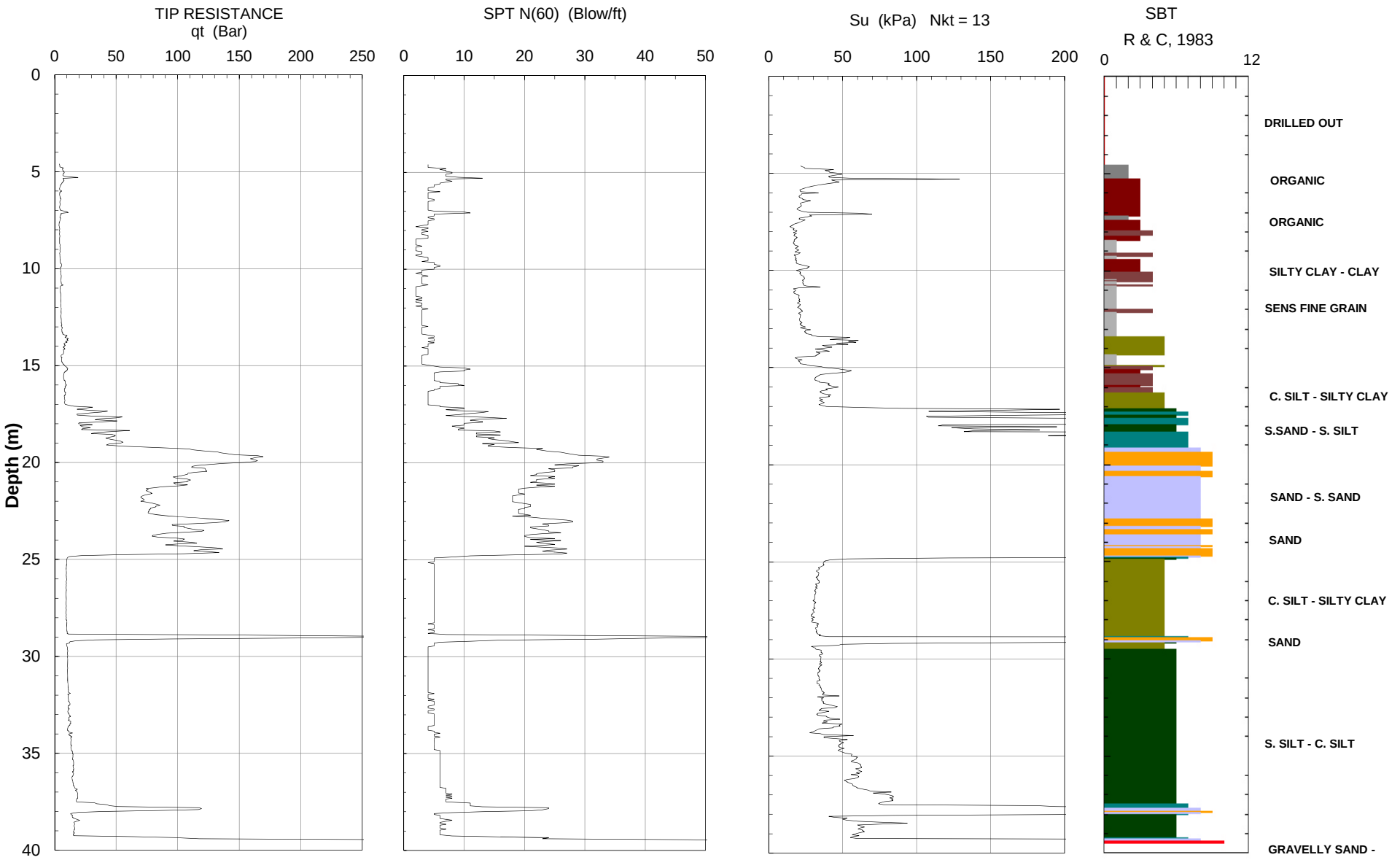
Schwartz SOIL TECH



Maximum Depth = 39.50 m

Depth increment = 0.05 meter

Thurber Engineering	Operator: Schwartz Soil Technical Sounding: CPT15-13 Cone ID: DPG1236	Date: March 11, 2015 Site: Trouton Pit, Surrey Thurber Job No: 14 - 81 - 76A	Schwartz SOIL TECH

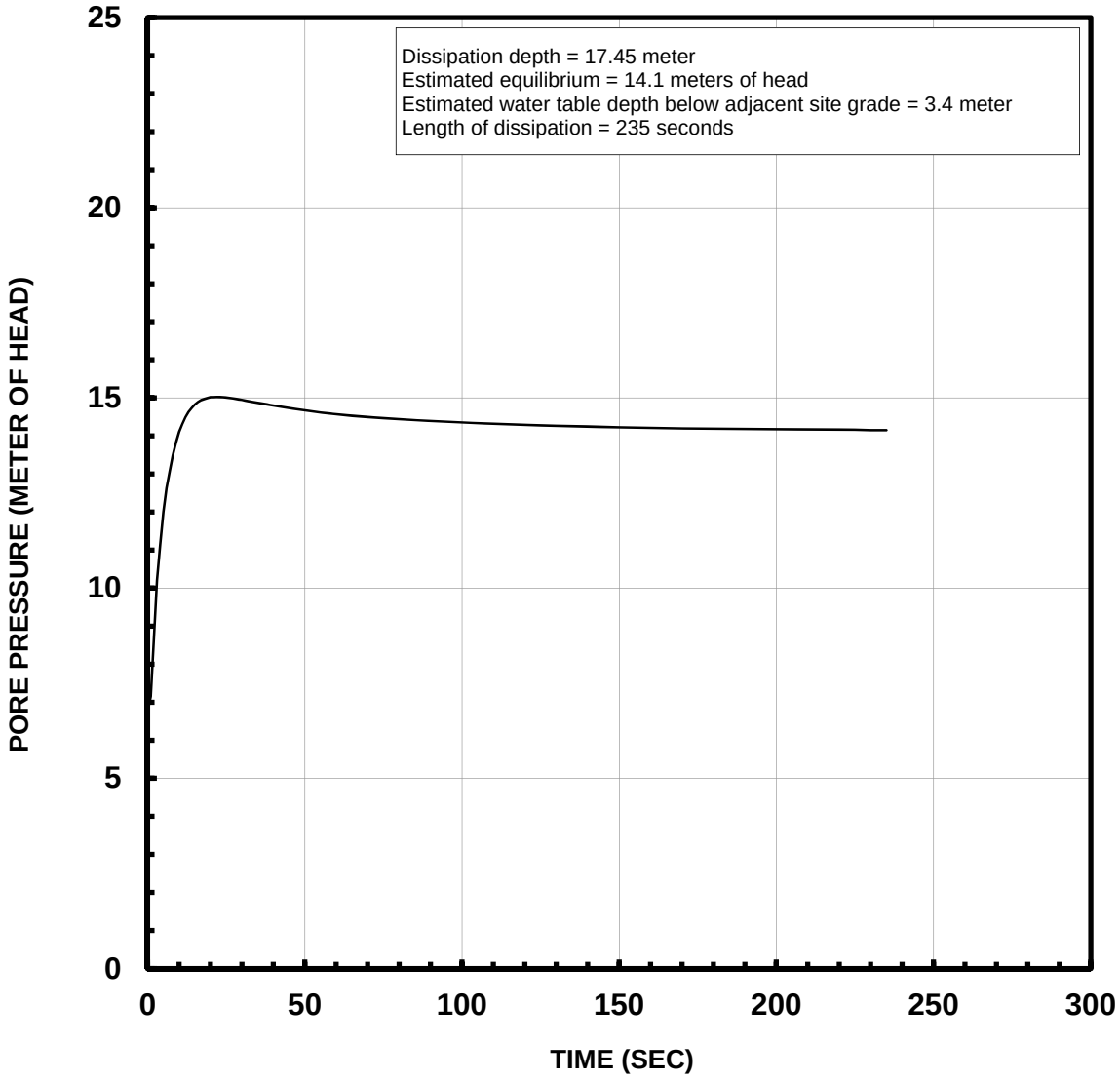


Maximum Depth = 39.50 m

Depth increment = 0.05 meter

THURBER ENGINEERING

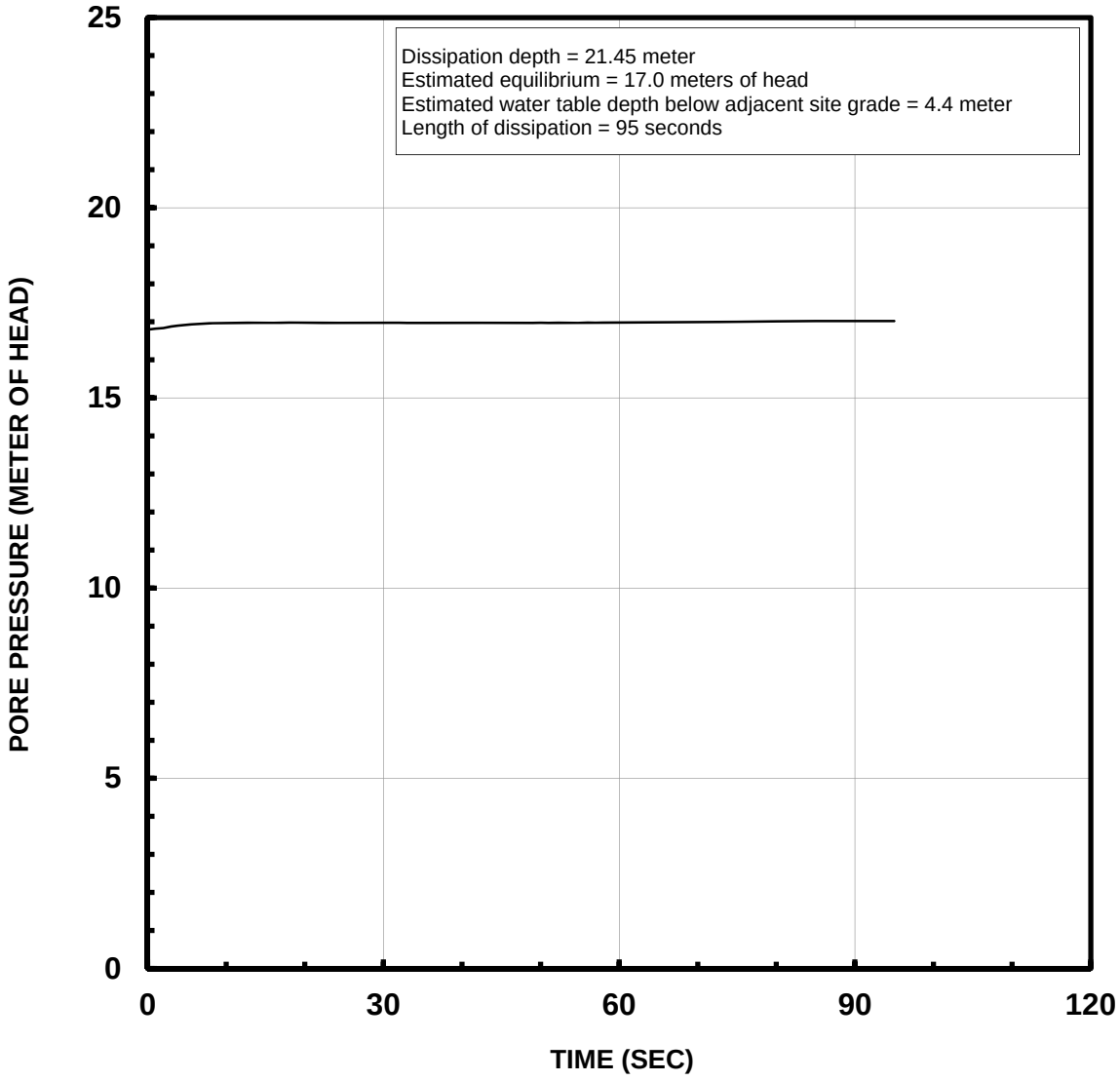
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 13 17.45 METER DEPTH
MARCH 11, 2015



Schwartz
SOIL TECH

THURBER ENGINEERING

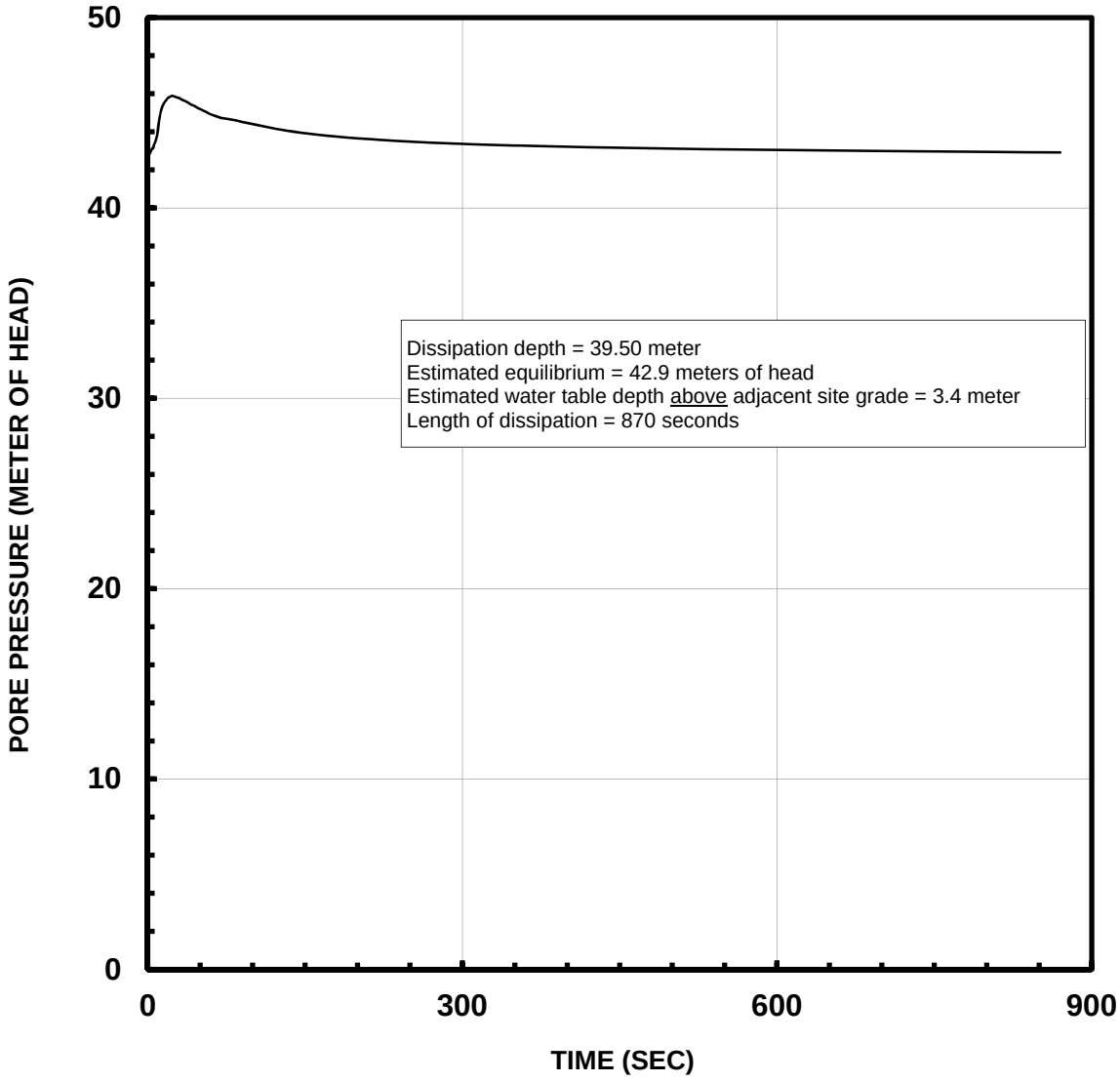
U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 13 21.45 METER DEPTH
MARCH 11, 2015



Schwartz SOIL TECH

THURBER ENGINEERING

U2 PORE PRESSURE DISSIPATION
TROUTON PIT, SURREY
CPT15 - 13 39.50 METER DEPTH
MARCH 11, 2015



Schwartz SOIL TECH

SCHEDULE B - QUOTATION

RFQ Title: Additional Geotechnical Services – Trouton Pit, South Westminster Arena

RFQ No: 1220-040-2016-062

CONTRACTOR

Legal Name: _____

Address: _____

Phone: _____

Fax: _____

Email: _____

CITY OF SURREY

City Representative: Richard D. Oppelt, Purchasing Manager

Address: Surrey City Hall
Finance & Technology Department – Purchasing Section
Reception Counter – 5th Floor West
13450 - 104 Avenue, Surrey, B.C., Canada, V3T 1V8

E-mail for PDF Files: purchasing@surrey.ca

1. If this Quotation is accepted by the City, a contract will be created as described in:
   (a) the Agreement;
   (b) the RFQ; and
   (c) other terms, if any, that are agreed to by the parties in writing.

2. Capitalized terms used and not defined in this Quotation will have the meanings given to them in the Agreement and RFQ. Except as specifically modified by this Quotation, all terms, conditions, representations, warranties and covenants as set out in the Agreement and RFQ will remain in full force and effect.

3. I/We have reviewed the RFQ Attachment 1 – Draft Agreement. If requested by the City, I/we would be prepared to enter into that Agreement, amended by the following departures (list, if any):

Section	**Requested Departure(s) / Alternative(s)**

4. The City requires that the successful Contractor have the following in place **before providing the Goods and Services**:

(a) Workers' Compensation Board coverage in good standing and further, if an "Owner Operator" is involved, personal operator protection (P.O.P.) will be provided,
Workers' Compensation Registration Number _____;

(b) Prime Contractor qualified coordinator is Name: _____
and Contact Number: _____;

(c) Insurance coverage for the amounts required in the proposed Agreement as a minimum, naming the City as additional insured and generally in compliance with the City's sample insurance certificate form available on the City's Website Standard Certificate of Insurance;

(d) City of Surrey or Intermunicipal Business License: Number _____;

(e) If the Contractor's Goods and Services are subject to GST, the Contractor's GST Number is _____; and

(f) If the Contractor is a company, the company name indicated above is registered with the Registrar of Companies in the Province of British Columbia, Canada, Incorporation Number _____.

As of the date of this Quotation, we advise that we have the ability to meet all of the above requirements **except as follows** (list, if any):

Requested Departure(s) / Alternative(s)

_____

_____

5. The Contractor acknowledges that the departures it has requested in Sections 3 and 4 of this Quotation will not form part of the Agreement unless and until the City agrees to them in writing by initialing or otherwise specifically consenting in writing to be bound by any of them.

SECTION B-1

Changes and Additions to Specifications:

6. In addition to the warranties provided in the Agreement, this Quotation includes the following warranties:

_____

_____

_____

7. I/We have reviewed the RFQ Attachment 1, Schedule A – Specifications of Goods and Scope of Services, to Attachment 1. If requested by the City, I/we would be prepared to meet those requirements, amended by the following departures and additions (list, if any):

Requested Departure(s) / Alternative(s) / Addition(s)

_____

_____

SECTION B-2

Fees and Payments

8. The Contractor offers to supply to the City of Surrey the Goods and Services for the prices plus applicable taxes as follows:

	Payment Terms: A cash discount of ____% will be allowed if invoices are paid within ___ days, or the ___ day of the month following, or net 30 days, on a best effort basis.	
Item #	**Item Name**	**Total Amount**
	The total quotation price below shall be all inclusive and include the costs of materials, equipment, small tools, consumable and expendable materials, labour, supervision, installation, incidental work necessary to satisfactorily complete the work and all other costs and profit in connection with the work. Place of the Work: Trouton Pit, South Westminster Arena, located at Place of the Work location: Trouton Pit, 12870 – 110th Avenue, Surrey, B.C, Mobilization & General Conditions ……. Dynamic Test Piles and Testing ……. Static Test Pile, Test Equipment & Support Frames & Testing Static Test Support Piles …….. (Unit Price for Static Support Piles $ _____ Note: Overheads, General Conditions and Profit are to be included in the above amounts.	$ _____ $ _____ $ _____ $ _____
CURRENCY: Canadian	Subtotal:	$
	GST 5%:	$
	TOTAL QUOTATION PRICE:	$

Please provide a firm all-inclusive cost for the project. Do not provide an estimate – we are looking for firm pricing.

SECTION B-3

Time Schedule:

9. Contractors should provide an estimated schedule, with major item descriptions and times indicating a commitment to provide the Goods and perform the Services within the time specified (use the spaces provided and/or attach additional pages, if necessary).

MILESTONE DATES _____

ACTIVITY	SCHEDULE									
	1	2	3	4	5	6	7	8	9	10

SECTION B-4

Key Personnel & Sub-Contractors:

10. Contractor should provide information on the background and experience of all key personnel proposed to provide the Goods and Services (use the spaces provided and/or attach additional pages, if necessary):

Key Personnel

Name: _____
Experience: _____
Dates: _____
Project Name: _____
Responsibility: _____

11. Contractor should provide the following information on the background and experience of all sub-contractors and material suppliers proposed to undertake a portion of the Goods and Services (use the spaces provided and/or attach additional pages, if necessary):

Description Of Goods & Services	*Sub-Contractors & Material Suppliers Names*	*Years Of Working With Contractor*	*Telephone Number And Email*

SECTION B-5

Experience and References:

12. Contractor's relevant experience and qualifications in delivering Goods and Services similar to those required by the RFQ (use the spaces provided and/or attach additional pages, if necessary):

13. Contractor's relevant references (name and telephone number) (use the spaces provided and/or attach additional pages, if necessary). The City's preference is to have a minimum of three references. Previous clients of the Contractor may be contacted at the City's discretion (use the spaces provided and/or attach additional pages, if necessary):

SECTION B-6 [Additional Information]

Technical Services:

14. Narrative that illustrates an understanding of the City's requirements and Services (use the spaces provided and/or attach additional pages, if necessary):

15. A description of the general approach and methodology that the Contractor would take in performing the Services including specifications and requirements (use the spaces provided and/or attach additional pages, if necessary):

16. A narrative that illustrates how the Contractor will complete the scope of Services, manage the Services, and accomplish required objectives within the City's schedule (use the spaces provided and/or attach additional pages, if necessary):

17. A description of the standards to be met by the Contractor in providing the Services (use the spaces provided and/or attach additional pages, if necessary):

_____

_____

18. I/We the undersigned duly authorized representatives of the Contractor, having received and carefully reviewed the RFQ and the Agreement, submit this Quotation in response to the RFQ.

This Quotation is offered by the Contractor this _____ day of _____, 201_.

CONTRACTOR

I/We have the authority to bind the Contractor

_____
(Legal Name of Contractor)

_____ _____
(Signature of Authorized Signatory) (Signature of Authorized Signatory)

_____ _____
(Print Name and Position of Authorized Signatory) (Print Name and Position of Authorized Signatory)

This Quotation is accepted by the City this _____ day of _____, 201_.

CITY OF SURREY

_____ _____
(Signature of Authorized Signatory) (Signature of Purchasing Representative

_____ _____
(Print Name and Position of Authorized Signatory) (Print Name of Purchasing Representative)

_____
(Signature of Authorized Signatory)

_____
(Print Name and Position of Authorized Signatory)