REQUEST FOR RECONSIDERATION OF COUNCIL RECOMMENDATION

MATERIAL CHANGE OF USE (IMPACT) FOR MULTIPLE DWELLINGS (RESIDENTIAL) – TWO (2) UNITS UNDER A SUPERSEDED PLANNING SCHEME

36 MURPHY STREET, PORT DOUGLAS

DESCRIBED AS LOT 131 ON PLAN 2094

COUNCIL FILE REF: 8/35/81

CARRON PROPERTIES PTY LTD (TLE)

VGF – C772
February 2010

REQUEST FOR RECONSIDERATION OF COUNCIL RECOMMENDATION IN RELATION TO MATERIAL CHANGE OF USE (IMPACT) FOR MULTIPLE DWELLINGS (RESIDENTIAL) – TWO (2) UNITS UNDER A SUPERSEDED PLANNING SCHEME
36 MURPHY STREET, PORT DOUGLAS

CONTENTS **PAGE NO.**

22 February 2010

REQUEST FOR RECONSIDERATION OF COUNCIL RECOMMENDATION IN RELATION TO MATERIAL CHANGE OF USE (IMPACT) FOR MULTIPLE DWELLINGS (RESIDENTIAL) – TWO (2) UNITS UNDER A SUPERSEDED PLANNING SCHEME
36 MURPHY STREET, PORT DOUGLAS

1.00 INTRODUCTION

We advise that we act as Town Planning Consultants and Agent for and on behalf of Carron Properties Pty Ltd (tle), the Applicant and owner of the subject land described as Lot 131 on PLAN2094 and located at 36 Murphy Street, Port Douglas, in relation an Application to Cairns Regional Council for Material Change of Use on land located at 36 Murphy Street, Port Douglas.

Reference is made to Council's recommendation to the Douglas Iconic Places Panel at the Ordinary Meeting on 20 January 2010 that a Preliminary Appeal be granted for the application. Further reference is also made to our letters dated 3 and 4 February 2010 agreeing that the decision making can be extended to 31 March 2010 to allow additional representations to be made to the Panel and Council.

A review of the recommendation by Council to the Panel has been undertaken based on the combined investigations of:

(a) Victor G Feros Town Planning Consultants	Statutory Town Planning
(b) Douglas Partners	Geotechnical Investigations
(c) A.F. Colafella & Associates	Engineering

The supporting information attached with this report requests that the recommendation by Council for the issue of Preliminary Approval be changed to issue a Development Permit as requested by the original application.

2.00 REVIEW OF CONDITIONS

Responses to the Preliminary Approval Conditions are provided below:

Condition 1

1. Provide a revised and expanded Geotechnical Investigations Report, prepared by Douglas Partners, October 2009, for the site and proposed development which addresses the following:

a. Expand the extent of the Geotechnical Investigations to cover the proposed access from Murphy Street for proposed Residence 1 and from Island Point Road for proposed Residence 2;

Response

A response to this item is provided by **Appendix A**.

b. Provide a revised set of civil drawings which incorporate all the recommendations outlined in Section 7 and Tables 1 & 2 of the Douglas Partners Report (October 2009). The revised plan must detail all works which will be undertaken as part of the development to ensure that the risk classification remains Low as defined by AGS2007.

Response

A response to this item is provided by **Appendix B**.

c. The revised plans must show all retaining and stabilisation structures associated with the development, including access driveways. All structures must be contained within the subject site and should not inhibit the continuation of the access track within the Murphy Street road reserve.

Response

A response to this item is provided by **Appendix B**.

d. Provide a full set of plans which detail all works to be completed as part of the development. Plans must be provided at scale and certified by an RPEQ, addressing the requirements of the geotechnical and drainage reports, including the necessary additions.

Response

A response to this item is provided by **Appendix B**.

Condition 2

2. The applicant is to demonstrate compliance with the proposed stormwater drainage system with the Queensland Urban Design Manual. In particular, details of the proposed navigation and treatment of stormwater from the property boundary to the bottom of the large batter and existing infrastructure on Murphy Street.

Response

A response to this item is provided by **Appendix B**.

Condition 3

3. Provide details on the proposed treatment of access driveways in accordance with AS2890.1 and FNQROC (S1110) requirements.

Response

A response to this item is provided by **Appendix B**.

3.00 RECOMMENDED ACTION

Based on the supporting information contained in this Report it is requested that Council, in conjunction with the Panel, undertake further assessment of the recommendation made at the Ordinary Meeting on 20 January 2010.

It is submitted that the **attached** supporting information responds fully to any and all matters required to be addressed in the proposed conditions to be attached to any granting of Preliminary Approval; and that, accordingly, there is now no need or other requirement for a Preliminary Approval to issue.

That is to say, all relevant matters are now fully addressed and therefore any recommendation to issue a Preliminary Approval may now be replaced by a Development Permit with appropriate conditions attached, and it is so submitted and recommended.

In the considered circumstances therefore, overall favourable consideration of this Request for Reconsideration of Council Recommendation by the Douglas Iconic Places Panel and the Council is accordingly commended.

VICTOR G FEROS TOWN PLANNING CONSULTANTS

February 2010

APPENDIX A

Douglas Partners

Geotechnics • Environment • Groundwater

Integrated Practical Solutions

REPORT

on

ADDITIONAL STABILITY ANALYSIS

PROPOSED ACCESS DRIVEWAYS

36 MURPHY STREET, PORT DOUGLAS

Prepared for

CARRON PROPERTIES

Project 38836.02

FEBRUARY 2010

Douglas Partners
Geotechnics • Environment • Groundwater

REPORT

on

ADDITIONAL STABILITY ANALYSIS

PROPOSED ACCESS DRIVEWAYS
36 MURPHY STREET, PORT DOUGLAS

Prepared for
CARRON PROPERTIES

Project 38836.02
FEBRUARY 2010

Douglas Partners Pty Ltd
ABN 75 053 980 117

13 Industrial Avenue
STRATFORD QLD 4870

Phone (07) 4055 1550
Fax (07) 4055 1774
cairns@douglaspartners.com.au

Douglas Partners
Geotechnics · Environment · Groundwater

TABLE OF CONTENTS

Page

DJM:KAB:clp
Project 38836.02
22 February 2010

REPORT ON ADDITIONAL STABILITY ANALYSIS
PROPOSED ACCESS DRIVEWAYS
36 MURPHY STREET, PORT DOUGLAS

1.0 INTRODUCTION

This report details the results of stability analysis undertaken at the site of two proposed access driveways to service a proposed residential subdivision, at 36 Murphy Street, Port Douglas. The work was performed at the request of Carron Properties.

Field work for this investigation comprised a site inspection by a senior geotechnical engineer, and excavation of two test pits. The purpose of the investigation was to assess the stability of the proposed access driveways, obtain information on site subsurface conditions, and then undertake engineering analysis and reporting. The scope of work included a review of previous work undertaken on the site.

A topographic survey plan of the allotment (ie 36 Murphy Street), which also extended partly, but not completely, along the alignments of both proposed access driveways, was provided by the client to assist in the investigation.

2.0 BACKGROUND

DP has previously undertaken several geotechnical investigations on this site. These include:

- "Report on Geotechnical investigation, Proposed Subdivision and Construction of Two Residences, Lot 131 (No 36) Murphy Street, Port Douglas", for Carron Concrete Services Pty Ltd, October 2009. This report presented the results of a risk assessment of the site, undertaken in accordance with the AGS Landslide Guidelines (Ref 1), as well as comments on good and poor development practice.
- "Report on Geotechnical Assessment, Lot 131 PTD 2094 Flagstaff Hill, Port Douglas" Project 27099 for Douglas Shire Council, December 2000. This report presented the results of a risk assessment of the site, as well as comments on good and poor development practice.
- "Report on Geotechnical Investigation, Proposed Hillside Sub-Division, Lots 131-133 Murphy Street, Port Douglas," Project 17979A, December 1994, for Jeremy Scriven & Associates Pty Ltd on behalf of Herbert Greer & Rundle Pty Ltd. This report comprised the results of "terrain analysis", geological surface mapping, excavation and sampling of

two test pits and two shallow test bores, laboratory testing of selected soil samples, and provided comments on stability analysis and classification. General development constraints were also recommended, addressing excavation and earthworks, foundation selection, retaining walls, soil erosion and site drainage.

- "Investigation Report, Proposed Residential Development, Lots 131-133 Murphy Street, Port Douglas," Project 17979, November 1993, for Jeremy Scriven & Associates Pty Ltd, on behalf of Herbert Greer & Rundle Pty Ltd. This report was based on the results of a brief walkover inspection and comprised a site description, comments on regional geology, slope stability, risk of instability, geotechnical design guidelines and development constraints.

3.0 SITE DESCRIPTION

3.1 Location

The site of the proposed subdivision is located on a south-west facing slope below Island Point Road, and above Murphy Street (refer attached Drawing 1). Unformed Owen Street is located adjacent to the site, to the north-west (refer attached Drawing 2). On the adjoining site to the south east is located a residential development.

The proposed access driveways provide access to proposed Lot 1 (off Island Point Road from above the site), and proposed Lot 2 (off Murphy Street from below the site). The access driveway off Island Point Road follows an existing cut track, of approximately 70m length, which was overgrown with thick grass and shrub vegetation at the time of the investigation. This access track is located within the undeveloped Owen street road reserve. The proposed access driveway from Murphy Street is within the Murphy Street road reserve, and follows an existing formed service track which runs uphill and above of the trafficked portion of Murphy Street, but within the Murphy Street road reserve, and is continuous along most of Murphy Street (refer attached Drawings 2 to 4). To provide access to the proposed Lot 2 from the west, it is understood that an approximately 100m length of this existing service track is to be utilised. The initial 45m or so of this formed service track coming off the trafficked portion of Murphy Street, is paved with a concrete slab, and the remainder is formed but has no seal or gravel pavement.

3.2 Proposed Access Driveway off Island Point Road

In the vicinity of the site, Island Point Road is aligned along a ridgeline, oriented approximately north to south, and the ground surface generally falls away on both sides of the road alignment. At the location of the proposed driveway alignment, within the Owen Street road reserve located on the south-western side of Island Point Road, ground surface levels slope down towards the west at approximately 20° to 22° below the horizontal.

The existing unformed track along the proposed driveway alignment was overgrown with long grass, vines and shrubs at the time of the fieldwork. The cut profile along the uphill (eastern) side of the existing track was typically less than about 0.3m in height, was overgrown and generally obscured by leaf mulch and vegetation, and was generally battered at about 1V:1H. Similar fill depths and batter slopes were observed along the western side of the unformed access track.

Vegetation in areas adjacent to the existing cut track mostly comprised numerous shrubs and relatively immature trees, with truck diameters up to about 150mm, but mostly smaller.

A photograph taken during the field work is shown below as Plate 1.

Plate 1 – View from Island Point Road looking south along the existing unformed track

3.3 Proposed Access Driveway off Murphy Street

The starting point of the proposed access driveway, where it rises up from Murphy Street, is located approximately 100m to the north-west of the site. The existing formed service track provides access to other allotments above Murphy Street, and runs parallel to the existing trafficable alignment along Murphy Street. The service track rises from where it commences, and is aligned immediately adjacent to and behind the crest of a very steep cut, which runs along the north-eastern edge of the formed Murphy Street alignment. This very steep cut has a maximum vertical height of about 12m, and generally slopes variously between 30° and 50° above the horizontal, with most of the cut sloping at about 40° to 45° above the horizontal. It is understood that, following instability in this area in early 2009, this cut was regraded by Cairns

Regional Council, to its existing profile from a previously steeper profile, and was also 'hydro-mulched'.

Photographs taken during the field work are shown below as Plates 1 and 2.

Plate 1 – View along sealed portion of existing service track, looking south-east

Plate 2 – Stitched view of steep cut, looking north-east from Murphy Street

The toe of the very steep cut is approximately 2m or less from the edge of the sealed pavement along Murphy Street, and within this distance, an unlined stormwater drain had been recently cut, showing outcropping bedrock (refer Plate 3).

Plate 3 – View of bedrock in unlined stormwater drain at toe of cut

The existing service track initially has a moderate slope along its longitudinal alignment, with maximum grades of about 13^{o} above the horizontal down towards the north-west. This grade decreases to zero where the track is located behind the highest point of the cut, and then falls gently to the south-east where the access track passes immediately adjacent to the site (ie immediately in front of 36 Murphy Street). The track continues along parallel to the front boundary of 36 Murphy Street towards the south-east, and continues beyond the subject site (36 Murphy Street) to the south-east.

At the time of the field work, the surface of the track, beyond the initial concrete paved portion, comprised bare soil, with some isolated zones where coarse single sized gravel has been laid to aid traction. The area between the track and the crest of the very steep cut was vegetated by grass, shrubs and small saplings, at the time of the field work. Uphill of the existing track, vegetation was more established and comprised shrubs and small trees, with less grass cover.

In addition to the above, a cut face along the uphill side of the existing service track adjacent to the subject site boundary (refer Drawings 2 to 4 attached) was observed to be typically up to

1m to 1.5m high (locally up to 1.8m high), and was near vertical in places. This cutting exposed organic topsoil over fine sandy silt. Weathered extremely low to very low strength arenite was observed in places below about 1.5m depth. Much of the red brown sandy silt, exposed below a shoulder formation which parallels the north-western boundary of 36 Murphy Street, appeared residual, whereas exposures in the vicinity of the central lower gully (refer Drawing 2) appeared colluvial, containing gravel and cobbles. Minor slumping appeared to have previously occurred on this cut face.

4.0 GEOLOGY

Reference to the Queensland Department of Mines 1:250,000 Mossman sheet 1996 (second edition) indicates that the site is underlain by the Hodgkinson Formation, typically comprising conglomeratic arenite. The map commentary indicates this formation to typically comprise "polymictic pebble to boulder conglomerate and thick to medium bedded arenite and conglomerate arenite with numerous conglomerate lenses". This formation is further indicated to be steeply folded and strongly faulted, and to have steeply inclined bedding and cleavage.

Due to the weathered nature of the limited rock exposures around the site, little information could be obtained on the structure of the rock (refer also Section 5 below).

5.0 FIELD WORK METHODS

The field work comprised:

- site inspection by a senior geotechnical engineer in the period 1 to 16 February 2010, including inspection of the steep cut below the proposed access driveway off Murphy Street; and
- the excavation of two test pits (Pits 1 and 2) to depths of 2.4m and 2.8m by mini-excavator on 1 February 2010.

The steep cut (bullet point 1 above) was inspected using rope support, assisted by appropriate traffic control on the sealed portion of Murphy Street below.

The approximate locations of the pits are indicated on the attached Drawing 1.

Logging and sampling of the subsurface profile at each pit location was undertaken by an experienced geotechnical scientist and a Senior Geotechnical Engineer.

6.0 FIELD WORK RESULTS

6.1 Test Pits

Details of the subsurface conditions encountered in the test pits are presented in the attached test report sheets. These should be read in conjunction with the general notes preceding them, which explain descriptive terms and classification methods.

The subsurface conditions encountered at the test locations generally comprised the following:

Filling (Pit 1 only) or Topsoil	Filling was encountered to 0.2m depth in Pit 1 only. This filling comprised very stiff to hard clayey silt. Clayey silt topsoil was encountered in Pit 2 to 0.2m depth.
Colluvium (Pit 1 only)	Stiff to very stiff to hard colluvial clayey silt with some sand and gravel and occasional angular cobbles was encountered below the filling in Pit 1, and continued to 0.9m depth.
Residual Soil	Very stiff to hard residual sandy clayey silt was encountered beneath the colluvium in Pit 1 to 2.0m depth, and beneath the topsoil in Pit 2 to 0.6m depth.
Arenite (bedrock)	Very low strength arenite bedrock was encountered below the residual soil in both pits, and continued to pit termination depth in each pit. In Pit 1, some occasional zones of stronger material was observed (ie cobble sized high strength zones), however the majority of the bedrock was no stronger than very low strength. In both pits, this bedrock was observed to be generally highly fractured to fragmented.

Free groundwater was not observed at either of the test locations. It should be noted, however, that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time.

6.2 Walk Over Inspection

6.2.1 Proposed Access Driveway off Island Point Road

The results of the walkover inspection indicated the following:

- evidence of very minor localised shallow slippage and slumping of near surface soils within the existing cut and fills along the uphill and downhill sides of the existing unsealed access track. In the existing cut, the observed soil comprised residual sandy clayey silt and clayey silt;
- occasional downslope leaning trees in areas adjacent to the proposed alignment;

- no gully features along the proposed alignment;
- no groundwater seepage or ponding of water was evident along the proposed alignment.

At the time of inspection, the site was mostly covered in a surface mat of decaying vegetation together with numerous low shrubs and relatively immature trees with trunks of up to 100mm to 150mm in diameter, but in most instances less than 100mm in diameter.

Measurements of slopes across the site were taken by hand-held clinometer, and indicate that the area of the proposed alignment slopes to the west at approximately 20° to 22° below the horizontal.

6.2.2 Proposed Access Driveway off Murphy Street

Inspection was undertaken of the very steep cut located between the existing service track above, and the sealed Murphy Street alignment beneath, in the area of the proposed access driveway. This involved climbing down the cut at two separate locations (Sections 1 and 2 on the attached Drawing 2), inspection of the material exposed on the face of cut (assisted by hand tools), and measurement of slope angle using a hand-held clinometer at various locations along each of these sections.

Sections 1 and 2, on attached Drawings 3 and 4, indicate the measured profile of the cut at both these locations.

Cut material was observed to comprise mostly extremely low to very low strength, highly weathered, highly fractured to fragmented arenite, beneath a thin surfical slope covering of clayey silt 'topsoil', grass and vegetation humus. The grass and vegetation humus are likely to be resultant from the previous 'hydro-mulching' of the slope. The 'topsoil' is considered to represent soil material which has slipped down the slope, probably during the 2009 reprofiling works undertaken by Council.

Exceptions to the above generalised profile were observed, and these included the following:

- Arenite bedrock of low to medium strength was located both within the lower approximately 1m to 3m height of the very steep slope, and within portions of the unlined stormwater drain at the toe of the slope. Except where encountered in the stormwater drain, this increased strength of the rock profile was observed to be generally 'patchy', and not continuous along the lower portion of the slope;
- A near vertical 'knob' of more competent rock was located near the toe of the very steep slope, just to the south–east of Section 2 (refer Drawing 2). This 'knob' was 3m to 4m in vertical height, and comprised mostly medium to high strength, fractured, arenite.
- Several small shallow and localised slips were located near the toe of the very steep slope, just north-west of Section 2 (refer Drawing 2). These slips were located in an area of very low strength, highly fractured arenite, were generally 2m to about 4m in height, 2m to 3m in width, and about 0.5m deep. No debris from these areas were

observed at the toe of the slope. A photograph of one such area of slope failure is shown below as Plate 4.

Plate 4 – View of small slope failure at toe of slope

Complete inspection of joints and discontinuities on the slope was not able to be achieved, due to the surficial topsoil and humus layer and the potential for triggering of additional slippage should this cover be excavated to inspect the rock beneath. At the toe of the slope, however, where recent drain clearing had exposed very low strength, grey brown and red, highly weathered arenite, numerous joints were observed. These joints included:

- a stained joint with some infill dipping down to the west (ie across slope) at approximately 40^{o} below the horizontal;
- a joint with some infill dipping down to the south-west (ie out of the slope) at approximately 5^{o} below the horizontal;
- a sub-vertical joint oriented west to east (ie dipping across slope);
- a stained joint with no infill dipping down to the south-west (ie out of the slope) at approximately 45^{o} below the horizontal;
- a stained joint with no infill dipping down to the north-west (ie across slope) at approximately 30^{o} below the horizontal.

Observed spacing in the above joints was typically less than 0.5m.

7.0 COMMENTS

7.1 Proposed Development

It is understood that construction of two access driveways are proposed on the site, one off Island Point Road to service proposed Lot 1, and the other off Murphy Street to service proposed Lot 2, as shown on Drawing 2.

It is anticipated that the access driveway off Island Point Road will follow the alignment of an existing cut track, which was thickly overgrown at the time of the investigation, and relatively minor cut and fill earthworks of the order of less than 1.0m to 1.5m height are anticipated.

The proposed access driveway off Murphy Street is understood to follow the existing formed service track, located immediately behind the crest of the steep soil cut. This access driveway is anticipated to require relatively nominal earthworks along its alignment, however, the steep cut slope below the track will require remedial works.

It is understood that Cairns Regional Council require the risk of future instability of both driveway alignments, when assessed in accordance the 2007 AGS Landslide Guidelines (Ref 1), to be no worse than 'low' risk.

7.2 Slope Stability of Proposed Driveway off Island Point Road

The factors which influence slope stability and the classification of risk of instability are discussed in the 2007 AGS Guidelines (Ref 1).

No signs of recent deep seated instability were observed along the proposed access to Lot 1 during the inspection of the site, although the driveway alignment traverses a relatively steep natural slope, and therefore has an elevated risk of future instability. Deflection of some trees from upright growth pattern may indicate downslope creep in some sections of the near-surface colluvial soil profile.

It is not known, at this stage, how deep the cuts will require to be along the uphill side of the proposed driveway. The following guidelines, therefore, are provided to assist in minimising the risk of landslip initiated by such cuts:

(i) cuts no deeper than 1.0m vertical height should be either battered back to no steeper than 2H to 1V or supported by engineered retaining walls designed in accordance with Section 7.6;

(ii) all cuts deeper than 1.0m vertical height should be supported by engineered retaining walls designed in accordance with Section 7.6.

Similar height and retention limitations to engineered fill along the downslope side of the proposed access driveway will apply as for cuts.

It is recommended that all footings for any proposed retaining walls, or other structures, should be founded in, and keyed into, hard residual soils, or rock.

A risk assessment has been undertaken of identified slope stability hazards to the driveway and is summarised in Table 1 below. Appropriate action to be undertaken to reduce the risk of any landslip affecting the proposed structures is also summarised in Table 1. The definitions of "likelihood", "consequence" and "risk", as used in this report, are as defined in the AGS Guidelines (Ref 1). Further information on Landslide Risk is provided in the attached GeoGuide LR7, which forms part of Ref 2.

Provided that the design and construction recommendations contained in the following sections of this report, and summarised in Table 1, are adopted as part of the development, then the risk of damage to the proposed driveway or adjacent property due to future instability is classified as 'Low', when assessed in accordance with Appendix C of Ref. 1. This meets the requirements of Cairns Regional Council. Hence, the suitability of the site for driveway development is contingent upon appropriate development and precautions being undertaken so as to maintain or reduce the overall risk level.

More details on typical development precautions to be undertaken and treatment options are presented in the following sections of this report. It is the responsibility of the landowner and/or Council to ensure that such precautions and treatment options are undertaken.

It should be recognised that when established tree vegetation is removed from proposed development areas, risk of instability may increase, due to loss of soil reinforcement and suction offered by tree root systems, and subsequent moisture increases in the soil cover when the roots have died. Any existing vegetation which is removed to facilitate development should therefore be replaced on remaining slopes unoccupied by structures with carefully selected deep rooted species as soon as possible.

Table 1 – Assessment of Landslip Risk to Property – Proposed Access Driveway off Island Point Road

Hazard	Initiating Factors	Risk Assessment based on Inappropriate Development			Appropriate Actions to be Undertaken for Development	Risk Assessment after Development Undertaken with Appropriate Actions		
		Likelihood of Landslip	Consequence	Risk		Likelihood of Landslip	Consequence	Risk
Landslip failure through soil cover on the steep slope across which the driveway traverses	• Heavy rain (saturation) • Disturbance to existing vegetation • Uncontrolled discharge of stormwater onto slope	Possible	Minor	Moderate	1. Found all retaining wall footings through all colluvial soil, onto, and penetrating into, hard residual soil, or rock. 2. Direct stormwater drainage discharge down to street stormwater system, via pipes or concrete lined drains. 3. Adopt good hillside construction practice, as set out in GeoGuide LR8. 4. Have all footings, and retaining walls designed by an engineer appropriately experienced in landslip terrain.	Unlikely	Minor	Low
Surface cobbles rolling down the natural slope above proposed driveway	• Heavy rain • Slope disturbance by humans, animals or falling trees	Unlikely	Minor	Low	No specific action required provided that risk level is accepted by all parties	-	-	-
		Worst Risk		**Moderate**		**Worst Risk**		**Low**

7.3 Slope Stability of Proposed Driveway off Murphy Street

7.3.1 Stability Analysis

Stability analysis was undertaken using the SLOPE/W stability software, using the cut geometry shown on attached Sections 1 and 2, and a simple ground profile comprising extremely low to very low strength, highly fractured to fragmented rock.

A summary of the effective stress parameters adopted in the analysis is presented in Table 2 below. These are based on general experience, with reference to the effective stress parameters suggested in AS 4678-2002 Earth Retaining Structures (Ref 3), and have not been confirmed by laboratory testing. It is considered that these parameters are relatively conservative, as they assume that the whole slope comprises relatively weak rock material, and take no account of any areas of the slope where stronger rock was observed. This approach seems sensible given that any outcrops of stronger rock were not observed to be extensive across any area of the slope, and as the weaker material will control the behaviour of the slope, these weaker rock parameters have been used in the analysis.

Table 2 – Summary of Effective Stress Parameters Used for Stability Analysis

Material	Cohesion c′ (kPa)	Friction Angle Φ′ (degrees)	Bulk Density (kN/m^3)
Extremely low to very low strength, highly fractured to fragmented arenite.	5	35	20

Two groundwater models were used in the analysis. These comprised a ‘low’ level, modelled under ‘dry season’ conditions, where no groundwater was assumed (ie a fully drained slope), and a ‘high’ groundwater level, modelled under ‘cyclonic wet season’ conditions, where the groundwater was modelled as day-lighting at the toe of the slope, and four times the height behind the slope, as described in Chart 3 of Hoek and Bray (Ref 4).

A surcharge loading of 10 kPa was modelled on the access track located at the top of the cut, to allow for constructions traffic.

The effects of tree root suction (which can have a positive reinforcing effect on shallow instability) were not taken into account.

7.3.2 Results of Analysis

The results of the analysis for the existing slope profiles are summarised in Table 3 below.

Table 3 – Results of Stability Analysis for Sections 1 and 2

Section Modelled	Groundwater Level	Calculated Factor of Safety (1)
1	None (ie normal dry season conditions)	1.17
	High (ie cyclonic wet season conditions)	0.93
2	None (ie normal dry season conditions)	1.24
	High (ie cyclonic wet season conditions)	0.99

Notes: (1) *Computed factor of safety against slip failure.*

Additional analysis was undertaken to examine the results of increasing the effective cohesion parameter (c′) on the calculated factor of safety. This parameter reflects the effect of having a temporary elevated cohesion, due to say vegetation cover. Such temporary increase in cohesion cannot generally be relied upon for long term performance but serves to illustrate the temporary increase in factor of safety again slope failure achieved during any periods of temporary increased cohesion. The results of this additional analysis for increased c′ are discussed in Section 7.3.3.

The results of the slope stability analysis on the existing slope profile indicate the following:

- There are very low factors of safety (less than 1.0) against deep seated instability for the existing slope profile, under ‘cyclonic wet season’ groundwater conditions. This indicates that stability failures will occur, and is likely to affect the proposed alignment. For these ‘cyclonic wet season’ temporary groundwater conditions, it is considered that a factor of safety of at least 1.2 to 1.3 would be required, based on common industry practice.
- Under ‘normal’ / ‘dry season’ groundwater conditions, the analysis indicates that a factor of safety of 1.17 would be applicable for Section 1 and 1.24 for Section 2, against deep seated instability. This is less than the usual recommended factor of safety of 1.5, as derived from common industry practice for normal loading conditions.

It was found that c′ is required to be increased to a value of approximately 17 kPa (while maintaining Φ′ at 35°) in order to achieve a factor of safety of 1.5 or greater. This value is considered unlikely to be maintainable, even if achieved, solely due to the effects of vegetation cover.

7.3.3 Slope Stability Conclusions

The results of the analysis indicates that the existing slope, which is a recently constructed cut slope, and considered likely not to have been rigorously designed for long term stability, has only marginal stability (ie factor of safety less than or equal to 1) against slope failure under ‘cyclonic wet season’ groundwater conditions. In addition, under ‘normal’ (ie dry season) groundwater conditions, the existing slope has a much lower than normally accepted factor of safety. This lower factor of safety of approximately 1.2 is less than the normally accepted minimum 1.5 for ‘normal’ conditions and could be approximately equated to a moderate or greater risk level of incurring landslip in the long term.

It follows that remedial works will be required to be undertaken on this slope, to achieve the required ‘low’ risk of future instability. This remedial work is summarised on Table 4, and further discussed below. It should be noted that appropriate remediation of the existing slope is likely to be costly to implement, and will require additional geotechnical design to be undertaken.

Further preliminary geotechnical analysis was undertaken to assess the approximate scale of the work required to undertaken to this very steep slope, in order to achieve an acceptable factor of safety. The results of this preliminary analysis indicate that a shotcrete revetment face will require to be constructed on the face of the steep cut, secured to the face by passive soil nails of nominal 12m to 15m length, and 1m to 2m centres across the face. The soil nail layout, length, and bore diameter should be further assessed during the geotechnical design of these works. The above is based on the assumption that the cut profile comprises mostly extremely low to very low strength argentite. As the presence of stronger rock will impact upon stability, and may reduce required nail lengths, it is suggested that as part of the geotechnical design of these nails, additional intrusive geotechnical investigation be carried out to confirm cut profile material. Such intrusive investigation should comprise at least two cored boreholes to about 12m depth, drilled from the existing service track above the cut.

7.3.4 Risk Analysis

A risk assessment has been undertaken of identified slope stability hazards to the Lot 2 driveway off Murphy Street and is summarised in Table 4 below. Appropriate action to be undertaken to reduce the risk of any landslip affecting the proposed structures is also summarised in Table 4. The definitions of “likelihood”, “consequence” and “risk”, as used in this report, are as defined in the AGS Guidelines (Ref. 1). Further information on Landslide Risk is provided in the attached GeoGuide LR7, which forms part of Ref. 2.

Provided that the design and construction recommendations contained in the following sections of this report, and summarised in Table 1, are adopted as part of the development, then the risk to the proposed driveway of property damage due to future instability is classified as ‘Very Low’ or ‘Low’, when assessed in accordance with Appendix C of Ref. 1. This meets the requirements of Cairns Regional Council. Hence, the suitability of the site for driveway development is contingent upon appropriate development and precautions being undertaken so as to maintain or reduce the overall risk level.

More details on typical development precautions to be undertaken and treatment options are presented in the following sections of this report, however, as referred both above and below, further geotechnical and stability analysis will be required to prepare a geotechnical design for the required nailed shotcrete revetment structure.

7.3.5 Retaining Wall above Service Track

A retaining wall is likely to be required to support the cut above the service track and which borders the lower boundary of 36 Murphy Street, and the adjacent lots. Guidelines for minimising risk of landslip along this alignment are the same as for the Lot 1 proposed access track (refer Section 7.2).

Table 4 – Assessment of Landslip Risk to Property – Proposed Access Driveway off Murphy Street

Hazard	Initiating Factors	Risk Assessment based on Inappropriate Development			Appropriate Actions to be Undertaken for Development	Risk Assessment after Development Undertaken with Appropriate Actions		
		Likelihood of Landslip	Consequence	Risk		Likelihood of Landslip	Consequence	Risk
Circular landslip failure through very steep to extreme slope located downhill of proposed driveway alignment	• Heavy rain (saturation) • Uncontrolled discharge of stormwater onto slope	Almost Certain (calculated FOS <1.0)	Medium	Very High	1. Construct a shot-crete revetment structure across face of slope, which is secured to face by passive soil nails, with appropriate drainage installed behind shotcrete. Revetment structure should be designed by an experienced engineer, to achieve an acceptable calculated factor of safety against future failure. 2. Construct a sealed driveway pavement along entire length of proposed driveway, which includes a concrete kerb to stop stormwater flowing down slope, and which includes an impermeable barrier between outer edge of kerb and top of slope, to minimise any water infiltration into top of slope. 3. Direct stormwater from driveway down to Murphy Street stormwater system, via pipes or concrete lined drains. 4. Adopt good hillside construction practice, as set out in GeoGuide LR8. 5. Have all footings and retaining walls designed by an engineer appropriately experienced in landslip terrain.	Unlikely (calculated FOS 1.25)	Medium	Low
Landslip failure through 1m to 2m high cut along uphill side of existing service track	• Heavy rain (saturation) • Disturbance to existing vegetation • Uncontrolled discharge of stormwater onto slope	Almost Certain	Minor	High	1. Construct an engineer designed retaining wall to support cut. Have all footings and retaining walls designed by an engineer appropriately experienced in landslip terrain. 2. Adopt good hillside construction practice, as set out in GeoGuide LR8.	Rare	Minor	Very Low
Surface cobbles rolling down the natural slope above proposed driveway	• Heavy rain • Slope disturbance by humans, animals or falling trees	Unlikely	Minor	Low	No specific action required provided that risk level is accepted by all parties	-	-	-
		Worst Risk		**Very High**		**Worst Risk**		**Low**

7.4 Overall Site Drainage

Adequate surface and subsurface drainage should be installed to maintain and protect cuts, fills and any development from ingress of water and associated increased risk of landslide. It is suggested that this should include upslope surface catch drains above any cuts and also along the toe, and subsoil drains along the uphill side of proposed pavements and behind retaining walls. All drainage should be discharged in a controlled manner via pipes or lined channels with flexible joints and inspection points at changes of grade and direction.

7.5 Overall Site Erosion

Any exposed soils on the site remaining after remedial works should be protected against erosion by vegetation cover or other approved soil erosion protection. Biodegradable netting and mulch application of grass seed may be required in order to facilitate initial growth. If potential soil erosion is not successfully controlled, then this may lead to slope instability.

7.6 Retaining Walls - All Locations

Retaining walls constructed for support of cuts or fills up to about 2m height should be specifically engineer-designed as follows:

- retaining walls should be designed in accordance with AS 4678 (Ref 3);
- "at rest" conditions (K_o) should be adopted for soil lateral pressure where rotational movement or flexing of the top of wall is not possible, or cannot be tolerated, and hence "active" conditions (K_a) cannot develop;
- passive pressure conditions (K_p) should be used to assess loads acting on retaining walls supporting cuts through colluvium, due to soil creep loads.
- passive pressure values are provided for lateral restraint in residual soil or bedrock;
- lateral pressure conditions should be designed for the co-efficients presented in Table 3 below:

Table 6 – Lateral Earth Pressure Co-efficients

Material	K_o	K_a	K_p	Passive Pressure
Colluvial Soil	0.6	0.4	-	-
Residual Soil	0.6	0.4	2.5	-
Bedrock (very low strength, or better)	0.3*	0.3*	-	400 kPa

* Subject to inspection for presence of adverse jointing

- filling compacted immediately behind structural retaining walls, as above, for a width of at least 0.3m over the full height of the wall, should be free draining and granular, to reduce the risk of incurring unduly high stress due to pore water pressure build-up, leading to overstressing of the wall;

- perforated or slotted drainage pipe should be provided behind the base of the retaining walls to further assist in reducing the risk of hydrostatic pressure build-up;
- discharge from retaining wall drainage pipes should be piped, or conveyed in lined channels, to the street stormwater system;
- due allowance should be made for surcharge loadings (over and above the lateral earth pressure coefficients presented in Table 3) where the finished ground level above retaining walls is above horizontal, or building loads exist, or traffic loading is imposed; and
- a reduction should be applied for sloping ground on the downslope side of retaining walls where passive pressure is to be relied upon in design.

It is recommended that all footings for retaining wall construction be founded through any colluvial soil and into residual soil of at least hard consistency, or weak rock. Retaining wall footings founded in hard residual sandy clayey silt (or better) or weak rock, may be designed for an allowable bearing pressure of 200 kPa.

All footing excavations should be inspected by experienced geotechnical personnel prior to casting, in order to confirm design parameters, and compatibility of the subsurface conditions at formation level with the above requirements.

Earthworks and development of the driveway should be undertaken with due regard to the procedures for hillside development, as illustrated in summary form in the attached GeoGuide LR8, from Ref. 2, and the specific comments contained in this report.

7.7 General

This investigation report does not address the site of any proposed residence.

Examples of good hillside engineering practice are presented in the attached Australian GeoGuide LR8, from Ref. 2.

8.0 LIMITATIONS

Douglas Partners (DP) has prepared this report on additional stability analysis for the proposed access driveways at 36 Murphy Street, Port Douglas, in accordance with DP's proposal dated 20 January 2010 and acceptance received from Mr Dennis Carron of Carron Properties on 20 January 2010. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Carron Properties, and/or other project consultants/contractors, for the specific project and purpose as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other sites or by a third party.

The results provided in the report are considered to be indicative of the sub-surface conditions on the site only to the depths investigated at the specific sampling and/or testing locations, and only at the time the work was carried out. DP's advice may be based on observations, measurements, tests or derived interpretations. The accuracy of the advice provided by DP in this report is limited by unobserved features and variations in ground conditions across the site in areas between test locations and beyond the site boundaries or by variations with time. The advice may be limited by restrictions in the sampling and testing which was able to be carried out, as well as by the amount of data that could be collected given the project and site constraints. Actual ground conditions and materials behaviour observed or inferred at the test locations may differ from those which may be encountered elsewhere on the site. Should variations in subsurface conditions be encountered, then additional advice should be sought from DP and, if required, amendments made.

This report must be read in conjunction with the attached "Notes Relating to This Report" and any other attached explanatory notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

DOUGLAS PARTNERS PTY LTD

Reviewed by:

Dan Martin
Senior Associate

Ken Boddie
Principal

References:

1. AGS Landslide Taskforce, Landslide Practice Note Working Group, "Practice Note Guidelines for Landslide Risk Assessment 2007", Australian Geomechanics, Vol 42, No 1, March 2007.
2. AGS Landslide Taskforce, Slope Management and Maintenance Working Group, "The Australian GeoGuides for Slope Management and Maintenance" Australian Geomechanics, Australian Geomechanics, Vol 42, No 1, March 2007.
3. Australian Standard AS 4678–2002 "Earth-retaining Structures", Standards Australia.
4. "Rock Slope Engineering – Civil and Mining" 4th Edition, by Duncan C Wyllie and Christopher W Mah, published by Spoon Press 2004, based on "Rock Slope Engineering" 3rd editions 1981 by Evert Hoek and John Bray.

Douglas Partners

Geotechnics • Environment • Groundwater

NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, Geotechnical Site Investigations Code. In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Undrained Shear Strength kPa
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

Drilling Methods.

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of say 4, 6 and 7

  as 4, 6, 7
  N = 13

- In the case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm

  as 15, 30/40 mm.

The results of the tests can be related empirically to the engineering properties of the soil.

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- Cone resistance — the actual end bearing force divided by the cross sectional area of the cone — expressed in MPa.
- Sleeve friction — the frictional force on the sleeve divided by the surface area — expressed in kPa.
- Friction ratio — the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6) \text{ N (blows per 300 mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

$$q_c = (12 \text{ to } 18)\, c_u$$

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

Bore Logs

The bore logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable, or possible to justify on economic grounds. In any case, the boreholes represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

TEST PIT REPORT

CLIENT: Carron Properties **PROJECT No:** 38836.02 **PIT No:** 1
PROJECT: Proposed Access Driveways **SURFACE LEVEL:** -- **DATE:** 01 Feb 10
LOCATION: 36 Murphy Street, Port Douglas **SHEET** 1 OF 1

Depth (m)	Description of Strata	Sampling & Testing Type	Depth (m)	Results
	FILLING - typically very stiff to hard brown and orange brown clayey silt filling with some fine grained sand and trace fine angular gravel		0.15	pp = 350 - 400 kPa
0.25	CLAYEY SILT - stiff dark brown clayey silt with some fine to medium sand and some fine to medium subangular gravel and occasional angular cobbles and small boulders (colluvium)	D	0.5	pp = 150 - 175 kPa
0.9	SANDY CLAYEY SILT - very stiff orange brown sandy clayey silt. Sand fine to medium grained (residual)	D	1.1	pp = 125 - 150 kPa
			1.2	pp = 350 - 400 kPa
		D	1.5	
2.0	ARENITE - very low strength, highly weathered arenite; highly fractured to fragmented	D	2.1	
	- with some occasional cobble sized medium to high strength zones below 2.4m depth	D	2.4	
2.8	TEST PIT DISCONTINUED AT 2.8m DEPTH - DUE TO VIRTUAL REFUSAL			

RIG: Kubota KX91-3 mini-excavator with 450mm bucket with blade cutting edge **LOGGED:** Koci/Martin

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
B	Bulk sample	PID	Photo Ionisation Detector
D	Disturbed sample	U_x	Tube sample (x mm dia.)
M	Moisture content (%)	Wp	Plastic limit

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

TEST PIT REPORT

CLIENT: Carron Properties
PROJECT: Proposed Access Driveways
LOCATION: 36 Murphy Street, Port Douglas

PROJECT No: 38836.02
SURFACE LEVEL: --

PIT No: 2
DATE: 01 Feb 10
SHEET 1 OF 1

Depth (m)	Description of Strata	Sampling & Testing Type	Depth (m)	Results
	TOPSOIL - dark brown slightly gravelly sandy clayey silt topsoil with some rootlets. Gravel fine to medium and subangular to subrounded (colluvium)	D	0.1	pp = 175 - 200 kPa
0.2	SANDY CLAYEY SILT - very stiff to hard orange brown sandy clayey silt. Sand fine to medium grained (probably residual)	D	0.4	pp = 350 - 400 kPa
0.6	ARENITE - very low strength highly weathered arenite; highly fractured to fragmented	D	0.7	
		D	2.0	
2.4	TEST PIT DISCONTINUED AT 2.4m DEPTH			

RIG: Kubota KX91-3 mini-excavator with 450mm bucket with blade cutting edge

LOGGED: Koci/Rackley

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
B	Bulk sample	PID	Photo Ionisation Detector
D	Disturbed sample	U_x	Tube sample (x mm dia.)
M	Moisture content (%)	Wp	Plastic limit

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

LANDSLIDE RISK

Concept of Risk

Risk is a familiar term, but what does it really mean? It can be defined as *"a measure of the probability and severity of an adverse effect to health, property, or the environment."* This definition may seem a bit complicated. In relation to landslides, geotechnical practitioners (GeoGuide LR1) are required to assess risk in terms of the likelihood that a particular landslide will occur and the possible consequences. This is called landslide risk assessment. The consequences of a landslide are many and varied, but our concerns normally focus on loss of, or damage to, property and loss of life.

Landslide Risk Assessment

Some local councils in Australia are aware of the potential for landslides within their jurisdiction and have responded by designating specific "landslide hazard zones". Development in these areas is often covered by special regulations. If you are contemplating building, or buying an existing house, particularly in a hilly area, or near cliffs, go first for information to your local council.

Landslide risk assessment must be undertaken by a geotechnical practitioner. It may involve visual inspection, geological mapping, geotechnical investigation and monitoring to identify:

- potential landslides (there may be more than one that could impact on your site)
- the likelihood that they will occur
- the damage that could result
- the cost of disruption and repairs and
- the extent to which lives could be lost.

Risk assessment is a predictive exercise, but since the ground and the processes involved are complex, prediction tends to lack precision. If you commission a landslide risk assessment for a particular site you should expect to receive a report prepared in accordance with current professional guidelines and in a form that is acceptable to your local council, or planning authority.

Risk to Property

Table 1 indicates the terms used to describe risk to property. Each risk level depends on an assessment of how likely a landslide is to occur and its consequences in dollar terms. "Likelihood" is the chance of it happening in any one year, as indicated in Table 2. "Consequences" are related to the cost of repairs and temporary loss of use if a landslide occurs. These two factors are combined by the geotechnical practitioner to determine the Qualitative Risk.

TABLE 2: LIKELIHOOD

Likelihood	Annual Probability
Almost Certain	1:10
Likely	1:100
Possible	1:1,000
Unlikely	1:10,000
Rare	1:100,000
Barely credible	1:1,000,000

The terms "unacceptable", "may be tolerated", etc. in Table 1 indicate how most people react to an assessed risk level. However, some people will always be more prepared, or better able, to tolerate a higher risk level than others.

Some local councils and planning authorities stipulate a maximum tolerable level of risk to property for developments within their jurisdictions. In these situations the risk must be assessed by a geotechnical practitioner. If stabilisation works are needed to meet the stipulated requirements these will normally have to be carried out as part of the development, or consent will be withheld.

TABLE 1: RISK TO PROPERTY

Qualitative Risk		Significance - Geotechnical engineering requirements
Very high	VH	**Unacceptable** without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low. May be too expensive and not practical. Work likely to cost more than the value of the property.
High	H	**Unacceptable** without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to acceptable level. Work would cost a substantial sum in relation to the value of the property.
Moderate	M	**May be tolerated** in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as possible.
Low	L	**Usually acceptable** to regulators. Where treatment has been needed to reduce the risk to this level, ongoing maintenance is required.
Very Low	VL	**Acceptable**. Manage by normal slope maintenance procedures.

AUSTRALIAN GEOGUIDE LR7 (LANDSLIDE RISK)

Risk to Life

Most of us have some difficulty grappling with the concept of risk and deciding whether, or not, we are prepared to accept it. However, without doing any sort of analysis, or commissioning a report from an "expert", we all take risks every day. One of them is the risk of being killed in an accident. This is worth thinking about, because it tells us a lot about ourselves and can help to put an assessed risk into a meaningful context. By identifying activities that we either are, or are not, prepared to engage in we can get some indication of the maximum level of risk that we are prepared to take. This knowledge can help us to decide whether we really are able to accept a particular risk, or to tolerate a particular likelihood of loss, or damage, to our property (Table 2).

In Table 3, data from NSW for the years 1998 to 2002, and other sources, is presented. A risk of 1 in 100,000 means that, in any one year, 1 person is killed for every 100,000 people undertaking that particular activity. The NSW data assumes that the whole population undertakes the activity. That is, we are all at risk of being killed in a fire, or of choking on our food, but it is reasonable to assume that only people who go deep sea fishing run a risk of being killed while doing it.

It can be seen that the risks of dying as a result of falling, using a motor vehicle, or engaging in water-related activities (including bathing) are all greater than 1:100,000 and yet few people actively avoid situations where these risks are present. Some people are averse to flying and yet it represents a lower risk than choking to death on food. Importantly, the data also indicate that, even when the risk of dying as a consequence of a particular event is very small, it could still happen to any one of us any day. If this were not so, no one would ever be struck by lightning.

Most local councils and planning authorities that stipulate a tolerable risk to property also stipulate a tolerable risk to life. The AGS Practice Note Guideline recommends that 1:100,000 is tolerable in newly developed areas, where works can be carried out as part of the development to limit risk. The tolerable level is raised to 1:10,000 in established areas, where specific landslide hazards may have existed for many years. The distinction is deliberate and intended to prevent the concept of landslide risk management, for its own sake, becoming an unreasonable financial burden on existing communities. Acceptable risk is usually taken to be one tenth of the tolerable risk (1:1,000,000 for new developments and 1:100,000 for established areas) and efforts should be made to attain these where it is practicable and financially realistic to do so.

TABLE 3: RISK TO LIFE

Risk (deaths per participant per year)	**Activity/Event Leading to Death** (NSW data unless noted)
1:1,000	Deep sea fishing (UK)
1:1,000 to 1:10,000	Motor cycling, horse riding , ultra-light flying (Canada)
1:23,000	Motor vehicle use
1:30,000	Fall
1:70,000	Drowning
1:180,000	Fire/burn
1:660,000	Choking on food
1:1,000,000	Scheduled airlines (Canada)
1:2,300,000	Train travel
1:32,000,000	Lightning strike

More information relevant to your particular situation may be found in other AUSTRALIAN GEOGUIDES:

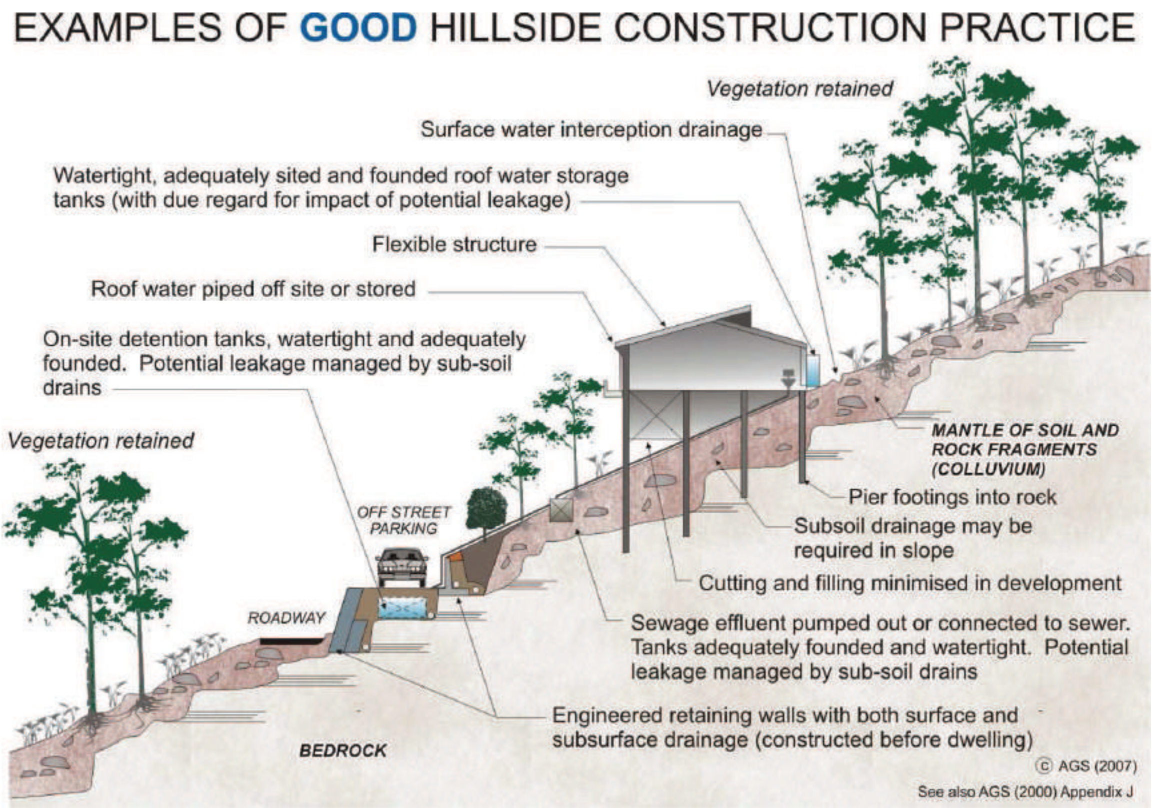
- GeoGuide LR1 - Introduction
- GeoGuide LR2 - Landslides
- GeoGuide LR3 - Landslides in Soil
- GeoGuide LR4 - Landslides in Rock
- GeoGuide LR5 - Water & Drainage
- GeoGuide LR6 - Retaining Walls
- GeoGuide LR8 - Hillside Construction
- GeoGuide LR9 - Effluent & Surface Water Disposal
  GeoGuide LR10 - Coastal Landslides
- GeoGuide LR11 - Record Keeping

The Australian GeoGuides (LR series) are a set of publications intended for property owners; local councils; planning authorities; developers; insurers; lawyers and, in fact, anyone who lives with, or has an interest in, a natural or engineered slope, a cutting, or an excavation. They are intended to help you understand why slopes and retaining structures can be a hazard and what can be done with appropriate professional advice and local council approval (if required) to remove, reduce, or minimise the risk they represent. The GeoGuides have been prepared by the Australian Geomechanics Society, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

HILLSIDE CONSTRUCTION PRACTICE

Sensible development practices are required when building on hillsides, particularly if the hillside has more than a low risk of instability (GeoGuide LR7). Only building techniques intended to maintain, or reduce, the overall level of landslide risk should be considered. Examples of good hillside construction practice are illustrated below.



WHY ARE THESE PRACTICES GOOD?

Roadways and parking areas - are paved and incorporate kerbs which prevent water discharging straight into the hillside (GeoGuide LR5).

Cuttings - are supported by retaining walls (GeoGuide LR6).

Retaining walls - are engineer designed to withstand the lateral earth pressures and surcharges expected, and include drains to prevent water pressures developing in the backfill. Where the ground slopes steeply down towards the high side of a retaining wall, the disturbing force (see GeoGuide LR6) can be two or more times that in level ground. Retaining walls must be designed taking these forces into account.

Sewage - whether treated or not is either taken away in pipes or contained in properly founded tanks so it cannot soak into the ground.

Surface water - from roofs and other hard surfaces is piped away to a suitable discharge point rather than being allowed to infiltrate into the ground. Preferably, the discharge point will be in a natural creek where ground water exits, rather than enters, the ground. Shallow, lined, drains on the surface can fulfil the same purpose (GeoGuide LR5).

Surface loads - are minimised. No fill embankments have been built. The house is a lightweight structure. Foundation loads have been taken down below the level at which a landslide is likely to occur and, preferably, to rock. This sort of construction is probably not applicable to soil slopes (GeoGuide LR3). If you are uncertain whether your site has rock near the surface, or is essentially a soil slope, you should engage a geotechnical practitioner to find out.

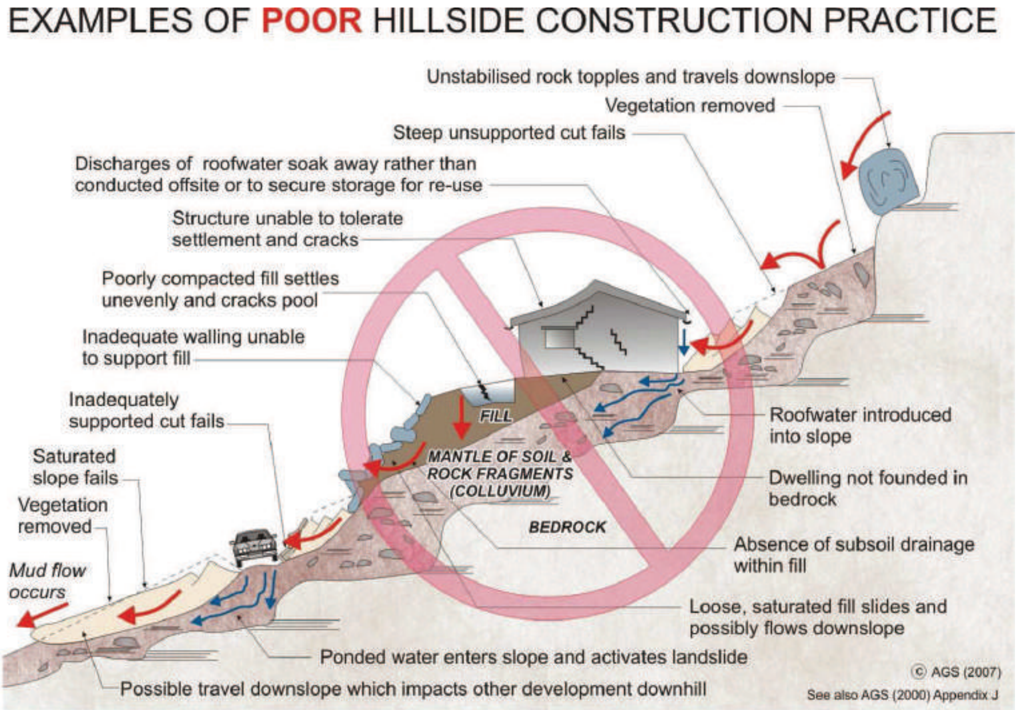
Flexible structures - have been used because they can tolerate a certain amount of movement with minimal signs of distress and maintain their functionality.

Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing can result in a rise in water table with a consequent increase in the likelihood of a landslide (GeoGuide LR5). An exception may have to be made to this rule on steep rock slopes where trees have little effect on the water table, but their roots pose a landslide hazard by dislodging boulders.

Possible effects of ignoring good construction practices are illustrated on page 2. Unfortunately, these poor construction practices are not as unusual as you might think and are often chosen because, on the face of it, they will save the developer, or owner, money. You should not lose sight of the fact that the cost and anguish associated with any one of the disasters illustrated, is likely to more than wipe out any apparent savings at the outset.

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)



WHY ARE THESE PRACTICES POOR?

Roadways and parking areas - are unsurfaced and lack proper table drains (gutters) causing surface water to pond and soak into the ground.

Cut and fill - has been used to balance earthworks quantities and level the site leaving unstable cut faces and added large surface loads to the ground. Failure to compact the fill properly has led to settlement, which will probably continue for several years after completion. The house and pool have been built on the fill and have settled with it and cracked. Leakage from the cracked pool and the applied surface loads from the fill have combined to cause landslides.

Retaining walls - have been avoided, to minimise cost, and hand placed rock walls used instead. Without applying engineering design principles, the walls have failed to provide the required support to the ground and have failed, creating a very dangerous situation.

A heavy, rigid, house - has been built on shallow, conventional, footings. Not only has the brickwork cracked because of the resulting ground movements, but it has also become involved in a man-made landslide.

Soak-away drainage - has been used for sewage and surface water run-off from roofs and pavements. This water soaks into the ground and raises the water table (GeoGuide LR5). Subsoil drains that run along the contours should be avoided for the same reason. If felt necessary, subsoil drains should run steeply downhill in a chevron, or herring bone, pattern. This may conflict with the requirements for effluent and surface water disposal (GeoGuide LR9) and if so, you will need to seek professional advice.

Rock debris - from landslides higher up on the slope seems likely to pass through the site. Such locations are often referred to by geotechnical practitioners as "debris flow paths". Rock is normally even denser than ordinary fill, so even quite modest boulders are likely to weigh many tonnes and do a lot of damage once they start to roll. Boulders have been known to travel hundreds of metres downhill leaving behind a trail of destruction.

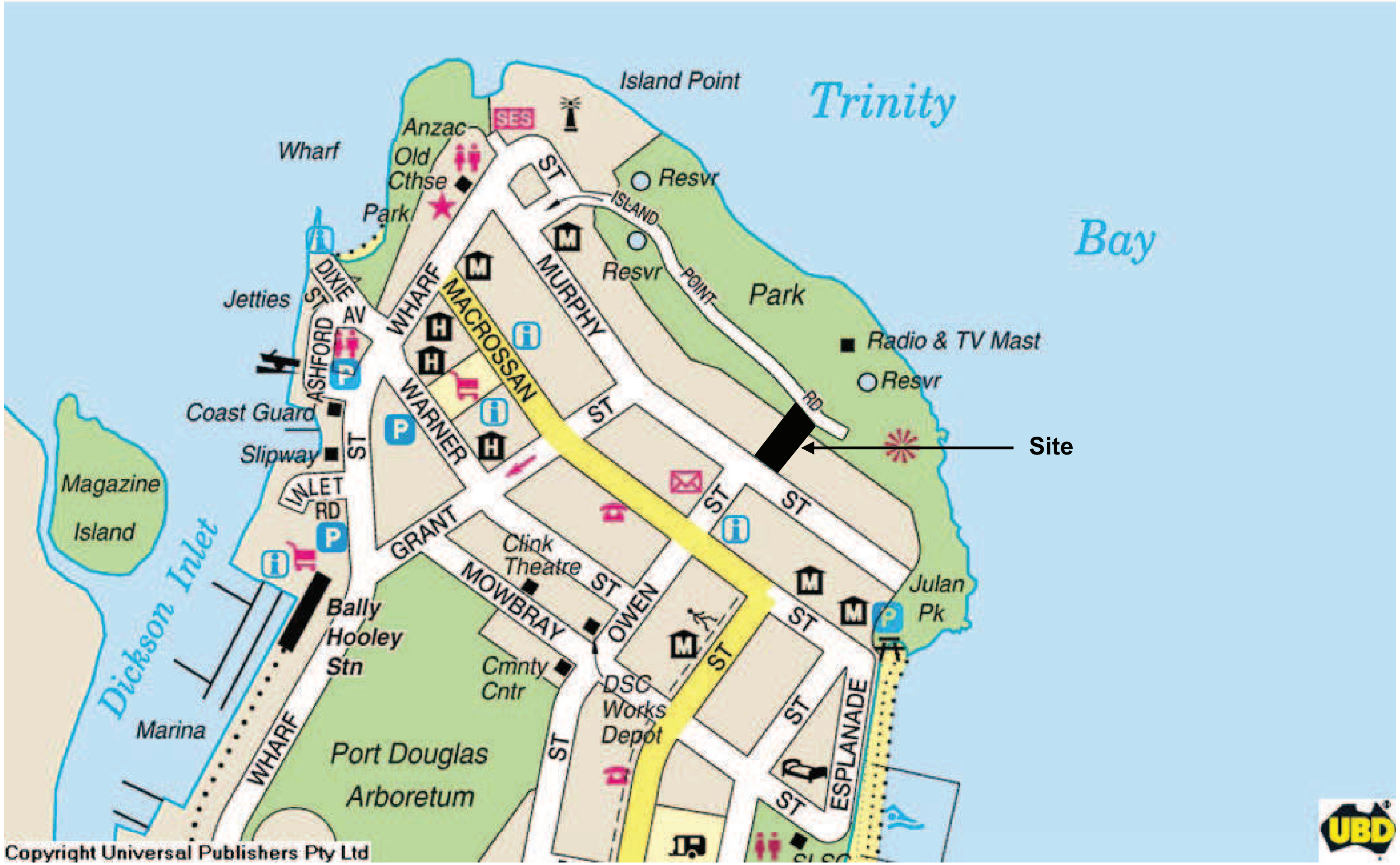
Vegetation - has been completely cleared, leading to a possible rise in the water table and increased landslide risk (GeoGuide LR5).

DON'T CUT CORNERS ON HILLSIDE SITES - OBTAIN ADVICE FROM A GEOTECHNICAL PRACTITIONER

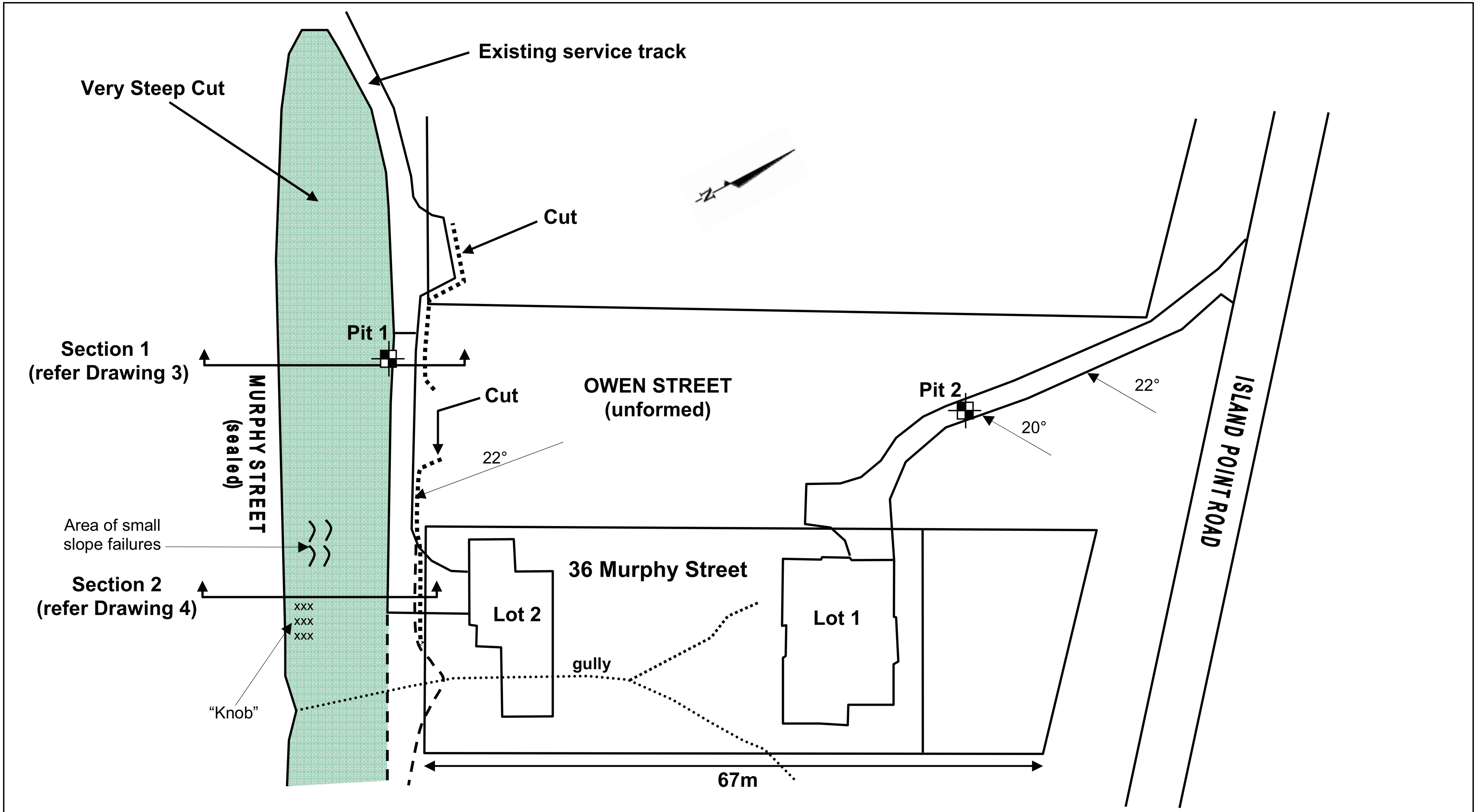
More information relevant to your particular situation may be found in other Australian GeoGuides:

- GeoGuide LR1 - Introduction
- GeoGuide LR2 - Landslides
- GeoGuide LR3 - Landslides in Soil
- GeoGuide LR4 - Landslides in Rock
- GeoGuide LR5 - Water & Drainage
- GeoGuide LR6 - Retaining Walls
- GeoGuide LR7 - Landslide Risk
- GeoGuide LR9 - Effluent & Surface Water Disposal
- GeoGuide LR10 - Coastal Landslides
- GeoGuide LR11 - Record Keeping

The Australian GeoGuides (LR series) are a set of publications intended for property owners; local councils; planning authorities; developers; insurers; lawyers and, in fact, anyone who lives with, or has an interest in, a natural or engineered slope, a cutting, or an excavation. They are intended to help you understand why slopes and retaining structures can be a hazard and what can be done with appropriate professional advice and local council approval (if required) to remove, reduce, or minimise the risk they represent. The GeoGuides have been prepared by the Australian Geomechanics Society, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.



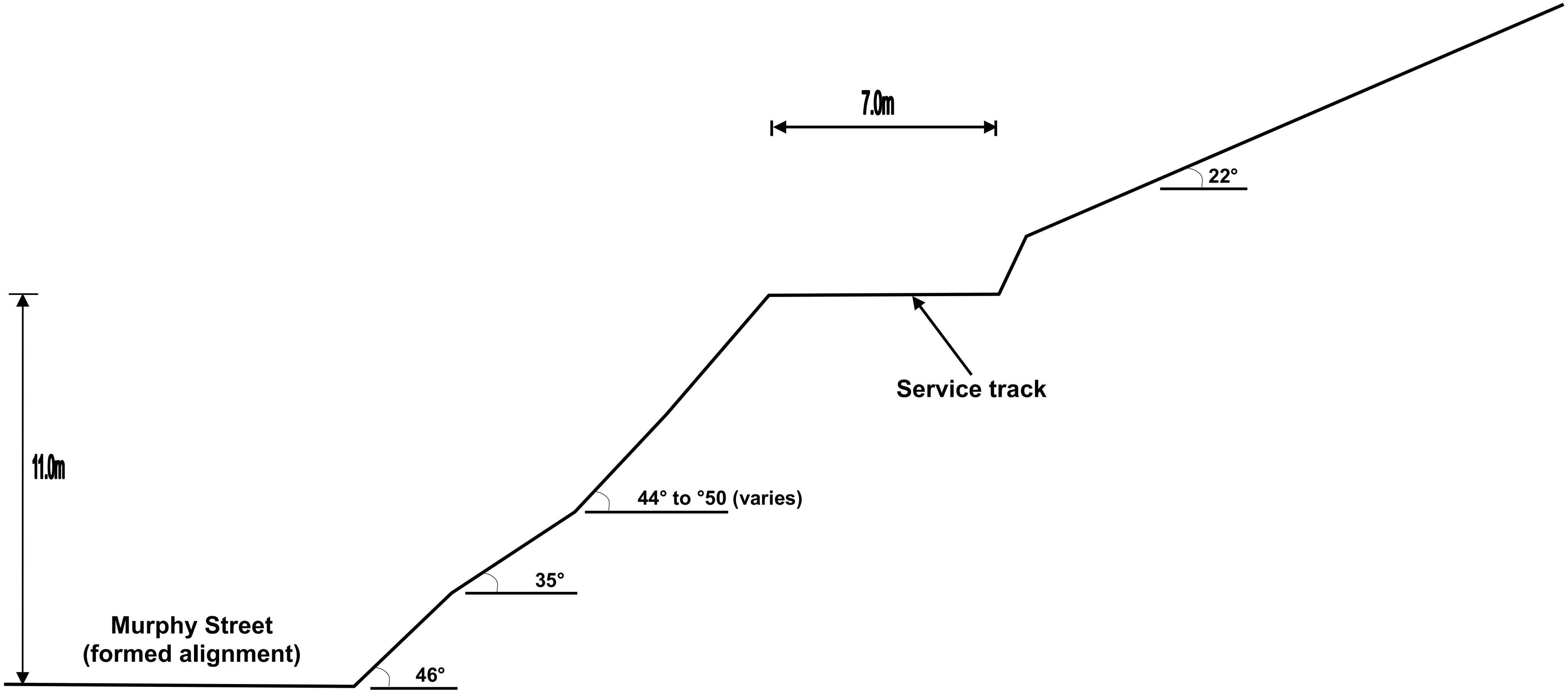
Douglas Partners Geotechnics · Environment · Groundwater		*Brisbane, Cairns, Canberra, Darwin, Gold Coast, Melbourne, Minto, Newcastle, Perth, Sunshine Coast, Sydney, Townsville, Wollongong, Wyong*	
SITE LOCATION PLAN **PROPOSED ACCESS DRIVEWAYS** **36 MURPHY STREET, PORT DOUGLAS**			
CLIENT: **CARRON PROPERTIES**			OFFICE: **CAIRNS**
DRAWN BY: **CLP**	SCALE: **NOT TO SCALE**	PROJECT No.: **38836.02**	DRAWING No.: **1**
APPROVED:		DATE: **FEBRUARY 2010**	



Note:

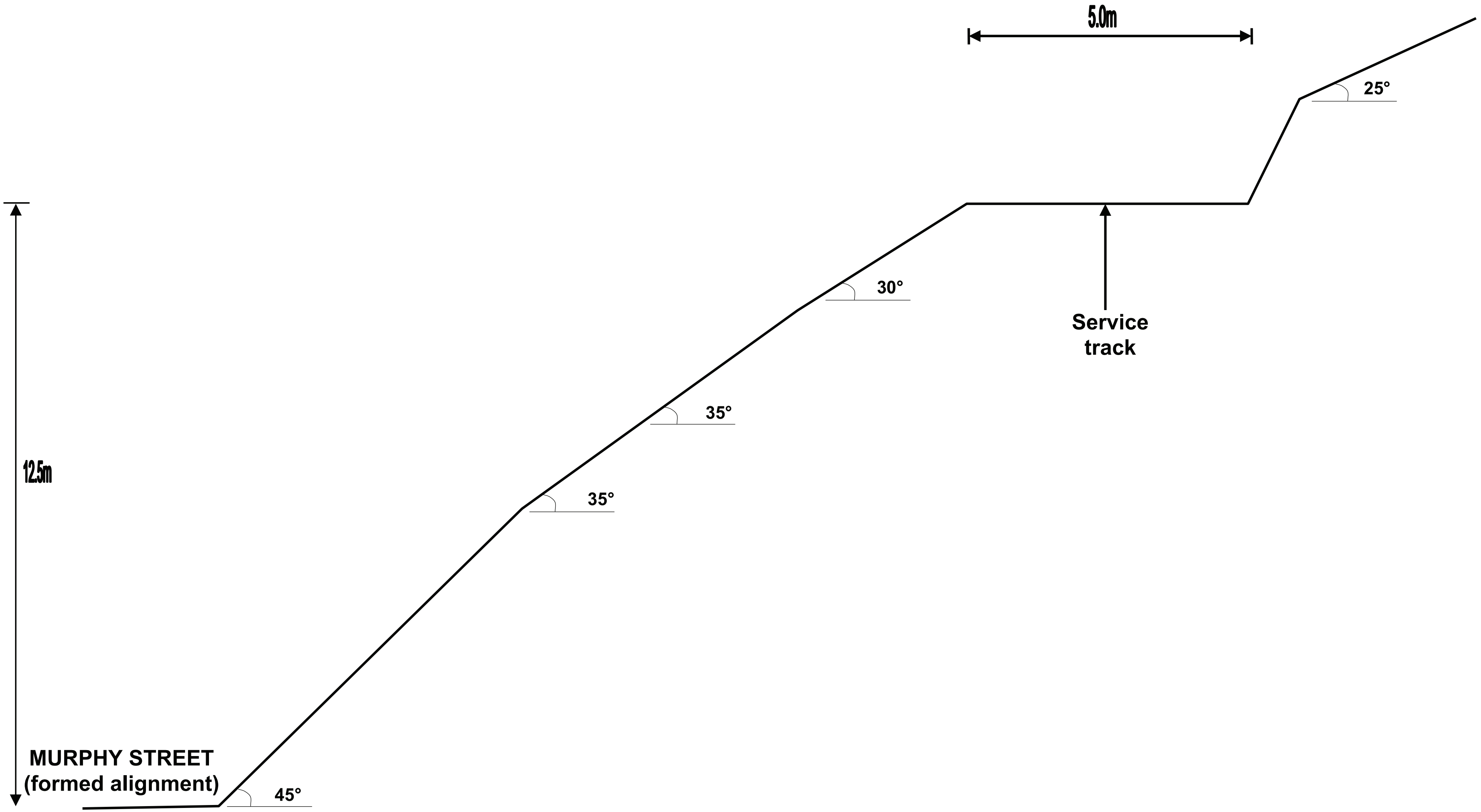
1. Test locations are approximate only and are shown with reference to existing site features.
2. Drawing adapted from site plan provided by client (A.F.Colafella Drawing No. 5773 TP3).

Douglas Partners — Geotechnics · Environment · Groundwater			*Brisbane, Cairns, Canberra, Darwin, Gold Coast, Melbourne, Minto, Newcastle, Perth, Sunshine Coast, Sydney, Townsville, Wollongong, Wyong*
TEST LOCATION PLAN **PROPOSED ACCESS DRIVEWAYS** **36 MURPHY STREET, PORT DOUGLAS**			
CLIENT: **CARRON PROPERTIES**			OFFICE: **CAIRNS**
DRAWN BY: **CLP**	SCALE: **NOT TO SCALE**	PROJECT No.: **38836.02**	DRAWING No.: **2**
APPROVED:		DATE: **FEBRUARY 2010**	



Note:
1. The approximate plan location of this section is shown on Drawing 2

Douglas Partners Geotechnics · Environment · Groundwater			*Brisbane, Cairns, Canberra, Darwin, Gold Coast, Melbourne, Minto, Newcastle, Perth, Sunshine Coast, Sydney, Townsville, Wollongong, Wyong*
SECTION 1 **PROPOSED ACCESS DRIVEWAYS** **36 MURPHY STREET, PORT DOUGLAS**			
CLIENT: **CARRON PROPERTIES**			OFFICE: **CAIRNS**
DRAWN BY: **CLP**	SCALE: **AS SHOWN**	PROJECT No.: **38836.02**	DRAWING No.: **3**
APPROVED:		DATE: **FEBRUARY 2010**	



Note:

1. The approximate plan location of this section is shown on Drawing 2

Douglas Partners Geotechnics · Environment · Groundwater	*Brisbane, Cairns, Canberra, Darwin, Gold Coast, Melbourne, Minto, Newcastle, Perth, Sunshine Coast, Sydney, Townsville, Wollongong, Wyong*

SECTION 2
PROPOSED ACCESS DRIVEWAYS
36 MURPHY STREET, PORT DOUGLAS

CLIENT: **CARRON PROPERTIES**		OFFICE: **CAIRNS**
DRAWN BY: **CLP**	SCALE: **AS SHOWN**	PROJECT No.: **38836.02**
APPROVED:		DATE: **FEBRUARY 2010**
		DRAWING No.: **4**

APPENDIX B

22nd February 2010

Cairns Regional Council
PO Box 359
Cairns Qld 4870

RE: **Material Change of Use (Impact) for Multiple Dwellings (Residential) – 2 Units Under a Superseded Planning Scheme**

36 Murphy Street, Port Douglas

Proposal: Multiple Dwellings (Residential)

Applicant: Carron Properties Pty Ltd

c/- Dennis Carron
A.F. Colafella & Associates Pty Ltd
4/178 Boronia Road,
Boronia Victoria,
Melbourne, 3155

Location of Site: 36 Murphy Street, Port Douglas

Property: Lot 131 PTD2094

Locality: Port Douglas and Environs

Planning Area: Residential 1

Planning Scheme: Douglas Shire Planning Scheme 1996

Introduction

As requested by Cairns Regional Council please find attached:

- A set of revised civil drawings which incorporate all the recommendations outlined in Section 7 and Tables 1 & 2 of the Douglas Partners Report (October 2009) and recommendations in the Revised and Expanded Geotechnical Report by Douglas Partners (February 2010). The revised plans detail all works which will be undertaken as part of the development to ensure that the risk classification remains as Low as defined by AGS2007.

- The revised plans show all retaining walls or stabilization structures associated with the development and access driveway. All structures are accommodated within the site and do not inhibit the continuation of the access track within the Murphy Street Road Reserve.

- A full set of revised Architectural Plans are attached detailing all works to be completed as part of the development. The plans are provided at scale and certified by RPEQ Mr. Alfred Colafella as addressing the requirements of the Geotechnical and Drainage Reports, including the necessary additions.

- The revised plans demonstrate compliance of the proposed stormwater drainage system with the Queensland Urban Drainage Manual. In particular the proposed treatment from the top to the bottom of the large batter and existing infrastructure on Murphy Street.

- Details have been provided on the proposed treatment of accessway driveways in accordance with AS2890.1 and FNQROC (S1110) requirements.

Summary of Revisions

The Architectural documentation prepared by A.F. Colafella & Associates Pty Ltd has been extended and amended as necessary to incorporate the conditions of the Cairns Regional Council's recommendations of the Preliminary Approval.

The revised plans include the adoption of recommendations required to maintain and/or achieve "low risk" classification as defined in AGS2007.

- Douglas Partners Geotechnical Investigation Report (Project 38836.01, October 2009) and specifically Section 7 and Tables 1 & 2.

- Douglas and Partners Additional Stability Analysis Report (Project 38836.02, February 2010) and specifically Section 7 and Tables 1& 4.

In addition the revisions to the civil documents include:

- Revisions of design levels at the South East end of the Murphy Street access (Lot 2 access) to permit stabilization structures (retaining walls) to be maintained within the subject site so as not to inhibit the continuation of the access track within the Murphy Street Road Reserve.

- Additional notations, details and sections have been provided identifying the works required to be completed which are part of the proposed development and which address the requirements of the Geotechnical and Drainage Reports.

- The relevant Design Engineer RPEQ membership details have been included on the title block section of the plans.

- Relevant notations, details and sections specifying stabilization and erosion protection measures of the large batter in the Murphy Street Road Reserve including means of conveying piped stormwater to the existing infrastructure in Murphy Street and provision navigation of overland flow of 1:100 year rainfall event from top to bottom of the batter.

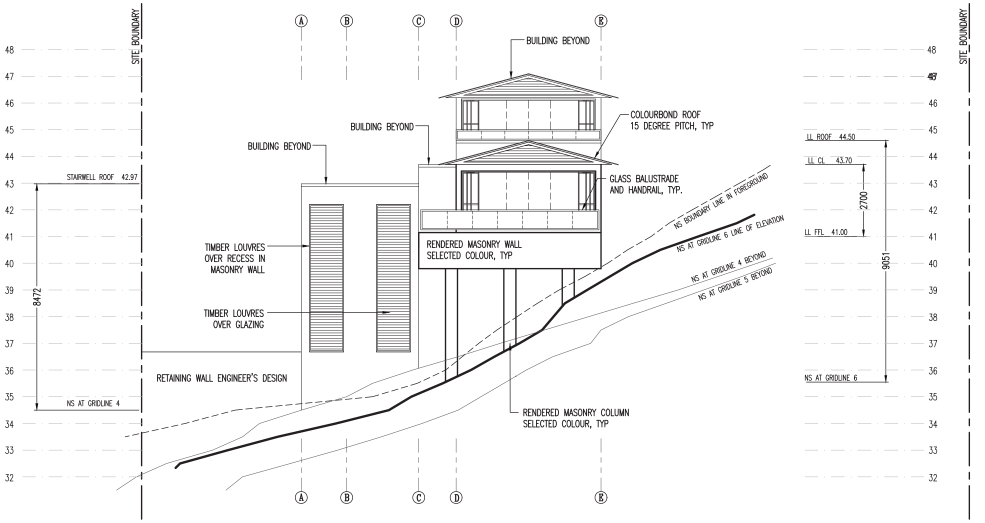
- Compliance with Queensland Urban Drainage Manual for stormwater discharge from the site is ensured by the provision of a piped drainage system and above ground storage facility at the base of the gully for Q100 rainfall events thereby reducing the intensity of overland conveyance of stormwater on neighboring and downstream properties.

- Deletion of the compacted gravel driveways and inclusion of notation as to treatment of the access ways in accordance with AS2890.1 and FNQROC (S1110) requirements.

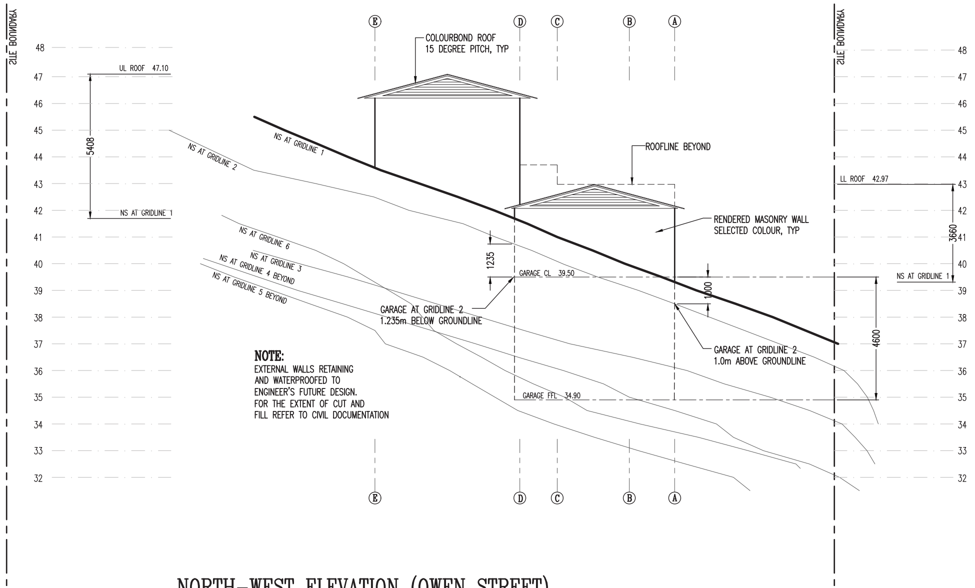
- Deletion of the proposed turn around area for Lot 2 within the Owen Street Reserve and relocation within the lot.

Yours sincerely

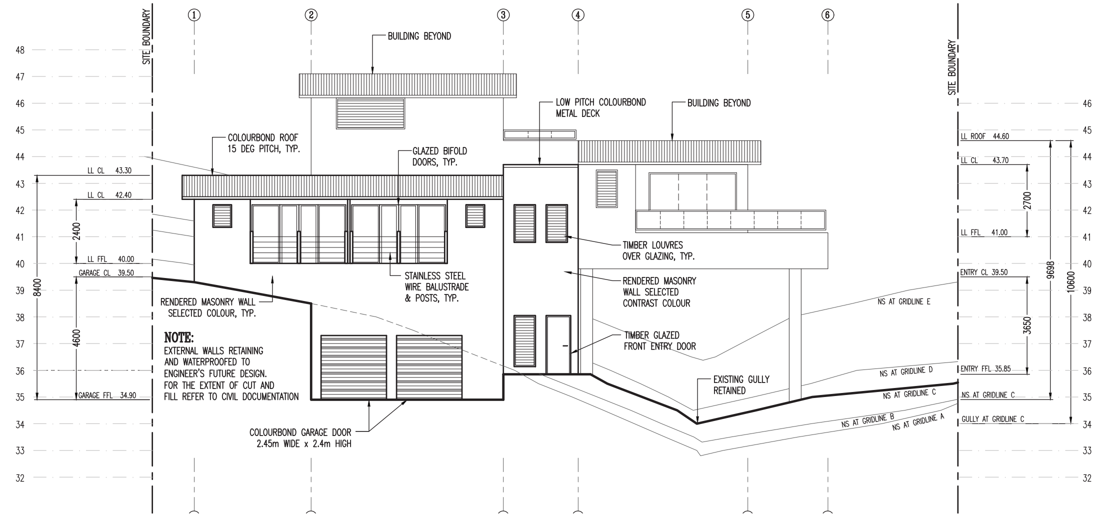
A.F. Colafella & Associates Pty Ltd.



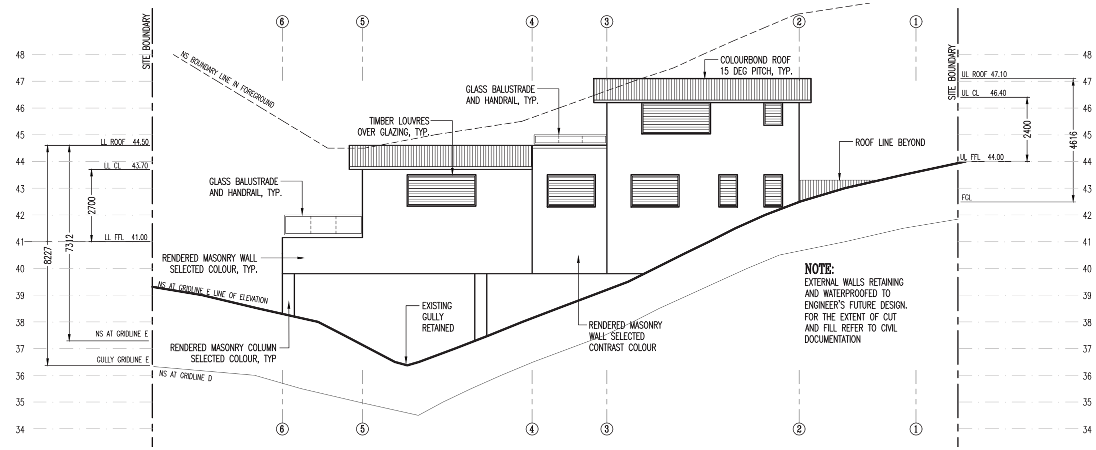
SOUTH-EAST ELEVATION
PROPOSED RESIDENCE LOT 1
SCALE 1:100



NORTH-WEST ELEVATION (OWEN STREET)
PROPOSED RESIDENCE LOT 1
SCALE 1:100



SOUTH-WEST ELEVATION (MURPHY STREET)
PROPOSED RESIDENCE LOT 1
SCALE 1:100



NORTH-EAST ELEVATION
PROPOSED RESIDENCE LOT 1
SCALE 1:100

REVISION	DESCRIPTION	DATE
A	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010

A.F.Colafella
& ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
2/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

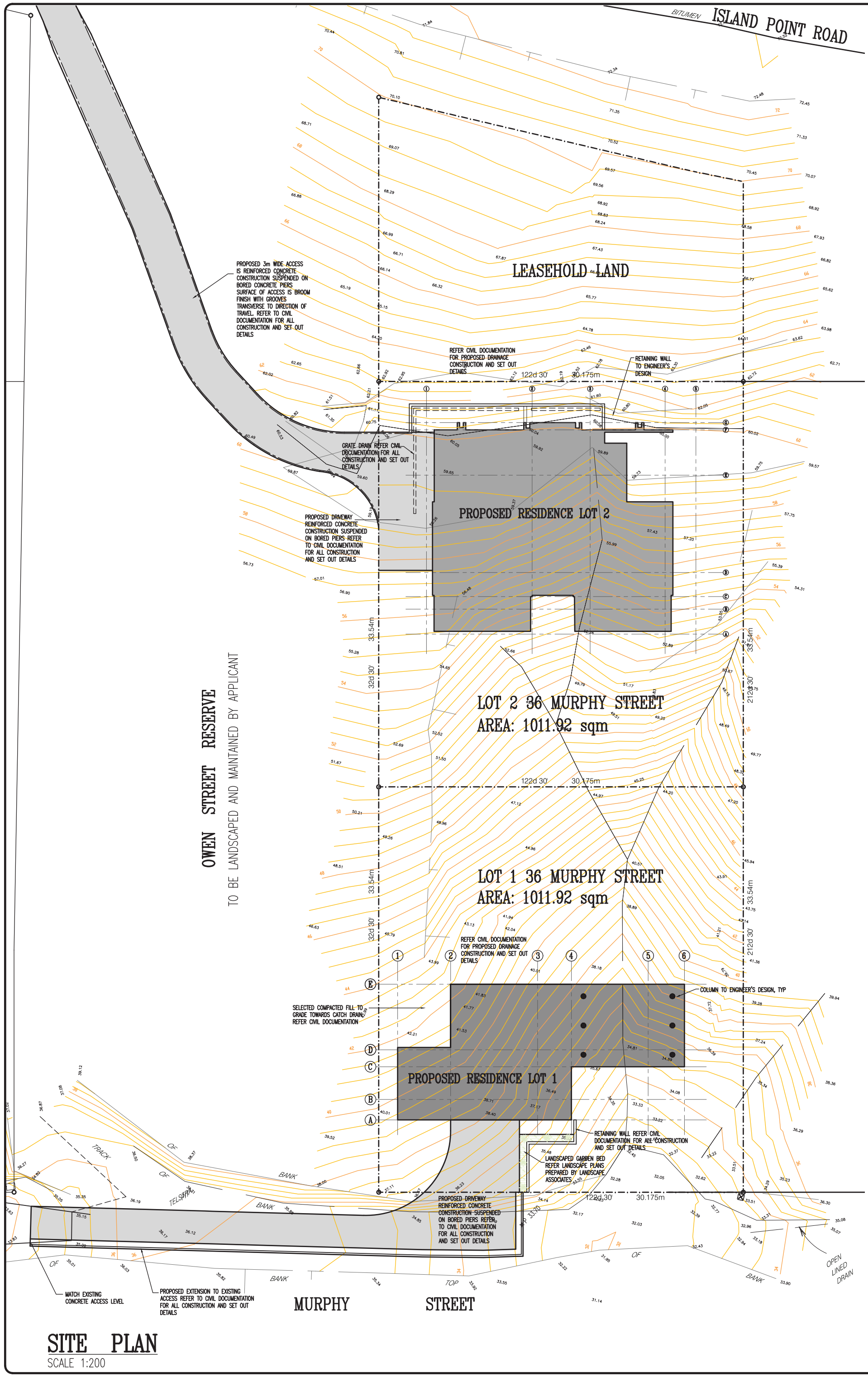
CARRON PROPERTIES P/L

N

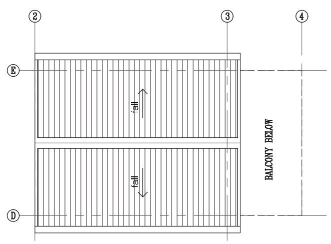
DRAWN	SCALE	DATE	CHECKED
RJC	AS NOTES	22.02.10	

DRAWING No.	REV.
4852 TP2	A

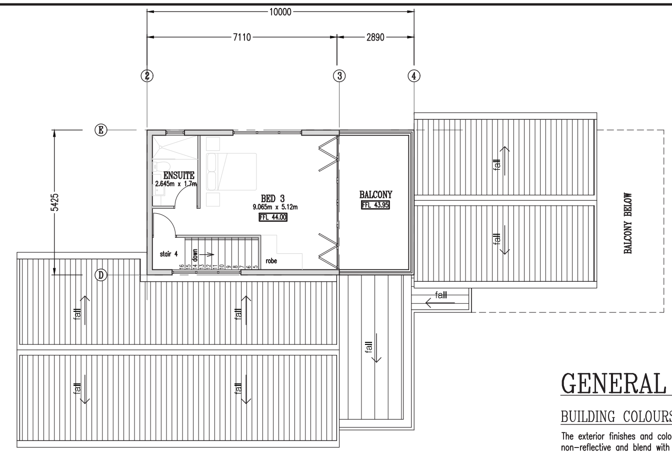
PLANNING – NOT FOR CONSTRUCTION



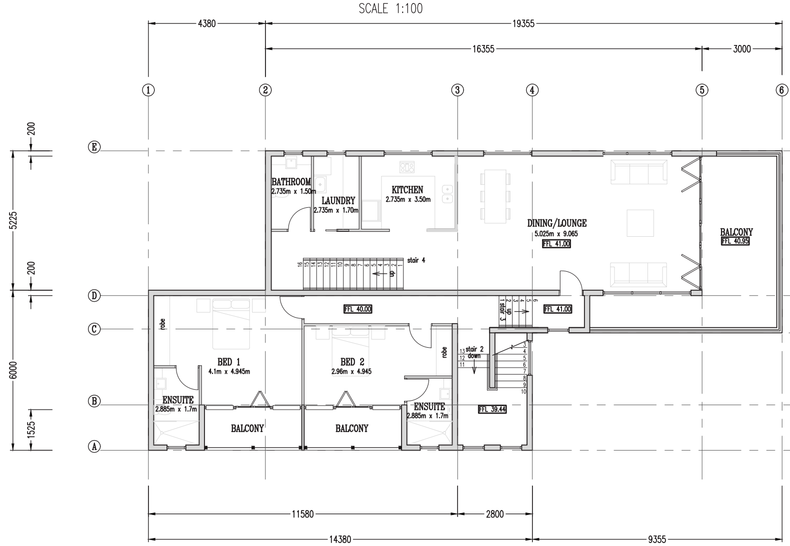
SITE PLAN
SCALE 1:200



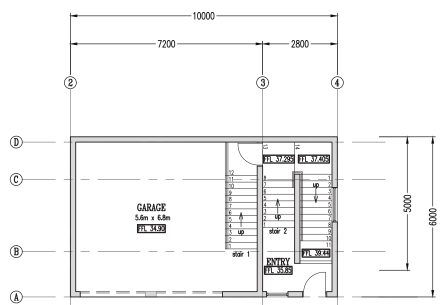
UPPER LEVEL ROOF PLAN
PROPOSED RESIDENCE LOT 1
SCALE 1:100



UPPER LEVEL PLAN
PROPOSED RESIDENCE LOT 1
SCALE 1:100



LOWER LEVEL PLAN
PROPOSED RESIDENCE LOT 1
SCALE 1:100



GARAGE PLAN
PROPOSED RESIDENCE LOT 1
SCALE 1:100

GENERAL NOTES

BUILDING COLOURS

The exterior finishes and colours of Buildings are non-reflective and blend with the natural colours of the surrounding environment.

Roofs must be of moderately dark to darker shades of green, grey and brown.

Details of colours are to be lodges with Council for its endorsement prior to the issue of a Development Permit for Building Work.

GEOTECHNICAL ASSESSMENT

An additional geotechnical assessment of the site in conjunction with the retaining wall design must be carried out by a qualified and experienced geotechnical consultant, and the design must be amended to incorporate recommendations made.

The report should specifically address the stated concerns of Council with regard to risk levels. The geotechnical report and details of any amendments to design must be endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Building Works.

ACCESS

Construct a gravel surface driveway to the nominated building area in accordance with relevant Australian Standards and certified by RPEQ. Once constructed, cut and fill batters must be stabilised and re-vegetated.

The finishes and colour of driveway is to blend with the natural colours of the surrounding natural environment being generally moderately dark to darker shades of green, grey and brown.

Details of colours are to be lodged with Council for its endorsement prior to the issue of a Development Permit for Operation Works for the driveway.

REVISION	DESCRIPTION	DATE
B	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010
A	RESIDENCE LOT 2 REDUCED IN AREA – SITE PLAN	NOV 2009

A.F.Colafella & ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
2/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

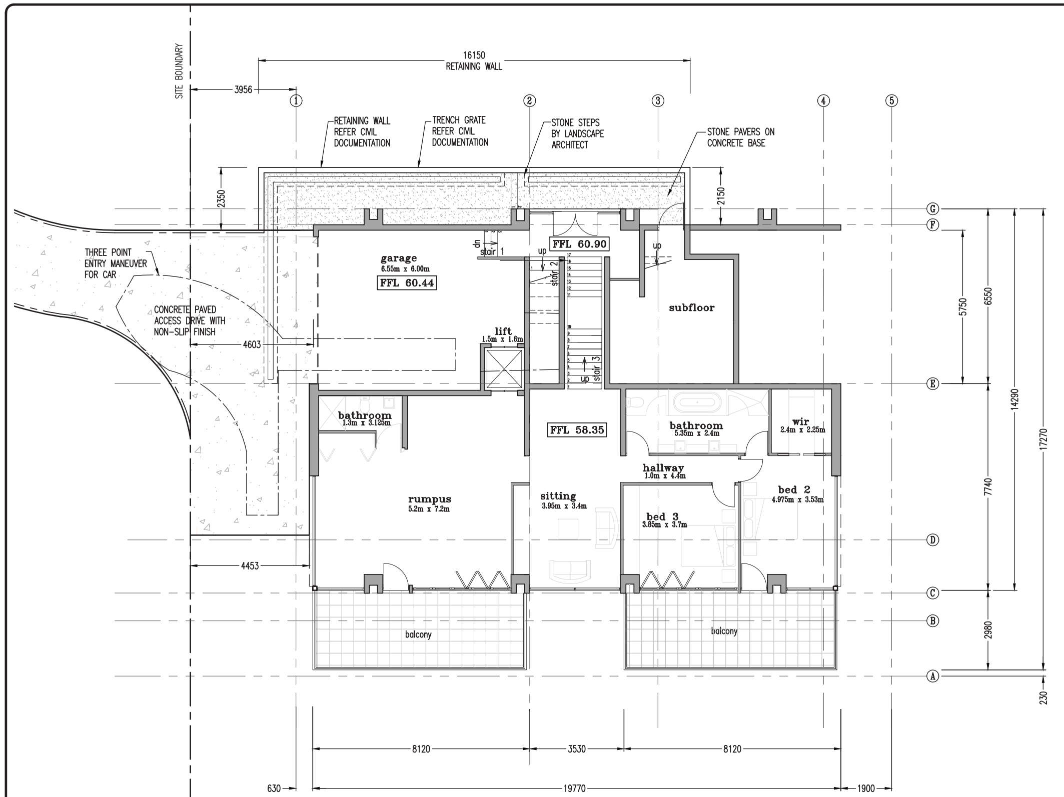
CARRON PROPERTIES P/L

N

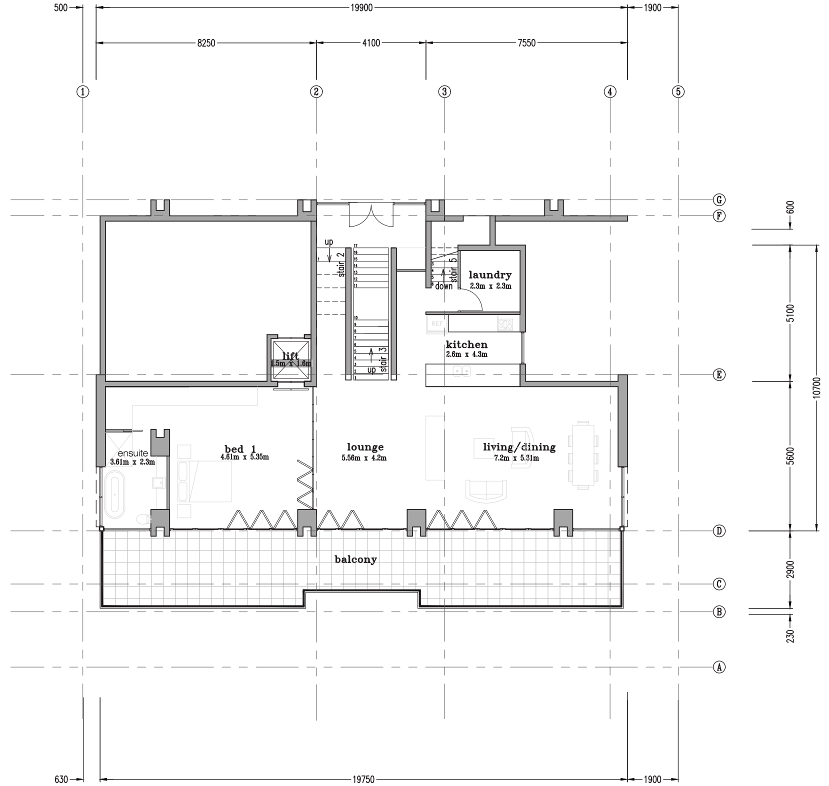
DRAWN	SCALE	DATE	CHECKED
RJC	AS NOTES	22.02.10	

DRAWING No.	REV.
4852 TP1	B

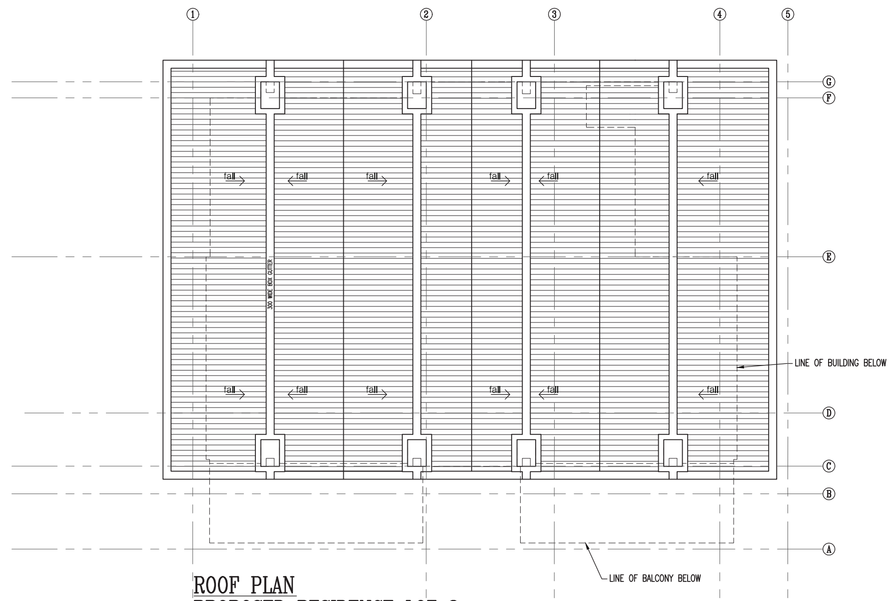
PLANNING – NOT FOR CONSTRUCTION



LOWER LEVEL PLAN
PROPOSED RESIDENCE LOT 2
SCALE 1:100



UPPER LEVEL PLAN
PROPOSED RESIDENCE LOT 2
SCALE 1:100



ROOF PLAN
PROPOSED RESIDENCE LOT 2
SCALE 1:100

GENERAL NOTES

BUILDING COLOURS

The exterior finishes and colours of Buildings are non-reflective and blend with the natural colours of the surrounding environment.

Roofs must be of moderately dark to darker shades of green, grey and brown.

Details of colours are to be lodges with Council for its endorsement prior to the issue of a Development Permit for Building Work.

GEOTECHNICAL ASSESSMENT

An additional geotechnical assessment of the site in conjunction with the retaining wall design must be carried out by a qualified and experienced geotechnical consultant, and the design must be amended to incorporate recommendations made.

The report should specifically address the stated concerns of Council with regard to risk levels. The geotechnical report and details of any amendments to design must be endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Building Works.

ACCESS

Construct a gravel surface driveway to the nominated building area in accordance with relevant Australian Standards and certified by RPEQ. Once constructed, cut and fill batters must be stabilised and re-vegetated.

The finishes and colour of driveway is to blend with the natural colours of the surrounding natural environment being generally moderately dark to darker shades of green, grey and brown.

Details of colours are to be lodged with Council for its endorsement prior to the issue of a Development Permit for Operation Works for the driveway.

REVISION	DESCRIPTION	DATE
C	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010
B	EAVE OVER BALCONY AT FIRST LEVEL REDUCED	18.11.2009
A	REVISED IN ACCORDANCE WITH PLOT RATIO OF DSC SUPERSEDED PLANNING SCHEME	16.11.2009

A.F.Colafella
& ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
2/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

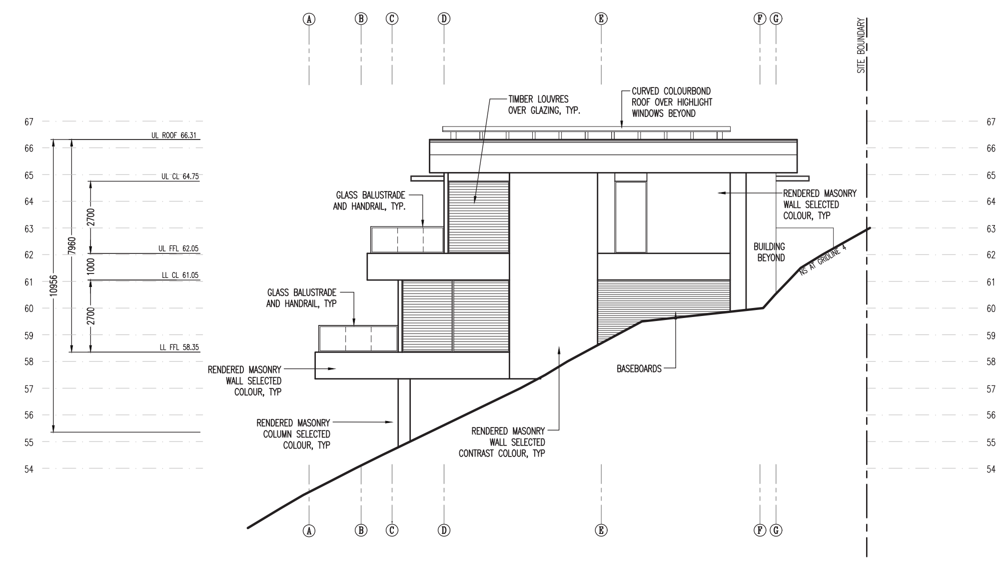
CARRON PROPERTIES P/L

N

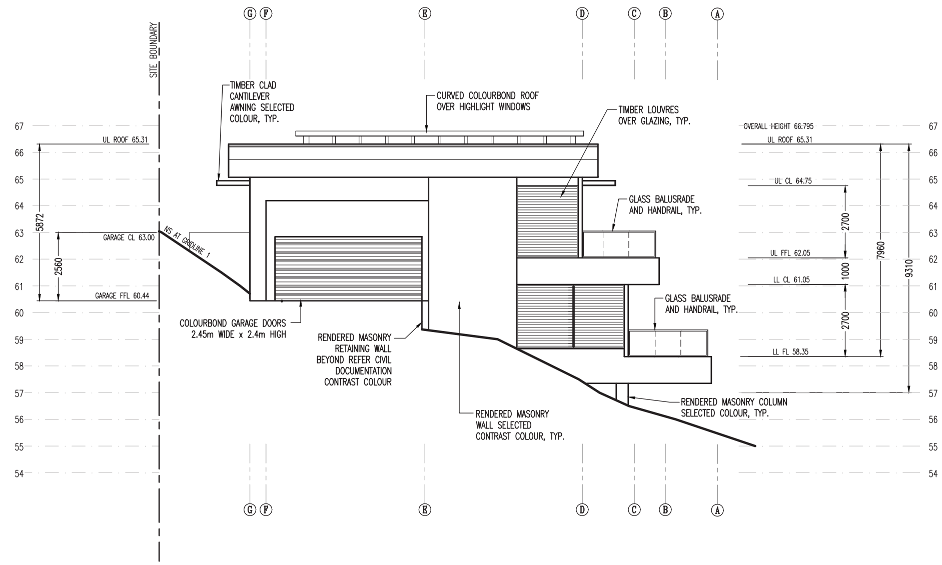
DRAWN	SCALE	DATE	CHECKED
RJC	AS NOTED	22.02.10	

DRAWING No.	REV.
5773 TP3	C

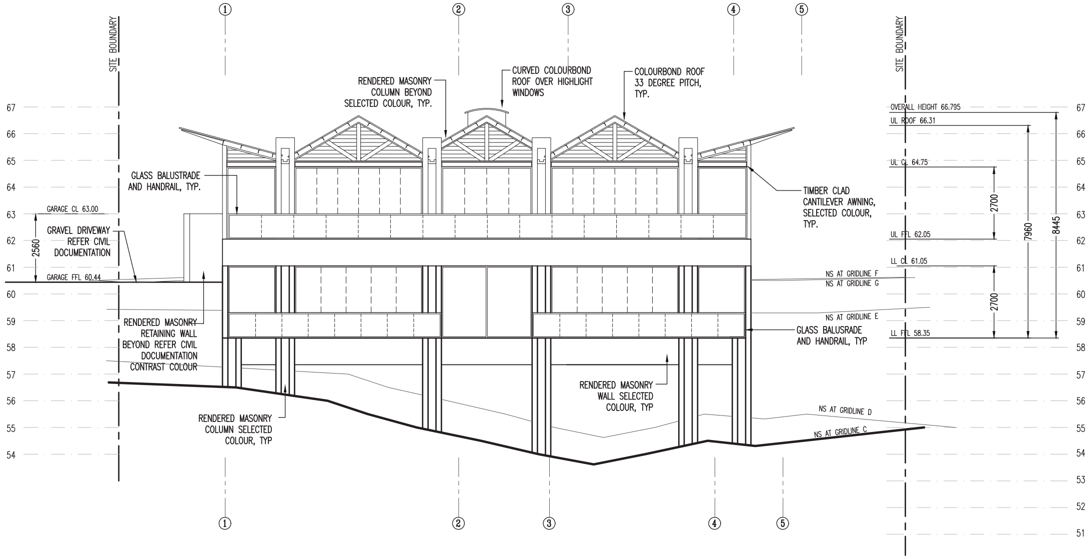
PLANNING – NOT FOR CONSTRUCTION



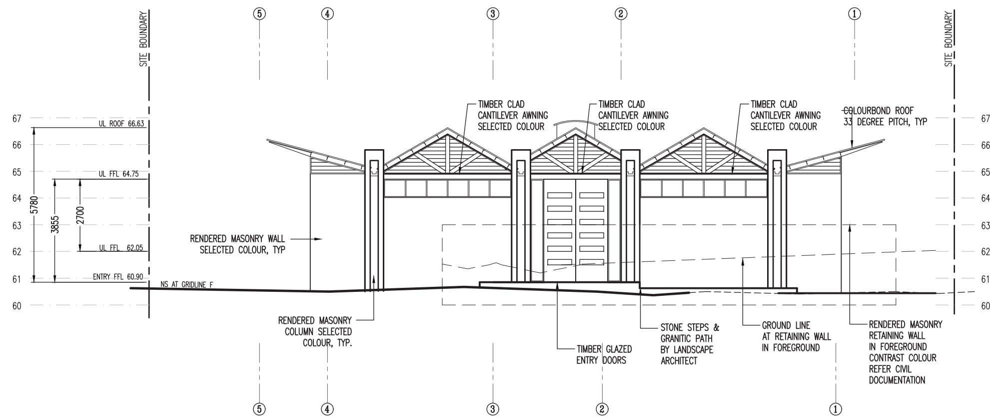
SOUTH EAST ELEVATION
PROPOSED RESIDENCE LOT 2
SCALE 1:100



NORTH WEST ELEVATION
PROPOSED RESIDENCE LOT 2
SCALE 1:100



SOUTH WEST ELEVATION
PROPOSED RESIDENCE LOT 2
SCALE 1:100



NORTH EAST ELEVATION
PROPOSED RESIDENCE LOT 2
SCALE 1:100

REVISION	DESCRIPTION	DATE
D	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010
C	AS REQUIRED BY COUNCIL	17.02.2010
B	BUILDING HEIGHT DIMENSIONS INCLUDED	18.11.2009
A	REVISED IN ACCORDANCE WITH PLOT RATIO OF DSC SUPERSEDED PLANNING SCHEME	16.11.2009

A.F.Colafella & ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
2/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

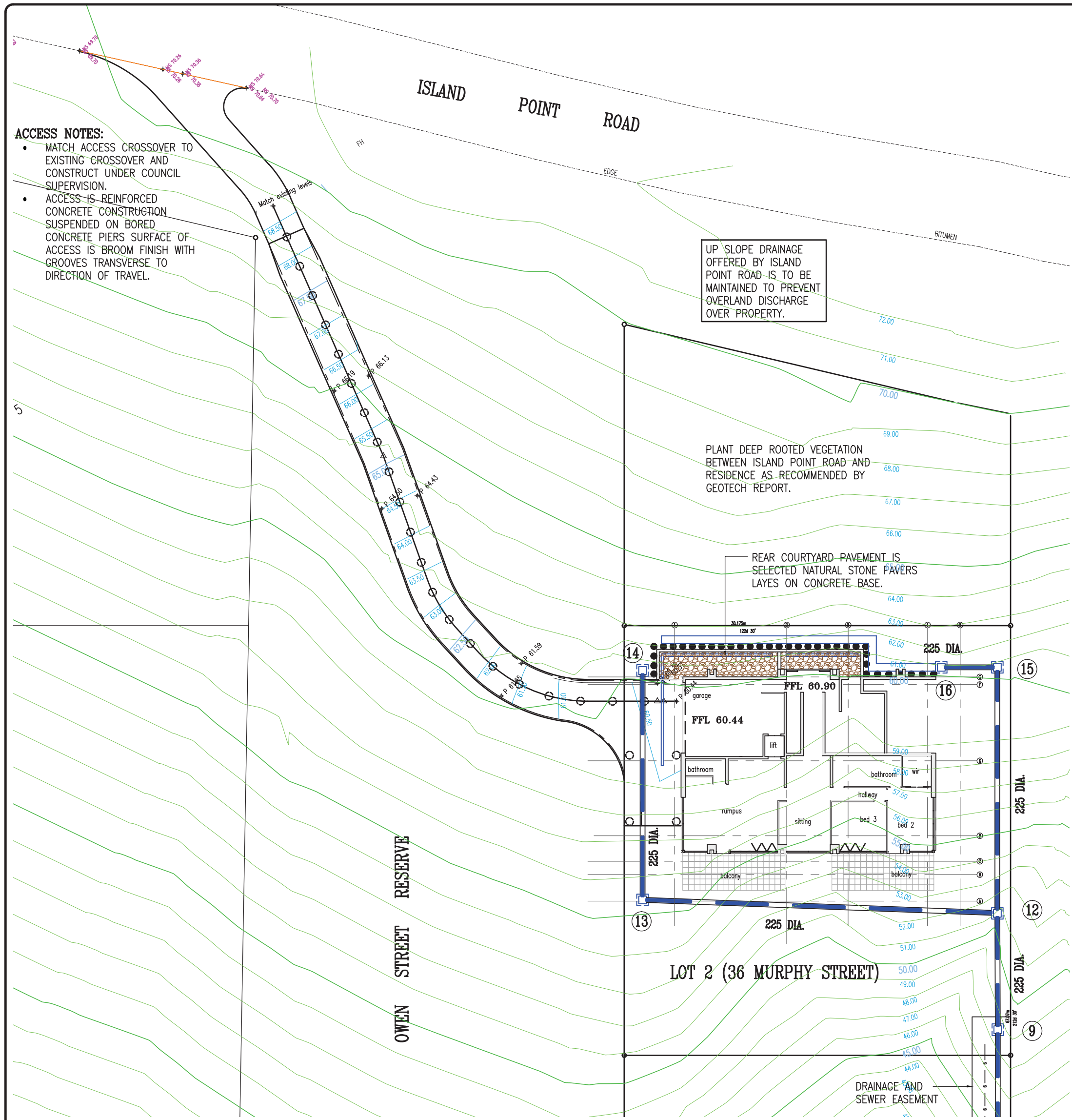
PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

CARRON PROPERTIES P/L

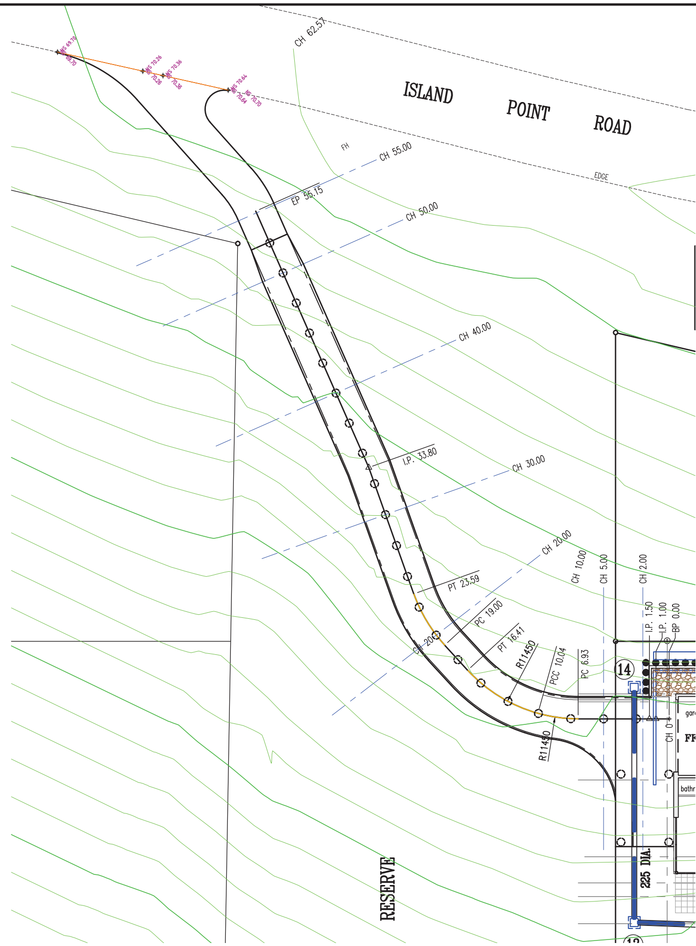
N

DRAWN: RJC
SCALE: AS NOTED
DATE: 22.02.10
CHECKED:
DRAWING No. 5773 TP4
REV. D

PLANNING – NOT FOR CONSTRUCTION



LOT 2 SITE ACCESS, DESIGN LEVELS & DRAINAGE PLAN



LOT 2 SITE ACCESS SET OUT PLAN

SEE SHEET 4852 C4 FOR NOTES AND SPECIFICATIONS

NOTE:

ACCESS IS SUPPORTED CLEAR OF GROUND LEVEL (ON CONCRETE PIERS) FOR THE GREATER PART OF ITS LENGTH (REFER CHAINAGE SECTIONS SHEET S2) TO AVOID CONCENTRATION OF SURFACE FLOWS AND TO MINIMISE EXCAVATION AND DISTURBANCE TO EXISTING VEGETATION.

PIT SCHEDULE

PIT N°	PIT TYPE	PIT SIZE (INT)	IL INLET	IL OUTLET	FINISHED LVL TOP OF PIT	DEPTH TO INVERT	COVER TYPE	REMARKS
16	G. PIT	600 x 600	–	60.40	61.00	600	HD GALV. GRATE COVER	
15	G. PIT	600 x 600	60.36	60.33	61.00	670	HD GALV. GRATE COVER	
14	G. PIT	600 x 600	–	59.60	60.20	600	HD GALV. GRATE COVER	
13	G. PIT	600 x 600	54.65	54.62	55.30	680	HD GALV. GRATE COVER	
12	G. PIT	600 x 600	EX PIT 13 50.33 EX PIT 15 49.99	49.96	51.00	1040	HD GALV. GRATE COVER	
9	G. PIT	900 x 600	47.46	47.20	48.50	1300	HD GALV. GRATE COVER	

REVISION	DESCRIPTION	DATE
A	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010

A.F.Colafella & ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
4/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E–Mail ADMIN@AFCOLAFELLA.COM

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

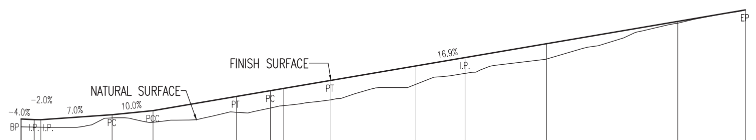
CLIENT: CARRON PROPERTIES P/L

DESIGN: A.F. COLAFELLA
MIE 343687 EC 1472
RPEQ 2242 (Civil)

DRAWN	SCALE	DATE	CHECKED
IMR	1 : 200	22.02.10	

DRAWING No. 4852 C1 — REV. A

ISSUE: PLANNING – NOT FOR CONSTRUCTION

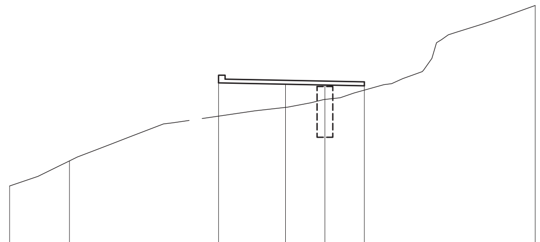


SCALE: 200 / 200
CH: 0.00 to 60.00
DATUM: 56.00

CUT/FILL DEPTHS	0.60	0.57	0.57	0.25	0.89	0.89	1.21	1.32	1.32	1.48	1.41	1.21	1.17	0.14	0.00	
DESIGN LEVELS	60.44	60.40	60.39	60.77	61.08	61.08	62.16	62.60	62.77	63.38	64.46	65.11	66.16	67.85	68.72	
EXISTING LEVELS	59.84	59.83	59.82	60.52	60.19	60.19	60.95	61.27	61.45	61.90	63.05	63.90	65.00	67.71	68.72	
CHAINAGE	0	1.00	1.50	6.93	10	10.04	16.41	19.00	20	23.59	30	33.80	40	50	55.15	60

LOT 2 ACCESS LONGITUDINAL SECTION

Scale 1:200

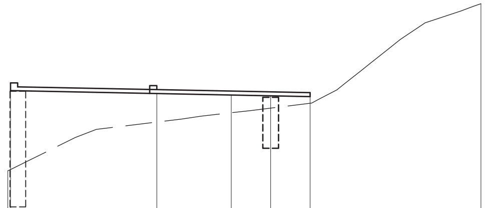


DATUM 54

DESIGN LEVELS		60.83	60.86	60.67	60.64	60.61	
EXISTING LEVELS		57.59	59.30	59.63	59.93	60.29	
OFFSETS	-12.00	-9.72	-4.00	-1.50	0.00	1.50	8.00

Chainage 5.00

Scale 1:100

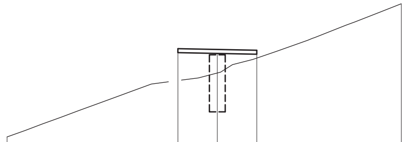


DATUM 54

DESIGN LEVELS		60.77	60.51	60.45	60.43	60.39	
EXISTING LEVELS		57.47	59.28	59.63	59.81	59.99	
OFFSETS	-10.00	-9.90	-3.70	-1.50	0.00	1.50	10.00

Chainage 2.00

Scale 1:100

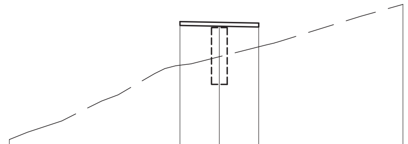


DATUM 55

DESIGN LEVELS		61.11	61.08	61.05	
EXISTING LEVELS		59.90	60.18	60.75	
OFFSETS	-8.00	-1.50	0.00	1.50	7.00

Chainage 10.00

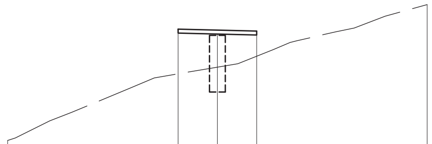
Scale 1:100



		62.80	62.77	62.74	
		61.13	61.45	61.83	
	-8.00	-1.50	0.00	1.50	7.00

Chainage 20.00

Scale 1:100

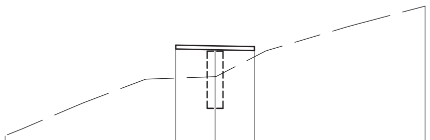


DATUM 57

DESIGN LEVELS		64.50	64.46	64.43	
EXISTING LEVELS		62.79	63.05	63.47	
OFFSETS	-8.00	-1.50	0.00	1.50	8.00

Chainage 30.00

Scale 1:100



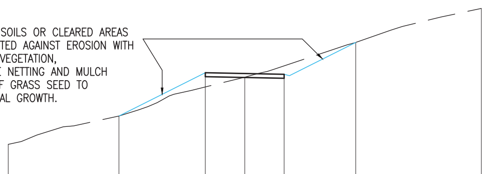
DATUM 60

DESIGN LEVELS		66.19	66.16	66.13	
EXISTING LEVELS		64.94	64.99	65.75	
OFFSETS	-8.00	-1.50	0.00	1.50	8.00

Chainage 40.00

Scale 1:100

ANY EXPOSED SOILS OR CLEARED AREAS TO BE PROTECTED AGAINST EROSION WITH DEEP ROOTED VEGETATION, BIODEGRADABLE NETTING AND MULCH APPLICATION OF GRASS SEED TO FACILITATE INITIAL GROWTH.



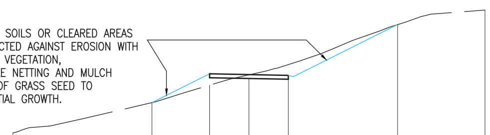
DATUM 62

DESIGN LEVELS		66.24	67.88	67.85	67.82	69.03	
EXISTING LEVELS		66.24	67.34	67.71	68.14	69.03	
OFFSETS	-9.00	-4.79	-1.50	0.00	1.50	4.22	9.00

Chainage 50.00

Scale 1:100

ANY EXPOSED SOILS OR CLEARED AREAS TO BE PROTECTED AGAINST EROSION WITH DEEP ROOTED VEGETATION, BIODEGRADABLE NETTING AND MULCH APPLICATION OF GRASS SEED TO FACILITATE INITIAL GROWTH.



DATUM 64

DESIGN LEVELS		67.63	68.73	68.70	68.67	70.61	
EXISTING LEVELS		67.63	68.29	68.68	69.10	70.61	
OFFSETS	-9.00	-3.70	-1.50	0.00	1.50	4.64	9.00

Chainage 55.00

Scale 1:100

SEE SHEET 4852 C4 FOR NOTES AND SPECIFICATIONS

REVISION	DESCRIPTION	DATE
A	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010

A.F.Colafella
& ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
4/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

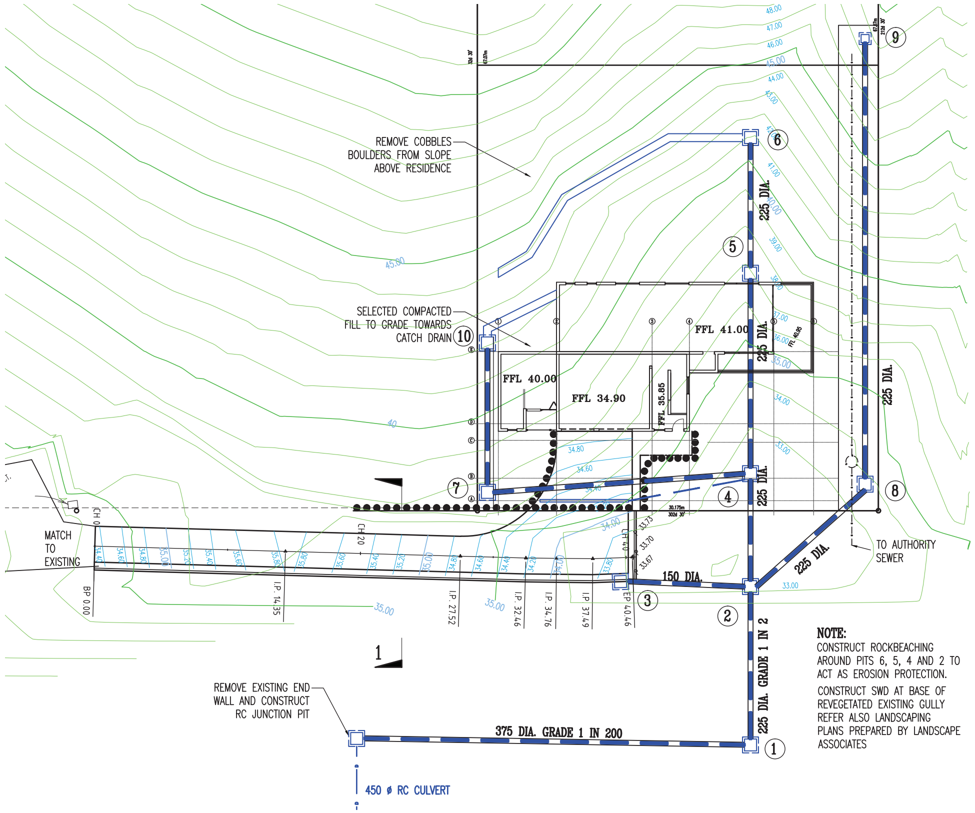
PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

CLIENT
CARRON PROPERTIES P/L

DESIGN
A.F. COLAFELLA
MIE 343687 EC 1472
RPEQ 2242 (Civil)

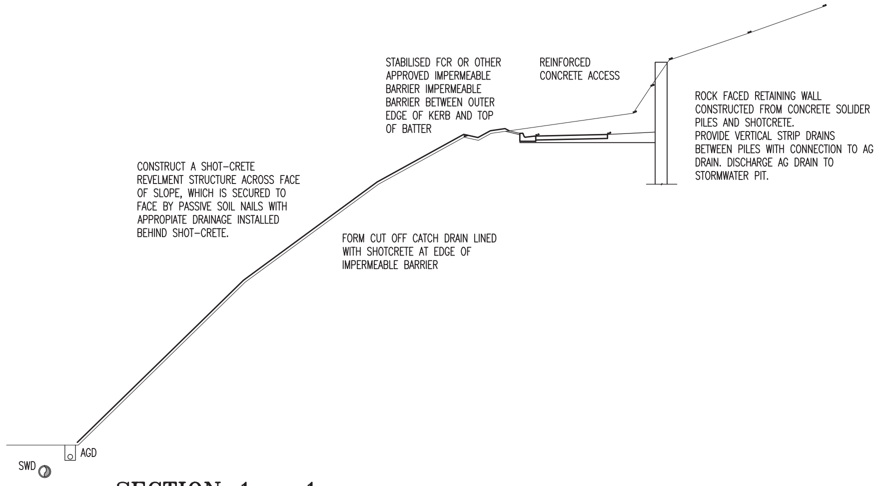
DRAWN	SCALE	DATE	CHECKED
IMR	1 : 100	22.02.10	

DRAWING No.	REV.
4852 C2	A



NOTE:
CONSTRUCT ROCKBEACHING AROUND PITS 6, 5, 4 AND 2 TO ACT AS EROSION PROTECTION.
CONSTRUCT SWD AT BASE OF REVEGETATED EXISTING GULLY REFER ALSO LANDSCAPING PLANS PREPARED BY LANDSCAPE ASSOCIATES

LOT 1 ACCESS SITE, DESIGN LEVELS & DRAINAGE PLAN
Scale 1:200

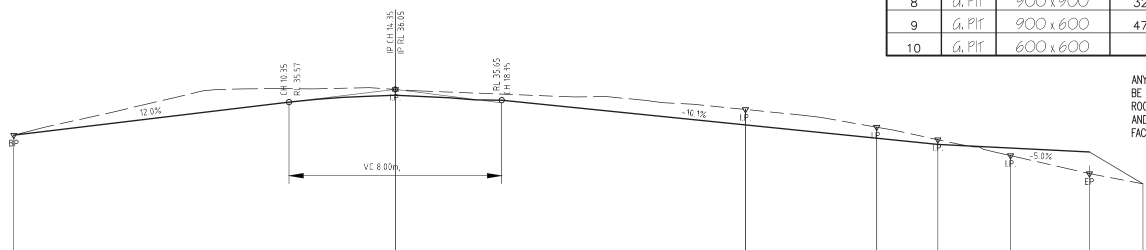


SECTION 1 – 1
Scale 1:100

PIT SCHEDULE

PIT N°	PIT TYPE	PIT SIZE (INT)	IL INLET	IL OUTLET	FINISHED LVL TOP OF PIT	DEPTH TO INVERT	COVER TYPE	REMARKS
1	J. PIT	900 x 600	47.46	20.93	21.80	870	HD CONCRETE COVER	
2	G. PIT	900 x 900	EX PIT 4 31.46 EX PIT 3 31.91 EX PIT 8 31.17	30.96	32.80	1840	GATIC COVER	PROVIDE STEP IRON TO STANDARD DRAWING
3	S.E.P.	900 x 600	–	33.00	33.67	670	HD CONCRETE COVER	PROVIDE STEP IRON TO STANDARD DRAWING
4	G. PIT	600 x 600	EX PIT 5 31.65 EX PIT 7 31.86	31.62	32.60	980	HD GALV. GRATE COVER	
5	G. PIT	600 x 600	36.42	36.39	37.00	610	HD GALV. GRATE COVER	
6	G. PIT	600 x 600	–	40.50	41.00	500	HD GALV. GRATE COVER	
7	G. PIT	600 x 600	37.32	37.29	37.80	510	HD GALV. GRATE COVER	
8	G. PIT	900 x 900	32.29	32.26	33.90	1640	HD GALV. GRATE COVER	
9	G. PIT	900 x 600	47.46	47.20	48.50	1300	HD GALV. GRATE COVER	
10	G. PIT	600 x 600	–	41.40	42.00	600	HD GALV. GRATE COVER	

ANY EXPOSED SOILS OR CLEARED AREAS TO BE PROTECTED AGAINST EROSION WITH DEEP ROOTED VEGETATION, BIODEGRADABLE NETTING AND MULCH APPLICATION OF GRASS SEED TO FACILITATE INITIAL GROWTH.



SCALE: 100 / 100
CH: 0.00 to 45.00
DATUM: 30.00

CUT/FILL DEPTHS	0.00	0.55	0.22	0.33	0.58	0.58	0.41	0.18	0.28	-0.73	-0.81	0.00
DESIGN LEVELS	34.33	35.53	35.83	35.48	34.72	34.47	34.22	33.99	33.85	33.72	33.70	32.50
EXISTING LEVELS	34.33	36.09	36.05	35.81	35.30	35.04	34.63	34.16	33.56	32.99	32.89	32.50
CHAINAGE	0	10	14.35	20	27.52	30	32.46	34.76	37.49	40	40.46	42.48

ACCESS LONGITUDINAL SECTION
Scale 1:100

SEE SHEET 4852 C4 FOR NOTES AND SPECIFICATIONS

REVISION	DESCRIPTION	DATE
A	COUNCIL'S CONDITIONS OF PRELIMINARY APPROVAL	FEB 2010

A.F.Colafella & ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
4/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

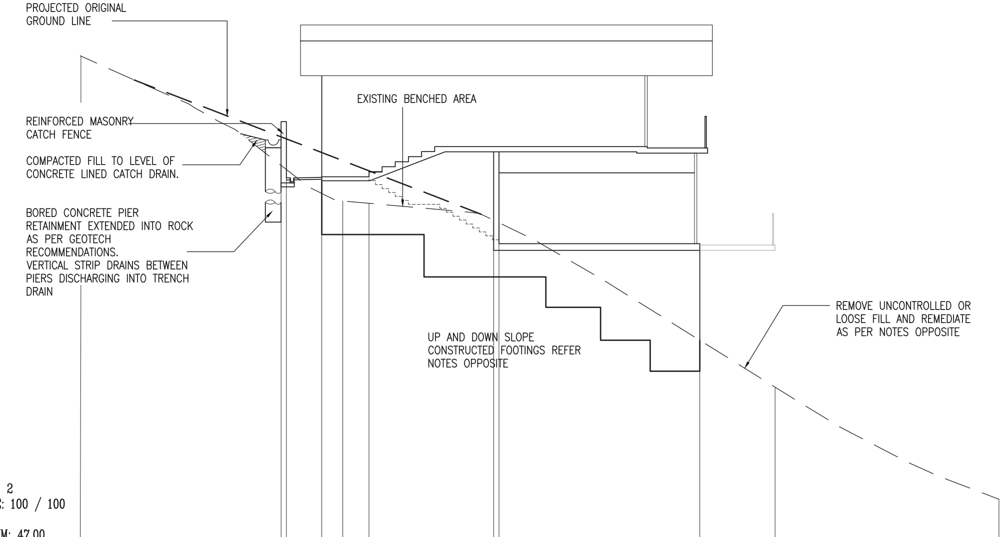
PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

CLIENT
CARRON PROPERTIES P/L

DESIGN
A.F. COLAFELLA
MIE 343687 EC 1472
RPEQ 2242 (Civil)

DRAWN	SCALE	DATE	CHECKED
IMR	AS NOTED	22.02.10	

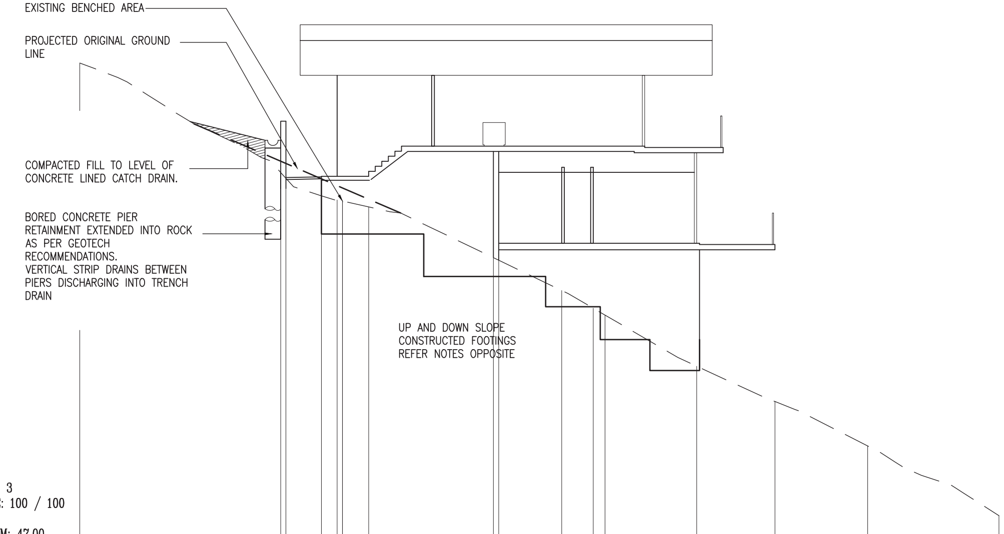
DRAWING No.	REV.
4852 C3	A



GRID 2
SCALE: 100 / 100

DATUM: 47.00

EXISTING LEVELS	65.51	61.34	61.18	60.26	59.98	59.89	59.24	59.15	56.92	55.11	54.68	52.89	50.82	48.62
CHAINAGE	0	7.65	7.85	9.20	10	11.00	15.75	15.95	20	22.90	23.60	26.47	30	35.60



GRID 3
SCALE: 100 / 100

DATUM: 47.00

EXISTING LEVELS	65.22	61.04	60.82	60.16	60.00	59.96	59.73	57.80	57.70	56.55	55.87	55.61	53.66	52.32	50.62	47.96
CHAINAGE	0	7.65	7.85	9.20	9.80	10	11.00	15.75	15.95	18.35	19.55	20	23.49	26.47	30	35.00

NOTES:

CIVIL DOCUMENTATION IS TO BE READ IN CONJUNCTION WITH THE GEOTECHNICAL INVESTIGATION REPORT PREPARED BY DOUGLAS PARTNERS REF. 38836.01 DATED OCT. 2009

GENERAL NOTES

1. ALL FOOTINGS AND RETAINING WALLS TO BE FOUNDED IN ROCK AND DESIGN FOR COLLUVIUM SOIL CREEP LOADS AS PER GEOTECH REPORT.

2. ALL FOOTINGS TO BE BORED PIER FOOTINGS OR DEEP STRIP FOOTINGS ORIENTED DIRECTLY UP AND DOWN SLOPE, CONSTRUCTED IN LEVEL STEPS AND TAKEN THROUGH ALL SOIL COVER INTO LOW STRENGTH OR BETTER ROCK AT DEPTH.

3. REINSTATE SOIL COVER TO FOOTINGS USING SELECTED APPROVED CLAY SOIL COMPACTED IN 200 THICK LAYERS GRADED TO MATCH EXISTING NATURAL GRADES.

4. REMOVE ANY UNCONTROLLED OR LOOSE FILL ENCOUNTERED ON DOWN SLOPE EDGE OF EXISTING CUT BENCH AND REPLACE WITH CLEAN APPROVED FILL PLACED UNDER LEVEL 1 SUPERVISION BY GEOTECHNICAL CONSULTANT AS DEFINED IN AS 3798-1996 AND COMPACTED TO A DRY DENSITY RATIO OF 98% STANDARD.
FINISHED GRADE OF REMEDIATED AREA IS TO MATCH EXISTING NATURAL SLOPES.

5. ANY EXPOSED SOILS OR CLEARED AREAS TO BE PROTECTED AGAINST EROSION WITH DEEP ROOTED VEGETATION, BIODEGRADABLE NETTING AND MULCH APPLICATION OF GRASS SEED TO FACILITATE INITIAL GROWTH.

6. AVOID STOCKPILING PILES OF SOIL ON THE SITE.

7. AVOID PONDING OF SURFACE WATER IN PARTICULAR AROUND HOUSE AREA WITH ADEQUATE SURFACE DRAINAGE.

8. PROVIDE FLEXIBLE COUPLING TO ALL DRAINAGE PIPES.

9. MAINTAIN DRAINAGE SYSTEMS, REPAIR LEAKS, CLEAR BLOCKAGES AND CLEAN OUT PITS AND TRENCH GRATES AND FLUSH OUT A.G. DRAINS.

10. CIVIL PLANS ARE TO BE READ IN CONJUNCTION WITH LANDSCAPE PLANTS PREPARED BY LANDSCAPE AND ASSOCIATES

RETAINING WALLS

RETAINING WALLS STRUCTURES MUST BE:

- DESIGNED WITH REFERENCE TO AS 4678-2002 AND THE SPECIFIC RECOMMENDATIONS CONTAINED IN THE REPORT ON THE GEOTECHNICAL INVESTIGATION REF. PROJECT 38836.01 DATED OCT. 2009.
- PROVIDED WITH SURFACE AND SUBSURFACE DRAINAGE.
- CONSTRUCTED PRIOR TO CONSTRUCTION OF THE RESIDENCES

A.F.Colafella & ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
4/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

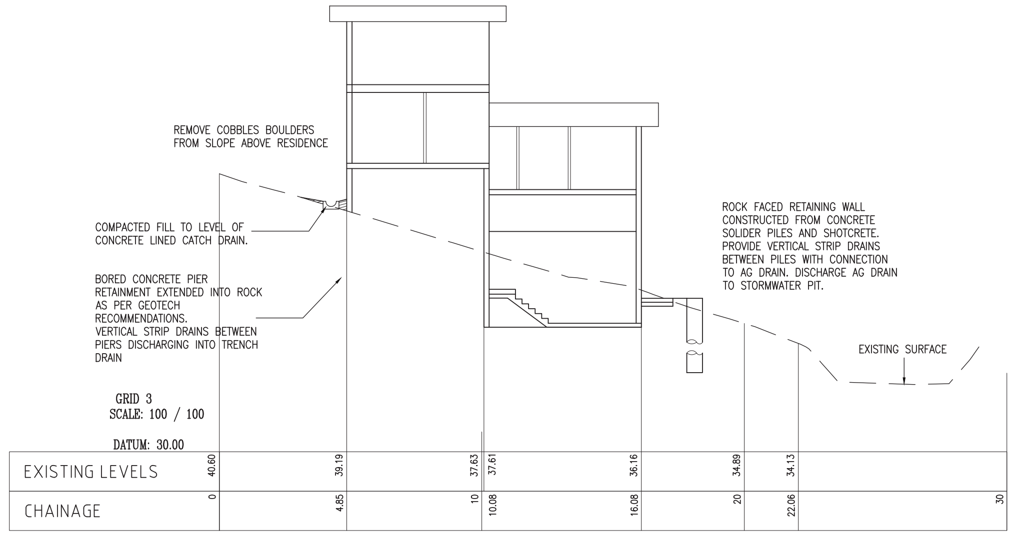
CLIENT
CARRON PROPERTIES P/L

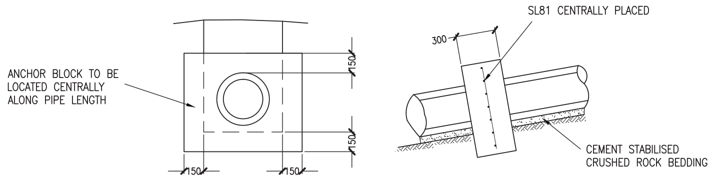
DESIGN
A.F. COLAFELLA
MIE 343687 EC 1472
RPEQ 2242 (Civil)

DRAWN	SCALE	DATE	CHECKED
IMR	AS NOTED	22.02.10	

DRAWING No. 4852 C4 — REV.

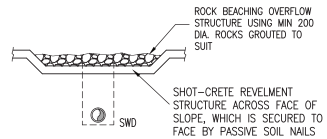
ISSUE: PLANNING - NOT FOR CONSTRUCTION



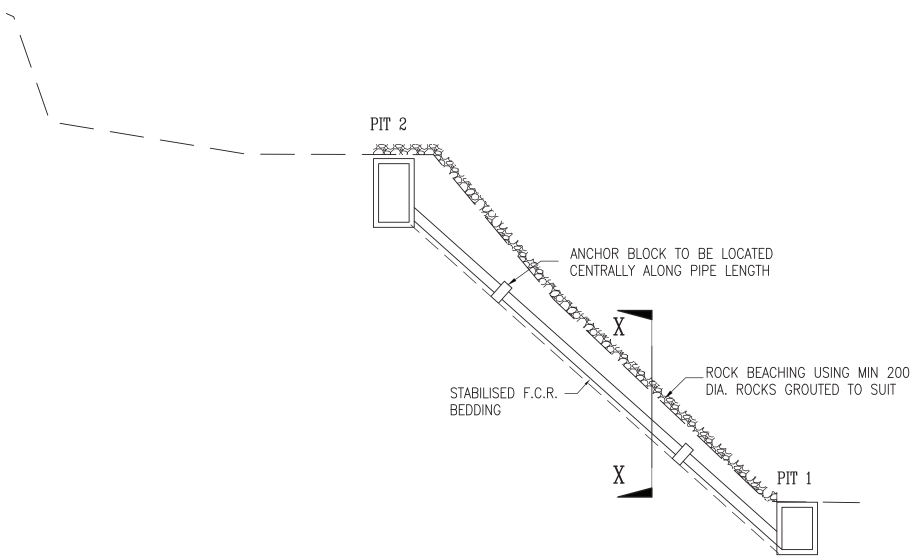


CROSS SECTION **SECTION ALONG PIPE**

ANCHOR BLOCK DETAILS
Scale 1:20



SECTION X – X
Scale 1:50



SECTION PIT 2 TO PIT 1
Scale 1:100

SEE SHEET 4852 C4 FOR NOTES AND SPECIFICATIONS

A.F.Colafella & ASSOCIATES PTY.LTD ACN 006 298 399
CONSULTING STRUCTURAL & CIVIL ENGINEERS
4/178 BORONIA ROAD, BORONIA, VICTORIA, 3155.
Telephone (03) 9762 6466 Fax: (03) 9761 1766
E-Mail ADMIN@AFCOLAFELLA.COM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
36 MURPHY STREET
PORT DOUGLAS

CLIENT
CARRON PROPERTIES P/L

DESIGN
A.F. COLAFELLA
MIE 343687 EC 1472
RPEQ 2242 (Civil)

DRAWN	SCALE	DATE	CHECKED
IMR	AS NOTED	22.02.10	

DRAWING No.	REV.
4852 C5	

ISSUE: PLANNING – NOT FOR CONSTRUCTION