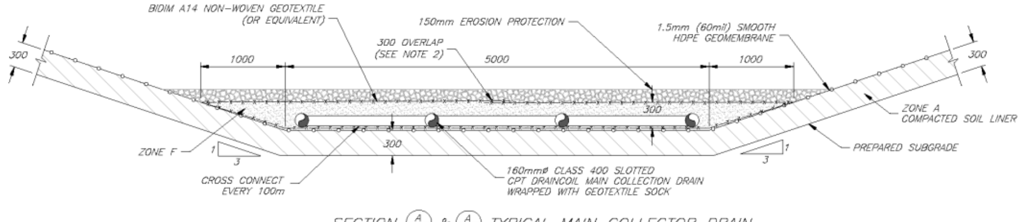
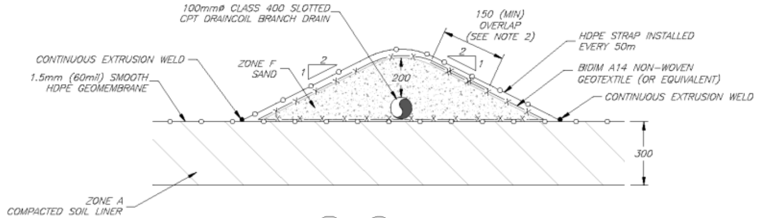
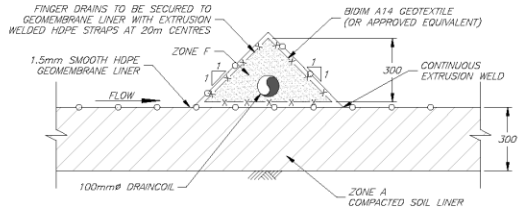
FINAL DESIGN



SECTION A/015 & A/017 TYPICAL MAIN COLLECTOR DRAIN
SCALE 1:50



SECTION B/015 & B/017 TYPICAL BRANCH DRAIN
SCALE 1:20



SECTION C/015 TYPICAL FINGER DRAIN
SCALE 1:20

NOTES:

1. DEPENDING ON THE CONSTRUCTION METHOD ADOPTED BY CONTRACTOR, THE GEOMEMBRANE ALONG THE MAIN CREEK BED COULD BE PLACED AT THE BEGINNING OR END OF INSTALLATION (FOR WATER CONTROL). THE GEOMEMBRANE INSTALLED ON THE SLOPES SHALL BE ANCHORED. SUBSEQUENT CONNECTION AT THIS POINT SHALL BE MADE BY CUTTING THE GEOMEMBRANE AT THE ANCHOR TRENCH LOCATION, AND THEN CONTINUOUSLY WEDGE WELDING THE PANELS.
2. ALL GEOTEXTILE USED TO WRAP DRAINS SHALL BE CONTINUOUSLY JOINED, SEWN OR THERMALLY BONDED (LEISTER) AT THE OVERLAP AS DIRECTED BY THE ENGINEER.
3. GEOTEXTILE FILTER SOCK FOR CPT DRAINCOIL SHALL BE BIDIM A14 NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
4. A NOMINAL BEDDING LAYER OF 500mm THICKNESS MAY BE REQUIRED ALONG THE MAIN CREEK ALIGNMENT TO ENABLE CONSTRUCTION. THICKNESS MAY BE BE REDUCED ON SITE AS DIRECTED BY THE ENGINEER.
5. COMPACTED GENERAL FILL SHALL BE PLACED IF REQUIRED TO ALLOW DRAINAGE BY GRAVITY AND/OR TO FORM MAIN CHANNEL.

BRANCH DRAINS ON GEOMEMBRANE CONSTRUCTION SEQUENCE

a. PLACE GEOTEXTILE.
b. PLACE, CUT AND CONNECT DRAINCOIL.
c. PLACE ZONE F SAND.
d. WRAP THE SAND WITH GEOTEXTILE TO FORM DRAIN.
e. SECURE BRANCH DRAINS TO HDPE GEOMEMBRANE LINER USING STRIPS WELDED TO THE BASIN LINER.
f. REMOVE ALL TEMPORARY WORKS.
g. INSPECT ADJACENT GEOMEMBRANE AND REPAIR IF DAMAGED.

MAIN COLLECTOR DRAINS ON GEOMEMBRANE CONSTRUCTION SEQUENCE

a. PLACE GEOTEXTILE
b. PLACE DRAINCOIL WITH GEOTEXTILE FILTER SOCK. CUT AND CROSS CONNECT DRAINCOIL EVERY 100m AND TIE IN WITH BRANCH DRAINS.
c. PLACE ZONE F SAND.
d. WRAP THE SAND WITH GEOTEXTILE TO FORM DRAIN.
e. REMOVE ALL TEMPORARY WORKS.
f. INSPECT ADJACENT GEOMEMBRANE AND REPAIR IF DAMAGED.

ORIGINAL STAMPED IN RED

Knight Piésold CONSULTING
Knight Piésold Pty Ltd
A.C.N. 001 040 419 A.B.N. 67 001 040 419
P.O. BOX 1710, Hornsby, N.S.W. 1635
Level 1, 184 Adelaide Terrace, East Perth, W.A. 6004
Level 1, 17 Cordelia Street, South Brisbane, QLD. 4101

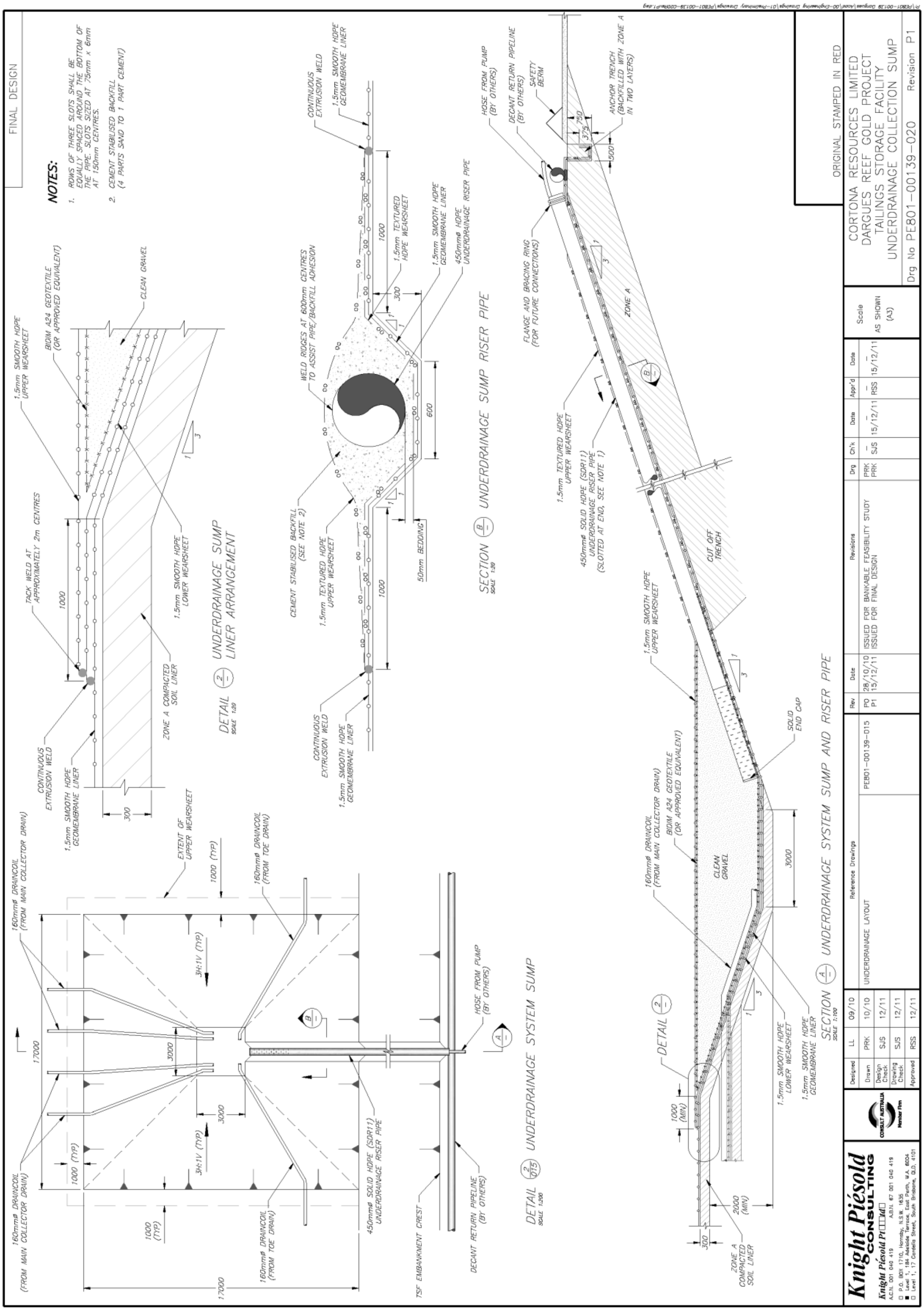
Designed	LL	09/10
Drawn	PRK	10/10
Design Check	SJS	12/11
Drawing Check	SJS	12/11
Approved	RSS	12/11

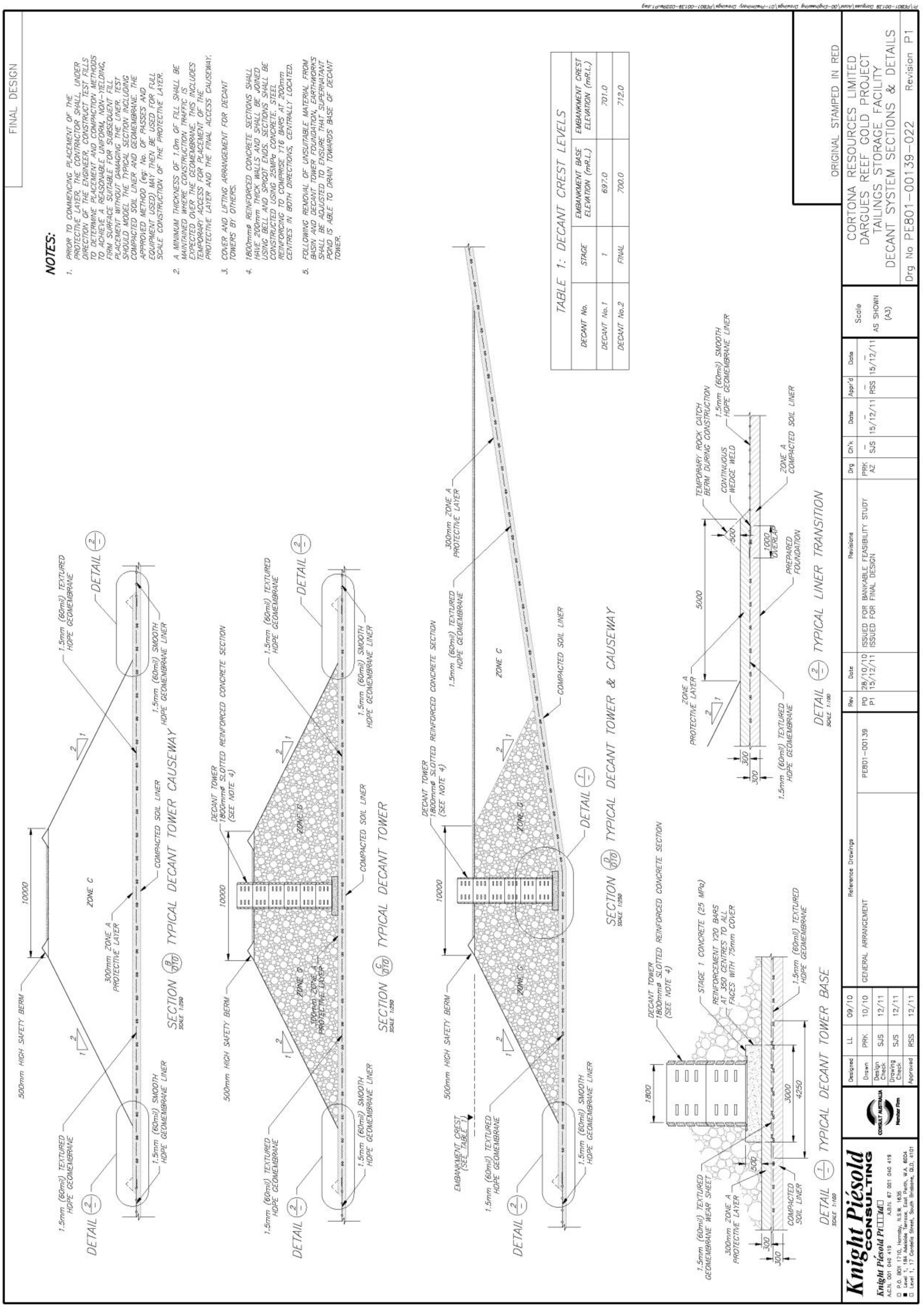
Reference Drawings	
UNDERDRAINAGE LAYOUT	PE801-00139-015
UNDERDRAINAGE SECTIONS & DETAILS (1 OF 2)	PE801-00139-017

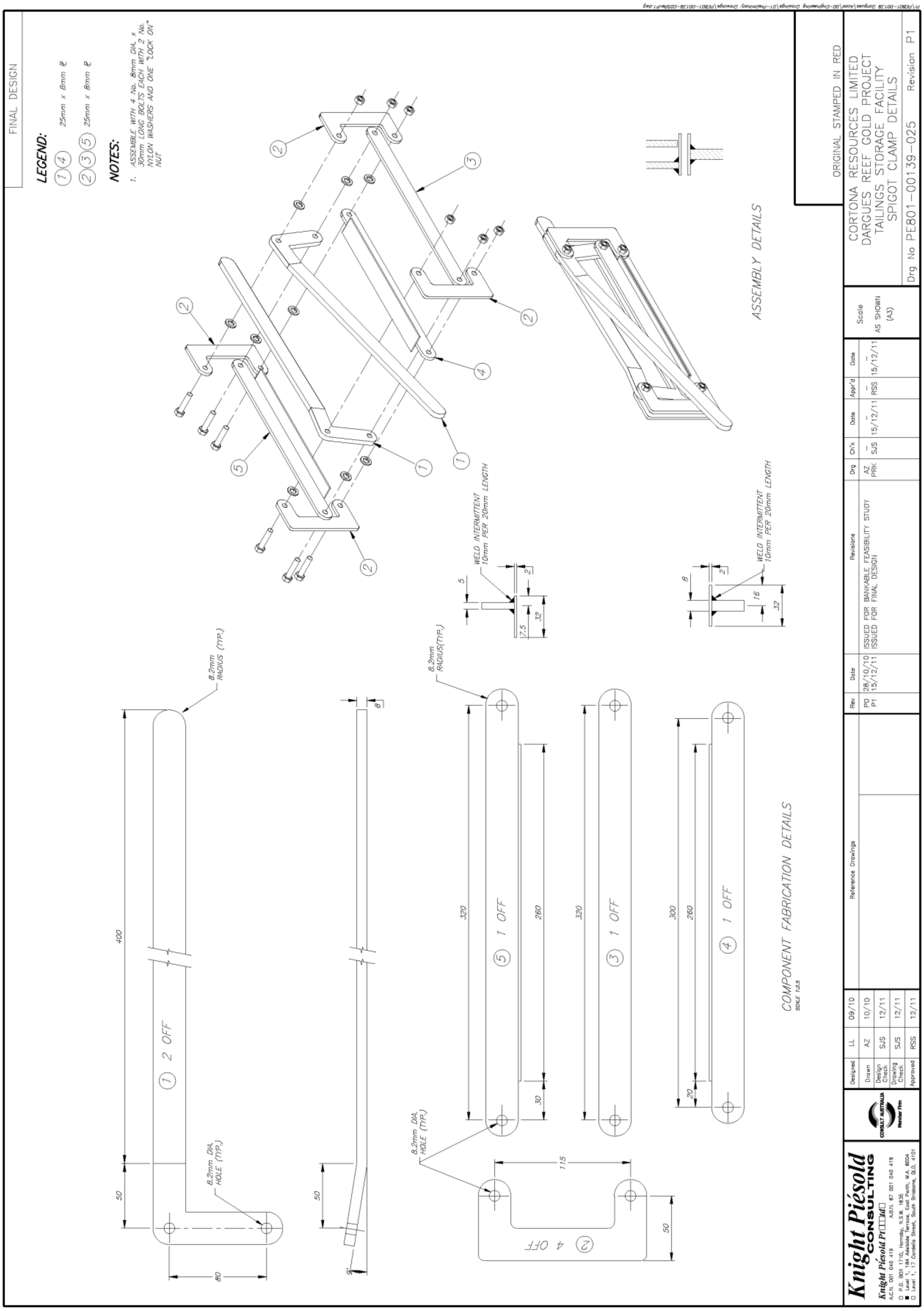
Rev	Date	Revisions	Drg	Ch'k	Date	Appr'd	Date
P0	28/10/10	ISSUED FOR BANKABLE FEASIBILITY STUDY	PRK	–	–	–	–
P1	15/12/11	ISSUED FOR FINAL DESIGN	PRK	SJS	15/12/11	RSS	15/12/11

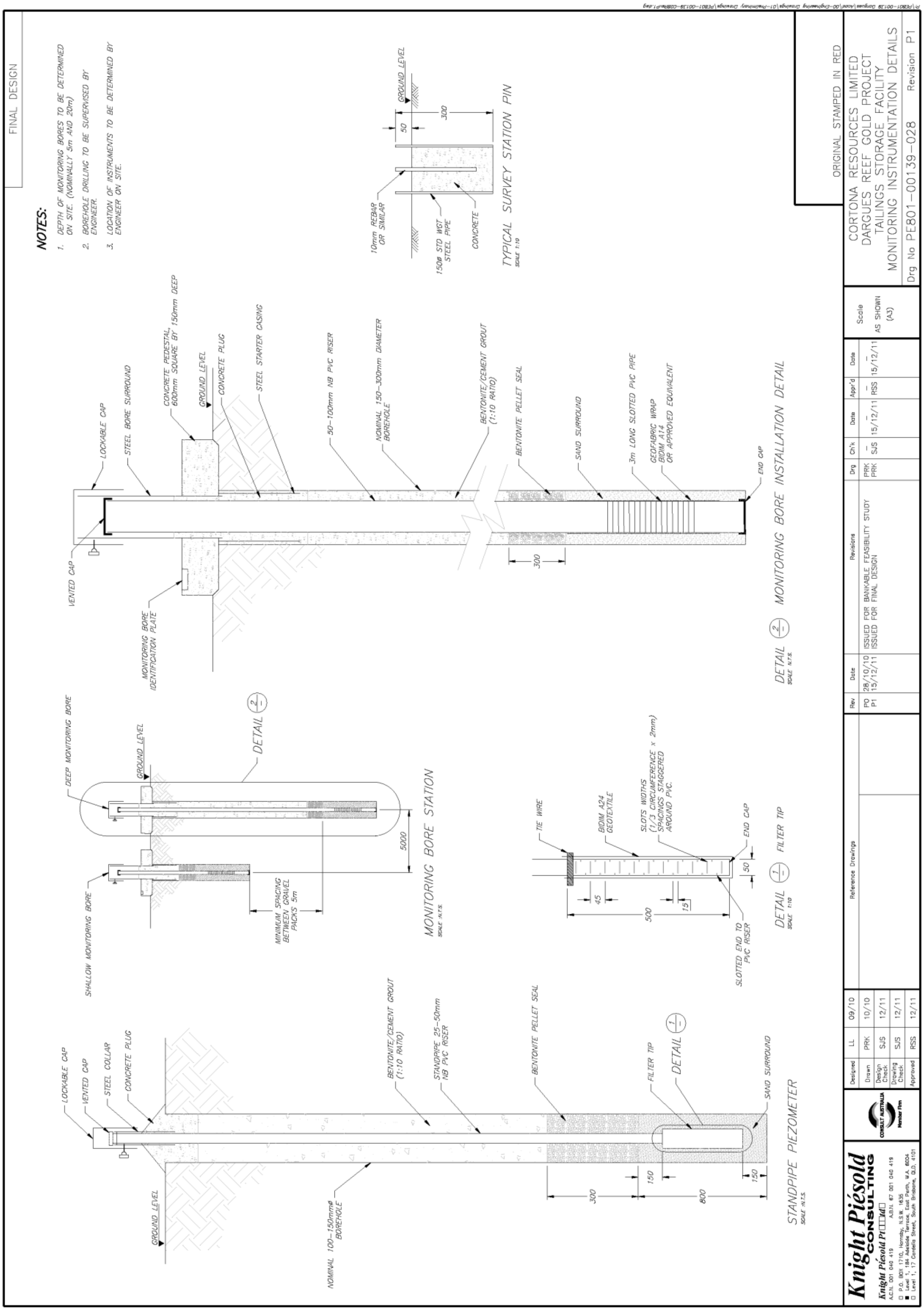
Scale AS SHOWN (A3)

CORTONA RESOURCES LIMITED
DARGUES REEF GOLD PROJECT
TAILINGS STORAGE FACILITY
UNDERDRAINAGE SECTIONS & DETAILS (2 OF 2)
Drg No PE801-00139-019 Revision P1

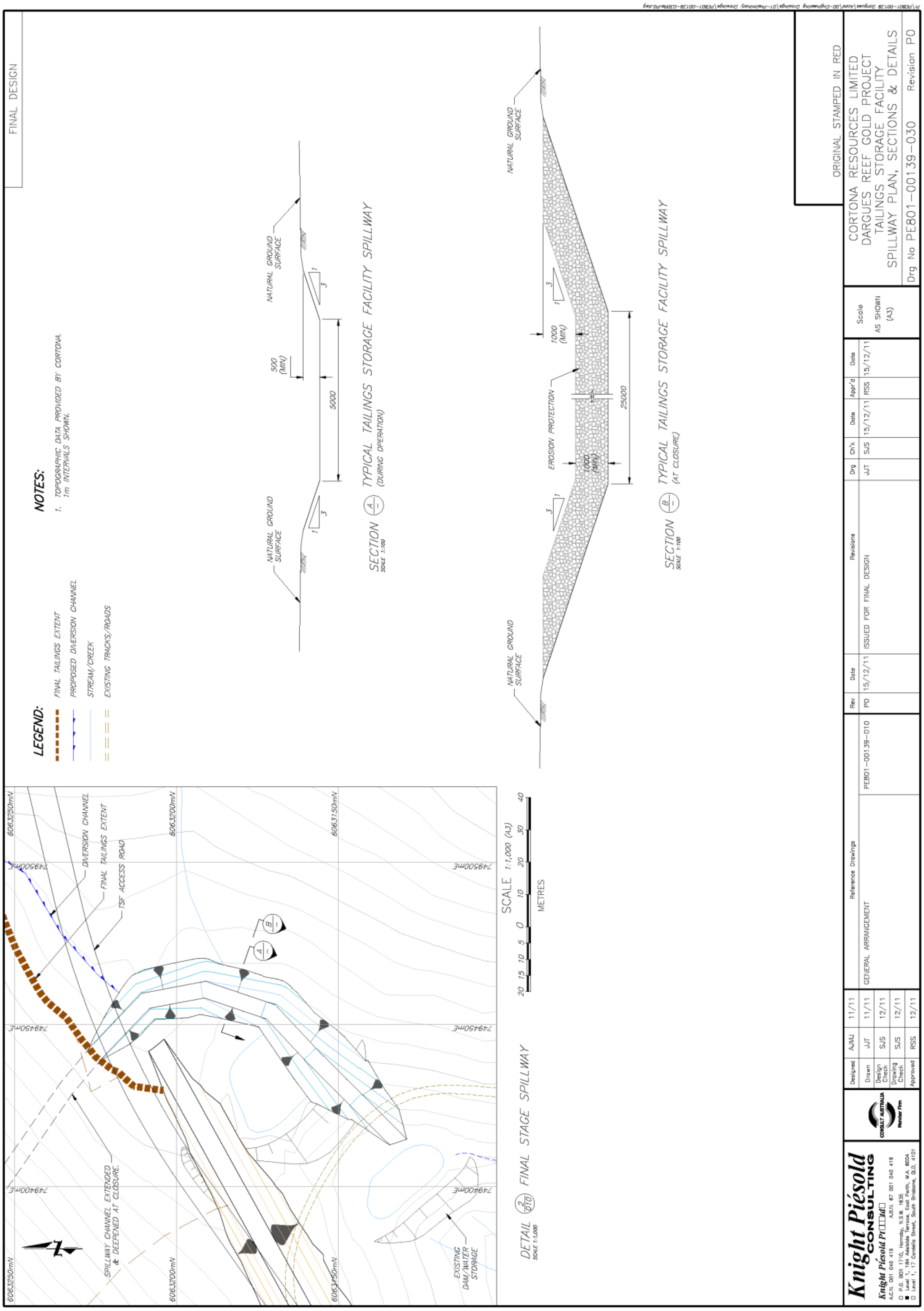

FINAL DESIGN
NOTES:
1. ROWS OF THREE SLOTS SHALL BE EQUALLY SPACED AROUND THE BOTTOM OF THE PIPE. SLOTS SIZED AT 75mm x 6mm AT 150mm CENTRES.
2. CEMENT STABILISED BACKFILL (4 PARTS SAND TO 1 PART CEMENT)
DETAIL 2 UNDERDRAINAGE SUMP LINER ARRANGEMENT
SECTION B UNDERDRAINAGE SUMP RISER PIPE
DETAIL 2 UNDERDRAINAGE SYSTEM SUMP
SECTION A UNDERDRAINAGE SYSTEM SUMP AND RISER PIPE
ORIGINAL STAMPED IN RED
CORTONA RESOURCES LIMITED
DARGUES REEF GOLD PROJECT
TAILINGS STORAGE FACILITY
UNDERDRAINAGE COLLECTION SUMP
Drg No PE801-00139-020
Revision P1
Knight Piésold CONSULTING

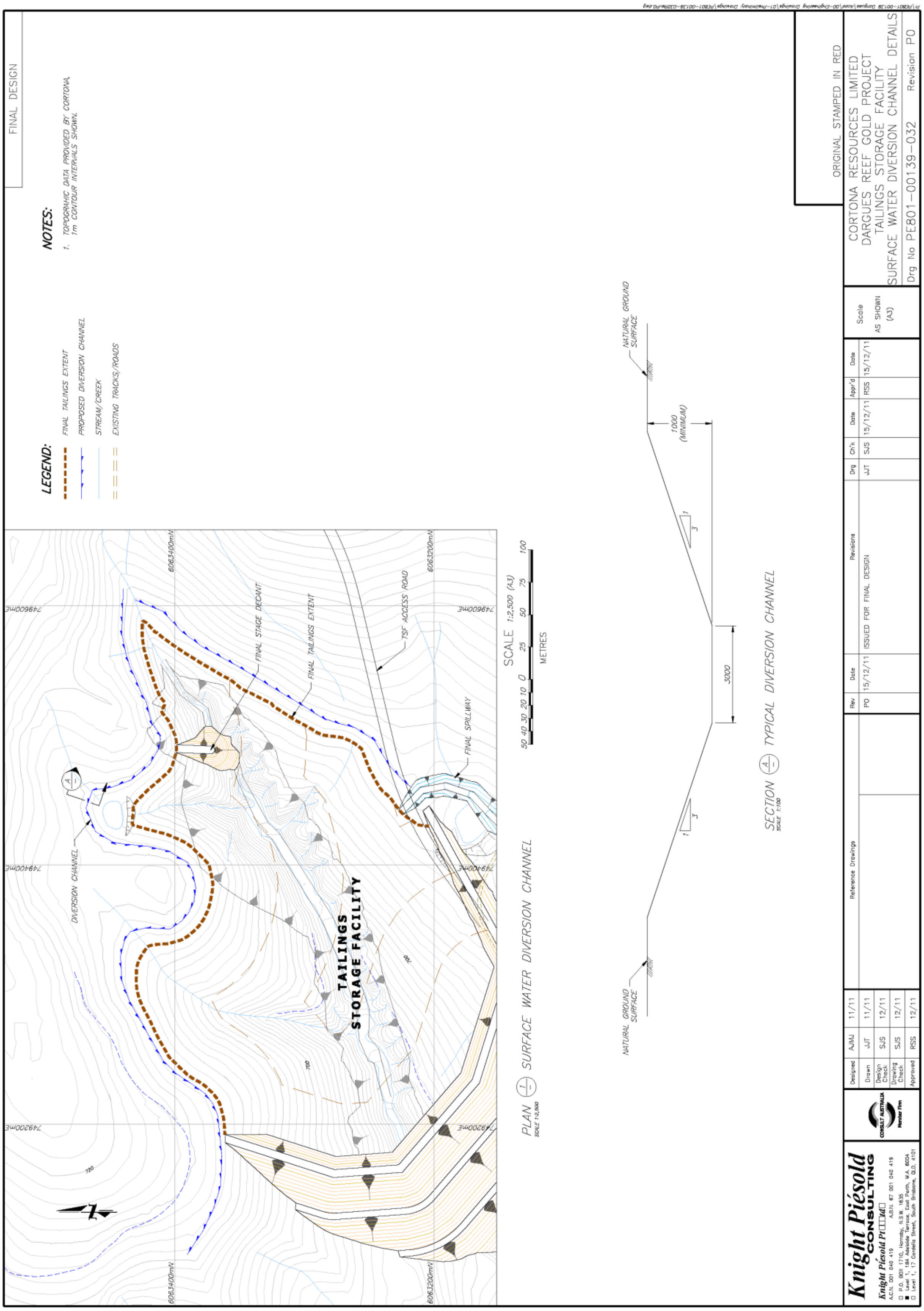

FINAL DESIGN
NOTES:
TABLE 1: DECANT CREST LEVELS
DECANT No.
STAGE
EMBANKMENT BASE ELEVATION (mR.L.)
EMBANKMENT CREST ELEVATION (mR.L.)
DECANT No.1
1
697.0
701.0
DECANT No.2
FINAL
700.0
712.0
SECTION B TYPICAL DECANT TOWER CAUSEWAY
SECTION C TYPICAL DECANT TOWER
SECTION D TYPICAL DECANT TOWER & CAUSEWAY
DETAIL 1 TYPICAL DECANT TOWER BASE
DETAIL 2 TYPICAL LINER TRANSITION
ORIGINAL STAMPED IN RED
CORTONA RESOURCES LIMITED
DARGUES REEF GOLD PROJECT
TAILINGS STORAGE FACILITY
DECANT SYSTEM SECTIONS & DETAILS
Drg No PE801-00139-022
Revision P1
Knight Piésold CONSULTING


FINAL DESIGN
LEGEND:
1 4 25mm x 8mm
2 3 5 25mm x 8mm
NOTES:
1. ASSEMBLE WITH 4 No. 8mm DIA. x 30mm LONG BOLTS EACH WITH 2 No. NYLON WASHERS AND ONE "LOCK ON" NUT
ASSEMBLY DETAILS
COMPONENT FABRICATION DETAILS
WELD INTERMITTENT 10mm PER 20mm LENGTH
8.2mm RADIUS (TYP.)
8.2mm DIA. HOLE (TYP.)
1 2 OFF
2 4 OFF
3 1 OFF
4 1 OFF
5 1 OFF
ORIGINAL STAMPED IN RED
CORTONA RESOURCES LIMITED
DARGUES REEF GOLD PROJECT
TAILINGS STORAGE FACILITY
SPIGOT CLAMP DETAILS
Drg No PE801-00139-025
Revision P1
Scale AS SHOWN (A3)
P0 28/10/10 ISSUED FOR BANKABLE FEASIBILITY STUDY
P1 15/12/11 ISSUED FOR FINAL DESIGN
Knight Piésold CONSULTING

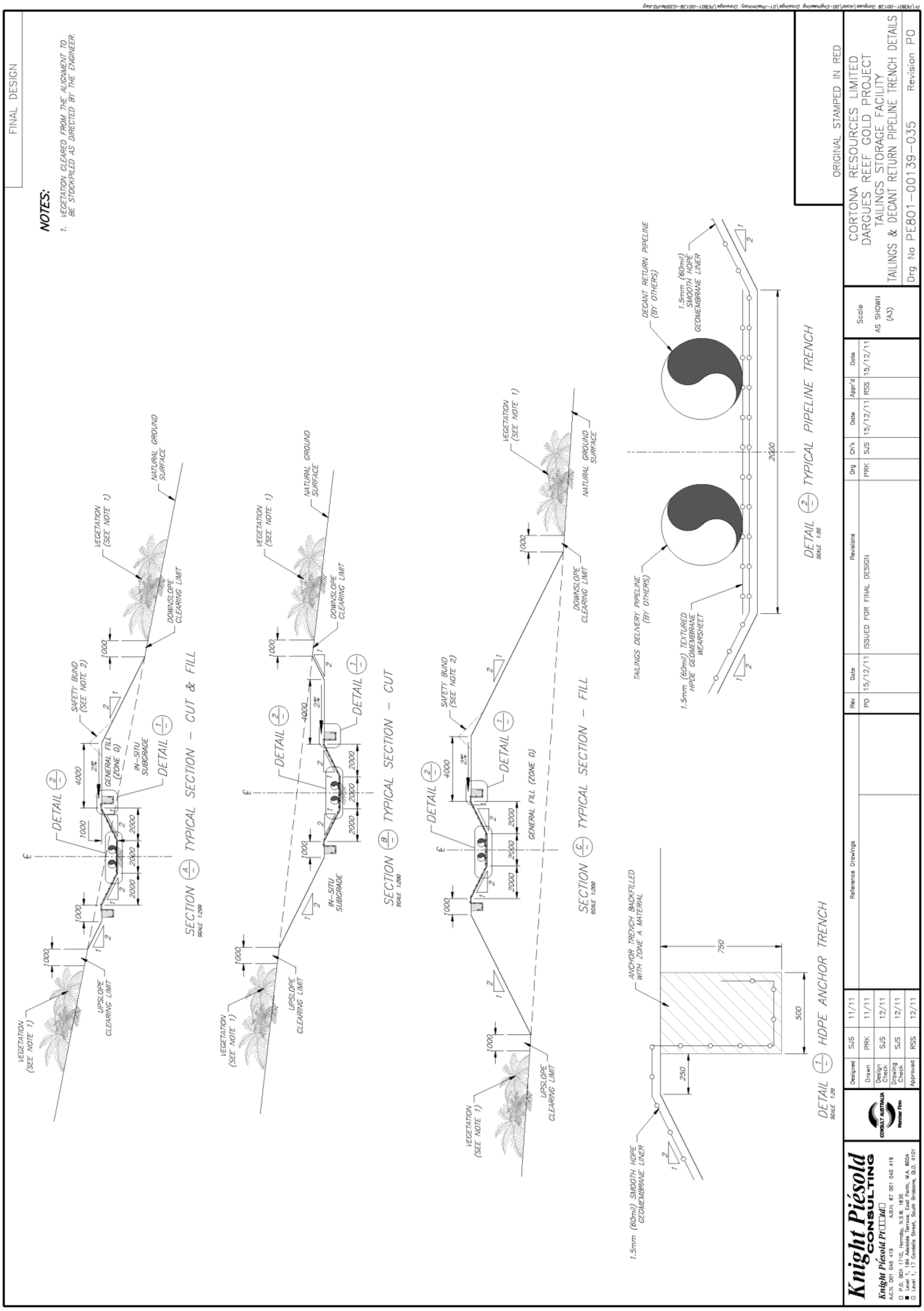


Knight Piésold CONSULTING


FINAL DESIGN
ORIGINAL STAMPED IN RED
NOTES:
1. TOPOGRAPHIC DATA PROVIDED BY CORTONA. 1m INTERVALS SHOWN.
LEGEND:
FINAL TAILINGS EXTENT
PROPOSED DIVERSION CHANNEL
STREAM/CREEK
EXISTING TRACKS/ROADS
NATURAL GROUND SURFACE
500 (MIN)
5000
SECTION A TYPICAL TAILINGS STORAGE FACILITY SPILLWAY (DURING OPERATION)
SCALE 1:100
EROSION PROTECTION
1000 (MIN)
25000
SECTION B TYPICAL TAILINGS STORAGE FACILITY SPILLWAY (AT CLOSURE)
SCALE 1:100
DIVERSION CHANNEL
FINAL TAILINGS EXTENT
TSF ACCESS ROAD
SPILLWAY CHANNEL EXTENDED & DEEPENED AT CLOSURE.
EXISTING DAM/WATER STORAGE
6063250mN
6063200mN
6063150mN
749500mE
749450mE
749400mE
SCALE 1:1,000 (A3)
METRES
DETAIL 2/010 FINAL STAGE SPILLWAY
SCALE 1:1,000
GENERAL ARRANGEMENT
PE801-00139-010
ISSUED FOR FINAL DESIGN
P0 15/12/11
Designed AJMJ 11/11
Drawn JJT 11/11
Design Check SJS 12/11
Drawing Check SJS 12/11
Approved RSS 12/11
Scale AS SHOWN (A3)
CORTONA RESOURCES LIMITED
DARGUES REEF GOLD PROJECT
TAILINGS STORAGE FACILITY
SPILLWAY PLAN, SECTIONS & DETAILS
Drg No PE801-00139-030
Revision P0
Knight Piésold CONSULTING



Knight Piésold CONSULTING


FINAL DESIGN
NOTES:
1. VEGETATION CLEARED FROM THE ALIGNMENT TO BE STOCKPILED AS DIRECTED BY THE ENGINEER.
SECTION A TYPICAL SECTION - CUT & FILL
SECTION B TYPICAL SECTION - CUT
SECTION C TYPICAL SECTION - FILL
DETAIL 1 HDPE ANCHOR TRENCH
DETAIL 2 TYPICAL PIPELINE TRENCH
ANCHOR TRENCH BACKFILLED WITH ZONE A MATERIAL
1.5mm (60mil) SMOOTH HDPE GEOMEMBRANE LINER
TAILINGS DELIVERY PIPELINE (BY OTHERS)
DECANT RETURN PIPELINE (BY OTHERS)
1.5mm (60mil) TEXTURED HDPE GEOMEMBRANE WEARSHEET
VEGETATION (SEE NOTE 1)
NATURAL GROUND SURFACE
UPSLOPE CLEARING LIMIT
DOWNSLOPE CLEARING LIMIT
SAFETY BUND (SEE NOTE 2)
GENERAL FILL (ZONE D)
IN-SITU SUBGRADE
ORIGINAL STAMPED IN RED
CORTONA RESOURCES LIMITED
DARGUES REEF GOLD PROJECT
TAILINGS STORAGE FACILITY
TAILINGS & DECANT RETURN PIPELINE TRENCH DETAILS
Drg No PE801-00139-035
Revision P0
P0 15/12/11 ISSUED FOR FINAL DESIGN
Scale AS SHOWN (A3)
Knight Piésold CONSULTING

APPENDIX A

Copy of Letter of Prescription from DSC

Knight Piésold
CONSULTING

Knight Piésold
CONSULTING

DSC NEW SOUTH WALES

Dams Safety Committee

ABN 55 079 703 705

9 November, 2010

Big Island Mining Pty Ltd
Ground Floor, 22 Oxford Close
West Leederville WA 6007

Our ref: DarguesTSF
Your ref:

Att: Ajanth Saverimutto

Dear Mr. Saverimutto,

Re: Dargues Reef Gold Project Tailings Storage Facility – Prescription

The Committee wishes to thank Knight Piesold Pty Ltd for its correspondence of 21st September 2010, including the D1, D2 and D8 Forms for the proposed tailings storage facility at Dargues Reef Gold Project, near Braidwood.

The Committee, at its October 2010 meeting, has noted the proposal, and will initially prescribe the dam with a "Significant" Consequence Category.

You are now requested to submit a Design Report for the Committee's consideration, prior to construction commencing.

It is requested that the constructed dam is to be capable of withstanding the impacts of mining. Please be advised that the DSC will put a Notification Area around the dam.

Your continuing cooperation is appreciated. If there are any queries in regard to the above please do not hesitate to contact the undersigned.

Yours faithfully,

Paul W. Heinrichs
Executive Engineer

cc. Simon Smith
Knight Piesold Pty Ltd
GPO Box 1302
West Perth WA 6872

U:\EH\DarguesReef-Prescribe.doc

Page 1 of 1

Postal: NSW Dams Safety Committee
PO Box 3720
Parramatta NSW 2124
Australia

Address: Level 3
10 Valentine Avenue
Parramatta NSW 2150
Australia

Phone: +61 (02) 9895 7363
Fax: +61 (02) 9895 7354
http: www.damsafety.nsw.gov.au
email: dsc@damsafety.nsw.gov.au

APPENDIX B

TSF Options Study Technical Memorandum

Knight Piésold
CONSULTING

Knight Piésold CONSULTING

MEMORANDUM

To:	**MACROMET**	**Date:**	25th February 2010
Attn:	**Gary Jobson**	**Our Ref:**	PE801-00139smwM10001PLV
		KP File Ref.:	PE801-139 EMEM-KP001
cc:		**From:**	Dave Morgan / Peter Veld

RE: DARGUES REEF – SITING STUDY FOR TSF

1. INTRODUCTION

A preliminary tailings storage facility (TSF) siting study has been undertaken for the Dargues Reef Gold Project.

2. DATA FOR DESIGN

The sizing of the facility was based on the following data:

Required storage capacity	1.0Mt
Tailings grind size	P_{80} = 212 – 250 µm
Average throughput	280,000 tpa
Tailings discharge %solids	55%

The site is located south-east of Canberra and a review of climatic maps of the relevant area indicate an annual rainfall of about 720 mm and an annual evaporation rate of about 1,620 mm (Class 'A' pan with birdguard).

3. DESIGN PARAMETERS

Based on the available tailings and site information the following design parameters were generated:

Tailings density	1.3 t/m^3
Supernatant release	40%
Nominal facility size for full air drying	12 ha
Runoff Coefficients	
Tailings	0.7
Undisturbed catchment	0.3
Evaporation pan factor	0.7
Embankment configuration	
Crest width	6 m
Upstream slope	1V:2H
Downstream slope	1V:3H

4. TSF OPTIONS

4.1 SELECTED OPTIONS

Two sites for the TSF were assessed as follows:

- Option 1 – Nominal square / rectangular facility south of the plant area.
- Option 2 – Valley storage in the stream to the east-northeast of the plant site.

Both locations are shown on Figure 1 and are discussed in more detail below.

4.2 OPTION 1

Option 1 is a rectangular facility in a relatively flat area south of the plant site.

The facility consists of two cells and the dimensions are provided below:

Facility Area	Cell 1 - 215 m x 240 m	Cell 2 - 215 m x 215 m
Average tailings depth	8.1 m	
Embankment heights	1 to 17 m (Cell 2 crest level nominally 7 m higher than Cell1)	
Estimated Embankment Volume		
Downstream	666,000 m^3	
Upstream	200,000 m^3	
Distance to plant (mill area to centroid of TSF)	500 m	

Based on the two cell configuration the TSF was assessed to determine the annual water balance as follows:

Water in with slurry	229,000 m^3
Supernatant released	91,600 m^3
Rainfall collection	48,200 m^3
Evaporation (based on 2 No 2 ha ponds)	45,200 m^3
Shortfall	134,400 m^3 (59%)

Thus the water balance for this option would be strongly negative with water makeup required from another source.

4.3 OPTION 2

Option 2 is a cross valley storage to the east-northeast of the plant. The facility dimensions are as follows:

Final tailings footprint	9.3 ha
Catchment Area (inside diversion channels)	12.0 ha
Maximum embankment height	21 m
Estimated embankment Volume downstream	184,800 m^3
Distance to plant (mill area to centroid of embankment)	480 m

It may be possible to construct the embankment using a modified centreline configuration which would potentially save 30% of the embankment volume.

The annual water balance for this option was assessed as follows:

Water in with slurry	229,000 m^3
Supernatant released	91,600 m^3
Rainfall collection (9.3 ha at RC=0.7, 2.7 ha at RC=0.3)	53,000 m^3
Evaporation (4 ha pond)	45,200 m^3
Shortfall	129,600 m^3 (57%)

Similar to Option 1 this TSF water balance is strongly negative with water makeup required from another source. However it would be possible to reduce the shortfall by modifying the diversion channels.

5. CONCLUSIONS

Both of the options selected are viable tailings storage areas. From an embankment volume point of view Option 2 is more efficient and it should be possible to reduce the water shortfall.

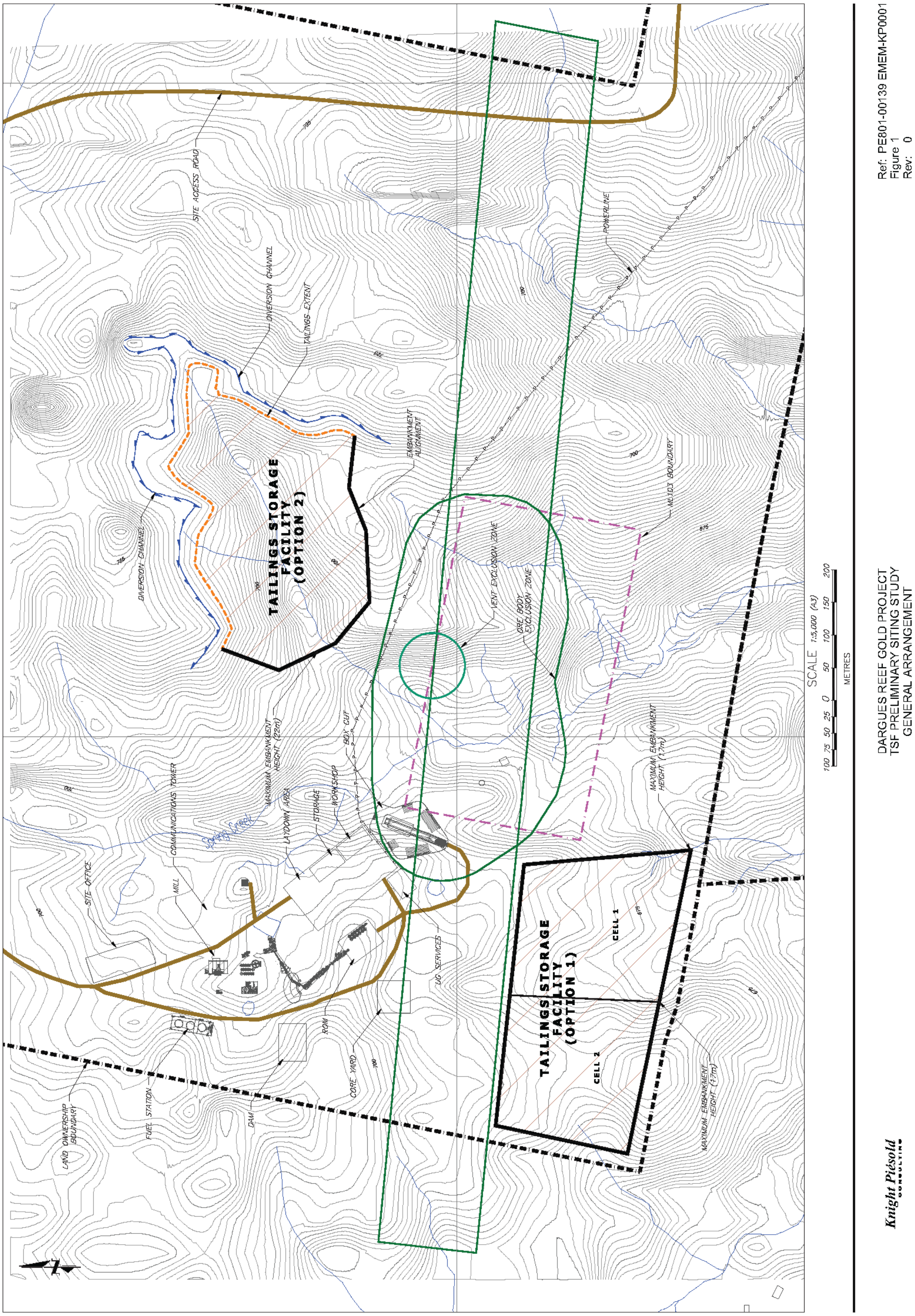
The following points should be noted:

- The siting study is a preliminary assessment only and more detailed work is required to do a full comparison of the potential sites.
- It needs to be confirmed that a TSF in the nominated valley is acceptable based on environmental criteria.

Yours faithfully
KNIGHT PIÉSOLD PTY LTD

PETER VELD
Technical Consultant

FIGURE


SITE ACCESS ROAD
DIVERSION CHANNEL
TAILINGS EXTENT
EMBANKMENT ALIGNMENT
POWERLINE
TAILINGS STORAGE FACILITY (OPTION 2)
DIVERSION CHANNEL
VENT EXCLUSION ZONE
ORE BODY EXCLUSION ZONE
MAXIMUM EMBANKMENT HEIGHT (22m)
BOX CUT
WORKSHOP
STORAGE
LAYDOWN AREA
COMMUNICATIONS TOWER
MILL
SITE OFFICE
UG SERVICES
ROM
CORE YARD
DAM
FUEL STATION
LAND OWNERSHIP BOUNDARY
MAXIMUM EMBANKMENT HEIGHT (17m)
TAILINGS STORAGE FACILITY (OPTION 1)
CELL 1
CELL 2
MAXIMUM EMBANKMENT HEIGHT (17m)
SCALE 1:5,000 (A3)
100 75 50 25 0 50 100 150 200
METRES
Ref: PE801-00139 EMEM-KP0001
Figure 1
Rev: 0
DARGUES REEF GOLD PROJECT
TSF PRELIMINARY SITING STUDY
GENERAL ARRANGEMENT
Knight Piésold CONSULTING

APPENDIX C

Detailed Seismicity Assessment of the Dargues Reef Project Site

CORTONA RESOURCES LIMITED

DARGUES REEF GOLD PROJECT

TAILIGNS STORAGE FACILITY FINAL DESIGN

DETAILED SEISMICITY ASSESSMENT

Ref. PE801-00139/07
November 2011

Rev. No.	Date	Description	KP Approved	Client Approved
A	23 Nov 2011	Issued for Client Review	DJTM	

Knight Piésold Pty Limited
A.B.N. 67 001 040 419
Level 1, 17 Cordelia Street
South Brisbane QLD 4101
AUSTRALIA

Knight Piésold CONSULTING

CONTENTS **PAGE**

1. INTRODUCTION

A probabilistic seismic hazard analysis has been carried out for the Dargues Reef Gold Project site. The site is situated in the Southern Tablelands region of NSW, approximately 14 km south of the town of Braidwood and approximately 60 km south-east of Canberra.

This report presents the methodology and results of a seismic hazard analysis carried out to determine appropriate seismic design parameters for use in the design of the Tailings Storage Facility (TSF). Existing information and historical data, including earthquake catalogues and technical publications on the tectonics and seismicity of the region have been collected and reviewed for this study.

Seismic ground motion parameters have been determined using probabilistic seismic hazard analysis. The probabilistic analysis was carried out using a seismic hazard model developed using the computer program EZ-FRISK. Appropriate seismic design parameters for the Operating Basis Earthquake (OBE) and Maximum Design Earthquake (MDE) for the TSF have been selected using the results of the analysis, together with consideration of the dam consequence classification defined for the facility.

For this seismic hazard assessment, the project site location has been defined as Latitude 35.55° S, Longitude 149.75° East.

2. REGIONAL TECTONICS AND SEISMICITY

The seismicity of south-east Australia is typical of an intraplate region, characterised by low levels of seismic activity with earthquakes apparently randomly distributed in location and time. The correlation between recorded earthquakes and geological features in Australia is typically not well known or understood. However, the Dargues Reef project site is known to be located within the Lachlan Fold Belt, a zone of folded and faulted rocks which dominates New South Wales and Victoria, also extending into Tasmania, the Australian Capital Territory and Queensland. It was formed in the Middle Palaeozoic by intense folding and deformation, major igneous intrusions and volcanic activity. Lambeck et al. (1984) believe that in Eastern Australia much of the present day seismicity is associated with the Lachlan Fold Belt, where earthquakes occur down to approximately 20 km, predominantly by strike-slip fault mechanisms. However, no recent surface faulting has been observed. Further Lambeck et al. (1984) suggest that the seismicity in the Lachlan Fold Belt is consistent with a local stress field associated with the erosion of the highlands leading to regional isostatic rebound.

Another seismic source zone in proximity to the site is the Dalton-Gunning zone, located approximately 30 km to the north of the study area. Gaull et al. (1990) identified the area as being a source of significant activity just north of Canberra. Three earthquakes of magnitude 5.5 to 5.6 are known to have occurred within the Dalton-Gunning zone during the last 130 years, in 1886, 1934 and 1949 (McCue et al. 1989). The majority of earthquakes in the Dalton area are very shallow, with focal depths of 5 km or less (Leiba 2007).

A review of historical earthquake data was carried out and incorporates data obtained from the USGS for earthquakes between 1973 and October 2011. Several different definitions of earthquake magnitude are included in the historical earthquake data, including Local (Richter) Magnitude (M_L), Surface Wave Magnitude (M_S), Body Wave Magnitude (M_B) and Moment Magnitude (M_W). Moment Magnitude is similar to M_S for events greater than about magnitude 6.0 and similar to M_B for events less than about magnitude 6.0. Moment Magnitude is the scale typically used by the majority of the more recently published ground motion attenuation relationships.

The database includes records of 46 earthquakes of M3.0 or greater which have occurred within 250 km of the site since 1973. The largest event was a M5.5 earthquake in March 1973 located approximately 165 km north-east of the site and with a focal depth of approximately 13 km.

The closest recorded earthquakes to the Dargues Reef site were M3.0 and M3.1 events located approximately 88 km from the site. These earthquakes were shallow crustal events with focal depths of approximately 5 to 10 km.

The locations of the recorded earthquakes in proximity to the Dargues Reef project site are presented in Figure 2.1.

3. SEISMIC HAZARD ANALYSIS

3.1 GENERAL

The seismic hazard for the Dargues Reef project has been examined using probabilistic methods of analysis. Seismic hazard analysis requires an examination of historical earthquake data and the regional tectonics to identify potential seismic sources and determine the maximum earthquake magnitude for each seismic source. An appropriate relationship defining the attenuation of earthquake ground motion is also required.

The methodology used to complete the site-specific probabilistic seismic hazard analysis and the results of the analysis are described in the following sections.

3.2 GROUND MOTION ATTENUATION

Appropriate attenuation models defining the relationship between earthquake magnitude, source to site distance and peak ground motion (acceleration) are required to carry out probabilistic hazard analyses. The ground motions experienced at the Dargues Reef project site are dependent on the regional ground motion attenuation characteristics and the earthquake source mechanisms.

There are very limited attenuation relationships for estimating maximum ground acceleration in Australia due to a lack of strong motion data. However, Somerville et al. (2009) published ground motion models for cratonic and non-cratonic regions of Australia. The non-cratonic model was developed specifically for the Lachlan Fold Belt and Sydney Basin. Therefore, this attenuation relationship is considered to be the most applicable to the site.

However, it is common practice to incorporate several attenuation relationships into seismic hazard analyses, especially in intraplate regions where there are generally greater uncertainties inherent within the attenuation relationships, primarily due to a lack of strong motion data. Therefore, additional published relationships which were developed for shallow crustal earthquake sources in central and/or eastern North America have been used. Central and eastern North America is considered to have a similar intraplate tectonic setting to Australia, and a number of attenuation relationships have been developed for the area. For this study, the relationships of Atkinson and Boore (2006), Toro (1999), Frankel (1996), Campbell (2003) and Silva et al. (2002) have been incorporated. In the probabilistic analysis, the attenuation equations developed for central and/or eastern America have each been given a weighting of 0.1, with the model of Somerville et al. (2009) given a weighting of 0.5. This is to account for the fact that the model of Somerville et al. (2009) was developed specifically for Australia.

3.3 PROBABILISTIC ANALYSIS

A probabilistic seismic hazard analysis is carried out to define a unique probability of occurrence for each possible level of ground acceleration experienced at a site. The methodology used for the probabilistic analysis is based on that presented by Cornell (1968). The likelihood of occurrence of earthquakes within defined seismic source zones is determined by examining seismicity data. Using historical earthquake records for the region, magnitude-frequency recurrence relationships are established for potential earthquake source zones. The magnitude recurrence relationships are of the form derived by Gutenberg-Richter (1944):

$$\log(N) = a - b(M)$$

Where, M = Earthquake magnitude

N = Annual frequency of occurrence for earthquakes exceeding magnitude M

(1/N = Return Period)

The parameter "a" is dependent on the period of observation and the level of seismicity, while the parameter "b" is a measure of seismicity that describes the scaling relationship between the number of small and large earthquakes. Global "b" values are typically in the range of 0.6 to 1.2. Low values of "b" typically indicate the potential for large earthquakes and/or low seismic activity in an earthquake zone.

The computer program EZ-FRISK (Risk Engineering, Inc., 2011) was used to develop a seismic hazard model for south-eastern Australia. The seismic hazard analysis module available with EZ-FRISK includes a database of faults and areal seismic sources for the study area provided by Risk Engineering. Seismic sources defined in the hazard model are similar to those proposed by Gaull et al. (1990) and include the Lachlan Fold Belt and Dalton-Gunning source zones. In addition, source zones further from the site such as those in the wider Sydney area and Tasman Sea Margin have been considered. All of the seismic sources included in the model comprise shallow crustal fault zones.

Magnitude-frequency recurrence relationships and the corresponding maximum earthquake magnitude for each seismic source are prepared by Risk Engineering from consideration of historical seismicity, fault characteristics and the regional tectonics, using information obtained from the U.S. Geological Survey and proprietary studies. For calculation of peak ground accelerations, a minimum magnitude of 5.0 was used in the analysis for all seismic source zones. Earthquakes of lower magnitude are not considered to be a risk to engineered facilities. Appropriate ground motion attenuation relationships were assigned to the seismic sources, as discussed in Section 3.2.

The seismic hazard model developed using EZ-FRISK was used to determine the relationship between peak ground acceleration and annual frequency of occurrence for the site. Median hazard values of peak ground acceleration have been determined for return periods ranging up to 10,000 years. Predicted values for the mine site are summarised in Table 3.1 in terms of earthquake return period, probability of exceedance (assuming a 63 month mine operating life) and peak ground acceleration. For a return period of 475 years, the corresponding peak ground acceleration is 0.07g, implying a low seismic hazard. The relationship between probability of exceedance and peak ground acceleration for a range of design lives (5, 10, 20, 50 and 100 years) is shown graphically in Figure 3.1.

Table 3.1: Summary of probabilistic seismic hazard analysis

Return Period (years)	Annual Frequency of Exceedance	Probability of Exceedance	Maximum Acceleration (g)
100	0.01	5%	0.03
200	0.005	3%	0.04
475	0.002	1%	0.07
1000	0.001	0.5%	0.11
2500	0.0004	0.2%	0.17
5000	0.0002	0.1%	0.25
10000	0.0001	0.05%	0.34

De-aggregation of the probabilistic seismic hazard results has been carried out to provide the relative contributions of all potential seismic sources, and to more accurately define the characteristics of design earthquakes required for the design of critical facilities at the site. The required characteristics of the design earthquake events include magnitude, mean distance, duration of shaking and frequency characteristics. Appropriate design earthquakes and their corresponding characteristics are discussed in Section 4.0

A global seismic hazard map was prepared for the Global Seismic Hazard Assessment Program (GSHAP, 1999). This hazard map presents the probabilistic maximum acceleration on rock with a 10% chance of exceedance in 50 years (corresponding to a return period of 475 years). The maximum acceleration indicated by the hazard map for the project site is 0.08g to 0.16g. This indicates that the site is in a region of moderate seismic hazard and corresponds reasonably well with the acceleration of 0.07g determined for this site-specific study.

Earthquake hazard maps provided in AS1170.4 (2007) indicate the site to be located in area where the hazard (z) for the 1 in 500 year annual probability of exceedance is equivalent to 0.08g to 0.09g. These maps were based on the earlier work by Gaull et al. (1990) who calculated the 1 in 500 year peak ground acceleration for the site area to be approximately 0.05g. These values are all in very good agreement with the acceleration of 0.07g calculated for this study.

4. SEISMIC DESIGN PARAMETERS

Appropriate design earthquakes and seismic design parameters have been selected for the Dargues Reef project site based on the findings of the seismicity review and the results of the probabilistic seismic hazard analysis.

Consistent with current design philosophy for geotechnical structures such as dams, two levels of design earthquake are typically considered: the Operating Basis Earthquake (OBE) for normal operations; and the Maximum Design Earthquake (MDE) for extreme (dam safety) conditions.

The OBE is typically determined using the probabilistic seismic hazard analysis to select an acceptable hazard level, based on the probability of exceedance over the design life of the facility. This is often chosen as the earthquake that has a 10% probability of exceedance in 50 years, corresponding to a return period of 475 years (ICOLD, 1995). For an operating life of just over 5 years, the probability of exceedance for the OBE event is 1%. The maximum acceleration for the 1 in 475 year OBE is 0.07g. A design earthquake magnitude of 5.8 within the Lachlan Fold Belt or Gunning-Dalton Fault Zone at a hypocentral distance of 25 km has been selected for the OBE, based on a review of historical seismicity and the findings of the seismic hazard analyses (including de-aggregation of the seismic hazard). The TSF would be expected to function in a normal manner after the OBE and any damage from the occurrence of earthquake shaking should be easily repairable (ICOLD, 1995).

An appropriate Maximum Design Earthquake (MDE) for the TSF is typically determined based on the consequence category of the facility, which considers the consequences of failure. This assessment typically includes consideration of the potential loss of life and environmental and economic impacts due to failure of the tailings dam (ICOLD, 1989 and ANCOLD, 2000). The TSF at the Dargues Reef project site has been assigned a consequence category of “Significant”, based on the NSW Dams Safety Committee (DSC) publication DSC3A “Consequence Categories for Dams” (2010).

The DSC publication DSC3C “Acceptable Earthquake Capacity for Dams” (2010) states that an appropriate MDE for a significant consequence category dam is equivalent to an annual exceedance probability (AEP) of 1 in 500. However, given that this has virtually the same return period as that adopted for the OBE, it is proposed that the adopted MDE should be the 1 in 1000 year acceleration of 0.11g. This is a conservative approach that also allows for some of the uncertainty inherent when conducting earthquake hazard assessments within Australia, as previously discussed in Section 3.2. For an operating life of just over 5 years, the probability of exceedance for a 1 in 1000 year MDE during operation is 0.5%. A design earthquake magnitude of

6.1 within the Lachlan Fold Belt at a hypocentral distance of 20 km has been selected for the MDE, based on a review of historical seismicity and the findings of the seismic hazard analyses (including de-aggregation of the seismic hazard). The DSC guidance document DSC3C (2010) states that all significant consequence category dams are to withstand shaking, without an uncontrolled loss of storage due to partial or complete failure of the dam, for the appropriate MDE. Considerable damage in such an event, however, would be acceptable.

Probabilistic response spectra have been derived for the OBE and MDE earthquakes, as summarised below in Table 4.1 and shown graphically in Figure 4.1.

Table 4.1: Summary of OBE and MDE response spectra

Spectral Period (Seconds)	Spectral Acceleration (g)	
	OBE	MDE
PGA	0.07	0.11
0.01	0.06	0.10
0.02	0.08	0.14
0.05	0.14	0.20
0.10	0.16	0.24
0.20	0.15	0.21
0.30	0.12	0.17
0.40	0.09	0.13
0.50	0.07	0.10
0.75	0.04	0.06
1.0	0.03	0.04
2.0	0.009	0.01
3.0	0.004	0.007
4.0	0.003	0.004

The maximum accelerations presented in this report are based on rock site conditions, as defined by the IBC (2009), with an average shear wave velocity of 760 m/s. Peak ground accelerations within the tailings deposit and embankment dam may be higher due to amplification of ground motion through the tailings facility. Typically, ground accelerations may amplify by a factor of about 1.5 to 3.0. The ability of the embankment fill and tailings materials to transmit high seismic ground motions is dependent on their dynamic stiffness and damping characteristics. Dynamic site response analyses can be carried out to determine the amplification of ground motions as seismic waves propagate through the foundation materials, tailings deposit and embankment dam.

5. SUMMARY

An assessment of the seismicity of south-eastern Australia has been carried out and probabilistic seismic hazard analyses have been completed for the Dargues Reef project site. Existing information and historical data, including earthquake catalogues and technical publications on the tectonics and seismicity of the region have been reviewed. The most prominent seismic source in the region that defines the seismic hazard for the project is the Lachlan Fold Belt, an areal source zone thought to be capable of causing earthquakes up to Magnitude 6.1. The Dalton-Gunning zone, located approximately 30 km to the north of the site, is another areal source zone that contributes significantly to the seismic hazard at Dargues Reef. This seismic source zone is also thought to be capable of causing earthquakes of up to M6.1 (Risk Engineering, 2011).

The computer program EZ-FRISK was used to develop a seismic hazard model for the Dargues Reef site. Seismic sources defined in the hazard model include shallow crustal earthquake sources such as the Lachlan Fold Belt and Dalton-Gunning zone, but also those located within the wider Sydney Basin area and Tasman Sea Margin. Appropriate attenuation models defining the relationship between earthquake magnitude, source to site distance and peak ground acceleration have been used in the probabilistic analysis.

Seismic design parameters have been determined for use in the design of the Tailings Storage Facility (TSF). Seismic ground motion parameters (including peak ground acceleration, earthquake magnitude and response spectra) have been determined using the results of the probabilistic seismic hazard analysis.

It is recommended that the 1 in 475 year earthquake be adopted as the Operating Basis Earthquake (OBE) for the TSF. For a design operating life of 63 months the probability of exceedance for the OBE event is 1%. The estimated peak ground acceleration for the 1 in 475 year earthquake is 0.07g. A design earthquake magnitude of 5.8 within the Lachlan Fold Belt or Gunning-Dalton Fault Zone at a hypocentral distance of 25 km is appropriate for the OBE. The TSF and appurtenances are expected to remain functional and any damage from the occurrence of earthquake shaking not exceeding the OBE would be easily repairable.

An appropriate Maximum Design Earthquake for the TSF has been determined based on the DSC guidance documents DSC3A and DSC3C (2010). The facility has been classified as a significant consequence category dam and, therefore, an appropriate MDE would be equivalent to an annual exceedance probability (AEP) of 1 in 500. However, given that this is virtually the same return period as that adopted for the OBE, it is proposed that the adopted MDE should be the 1 in 1000 acceleration of 0.11g. This is a conservative approach that also allows for some of the uncertainty inherent when conducting earthquake hazard assessments within Australia. Considerable damage of the tailings dam is acceptable under seismic loading from the MDE, provided that there is no uncontrolled loss of storage due to partial or complete failure of the dam.

6. REFERENCES

1. ANCOLD - Australian National Committee on Large Dams (1998), "Guidelines for Design of Dams for Earthquakes", August 1998.
2. ANCOLD - Australian National Committee on Large Dams (2000), "Guidelines on Assessment of the Consequences of Dam Failure", May 2000.
3. Atkinson, G.M. and Boore, D. M. (2006), "Earthquake Ground-Motions Prediction Equations for Eastern North America", Bulletin of the Seismological Society of America, Vol. 96, No. 6, p2181.
4. Australian Standard AS1170.4 (2007), "Minimum Design Loads on Structures", Part 4, Earthquake Loads.
5. Campbell, K.W. (2003), "Prediction of Strong Ground Motion Using the Hybrid Empirical Method and its use in the Development of the Ground-Motion (Attenuation) Relations in Eastern North America", Bulletin of the Seismological Society of America, Vol. 93, No. 3, p1012-1033.
6. Cornell, C.A. (1968), "Engineering Seismic Risk Analysis", Bulletin of the Seismological Society of America, Vol. 58, p.1583-1606.
7. EZ-FRISK (2011), Software for Earthquake Ground Motion Estimation, Version 7.62, Risk Engineering, Inc., Boulder, Colorado, USA.
8. Frankel, A. (1996), "National Seismic Hazard Maps: Documentation", US Geological Survey, OFR 96-532, 110 pp.
9. Gaull, B.A., Michael-Leiba, M.O. and Rynn, J.M.W. (1990), "Probabilistic earthquake risk maps of Australia", Australian Journal of Earth Sciences, 37, 169-187.
10. GSHAP – Global Seismic Hazard Assessment Program, (1999), A Demonstration Project of the UN/International Decade of Natural Disaster Reduction, GSHAP (http://seismo.ethz.ch/GSHAP/.)
11. Gutenberg, B. and Richter, C.F. (1944), "Frequency of Earthquakes in California", Bulletin of the Seismological Society of America, Vol. 34, p.185-188.
12. ICOLD – International Commission on Large Dams (1989), "Selecting Seismic Parameters for Large Dams," Bulletin 72.
13. ICOLD – International Commission on Large Dams (1995), "Tailings Dams and Seismicity: Review and Recommendations," Bulletin 98.

14. Lambeck, K., McQueen, H.W.S., Stephenson, R.A. and Denham, A. (1984), "The state of stress within the Australian continent", Annales Geophysicae, 1984, 2, 6, 723-742.

15. Leiba, M. (2007), "Earthquakes in the Canberra Region", Geoscience Australia, December 2007, Australian Government.

16. McCue, K.F., Kennett, B.L.N., Gaull, B. A., Michael-Leiba, M. O., Weekes, J. and Krayshek, C. (1989) "A century of earthquakes in the Dalton-Gunning region of New South Wales", BMR Journal of Australian Geology and Geophysics, 11, 1-9.

17. New South Wales Dams Safety Committee (2010), "DSC3A – Consequence Categories for Dams, June 2010.

18. New South Wales Dams Safety Committee (2010), "DSC3C – Acceptable Earthquake Capacity for Dams, June 2010.

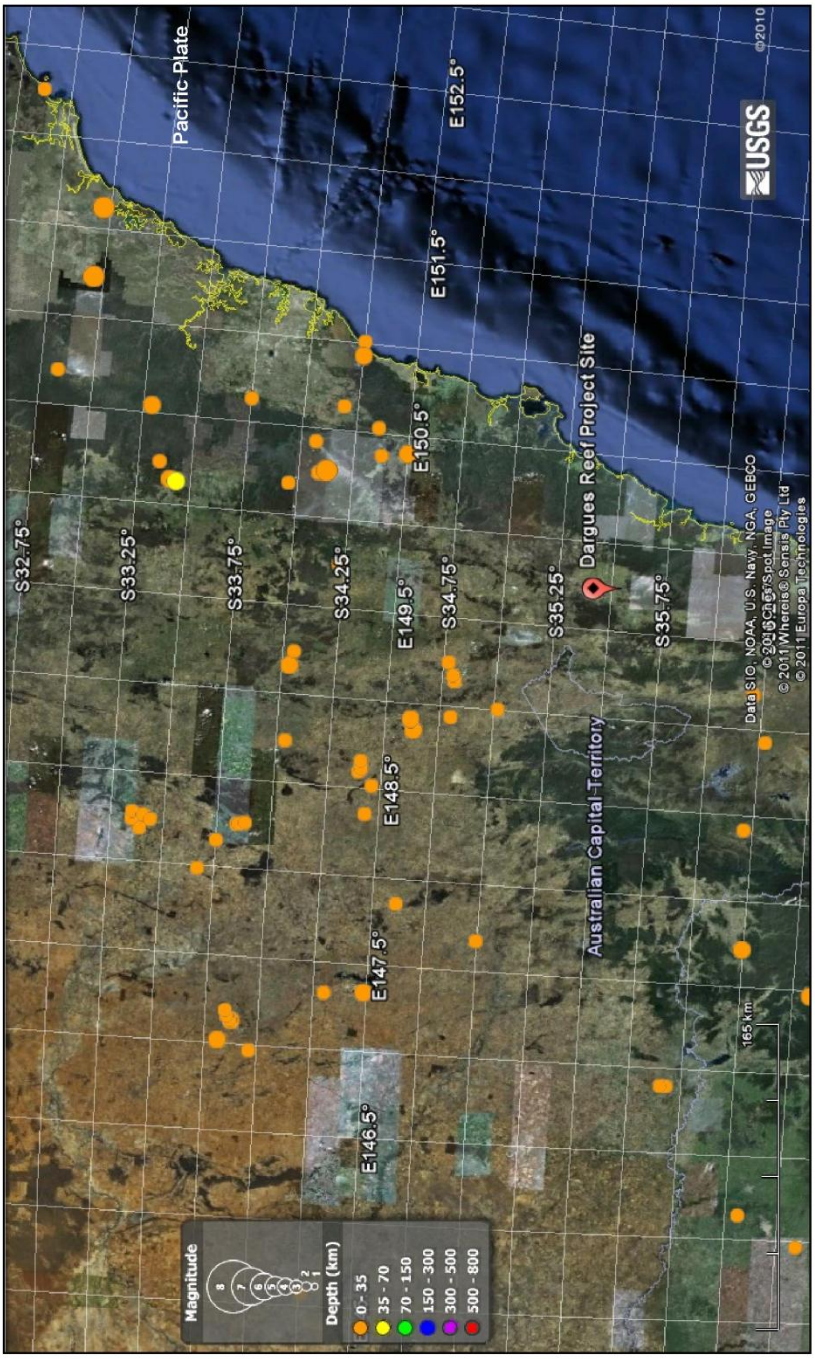
19. Silva, W.J. (2002), "Development of Regional Hard Rock Attenuation Relations for Central and Eastern North America", www.pacificengineering.org

20. Somerville, P., Graves, R., Collins, N., Song, S.G., Ni, S. and Cummins, P. (2009), "Source and Ground Motion Models for Australian Earthquakes", Proceedings of the 2009 Conference of the Australian Earthquake Engineering Society, Newcastle, Australia. http://www.aees.org.au/Proceedings/2009_Papers/Somerville_et_al.pdf

21. Toro, G.R. (1999), "Modifications of the Toro et al. (1997) Attenuation Equations for Large Magnitudes and Short Distances", Risk Engineering Inc. Website www.riskeng.com

FIGURES

Knight Piésold
CONSULTING

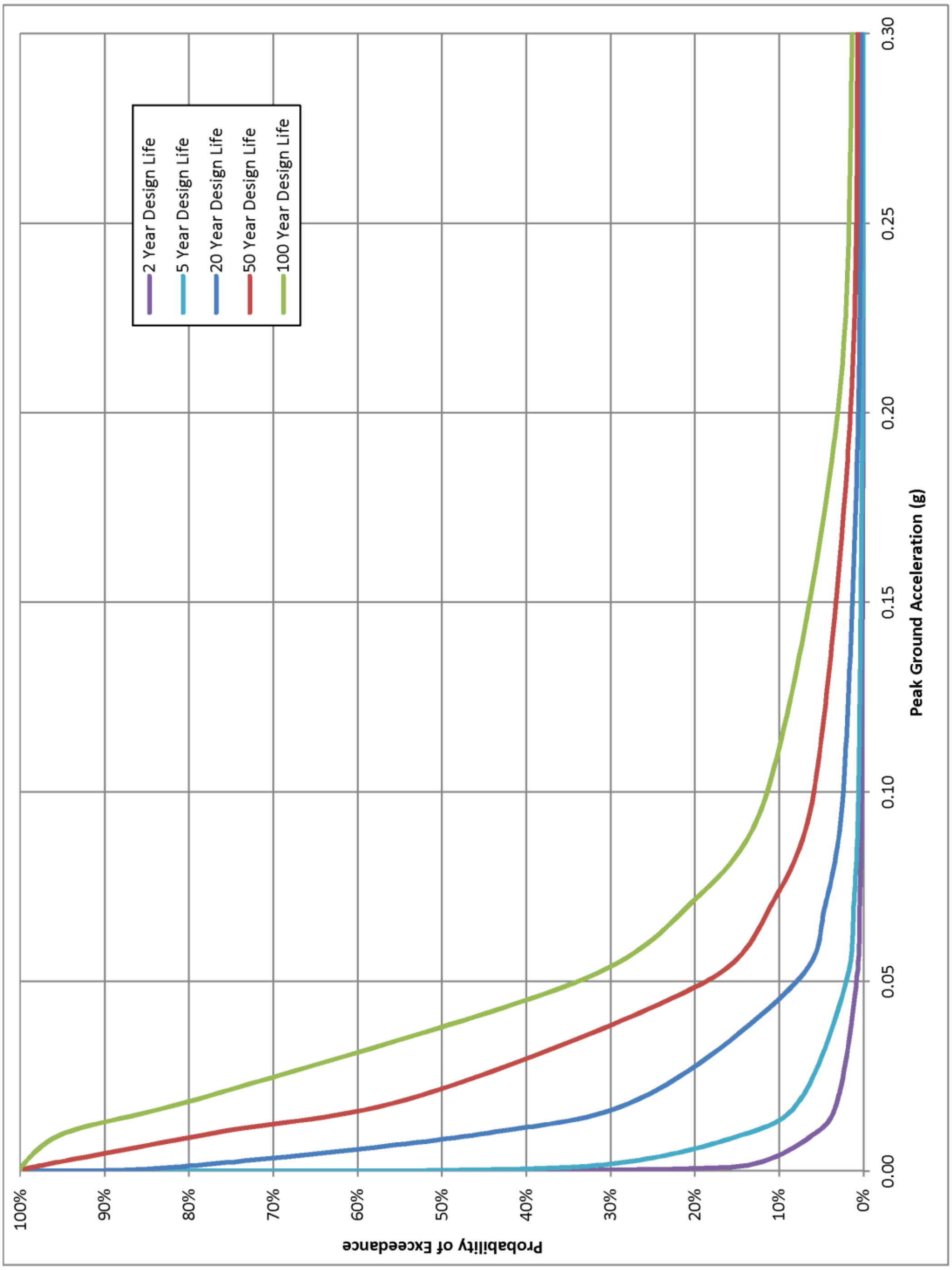


Circular search area of 500 km radius around the Dargues Reef Site, including all earthquakes M3.0 and above.

Ref: PE801-00139/07
Figure 2.1

DARGUES REEF GOLD PROJECT
DETAILED SEISMICITY REPORT
HISTORICAL EARTHQUAKE DATA

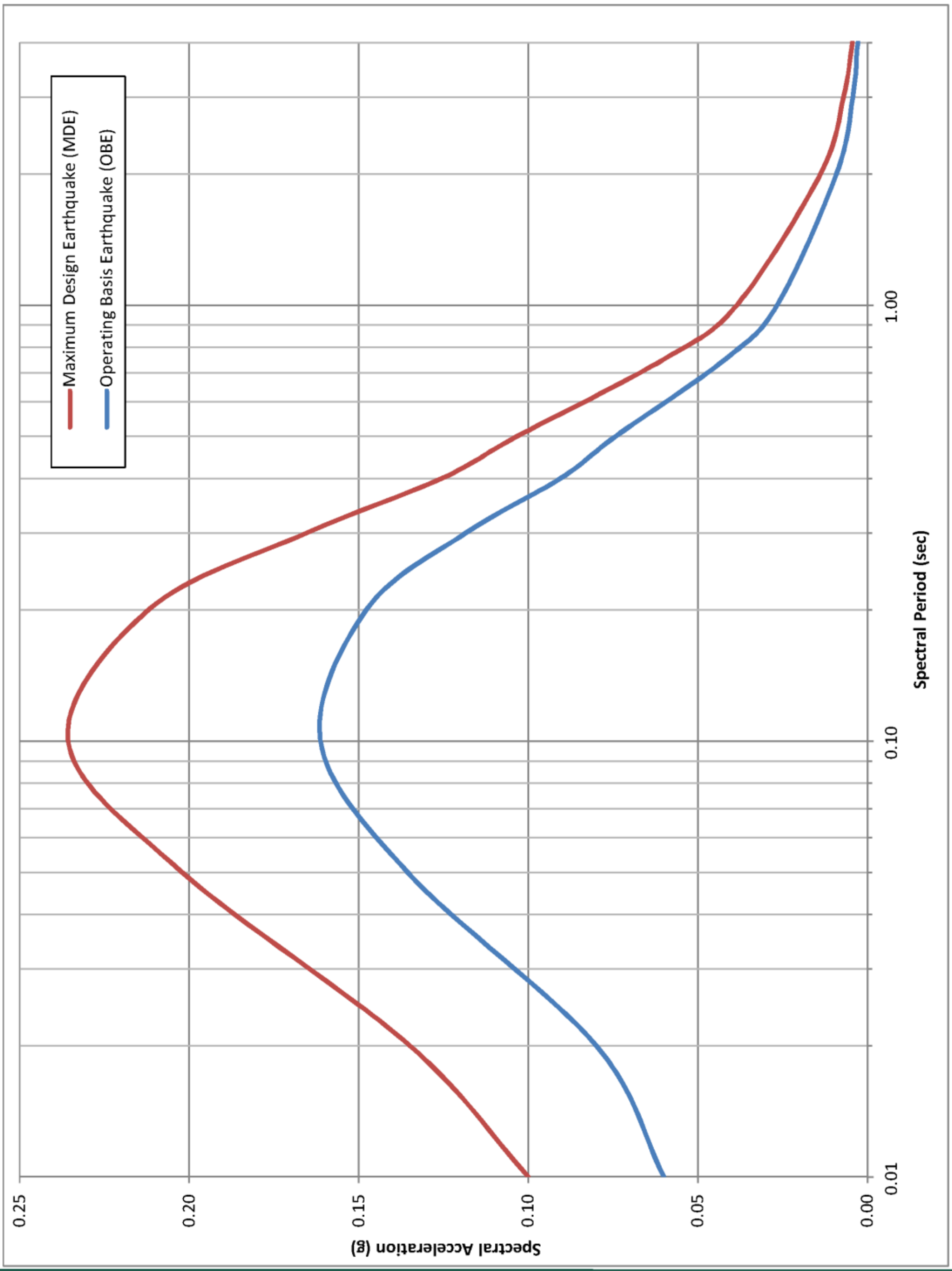
Knight Piésold
CONSULTING



Knight Piésold CONSULTING

DARGUES REEF GOLD PROJECT
DETAILED SEISMICITY ASSESSMENT
RELATIONSHIP BETWEEN DESIGN LIFE, PROBABILITY OF EXCEEDANCE AND PEAK GROUND ACCELERATION

Ref: PE801-00139/07
Figure 3.1



Knight Piésold CONSULTING

DARGUES REEF GOLD PROJECT
DETAILED SEISMICITY ASSESSMENT
PROBABILISTIC RESPONSE SPECTRA FOR DESIGN EARTHQUAKES

Ref: PE801-00139/07
Figure 4.1

APPENDIX D

Photographic Record of Walk Over Survey

Knight Piésold CONSULTING

Knight Piésold CONSULTING

DARGUES REEF GOLD PROJECT
GEOTECHNICAL INVESTIGATION
WALK-OVER SURVEY

Plate 1: View of TSF area facing southwest.

Plate 2: View of TSF area facing west.

DARGUES REEF GOLD PROJECT
GEOTECHNICAL INVESTIGATION
WALK-OVER SURVEY

Plate 3: View of TSF area facing north.

Plate 4: View of TSF area facing south.

DARGUES REEF GOLD PROJECT
GEOTECHNICAL INVESTIGATION
WALK-OVER SURVEY

Plate 5: View of TSF tributary facing west.

Plate 6: View across TSF facing west.

DARGUES REEF GOLD PROJECT
GEOTECHNICAL INVESTIGATION
WALK-OVER SURVEY

Plate 7: View down creek.

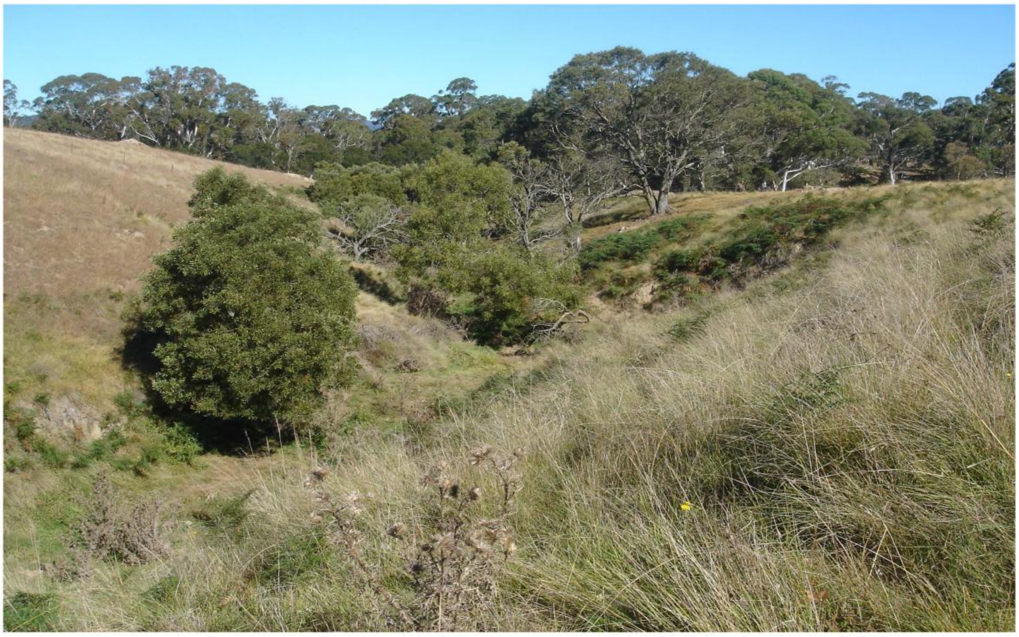


Plate 8: View down creek from TP05.

DARGUES REEF GOLD PROJECT
GEOTECHNICAL INVESTIGATION
WALK-OVER SURVEY

Plate 9: View up creek from TP11.

Plate 10: View up creek from TP04.

DARGUES REEF GOLD PROJECT
GEOTECHNICAL INVESTIGATION
WALK-OVER SURVEY

Plate 11: View up creek from TP19.

APPENDIX E

Borehole Logs and Core Photographs

Knight Piésold CONSULTING

Knight Piésold CONSULTING
Knight Piesold Pty Limited
A.B.N. 67 001 040 419
Level 3, 46 Ventnor Avenue
WEST PERTH WA 6005
Australia

Dargues Reef Gold Project
Cortona Resources Ltd
Tailings Storage Facility
New South Wales

HOLE: **DRTSF1**
Sheet 1 of 5

JOB: PE801-00139

TOTAL RECOVERY (%)	SOLID CORE RECOVERY (%)	ROCK QUALITY DESIGNATION (%)	FRACTURE FREQUENCY	GRAPHIC LOG	DEPTH (m)	MATERIAL DESCRIPTION	STRENGTH/ CONSISTENCY	WEATHERING	DEFECTS/ADDITIONAL COMMENTS	WATER STRIKES AND SAMPLING
-	-	-	-		0m	**SAND**, silty, with gravel and clay, low plasticity, grey brown, dry. TOPSOIL				
					0.2m	**GRANITE**, light brown, cream and orange, extremely weathered, recovered as sand and gravel. Occasionally clayey or consolidated, low plasticity.			Where visible joints in weathered granite are sub-horizontal to sub-vertical, undulating, rough and open. (Probably drilling induced)	
55	37	37	2		1 – 3	Poor recovery to 13.65 m.	EL	XW		
100	50	41	4		3 – 5		EL	XW		

NOTES:
1. Advanced by auger to 1.0 m.
2. Advanced using water flush drilling technique below 1.0 m.
3. Difficulties drilling between 15.0 - 25.8 m. Rods sticking due to collapse of hole and drill bit expired in hard rock (Aplite).
4. Packer tests attempted between 2-6 m, 10-15 m and 20-30 m.
5. NI - Non intact.
6. NR - No recovery.

CONTRACTOR: Terratest MACHINE: Edson Truck Mounted Rig	DATE STARTED: 14/05/2010	NORTHING: 6063221	INCLINATION: -90
LOGGED BY: SW CHECKED BY:	DATE FINISHED: 17/05/2010	EASTING: 749124	DRTSF1
	HOLE SIZE: 100 mm	ELEVATION: 690.506	

KP_BH3_PE801-00139 BH LOGS.GPJ KP_BH1.GDT 30/8/10

Knight Piésold CONSULTING
Knight Piesold Pty Limited
A.B.N. 67 001 040 419
Level 3, 46 Ventnor Avenue
WEST PERTH WA 6005
Australia

Dargues Reef Gold Project
Cortona Resources Ltd
Tailings Storage Facility
New South Wales

HOLE: **DRTSF1**
Sheet 2 of 5

JOB: PE801-00139

TOTAL RECOVERY (%)	SOLID CORE RECOVERY (%)	ROCK QUALITY DESIGNATION (%)	FRACTURE FREQUENCY	GRAPHIC LOG	DEPTH (m)	MATERIAL DESCRIPTION	STRENGTH/ CONSISTENCY	WEATHERING	DEFECTS/ADDITIONAL COMMENTS	WATER STRIKES AND SAMPLING
					6		EL	XW		
76	53	37	7		7					
					8					
					9		EL	XW		
85	22	22	1		10					

KP_BH3_PE801-00139 BH LOGS.GPJ KP_BH1.GDT 30/8/10

Knight Piésold CONSULTING
Knight Piesold Pty Limited
A.B.N. 67 001 040 419
Level 3, 46 Ventnor Avenue
WEST PERTH WA 6005
Australia

Dargues Reef Gold Project
Cortona Resources Ltd
Tailings Storage Facility
New South Wales

HOLE: **DRTSF1**
Sheet 3 of 5

JOB: PE801-00139

TOTAL RECOVERY (%)	SOLID CORE RECOVERY (%)	ROCK QUALITY DESIGNATION (%)	FRACTURE FREQUENCY	GRAPHIC LOG	DEPTH (m)	MATERIAL DESCRIPTION	STRENGTH/ CONSISTENCY	WEATHERING	DEFECTS/ADDITIONAL COMMENTS	WATER STRIKES AND SAMPLING
31	0	0	NI		12, 13		EL	XW		
72	60	53	2		14	13.65m **GRANITE**, coarse grained, crystalline, massive, cream, brown, black, pink grey.	VH EL	SW SW	14.07-14.33 m - sub-vertical joints, 45°, planar, smooth, open, fresh. 14.33-14.63 m - sub-horizontal joints, 20°, planar, smooth, open, calcite coated 14.63-14.77 m - sub-horizontal joints, 25°, undulating, smooth, open, silty 14.77-15.0 m - sub-horizontal joints, 40°, undulating, smooth, open fresh	
0	0	0	NR		15, 16	15m No recovery Possible weathered zone above dyke				

KP_BH3_PE801-00139 BH LOGS.GPJ KP_BH1.GDT 30/8/10

Knight Piésold CONSULTING

Knight Piesold Pty Limited
A.B.N. 67 001 040 419
Level 3, 46 Ventnor Avenue
WEST PERTH WA 6005
Australia

Dargues Reef Gold Project
Cortona Resources Ltd
Tailings Storage Facility
New South Wales

HOLE: **DRTSF1**
Sheet 4 of 5

JOB: PE801-00139

TOTAL RECOVERY (%)	SOLID CORE RECOVERY (%)	ROCK QUALITY DESIGNATION (%)	FRACTURE FREQUENCY	GRAPHIC LOG	DEPTH (m)	MATERIAL DESCRIPTION	STRENGTH/ CONSISTENCY	WEATHERING	DEFECTS/ADDITIONAL COMMENTS	WATER STRIKES AND SAMPLING
30	18	18	2		18m	Very poor recovery, only 100 mm of gravel returned. Gravel includes granite and Aplite. Possible fault / Aplite dyke				
					19					
					20					
					20.24m	**GRANITE**, coarse grained, crystalline, massive, brown cream, oxidised.	L	DW	20.24-20.36 m - sub-vertical joints, 60°, planar, smooth, open, calcite coating 20.36-20.61 m - undulating, smooth, open, fresh 20.53-20.94 m - sub-horizontal joints, 35°, undulating, rough, open, oxidised 20.61-20.66 m - sub-vertical joints, 45°, undulating, smooth, open, partial calcite coating 20.66-20.87 m - sub-vertical joints, 85°, undulating, planar, rough and smooth, open, calcite coating 20.87-20.53 m - sub-vertical joints, 45°, undulating, rough, open, oxidised 20.94-21.27 m - sub-horizontal joints, 28°, undulating, rough, open, oxidised 21.27-21.28 m - sub-horizontal joints, 65°, planar, smooth, open, calcite coated 21.28-21.45 m - horizontal joints, undulating, smooth, open fresh 21.45-21.57 m - sub-horizontal joints, 35°, planar, stepped,	
					20.64m	**GRANITE**, coarse grained, crystalline, massive, cream, brown, black, pink grey.	EH	SW		
100	100	80	4		21		VH	SW		
							EH	SW		
					22		EH	SW		
					22.5m	Very poor recovery, only 500 mm of gravel returned. Gravel includes granite and Aplite. Possible fault / Aplite dyke				

KP_BH3_PE801-00139 BH LOGS.GPJ KP_BH1.GDT 30/8/10

Knight Piésold CONSULTING
Knight Piesold Pty Limited
A.B.N. 67 001 040 419
Level 3, 46 Ventnor Avenue
WEST PERTH WA 6005
Australia

Dargues Reef Gold Project
Cortona Resources Ltd
Tailings Storage Facility
New South Wales

HOLE: **DRTSF1**
Sheet 5 of 5

JOB: PE801-00139

TOTAL RECOVERY (%)	SOLID CORE RECOVERY (%)	ROCK QUALITY DESIGNATION (%)	FRACTURE FREQUENCY	GRAPHIC LOG	DEPTH (m)	MATERIAL DESCRIPTION	STRENGTH/ CONSISTENCY	WEATHERING	DEFECTS/ADDITIONAL COMMENTS	WATER STRIKES AND SAMPLING
6	0	0	NI	+ +	24				open, fresh 21.57-21.67 m - sub-vertical joints, 50°, undulating, rough, open calcite coated 21.67-22.1 m - sub-vertical joints, 45°, planar, smooth, open, partially calcite coated 22.1-22.3 m - sub-horizontal joints, 35°, planar, smooth, open, partially calcite coated 22.3-22.5 m - sub-horizontal joints, 26°, undulating, rough, open silty	
33	0	0	NI	+ +	25					
100	83	61	7	+ +	25.8m, 26, 27	25.8m **GRANITE**, coarse grained, crystalline, massive, cream, brown, black, pink grey. (Aplite band noted between 26.75 - 26.83 m).	EH VH VH	SW SW SW	25.8-26.25 m - sub-horizontal joints, 10°, stepped, undulating, smooth, open, silty 26.25-26.27 m - sub-vertical joints, 70-90°, undulating, smooth, oxidised (400 mm long) 26.27-26.32 m - sub-vertical joints, 45°, planar, smooth, open, calcite coated 26.32-26.6 m - sub-horizontal joints, 30°, planar, smooth, open, calcite coated, oxidised 26.6-26.67 m - sub-vertical joints, 50°, planar, smooth, open, calcite coated 26.67-26.84 m - sub-vertical joints, 60°, planar, smooth, open, calcite coated 26.84-27.0 m - sub-vertical joints, 60°, undulating, rough, open, silty, with calcite coating 27.0-27.12 m - sub-vertical joints, 75°, planar, smooth, open, calcite coated, undulating, smooth, open silty 27.12-27.3 m - sub-vertical joints, 60°, undulating, smooth, open, silty, oxidised	
					27.3m, 28	27.3m Borehole DRTSF1 terminated at 27.3 m				

KP_BH3_PE801-00139 BH LOGS.GPJ KP_BH1.GDT 30/8/10