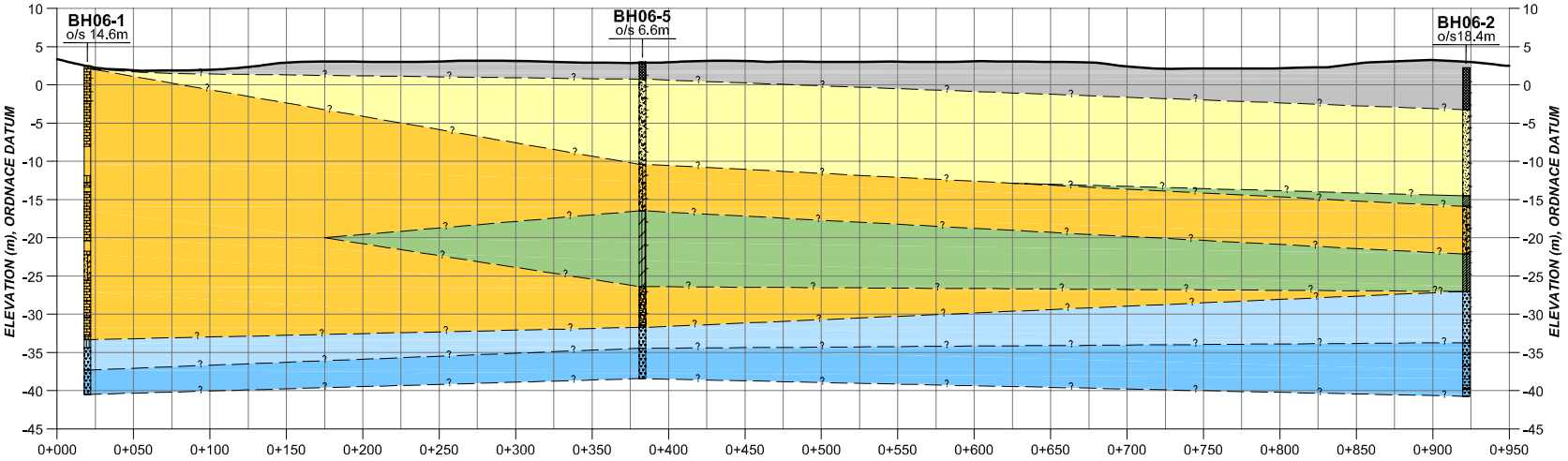

1 PLAN

SCALE (m) 0 100




2 INFERRED STRATIGRAPHIC PROFILE

VERTICAL SCALE (m) 0 20

HORIZONTAL SCALE (m) 0 100

## NOTES

1.) Information presented on this drawing has been prepared specifically for the Government of Bermuda. It may not be copied, reproduced or used for any other purpose without the express written consent of Golder Associates Ltd. (Golder) and the Government of Bermuda.

2.) The interpreted stratigraphy on this drawing is intended only for the guidance of the Government of Bermuda in the feasibility assessment of the project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect design and construction costs, techniques and equipment choice, scheduling and sequence of operations would normally be greater than has been carried out. Those using this data should rely on their own interpretations of the original factual data, as to how subsurface conditions may affect their work.

3.) Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions, and even a comprehensive investigation, sampling and testing program may fail to detect certain conditions. The geologic, geotechnical and hydrogeologic conditions that Golder interprets to exist between sampling points may differ from those that actually exist.

4.) Elevations shown in metres are based on ordnace datum.

## LEGEND

Surveyed Borehole Location

BH06-1
o/s 14.6m

Test Hole Location Showing Stratigraphy Data. (For detailed stratigraphy information refer to borehole logs.)

- FILL
- Uncemented to Weakly Cemented Coralline Deposits
- Highly Cemented Coralline Deposits
- SILT and CLAY Sediments
- Weathered VOLCANICS
- Slightly Weathered to Fresh VOLCANICS

## REFERENCES

1.) GOVERNMENT OF BERMUDA, Image File: Boreholes_Overall.jpg., Date Received: December 2006.
2.) HALCROW GROUP, CAD File: Csway2000_composite.dwg., Date Received: December 2006.

PROJECT
GOVERNMENT OF BERMUDA
NEW GROTTO BAY - CASTLE HARBOUR CROSSING
BERMUDA

TITLE
# INFERRED STRATIGRAPHIC PROFILE ALONG EXISTING CAUSEWAY ALIGNMENT

Golder Associates
Abbotsford, BC

| | | | | | |
|---|---|---|---|---|---|
| PROJECT No. 05-1411-081U | | | FILE No. | P4110811U-02.dwg | |
| DESIGN | P.B.B. | DEC-18-06 | SCALE | AS SHOWN | REV. 0 |
| CADD | J.S.D. | DEC-18-06 | | | |
| CHECK | | | | | |
| REVIEW | | | | | |

FIGURE 3

# APPENDIX I

# RECORD OF TEST HOLE LOG SHEETS

# LIST OF SYMBOLS

## I. GENERAL

$\pi = 3.1416$
$e$ = base of natural logarithms 2.7183
$\log_e a$ or $\ln a$, natural logarithm of $a$
$\log_{10} a$ or $\log a$, logarithm of $a$ to base 10
$t$ time
$g$ acceleration due to gravity
$V$ volume
$W$ weight
$M$ moment
$F$ factor of safety

## II. STRESS AND STRAIN

$u$ pore pressure
$\sigma$ normal stress
$\sigma'$ normal effective stress ($\overline{\sigma}$ is also used)
$\tau$ shear stress
$\varepsilon$ linear strain
$\varepsilon_{xy}$ shear strain
$\nu$ Poisson's ratio ($\mu$ is also used)
$E$ modulus of linear deformation (Young's modulus)
$G$ modulus of shear deformation
$K$ modulus of compressibility
$\eta$ coefficient of viscosity

## III. SOIL PROPERTIES

(a) *Unit Weight*
$\gamma$ unit weight of soil (bulk density)
$\gamma_s$ unit weight of solid particles
$\gamma_w$ unit weight of water
$\gamma_d$ unit dry weight of soil (dry density)
$\gamma'$ unit weight of submerged soil
$G_s$ specific gravity of solid particles $G_s = \gamma_s/\gamma_w$
$e'$ void ratio
$n$ porosity
$w$ water content
$S_r$ degree of saturation

(b) *Consistency*
$w_L$ liquid limit
$w_P$ plastic limit
$I_P$ plasticity index
$w_S$ shrinkage limit
$I_L$ liquidity index = $(w - w_P)/I_P$
$I_C$ consistency index = $(w_L - w)/I_P$
$e_{max}$ void ratio in loosest state
$e_{min}$ void ratio in densest state
$D_r$ relative density = $(e_{max} - e)/(e_{max} - e_{min})$

(c) *Permeability*
$h$ hydraulic head or potential
$q$ rate of discharge
$v$ velocity of flow
$i$ hydraulic gradient
$k$ coefficient of permeability
$j$ seepage force per unit volume

(d) *Consolidation (one-dimensional)*
$m_v$ coefficient of volume change = $-\Delta e/(1+e)\Delta\sigma'$
$C_c$ compression index = $-\Delta e/\Delta \log_{10} \sigma'$
$c_v$ coefficient of consolidation
$T_v$ time factor = $c_v t/d^2$ ($d$, drainage path)
U degree of consolidation

(e) *Shear Strength*
$\tau_f$ shear strength
$c'$ effective cohesion intercept — In terms of effective stress
$\phi'$ effective angle of shearing resistance, or friction — In terms of effective stress: $\tau_f = c' + \sigma' \tan \phi'$
$c_u$ apparent cohesion* — In terms of total stress
$\phi_u$ apparent angle of shearing resistance, or friction — In terms of total stress: $\tau_f = c_u + \sigma \tan \phi_u$
$\mu$ coefficient of friction
$S_t$ sensitivity

* For the case of saturated cohesive soil, $\phi_u = 0$ and the undrained shear strength $\tau_s = c_u$ is taken as half the undrained compressive strength.

## LIST OF ABBREVIATIONS

The abbreviation commonly employed on each "Record of Borehole", on the figures and in the test of the report, are as follows:

### I. SAMPLE TYPES

*AS* auger sample
*CS* chunk sample
*DO* drive open
*DS* Denison type sample
*FS* foil sample
*RC* rock core
*ST* slotted tube
*TO* thin-walled, open
*TP* thin-walled, piston
*WS* wash sample
*CC* continuous core

### II. PENETRATION RESISTANCES

Dynamic Penetration Resistance:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 0.3 m (12 in.).

Standard Penetration Resistance, *N*:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 0.3 m (12 in.).

*WH* sampler advanced by static weight – weight, hammer.

*PH* sampler advanced by pressure – pressure, hydraulic.

*PM* sampler advanced by pressure – pressure, manual.

### III. SOIL DESCRIPTION

(a) *Cohesionless Soils*

| *Relative Density* | *'N' Blows/0.30 m or Blows/ft.* |
|---|---|
| Very Loose | 0 to 4 |
| Loose | 4 to 10 |
| Compact | 10 to 30 |
| Dense | 30 to 50 |
| Very Dense | Over 50 |

(b) *Cohesive Soils*

| *Consistency* | *'Cu'* kPa | *'Cu'* psf. |
|---|---|---|
| Very Soft | 0 to 12 | 0 to 250 |
| Soft | 12 to 25 | 250 to 500 |
| Firm | 25 to 50 | 500 to 1,000 |
| Stiff | 50 to 100 | 1,000 to 2,000 |
| Very Stiff | 100 to 200 | 2,000 to 4,000 |
| Hard | over 200 | over 4,000 |

### IV. SOIL TESTS

*C* consolidation test
*H* hydrometer analysis
*M* sieve analysis
*MH* combined analysis, sieve and hydrometer[1]
*Q* undrained triaxial[2]
*R* consolidated undrained triaxial[2]
*S* drained triaxial
*U* unconfined compression
*V* field vane test

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NOTES:
1 Combined analyses when 5 to 95 per cent of the material passes the No. 200 sieve.
2 Undrained triaxial tests in which pore pressures are measured are shown as $\overline{Q}$ or $\overline{R}$.

# LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

## WEATHERING STATE (ISRM, 1981)

| Term | Description | Grade |
|---|---|---|
| Fresh | No visible sign of rock material weathering: perhaps slight discolouration on major discontinuity surfaces. | I ≡ WI |
| Slightly weathered | Discolouration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discoloured by weathering and may be somewhat weaker externally than in its fresh condition. | II ≡ W2 |
| Moderately weathered | Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as corestones. | III ≡ W3 |
| Highly weathered | More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones. | IV ≡ W4 |
| Completely weathered | All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact. | V ≡ W5 |
| Residual soil | All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume. But the soil has not been significantly transported. | VI ≡ W6 |
| * 'WI' refers to Grade I weathering and is not a reference to filling materials | | |

## BEDDING THICKNESS

| Description | Bedding Plane Spacing |
|---|---|
| Very thickly bedded | > 2 m |
| Thickly bedded | 0.6 m to 2 m |
| Medium bedded | 0.2 m to 0.6 m |
| Thinly bedded | 60 mm to 0.2 m |
| Very thinly bedded | 20 mm to 60 mm |
| Laminated | 6 mm to 20 m |
| Thinly laminated | < 6 mm |

## DISCONTINUITY SPACING (ISRM, 1981)

| Description | Spacing |
|---|---|
| Very wide | > 3m |
| Wide | 1 – 3 m |
| Moderate | 0.3 – 1 m |
| Close | 50 – 300 mm |
| Very close | < 50 mm |
| Extremely close | < 20 mm |

## ROCK STRENGTH INDEX (ISRM, 1981)

The strength of the intact rock has been estimated in accordance with the International Society of Rock Mechanics (ISRM) Standard Classification System.

| Grade | Description | Field Identification | Approx. Range of Uniaxial Compressive Strength (MPa) |
|---|---|---|---|
| R0 | Extremely weak rock | Indented by thumbnail | 0.25 – 1.0 |
| R1 | Very weak rock | Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife | 1.0-5.0 |
| R2 | Weak rock | Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer | 5.0 - 25 |
| R3 | Medium strong rock | Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer | 25 – 50 |
| R4 | Strong rock | Specimen requires more than one blow of geological hammer to fracture it. | 50-100 |
| R5 | Very strong rock | Specimen requires many blows of geological hammer to fracture it | 100 – 250 |
| R6 | Extremely strong rock | Specimen can only be chipped with geological hammer | >250 |

## GRAIN SIZE

| Term | Size* |
|---|---|
| Coarse Grained | 0.6 – 2mm |
| Medium Grained | 0.2 – 0.6 mm |
| Fine Grained | 0.06 – 0.2 mm |
| Very Fine Grained silt, clay | <0.06 mm |

# LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY (continued)

## CORE CONDITION

**Total Core Recovery**
The summed length of all pieces of recovered core expressed as a percentage of length drilled. When the core is highly fragmented the length of such portions is estimated by assembling the fragments and estimating the length of core that the fragments appear to represent.

**Solid Core Recovery (SCR)**
The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

**Rock Quality Designation (RQD)**
A modified core recovery percentage in which all the pieces of sound core over 10 cm long are counted as recovery. And are expressed as a percentage of the length drilled. If the core is mechanically broken (i.e. by handling or by the drilling process) the broken pieces should be fitted together and counted as one piece, provided they form the requisite length of 10 cm. RQD varies from 0% for completely broken core to 100% for core in solid sticks.

## DISCONTINUITY DATA

**Fracture Index**
A count of the number of natural occurring discontinuities (physical separations) in the rock core, per 0.25 m.

**Dip with Respect to (W.R.T.) Core Axis**
The angle of the discontinuity relative to the axis (length) of the core. IN a vertical borehole a discontinuity with a 90° angle is horizontal.

**Description and Notes**
An abbreviated description of the discontinuities including naturally occurring separations such as bedding, planes, joints, and foliation planes. Additional information concerning the shape, roughness and infilling materials of the discontinuity are also noted.

**Discontinuity Abbreviations**

| Joint Type | | Joint Shape | | Joint Roughness | | Joint Infilling | |
|---|---|---|---|---|---|---|---|
| BD | Bedding | CU | Curved | PO, P | Polished | Br | Broken Rock |
| CL | Cleavage | IR | Irregular | Ro, R | Rough | Bt | Biotite |
| CO | Contact | PL | Planar | K,S | Slickensided | Ca | Calcite |
| FLT,F | Fault | ST | Stepped | SM | Smooth | Ch | Chlorite |
| FO | Foliation | UN | Undulating | VR | Very Rough | Cl | Clay |
| JN, J | Joint | | | | | Ep | Epidote |
| SH | Shear | | | | | Fe | Iron |
| VN | Vein | | | | | Go | Gouge |
| | | | | | | Gr | Gravel |
| | | | | | | He | Hematite |
| | | | | | | Qz | Quartz |
| | | | | | | Sa | Sand |
| | | | | | | Se | Sericite |
| | | | | | | Si | Silt |
| | | | | | | Su | Sulphide |

## Notes:

1. These logs should be read in conjunction with the "Alteration Logs". The Alteration Log is assumed to be the primary reference regarding alteration properties, mineralogy and petrology.

2. Unless drilling evidence indicates otherwise, areas of core loss are assumed to occur at the lower end of each core run. In zones of poor core recovery, rock conditions have been inferred as noted.

3. Core breaks interpreted to have been caused by drilling are termed "mechanical breaks". Mechanical breaks have not been considered in the determination of RQD or Fracture Index and have not been noted in the borehole logs. Identification of mechanical breaks is subject to interpretation. All interpretation of mechanical breaks have been made by the geotechnical engineer at the time of drilling. If the core is determined to be broken by handling or by the drilling process, the broken pieces have been fitted together and counted as one piece for assessing RQD.

4. UTM Coordinates are used for the borehole locations. Geodetic datum is used fore borehole collar elevations. McElhanney Consulting Services Ltd have surveyed both location coordinates and elevations of Phase I boreholes. Matson Peck and Topliss, BC Land Surveyors surveyed the Phase II boreholes.

5. Joint infill minerology has been inferred based on visual assessment; confirmatory XRD testing has not been completed on the joint infill.

6. Preparation of the borehole logs has generally been carried out in accordance to "Rock Characterization Testing and Monitoring, ISRM Suggested Methods," ed. ET Brown; Published for the Commission on Testing Methods, International Society for Rock Mechanics (ISRM), 1981.

PROJECT No.: 05-1411-081U

# RECORD OF BOREHOLE: BH06-2

SHEET 1 OF 6

LOCATION: See Figure 2
N: 139801.87 E: 554160.36

BORING DATE: October 6-8, 2006

DATUM: Ordnance Datum

SAMPLER HAMMER, 64kg; DROP, 762mm

| DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLES: NUMBER | TYPE | BLOWS/0.3m | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) | HYDRAULIC CONDUCTIVITY, k, cm/s ($10^{-6}$ $10^{-5}$ $10^{-4}$ $10^{-3}$) / WATER CONTENT PERCENT (Wp W Wl) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Aardvark Drilling Ltd. Trailer Mounted CME 55 - Hollow Stem Auger | Ground Surface | | 2.24 / 0.00 | | | | | | | |
| 1 | | Loose to compact, moist, light brown-grey to white with black and brown pockets, SAND, trace to some gravel, to SAND and GRAVEL, trace to some silt. (FILL) | | | 1 | 50 DO | 29 | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | 2 | 50 DO | 7 | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | 3 | 50 DO | 7 | | | | |
| 6 | | | | -3.25 / 5.49 | 4 | 50 DO | 17 | | | | |
| 7 | | Loose to compact, wet, pink-white SAND, some gravel, trace to some silt (lightly to moderately cemented coralline deposits). | | | | | | | | | |
| 8 | | | | | 5 | 50 DO | 17 | | | M | |
| 9 | | | | | | | | | | | |
| 10 | | | | | 6 | 50 DO | 7 | | | | |
| | | CONTINUED NEXT PAGE | | | | | | | | | |

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.B.
CHECKED:

BOREHOLE 05-1411-081U.GPJ GLDR_CAN.GDT 12/29/06

PROJECT No.: 05-1411-081U

# RECORD OF BOREHOLE: BH06-2

SHEET 2 OF 6

LOCATION: See Figure 2
N: 139801.87 E: 554160.36

BORING DATE: October 6-8, 2006

DATUM: Ordnance Datum

SAMPLER HAMMER, 64kg; DROP, 762mm

| DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLES: NUMBER | TYPE | BLOWS/0.3m | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) | SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80) | HYDRAULIC CONDUCTIVITY, k, cm/s ($10^{-6}$ $10^{-5}$ $10^{-4}$ $10^{-3}$) | WATER CONTENT PERCENT: Wp W Wl (20 40 60 80) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | Aardvark Drilling Ltd. Trailer Mounted CME 55 - Hollow Stem Auger | Loose to compact, wet, pink-white SAND, some gravel, trace to some silt (lightly to moderately cemented coralline deposits). *(continued)* | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | 7 | 50 DO | 13 | | | | ○ | M | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | 8 | 50 DO | 20 | | | | ○ | | |
| 17 | Aardvark Drilling Ltd. Trailer Mounted CME 55 - NW Casing with Tricone | Firm to stiff, moist, grey-green CLAY, some silt. | | -14.52 / 16.76 | | | | | | | | | |
| 18 | | Compact, wet, pink-white sandy SILT, some gravel to gravel, some sand, trace silt (lightly cemented coralline deposits). - alternating soft and hard drilling zones to bottom of layer. - with grey sea shells at bottom of layer. | | -15.90 / 18.14 | 9 | 50 DO | 13 | | | | ○ | H | |
| 19 | | | | | | | | | | | | | |
| 20 | | *CONTINUED NEXT PAGE* | | | | | | | | | | | |

BOREHOLE 05-1411-081U.GPJ GLDR_CAN.GDT 12/29/06

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.B.
CHECKED:

PROJECT No.: 05-1411-081U

# RECORD OF BOREHOLE: BH06-2

SHEET 3 OF 6

LOCATION: See Figure 2
N: 139801.87 E: 554160.36

BORING DATE: October 6-8, 2006

DATUM: Ordnance Datum

SAMPLER HAMMER, 64kg; DROP, 762mm

| DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLES: NUMBER | TYPE | BLOWS/0.3m | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) | HYDRAULIC CONDUCTIVITY, k, cm/s ($10^{-6}$ $10^{-5}$ $10^{-4}$ $10^{-3}$) / WATER CONTENT PERCENT (Wp W Wl) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Aardvark Drilling Ltd. Trailer Mounted CME 55 - NW Casing with Tricone | Compact, wet, pink-white sandy SILT, some gravel to gravel, some sand, trace silt (lightly cemented coralline deposits). - alternating soft and hard drilling zones to bottom of layer. - with grey sea shells at bottom of layer. *(continued)* | | | | | | | | | |
| 21 | | | | | 10 | 50 DO | 13 | | O | M | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | 11 | 50 DO | 74 | | O | | |
| | | | | -22.14 | | | | | | | |
| | | | | 24.38 | | | | | | | |
| 25 | | | | | | | | | | | |
| | | | | | 12 | 50 DO | 14 | | O | | |
| 26 | | | | | | | | | | | |
| | | Firm to stiff, moist, grey-green SILT, some clay to silty CLAY, with some black, fine to medium grained sand. - white SAND and SILT layer between 25.5m - 25.8m depth (possible volcanic ash). - hard drilling between 28.0m - 28.3m depth. | | | | | | | | | |
| 27 | | | | | 13 | 50 DO | 8 | | W | | |
| 28 | | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| | | | | -27.02 | | | | | | | |
| | | | | 29.26 | | | | | | | |
| 30 | | | | | 14 | 50 | 97 | | | | |
| | | *CONTINUED NEXT PAGE* | | | | | | | | | |

BOREHOLE 05-1411-081U.GPJ GLDR_CAN.GDT 12/29/06

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.B.
CHECKED:

PROJECT No.: 05-1411-081U

# RECORD OF BOREHOLE: BH06-2

SHEET 4 OF 6

LOCATION: See Figure 2
N: 139801.87 E: 554160.36

BORING DATE: October 6-8, 2006

DATUM: Ordnance Datum

SAMPLER HAMMER, 64kg; DROP, 762mm

| DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE: DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (m) | SAMPLES: NUMBER | TYPE | BLOWS/0.3m | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) | SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80) | HYDRAULIC CONDUCTIVITY, k, cm/s ($10^{-6}$ $10^{-5}$ $10^{-4}$ $10^{-3}$) | WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | Aardvark Drilling Ltd. Trailer Mounted CME 55 - NW Casing with Tricone | Highly to completely weathered thinly bedded, dark grey with localized light grey zones and red and green mineralization, microcrystalline to very coarse grained, faintly porous to non-porous, extremely weak VOLCANICS. *(continued)* | | | 14 | DO 50 DO | 97 | | | | O H | | |
| 31 | | | | | 15 | 50 DO | 73 | | | | O | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | 16 | 50 DO | 51 | | | | O | | |
| | | | | -31.14 | | | | | | | | | |
| 34 | | Refer to ROCK LOG for continuation of rock description. | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | |

BOREHOLE 05-1411-081U.GPJ GLDR_CAN.GDT 12/29/06

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.B.

CHECKED:

PROJECT No.: 05-1411-081U

# RECORD OF DRILLHOLE: BH06-2

SHEET 5 OF 6

LOCATION: See Figure 2
N: 139801.87 E: 554160.36

DRILLING DATE: October 6-8, 2006
DRILL RIG: CME 55
DRILLING CONTRACTOR: Aardvark Drilling Ltd.

DATUM: Ordnance Datum

FR-FRACTURE F-FAULT SM-SMOOTH FL-FLEXURED BC-BROKEN CORE
CL-CLEAVAGE J-JOINT R-ROUGH UE-UNEVEN MB-MECH. BREAK
SH-SHEAR P-POLISHED ST-STEPPED W-WAVY B-BEDDING
VN-VEIN S-SLICKENSIDED PL-PLANAR C-CURVED CH-CHLORITIZED

| DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE (m/min) | FLUSH / % RETURN | RECOVERY: TOTAL CORE % | RECOVERY: SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 0.3 | DISCONTINUITY DATA: DIP w.r.t. CORE AXIS | DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION | ROCK STRENGTH INDEX | WEATHERING INDEX | NOTES WATER LEVELS INSTRUMENTATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Continued from SOIL LOG. | | -31.14 | | | | | | | | | | | | |
| 34 | Aardvark Drilling Ltd. Trailer Mounted CME 55 - NQ Core Barrel | Highly to completely weathered thinly bedded, dark grey with localized light grey zones and red and green mineralization, microcrystalline to very coarse grained, faintly porous to non-porous, extremely weak VOLCANICS.<br>- broken core from: 33.4m to 35.9m depth.<br>- see detailed lithology in Appendix II. | | 33.38 | 1 | | Grey 100 | | | | | | | | | |
| | | | | | 2 | | Grey 100 | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | | |
| 36 | | | | -33.73 | 3 | | Grey 100 | | | | | | | | | |
| | | Moderate to slightly weathered, thinly bedded, medium to dark grey-green with white calcite veins, fine to very coarse grained, non-porous, weak VOLCANICS.<br>- broken core from: 36.0m to 36.8m and 37.2m to 37.4m depths.<br>- see detailed lithology in Appendix II. | | 35.97 | | | | | | | | | | | | |
| 37 | | | | | 4 | | Grey 100 | | | | | | | | | |
| | | | | -35.25 | | | | | | | | | | | | |
| 38 | | Fresh, thinly bedded, medium to dark grey-green with white calcite veins, microcrystalline to coarse grained, non-porous, weak to medium strong VOLCANICS.<br>- joints are planar to irregular and rough to very rough.<br>- broken core from: 38.1m to 38.7m depth.<br>- see detailed lithology in Appendix II. | | 37.49 | | | | | | | | | | | | UCS = 22.6 MPa |
| | | | | -36.77 | | | | | | | | | | | | |
| 39 | | Fresh, thinly bedded, dark grey with white calcite veins, fine to medium crystalline, non-porous, medium strong VOLCANICS.<br>- broken core from: 39.0m to 39.6m and 40.0m to 40.6m depth.<br>- see detailed lithology in Appendix II. | | 39.01 | 5 | | Grey 100 | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | |
| | | | | -38.45 | 6 | | Grey 100 | | | | | | | | | |
| | | Fresh, thinly bedded, green-grey with white calcite veins, microcrystalline, medium strong VOLCANICS.<br>- broken core through layer.<br>- see detailed lithology in Appendix II. | | 40.69 | | | | | | | | | | | | |
| 41 | | | | -39.26 | | | | | | | | | | | | |
| | | Fresh, thinly bedded, grey-green-black, fine to very coarse grained, non-porous, weak VOLCANICS. | | 41.50 | | | | | | | | | | | | UCS = 13.8 MPa |
| | | | | -39.67 | | | | | | | | | | | | |
| 42 | | Firm, moist, grey-green, silty CLAY, some sand and angular gravel, some silt. | | -39.82 | | | | | | | | | | | | |
| | | Fresh, thinly bedded, light grey-green, microcrystalline with fine to medium grained inclusions, non-porous, weak VOLCANICS.<br>- joints are planar to irregular and very rough.<br>- broken core from: 42.2m to 42.7m depth.<br>- see detailed lithology in Appendix II. | | 42.06 | 7 | | Grey 100 | | | | | | | | | |
| 43 | | | | -40.74 | | | | | | | | | | | | |
| | | | | 42.98 | | | | | | | | | | | | |
| | | CONTINUED NEXT PAGE | | | | | | | | | | | | | | |

DRILLHOLE 05-1411-081U.GPJ GLDR_CAN.GDT 12/29/06

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.B.
CHECKED:

PROJECT No.: 05-1411-081U

# RECORD OF DRILLHOLE: BH06-2

SHEET 6 OF 6

LOCATION: See Figure 2
N: 139801.87 E: 554160.36

DRILLING DATE: October 6-8, 2006
DRILL RIG: CME 55
DRILLING CONTRACTOR: Aardvark Drilling Ltd.

DATUM: Ordnance Datum

FR-FRACTURE F-FAULT SM-SMOOTH FL-FLEXURED BC-BROKEN CORE
CL-CLEAVAGE J-JOINT R-ROUGH UE-UNEVEN MB-MECH. BREAK
SH-SHEAR P-POLISHED ST-STEPPED W-WAVY B-BEDDING
VN-VEIN S-SLICKENSIDED PL-PLANAR C-CURVED CH-CHLORITIZED

| DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | PENETRATION RATE (m/min) | FLUSH | COLOUR % RETURN | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 0.3 | DISCONTINUITY DATA DIP w.r.t. CORE AXIS | DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION | ROCK STRENGTH INDEX | WEATH-ERING INDEX | NOTES WATER LEVELS INSTRUMENTATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | End of BOREHOLE. at 42.98m. (achieved suitable depth) | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | | | | | | |

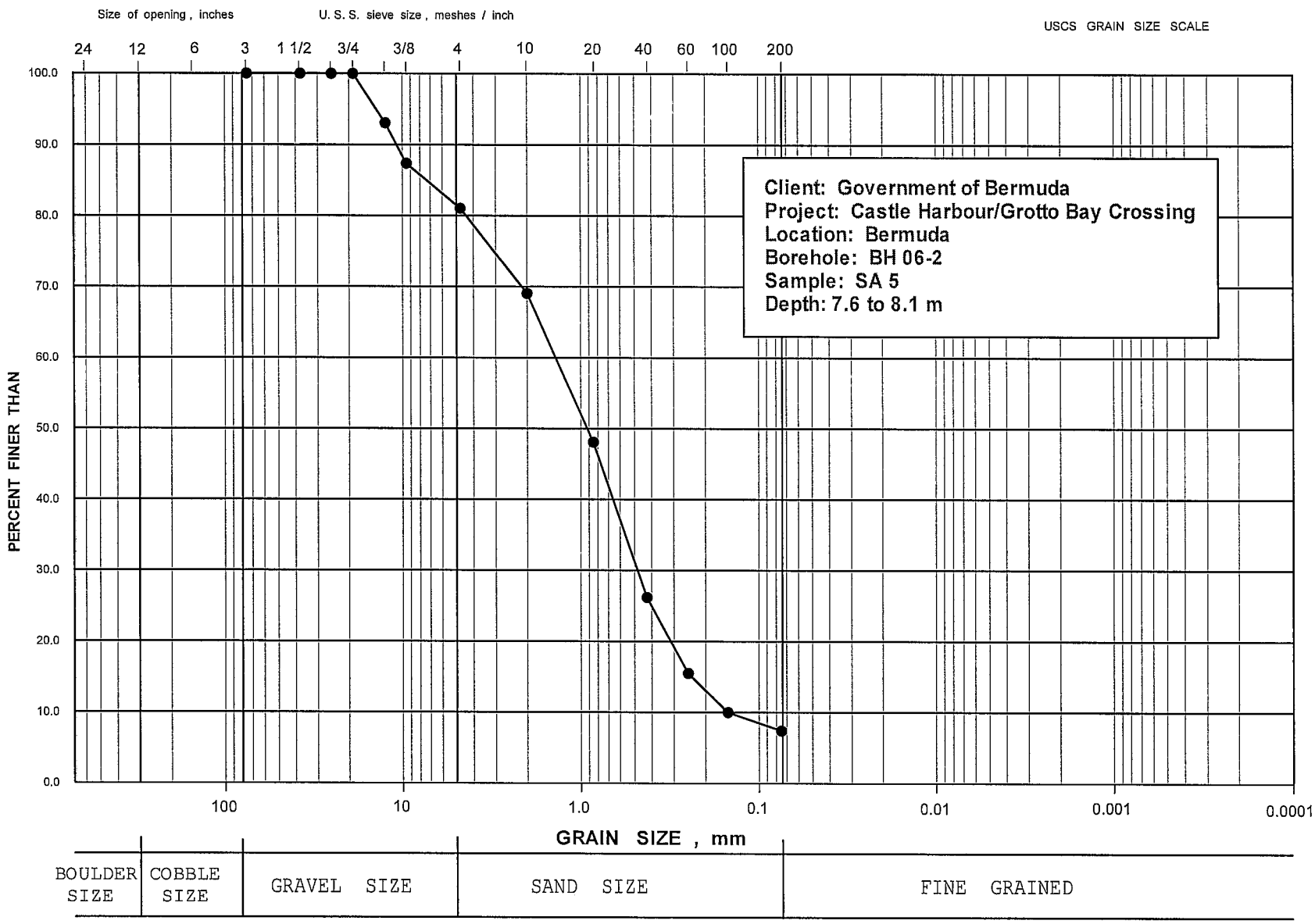
DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.B.
CHECKED:

DRILLHOLE 05-1411-081U.GPJ GLDR_CAN.GDT 12/29/06

# GRAIN SIZE DISTRIBUTION ANALYSIS TEST RESULTS

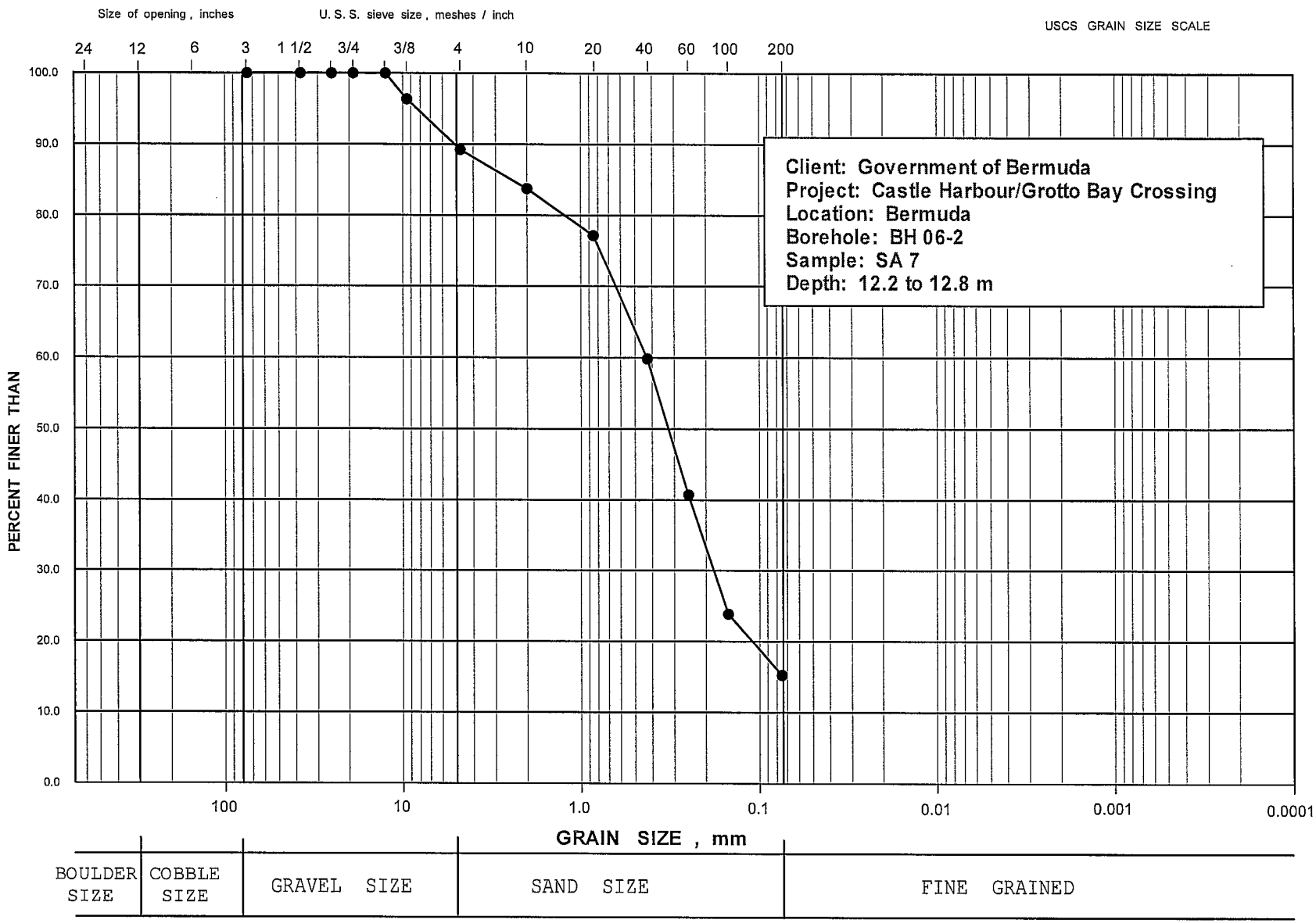



Project No.:.05-1411081U
Drawn: .....TP.....
Reviewed: .....PBB.....
Date:.....Nov. 28/06.....

Golder Associates

## GRAIN SIZE DISTRIBUTION

Figure
**II-3**




Project No.:05-1411081U
Drawn: .....TP.....
Reviewed: ...PSB.....
Date:.....Nov. 28/06.....

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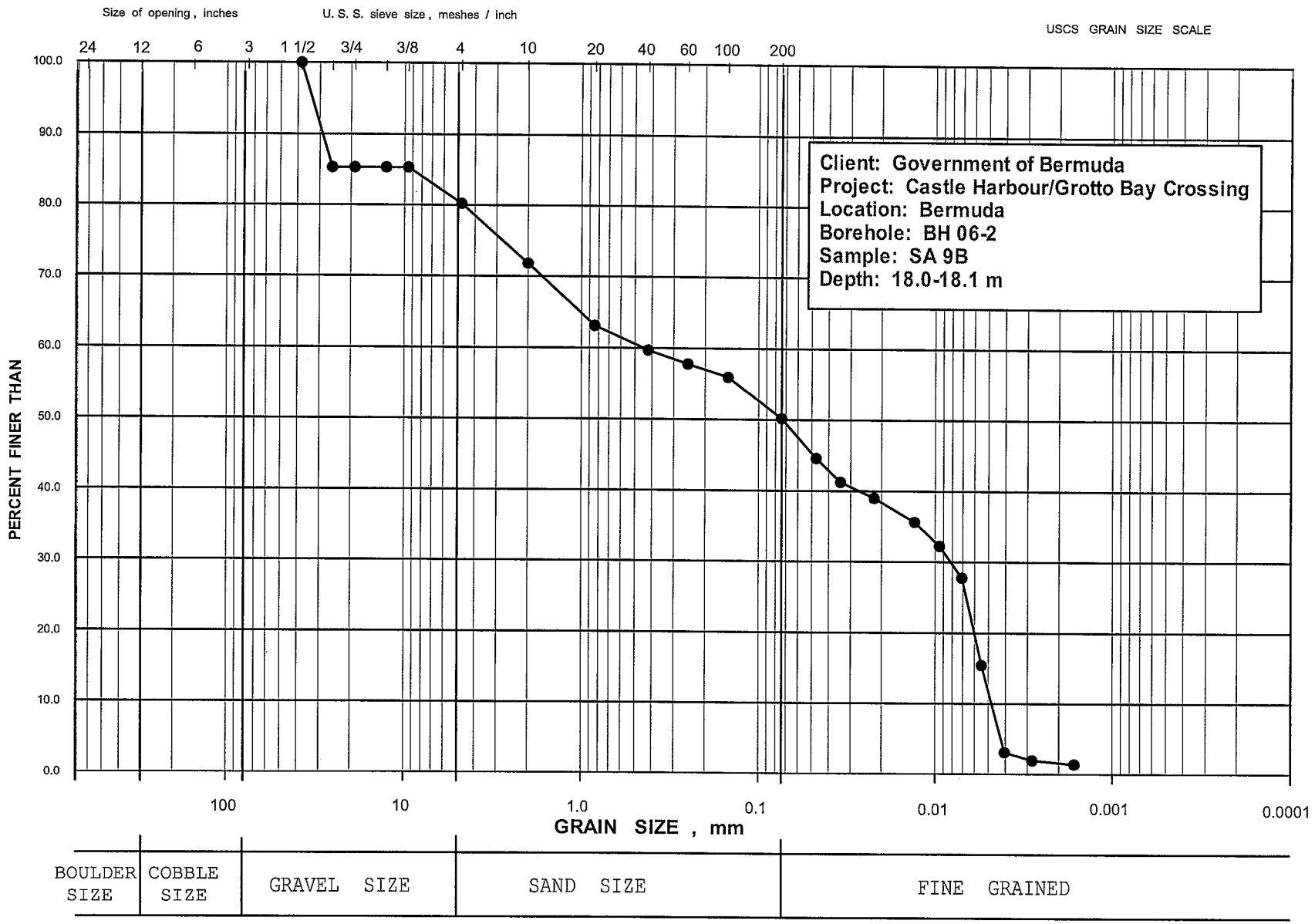
## GRAIN SIZE DISTRIBUTION

Figure
**II-4**




Project No.:..05-1411-081U...
Drawn: .....LL.....
Reviewed: ....PBB.....
Date:....November 24, 2006...

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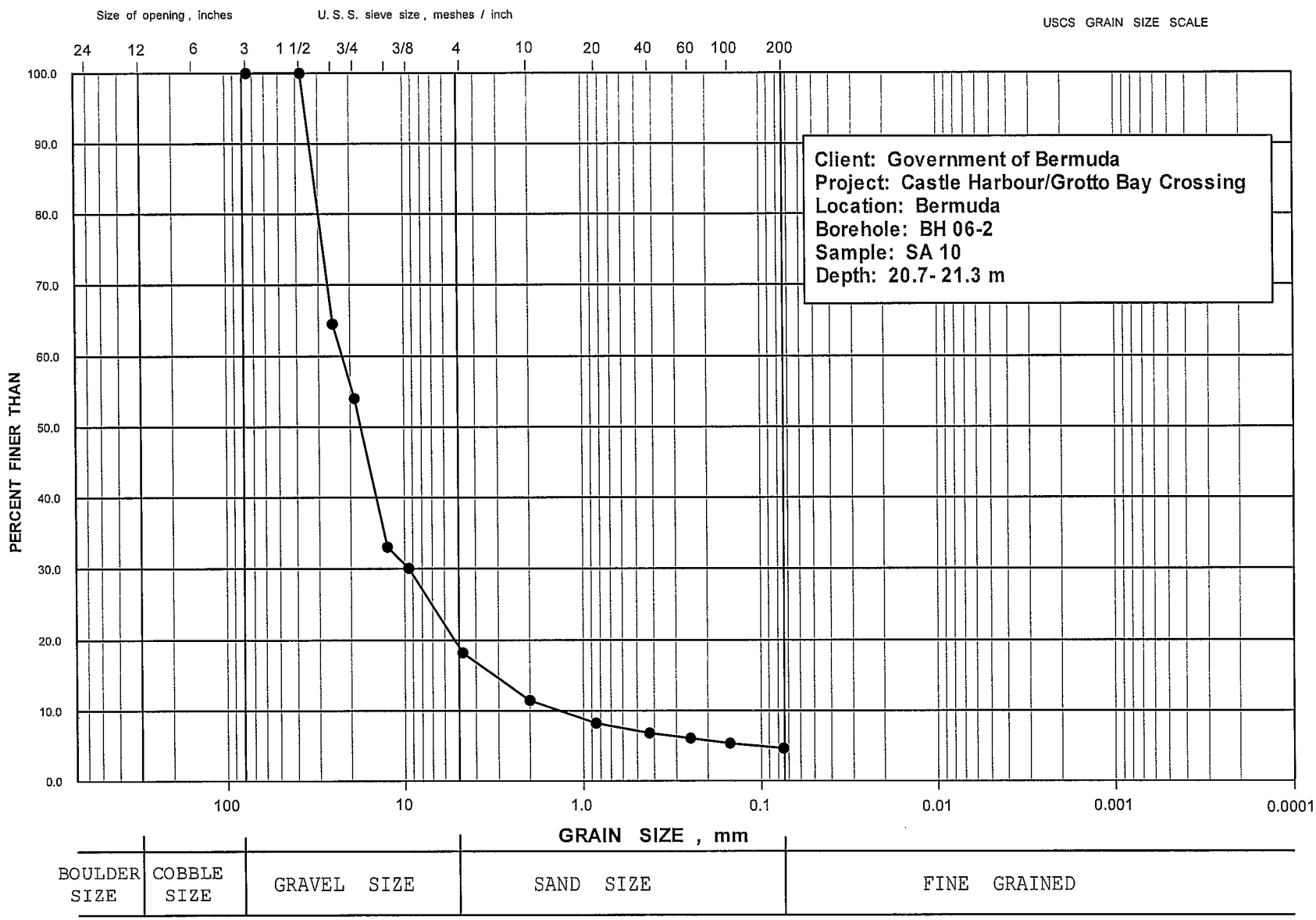
**GRAIN SIZE DISTRIBUTION**

**Figure II-5**




Project No.:05-1411081U
Drawn: .....TP.....
Reviewed: .....PGB.....
Date:.....Nov. 28/06.....

Golder Associates

## GRAIN SIZE DISTRIBUTION

Figure
**II-6**