WILLIAM C. CROMER PTY. LTD.
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ENVIRONMENTAL, ENGINEERING AND GROUNDWATER GEOLOGISTS

ECOAST HOMES PTY LTD

EASTMAN'S GREEN SUBDIVISION
PENQUITE ROAD, NEWSTEAD

GEOTECHNICAL ASSESSMENT

ADDENDUM REPORT
MAY 2011

Cover photo View looking towards the western slopes of the subdivision, on which three diamond drill holes were located and drilled in December 2010 and April 2011.

Refer to this report as

Cromer, W. C. (2008). *Geotechnical Assessment Addendum Report, Eastman's Green subdivision, Penquite Road, Newstead.* (Unpublished report for ECoast Homes Pty Ltd by William C. Cromer Pty. Ltd., 22 May 2011; 33 pages)

William C Cromer Pty Ltd may submit hard or electronic copies of this report to Mineral Resources Tasmania to enhance the geotechnical database of Tasmania.

Important Note

1 INTRODUCTION

1.1 BACKGROUND

ECoast Homes Pty Ltd is developing a 76-lot residential subdivision ("Eastman's Green") on about 6ha of land off Penquite Road in Newstead (Attachment 1).

In 2009, William C Cromer Pty Ltd was commissioned by the client via engineer M. van der Molen to prepare a geotechnical assessment of the property, with particular reference to the risk of slope instability in relation to residential dwellings. A geotechnical report was completed and recommended conditional development. Condition 16 on page 22 of the April 2009 report stated:

> "Undertake a programme of diamond drilling on selected parts of the property. Its intent is to refine the geological model and slope stability assessment in relation to deep-seated slope instability. Further recommendations might arise as a result."

Accordingly, a three-hole diamond drilling programme was conducted in December 2010 and April 2011.

This is an addendum report to the April 2009 report, which describes the drilling programme, reviews its results, and offers recommendations for development of this part of the subdivision.

The reader is referred to the original report for a detailed presentation and discussion of the geology of the site, and its geotechnical (including slope stability) issues.

1.2 ATTACHMENTS TO THIS REPORT

Some of the following Attachments were included in the April 2009 report, and are repeated here with or without amendment.

Attachment 1. Location of the proposed subdivision (1 page)
Attachment 2. District and local geology (1 page)
Attachment 3. Proposal plan and Google Earth imagery (1 page)
Attachment 4. 1947 aerial photography of the area, showing 2010 – 2011 diamond drill hole locations (1 page)
Attachment 5. Geotechnical sketch of the proposal showing topography, 2009 test pit locations, and 2010-2011 diamond drill hole locations (1 page)
Attachment 6. Drill hole logs and site and core photograph (18 pages)
Attachment 7. Interpreted geological map and cross sections cross sections (2 pages)

2 RESULTS

2.1 DIAMOND DRILLING

The diamond drill holes (Table 1) were located on the western slopes of the subdivision (Attachments 4 and 5), at elevations between about 35m and 41m, to investigate the evidence or potential for of deep-seated slope instability.

Details relating to each hole, including completion details, are presented in the engineering logs and core photographs in Attachment 6.

Each hole was completed as piezometers or monitoring bores using machine-slotted PVC screens, gravel pack and bentonite seals.

Table 1. Summary of diamond drill holes

	RL	Easting	Northing	Total depth (m)
DDH A	40.69	513916	5411014	20.0
DDH B	35.07	513962	5410874	18.5
DDH C	41.07	513945	5410939	20.0

2.2 STRATIGRAPHY

All three holes penetrated materials interpreted as Tertiary sediments – mainly sandstone and claystone, as follows:

DDH A

0 – 3m	Sandy clay (surface 0.6m is FILL; remainder is soil)
3 – 7m	Clay and Claystone
7 – 18m	Sandstone: weakly cemented
18 – 20m	Claystone

DDH B

0 – 0.8m	Sandy silt (soil)
0.8 – 10m	Clay
10 – 17m	Sandstone: weakly cemented
17 – 18.5m	Claystone

DDH C

0 – 1.2m	Sandy silt (soil)
1.2 – 10.4m	Clay
10.4 – 13.3m	Sandstone: weakly cemented, and sand
13.3 – 16.2m	Claystone and sandstone
16.2 – 18.5	Sandstone

There is thus a rough correlation across the slope between the three holes (Attachment 7), with a near-surface clayey unit between 7 – 10m thick, overlying a sandstone unit of more variable thickness (about 3 – 11m) which in turn overlies claystone in DDH A and DDH B (but not DDH C which is located between them).

The sandstone and claystone may be correlated with similar materials exposed in test pits on lower slopes, but they could also simply be stratigraphic repetitions.

See Attachment 11 of the April 2009 report for a detailed discussion of the geology of the subdivision.

2.3 STRUCTURE

Sediments exposed in test pits in the subdivision exhibit variable dips (Attachment 5) and dip directions. Measured dips are in the range 5 – 30^0, and dip directions range from SE to SW to W and NNE. The variability is unlikely to be due to original sedimentary angles, and is more likely to relate to basement form, folding, faulting and intraformational slumping rather than more recent slope instability.

The variability also suggested that angled diamond drilling to estimate true dip would add little to the overall structural picture. Core from the vertical diamond holes generally show low angle dips around 5^0, but two instances of steep dips beneath subhorizontal dips were observed – at 14.4m in DDH B, and 10.5m in DDH C. Photographs of the cores near these depths are shown in Attachment 6.

In both instances the surface separating the two dip angles are interpreted as failure surfaces. In each instance, the failure surface and the materials above and below were of relatively high strength and weakly cemented, suggesting they are old features with no recent movement.

2.4 GROUNDWATER

Groundwater was encountered in DDH A and DDH B. It is probably present also in DDH C, but the diamond hole was not completed. Instead, to test material type, strength and groundwater conditions without drilling with water, a hole was drilled with a solid auger next to DDH C to refusal at a depth of 14.5m. The driller reported very tight, dry clay from 10 – 14.5m, indicating the water table is deeper. This hole was cased, screened, gravel packed and bentonite-sealed.

During drilling DDH A, minor water losses occurred in sandstone in the interval 11.5 to 12.5m, and rapid losses were observed in sandstone in the interval 17.7 – 17.9m. Groundwater slowly entered the hole and three measurements between 2 December 2010 and 23 April 2011 showed a water table falling from 13.3m to 14.2m.

During drilling DDH B, water losses occurred in sandstone below about 12m. Groundwater slowly entered the hole and three readings between 2 December 2010 and 23 April 2011 showed a water table rising from the bottom of the hole at 18.5m, to 12.7m on 23 April 2011.

It appears a water table is present in the sediments at depths below about 12m or so.

2.5 MATERIAL STRENGTHS

Generally, the materials encountered in the diamond holes exhibited soil properties (remouldable in the hand, with or without adding water). Below the surface metre or so, clays and claystones were hard, and the sand and weakly cemented sandstone showed dense relative densities.

Standard penetration tests (SPTs) and pocket penetrometer readings were routinely conducted in each hole.

In DDH A, seven SPTs were done in the first 10.5m. N-values ranged from 10 near the surface, to 39 (bouncing) at 9m. The latter values in sand and weakly cemented sandstone indicate dense sand with relative densities in the 65 – 85% range. All values in clay indicate hard consistencies with undrained shear strengths above 200kPa. Pocket penetrometer readings on core were consistently above 400kPa below about 1.5m.

In DDH B, seven SPTs were done in the first 10.5m. N-values ranged from 9 near the surface, to 49 at 10.2m. The latter values in sand and weakly cemented sandstone indicate dense sand with relative densities in the 65 – 85% range. All values in clay indicate hard consistencies with undrained shear strengths above 200kPa. Pocket penetrometer readings on core were consistently above 300kPa below about 3m.

In DDH C, seven SPTs were done in the first 10.5m. N-values ranged from 20 near the surface, to 29 at 10.2m. The latter values in sand and weakly cemented sandstone indicate dense sand with relative densities in the 65 – 85% range. All values in clay indicate hard consistencies with undrained shear strengths above 200kPa. Pocket penetrometer readings on core were above 600kPa in the surface 4m or so, and mostly above 300kPa below about 4m.

3 DISCUSSION

In assessing the potential for deep seated slope instability on the western side of Eastman's Green subdivision, the following observations are relevant.

- Mineral Resources Tasmania (MRT) Landslide Hazard mapping shows that the higher, western parts of the proposal include both a fossil or old dormant landslide zone, and a fossil or old dormant landslide. The approximate locations of these features are shown here in Attachment 5, and were included in Attachment 5 of the April 2009 report.

- The same MRT maps show recent or active shallow landslides, and fossil or old dormant shallow landslides, near but not within the subdivision. Subsequent to the April 2009 report, land clearing on slopes below DDH A and DDH C exposed a topographic irregularity which appears to be a recent or dormant shallow landslide.

- There is no evidence of currently active deep-seated landsliding on or near the subdivision.

- Diamond drilling has revealed subsurface clay, claystone, sand and weakly cemented sandstone similar to materials exposed over the subdivision and in test pits. The materials are of relatively high strength.

- As discussed in the April 2009 report, examination of the dip directions and topographic slope directions over the subdivision indicate that there is no consistent relationship between them. Attachment 11 of the report stated: "This is significant from a slope stability viewpoint: if dip directions are similar to slope directions, it is possible the former are the result of slope failure. However, with the exception of pit N (where the dip and slope directions are effectively identical), dip directions on the Tertiary sediments differ by 45^0 to 315^0 from slope directions. This suggests their varied attitude is related to structural controls (basement form and post-depositional faulting, etc) rather than slope instability."

- Subhorizontal surfaces at around 14.4m in DDH B and 10.5m in DDH C separating disparate dip directions are interpreted as former failure surfaces. They are tight and sealed, suggesting ancient, not recent, deep seated movement.

4 CONCLUSIONS

It is concluded that the diamond drilling programme conducted in accordance with Recommendation 16 of the April 2009 geotechnical report has revealed no significant geotechnical issues which would materially alter the potential for deep-seated slope instability on the western slopes of the subdivision.

5 RECOMMENDATIONS

Continued development of the subdivision should proceed in accordance with the recommendations of the April 2009 geotechnical report. In particular, recommendations 6 to 15 are particularly important on the steeper western slopes of the subdivision.

W. C. Cromer
Principal

22 May 2011

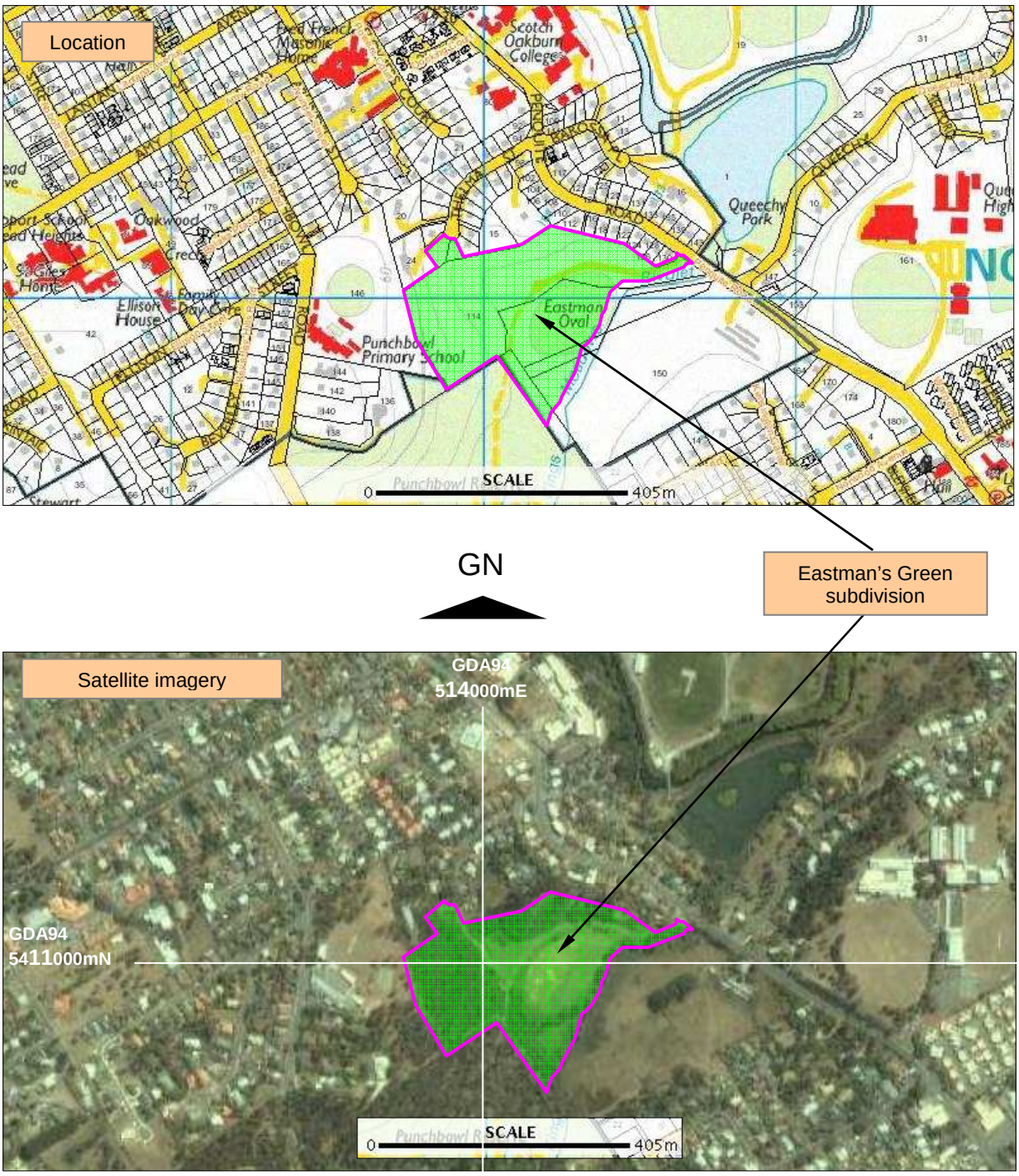
This report is and must remain accompanied by the following Attachments:

Attachment 1. Location of the proposed subdivision (1 page)
Attachment 2. District and local geology (1 page)
Attachment 3. Original proposal plan and Google Earth imagery (1 page)
Attachment 4. 1947 aerial photography of the area, showing 2010 – 2011 diamond drill hole locations (1 page)
Attachment 5. Geotechnical sketch of the proposal showing topography, 2009 test pit locations, and 2010-2011 diamond drill hole locations (1 page)
Attachment 6. Drill hole logs and site and core photograph (18 pages)
Attachment 7. Interpreted geological map and cross sections (3 pages)

Attachment 1

(1 page)

Location of the proposed subdivision

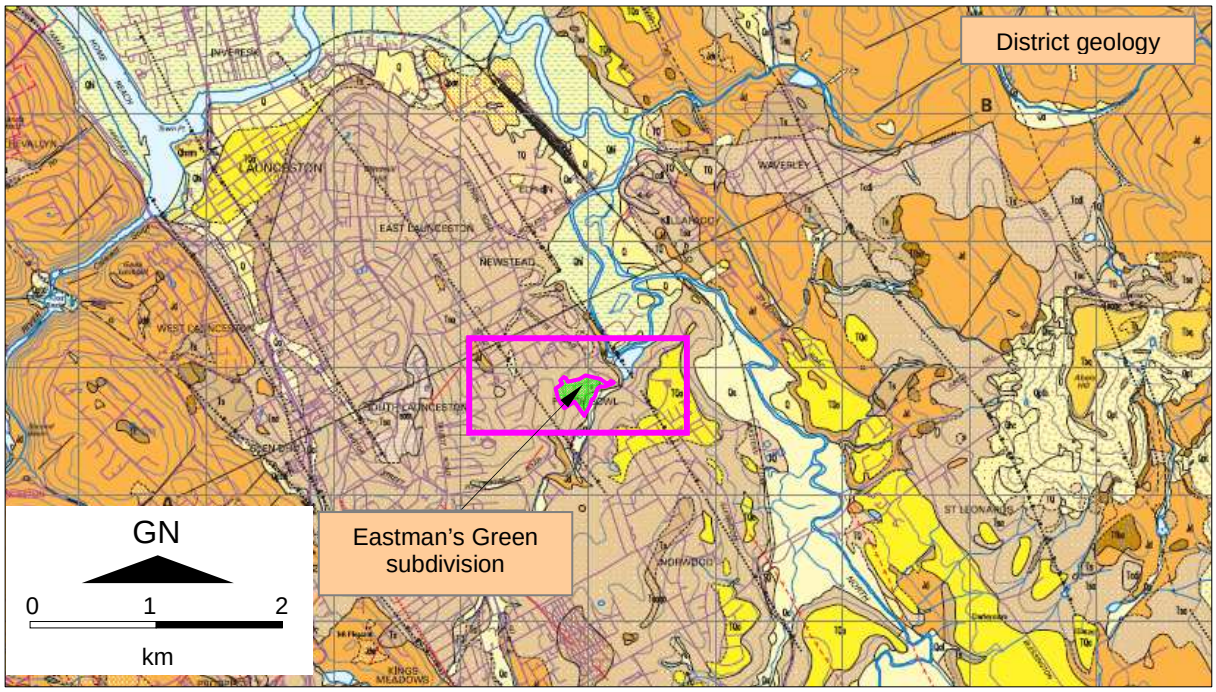


Sources: Location: www.thelist.tas.gov.au; Satellite imagery: Google Earth

Attachment 2

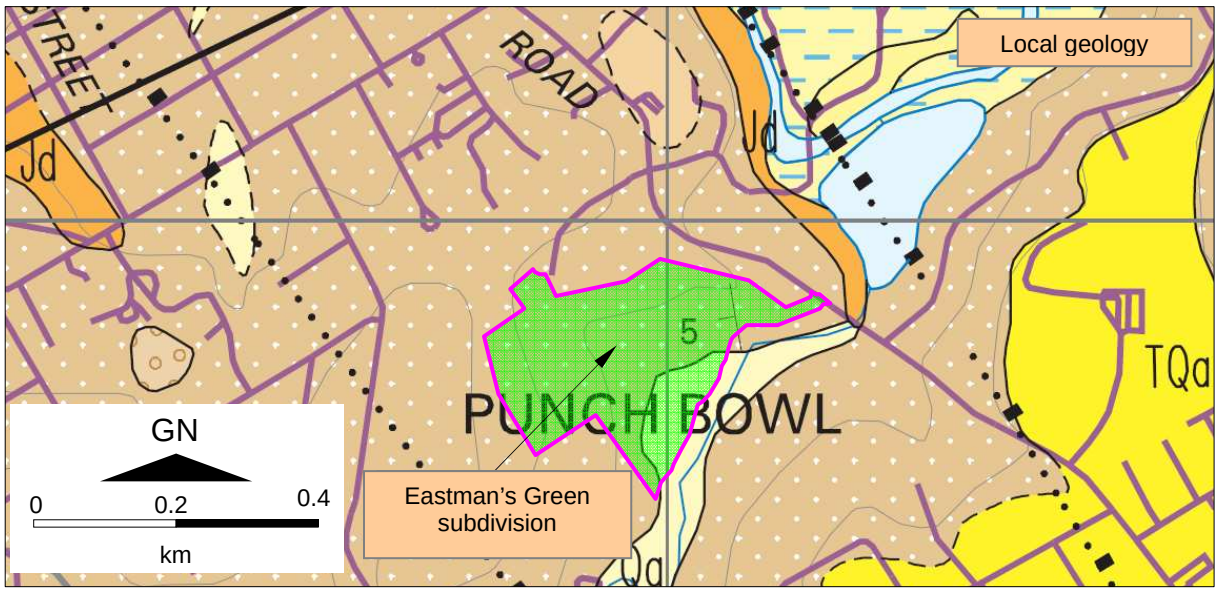
(1 page)

District and local geology



Source: Calver, C. R. and Forsyth, S. M (compilers) (2005). Map 3, Launceston – Geology. Tasmanian Landslide Hazard Series. Mineral Resources Tasmania. Key to rock types – Orange = Jurassic dolerite; Brown: Tertiary partly consolidated clay, silt, sand, clayey sand with rare lignite and gravel; Bright yellow = Late Cainozoic terrace deposits of gravel and sand alluvial materials; Light yellow = Quaternary talus; Yellow+blue dashes = Quaternary estuarine deposits

Site investigations confirm that most of the proposed subdivision (below) is underlain by partly consolidated sand (weakly cemented sandstone) and claystone of inferred Tertiary age. The balance along

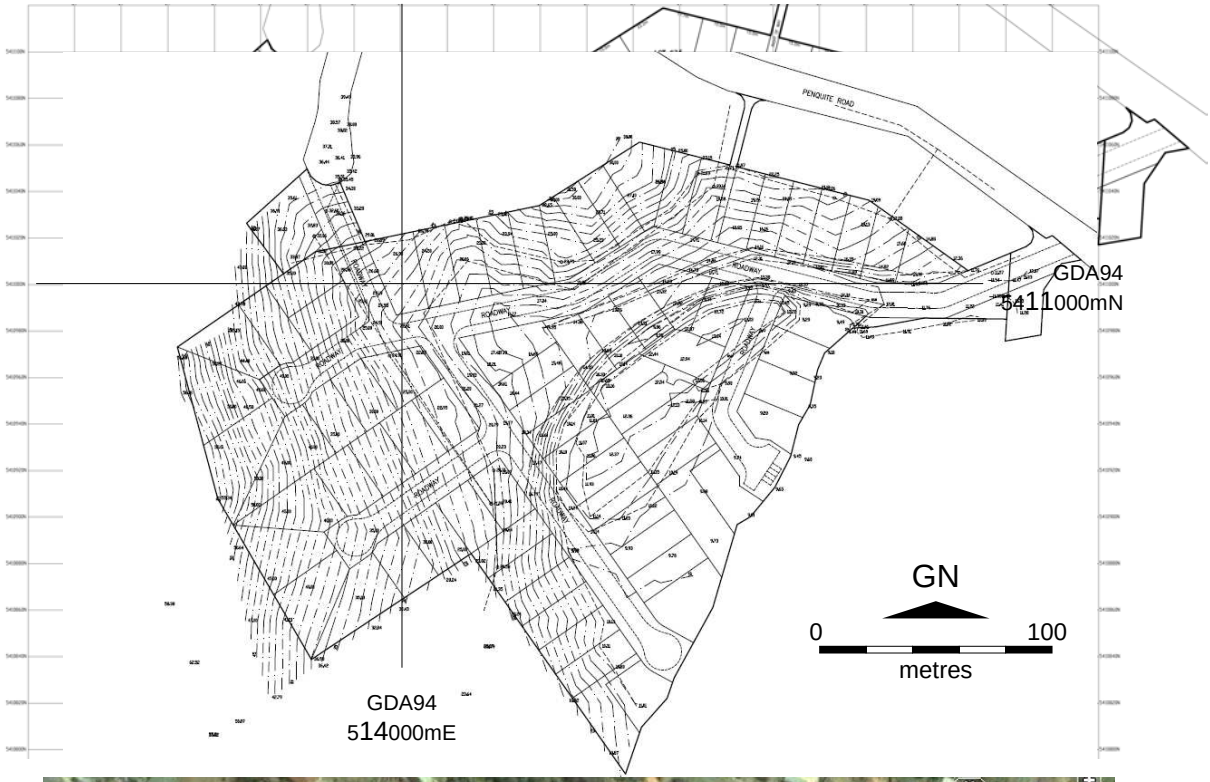


Attachment 3

(1 page)

Original proposal plan and Google Earth imagery

Source for proposal plan: Meindert van der Molen Drawing # ECHO209-DA 1/8

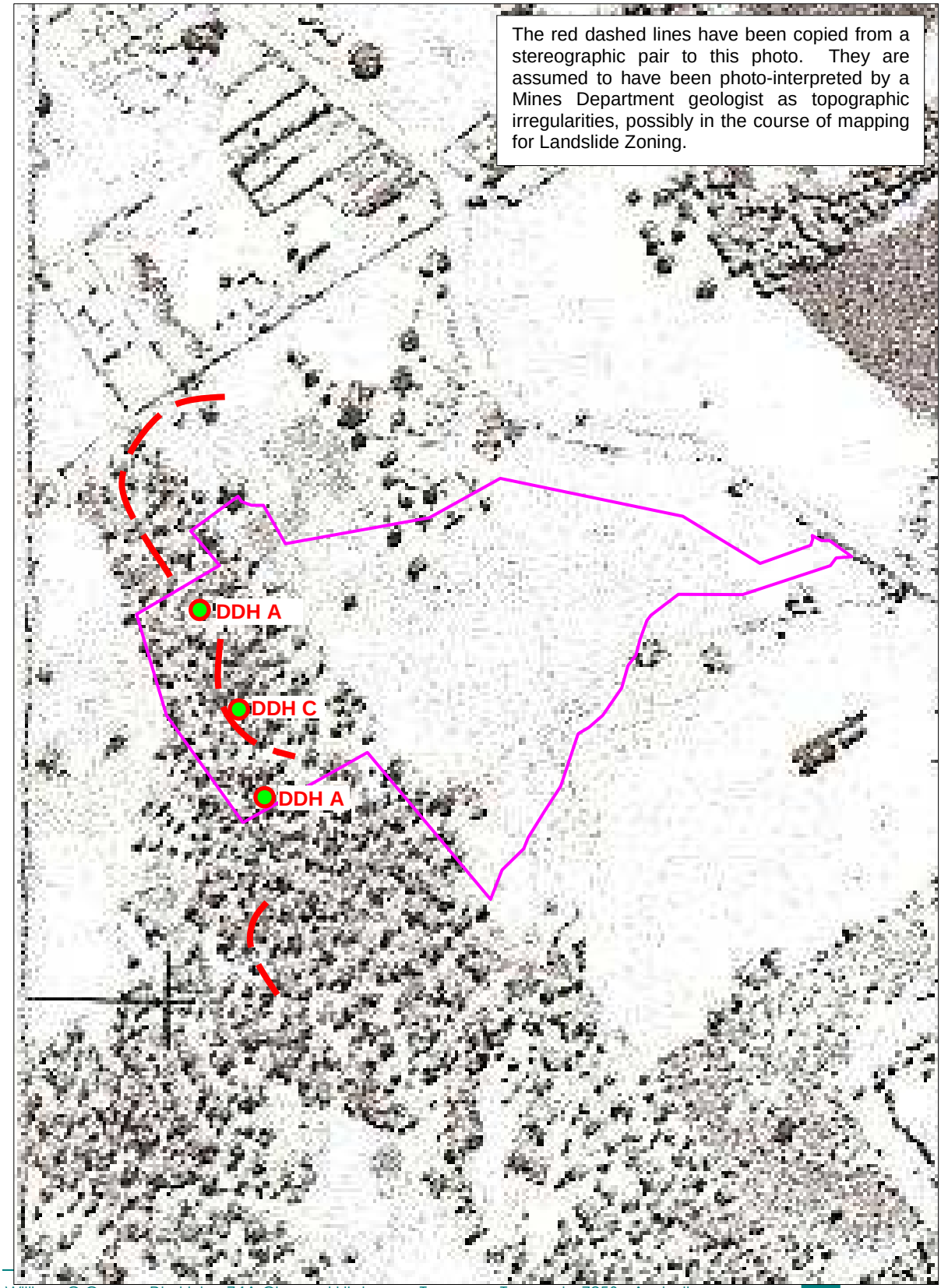


Attachment 4

(1 page)

1947 aerial photograph of the area, showing 2010 – 2011 diamond drill hole locations DDH A, DDH B AND DDH C

Mineral Resources Tasmania library: Launceston Run3 Print 20

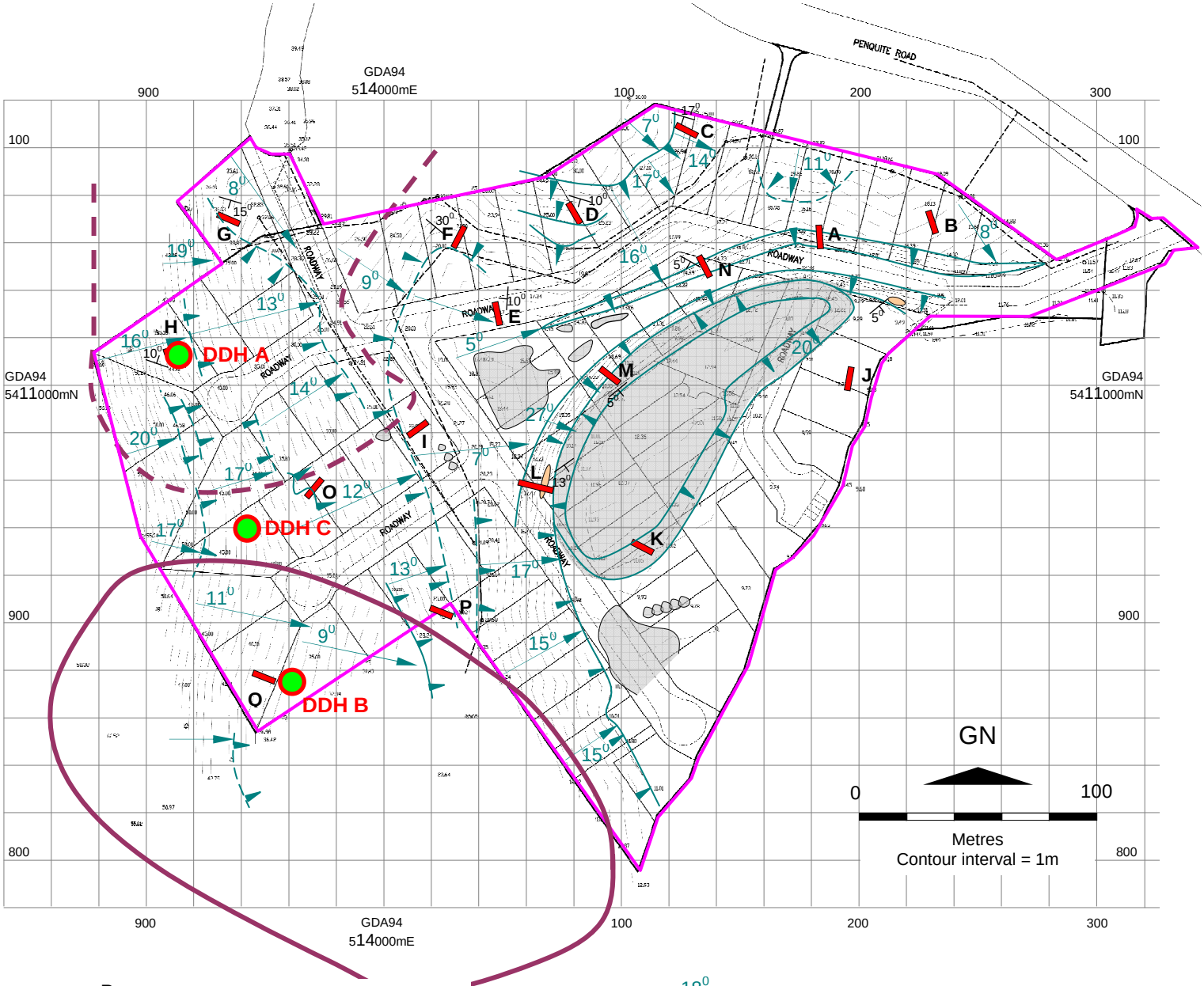


Attachment 5

(1 page)

Geotechnical sketch map of the proposal showing topography, 2009 test pit locations, and 2010 – 2011 diamond drill hole locations DDH A, DDH B AND DDH C

Source for base map: Meindert van der Molen



P — Test pit dug 17, 18 or 25 February 2009

Diamond drill hole location, Dec 2010 and April 2011

Fossil or old dormant landslide, position approximate

Landslide Zone; fossil or old dormant, position approximate

Recent inert fill

Outcrop of Tertiary weakly cemented sandstone with dip and strike of bedding shown; dip and strike also shown for sediments when exposed in test pits

18⁰ — Slope direction and angle

Convex change of slope (gentle)

Convex change of slope (abrupt)

Concave change of slope (gentle)

Concave change of slope (abrupt)

Attachment 6

(18 pages including this page)

Drill hole logs and site and core photographs


DDH A Location

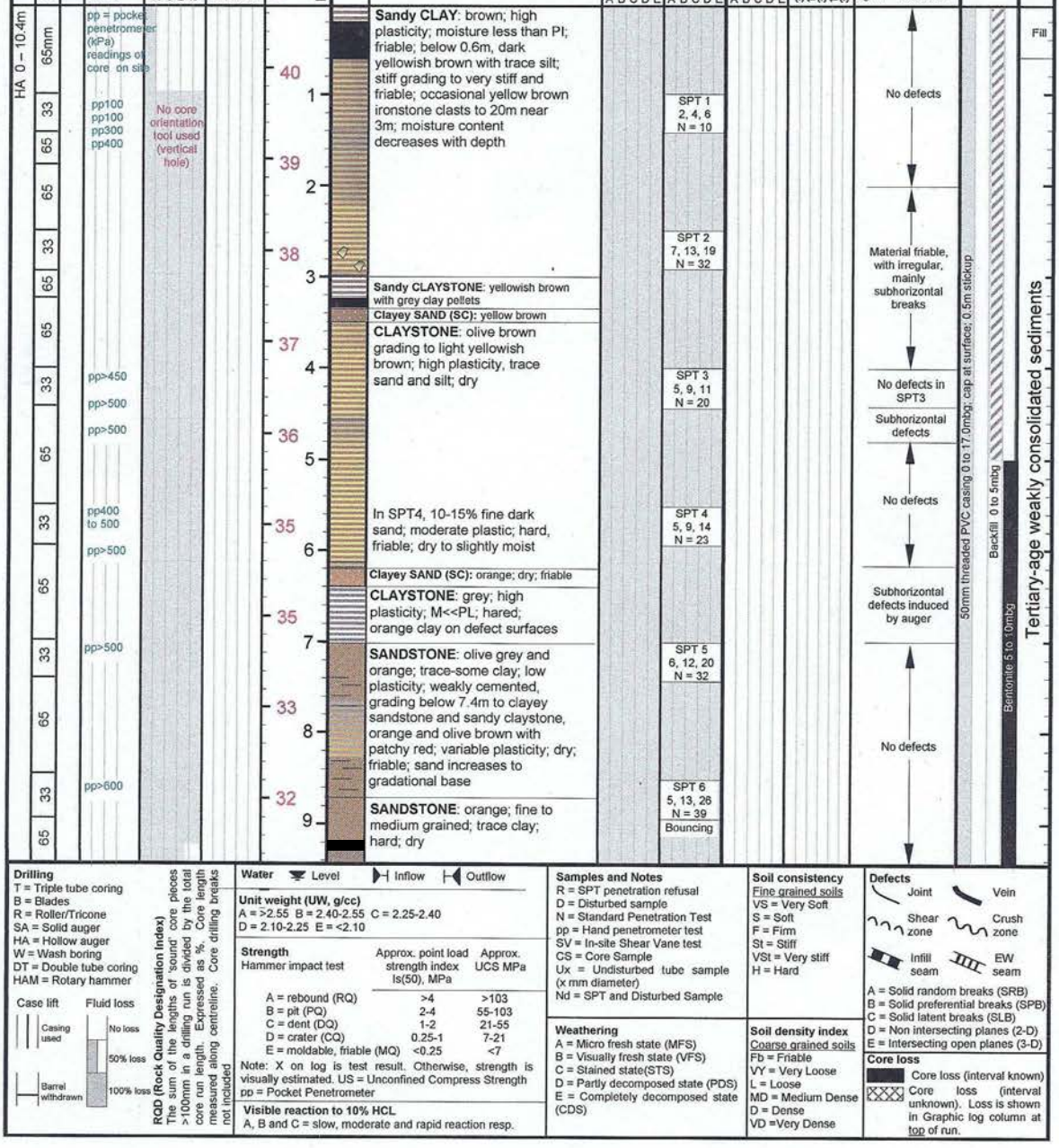
William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

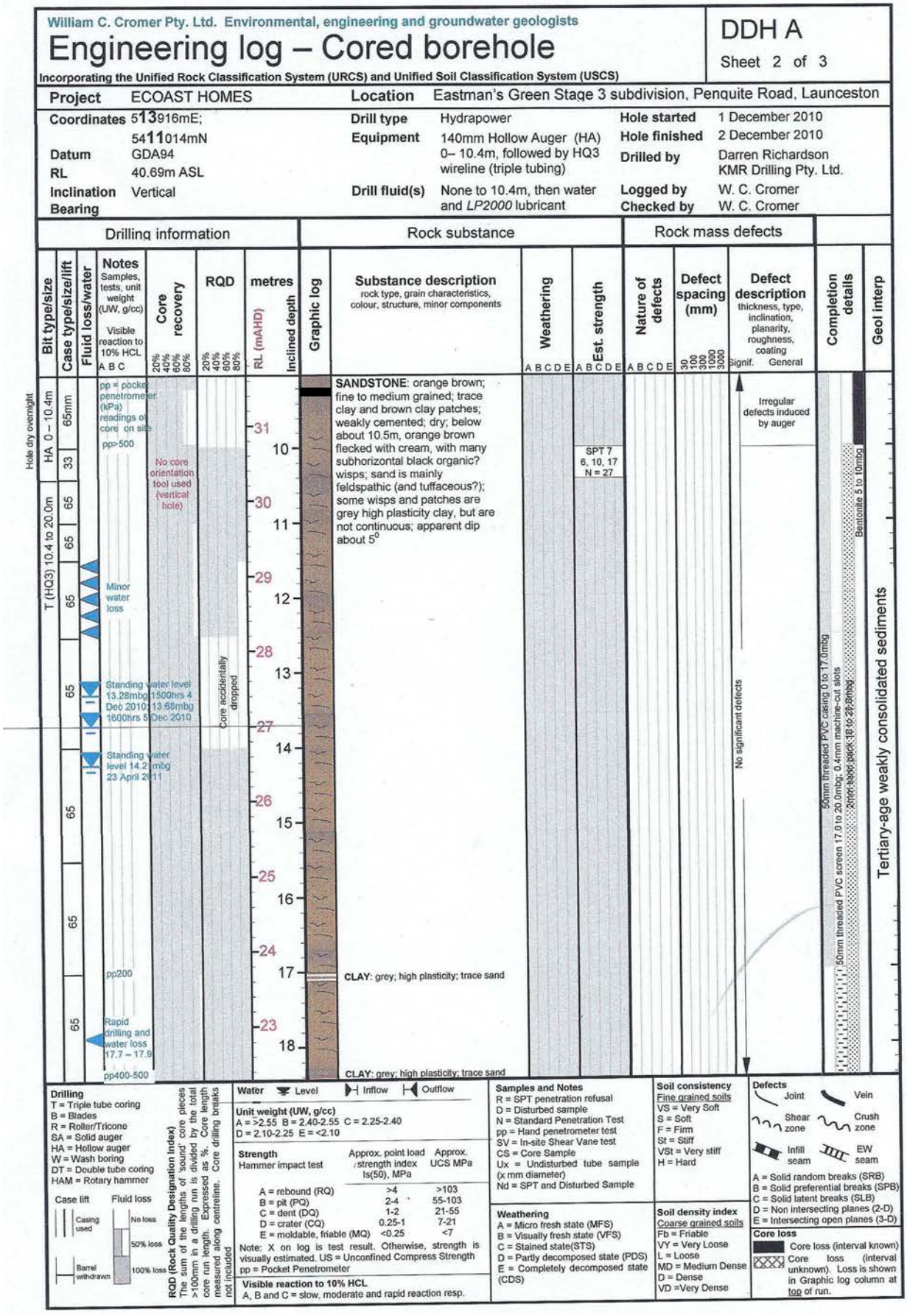
Engineering log – Cored borehole

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

DDH A Sheet 1 of 3

Project	ECOAST HOMES	**Location**	Eastman's Green Stage 3 subdivision, Penquite Road, Launceston
Coordinates	513916mE; 5411014mN	**Drill type**	Hydrapower
Datum	GDA94	**Equipment**	140mm Hollow Auger (HA) 0– 10.4m, followed by HQ3 wireline (triple tubing)
RL	40.69m ASL	**Drill fluid(s)**	None to 10.4m, then water and *LP2000* lubricant
Inclination	Vertical	**Logged by**	W. C. Cromer
Bearing		**Checked by**	W. C. Cromer
		Hole started	1 December 2010
		Hole finished	2 December 2010
		Drilled by	Darren Richardson KMR Drilling Pty. Ltd.




William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists
Engineering log – Cored borehole
Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)
DDH A
Sheet 2 of 3
Project ECOAST HOMES
Location Eastman's Green Stage 3 subdivision, Penquite Road, Launceston
Coordinates 513916mE; 5411014mN
Datum GDA94
RL 40.69m ASL
Inclination Vertical
Bearing
Drill type Hydrapower
Equipment 140mm Hollow Auger (HA) 0– 10.4m, followed by HQ3 wireline (triple tubing)
Drill fluid(s) None to 10.4m, then water and LP2000 lubricant
Hole started 1 December 2010
Hole finished 2 December 2010
Drilled by Darren Richardson KMR Drilling Pty. Ltd.
Logged by W. C. Cromer
Checked by W. C. Cromer
Drilling information
Rock substance
Rock mass defects
Bit type/size
Case type/size/lift
Fluid loss/water
Notes Samples, tests, unit weight (UW, g/cc) Visible reaction to 10% HCL
Core recovery
RQD
metres
RL (mAHD)
Inclined depth
Graphic log
Substance description rock type, grain characteristics, colour, structure, minor components
Weathering
Est. strength
Nature of defects
Defect spacing (mm)
Defect description thickness, type, inclination, planarity, roughness, coating
Completion details
Geol interp
Hole dry overnight
HA 0 – 10.4m
T (HQ3) 10.4 to 20.0m
pp = pocket penetrometer (kPa) readings of core on site
pp>500
No core orientation tool used (vertical hole)
Minor water loss
Standing water level 13.28mbg 1500hrs 4 Dec 2010; 13.68mbg 1600hrs 5 Dec 2010
Standing water level 14.2 mbg 23 April 2011
pp200
Rapid drilling and water loss 17.7 – 17.9
pp400-500
Core accidentally dropped
SANDSTONE: orange brown; fine to medium grained; trace clay and brown clay patches; weakly cemented; dry; below about 10.5m, orange brown flecked with cream, with many subhorizontal black organic? wisps; sand is mainly feldspathic (and tuffaceous?); some wisps and patches are grey high plasticity clay, but are not continuous; apparent dip about 5°
SPT 7 6, 10, 17 N = 27
CLAY: grey; high plasticity; trace sand
CLAY: grey; high plasticity; trace sand
Irregular defects induced by auger
No significant defects
50mm threaded PVC casing 0 to 17.0mbg
50mm threaded PVC screen 17.0 to 20.0mbg; 0.4mm machine-cut slots
Bentonite 5 to 10mbg
Tertiary-age weakly consolidated sediments
Drilling
T = Triple tube coring
B = Blades
R = Roller/Tricone
SA = Solid auger
HA = Hollow auger
W = Wash boring
DT = Double tube coring
HAM = Rotary hammer
Case lift
Fluid loss
Casing used
Barrel withdrawn
No loss
50% loss
100% loss
RQD (Rock Quality Designation Index) The sum of the lengths of 'sound' core pieces >100mm in a drilling run is divided by the total core run length. Expressed as %. Core length measured along centreline. Core drilling breaks not included
Water Level Inflow Outflow
Unit weight (UW, g/cc)
A = >2.55 B = 2.40-2.55 C = 2.25-2.40
D = 2.10-2.25 E = <2.10
Strength
Hammer impact test
Approx. point load strength index Is(50), MPa
Approx. UCS MPa
A = rebound (RQ) >4 >103
B = pit (PQ) 2-4 55-103
C = dent (DQ) 1-2 21-55
D = crater (CQ) 0.25-1 7-21
E = moldable, friable (MQ) <0.25 <7
Note: X on log is test result. Otherwise, strength is visually estimated. US = Unconfined Compress Strength
pp = Pocket Penetrometer
Visible reaction to 10% HCL
A, B and C = slow, moderate and rapid reaction resp.
Samples and Notes
R = SPT penetration refusal
D = Disturbed sample
N = Standard Penetration Test
pp = Hand penetrometer test
SV = In-site Shear Vane test
CS = Core Sample
Ux = Undisturbed tube sample (x mm diameter)
Nd = SPT and Disturbed Sample
Weathering
A = Micro fresh state (MFS)
B = Visually fresh state (VFS)
C = Stained state(STS)
D = Partly decomposed state (PDS)
E = Completely decomposed state (CDS)
Soil consistency
Fine grained soils
VS = Very Soft
S = Soft
F = Firm
St = Stiff
VSt = Very stiff
H = Hard
Soil density index
Coarse grained soils
Fb = Friable
VY = Very Loose
L = Loose
MD = Medium Dense
D = Dense
VD =Very Dense
Defects
Joint
Vein
Shear zone
Crush zone
Infill seam
EW seam
A = Solid random breaks (SRB)
B = Solid preferential breaks (SPB)
C = Solid latent breaks (SLB)
D = Non intersecting planes (2-D)
E = Intersecting open planes (3-D)
Core loss
Core loss (interval known)
Core loss (interval unknown). Loss is shown in Graphic log column at top of run.

William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

Engineering log – Cored borehole

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

DDH A Sheet 3 of 3

Project	ECOAST HOMES	**Location**	Eastman's Green Stage 3 subdivision, Penquite Road, Launceston
Coordinates	513916mE; 5411014mN	**Drill type**	Hydrapower
Datum	GDA94	**Equipment**	140mm Hollow Auger (HA) 0– 10.4m, followed by HQ3 wireline (triple tubing)
RL	40.69m ASL	**Drill fluid(s)**	None to 10.4m, then water and *LP2000* lubricant
Inclination	Vertical	**Hole started**	1 December 2010
Bearing		**Hole finished**	2 December 2010
		Drilled by	Darren Richardson KMR Drilling Pty. Ltd.
		Logged by	W. C. Cromer
		Checked by	W. C. Cromer

Drilling information								Rock substance			Rock mass defects					
Bit type/size	Case type/size/lift	Fluid loss/water	Notes: Samples, tests, unit weight (UW, g/cc); Visible reaction to 10% HCL (A B C)	Core recovery (20% 40% 60% 80%)	RQD (20% 40% 60% 80%)	metres: RL (mAHD)	metres: Inclined depth	Graphic log	Substance description: rock type, grain characteristics, colour, structure, minor components	Weathering (A B C D E)	Est. strength (A B C D E)	Nature of defects (A B C D E)	Defect spacing (mm) (30 100 300 1000 3000)	Defect description: thickness, type, inclination, planarity, roughness, coating (Signif. / General)	Completion details	Geol interp
T (HQ3) 10.4 to 20.0m	65		pp>600 pp600 pp>600 pp550 pp>600 pp550 pp510 p550 pp550	No core orientation tool used (vertical hole)		22 19 21 20			**CLAYSTONE and sandy CLAYSTONE**: dark grey to 19m, then grey; some black organic charcoal? wisps; trace silt; apparent dip at 18.8m approx. 20°					No significant defects	50mm threaded PVC screen 17.0 to 20.0mbg; 0.4mm machine-cut slots 2mm sand pack 10 to 20.0mbg Bentonite 5 to 10mbg	Tertiary-age weakly consolidated sediments
			pp = pocket penetrometer (kPa) readings of core on site						End of hole as required at 20.0mbg (RL20.7m)							

Drilling
T = Triple tube coring
B = Blades
R = Roller/Tricone
SA = Solid auger
HA = Hollow auger
W = Wash boring
DT = Double tube coring
HAM = Rotary hammer

Case lift: Casing used; Barrel withdrawn
Fluid loss: No loss; 50% loss; 100% loss

RQD (Rock Quality Designation Index) The sum of the lengths of sound core pieces >100mm in a drilling run is divided by the total core run length. Expressed as %. Core length measured along centreline. Core drilling breaks not included

Water Level; Inflow; Outflow

Unit weight (UW, g/cc)
A = >2.55 B = 2.40-2.55 C = 2.25-2.40
D = 2.10-2.25 E = <2.10

Strength

Hammer impact test	Approx. point load strength index Is(50), MPa	Approx. UCS MPa
A = rebound (RQ)	>4	>103
B = pit (PQ)	2-4	55-103
C = dent (DQ)	1-2	21-55
D = crater (CQ)	0.25-1	7-21
E = moldable, friable (MQ)	<0.25	<7

Note: X on log is test result. Otherwise, strength is visually estimated. US = Unconfined Compress Strength
pp = Pocket Penetrometer

Visible reaction to 10% HCL
A, B and C = slow, moderate and rapid reaction resp.

Samples and Notes
R = SPT penetration refusal
D = Disturbed sample
N = Standard Penetration Test
pp = Hand penetrometer test
SV = In-site Shear Vane test
CS = Core Sample
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Weathering
A = Micro fresh state (MFS)
B = Visually fresh state (VFS)
C = Stained state(STS)
D = Partly decomposed state (PDS)
E = Completely decomposed state (CDS)

Soil consistency
Fine grained soils
VS = Very Soft
S = Soft
F = Firm
St = Stiff
VSt = Very stiff
H = Hard

Soil density index
Coarse grained soils
Fb = Friable
VY = Very Loose
L = Loose
MD = Medium Dense
D = Dense
VD =Very Dense

Defects
Joint; Vein; Shear zone; Crush zone; Infill seam; EW seam
A = Solid random breaks (SRB)
B = Solid preferential breaks (SPB)
C = Solid latent breaks (SLB)
D = Non intersecting planes (2-D)
E = Intersecting open planes (3-D)

Core loss
Core loss (interval known)
Core loss (interval unknown). Loss is shown in Graphic log column at top of run.

DDH A Core photos


DDH B Location

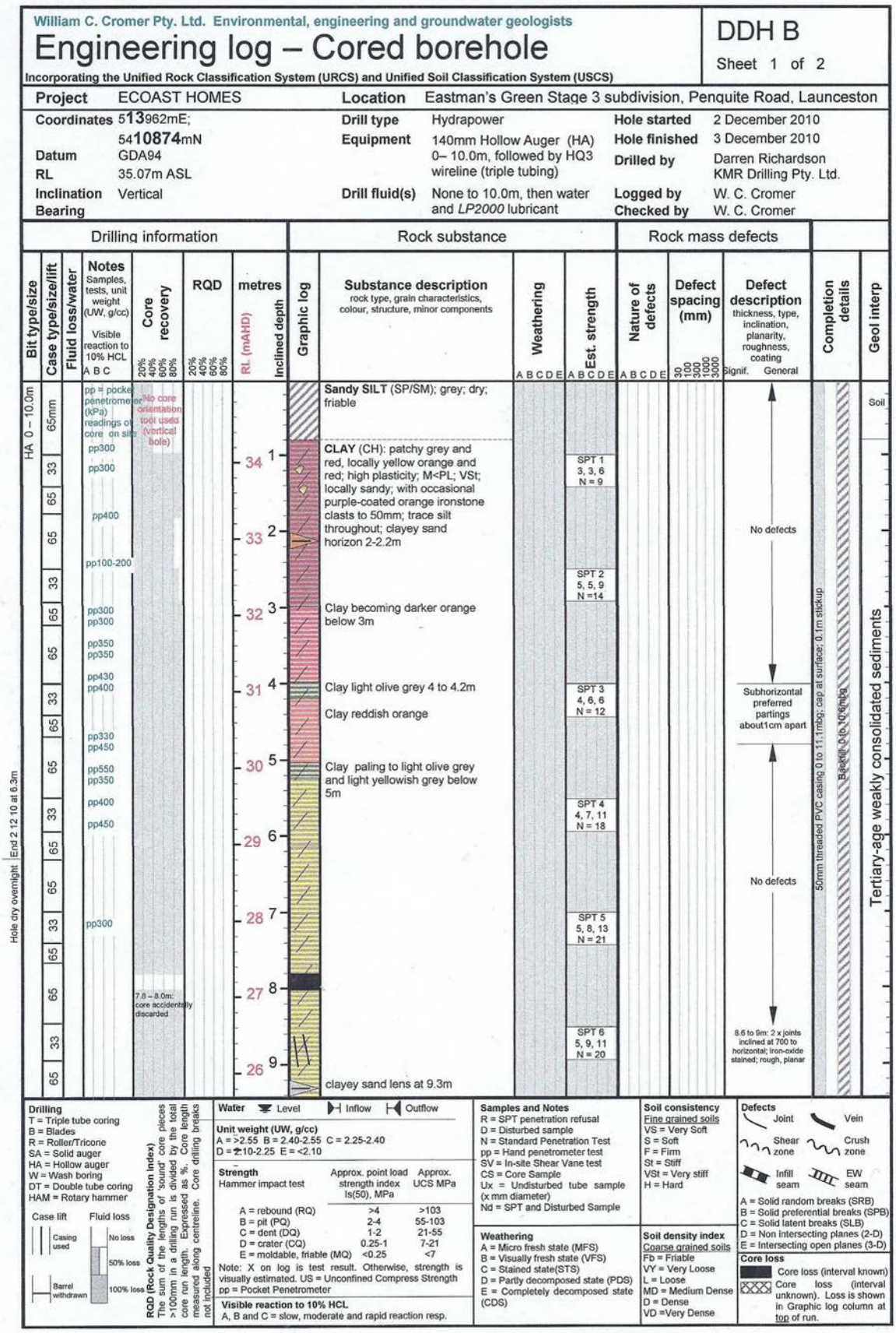
William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

Engineering log – Cored borehole

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

DDH B
Sheet 1 of 2

Project	ECOAST HOMES	**Location**	Eastman's Green Stage 3 subdivision, Penquite Road, Launceston
Coordinates	513962mE; 5410874mN	**Drill type**	Hydrapower
Datum	GDA94	**Equipment**	140mm Hollow Auger (HA) 0– 10.0m, followed by HQ3 wireline (triple tubing)
RL	35.07m ASL	**Drill fluid(s)**	None to 10.0m, then water and *LP2000* lubricant
Inclination	Vertical	**Hole started**	2 December 2010
Bearing		**Hole finished**	3 December 2010
		Drilled by	Darren Richardson KMR Drilling Pty. Ltd.
		Logged by	W. C. Cromer
		Checked by	W. C. Cromer



Drilling
T = Triple tube coring
B = Blades
R = Roller/Tricone
SA = Solid auger
HA = Hollow auger
W = Wash boring
DT = Double tube coring
HAM = Rotary hammer

Case lift: Casing used; Barrel withdrawn
Fluid loss: No loss; 50% loss; 100% loss

RQD (Rock Quality Designation Index) The sum of the lengths of 'sound' core pieces >100mm in a drilling run is divided by the total core run length. Expressed as %. Core length measured along centreline. Core drilling breaks not included

Water Level; Inflow; Outflow

Unit weight (UW, g/cc)
A = >2.55 B = 2.40-2.55 C = 2.25-2.40
D = 2.10-2.25 E = <2.10

Strength Hammer impact test

	Approx. point load strength index Is(50), MPa	Approx. UCS MPa
A = rebound (RQ)	>4	>103
B = pit (PQ)	2-4	55-103
C = dent (DQ)	1-2	21-55
D = crater (CQ)	0.25-1	7-21
E = moldable, friable (MQ)	<0.25	<7

Note: X on log is test result. Otherwise, strength is visually estimated. US = Unconfined Compress Strength
pp = Pocket Penetrometer

Visible reaction to 10% HCL
A, B and C = slow, moderate and rapid reaction resp.

Samples and Notes
R = SPT penetration refusal
D = Disturbed sample
N = Standard Penetration Test
pp = Hand penetrometer test
SV = In-site Shear Vane test
CS = Core Sample
Ux = Undisturbed tube sample (x mm diameter)
Nd = SPT and Disturbed Sample

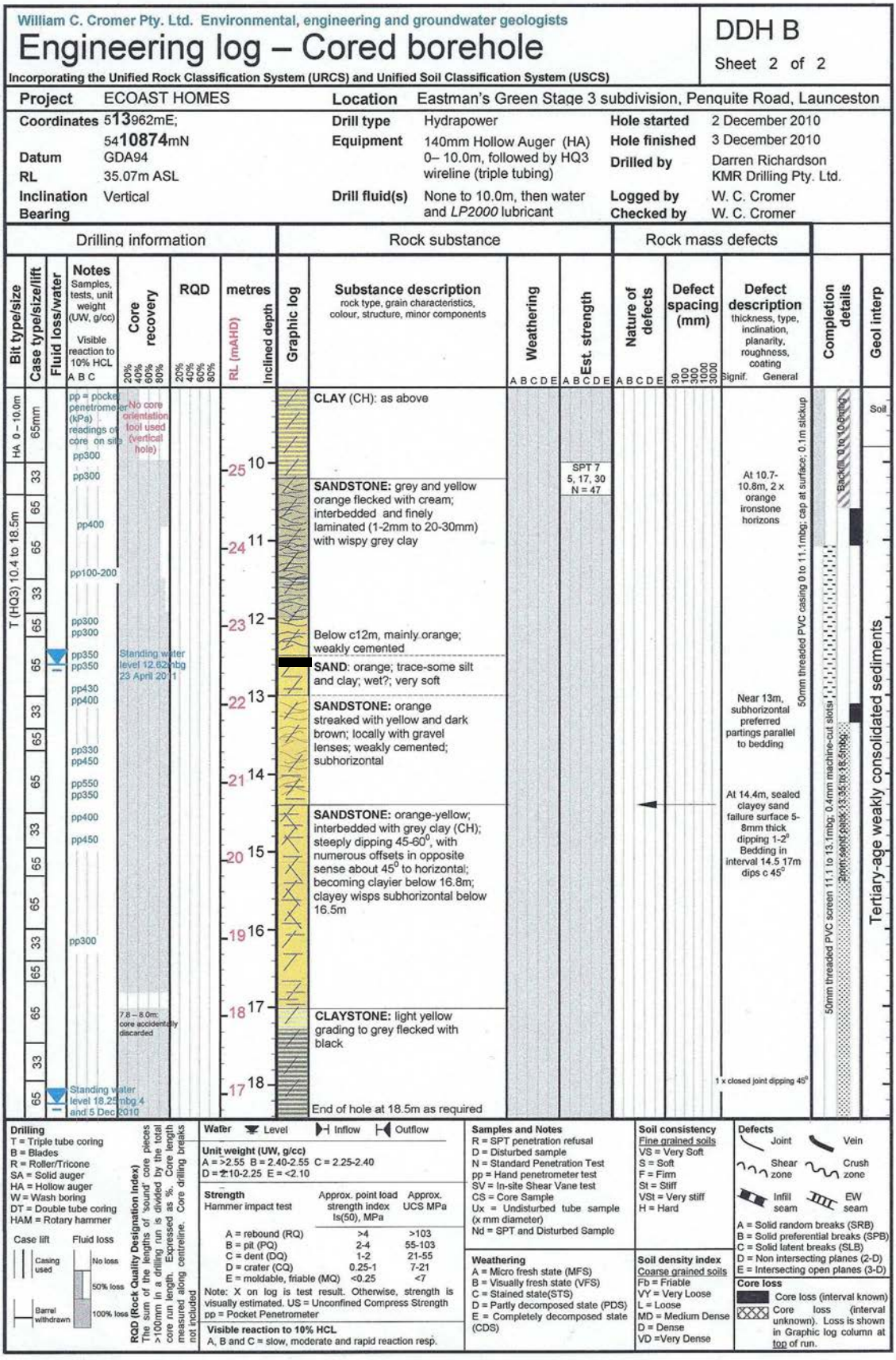
Weathering
A = Micro fresh state (MFS)
B = Visually fresh state (VFS)
C = Stained state(STS)
D = Partly decomposed state (PDS)
E = Completely decomposed state (CDS)

Soil consistency
Fine grained soils
VS = Very Soft
S = Soft
F = Firm
St = Stiff
VSt = Very stiff
H = Hard

Soil density index
Coarse grained soils
Fb = Friable
VY = Very Loose
L = Loose
MD = Medium Dense
D = Dense
VD =Very Dense

Defects
Joint; Vein; Shear zone; Crush zone; Infill seam; EW seam
A = Solid random breaks (SRB)
B = Solid preferential breaks (SPB)
C = Solid latent breaks (SLB)
D = Non intersecting planes (2-D)
E = Intersecting open planes (3-D)

Core loss
Core loss (interval known)
Core loss (interval unknown). Loss is shown in Graphic log column at top of run.



William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

Engineering log – Cored borehole

DDH B
Sheet 2 of 2

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

Project	ECOAST HOMES	**Location**	Eastman's Green Stage 3 subdivision, Penquite Road, Launceston		
Coordinates	513962mE; 5410874mN	**Drill type**	Hydrapower	**Hole started**	2 December 2010
Datum	GDA94	**Equipment**	140mm Hollow Auger (HA) 0– 10.0m, followed by HQ3 wireline (triple tubing)	**Hole finished**	3 December 2010
RL	35.07m ASL			**Drilled by**	Darren Richardson KMR Drilling Pty. Ltd.
Inclination	Vertical	**Drill fluid(s)**	None to 10.0m, then water and *LP2000* lubricant	**Logged by**	W. C. Cromer
Bearing				**Checked by**	W. C. Cromer

Drilling information | Rock substance | Rock mass defects

Bit type/size: HA 0 – 10.0m; T (HQ3) 10.4 to 18.5m
Case type/size/lift: 65mm; 33; 65; 65; 33; 65; 65; 33; 65; 65; 33; 65; 65; 33; 65
Fluid loss/water
Notes: Samples, tests, unit weight (UW, g/cc); Visible reaction to 10% HCL A B C
Core recovery: 20% 40% 60% 80%
RQD: 20% 40% 60% 80%
metres: RL (mAHD); Inclined depth

Graphic log

Substance description (rock type, grain characteristics, colour, structure, minor components)

Weathering: A B C D E
Est. strength: A B C D E

Nature of defects: A B C D E
Defect spacing (mm): 30 100 300 1000 3000
Defect description (thickness, type, inclination, planarity, roughness, coating): Signif. General

Completion details
Geol interp

pp = pocket penetrometer (kPa) readings of core on site

No core orientation tool used (vertical hole)

pp300 pp300 pp400 pp100-200 pp300 pp300 pp350 pp350 pp430 pp400 pp330 pp450 pp550 pp350 pp400 pp450 pp300

Standing water level 12.62mbg 23 April 2011

7.8 – 8.0m: core accidentally discarded

Standing water level 18.25mbg 4 and 5 Dec 2010

CLAY (CH): as above

SPT 7 5, 17, 30 N = 47

SANDSTONE: grey and yellow orange flecked with cream; interbedded and finely laminated (1-2mm to 20-30mm) with wispy grey clay

Below c12m, mainly orange; weakly cemented

SAND: orange; trace-some silt and clay; wet?; very soft

SANDSTONE: orange streaked with yellow and dark brown; locally with gravel lenses; weakly cemented; subhorizontal

SANDSTONE: orange-yellow; interbedded with grey clay (CH); steeply dipping 45-60°, with numerous offsets in opposite sense about 45° to horizontal; becoming clayier below 16.8m; clayey wisps subhorizontal below 16.5m

CLAYSTONE: light yellow grading to grey flecked with black

End of hole at 18.5m as required

At 10.7-10.8m, 2 x orange ironstone horizons

Near 13m, subhorizontal preferred partings parallel to bedding

At 14.4m, sealed clayey sand failure surface 5-8mm thick dipping 1-2° Bedding in interval 14.5 17m dips c 45°

1 x closed joint dipping 45°

50mm threaded PVC casing 0 to 11.1mbg; cap at surface; 0.1m slickup

Backfill 0 to 10.6mbg

50mm threaded PVC screen 11.1 to 13.1mbg; 0.4mm machine-cut slots

Sand pack 10.6 to 18.5mbg

Soil

Tertiary-age weakly consolidated sediments

Drilling
T = Triple tube coring
B = Blades
R = Roller/Tricone
SA = Solid auger
HA = Hollow auger
W = Wash boring
DT = Double tube coring
HAM = Rotary hammer

Case lift: Casing used; Barrel withdrawn
Fluid loss: No loss; 50% loss; 100% loss

RQD (Rock Quality Designation Index) The sum of the lengths of 'sound' core pieces >100mm in a drilling run is divided by the total core run length. Expressed as %. Core length measured along centreline. Core drilling breaks not included

Water Level; Inflow; Outflow

Unit weight (UW, g/cc)
A = >2.55 B = 2.40-2.55 C = 2.25-2.40
D = 2.10-2.25 E = <2.10

Strength

Hammer impact test	Approx. point load strength index Is(50), MPa	Approx. UCS MPa
A = rebound (RQ)	>4	>103
B = pit (PQ)	2-4	55-103
C = dent (DQ)	1-2	21-55
D = crater (CQ)	0.25-1	7-21
E = moldable, friable (MQ)	<0.25	<7

Note: X on log is test result. Otherwise, strength is visually estimated. US = Unconfined Compress Strength
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Visible reaction to 10% HCL
A, B and C = slow, moderate and rapid reaction resp.

Samples and Notes
R = SPT penetration refusal
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CS = Core Sample
Ux = Undisturbed tube sample (x mm diameter)
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Weathering
A = Micro fresh state (MFS)
B = Visually fresh state (VFS)
C = Stained state(STS)
D = Partly decomposed state (PDS)
E = Completely decomposed state (CDS)

Soil consistency (Fine grained soils)
VS = Very Soft
S = Soft
F = Firm
St = Stiff
VSt = Very stiff
H = Hard

Soil density index (Coarse grained soils)
Fb = Friable
VY = Very Loose
L = Loose
MD = Medium Dense
D = Dense
VD =Very Dense

Defects
Joint; Vein; Shear zone; Crush zone; Infill seam; EW seam
A = Solid random breaks (SRB)
B = Solid preferential breaks (SPB)
C = Solid latent breaks (SLB)
D = Non intersecting planes (2-D)
E = Intersecting open planes (3-D)

Core loss
Core loss (interval known)
Core loss (interval unknown). Loss is shown in Graphic log column at top of run.

DDH B Core photos

DDH B Core photos


DDH C Location

William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

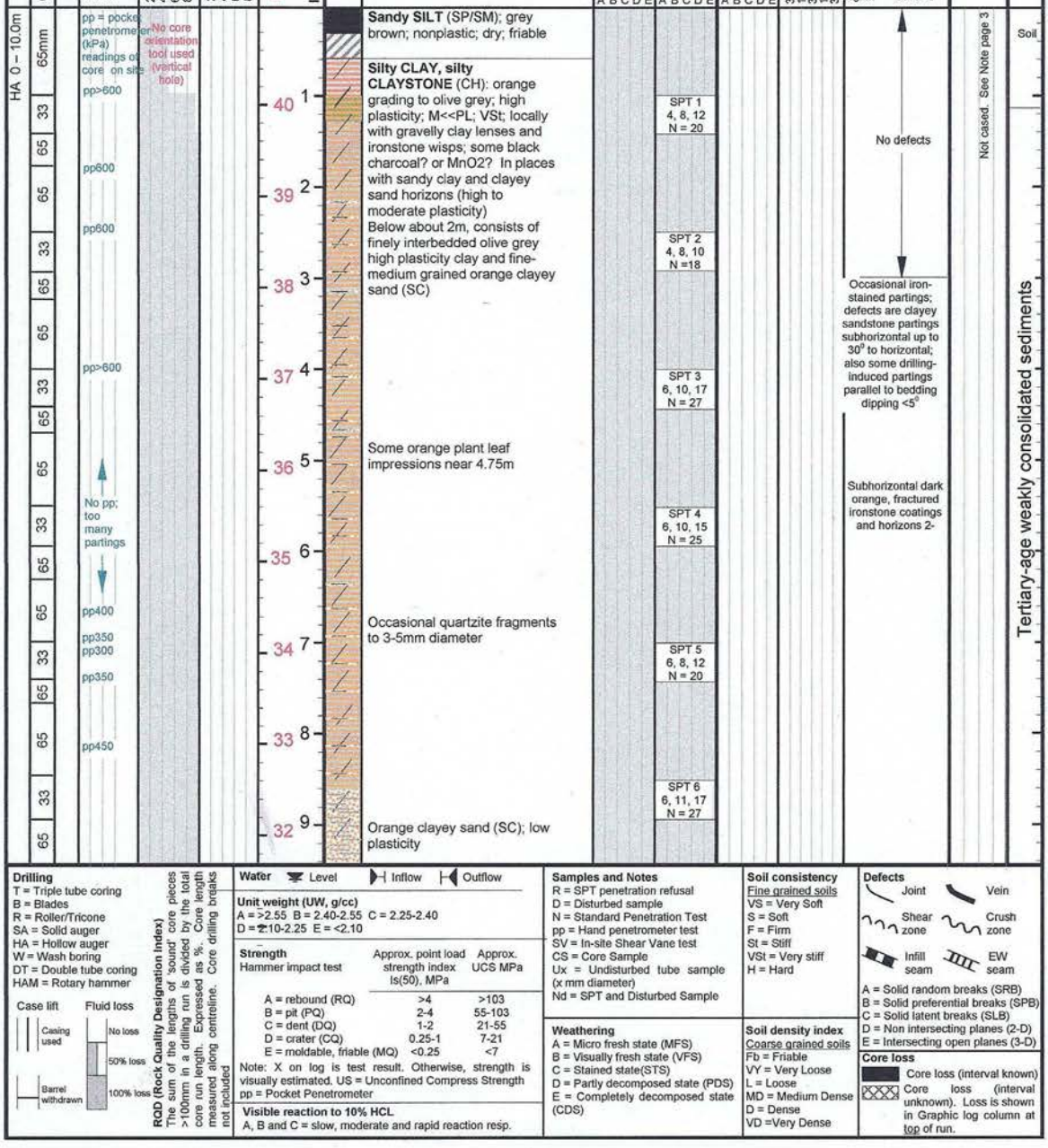
Engineering log – Cored borehole

DDH C

Sheet 1 of 3

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

Project	ECOAST HOMES	**Location**	Eastman's Green Stage 3 subdivision, Penquite Road, Launceston
Coordinates	513945mE; 5410938mN	**Drill type**	Hydrapower
Datum	GDA94	**Equipment**	140mm Hollow Auger (HA) 0– 10.0m, followed by HQ3 wireline (triple tubing)
RL	41.07m ASL	**Drill fluid(s)**	None to 10.0m, then water and *LP2000* lubricant
Inclination	Vertical	**Hole started**	6 April 2011
Bearing		**Hole finished**	7 April 2011
		Drilled by	Des and Cameron KMR Drilling Pty. Ltd.
		Logged by	W. C. Cromer
		Checked by	W. C. Cromer



Drilling
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B = Blades
R = Roller/Tricone
SA = Solid auger
HA = Hollow auger
W = Wash boring
DT = Double tube coring
HAM = Rotary hammer

Case lift: Casing used; Barrel withdrawn
Fluid loss: No loss; 50% loss; 100% loss

RQD (Rock Quality Designation Index)
The sum of the lengths of 'sound' core pieces >100mm in a drilling run is divided by the total core run length. Expressed as %. Core length measured along centreline. Core drilling breaks not included

Water Level Inflow Outflow

Unit weight (UW, g/cc)
A = >2.55 B = 2.40-2.55 C = 2.25-2.40
D = 2.10-2.25 E = <2.10

Strength Hammer impact test

	Approx. point load strength index Is(50), MPa	Approx. UCS MPa
A = rebound (RQ)	>4	>103
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Joint, Vein, Shear zone, Crush zone, Infill seam, EW seam
A = Solid random breaks (SRB)
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Core loss
Core loss (interval known)
Core loss (interval unknown). Loss is shown in Graphic log column at top of run.

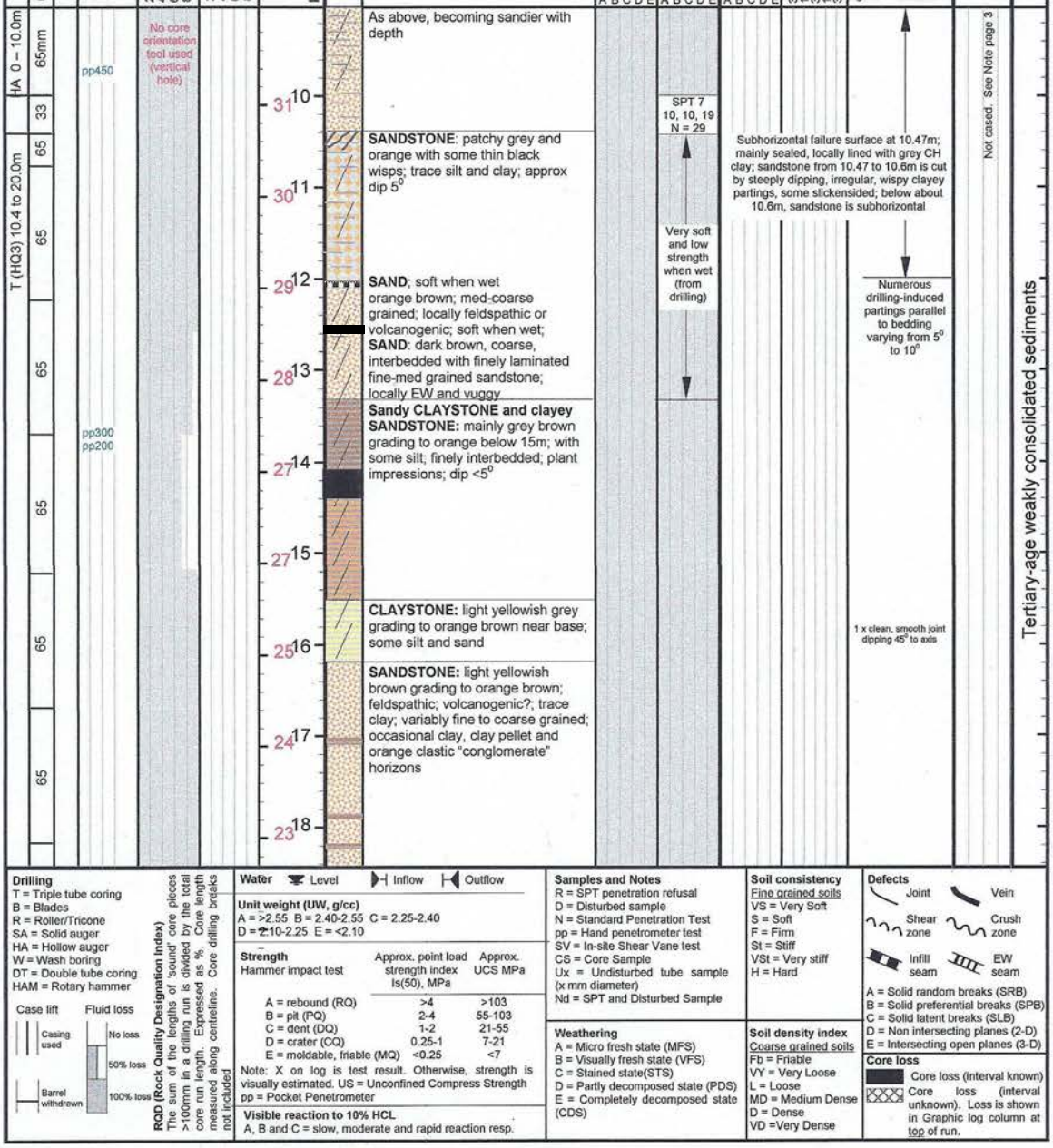
William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

Engineering log – Cored borehole

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

DDH C
Sheet 2 of 3

Project	ECOAST HOMES	**Location**	Eastman's Green Stage 3 subdivision, Penquite Road, Launceston		
Coordinates	513945mE; 5410938mN	**Drill type**	Hydrapower	**Hole started**	6 April 2011
Datum	GDA94	**Equipment**	140mm Hollow Auger (HA) 0– 10.0m, followed by HQ3 wireline (triple tubing)	**Hole finished**	7 April 2011
RL	41.07m ASL			**Drilled by**	Des and Cameron KMR Drilling Pty. Ltd.
Inclination	Vertical	**Drill fluid(s)**	None to 10.0m, then water and *LP2000* lubricant	**Logged by**	W. C. Cromer
Bearing				**Checked by**	W. C. Cromer



William C. Cromer Pty. Ltd. Environmental, engineering and groundwater geologists

Engineering log – Cored borehole

DDH C

Sheet 3 of 3

Incorporating the Unified Rock Classification System (URCS) and Unified Soil Classification System (USCS)

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		Drilled by	Des and Cameron KMR Drilling Pty. Ltd.
		Logged by	W. C. Cromer
		Checked by	W. C. Cromer

Drilling information								Rock substance				Rock mass defects					
Bit type/size	Case type/size/lift	Fluid loss/water	Notes: Samples, tests, unit weight (UW, g/cc); Visible reaction to 10% HCL A B C	Core recovery 20% 40% 60% 80%	RQD 20% 40% 60% 80%	metres: RL (mAHD)	metres: Inclined depth	Graphic log	Substance description: rock type, grain characteristics, colour, structure, minor components	Weathering A B C D E	Est. strength A B C D E	Nature of defects A B C D E	Defect spacing (mm) 30 100 300 1000 3000	Defect description: thickness, type, inclination, planarity, roughness, coating. Signif. General	Completion details	Geol interp
T (HQ3) 10.4 to 20.0m	65		No core orientation tool used (vertical hole)						As above, becoming sandier with depth							
	65					22 19			**CLAYSTONE:** grey; finely laminated with cream sandy clay wisps; some plant impressions; apparent dip 10°					Numerous drilling-induced partings parallel to bedding varying from 5° to 10°		Tertiary-age weakly consolidated sediments
						21 20			End of hole as required at 20.0mbg (RL21.07m)							

DDH C not cased. Hole C2 drilled 2m away was completed as follows:
Casing 50mm Class 18 UPVC

Casing 0 – 12.8m
Screen 12.8 - 13.8m
Sand pack 12.7 – 13.8m
Bentonite 11.7 – 12.7m
Backfill 1.0 – 11.7m
Bentonite 0.5 – 1.0,

Drilling
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Unit weight (UW, g/cc)
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Strength: Hammer impact test	Approx. point load strength index Is(50), MPa	Approx. UCS MPa
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CS = Core Sample
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Joint; Vein; Shear zone; Crush zone; Infill seam; EW seam
A = Solid random breaks (SRB)
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D = Non intersecting planes (2-D)
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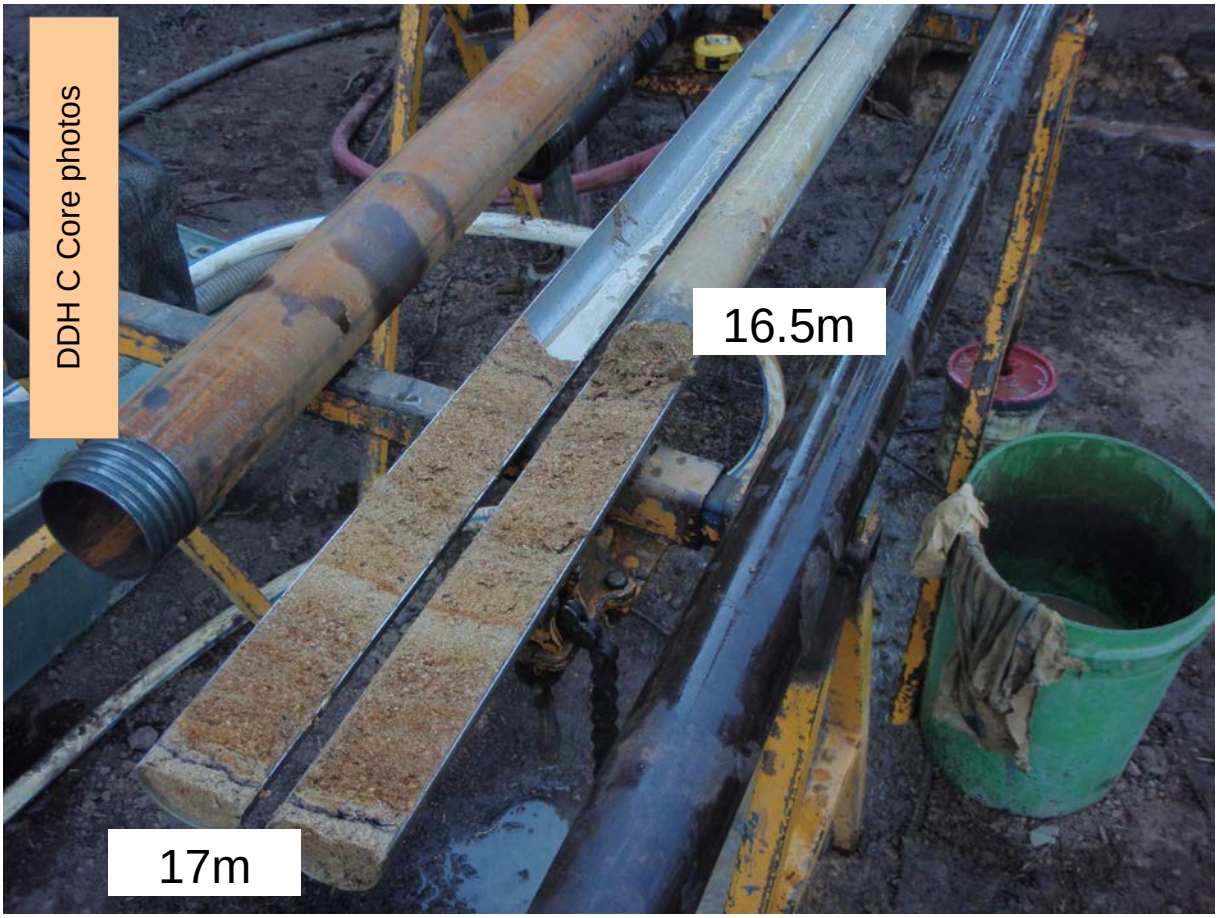
Core loss
Core loss (interval known)
Core loss (interval unknown). Loss is shown in Graphic log column at top of run.

DDH C Core photos

DDH C Core photos



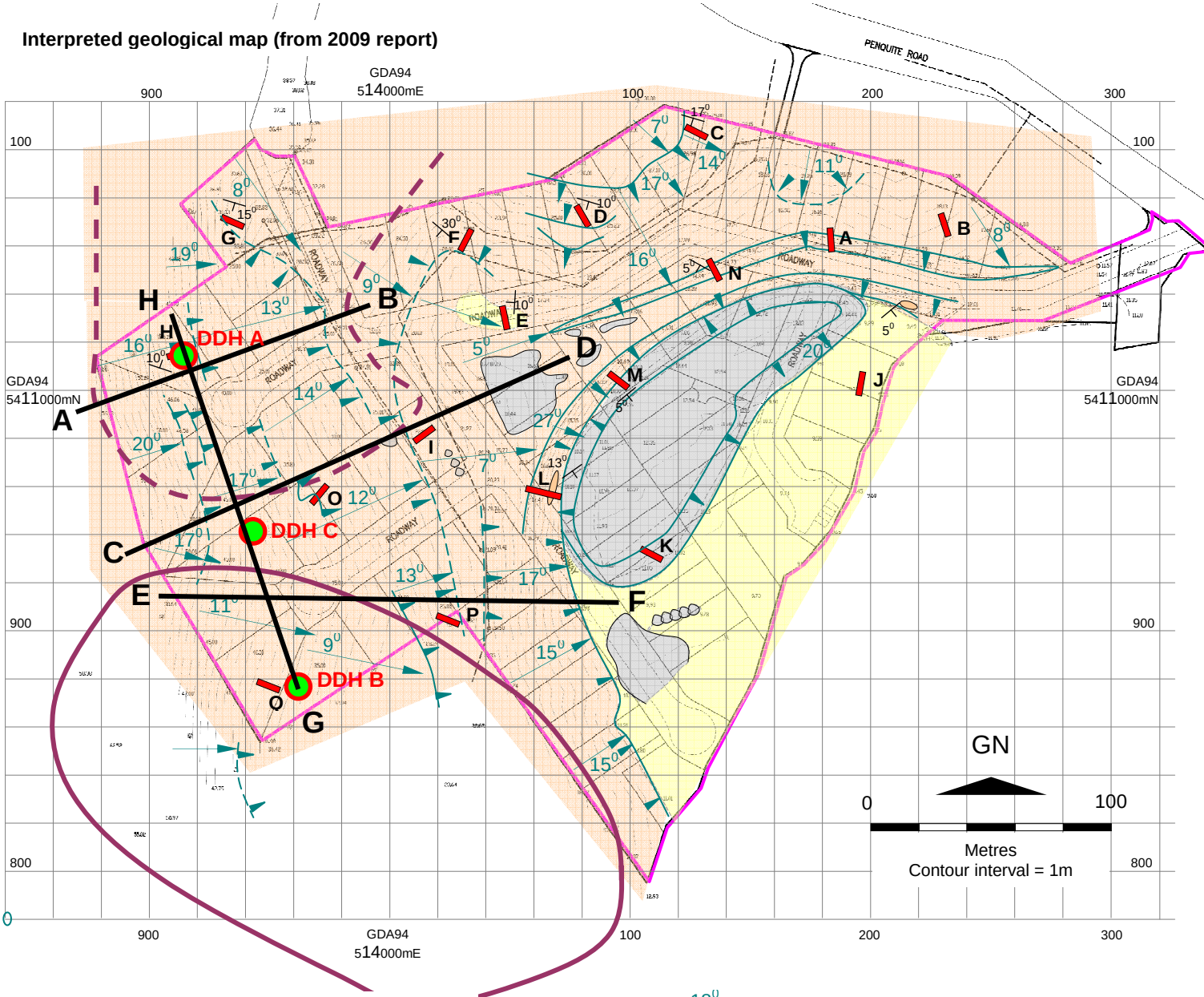
Weakly cemented low strength and coarse grained sandstone in DDH C near 17m.

Attachment 7

(3 pages)

Interpreted geological map and cross sections

Interpreted geological map (from 2009 report)



P — Test pit dug 17, 18 or 25 February 2009

Diamond drill hole location, Dec 2010 and April 2011

Inferred fossil or old dormant landslide, position approximate

Inferred Landslide Zone; fossil or old dormant, position approximate

Recent inert fill

Quaternary alluvium (covered with c. 0.5m of silty clay fill)

Tertiary claystone and weakly cemented sandstone

Outcrop of Tertiary weakly cemented sandstone with dip and strike of bedding shown; dip and strike also shown for sediments when exposed in test pits

18⁰ — Slope direction and angle

Convex change of slope (gentle)

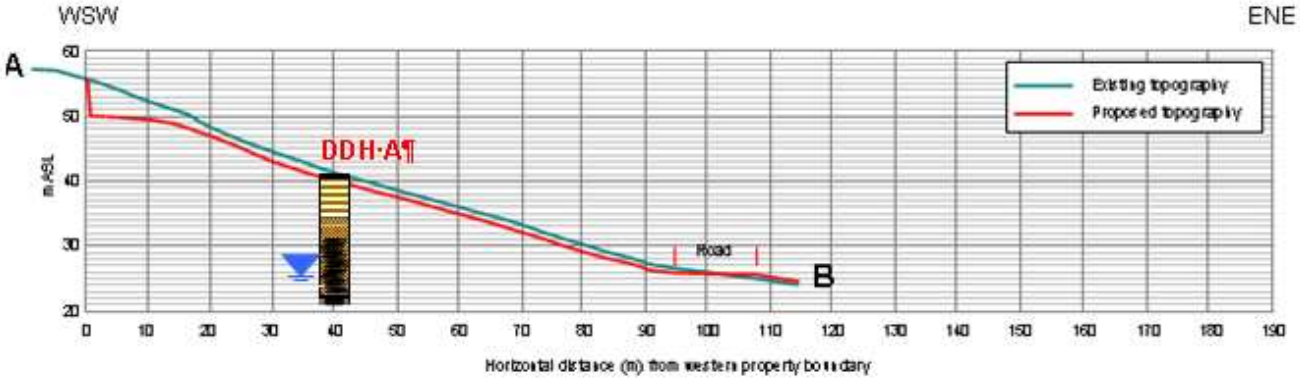
Convex change of slope (abrupt)

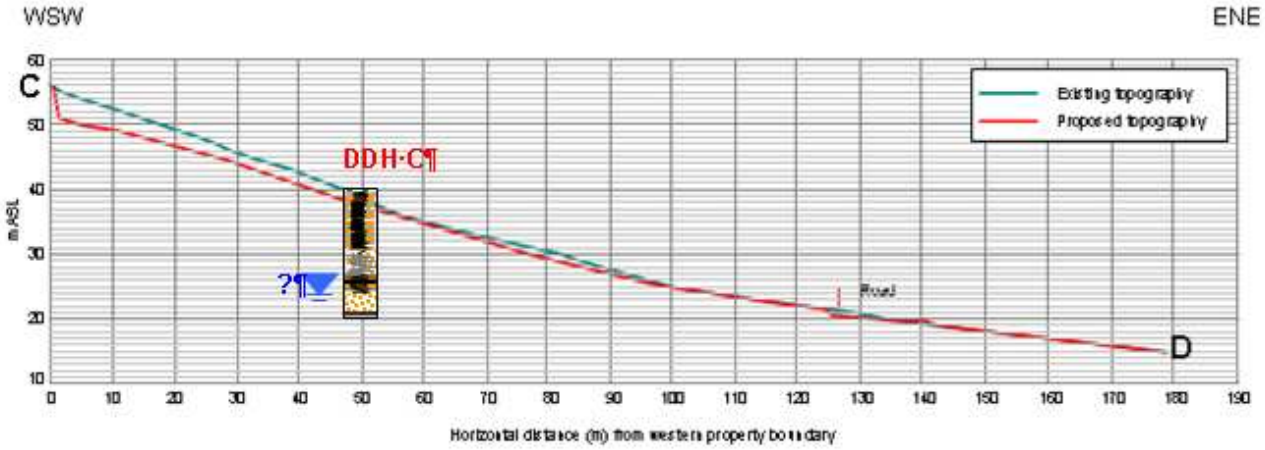
Concave change of slope (gentle)

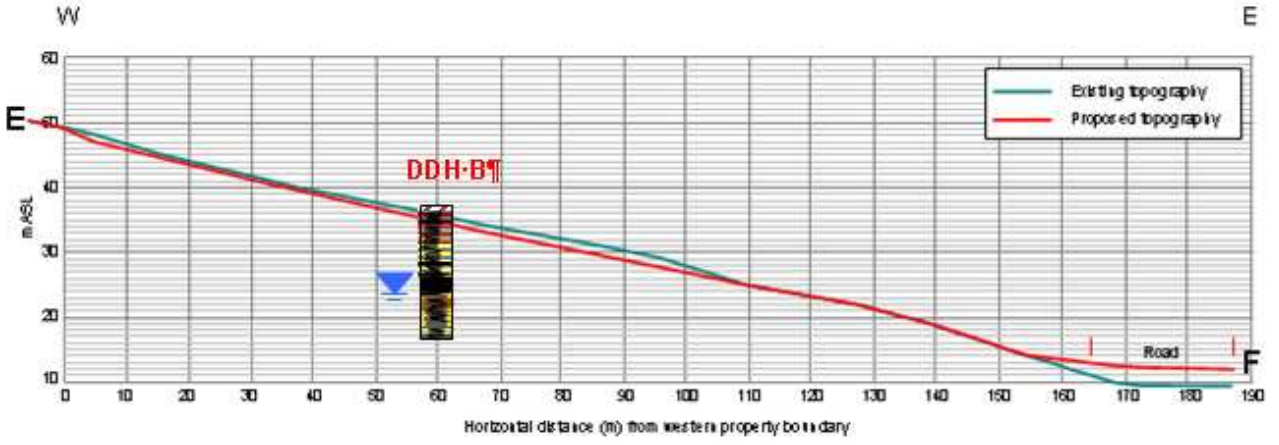
Concave change of slope (abrupt)

A–B — Section line

Geological cross-sections from 2009 report with 2010 and 2011 diamond drill holes added.
Ignore red line (proposed topography)

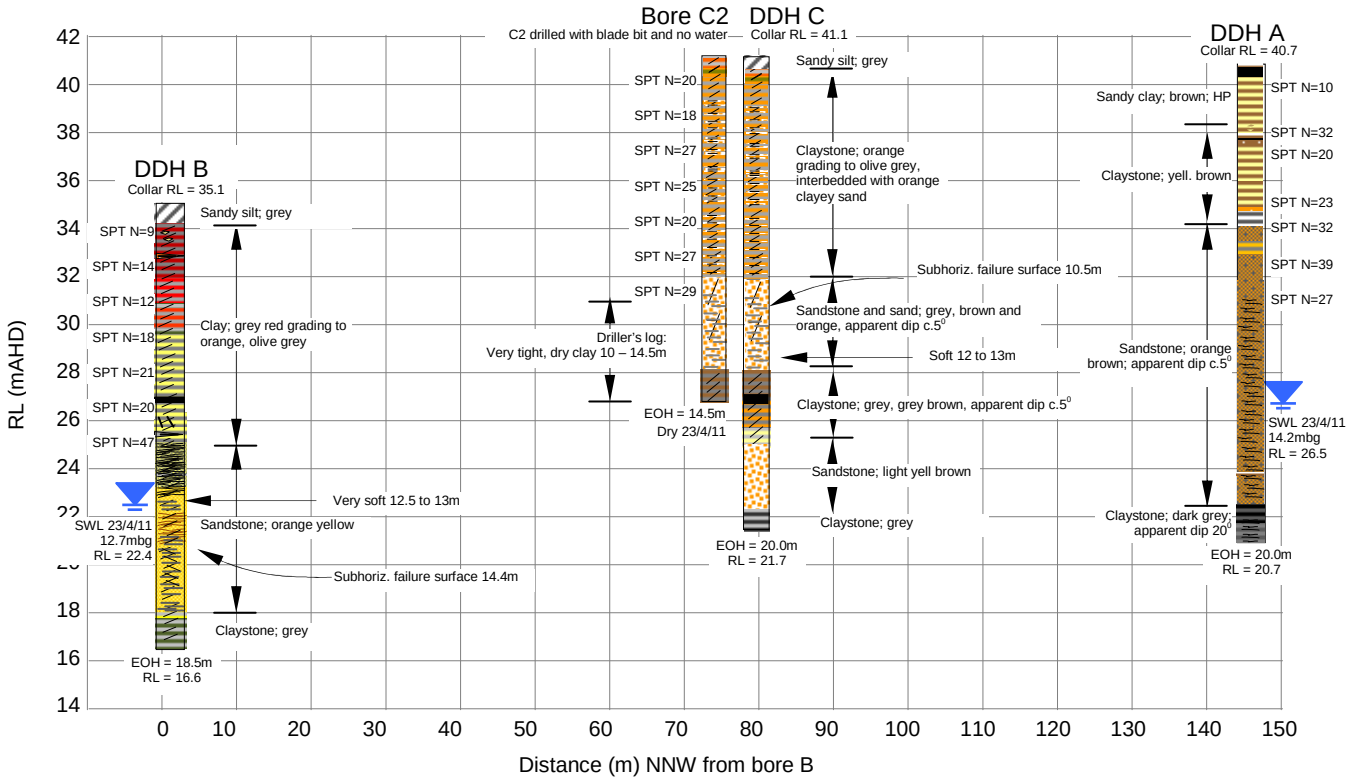






Cross section through section line G – H

G: SSE H: NNW



	RL	Easting	Northing	Total depth (m)
Bore A	40.69	513916	5411014	20.0
Bore B	35.07	513962	5410874	18.5
Bore C	41.07	513945	5410939	20.0