RISE®

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MAJOR PROJECT APPLICATION No. MP08-0234

RISE CONCEPT PLAN

ENGINEERING REPORTS

Amended August 2010

vklconsulting
INFRASTRUCTURE ENGINEERING

P.O. Box 292
Ashmore City
QLD 4214

Ph: 07 5510 0200
Fax: 07 5510 0299
E: mail@vkl.com.au
ABN: 55 114 638 934

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EC3 EVALUATE COMMUNICATE EVOLVE

GREEN GLOBE CERTIFIED PRECINCT PLANNING AND DESIGN

August 2010

CONTENTS

PART A - UTILITIES & INFRASTRUCTURE REPORT, RESPONSE TO DIRECTOR GENERALS ENVIRONMENTAL ASSESSMENT REQUIREMENTS, KEY ASSESSMENT REQUIREMENTS No. 5

PART B - SUBDIVISION DCP CONFLICTS, RESPONSE TO DGEARS GENERAL REQUIREMENTS No. 3B

PART C - RESPONSE TO DIRECTOR GENERALS ENVIRONMENTAL ASSESSMENT REQUIREMENTS, KEY ASSESSMENT REQUIREMENT No. 12 – SITE PREPARATION WORK

PART D - VKL CONSULTING PTY LTD DRAWINGS

PART A

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RESPONSE TO DIRECTOR GENERALS ENVIRONMENTAL ASSESSMENT REQUIREMENTS

KEY ASSESSMENT REQUIREMENT No. 5

UTILITIES & INFRASTRUCTURE REPORT

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CONTENTS

1. INTRODUCTION 1
2. EXISTING UTILITIES & INFRASTRUCTURE 1
   - 2.1 General 1
   - 2.2 Specific Utilities 1
     - *2.2.1 Potable Water* 1
     - *2.2.2 Sewerage* 2
3. UTILITIES & INFRASTRUCTURE REQUIREMENTS FOR THE RISE DEVELOPMENT 3
   - 3.1 General 3
   - 3.2 Projected Water & Sewerage Infrastructure Demands 4
     - *3.2.1 General* 4
     - *3.2.2 Demands – Potable Water & Sewerage* 4
     - Table 3.1 - Projected Potable Water Demand 4
     - Table 3.2 - Possible Additional Demand if Other Areas of Terranora Group Management land is developed in the Future 6
4. INFRASTRUCTURE COMPONENTS - INTERNAL 6
   - 4.1 Potable Water System 6
     - *4.1.1 Low Level Potable Water* 6
     - *4.1.2 High Level Zone* 7
     - *4.1.3 Boosted Level Zone* 7
   - 4.2 Sewerage System 7
     - *4.2.1 General* 7
     - *4.2.2 Initial Stage – Interim Servicing* 8
     - *4.2.3 Internal Works* 8
5. INFRASTRUCTURE COMPONENTS - EXTERNAL 8
   - 5.1 Potable Water 8
   - 5.2 Sewer 9
6. ROADS 9
   - 6.1 General 9
   - 6.2 Public Road - Internal 10
   - 6.3 Private Roads 10
   - 6.4 Internal Private Cycleways & Pathways 10
   - 6.5 External Road Works 10
7. STORMWATER DRAINAGE 11
8. SUMMARY OF EXISTING INFRASTRUCTURE CAPACITY TIMING & MANAGEMENT OF STAGED CONSTRUCTION OF INFRASTRUCTURE 11

APPENDIX A – *VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK03, SK09, SK10, SK11, SK14, SK200, SK201 & SK202*

1. INTRODUCTION

This Amended Utilities & Infrastructure Report has been prepared in response to the DGEAR's Key Assessment Requirement No. 5 for Rise Concept Plan application MP08-0234 and the Minister's Determination dated 29th June 2010.

2. EXISTING UTILITIES & INFRASTRUCTURE

2.1 General

The proposed Rise development is located within the boundaries of the Bilambil Heights Urban Release Area in Tweed Shire.

Portions of the site are currently connected to existing utilities and infrastructure. Existing utilities and infrastructure will require upgrading and new infrastructure constructed to meet the ultimate requirements of the overall development in accordance with the overall Tweed Shire Council (TSC) Infrastructure Planning and Section 64 Developer Services Plan (DSP) prepared for the Bilambil Heights Urban Release Area.

2.2 Specific Utilities

2.2.1 Potable Water

The Rise development site is located in the North West Precinct of the DSP for Tweed Shire.

Potable water is derived from the Bray Park Water Treatment Plant in Murwillumbah and pumped to a low level water zone reservoir located at Snowgum Crescent Bilambil Heights and services development within Bilambil Heights by gravity up to approximately RL 85.

A booster pump station is located adjacent to the Snowgum Crescent Reservoir which pumps potable water from the Snowgum Crescent reservoir to an existing 1.1 ML reservoir located within Rise Development on a parcel of land owned by TSC in fee simple.

The 1.1 ML reservoir has a base level of RL 207 and services an intermediate water catchment zone between RL 120 and RL 85, generally external to the Rise Development site.

The rising main linking the booster pump station at the Snowgum Crescent reservoir to the existing 1.1 ML reservoir at a high point within Rise is currently inadequate to service the numbers of houses connected to the intermediate zone and requires upgrade to DN250 or greater, subject to detailed design by TSC.

TSC have placed development conditions on an existing Deferred Commencement Development Consent for a 76 Lot subdivision over the proposed Precinct B of the

Rise Concept Plan area which will require the Developer of Rise to contribute to the upsizing of the rising main between Snowgum Crescent reservoir and the existing 1.1 ML reservoir servicing the existing Bilambil Heights residential area. Further it requires the Developer to provide TSC a site for the future augmentation of the Snowgum Crescent low level reservoir to be dedicated to TSC for the purposes of constructing a future low level reservoir adjacent to McAlisters Road to augment the existing storage capacity of the Snowgum Crescent reservoir and provide access easements. TSC is to purchase the future low level reservoir site from the Developer and the developer is to create the required access and service line easements.

TSC has an existing easement for access to the existing 1.1 ML reservoir and the existing rising main is located within that easement.

The location of the existing easement to the existing 1.1 ML reservoir does not suit the ultimate layout of Rise Development and negotiations have occurred between the Developer and TSC to agree on a proposed Water Strategy which will result in TSC constructing the new increased capacity rising main to the 1.1 ML reservoir in Rise along the existing easement and Rise fully funding the relocation of the rising main to another vertical / horizontal alignment that suits the Rise development on a progressive basis as subdivision works proceed.

Refer to Appendix A and VKL Consulting Pty Ltd Drawing No. 1355-09-SK200.

The cost of infrastructure to deliver from the Tweed River to Rise development via the Bray Park Water Treatment Plant, a series of pumping stations and reservoirs and rising mains are part of the Section 64 Developer Services Plan (DSP) for the NW area of Tweed Shire.

The current DSP for the Bilambil Heights Urban Release Area makes provision for upgrades in capacity to service the area and a major upgrade of the Bray Park Water Treatment Plant is expected to be completed by December 2009 by TSC.

The existing 1.1 ML reservoir surrounded by the Rise development will be replaced by a new reservoir with sufficient capacity to service Rise development, at the cost of the Developer with TSC contributing to the pro rata cost of capacity to service areas of the Bilambil Urban Release Area beyond Rise development, the details of which will be resolved with TSC during the processing by TSC of the first Rise Precinct Development Consent.

2.2.2 Sewerage

The Rise development is located within the Banora Point DSP area.

Limited external reticulated sewerage sewer main capacity exists for the servicing of new development comprising the Rise development and future development within the Cobaki and Bilambil Heights precinct. Adequate capacity or planned augmentation of the Banora Point Waste Water Treatment Plant exists to service these areas.

There is a Deferred Commencement Development Approval for a 76 Lot subdivision over Precinct B of the Rise development. This area of the site gravitates to an existing public sewerage system in McAllisters Road.
Refer VKL Consulting Pty Ltd Drawing No. 1355-09-SK201 in Appendix A.

Subject to available capacity of this system at the time of Construction Certificate, augmentation of the pumps in the existing pump station and flat grade sections of the existing gravity sewer in Peninsular Drive will be determined. The extent of augmentation required will be dependent upon whether other approved developments within the catchment have proceeded at the time that the Rise development approvals are granted over that particular precinct.

There is an existing licensed sewerage treatment plant *"Pasveer 1000"* on the Rise site which serviced the Terranora Country Club however it is not intended to operate this plant to service the overall Rise development but it may be utilized in the initial stages of Rise as a storage tank prior to pumping off peak to the existing Peninsular Drive gravity sewer system.

Approval exists under the current Resort Consent for a sewerage treatment plant to be located to the north of the subject site near Cobaki Road but within the land owned by the Rise applicant. The approval for this site sewerage treatment plant is part of an existing approval for a Golf Course Resort Development. This approval is still valid as substantial commencement on the Golf Course Resort Development Consent has been acknowledged by TSC. The approval provides for site disposal of treated effluent with precautionary discharge approval to Cobaki Creek.

The Rise Concept envisages that this approved Sewerage Treatment Plant will not be constructed and that sewage will be pumped to the Banora Point Waste Water Treatment Plant for treatment and effluent disposal via existing discharge licenses that TSC has for Banora Point Waste Water Treatment Plant.

3. UTILITIES & INFRASTRUCTURE REQUIREMENTS FOR THE RISE DEVELOPMENT

3.1 General

The Rise Concept proposal is for a major Community Title Scheme (CTS) development comprising mixed land uses with some public and mostly private roads for access to and within the various precincts as shown on the Rise Concept Plan.

As a consequence of the proposed size of Rise it is proposed that potable water storage and potable water reticulation be owned, operated and maintained by TSC.

Similarly it is proposed that sewerage reticulation mains, pump stations and rising mains are also owned, operated and maintained by TSC, as is the case with freehold lot subdivisions within TSC area, except for the sewerage system from Precinct I – private school which will discharge into the public sewer via private pump station and private rising main.

The overall utilities and infrastructure required for the Rise development will include the construction of infrastructure external to the site and within the Rise development footprint.

Determination of utility services demands and infrastructure sizing for the Rise development have been calculated on the proposed densities and standard TSC Design Guidelines as set out in TSC DCP D10 Water and D11 Sewer unless otherwise noted.

3.2 Projected Water & Sewerage Infrastructure Demands

3.2.1 General

The proposed system will mean that a publicly owned water reticulation system will be provided in accordance with the principals set forth in relevant Water Services Association of Australia (WSAA) Water Code of Australia and in accordance with the DCP design requirements of TSC. Installation will also comply with the NSW Plumbing Code and AS3500.

Potable water will be plumbed into all dwellings and other types of uses in the development.

3.2.2 Demands – Potable Water & Sewerage

Table 3.1 sets forth the projected potable water demands for the development on a development precinct basis together with projected sewage discharge from each precinct and the Rise development in total.

Table 3.1 - Projected Potable Water Demand

Precinct	Product	Number of Units or Area	Equivalent Persons EP	Sewerage Discharge 180/EP/d with application of Basix Litres	Max. Day Water Demand System 850 *l*/d/EP Litres
A-1	Community hall	500 m2	50	9000	42500
A-2	Village supermarket	1200 m2	20	3600	17000
A-3	Village shopping centre	600 m2	5	900	4250
A-4	Boutique hotel apartments	146 Apts	351	63072	298350
A-5	Tavern	600 m2	40	7200	34000
A-6	Hospitality Training school	700 m2	21	3780	17850
A-7	Local business suites & Retail	3700 m2	32	5760	27200
A-8	Medium Rise apartments	42	134.4	24192	114240
A-9	Medium Rise apartments	21	50.4	9072	42840
A-10	Medium Rise apartments	48	115.2	20736	97920
A-11	Child care	400 m2	16	2880	13600
A-12	Community Club	350 m2	25	4500	21250
A-13	Community lap pool	25 m long	25	6000	21250
B-1	Retirement living	15	48	8640	40800
B-2	Retirement living	180	432	77760	367200
B-3	Retirement living club	800 m2	58	10440	49300

Table 3.1 continued.

Precinct	Product	Number of Units or Area	Equivalent Persons EP	Sewerage Discharge 180/EP/d with application of Basix Litres	Max. Day Water Demand System 850 *l*/d/EP Litres
D-1	Low density house & land	80	256	46080	217600
D-2	2 storey townhouse	49	156.8	28224	133280
E-1	Res A housing lots	24	76.8	13824	65280
E-2	3 storey Boulevard villas	45	144	25920	122400
E-3	3 storey townhouses	6	19.2	3456	16320
F	Nursing home land	200 beds	680	122400	578000
G-1	Retirement living	25	60	10800	51000
G-2	Retirement living	162	388.8	69984	330480
G-3	Retirement living	12	28.8	5184	24480
G-4	Retirement living club bld	800 m2	58	10440	49300
H-1	Res A housing lots	34	108.8	19584	92480
H-2	Housing lots	2	6.4	1152	5440
H-3	3 storey townhouses	3	9.6	1728	8160
I	Private School	2.76 Ha	100	18000	85000
L-1	Hilltop Plaza penthouses	5	16	2880	13600
L-2	Hilltop Plaza sub penthouses	26	83.2	14976	70720
L-3	Hilltop Plaza apartments	17	40.8	7344	34680
L-4	Hilltop Plaza apartments facilities	1 (750m2)	40	7200	34000
L-5	Hilltop Plaza retail / restaurants / studios /	1472 m2	63.2	11376	53720
L-6	Retail art shop houses (Soho units)	8	19.2	3456	16320
L-7	Art studios & shops	8	19.2	3456	16320
L-8	Art house apartments	16	38.4	6912	32640
L-9	Art facility/café building	200 m2	5.3	954	4505
L-10	Hilltop apartments (Nth Ridge)	137	328.8	59184	279480
L-11	Hilltop apartments (Nth Ridge)	28	67.2	12096	57120
L-12	Health Spa	600 m2	26.4	4752	22440
L-13	2 storey Hillside Pole homes	30	96	17280	81600
L-14	Custom house lots	15	48	8640	40800
L-15	3 storey Boulevard villas	35	112	20160	95200
M-1	Retirement village	60	144	25920	122400
M-2	Retirement village	144	345.6	62208	293760
M-3	Retirement club	800 m2	57.2	10296	48620
N-1	Res A housing lots	28	89.6	16128	76160
N-2	Villas	38	121.6	21888	103360
N-3	Retail shops	375 m2	5.3	954	4505
N-4	Hillside housing	11	35.2	6336	29920
N-5	Apartments on 'bluff'	70	168	30240	142800
N-6	Apartments on 'bluff'	7	16.8	3024	14280
N-7	Private Community club	350 m2	25	4500	21250
N-7	Private community lap pool	25m long	25	6000	21250
N-7	Private Community tennis court + Pavillon	1	5	900	4250
O-1	Hillside housing	27	86.4	15552	73440
U	Sports Fields & Amenities	1	10	1800	8500
	RISE TOTALS		**5,659.6 EP**	**1,021,620 Litres**	**4,810,660 Litres**

Table 3.2 - Possible Additional Demand if Other Areas of Terranora Group Management land is developed in the Future

Precinct	Product	Number of Units or Area	Equivalent Persons EP	Sewerage Discharge 180/EP/d with application of Basix Litres	Max. Day Water Demand System 850 *l*/d/EP Litres
N-8	Res A lots	12	38.4	6912	32640
O-2	Hillside housing	11	35.2	6336	29920
P-1	Hillside housing	34	108.8	19584	92480
P-2	Res A lots	10	32	5760	27200
Q	Eco village Rural Res	8	25.6	4608	21760
R-1	Village centre general store	200 m2	5	900	4250
R-2	Village centre servicestation	200 m2	5	900	4250
S	Nursing home land	200 beds	680	122400	578000
T	2 Storey villas	16	51.2	9216	43520
	RISE TOTALS		**942.8 EP**	**169,704 Litres**	**801,380 Litres**

4. INFRASTRUCTURE COMPONENTS - INTERNAL

4.1 Potable Water System

The Rise development land ranges in elevation from RL 5 AHD to RL 216 AHD.

The Rise development will have three (3) potable water supply zones.

Refer to VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK11 & 1355-07-SK200 in Appendix A.

4.1.1 Low Level Potable Water

This zone applies to future Precincts located on the northern extremity of the development site outside the Rise MP08-0234 Concept Plan area where possible future development may occur subject to future rezoning and Development Applications to TSC.

Precinct U (Sports Park) is included in the low level potable water zone.

As this zone will ultimately be serviced from the east, initially it will be serviced from the proposed 7 ML high level zone reservoir located within the subject site with a pressure reduction valve in the trunk main located at approximately RL 85 AHD.

Ultimately the low level zone will service development between RL 85 to RL 5.

On the south eastern section of Rise no development exists in the range of RL 120 to RL 85 and therefore the Snowgum Crescent Reservoir does not service any of Rise by gravity feed.

4.1.2 High Level Zone

VKL Consulting Pty Ltd Drawing No. 1355-07-SK11 shows the extent of development which is serviced by the high level zone located in Precinct K. Refer Appendix A.

This water zone will be serviced by a proposed 7 ML reservoir to be constructed in the region of the existing 1.1 ML reservoir. It is proposed that the reservoir be constructed in two (2) sections which will facilitate future TSC reservoir maintenance and allow the existing 1.1 ML reservoir to remain in service until the first half of the new reservoir is constructed and commissioned then it will be decommissioned / demolished and the second half of the new reservoir constructed.

The 7 ML reservoir will be filled via a new pumping main to be constructed from the existing Snowgum Low Level Reservoir to the new reservoir. An upgrade of the existing pump station and pumps at Snowgum Reservoir will be required because of the greater delivery flow required. Refer to External Components.

The high level zone will service development between RL 180 and RL 120 within the Rise development and within other existing areas and future Bilambil Heights Urban Release areas.

4.1.3 Boosted Level Zone

An area of the proposed development, contained in Precinct L, is at an elevation above the high level zone serviced by the proposed new 7 ML reservoir and will service development above RL 180.

This boosted level water zone will be serviced by the high level reservoir supplying a pressure booster pump station. This booster pump station will be supported with backup diesel powered pump or generator, subject to detailed design, to ensure continuity of supply water to the boostered level zone if a electricity outage occurs.

Pumps will have a duty point which will service the highest properties in the development and provide adequate fire flows for the commercial development proposed in precincts of the boostered level water zone.

4.2 Sewerage System

4.2.1 General

The proposed development is part of the contributing area serviced by the Section 64 DSP covering Banora Point Sewerage Treatment Plant. Current capacity or planned expansion of capacity of the plant exists to handle sewage from the RISE development and Bilambil Heights Urban Release Area in general.

4.2.2 Initial Stage – Interim Servicing

The subject site has a number of sub catchments – Refer VKL Consulting Pty Ltd Drawing No. 1355-07-SK10 in Appendix A.

Subject to approval and phasing of actual development it is probable that initial development will commence from Marana Street in Precinct B. This area is proposed to be sewered via the existing Peninsular Drive system to Banora Point STP.

Sections of this existing Council system will require augmentation to have adequate capacity. Subject to final design considerations the existing licensed Pasveer sewerage treatment plant (P1000) located on the southern part of the proposed development land may be utilised to provide limited storage capacity for the sewage from initial areas of development. This sewage will then be pumped into the existing Peninsular Drive sewerage system at off peak times thereby making more efficient use of existing sewerage infrastructure.

4.2.3 Internal Works

The various sewerage sub catchments within Rise will be sewered by gravity sewer combined with pump stations and rising mains to convey the sewage to a major pump station near Cobaki Road on the applicants land. These sewers and pump stations are proposed to be transferred to TSC ownership for operation and maintenance except for a small privately owned system which will service the proposed private school in Precinct I in the southern section of the subject development.

Sewage from this privately owned and operated system will be conveyed by rising main to the proposed public sewers.

It is proposed that pump stations will have eight (8) hours storage at average dry weather flow (ADWF) to provide adequate storage in the event of an electrical outage or mechanical failure.

Refer VKL Consulting Pty Ltd Drawing No. 1355-07-SK09 in Appendix A for layout.

5. INFRASTRUCTURE COMPONENTS - EXTERNAL

5.1 Potable Water

The supply of potable water to Rise Development comes from the Tweed River and is treated at the Bray Park Water Treatment Plant which is currently undergoing a major augmentation to increase capacity to 100 ML per day. This augmentation by TSC is expected to be completed by December 2009.

The Bilambil Urban Release Area is part of the TSC North West DSP. Provision has been made in the DSP to upgrade the potable water delivery and storage system that will service the Rise development.

Components of these upgrades of the delivery and storage system are planned to be constructed in the near future by TSC in their planned works programme.

The timing of the Rise development is not expected to require TSC to bring forward any of the planned DSP works.

5.2 Sewer

Ultimately sewage from the majority of the development will gravitate and be pumped to the north of the site, consistent with the current Resort Development Approval, and conveyed along Cobaki Road / Pigabeen Road by rising main to the existing TSC trunk sewerage system which delivers sewage to Banora Point STP.

The extent of external work required to service the subject land will be dependent upon timing of the development and whether construction of Cobaki Lakes Development has proceeded to the extent of construction of the proposed regional sewerage pump station near the intersection of the proposed Cobaki Parkway and Piggabeen Road.

If this proposed regional pump station has not been constructed for Cobaki Lakes by the time the proposed Rise development proceeds then the external works required to service the subject land will need to be extended to the Council existing trunk sewerage infrastructure at the Gollin Drive pump station.

External sewerage infrastructure from the regional pump station to be constructed near the intersection of Cobaki Parkway to Banora Point Waste Water Treatment Plant form part of the DSP charges for Banora Point.

Provision exists under this DSP for Developers to fund the construction of works included in the DSP and receive credits against future DSP charges applicable.

Conveyance of sewage from Rise to the regional pump station is a cost to be borne by the Developer of Rise.

6. ROADS

6.1 General

As the Rise development will be a Community Title Scheme development the roads will be a combination of public and privately owned and maintained roads.

VKL Consulting Pty Ltd Drawing No. 1355-07-SK03 in Appendix A sets out the proposed road hierarchy for the development.

6.2 Public Road - Internal

The proposed public roads in the development form part of the proposed local area road network as reviewed with TSC.

Preliminary negotiations with TSC has determined that a maximum centreline grading of 12% will be supported on these roads.

Long sections and cross sections of these proposed public road are attached to this submission.

6.3 Private Roads

The private roads proposed for the development will have various profiles and surface treatments.

Long sections and cross sections of the proposed private roads are attached to this submission.

6.4 Internal Private Cycleways & Pathways

The locations of proposed internal private cycleways and pathways are shown on VKL Consulting Pty Ltd Drawing No. 1355-07-SK03 in Appendix A.

6.5 External Road Works

The Traffic Report by CRG which forms part of this Application is the reference document on external road works required to accommodate traffic volumes generated by this development.

Upgrade works will be required along Cobaki Road and Piggabeen Road to the north and Marana Street to the east with various other intersection upgrade works. Some of these external works are included in the Tweed Shire Section 94 plans.

In respect of the Section 94 listed works the proponent shall seek offsets for any works constructed by the proponent.

7. STORMWATER DRAINAGE

The Stormwater Management Plan prepared by Gilbert & Sutherland which forms part of the MP08-0234 application is the reference document in regard to stormwater.

Peak stormwater discharges from the site will not exceed predevelopment peak discharges.

It is proposed that the network of collection pits, pipes and open swales that are used to capture and convey stormwater to community owned facilities, open water bodies and legal points of discharge from the site will conform with TSC Standard DCP requirements for subdivisions.

It is proposed that all public road drainage to a point of legal discharge will be an asset of TSC. Where appropriate, easements through the Community land to a legal point of discharge will be provided in favour of TSC via Statutory Easements.

If the legal point of discharge is or becomes a Community owned tank or open storage the Community Association will become the owner of the water from the point of entry into the tank or open storage of water from public roads in the development.

Overflows from these storages will be directed to natural depressions in a manner which does not cause concentration and potential scouring of the natural depression(s).

8. SUMMARY OF EXISTING INFRASTRUCTURE CAPACITY TIMING & MANAGEMENT OF STAGED CONSTRUCTION OF INFRASTRUCTURE

A. Potable Water Supply

Refer to VKL Consulting Pty Ltd Drawing No. 1355-07-SK200 in Appendix A for proposed staging.

Capacity of Existing Infrastructure	Future Infrastructure	Timing of Construction of Infrastructure	Management of Staged Infrastructure
1. <u>External</u> (i) Sufficient capacity at low level Snowgum Reservoir for Stage 1	(i)Water treatment plant at Bray Park upgrade to 100ML/day now under construction by TSC via DSP charges.	(i) Completed by Dec 2009	(i) No impact on management
(ii) Rising main/pumps to 1.1ML reservoir. Sufficient capacity of Reservoir to service Precinct B. Rising main to 1.1ML Reservoir currently under sized for existing connections.	(ii) TSC to build new rising main to 1.1ML Reservoir. (iii)Rise to construct new 7ML Reservoir in two halves. Decommission 1.1ML Reservoir when one half of 7ML Reservoir built. (iv)TSC to upgrade Snowgum Pump Station to match design flow requirements. (v) Capacity upgrade will provide for other Bilambil Heights Urban Release area. (vi)TSC to upgrade water conveyance from Bray Park to Snowgum Reservoir. TSC to construct additional low level Reservoir on site purchased from Rise in Precinct C.	(ii) TSC planning immediate upgrade of rising main to 1.1ML Reservoir. Easement already exists for this main. (iii) Commission 1st half of 7ML Reservoir by commencement of demand from Precincts A, D or F of Rise (Actual Precincts may change depending on market demand). (iv) Immediate upgrade planned by TSC with rising main upgrade. (v) As required by DSP & demand.	(ii) Construction in accordance with DSP & TSC Infrastructure Planning. (iii) Progressively build infrastructure ahead of demand.
2. <u>Internal</u> (i) No existing reticulation	(i) Construction of reticulation mains (ii) Construction of booster pump station	(i) Progressively on a stage by stage basis by Rise. (ii) To be available by demand by Precincts H or L (Actual Precincts may change depending on market demand).	(i) Design overall system to ensure that reticulation main will have capacity for stages to be serviced. (ii) Design overall system to ensure that reticulation is sized to have capacity on a staged basis.

B. Sewerage

Refer to VKL Consulting Pty Ltd Drawing No. 1355-07-SK201 & SK202 in Appendix A.

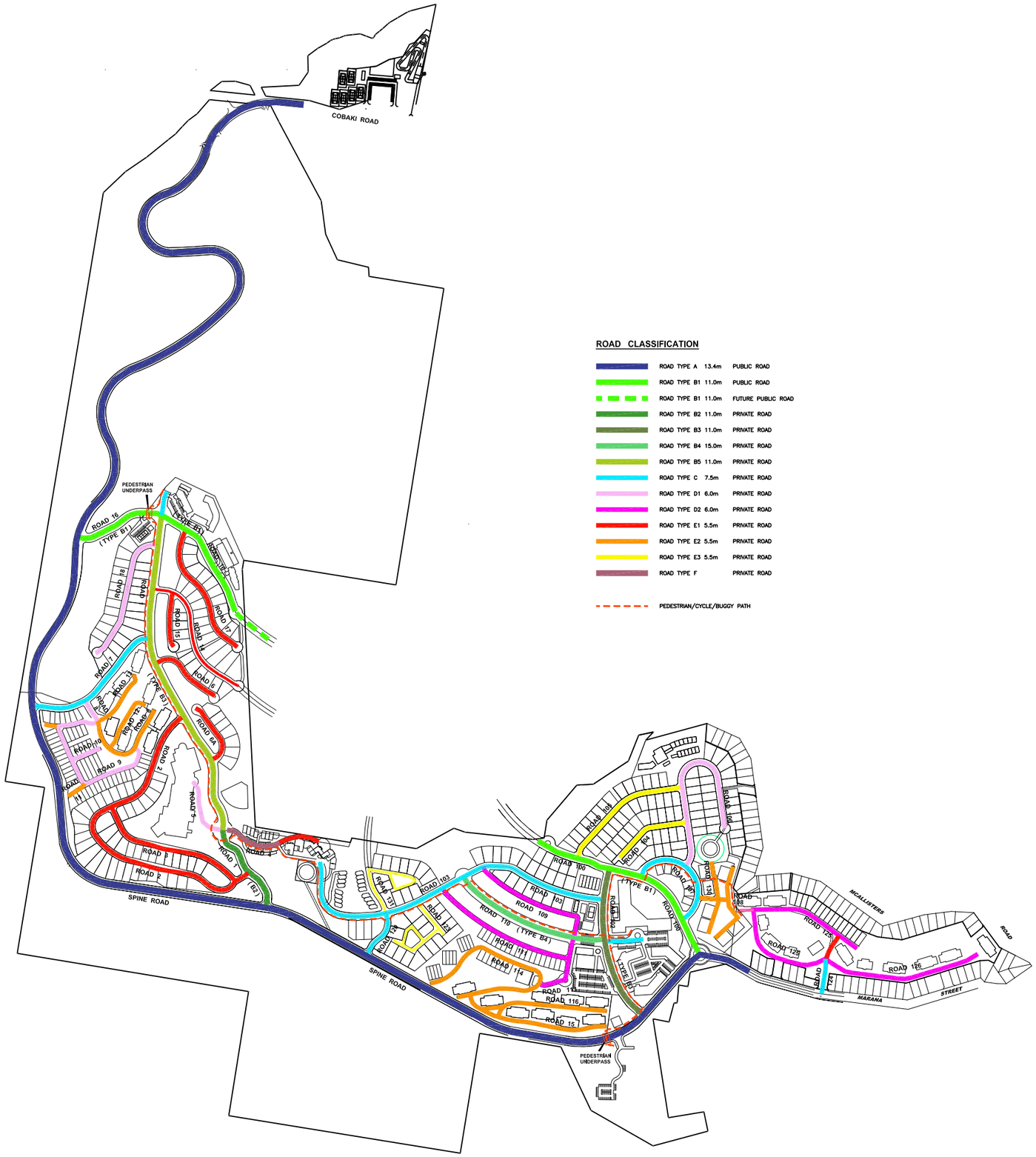
Capacity of Existing Infrastructure	Future Infrastructure	Timing of Construction of Infrastructure	Management of Staged Infrastructure
1. External			
(i) Limited external sewer reticulation capacity exists for Rise early Precincts to Peninsular Drive pump station	(i) Upgrade existing pump station in McAllisters Rd & augment flat sections of Peninsular Drive gravity sewer	(i) With development of Precinct B (or the first Precinct to be developed).	(i) All work required with construction of Precinct B(or the first Precinct to be developed).
(ii) Banora Point Waste Water Treatment Plant	(i) Designed for staged upgrade to services DSP for Bilambil Heights Urban Release Area	(i) As set out in DSP	(i) Management of upgrades by TSC
(iii) Gollin Drive PS to Banora Point WWTP. Existing capacity as part of Bilambil Heights / Cobaki Lakes DSP	(i) Upgrade PS at Gollin Drive as required by DSP	(i) As set out in DSP	(i) Management of upgrades by TSC
(iv) Conveyance from Rise to Gollin Drive, no existing infrastructure	(i)Regional pump station & rising main to Gollin Drive (ii) Rising main from Rise to regional pump station	(i) First developer in Cobaki Lakes / Bilambil Heights Urban Release Area to build off-sets against Sec 64 charges. (ii) By Rise developer after Precinct B. (or the first Precinct to be developed).	(i) Management by TSC as DSP infrastructure (ii) Managed by Rise developer. Top up water required to minimise sepcicity.
2. Internal			
(i) No existing infrastructure	(i) Pump stations, rising mains & gravity sewers	(i) As required to meet development	(i) Early stages water injection will be required & temporary rising mains of smaller diameter required to minimize sepcicity. Design overall system to ensure adequate capacity for development.

C. Roads

Capacity of Existing Infrastructure	Future Infrastructure	Timing of Construction of Infrastructure	Management of Staged Infrastructure
1. External (i) Capacity exists for 3221 traffic movements per day on Kennedy Drive	(i) Cobaki Parkway (ii) Connection from Rise to Cobaki Parkway upgrade to Cobaki Rd.	(i) After existing capacity used in Kennedy Drive (ii) After existing capacity used in Kennedy Drive	(i) TSC D/A control (ii) TSC D/A control
2. Internal (i) No existing infrastructure	(i) Spine Road (ii) Internal roads	(i) After existing capacity used in Kennedy Drive (ii) Stage by stage	(i) Not staged TSC D/A control (ii) TSC D/A control

APPENDIX A

VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK03, SK09, SK10, SK11, SK14, SK200, SK201 & SK202



ROAD CLASSIFICATION

ROAD TYPE A	13.4m	PUBLIC ROAD
ROAD TYPE B1	11.0m	PUBLIC ROAD
ROAD TYPE B1	11.0m	FUTURE PUBLIC ROAD
ROAD TYPE B2	11.0m	PRIVATE ROAD
ROAD TYPE B3	11.0m	PRIVATE ROAD
ROAD TYPE B4	15.0m	PRIVATE ROAD
ROAD TYPE B5	11.0m	PRIVATE ROAD
ROAD TYPE C	7.5m	PRIVATE ROAD
ROAD TYPE D1	6.0m	PRIVATE ROAD
ROAD TYPE D2	6.0m	PRIVATE ROAD
ROAD TYPE E1	5.5m	PRIVATE ROAD
ROAD TYPE E2	5.5m	PRIVATE ROAD
ROAD TYPE E3	5.5m	PRIVATE ROAD
ROAD TYPE F		PRIVATE ROAD

PEDESTRIAN/CYCLE/BUGGY PATH

RISE
ABOVE IT ALL

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ABN: 55 114 636 934

ROAD CLASSIFICATIONS

1355 - 07 - SK03 C

0 100 200
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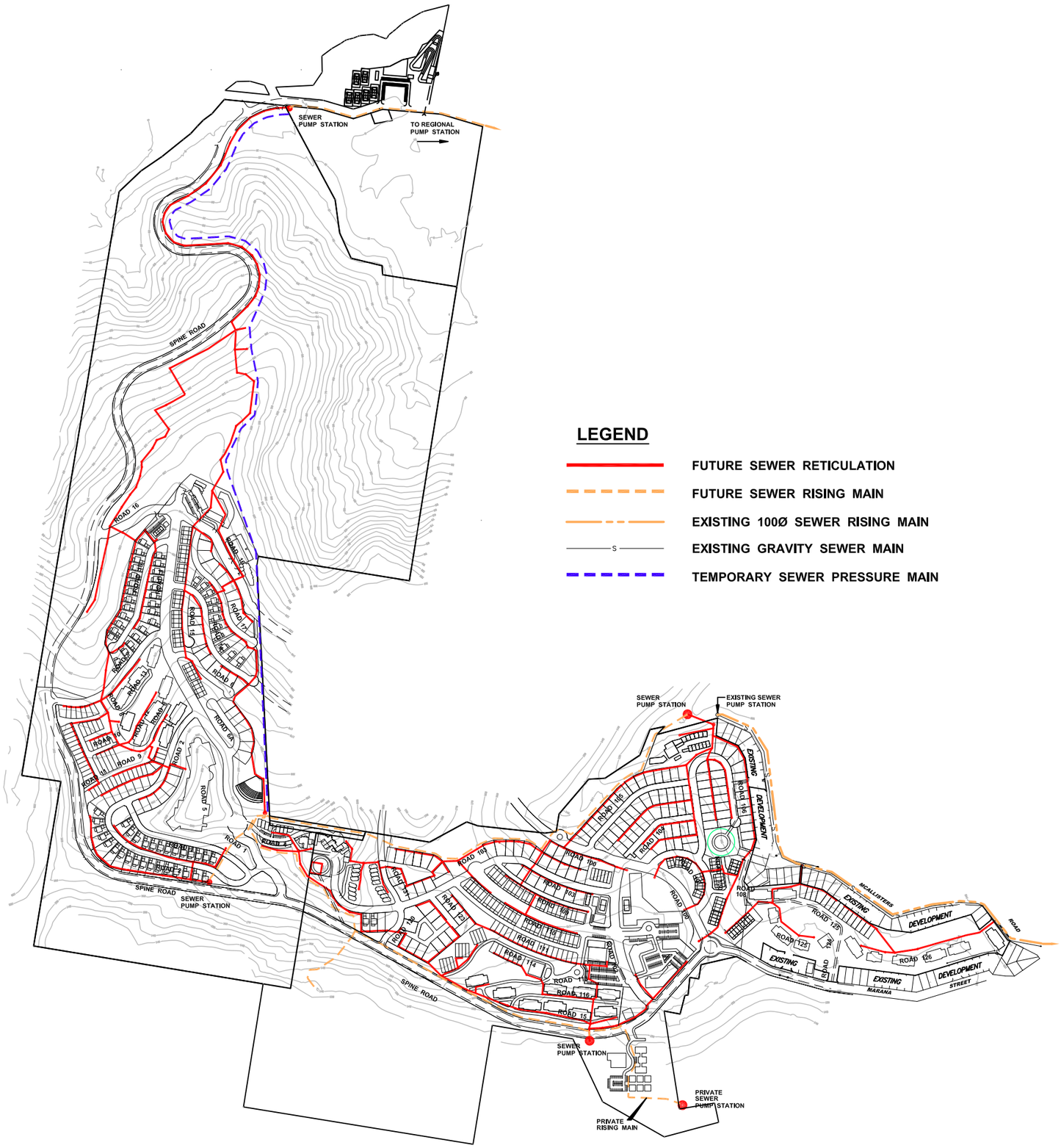
1:10000 at A3

C - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LEGEND

- FUTURE SEWER RETICULATION
- FUTURE SEWER RISING MAIN
- EXISTING 100Ø SEWER RISING MAIN
- EXISTING GRAVITY SEWER MAIN
- TEMPORARY SEWER PRESSURE MAIN

RISE
ABOVE IT ALL

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SEWER RETICULATION

0 100 200
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1:10000 at A3

1355 - 07 - SK09 C

C - 08/10 - PREINCT J DELETED

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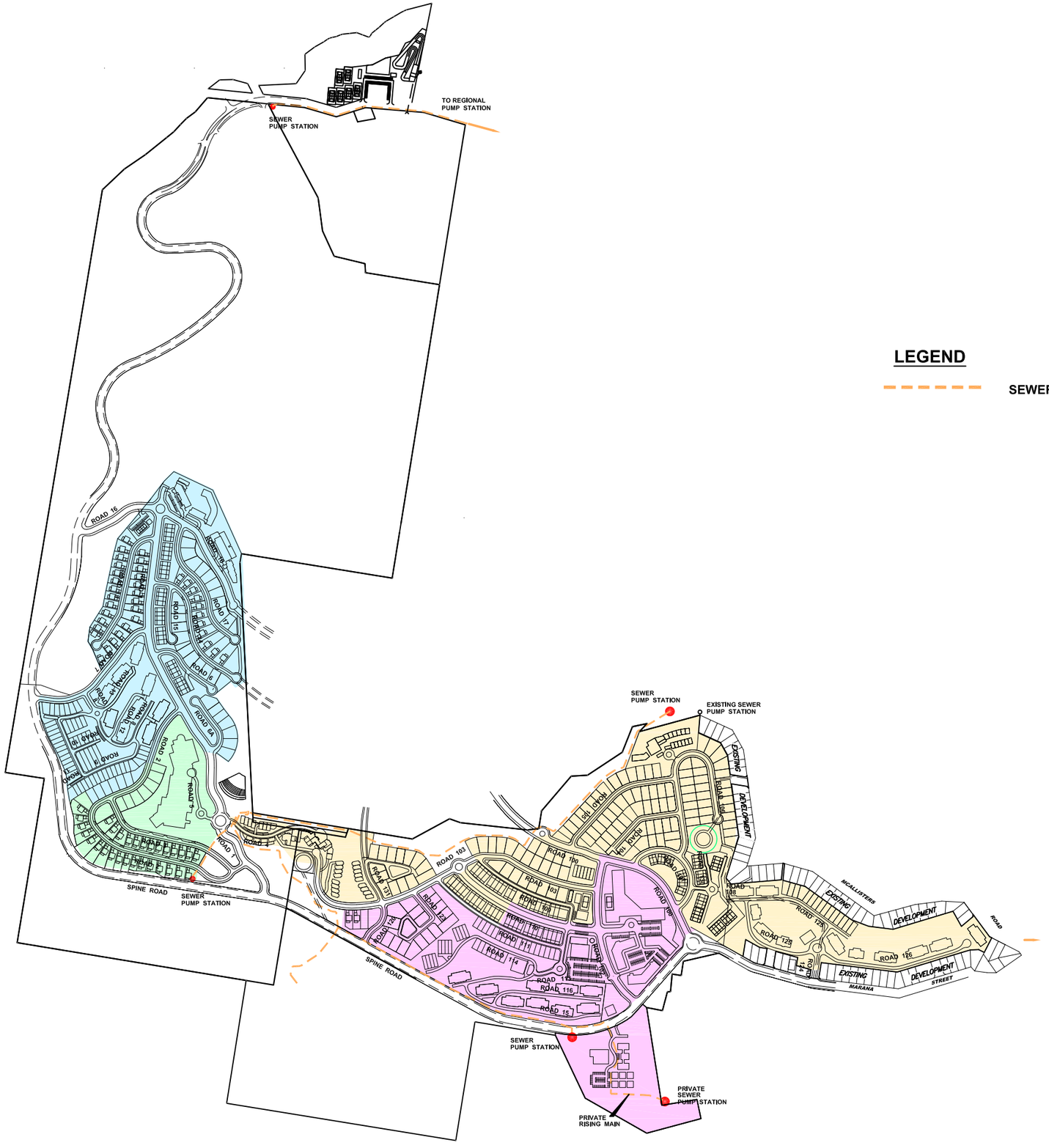

LEGEND

SEWER RISING MAIN

RISE
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SEWER RETICULATION CATCHMENT ZONE PLAN

1355 - 07 - SK10 C

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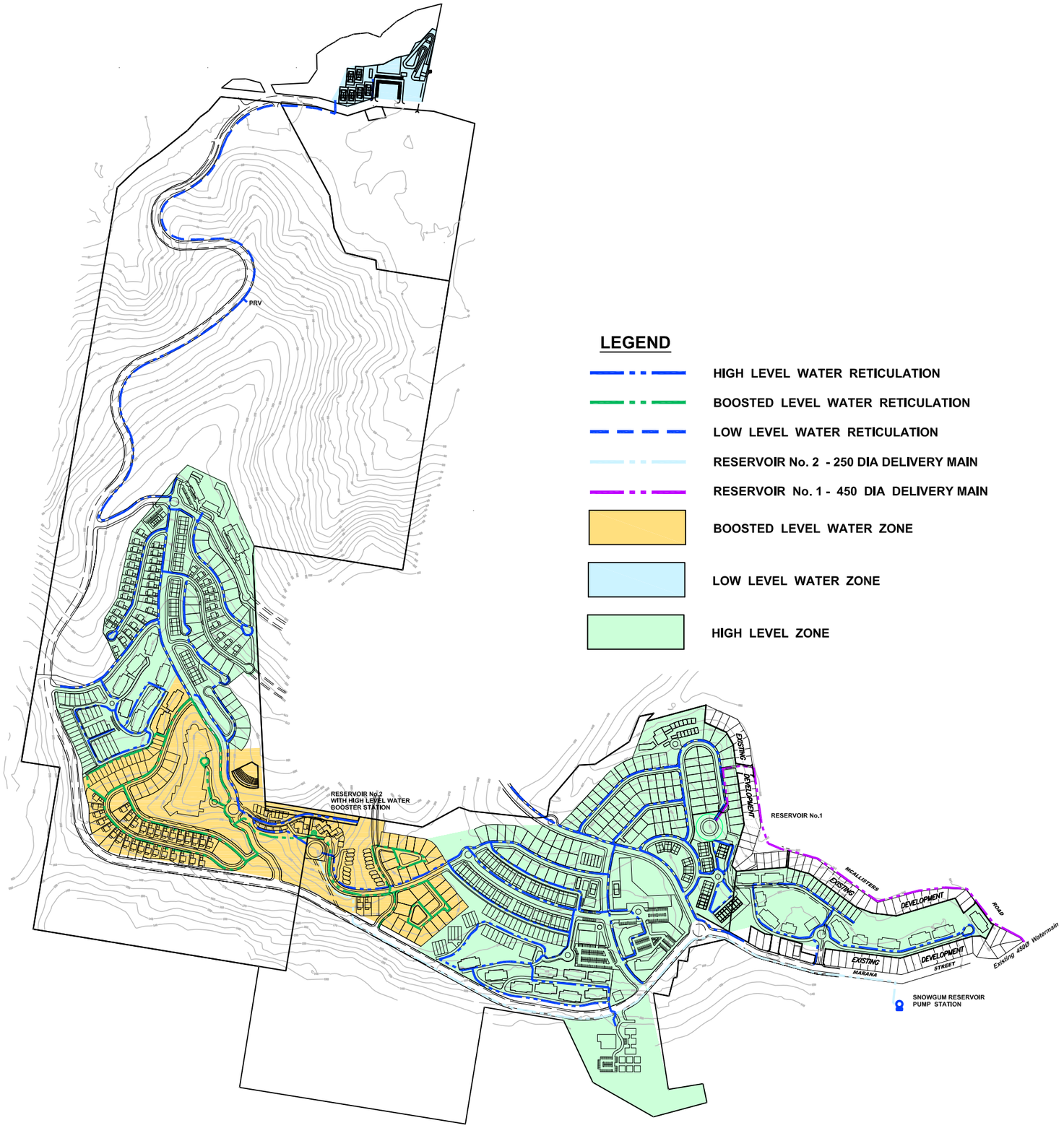
C - 08/10 - PREINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LEGEND

- HIGH LEVEL WATER RETICULATION
- BOOSTED LEVEL WATER RETICULATION
- LOW LEVEL WATER RETICULATION
- RESERVOIR No. 2 - 250 DIA DELIVERY MAIN
- RESERVOIR No. 1 - 450 DIA DELIVERY MAIN
- BOOSTED LEVEL WATER ZONE
- LOW LEVEL WATER ZONE
- HIGH LEVEL ZONE

RISE
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POTABLE WATER RETICULATION

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

0 100 200
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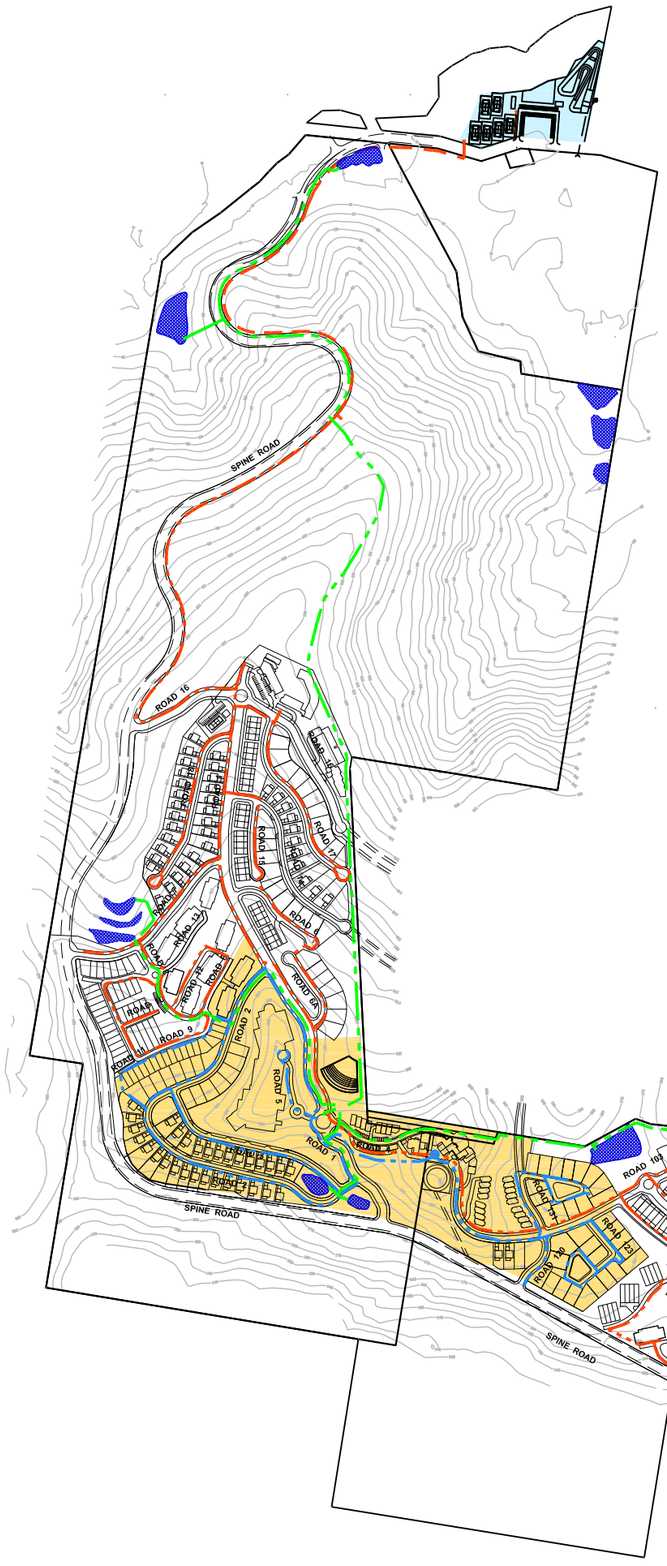
1:10000 at A3

1355 - 07 - SK11 C

C - 08/10 - PREINCT J DELETED



LEGEND

- HIGH LEVEL RECYCLED STORMWATER RETICULATION
- BOOSTED LEVEL RECYCLED STORMWATER RETICULATION
- LOW LEVEL RECYCLED STORMWATER RETICULATION
- STORMWATER RISING MAIN
- BOOSTED LEVEL RECYCLED STORMWATER ZONE
- LOW LEVEL RECYCLED STORMWATER ZONE
- HIGH LEVEL RECYCLED STORMWATER ZONE
- STORMWATER WETLANDS

RISE
ABOVE IT ALL

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ABN: 55 114 638 934

RECYCLED STORMWATER RETICULATION

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

0 100 200
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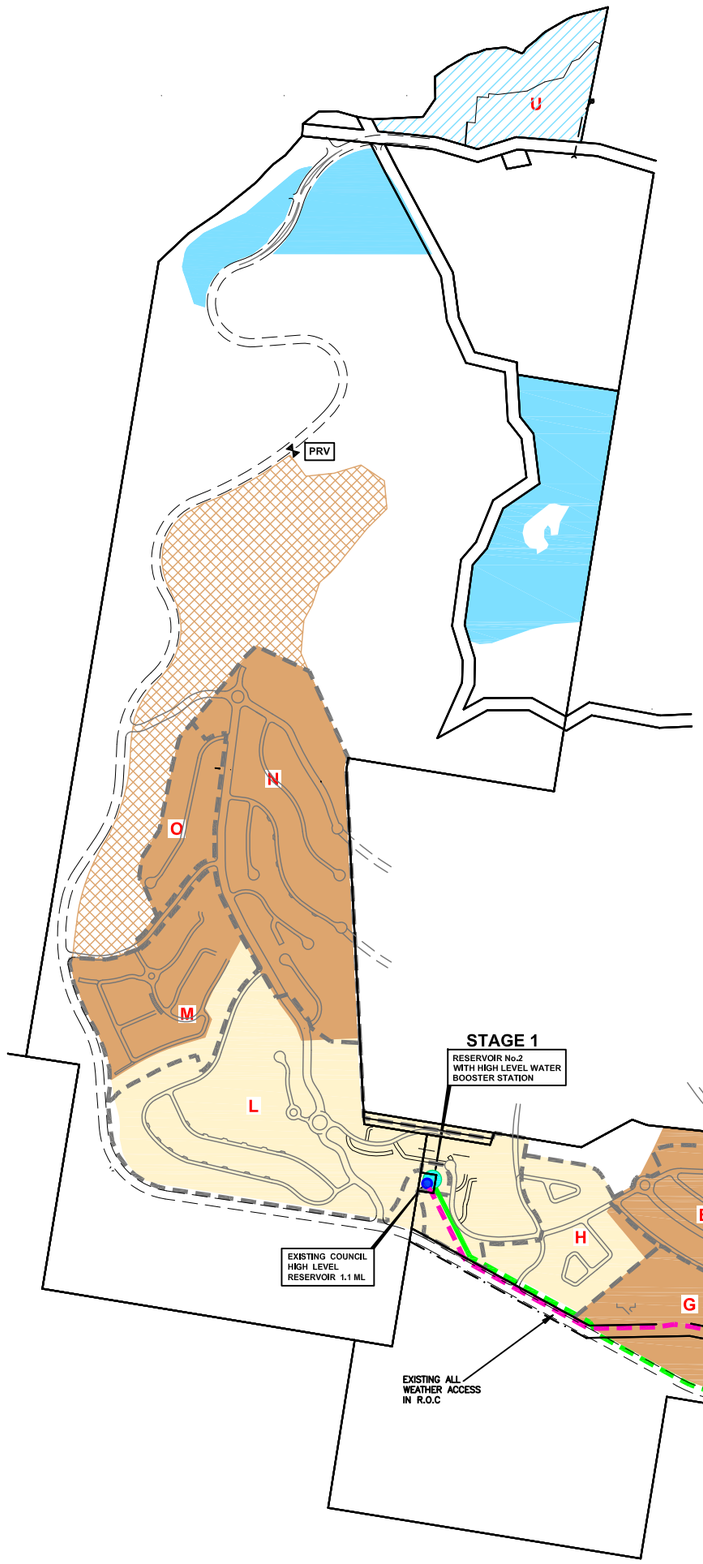
1:10000 at A3

1355 - 07 - SK14 A

C - 08/10 - PRECINCT J DELETED



LEGEND

STAGE 2	BOOSTERED PRESSURE ZONE
POSSIBLE FUTURE STAGE	LOW LEVEL ZONE WITHIN POSSIBLE FUTURE DEVELOPMENT T.G.M LAND - SUBJECT TO SEPARATE FUTURE APPLICATION
STAGE 1	LOW LEVEL ZONE WITHIN FUTURE DEVELOPMENT T.G.M LAND MAJOR PROJECT MP08-0234 RISE
STAGE 1	HIGH LEVEL ZONE WITHIN FUTURE DEVELOPMENT T.G.M LAND MAJOR PROJECT MP08-0234 RISE
POSSIBLE FUTURE STAGE	HIGH LEVEL ZONE WITHIN POSSIBLE FUTURE DEVELOPMENT T.G.M LAND - SUBJECT TO SEPARATE FUTURE APPLICATION
STAGE 1	HIGH LEVEL ZONE - EXISTING APPROVALS & MAJOR PROJECT MP08-0234 RISE
STAGE 1	CONSTRUCT DN 250 IN EXISTING R.O.C (SIZE TO BE CONFIRMED)
STAGE 1	CONSTRUCT PERMANENT SIZED MAIN WHERE FINAL LEVEL ESTABLISHED
STAGE 2	FUTURE RELOCATION OF DN 250 OR APPROPRIATE DIAMETER MAIN TO SERVICE ALL OF T.G.M PROPERTY
STAGE 1	CONSTRUCT PERMANENT SIZED MAIN WHERE FINAL LEVEL ESTABLISHED
STAGE SUBJECT TO TSC DETERMINATION	FUTURE CONNECTION MAIN BETWEEN SNOWGUM RESERVOIR & NEW LOW LEVEL RESERVOIR - NOT REQUIRED FOR RISE DEVELOPMENT
	PROPOSED ALIGNMENT OF SPINE ROAD
A, B, D, E, F, G, H, I, L, M, N, O, U	RISE PRECINCT NUMBER

RISE
ABOVE IT ALL

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

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ABN: 55 114 638 934

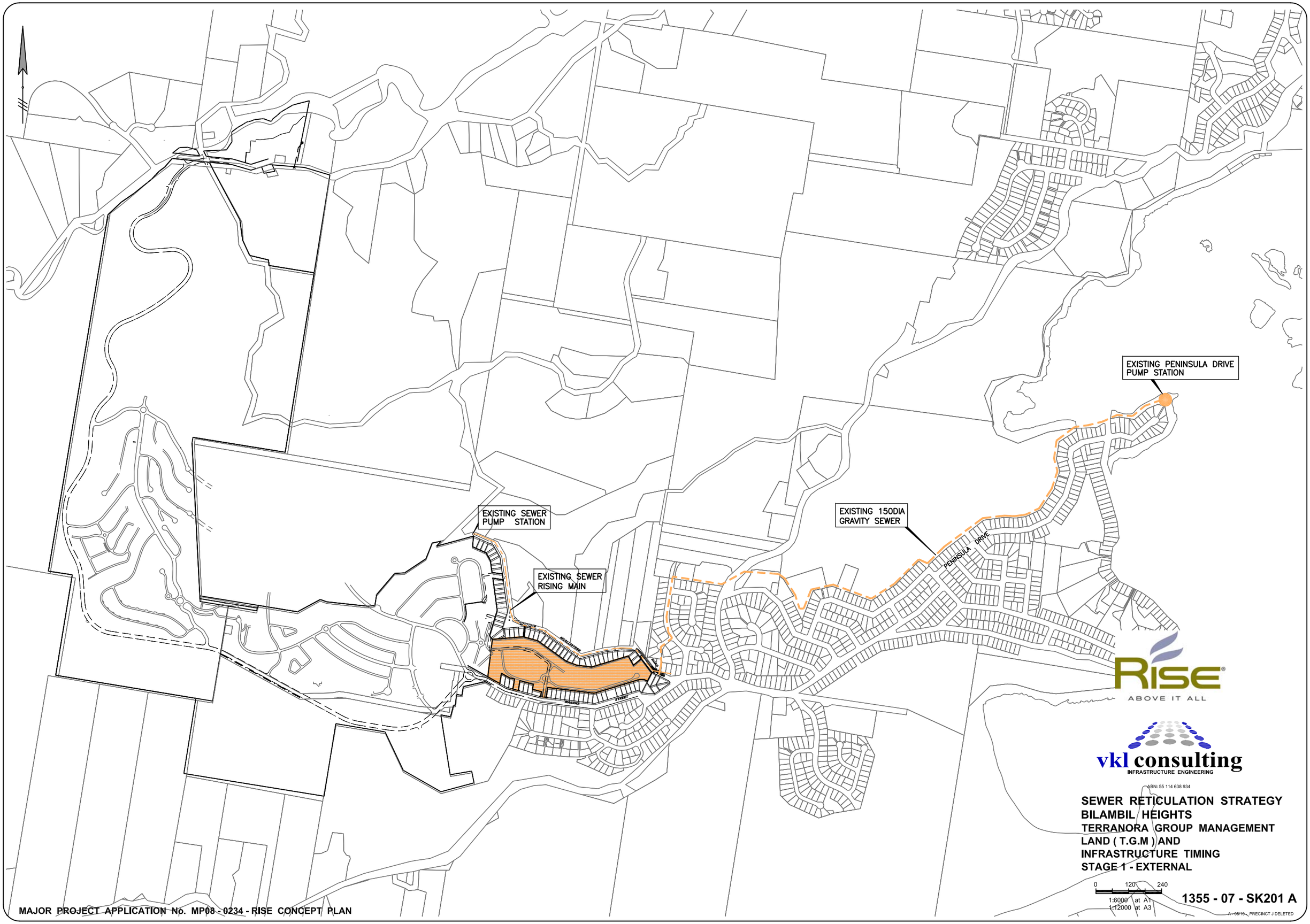
WATER RETICULATION STRATEGY
BILAMBIL HEIGHTS
TERRANORA GROUP MANAGEMENT LAND (T.G.M) AND INFRASTRUCTURE TIMING

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK200 A

A - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN


EXISTING PENINSULA DRIVE
PUMP STATION
EXISTING 150DIA
GRAVITY SEWER
PENINSULA DRIVE
EXISTING SEWER
PUMP STATION
EXISTING SEWER
RISING MAIN
MARIANA STREET
RISE
ABOVE IT ALL
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934
SEWER RETICULATION STRATEGY
BILAMBIL HEIGHTS
TERRANORA GROUP MANAGEMENT
LAND (T.G.M) AND
INFRASTRUCTURE TIMING
STAGE 1 - EXTERNAL
0
120
240
1:6000 at A1
1:12000 at A3
1355 - 07 - SK201 A
A - 08/10 - PRECINCT J DELETED
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

LEGEND

GRAVITY SEWER

TRUNK SEWER RISING MAIN CONNECTION TO GOLLAN DRIVE REGIONAL PUMP STATION

PROPOSED PUMP STATION

COBAKI LAKES REGIONAL PUMP STATION

EXISTING PUMP STATION

PIGGABEEN ROAD

FUTURE BILAMBIL HEIGHTS URBAN RELEASE AREA SEWERAGE PUMP STATION

FUTURE BILAMBIL HEIGHTS URBAN RELEASE AREA SEWERAGE PUMP STATION

FUTURE BILAMBIL HEIGHTS URBAN RELEASE AREA SEWERAGE PUMP STATION

GOLLAN DRIVE PUMP STATION

GOLLAN DRIVE

COBAKI ROAD

RISE SEWER PUMP STATION

RISE DEVELOPMENT

0 150 300

1:7500 at A1
1:15000 at A3

RISE
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EXTERNAL TRUNK SEWER LAYOUT

1355 - 07 - SK202

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

PART B

MAJOR PROJECT APPLICATION No. MP08-0234

RISE CONCEPT PLAN

SUBDIVISION DCP CONFLICTS

RESPONSE TO DGEARS GENERAL REQUIREMENTS No. 3B

Amended August 2010

vklconsulting
INFRASTRUCTURE ENGINEERING

P.O. Box 292
Ashmore City
QLD 4214

Ph: 07 5510 0200
Fax: 07 5510 0299
E: mail@vkl.com.au
ABN: 55 114 638 934

August 2010

CONTENTS

1. INTRODUCTION 1
2. IDENTIFICATION OF CLAUSES & PROPOSED VARIATIONS 1

A5 – Subdivision Manual 1

D1 –Development Design Specification Road Design 5

D6 – Site Regrading 8

D9 – Cycleway & Pedestrian Pathway Design Specification 10

D11 – Water Supply Development Design Specification 11

D12 – Sewerage System Design Specification 12

1. INTRODUCTION

This Report sets out items in Tweed Shire Council DCP – Section A5 Subdivision Manual where variation is sought to enable the proposed Rise Concept Plan to succeed.

Some variations are sought as a consequence of Rise being a large scale Community Title Scheme but with significant elements which will appear and function as a standard subdivision.

2. IDENTIFICATION OF CLAUSES & PROPOSED VARIATIONS

A5 – Subdivision Manual

Item No.	DCP A5 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
1.	A5.2.1 (a) Dot point 3 sub Dot 4	"Provide public transport & local community facilities operating from initial stage of development"	Delete requirement	Initial development likely to be Retirement living precinct which will have private transport facilities. Decision on when public transport is provided is decision taken by Government & private bus owner who has licence for that area.	Transport & facilities will be provided in initial phase but it will be private. The intent of the requirement will be met. Overall on Rise Development private facilities will be provided to residents as it is a Community Title development.
2.	A5.2.1 (a) Dot points 7 & 8	"Ridgelines are preserved without visual intrusion….. and excessive benching" "housing & other forms of urban development to integrate natural features not dominate or remove"	Delete requirement	Integrated concept plan which provides features of hillside village. Concept destroyed if compliance required.	Extent of visual intrusion onto ridgeline is minimal. This has been documented in ML Design Report.
3.	Table A5-3 Note 1	Site Grading Acceptance Criteria	Amend 1.2m to 3.0m	Built form solution to be applied to site. Concept plan shows Architectural concept details.	As a consequence of topography & minimization of cut / fill at subdivision stage a built form solution is proposed in some areas which requires some flexibility on retaining wall height as the retaining walls may be incorporated in buildings. The maximum

Item No.	DCP A5 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
					height of 1.2m is too restrictive in some locations. The majority of the site is capable of achieving the current DCP D6 Guidelines. The suggested amendments will allow site specific solutions without need to amend DCP at a later date. The suggested 3.0m was chosen as it is approximately equivalent to a floor level.
4.	Table A5-3 E2	Criteria for maximum permissible combined height of retaining walls or batters	Amend heights at boundaries of lots created within subdivision. Residential insert 3.0m for above & below street level. No limit on Spine Road	Topographic reasons. Built form solution to be applied to site. Concept plan shows Architectural concept details. Not practical along Spine Road as road level is controlled by grade agreed with TSC.	Comments as for Item 3 above. This will only apply where there is multi unit development not where detached housing is to be provided. The Spine Road is access denied except at public and private road intersections. The levels of the Spine Road are based on 12% grade which dictate batter / retaining wall heights.
5.	A5.4.10	Movement Network	Criteria to apply only to public roads	Large integrated Community Title development with many private roads, bikeways & pathways.	The DCP Movement Network Criteria is essentially applicable to freehold subdivisions. Rise generally conforms to the majority of the requirements however flexibility is required to deal with topography & built form solutions, private road sections & logical sizing of multi unit developments.
6.	A5.4.11	Open Space Network	Delete specific requirements	Open Space provided within large integrated Community Title development	The Open Space Criteria in the DCP have been based on freehold subdivision open space uses. Provision is made on the community land for residents. The overall Rise Development will provide more open space than a freehold subdivision of equal size.
7.	A5.4.12	Lot Layout	Delete specific requirements	Concept Plan provides details of large integrated Community Title development lot layout.	The Lot Layout requirements do not envisage a Community Title development of the size of Rise. Whilst Rise Development does not comply with the prescriptive requirements of A5.4.12 it does achieve a suitable outcome given site topography.

Item No.	DCP A5 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
8.	A5.5 in its Entirety	Rural Subdivision Guidelines & Development Standards	Delete	No applicable to large integrated Community Title development.	No Rural Residential lots proposed in concept therefore these requirements are not appropriate for inclusion.
9.	A5.6.1 Subdivision under the Community Titles Act General	Description of Works	After "…will include community owned…" insert "and public"	As a consequence of the large scale of the Community Titled development water reticulation & sewerage infrastructure to be publically owned to avoid differential treatment for rating purposes.	Tweed Shire Council DCP has been prepared on the basis that Community Title developments are relatively small in size & have private services. Rise Development is a large integrated development & proposes that public water supply & sewerage infrastructure be provided on the basis of equality to all ratepayers. The Community Titles Act provides for Statutory Easements to permit utility services providers to access the infrastructure for operational & maintenance purposes.
10.	A5.6.1 Subdivision under the Community Titles Act Design Guidelines & Development Standards	(i) Landforming	Amend as proposed in Items 3 & 4	Large integrated Community Title development with Architectural solution	Refer to appropriate submissions Items 1 to 9 above.
		(ii) Movement network	Amend as proposed in Item 5	Large integrated Community Title development with Architectural solution	Refer to appropriate submissions Items 1 to 9 above.
		(iii) Lot layout	Amend as proposed in Item 7	Large integrated Community Title development with Architectural solution	Refer to appropriate submissions Items 1 to 9 above.
		(iv) Open space network	Amend as proposed in Item 6	Large integrated Community Title development with Architectural solution	Refer to appropriate submissions Items 1 to 9 above.
		(v) Infrastructure (a) Water, Sewer	Delete references to community responsibility. All reticulation to be publically owned & maintained in a similar manner to freehold title subdivision.	Large scale Community Title development. Council policy not developed for this size development. To avoid adverse differential rating between TSC rate payers.	Refer to appropriate submissions Items 1 to 9 above.

Item No.	DCP A5 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
11.	Appendix E	Buffers	Delete	Subject to Major Project determination	It is acknowledged that Appendix E is advisory & these matters are to be addressed by DGEARS specific requirements. The outcomes of those considerations will determine any specific buffer requirements.

D1 –Development Design Specification Road Design

Item No.	DCP D1 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
1.	D1.10 Table D1.6	Maximum Grades on Roads	1. Insert additional road type for "private road" Desirable max. grade – 16% Absolute max. grade – 25%	Large integrated Community Title development with low speed environment. Variable topography to avoid significant cut & batter heights	Overall the majority of the road gradings comply with the DCP however in a number of minor areas the private road gradings will need to be 25% grades. This 25% grade is consistent with private access requirements & relevant Codes. All public roads comply with the DCP.
2.	D1.10.2	Longitudinal grade through intersection	Delete clause for private roads	Impractical in community titled areas of site. Low speed traffic environment.	Public roads comply. The majority of the private roads throughout Rise comply with the requirement however where the maximum 25% grades apply to private roads it is not possible to achieve the requirements without extensive earthworks.
3.	D1.11.2(c) D1.11.3(b) & (c)	Minimum length vertical curves for visual appearance	Delete for private roads	Variable topography to avoid significant cut & batter heights	Public roads comply. The majority of private roads throughout Rise comply however where maximum grades are required the use of public road minimum vertical curve standards would result in significant earthworks. As internal private road the traffic speeds will be low. Lengths of vertical curves can be lowered with safety.
4.	D1.14	Urban cross section elements	Delete entire clause for private roads. Adopt cross sections shown in Rise Major Project Application No. MP08-0234	Large integrated Community Title development. To minimize cut / fill on site & integrate with Architectural built form concepts	Public road cross sections will conform, some of the private road cross sections conform, however some have been modified to suit build form access solutions as a consequence of topography & requirement to conform where possible with D6 of the TSC DCP – Landforming.
5.	D1.15 Table D1.8 & Notes	Footpath & utility services allocation	Delete for private roads. Insert publically owned infrastructure within Statutory Easements in Rise development	Existing requirements do not fit with Rise concept private road cross section configuration	Public road sections will conform. Private road verge widths vary to suit topography and built form access solutions. All private road reserves are community land & will have Statutory Easements where public utilities are layed.

Item No.	DCP D1 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
6.	D1.16	Urban footways & cycleways	Delete for private roads & infrastructure Austroads grades & signage to apply	Large integrated Community Title development. Australian road rules do not apply	Public roads will comply. Proposed cycleways / footways within Rise will be community owned & maintained. Generally these will conform with public road standards however as a consequence of topography some small lengths may not comply. These will be constructed on community land & may have variable alignment to achieve satisfactory grade.
7.	D1.17	Urban intersection	Delete sections for private roads that are not applicable to low speed environment	Low speed environment on private roads	Public roads comply. Some private intersections will conform however in certain circumstances the topography / road sections & low speed environment dictates that public road intersection configurations are not warranted.
8.	D1.18 D1.19	Roundabout & traffic calming	Delete requirement for private roads in low speed environment	Large scale Community Title development	Public roads will comply. Public road configurations are not necessary for low speed environment of private roads. Traffic calming will be achieved on private roads by the topography, gradings & where required, other traffic calming features.
9.	D1.20.1 D1.20.2	Parking	Delete for private roads. Insert “as proposed in Architects submission”	Large scale Community Title development. Private parking.	Generally adequate parking will be provided within private property, private roads & in buildings.
10.	D1.21	Bus routes	Applicable only to public roads	Community Title development with private roads	Public roads will be suitable for public bus transport. Public bus operators in general will not travel on private roads. Shape of development land and Spine Road will mean that distance to public transport DCP requirements can be complied with.
11.	D1.22	Urban driveways & access	Delete requirement for access to every lot at time of land subdivision	Large Community Title development which includes Architectural built form solutions in some areas to avoid excessive cut / fill batters. Access gained at building stage.	Access to each lot will be provided to most lots at time of subdivision. There are some locations where the built form solution will provide the formal access to the lot. Rather than undertake excessive earthworks at subdivision stage it is appropriate to permit steep embankments at subdivision stage. Flexibility is required so that unnecessary earthworks is eliminated.

Item No.	DCP D1 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
12.	D1.24 to D1.34	Rural development standards	Delete	Not applicable to Community Title development	No Rural Residential lots proposed in Rise Development.

D6 – Site Regrading

Item No.	DCP D6 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
1.	D6.05.2(i) Dot point 1	General criteria Regrading not to take place on significant topographical natural features	Delete this requirement	Rise concept provides or hillside development Art village on highest land which will require reprofiling	Regrading is proposed in the area of the Arts Village as this is central to Rise concept of "hillside villages". Other areas generally comply.
2.	D6.05.4(i) Dot points 2 & 3	Shape surface criteria	Delete this requirement	Architectural solution for built form to take up changes in level to avoid significant cut / fill batters in Community Title development	It is not intended that major terracing of land occur at subdivision stage so that earthworks are minimized. Some reprofiling will occur at building stage as buildings take account of landform.
3.	D6.05.4 Note 1	Combined height of retaining wall	Delete 1.2m Insert 3.0m	Architectural solution for built form to take up changes in level to avoid significant cut / fill batters in Community Title development	As a consequence of topography & minimization of cut / fill at subdivision stage a built form solution is proposed which requires some flexibility. The maximum height of 1.2m is too restrictive in some locations. The majority of the site is capable of achieving the current DCP D6 Guidelines. The suggested amendments will allow site specific solutions without need to amend DCP at a later date. The suggested 3.0m was chosen as it is approximately equivalent to a floor level.
4.	D6.05.6(b)(c) Table D6.1	Maximum permissible combined height of retaining walls	Amend Table D6.1 Boundaries of lots created in subdivision Side & rear boundaries – 3.0m all types of subdivision Street boundaries above & below roads – 3.0m	Large integrated Community Title development with built form Architectural solutions to avoid significant cuts & fills.	Comments as for Item 3 above. This will only apply where there is multi unit development not where detached housing is to be provided. The Spine Road is accessed denied except at public and private road intersections. The levels of the Spine Road are based on 12% grade which dictate batter / retaining wall heights.
5.	D6.07.2	Removal of cleared material from site	Amend to allow vegetation chipping & use as mulch	Recycling of material. Helps stabilized disturbed areas.	More appropriate that vegetation that is removed is recycled on site & used in landscape works.

Item No.	DCP D6 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
6.	D6.15	Staging	Delete this clause	Large Community Title scheme. This clause will not function where Architectural solutions used to reduce significant cut / fill batter heights. Not practical in Rise circumstances.	In most project stages compliance can be achieved however flexibility is required where topography dictates built form solutions, particularly as Rise is a major integrated Community Title with many stages.

D9 – Cycleway & Pedestrian Pathway Design Specification

Item No.	DCP D9 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
1.	D9.10.1 Table D9.1	Minimum design standards	Delete minimum path & formation width. Delete maximum grades on private community land & roads	Community Title development. Adopt as shown on Rise concept plans to avoid significant cuts & fills.	Comply on public roads & most private roads & community owned pathways & cycleways. Flexibility needed to reduce major earthworks where steeper grades occur on Rise project.
2.	D9.12	Special requirements footpaving	Delete for private community land & roads	Not public footpaving	Comply for public roads. Privately owned & maintained surfaces may have special treatments.

D11 – Water Supply Development Design Specification

Item No.	DCP D11 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
1.	D11.07(a)	Mains alignment	Delete where water mains layed within community lands & private roads	Large scale Community Title development with public watermains in Statutory Easements with varied private road cross sections	Will comply in public roads. In private roads an allocation of alignment will be provided & covered by Statutory Easement.
2.	D11.07.2	Private land easements	Amend to Statutory Easement	Community Title Act has provision for Statutory Easement over publically owned infrastructure	Provisions for Statutory Easement exists in Community Titles Act for public owned infrastructure to be accessed & maintained.

D12 – Sewerage System Design Specification

Item No.	DCP D12 Clause No.	Subject Matter	Proposed Variation	Justification	Overall Project Compliance
1.	D12.06.2	Design loading	Amend ADWF to 180 ℓ / EP / day	Large scale Community Title development will be subject to Basix provisions which result in lower volume of sewage per EP	TSC DCP D12 requirements do not take into account projects subject to Basix & resulting reduction in sewage generation through low use shower heads, taps, dishwashers, washing machines & dual flush toilets. Accepted criteria is 180 ℓ/EP/day compared to 240 ℓ/EP/day in D12 of DCP.
2.	D12.07.1(a) & (b)	Sewer alignment	Delete requirements	Concept is for public sewers in large scale Community Title development with Concept Architectural solutions to minimize significant cut & fill batters. Existing requirements will be impractical. In some areas public sewers will be located within private roads because of topography.	Comply with alignment on public roads where applicable. Built form access solutions & topography require flexibility be available for alternate alignments where public sewers are layed through community lands within Statutory Easement.
3.	D12.07.1(c) & D12.07.4	Sewer alignment & easements	Insert Statutory Easement where public sewers are layed in community land	Community Title Act provides for Statutory Easements over publically owned utilities.	Public sewers to be layed on appropriate alignments with Statutory Easements for maintenance access.
4.	D12.10.9	Property connection	Delete requirement	May not be practical because of topographical constraints.	Comply in most instances however flexibility required because of topography in community lands.
5.	D12.12.30	Trunk sewer design	Delete requirement	May not be practical because of topography & public sewers in large Community Title development.	Generally will comply however flexibility required in community lands because of topography. Public trunk sewers layed in Statutory Easements.

PART C

MAJOR PROJECT APPLICATION No. MP08-0234

RISE CONCEPT PLAN

RESPONSE TO DIRECTOR GENERAL'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

KEY ASSESSMENT REQUIREMENT No. 12 SITE PREPARATION WORKS

Amended August 2010

vklconsulting
INFRASTRUCTURE ENGINEERING

P.O. Box 292
Ashmore City
QLD 4214

Ph: 07 5510 0200
Fax: 07 5510 0299
E: mail@vkl.com.au
ABN: 55 114 638 934

August 2010

CONTENTS

DGEARS ITEM 12 SITE PREPARATION (2)
MAJOR PROJECT APPLICATION No. MP08-0234 – RISE CONCEPT PLAN
GEOTECHNICAL REPORT & SLOPE ANALYSIS

1. INTRODUCTION 1
2. INTERPRETATION 2
3. EXTENT OF TESTING 3
4. GEOLOGY OF SITE 4
5. SUBSURFACE PROFILE 5
6. GEOTECHNICAL CONCLUSIONS – Including Conclusions from Border-Tech Report Dated November 1996 6
7. SUMMARY OF GEOTECHNICAL INVESTIGATIONS 7
8. SLOPE ANALYSIS 8

DGEARS ITEM 12
SITE PREPARATION WORKS
DETAILED SURVEY PLAN SHOWING EXISTING & PROPOSED LEVELS & CUT & FILL QUANTITIES

1. EXISTING & PROPOSED LEVELS 9
2. CUT & FILL QUANTITIES 10
3. ASSESSMENT OF EXTENT OF CUT/FILL DEPTHS & AREA OF SITE DISTURBANCE 11

Appendix A - *VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK06, SK07, SK12, SK13, SK150 & SK301*

Appendix B - *Border-Tech Geotechnical Services Report dated November 1996*

Appendix C - *Gilbert & Sutherland Report dated December 1997*

Appendix D - *Slope Analysis Plan No. 8715-8 prepared by Michel Group Services*

GEOTECHNICAL REPORT & SLOPE ANALYSIS
DGEARS ITEM 12 SITE PREPARATION (2)

1. INTRODUCTION

Geotechnical investigations have previously been undertaken by Border-Tech Geotechnical Engineering Services in November 1996 and by Gilbert & Sutherland in December 1997.

These Geotechnical investigations were undertaken as part of the Statement of Environmental Effects (SEE) in support of a Resort Development Application which was approved over the subject site and remains as an active Development Approval.

Investigation test locations of the two Geotechnical investigations have been compiled and overlayed with the Rise concept so that the relativity of the Geotechnical testing can be related to the current application concept. Refer Appendix A of this Report – VKL Consulting Pty Ltd Drawing No. 1355-07-SK150.

This Report has been prepared on the basis of the conclusions of the Border-Tech Geotechnical Engineering Services Report dated November 1996 and extracts from the Gilbert & Sutherland Report dated December 1997 which are included in Appendices B & C respectively as the Geotechnical conditions applicable to the site have not changed, notwithstanding that the project concept has changed.

2. INTERPRETATION

The Border-Tech Geotechnical Engineering Services Report dated November 1996 makes references to various components of the Golf Course Resort and proprietary names. These are not referred to elsewhere in the Rise Major Project Application documentation.

For the purpose of interpretation we identify the subject area in the Rise concept plan.

Table 1

Item No.	Reference Clause Border-Tech Report dated Nov 1996	Ref Page No. Border-Tech Report dated Nov 1996	Area Referred to in Border-Tech Report dated Nov 1996	Equivalent Location in Rise Concept Plan
1.	2.1	3	"Landscaped Golf Course Area"	Precincts A, B, C, D, E, F, G & H
2.	2.1	3	"Clubhouse & Hotel" Precinct	Precincts A, D, E & G
3.	2.1	3	"Norville Property"	Part Precinct L, Precincts M, N, O & land to the north of Precinct N through to Cobaki Creek Road
4.	2.1	3	"Holmview"	West of the Spine Road Chainages 2700 to 3400 Refer VKL Consulting P/L Dwg No. 1355-07-SK07C for Spine Road chainages. This area is outside of Rise concept application area.

3. EXTENT OF TESTING

During the Border-Tech Geotechnical investigation of the site a total of 30 No. boreholes and 17 No. test pits were bored / excavated to establish underlying Geotechnical conditions. Undisturbed and disturbed samples were collected and tested and reported on.

A further 5 No. boreholes were drilled by Gilbert & Sutherland during their investigation to establish soil classifications over the site.

Refer to VKL Consulting Pty Ltd Plan No. 1355-07-SK150 for locations of boreholes and test pits in Appendix A.

4. GEOLOGY OF SITE

Extracts & Ref. Border-Tech Report dated November 1996 – Section 2 & Gilbert & Sutherland Report dated December 1996 – Section 3.4 / 3.5

The site consists of various geological formations with the oldest rocks being metasediments of the Neranleigh - Fernvale Group. These occur in the northern region of the site in the valley floor near Cobaki Creek Road and form the foot slopes rising to the south from Cobaki Creek Road.

Metasediments are typically sandstone and siltstone however beds of greywake can occur near the basalt – metasediment contact.

Above these Neranleigh – Fernvale Group are Tertiary age basalt lava flows (Lamington Volcanic Group) with younger volcanic rhyolitic lava (Lamington Volcanic Group) overlaying the basalt and forms the higher areas of the subject site.

The rhyolitic can be dissected into two types, being upper tuffaceous rhyolite and lower penlitic, vitreous (glassy) brittle rhyolite.

The contacts between the base of the basalt and underlying Neranleigh – Fernvale beds and the top of the basalt and overlaying rhyolitic have their own weathering characteristics and locally control topography and soil type.

Recent alluvials of Cobaki Creek form low lying land at Cobaki Creek level.

Gilbert & Sutherland's investigation of soil types found that the site soils consisted of Ferrosols, Dermosols and Kurosols.

The Ferrosols being associated with the Tertiary Age basalt lava flows and the Demosols / Kurosols associated with the younger volcanic rhyolitic lava and older metasediments of the Neranleigh – Fernvale Group.

5. SUBSURFACE PROFILE

Extracts & Ref. Border-Tech Report dated November 1996 – Section 3

The Geotechnical investigation identified boundaries between different soil and rock types. Each type has different influences and effect on development.

The Border-Tech Report dated November 1996 breaks the site up into different Geotechnical assessment units (GAU's). Descriptions of each unit is contained in the Border-Tech Report.

6. GEOTECHNICAL CONCLUSIONS – Including Conclusions from Border-Tech Report Dated November 1996

The subject site has some complex geological structures and whilst geological / Geotechnical properties are expected to be typically gradational they could exhibit rapid lateral variations.

In a broad scale Geotechnical investigations such as the Border-Tech and Gilbert & Sutherland investigations it cannot be expected that lateral variations can be identified.

Specific detailed Geotechnical investigations will be required for each component or Precinct of the development at the time Development Consent application or construction approval stage.

The investigations found that there are no geological conditions evident on the site which would indicate that the proposed development cannot be satisfactorily achieved.

There are no known geological conditions at the site which could adversely affect the adjoining land and a consequence of the proposed development.

Rhyolitic deeper than 5-7 metres and basalt shelf rock may not be rippable.

Specifically designed subsurface drainage will be required in the contact zones between the various geological formations throughout the subject site.

Subject to detailed design of earthworks at Development Application stage per Precinct a range in size of basalt boulders may be encountered. In those areas where basalt boulders are encountered, foundation design for structures will need to account for the possibility of variable degrees of bearing capacity.

If areas of basalt boulders are encountered during DA and construction design specific attention to construction safety methods will be required to prevent boulders from rolling beyond the specific construction sites. One method of achieving this is to locate stripped topsoil windrows down slope of the construction site.

No evidence of active land slippage was identified on the subject site during investigations.

As a consequence of slopes in steeper areas of the site construction design documentation should take into account the potential for stability failure to occur and provide suitable batter / fill slopes, benching of fill areas, subsurface and cut off drainage together with vegetation restoration of disturbed areas.

7. SUMMARY OF GEOTECHNICAL INVESTIGATIONS

Ref. Border-Tech Report dated November 1996 & Gilbert & Sutherland Report dated December 1997

There are no apparent Geotechnical reasons evident that would prevent the proposed development being completed.

Detail Geotechnical investigations will be required at the time of construction of the various components of the proposed development.

Unrippable rhyolite and basalt may be encountered in various areas of the proposed development together with varying sizes of basalt boulders.

Subsurface drainage will be required at the interface zone of various geological formations and cut off drains will be required where cut batters are to be located.

Disturbed areas are to be reinstated with appropriate vegetation.

8. SLOPE ANALYSIS

Slope analysis mapping has been prepared which reflects the existing profiles of the site. Refer Michel Services Group Drawing No. 8715-8 - Refer Appendix D of this Report.

The concept plan for Rise has taken into account the existing slopes during the preliminary design of the concept.

The built form of the proposed Rise development will modify the existing slopes in some areas.

SITE PREPARATION WORKS
DETAILED SURVEY PLAN SHOWING EXISTING & PROPOSED LEVELS & CUT & FILL QUANTITIES
DGEARS ITEM 12

1. EXISTING & PROPOSED LEVELS

Preliminary road and adjacent land proposed to be reprofiled as shown in VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK06C and 07C appended in the project concept drawing documentation and specifically in Appendix A of this Report.

Existing contours are shown in light grey at 5m contour interval and preliminary final contour levels shown in red at 1m contour interval.

These plans show, in plan view, the areas of proposed disturbance at the subdivision stage.

Additional reprofiling of the site will occur at the building stage however the architectural design seeks to accommodate changes in level across the various sites by incorporating level differences within the built form to minimise the extent of earthworks required.

Differences in level are also accommodated by single sided access from internal roads where appropriate – See typical sections on VKL Consulting Pty Ltd Drawing No. 1355-07-SK13A.

Preliminary road gradings and cross sections are shown on VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK20 to SK142. Refer to Major Project Application MP08-0234 VKL Consulting Pty Ltd drawing set.

2. CUT & FILL QUANTITIES

Based on the preliminary road gradings and lot reprofiling included with this application have been calculated and are recorded on VKL Consulting Pty Ltd Drawing No. 1355-07-SK12C in Appendix A. These volumes of cut and fill are not solid volumes and make no provision for any detailed earthworks that may be required during building operations.

Subject to detailed design there will be an excess of material to site requirements of approximately 237,920 cubic metres.

This volume of earthworks will be hauled from the site and will comprise a mixture of the various material types identified in the Geotechnical investigations by Border-Tech and Gilbert & Sutherland.

No specific area of disposal of this material has been identified at this early phase however preliminary discussions have occurred with Tweed Shire Council on the need for fill to complete the formation of future arterial roads servicing Bilambil Heights Release Area.

Potential sites are shown on VKL Consulting Pty Ltd Drawing No. 1355-07-150. Refer Appendix A of this Report.

Subject to final design, approval and construction timing it is anticipated that the haul route of excess earthworks from the site will be along Cobaki Road to the proposed Scenic Drive deviation.

No earthworks materials will be required to be imported to the site.

Soil and fill materials will be moved from one section of the site to other areas of the site, subject to design requirements and construction of the various precincts of the development.

3. ASSESSMENT OF EXTENT OF CUT/FILL DEPTHS & AREA OF SITE DISTURBANCE

An assessment of the extent of depths of cut/fill over the proposed development area at bulk earthworks stage is required.

This assessment is shown on VKL Consulting Pty Ltd Drawing No. 1355-07-301 in Appendix A in the form of coloured areas showing ranges of depths of cut/fill.

This assessment has then been used to assess the percentage of areas of the development footprint where cut/fill depths exceed five (5) metres as set out in TSC DCP - D6 which provides for a maximum percentage of 10%.

The outcome of this assessment indicates that the proposed Rise Development complies with the DCP – D6 with a percentage of 6.51% taking into account of public and private roads.

APPENDIX A

VKL Consulting Pty Ltd Drawing Nos. 1355-07-SK06, SK07, SK12, SK13, SK150 & SK301

JOIN SHEET 2 1355 - 07 - SK07

ROAD 16
ROAD 17
ROAD 6
ROAD 6A
ROAD 1
ROAD 4
ROAD 105
ROAD 104
ROAD 100
ROAD 103
ROAD 131
ROAD 123
ROAD 122
ROAD 109
ROAD 110
ROAD 111
ROAD 114
ROAD 113
ROAD 116
ROAD 15
ROAD 102
ROAD 101
ROAD 130
ROAD 106
ROAD 108
ROAD 125
ROAD 126
ROAD 124
EXISTING DEVELOPMENT
MCALLISTERS EXISTING DEVELOPMENT ROAD
EXISTING MARANA DEVELOPMENT STREET
SPINE ROAD
PEDESTRIAN UNDERPASS
A 13
E 13

LEGEND

- DESIGN CONTOURS (1.0m)
- EXISTING CONTOURS (5.0m)
- RETAINING WALL

RISE ABOVE IT ALL

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ROAD LAYOUT SHEET 1 OF 2

1355 - 07 - SK06 D

D - 08/10 - PREINCT J DELETED

0 25 50 75 100
1:2500 at A1
1:5000 at A3

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

JOIN SHEET 1 1355 - 07 - SK06

FILL SITE

FILL SITE

SPINE ROAD

PEDESTRIAN UNDERPASS

ROAD 16

ROAD 10

ROAD 17

ROAD 14

ROAD 15

ROAD 6

ROAD 6A

ROAD 5

ROAD 18

ROAD 1

ROAD 4

ROAD 131

ROAD 2

ROAD 3

ROAD 7

ROAD 13

ROAD 8

ROAD 8

ROAD 12

ROAD 9

ROAD 10

ROAD 11

ROAD 19

SPINE ROAD

D 13

B 13

C 13

LEGEND

- DESIGN CONTOURS (1.0m)
- EXISTING CONTOURS (5.0m)
- RETAINING WALL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

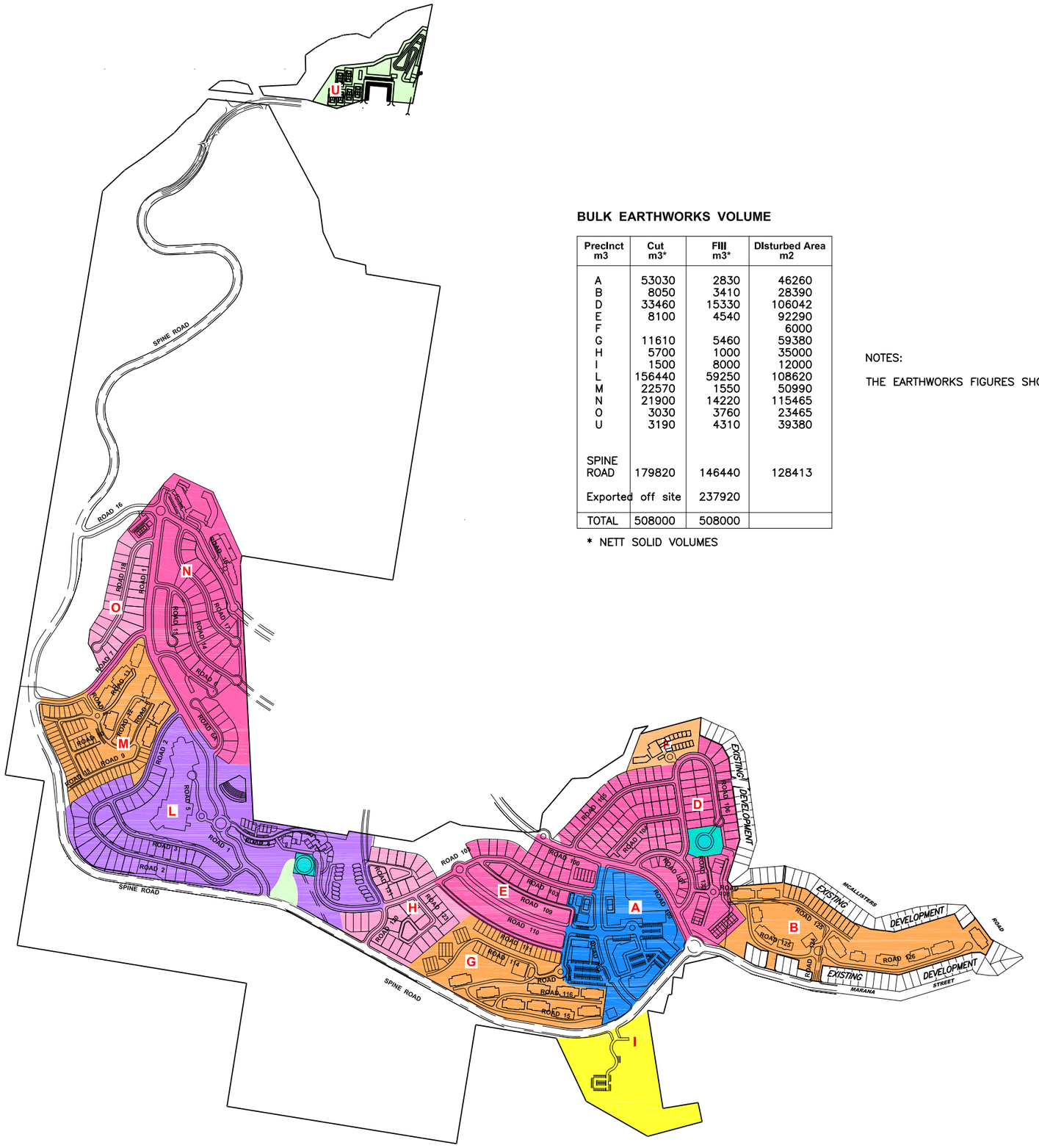
ROAD LAYOUT
SHEET 2 OF 2

0 25 50 75 100
1:2500 at A1
1:5000 at A3

1355 - 07 - SK07 D

D - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



BULK EARTHWORKS VOLUME

Precinct m3	Cut m3*	Fill m3*	Disturbed Area m2
A	53030	2830	46260
B	8050	3410	28390
D	33460	15330	106042
E	8100	4540	92290
F			6000
G	11610	5460	59380
H	5700	1000	35000
I	1500	8000	12000
L	156440	59250	108620
M	22570	1550	50990
N	21900	14220	115465
O	3030	3760	23465
U	3190	4310	39380
SPINE ROAD	179820	146440	128413
Exported off site		237920	
TOTAL	508000	508000	

* NETT SOLID VOLUMES

NOTES:

THE EARTHWORKS FIGURES SHOWN ARE PRELIMINARY ONLY.

RISE ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 636 934

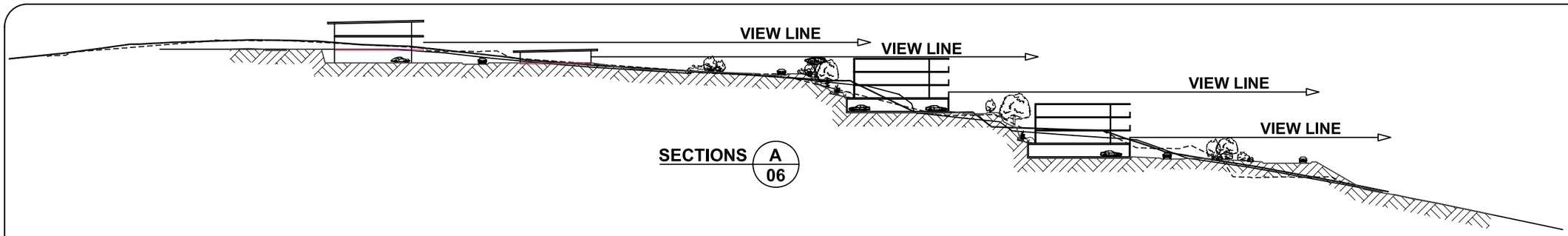
BULK EARTHWORKS VOLUMES

0 100 200
1:5000 at A1
1:10000 at A3

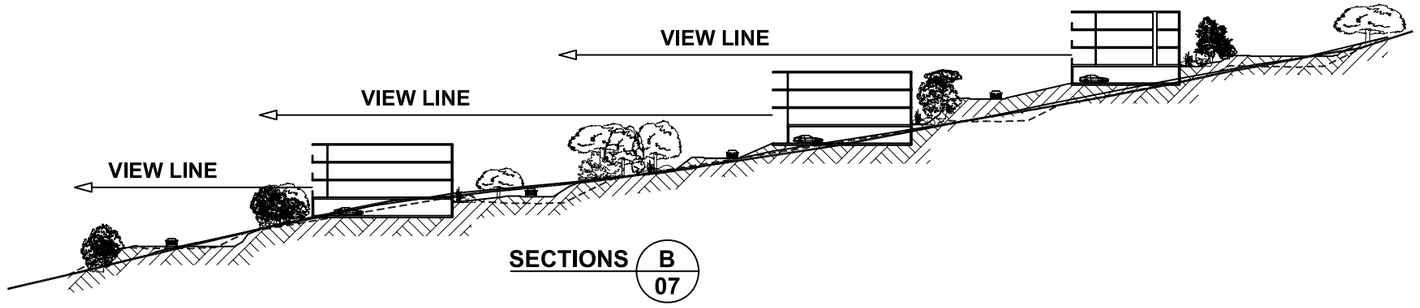
1355 - 07 - SK12 C

C - 08/10 - PRECINCT J DELETED

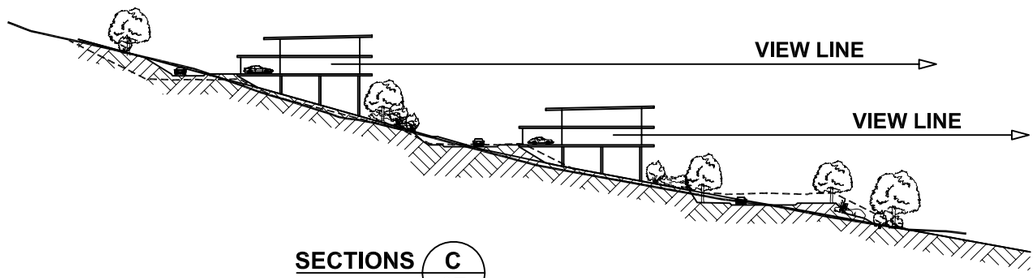
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



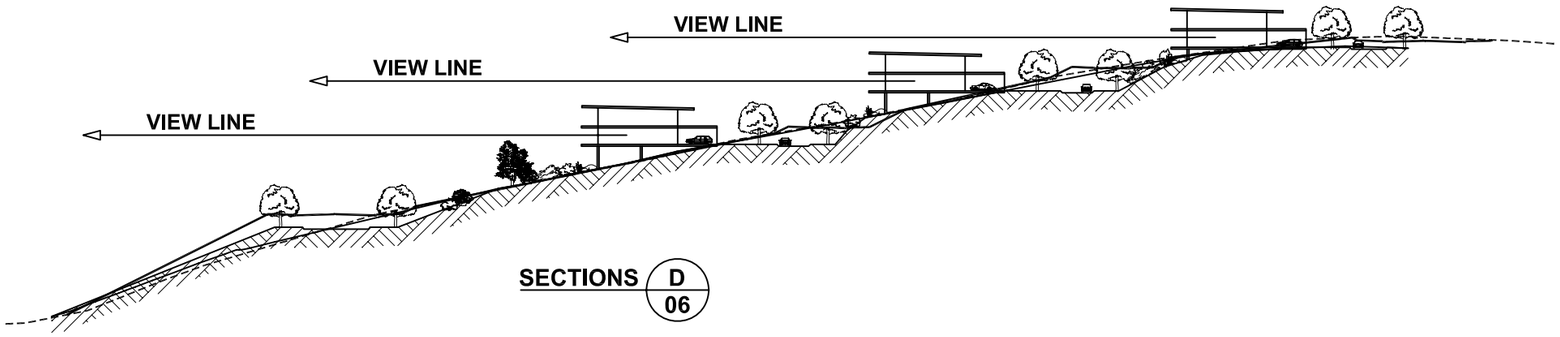
SECTIONS A 06



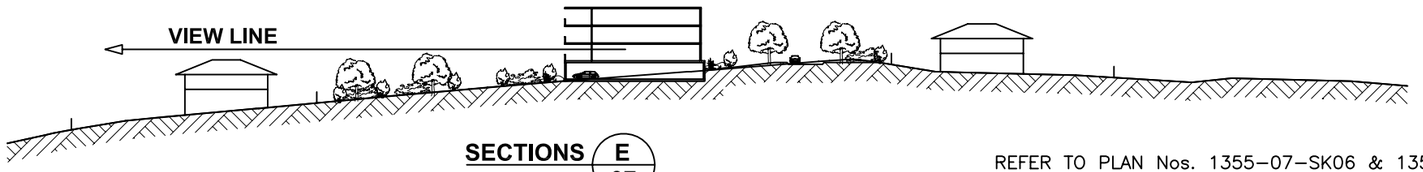
SECTIONS B 07



SECTIONS C 07



SECTIONS D 06



SECTIONS E 07

REFER TO PLAN Nos. 1355–07–SK06 & 1355–07–SK07
FOR LOCATIONS OF SECTIONS

RISE
ABOVE IT ALL

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SITE SECTIONS

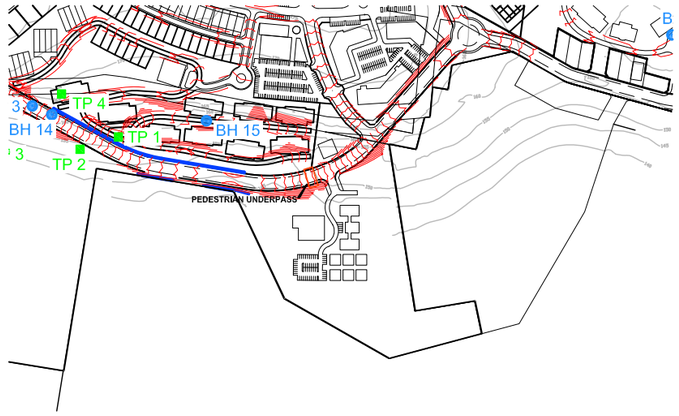
0 10 20
1:50 at A1
1:100 at A3

1355 - 07 - SK13 A

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

LEGEND

BH 1	BORE HOLE LOCATION FROM BORDERTECH REPORT NOVEMBER 1996
TP 15	TEST PIT LOCATION FROM BORDERTECH REPORT NOVEMBER 1996
GS BH 5	BORE HOLE LOCATION FROM GILBERT & SUTHERLAND REPORT DATED DECEMBER 1997
	FINISHED CONTOURS 1m INTERVALS
	EXISTING CONTOURS 5m INTERVALS



INSET

COMBINED PLAN OF BORE HOLE AND TEST PIT LOCATION BASE ON GEOTECHINCAL INVESTIGATIONS OF BORDER-TECH REPORT DATED NOVEMBER 1996 AND GILBERT & SUTHERLAND REPORT DATED DECEMBER 1997

RISE ABOVE IT ALL

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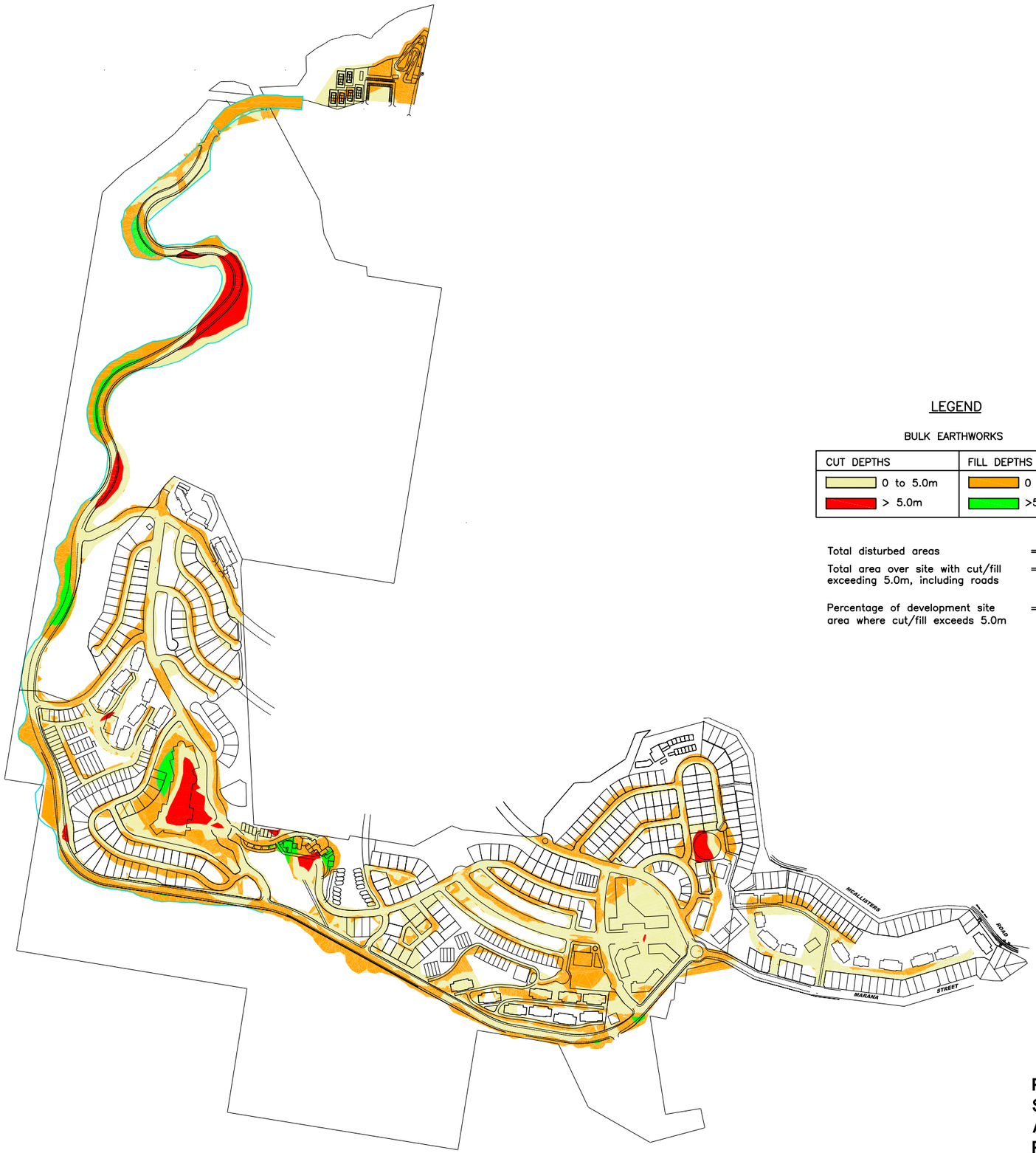
1355 - 07 - SK 150 A

A - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

REFER INSET

0 40 80 120 160
1:4000 at A1
1:8000 at A3



LEGEND

BULK EARTHWORKS

CUT DEPTHS	FILL DEPTHS
0 to 5.0m	0 to 5.0m
> 5.0m	>5.0m

Total disturbed areas = 561180m2

Total area over site with cut/fill exceeding 5.0m, including roads = 36510m2

Percentage of development site area where cut/fill exceeds 5.0m = 6.51%

RISE
ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

PLAN OF BULK EARTHWORKS SHOWING DEPTHS OF CUT/FILL AND AREAS OF DISTURBANCE INCLUDING PUBLIC AND PRIVATE ROADS

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK301 A

A - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

APPENDIX B

Border-Tech Geotechnical Services Report dated November 1996

Site Investigation Report

for

The Proposed Terranora Resort Project

for

Terranora Group Management

Report Number : BT 4466
Date Issued : 1 Nov 96

BORDER-TECH

Geotechnical Engineering Services
Unit 6/12 Greenway Drive
Tweed Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

MB:db:BT 4466

27 August 1996

Terranora Group Management
c/- Weathered Howe Pty Ltd
Consulting Engineers
P.O. Box 1653
SOUTHPORT QLD 4215

Dear Sir

Re: Terranora Golf Project

1. As requested we have carried out the preliminary site investigation and geological assessment of the above property. The aim of the investigation was to establish the soil and geological conditions pertaining to the site to confirm it's suitability for the proposed development.

2. This report presents the results of the investigation. Should you have any queries please do not hesitate to contact this office.

Yours faithfully
BORDER-TECH

Thomas J Dick
B.E., M.I.E., C.P.Eng., L.G.E. (Q & NSW), R.P.E.Q. (4105)

John C Beal
M.Sc.(Geol),M.A.G.S, M.A.I.M.M, M.I.A.E.G, M.A.N.C.O.L.D.

CONTENTS

1.0 INTRODUCTION

2.0 SITE DESCRIPTION

- 2.1 Topography
- 2.2 Vegetation
- 2.3 Drainage
- 2.4 Geology

3.0 SUBSURFACE PROFILE

- 3.1 Rhyolite
- 3.2 Rhyolite / Basalt contact
- 3.3 Basalt
- 3.4 Metasediments
- 3.5 Alluvials

4.0 MATERIAL PROPERTIES

- 4.1 Material Sampling Programme
- 4.2 Laboratory Test Results
- 4.3 Construction Materials

5.0 SLOPE STABILITY

- 5.1 Natural Slope
- 5.2 Landscaped Slopes
- 5.3 Road Alignment

6.0 HYDROGEOLOGY AND WATER STORAGE

- 6.1 Surface Run-off and Seepage
- 6.2 Groundwater Aquifers
- 6.3 Surface Storage
  - 6.3.1 New Dam Sites
  - 6.3.2 Enlargement of existing Dams

7.0 BEDROCK RIPPABILITY

7.1 Hotel Area

7.2 Clubhouse Area

7.3 Access Road

8.0 GEOTECHNICAL SUMMARY

8.1 Statement on Foundation conditions

8.2 Statement on Site Slope Stability

8.3 Road Construction

8.4 Unit Development

8.5 Retaining Walls

8.6 Erosion & Siltation

8.7 Further Site Investigation

9.0 OVERALL ASSESSMENT

APPENDICES

A: Drillhole and Test Pit Logs

B: Laboratory Sample Test Results

C: Geotechnical Assessment Units & Location of Drill holes and Test Pits

D: Photographic Plates

1.0 INTRODUCTION

This preliminary geotechnical study has been carried out at the request of Mr N Grummet of Weathered Howe Pty Ltd on behalf of Terranora Group Management (17 July 1996) for the purpose of assessing the overall suitability of the site for the proposed development and to identify any potential problem areas.

The scope of the report is to identify soil and rock types and any unstable slopes via aerial photos, geological mapping, auger drilling, test pitting and materials testing. Comment is also sought on the hydrogeology of the site with particular reference to water storage areas.

The geotechnical site investigation consisted of drilling a total of thirty boreholes using either a Jacro 200 or a GCH 200 truck mounted drilling rig employing spiral flight augering techniques. Seventeen backhoe test pits were also excavated across the site to allow bulk sampling and visual inspection of insitu sub surface profiles. Undisturbed samples were obtained in the boreholes to allow strength properties to be established in the field. Both undisturbed and disturbed samples were returned to the laboratory for analysis. The locations of the boreholes and test pits are shown on the drawings included in Appendix C to this report.

2.0 SITE DESCRIPTION

2.1 Topography

The undulating landscaped golf course area is bounded by basalt scarps facing east, south and southwest. There are topographic - highs (volcanic rhyolite) in the area of the proposed Clubhouse and Hotel precinct.

The Norville property has centrally located undulating ground with gradients mainly 10° - 25° bounded by basalt scarps (25° - 35°) facing south, east and west and with slopes (20° - 30°) steepening northwards as the land drops down to merge with flatter ground (Storage site area) and alluvial flats areas of Cobaki Creek. (Farmhouse area)

The site is free of obvious landslip topography (slip scarps, hummocky ground, tilted trees) apart from possible minor shallow slumping marked by reedy patches. Ancient landslips along the steep basalt scarp areas are indicated by anomalous contour patterns but these areas are well treed and cannot be identified with any certainty. There is no evidence of active large scale landslips.

Active erosion gullying is limited to cuts in the steep sections of the existing access track between "Holmview" and the two water tanks, and in the area of the spillway for the main Norville property dam adjacent to Cobaki Creek Road.

2.2 Vegetation

It is understood that details of vegetation will be covered in an environmental report. Generally vegetation is either golf course, grass in cleared areas, or pockets of a dense shrub and tree growth. Grassing has been achieved by the past clearing of basalt boulders now left

as windrows, the latter commonly defining the edge of treed areas. Treed areas also occur along the steep basalt scarps and restrict detailed mapping and drilling access.

2.3 Drainage

Drainage of the Norville property is by numerous small natural watercourses, towards Cobaki Creek with the exception of east and southeast aspects where minor courses drain hillslopes towards Bilambil Creek.

Drainage of the existing golf course is into a series of small dams placed along the watercourse bounding its north / northwestern extent. Comments on the availability of groundwater is discussed in section 6.0 below.

Along the western proposed boundary of the Norville property and in the north east corner at the footslopes of steep basalt hillside, springs and boggy areas occur where bedrock lies at a shallow depth.

Two dams occur at the contact between the volcanic rhyolite and the basalt and tracks traversing this contact were observed to be boggy; drilling returns from this contact showed higher than normal soil moisture content.

2.4 Geology

The oldest rocks, metasediments of the Neranleigh-Fernvale Group, occur in the valley floor along Cobaki Road formation and form the foot slopes of the Norville Property and the steep

ascent area between the proposed storage site and the existing two small water tanks located upslope of the basalt / metasediment contact. The metasediments are typically sandstone and siltstone, although beds of greywacke occur at two known locations near to the basalt - metasediment contact.

These are followed by Tertiary age basalt lava flows (Lamington Volcanic Group) which overlie the Neranleigh-Fernvale Group and form all the remaining Norville property and the golf course with the exception of the topographic high country.

The younger volcanic rhyolitic lava (Lamington Volcanic Group) overlies the basalt and forms the high points, that is, the distinctive hill at the southern end of the Norville property (Hotel precinct area) and the hill on the golf course near to the reservoir tank. (Clubhouse area) The rhyolite can be subdivided into two types; an upper tuffaceous rhyolite and a lower perlitic, vitreous (glassy) brittle rhyolite.

The contacts between the base of the basalt and underlying Neranleigh-Fernvale Beds and the top of the basalt and overlying rhyolite have their own weathering characteristics and locally control topography and soil type.

Recent alluvials of the Cobaki Creek form the low lying land at the Cobaki Road level. (Commencement of access road area)

3.0 SUBSURFACE PROFILE

Geological mapping (Figure 1), auger drilling (Appendix A), test pitting (Appendix A) and sample collection have been carried out across the proposed development site. Physical

properties of materials tested are discussed in section 4.0 below and summarised in Appendix C. The definition of selected geotechnical terms also appears in this appendix.

The geotechnical investigation identified boundaries between the different soil and rock types. Each type is associated with a typical profile (depth, weathering grade and material strength) with its own influence on site development. The site has therefore been subdivided into the various profiles which are referred to as geotechnical assessment units. (GAU's). Their relevance to geotechnical work is listed in Table 1 which can also be referred to in Figure 1 which locates the GAU's and the approximate location of contact boundaries between the main rock types.

A brief description of the profiles is given below and Table 2 summarises the main findings of the drilling and pit testing programme.

3.1 Rhyolite

The two types of rhyolite give different profiles. The tuffaceous rhyolite appears to have a gradational profile showing a gradual decrease in weathering and increase in rock strength with depth. Typically an intermediate to low plasticity soil (clay-silty clay) passes into a highly weathered, weak bedrock at about 2.0 metres below ground surface, becoming strong to very strong at about 5.0 - 7.0 metres below ground surface. (Depth estimated from exposure in the cut for the existing reservoir tank.) This depth is variable particularly if the land surface has been modified by removal of soil or placement of fill. Table 1 and Figure 1 shows this profile as [2A].

The perlitic and rhyolite appears not to have the gradational profile of the tuffaceous variety. Fresh to near fresh perlite is glassy, brittle and strong but with weathering can rapidly break down into a silt clay of low to high plasticity clay. Up to 4.0 metres or so of residual soil in this material has been recorded. Table 1 and Figure 1 shows this profile as [2B].

3.2 The Rhyolite / Basalt Contact.

In areas where there is a rhyolite / basalt contact, the development of 8 metres or more of highly weathered, very weak siltstones - claystones with near soil type properties can occur. This has been observed at the borrow pit area downslope of the existing reservoir tank.

These materials may not be limited to the present day weathered profile, but may continue, near horizontal, between the base of the Rhyolite and upper surface of the basalt. That is, drilling through the rhyolite may intersect soil to weak rock at depth, interbedded between strong rhyolite and basalt. Where erosion has exposed these ancient conditions in association with weathered basalt a complex weathered soil profile has resulted. Table 1 and Figure 1 shows this contact profile as 2A / 3B or 2B / 3B and may be present at 2A / 3C; 2B / 3C contacts.

3.3 Basalt

Because of an unstable silica contact volcanic rocks commonly weather rapidly and the typical gradation of rock to a residual soil can be absent; strong near fresh corestones rapidly pass into an adjacent weak highly weathered basalt. This makes assessment of soil profile difficult - drilling refusal may indicate a corestone and not necessarily the depth at which weak, highly weathered basalt is absent.

Soil thickness includes colluvial and residual soils and in most places differentiation between the two is uncertain particularly over the basalt areas where loose rock boulders may either have originated from short distances upslope (ie: colluvial 'floaters') or be in-situ corestones, (the residual product of weathered basalt.) Figure 4 illustrates the relationship between colluvium, residual soil and weathered rock.

Soil thickness can also vary depending on its topographic position. Down the centre of the Norville property 4.0 metres or more of plastic clay and clay with corestones occur and are assumed to overly massive, strong basalt although this has yet to be proved by drilling. This contrasts to steep hillside - scarp areas where perhaps up to twice this thickness may occur in areas where both colluvial and residual soils have accumulated and where strong massive layers of basalt may be completely absent.

Figure 4 shows now a profile of soil upon rock can pass into an underlying soil. A reverse weathered profile is not uncommon in areas of numerous thin basalt flows and care must be taken that investigation identifies the presence of a reverse profile and that any bedrock used as a foundation horizon is not underlain by a soil.

Table 1 and Figure 1 show basalt scarp profile as unit [3B] and the more typical basalt profile away from steep areas as unit [3A]. Ground with a topography between 3A and 3B type profiles is described as GAU 3C and is assumed to have a profile somewhere between the two.

3.4 Metasediments

These beds weather to give an intermediate to high plasticity clay. Depth of weathering is variable due to the different rock types found in the Neranleigh-Fernvale Beds. These are typically sandstones, siltstones and greywackes and shown as unit 4A in Table 1 and Figure 1. Depth to bedrock is typically 1.0 to 2.0 metres. However, in the steep hillside above the major dam on the Norville property, up to 4.3 metres of colluvium and residual soil is present.

3.5 Alluvials

Local knowledge of the area opposite to Norville's "Holmeview" indicate up to 6.0 metres of alluvial sands and gravels occur. Historically these alluvials have been used for aggregate and localised earthworks. It is understood that the proposed development will not utilise these materials. Table 1 and Figure 1 show these river alluvials as UNIT [1A].

TABLE 2: Summary of soil types from Borehole and Test Pit Programme

Neranleigh-Fernvale Beds [GAU: 4]	Typically a 2.0 metre residual soil (CL-CH) overlying 0.5 to 2.0 metres of highly weathered very weak bedrock. Depth to the weak bedrock may be greater than 4.0 metres in places, as shown by TP 15 and BH 27 where both show sandy clay (approximately 1.0 metre thick) overlying at least 2.0 metres of extremely weathered low strength metasediment. These locations may be a source of earthworks construction material.

Basalt (Spurs and undulatory topography.) [GAU: 3A]	Typically cobbles and boulders in colluvium within a residual CL-CH profile (mainly CH) known to be 4.7 metres thick in places. (TP 9) The residual clay is typically very stiff below 2.5 metres but can soften with depth. It is worth noting that massive fresh or near fresh basalt bedrock has not been intercepted. Excavation into 0.5 metres of extremely weathered basalt underlying 3.8 metres residual CH was achieved in TP 16. (3.8 to 4.3 metres).
Basalt (Scarp and steep hillside areas) [GAU: 3B / 3C]	Highly variable thicknesses of MH-CH clay with moderately strong (in-situ) corestones of highly weathered basalt passing into an underlying CL-CH clay soil. This repeated soil profile is greater than 8.8 metres thick in places. (BH 15)
Rhyolite [GAU: 2A / 2B]	Typically 1.5 to 2.0 metres ML-CI clay overlying extremely weathered very weak bedrock (eg: BH 9) Residual soil thickness greater towards base of the rhyolite (typically a perlitic variety of the rhyolite) where up to 4.0 metres has been recorded. (TP 12) and in the cut face adjacent to BH 16. In BH 16 the residual soil of the weathered rhyolite sits upon at least 2.0 metres of completely to extremely weathered bedrock (leached basalt profile?)

Based on preliminary field mapping, bedrock excavation in access road cuts is expected to be achieved without the need to blast

* At chainage CH: 660 metres a 6 - 10 metre cut may intersect a greywacke bed of the Neranleigh- Fernvale Group. The greywacke when fresh is typically very strong and may present slow excavation conditions.

* At chainage CH: 900 - 1000 metres a 6 - 10 metre cut through steep basalt scarps may go below the weathered profile into fresh extremely strong basalt which if massive with tight discontinuity's will present slow excavation conditions with the possibility of either a rock breaker or blasting being required. Site investigations to date indicate that the basalt is not likely to be massive, but made up of discrete corestones and weathered material, and will therefore be rippable.

* At chainage CH: 2000 - 2100 metres a 5 - 10m cut for the access road into rhyolite may intersect tight strong bedrock and present slow excavation conditions.

It is advised that drilling at these chainages (see Table 4) to a depth equal to the proposed design cuts be carried out to ascertain rock quality. Similarly, drilling at the site of the cut or cut and fill for the proposed Golf cart Storage area should be undertaken.

8.0 GEOTECHNICAL SUMMARY

Excavation across the site will be in several materials types with their own distinctive geotechnical properties. Geological mapping and subsurface investigations have identified the

locations of the various soil and rocks of the area. It is emphasised that geological and geotechnical properties are typically gradational yet can exhibit rapid lateral variations. Detailed geological assessment for specific site work during the construction period is strongly advised.

8.1 Statement of Foundation Conditions.

Generally, acceptable foundation conditions exist across the site. Areas where prediction is uncertain are:

(1). Along steep basalt scarps [GAU 3B and 3C - in part] where reverse weathering profiles occur and sound bedrock may be 8.0 metres or more below ground surface. Acceptable bedrock for unit foundations may occur at shallower depths where the profile includes an horizon of strong weathered basalt corestones. Drilling through this horizon to ascertain its thickness will be necessary before relying upon it as a foundation base.

(2) In areas described in (1) above but overlain by weathered rhyolite [contact of GAU 3B with 2A & 2B]. Drilling plus Standard Penetration Testing will need to be carried out if units are to be located on this material. High material moisture contents can be expected.

(3) Along the rhyolite / basalt contact generally (contact of GAU 3A with 2A and 2B) where depth of weathering is likely to be highly variable and where seepages from the contact can be expected. It is not yet known whether weak material at this contact is limited to depth of weathering below the present day ground surface or whether these conditions persist along the contact to pass beneath the hotel precinct and areas proposed for some of the units. The

intermittent presence of perlitic rhyolite at or adjacent to the rhyolite / basalt contact increases the uncertainty of the state of weathering and strength of material in the contact areas.

8.2. Statement on Site Slope Stability

There is no evidence of active landsliding on the site or degrading by collapse / slumping of the golf course. Instability may occur as a result of excavating the deep cuts for the proposed access road.

Slope failure modes include:

- basalt boulders and corestones rolling or toppling out of the cut
- rock blocks in the metasediments sliding or toppling from the cut / batters.
- slumping or circular soil-slip failure of the residual and colluvial soil.
- deterioration of cut batters by extensive gully erosion or rilling in the mildly dispersive soils of the Neranleigh-Fernvale metasediments.

The construction of cut-off drains and bench drains and their rehabilitation by vegetation of the slopes is expected to stabilise the cuts. In areas of deep cuts into basalt boulders and corestones, barriers placed at the foot of the cuts will be sufficient to keep the road clear of falls.

Limit equilibrium analyses of slopes using peak effective strength parameters for the Neranleigh Fernvale soils show that for soil covers of 1.5 to 2.5 metres thickness :-

* Slopes of 12° to 20° have calculated factors of safety against mass movements of between 1.8 and 2.9; and

* Slopes of 20° to 27° have factors of safety of between 1.5 and 1.8.

Hence one and two storey development on existing slopes of up to 20° does not represent a hazardous situation provided that siteworks do not increase the overall slope. However the marginal nature of the estimated factors of safety for slopes in excess of 20° will necessitate geotechnical review of individual building proposals at the planning stage.

Also arising from the stability analyses are the flowing conclusions :-

* For cut slopes in the residual soils and extremely weathered Neranleigh Fernvale bedrock, a long term factor of safety of 1.5 will limit heights and batter slopes to :-

Height of Cut (m)	Maximum Overall Batter Slope (H to V)
2.0	0.75 to 1
3.0	1 to 1
4.0	1.25 to 1
5.0	1.5 to 1

* Cut slopes in excess of 5.0 metres will require field assessment during excavation.

* The stability of the cut sloes in highly to slightly weathered bedrock will be controlled by defects in the rock mass rather than rock mass strength. However it is anticipated that cut slopes of 0.66 to 1 will be stable.

* Natural slopes of 7 to 1 (8°) require benching prior to placing and compacting fill.

8.3 Road Construction

Following bulk excavations, the subgrade along the road will vary from residual soils through weathered rock to moderately strong to strong bedrock. CBR tests indicate results of 9 to 15 with basaltic soils being the lowest grade material. We would recommend that these values be used for design purposes until more detailed information is available regarding the location and level of the road. Design CBR values should be confirmed once the subgrade is during exposed during construction.

The installation of sub soil drains will be required in areas where ground seepage is encountered. The areas of likely groundwater have been dealt with in this report.

With respect to subgrade preparation, should bedrock be exposed at subgrade level, the rock should be ripped to a depth of 0.3 metres and compacted to a density ratio of 90 per cent modified. For soil subgrades or select fills, recommended density ratios are :-

* Within 1 metre of final level — 100 % Standard Compaction
* 1 metre or more below final level — 95% Standard Compaction

Soil fill should be placed and compacted in layers not exceeding 200 mm loose thickness and at a moisture content in range of Optimum minus 1 per cent to Optimum plus 2 per cent.

8.4 Unit Development

This section report is intended to deal with the proposed unit construction. This assumes that the proposed units will fall within the scope of AS 2870 - 1996 'Residential Slabs and Footings'. Development outside the scope of this standard will require detailed analysis once final location and type of construction if available. Earthworks will also play a large part in the design of the footing systems for the proposed units and we would therefore recommend that each construction site be addressed individually once location and level are finalised.

Residual soils occurring in the study area are relatively strong and generally shallow strip / pad footings may be designed for an allowable bearing pressure of 150 kPa. However the clay soils are moderately reactive to moisture variations and the site conditions would be classified as Class **M** in accordance with AS 2870 - 1996 'Residential Slabs and Footings' where final soil depths exceed 1 metre. For soil depths of 0.4 to 1.0 metres, a classification of Class **S** could be adopted and Class **A** for depths of less than 0.4 metres.

Thus the design of foundations for individual structures will generally be governed by shrink / swell considerations as well as differential settlements due to varying fill depths. Alternate footing systems that may be adapted to the site conditions include :-

* Strip / Pad footings
* 'Deep Beam' strip footings
* Raft Slabs; and
* Pier and beam foundations

Due to the potentially expansive nature of the clay soils, it is recommended that gardens and large trees are not located in close proximity to dwellings as these can induce significant moisture changes beneath footings.

In areas where fill is to placed, slopes in excess of 8° will require terracing to key the fill onto the slope. Fill should be placed in layers of 200 millimetres loose thickness and each layer compacted to at least 95 per cent of the Maximum Dry Density for Standard Compaction at a moisture content in range of Optimum minus 1 per cent to Optimum plus 2 per cent.

Fill slopes supporting buildings should be battered to maximum gradients of 1.5 (H) to 1 (V) and limited in height to 2.5 metres. Structures should be set back at least 2.0 metres from the crest of fill slopes. Where fills do not support dwellings, the maximum height may be increased to 4 metres for a slope of 1.5 (H) to 1 (V) and 5.5 metres for a slope of 2 (H) to 1 (V). Placement of fill on slopes in excess of 20° is not recommended.

8.5 Retaining Walls

Where an excavated slope is to be cut to a slope of less than 1.25 (H) to 1 (V), some form of retaining structure will be necessary.

For large or important retaining structures, detailed analysis and design on an individual basis is recommended. For minor structures or preliminary purposes, the following design parameters may be adopted :

*	Bulk Density	1.8 t/m^3
*	Lateral Earth Pressure Coefficients	
	'At Rest' conditions	0.5
	'Active' conditions	0.4
*	Minimum lateral earth pressure	5.0 kPa

These parameters assume that adequate sub soil drainage is provided behind the walls to prevent any build up in hydro static pressure and that a free draining material is used as backfill. A minimum lateral earth pressure of 5 kPa has been recommended to allow for local surcharge and pressures developed during compaction of the backfill. This precaution may not be necessary for all applications.

8.6 Erosion & Siltation

The clay soils are generally not dispersive in nature and thus run off should not be turbid. However, the strong aggregation and bonding of soil particles could lead to erosion where high water velocities are allowed to develop on unprotected or unvegetated slopes.

The faces of cut or fill slopes should be protected from erosion by vegetation and / or artificial coverings. In addition, sheet run off should be intercepted by catch drains or diversion bunds above the cuts major slopes. It is likely that construction activities will result in some erosion and necessitate siltation control measures. Appropriate measures are detailed in the Soil Conversation Service of New South Wales publication 'Urban Erosion and Sediment Control'.

8.7 Further Site Investigation

Prior to finalisation of building design foundation and road alignment or dam site location it is considered the following site investigations should be carried out. A summary is given in Table 1.

Hotel Precinct:	A minimum of two cored boreholes to be drilled through varied rock types into basalt bedrock.
Clubhouse:	A minimum of two cored boreholes to be drilled two to three metres beyond golf cart storage foundations.
Access Road:	Drilling of deep cut areas into underlying bedrock.
Residential units located on basalt scarps:	Either dozer excavation of scarp or core drilling to establish soil / rock profile.
Residential units located	Occasional core drilling to confirm soil / rock profile.

on undulating basalt country:

Small dam sites on minor watercourse:	One or two test pits to bedrock and testing of soils for embankment usage.
Extension of existing dam site (s):	Numerous test pits to bedrock in both dam floor and abutments; assess suitability of available soils for embankment usage. Field permeability testing of reservoir floor
Groundwater:	Assess local knowledge of possibility of fractured rock aquifer at depth. Check yield and water quality.

TABLE 4: ACCESS ROAD INVESTIGATION - DRILL HOLE LOCATIONS

Chainage	
250 -270 *	Metasediment [GAU 4A]
440 - 450 *	Metasediments [GAU 4A]
550 - 600 *	Metasediments [GAU 4A]
Note 660 *	**Metasediment / Basalt contact ?**
830 -840 *	Basalt [GAU 3B/3C]
900 - 910 *	Basalt [GAU 3B/3C]
950 - 1000	[East side of centre line] [3C/3A]
1650 - 1700 *	Basalt [GAU 3B/3C]
Note 1900 *	**Perlite / Basalt contact?**
2050 - 2100 *	Rhyolite [GAU 2B]

Note 2700	**Tuff / Perlite contact? [GAU 2A / 2B]** [West side of centre line]

* Unless indicated otherwise holes are to be located upslope of proposed road centre line.

9.0 OVERALL ASSESSMENT

- There are no geological conditions at the site which would indicate that the proposed development cannot be satisfactorily realised.
- There are no geological conditions at the site which because of the proposed development would adversely affect neighbouring properties.
- Further foundation investigation drilling in the location of the proposed hotel precinct and Clubhouse / golf cart storage area need to be carried out.
- Rock rippability of rhyolite below 5.0 to 7.0 metres may not be possible.
- Availability of underground water remains to be investigated.
- Consideration should be given to the enlargement of existing dams for reservoir storage.
- The rippability of deep cuts in basalt areas cannot be predicted. Further investigation of these deep cuts along the access road alignment is advised prior to commencement of excavation.
- In general the proposed location of all the residential units requires only confirmation foundation drilling with the exception of any units located on steep basalt scarp or on the contact of geological rock types where further foundation investigation to bedrock is advised.

- On-site geotechnical supervision for specific site works during the construction period is advised.

Thomas J Dick
B.E., M.I.E., C.P.Eng., L.G.E. (Q & NSW), R.P.E.Q. (4105)

John C Beal
M.Sc. (Geol), M.A.G.S, M.A.I.M.M, M.I.A.E.G, M.A.N.C.O.L.D.

Test Pit Results

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Appendix A

Field Results

Borehole Logs BH 1 to BH 30

Test Pit Logs TP 1 to TP 17

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 1
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			1.3		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. Trace of fine to medium irregular gravel (Surface cobbles & boulders frequent in places). Moist ($w<w_p$). Pale yellow/brown **(CL-CH)**	**STIFF** **VERY STIFF**
NERAN LEIGH FERNVALE GROUP			2.0		Extremely Weathered **ROCK:** Remoulds to Silty Sandy CLAY: Dry to moist. Pale yellow/ brown **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 1 TERMINATED AT 2.0m TUNGSTEN CARBIDE REFUSAL ON DISTINCTLY WEATHERED ROCK	

Logged By	JED	Date	22/7/96	Checked By	[illegible]	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 2
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			1.3		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. Trace of fine to medium irregular gravel Moist ($w<w_p$). Pale yellow/brown **(CL-CH)**	**STIFF** **VERY STIFF**
NERAN LEIGH FERNVALE GROUP			2.0		Extremely Weathered **ROCK:** Remoulds to Silty Sandy CLAY: Dry to moist, Pale yellow/ brown **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 2 TERMINATED AT 2.0m TUNGSTEN CARBIDE REFUSAL ON DISTINCTLY WEATHERED ROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 3
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency / Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			1.4		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. Trace of fine to medium irregular gravel. Moist ($w<w_p$). Pale yellow/brown **(CL-CH)**	**STIFF** **VERY STIFF**
NERAN LEIGH FERNVALE GROUP			2.0		Extremely Weathered **ROCK:** Remoulds to Silty Sandy CLAY: Dry to moist. Pale yellow/ brown **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 3 TERMINATED AT 2.0m TUNGSTEN CARBIDE REFUSAL ON DISTINCTLY WEATHERED ROCK	

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 4
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			0.8		Silty **CLAY:** High plasticity. Trace of fine to medium grained sand. Occasional cobbles. Moist ($w<w_p$). Red/brown **(CH)**	**STIFF**
RESIDUAL			1.3		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. Trace of fine to medium irregular gravel Moist ($w<w_p$). Pale yellow/brown **(CL-CH)**	**VERY STIFF**
NERAN LEIGH FERNVALE GROUP			2.9		Extremely Weathered **ROCK:** Remoulds to Silty Sandy CLAY: Dry to moist. Pale yellow/ brown **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 4 TERMINATED AT 2.9m ON EXTREMELY WEATHERED ROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 5
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL	Disturbed =12503 FMC=34.8				**CLAY:** High plasticity, With fine to medium grained sand and silt, Moist ($w<w_p$). Red/brown **(CH)**	**STIFF**
	0.5m Disturbed =12504 FMC=34.8		1.0			
	1.0m Disturbed =12505 FMC=37.2		1.6		Silty **CLAY:** High plasticity, With fine grained sand, Moist ($w\geq w_p$), Orange/brown **(CH)**	**STIFF**
	1.6m				**BH 5 TERMINATED AT 1.6m TUNGSTEN CARBIDE REFUSAL ON FLOATER OR BEDROCK**	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 6
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL	0.2m		0.2		**TOPSOIL**	
	Disturbed =12506 NMC=38.7				**CLAY:** High plasticity. With a trace of fine grained sand and silt. Moist ($w \leq w_p$). Red/brown **(CH)**	**STIFF**
	0.5m Disturbed =12507 NMC=39.3		1.0			
RESIDUAL	1.0m				Clayey **SILT:** High plasticity. Trace of fine grained sand. Moist ($w \leq w_p$). Red/brown **(MH)**	**VERY STIFF**
			2.0		**BH 6 TERMINATED AT 2.0m**	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 7
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			2.3		Silty **CLAY:** High plasticity. Trace of fine grained sand. Occasional cobbles & floaters. Moist ($w<w_p$). Red/brown **(CH)**	**STIFF** **VERY STIFF**
					BH 7 TERMINATED AT 2.3m	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 8
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
	0.5m				Silty **CLAY:** High plasticity, With fine grained sand, Moist ($w \leq w_p$), Red/brown **(CH)**	**STIFF**
RESIDUAL	- Disturbed =12508 NMC=34.7		0.8			
	1.0m				Silty **CLAY:** High plasticity, With fine grained sand Moist ($w < w_p$), Red/brown **(CH)**	**VERY STIFF**
			1.5		**BH 8 TERMINATED AT 1.5m** **TUNGSTEN CARBIDE REFUSAL ON FLOATER**	

Logged By	JED	Date	23/7/96	Checked By	JCo	Date	14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 9
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL	0.2m		0.2		**TOPSOIL**	
RESIDUAL	Disturbed =12484 NMC=24.2				Clayey Sandy **SILT:** Medium plasticity. Sand fine to medium grained. Moist ($w \approx w_p$). Grey/brown **(ML-MH)**	**STIFF**
	0.5m Disturbed =12485 NMC=32.8		1.0			
	1.0m Disturbed =12486 NMC=30.5				Sandy **CLAY:** Low to medium plasticity. With fine to medium grained sand. Moist ($w \leq w_p$). Pale grey/brown (Rock structure evident) **(CL/CL-CH)**	**STIFF**
LAMINGTON VOLCANICS	1.5m Disturbed =12487 NMC=18.7		1.6		Extremely Weathered **ROCK:** Remoulds to Sandy CLAY: Low to medium plasticity. Fine to medium grained sand. Dry to moist ($w < w_p$). Pale grey/white **(XW)**	**EXTREMELY LOW STRENGTH**
	1.9m		1.9		**BH 9 TERMINATED AT 1.9m TUNGSTEN CARBIDE REFUSAL**	

Logged By	JED	Date	22/7/96	Checked By	JCO Date 14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 10
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
RESIDUAL			0.8		Sandy **CLAY:** Medium plasticity. With silt. Fine to medium grained sand. Dry to moist. Pale grey **(CL-CH)**	**VERY STIFF**
			1.4		Sandy **CLAY:** Medium plasticity. With silt. Fine to medium grained sand. Dry to moist ($w \geq w_p$). Pale grey/brown **(CL-CH)**	**STIFF**
			1.6		Silty **CLAY:** Medium plasticity. With silt. Fine to medium grained sand. Dry to moist. Pale yellow/brown **(CL-CH)**	**VERY STIFF**
LAMINGTON VOLCANICS			2.5		Extremely Weathered **ROCK:** Remoulds to Silty CLAY: Dry. Pale grey/white **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 10 TERMINATED AT 2.5m	

Logged By	JED	Date	22/7/96	Checked By JCO	Date 14-8-96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 11
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
	0.5m				**CLAY:** Medium plasticity. With fine to medium grained sand. Moist ($w<w_p$). Pale grey/ brown **(CL-CH)**	**STIFF**
	Disturbed =12509 FMC=25.5		0.9			
	1.0m					**FIRM/ STIFF**
RESIDUAL	Disturbed =12510 FMC=37.0				**CLAY:** Medium plasticity. With silt and fine grained sand. Moist ($w>w_p$). Pale grey/ brown **(CL-CH)**	**STIFF**
	2.0m		2.0		Silty **CLAY:** Medium plasticity. With fine to medium grained sand. Moist ($w<w_p$). Pale brown **(CL-CH)**	**STIFF**
			2.5		**BH 11 TERMINATED AT 2.5m**	

Logged By	JED	Date	23/7/96	Checked By	JGD Date 14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 12
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
RESIDUAL			1.0		Clayey SILT: High plasticity. With fine grained sand. Moist ($w<w_p$). Red/brown **(MH)**	**STIFF** / **VERY STIFF**
					BH 12 TERMINATED AT 1.0m IN VERY STIFF CLAYEY SILT	

Logged By	JED	Date	23/7/96	Checked By	JCO	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 13
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: GCH 200	**HOLE DIAMETER:** 110mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	**STIFF**
FILL			0.6		Gravelly Clayey **SILT:** High plasticity. With fine to medium grained sand. Fine to coarse irregular gravel. Moist ($w<w_p$). Red/brown **(MH)**	**VERY STIFF**
					BH 13 TERMINATED AT 0.6m **TUNGSTEN CARBIDE REFUSAL** **ON BEDROCK OR FLOATER**	

Logged By	JED	Date	24/7/96	Checked By	JCD	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 14
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL**	
RESIDUAL	0.4 U=50 PP=300 0.6		0.7		Clayey **SILT:** High plasticity. With fine to medium grained sand. Moist ($w<w_p$). Red/brown **(MH)**	**STIFF**
			0.9		Cobbles & Clayey **SILT:** High plasticity. With fine to medium grained sand & medium to coarse friable gravel. Moist ($w<w_p$). Red/brown **(MH)**	**DENSE/ STIFF**
					BH 14 TERMINATED AT 0.9m	

Logged By	JED	Date	24/7/96	Checked By	FCO	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 15/1
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
FILL	Disturbed =12511 NMC=29.5				Gravelly Silty **CLAY:** High plasticity. With fine to medium grained sand. Moist ($w<w_p$). Occasional cobbles . Red/brown **(CH)**	**STIFF**
	0.5m					
	0.8m		0.8			
COLLUVIUM	Disturbed =12512 NMC=16.8		0.9		Silty **SAND:** Fine to medium grained. Dry to moist Pale grey **(SM)**	**DENSE**
	0.9m					
	1.0m				Sandy **CLAY:** High plasticity. With silt. Fine to medium grained sand. Predominantly fine grained. Dry to moist ($w<w_p$). Red/brown **(CH)**	**STIFF**
	Disturbed =12513 NMC=24.8					
	1.5m		1.8			
	2.0m					
	Disturbed =12514 NMC=36.5					**STIFF**
	2.5m					
RESIDUAL					Silty **CLAY:** High plasticity. With fine grained sand. Moist ($w<w_p$). Red/brown **(CH)**	**VERY STIFF**
	4.2m					
	U50 PP>400					**VERY STIFF**
			4.5			
	4.55m				Continued on BH 15/2	

Logged By	JED	Date	24/7/96	Checked By	JCJ Date 14-8-96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 15/2
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
			4.5		Continued from BH 15/1	
	4.7m		4.7		Gravelly **CLAY:** High plasticity. With sand fine to medium grained. Fine to coarse irregular gravel.Some friable particles. Dry to moist ($w<w_p$). Red/brown **(CH)**	**STIFF**
	Disturbed =12515 NMC=45.0					
	4.9m				Silty **SAND:** Fine grained. Moist to wet. Grey **(SM)**	**DENSE**
	6.0m		5.9			
	Disturbed =12516 NMC=43.0				Completely Weathered **ROCK:** Remoulds to Silty CLAY: Fine to coarse grained sand. Intrusions (Quartz) Moisture ingress ($w \geq w_p$). Pale grey blotched and streaked pale orange/ brown **(RS)**	**STIFF**
RESIDUAL	6.5m					
			7.0		Clayey **SILT:** Medium plasticity. With clay and fine grained sand. Moist ($w>w_p$). Grey **(ML-MH)**	**STIFF**
	7.5m		7.5			
	Disturbed =12517 NMC=43.4		7.7		Sandy Clayey **SILT:** High plasticity. Fine to medium grained sand. Moist ($w>w_p$). Pale grey streaked grey and red **(MH)**	**STIFF**
	7.7m 8.0m					
	Disturbed =12518 NMC=46.4				Sandy Clayey **SILT:** Medium to high plasticity. Fine to medium grained sand. Moist ($w>w_p$). Grey blotched orange/brown **(ML-MH)**	**STIFF**
			8.5			
	8.5m				**BH 15 TERMINATED AT 8.5m**	

Logged By	JED	Date	24/7/96	Checked By TCO	Date 14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 16/1
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	GCH 200	**HOLE DIAMETER:**	110mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL	L O G O F C U T		2.3		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. Trace of fine to medium friable gravel. Moist ($w<w_p$). Pale yellow/brown **(CL-CH)**	**STIFF**
LAMINGTON VOLCANICS			3.6		Extremely Weathered **ROCK:** Remoulds to Silty CLAY: Medium plasticity. With fine to medium friable gravel. Moist ($w<w_p$). Pale yellow flecked white **(XW)**	**EXTREMELY LOW STRENGTH**
RESIDUAL			4.0		**CLAY:** High plasticity. With silt and fine grained sand. Dry to moist ($w<w_p$). Dark red/brown **(CH)**	**VERY STIFF**
					Continued on BH 16/2	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 16/2
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	GCH 200	**HOLE DIAMETER:**	110mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
			4.0		**Continued from BH16/1**	
RESIDUAL	4.2m U50 PP>400 4.55m		5.0		Completely Weathered **ROCK:** Remoulds to Silty CLAY: Medium plasticity. With fine to medium grained sand. Moist ($w \leq w_p$). Grey blotched orange/brown **(RS)** (Rock structure evident)	**STIFF**
LAMINGTON VOLCANICS			6.0		Extremely Weathered **ROCK:** Remoulds to Silty SAND: Fine to medium grained. Moist Grey streaked orange/brown **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 16 TERMINATED AT 6.0m **TUNGSTEN CARBIDE REFUSAL** **IN DISTINCTLY WEATHERED ROCK**	

Logged By	JED	Date	26/7/96	Checked By	JED	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 17
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL (BASALT)			1.6		Silty **CLAY:** High plasticity. Trace of fine to medium grained sand. Moist ($w \approx w_p$). Red/brown **(CH)**	**STIFF** / **VERY STIFF**
					BH 17 TERMINATED AT 1.6m TUNGSTEN CARBIDE REFUSAL ON FLOATER	

Logged By	JED	Date	9/8/96	Checked By	JGD	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 18
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL (BASALT)			0.9		Silty **CLAY:** High plasticity, Trace of fine to medium grained sand, Moist ($w \approx w_p$). Red/brown **(CH)**	**STIFF** **VERY STIFF**
					BH 18 TERMINATED AT 0.9m TUNGSTEN CARBIDE REFUSAL ON FLOATER	

Logged By	JED	Date	9/8/96	Checked By	JCD	Date	14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 19
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency / Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL (BASALT)			1.4		Silty **CLAY:** High plasticity. Trace of fine to medium grained sand. Moist ($w \approx w_p$). Red/brown **(CH)**	**STIFF** → **VERY STIFF**
					BH 19 TERMINATED AT 1.4m TUNGSTEN CARBIDE REFUSAL ON FLOATER	

Logged By	JED	Date	9/8/96	Checked By	JED	Date	14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 20
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL	0.0m				**TOPSOIL**	
	Disturbed =12545 FMC=18.2 0.5m		0.2		Sandy **CLAY:** Medium plasticity. With silt. Fine to medium grained sand. Dry to moist ($w<w_p$). Pale orange/brown **(CL-CH)**	**VERY STIFF**
RESIDUAL	U50 =12546 PP=>400 FMC=16.6		0.9		Silty Sandy **CLAY:** Low to medium plasticity. Fine to medium grained sand. Moist ($w<w_p$). Pale yellow/brown **(CL/CL-CH)**	**VERY STIFF/ HARD**
	0.65m 1.0m Disturbed =12547 FMC=4.7		1.3		Extremely Weathered **ROCK:** Remoulds to Silty SAND: With clay. Dry to moist. Pale yellow/white **(XW)**	EXTREMELY **LOW STRENGTH**
NERAN LEIGH FERNVALE GROUP	1.5m		2.1		**BH 20 TERMINATED AT 2.1m V BIT REFUSAL ON EXTREMELY WEATHERED ROCK**	

Logged By	JED	Date	26/7/96	Checked By	JCO Date 14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 21
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	HAND AUGER	**HOLE DIAMETER:**	65mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL	0.5m Disturbed =12548 FMC=1.5		0.7		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. With silt. Trace of fine angular gravel. Dry ($w<w_p$). Pale yellow/brown **(CL-CH)**	**VERY STIFF**
NERAN LEIGH FERNVALE GROUP	1.0m		1.2		Extremely Weathered **ROCK:** Remoulds to Silty Clayey SAND: Fine to medium grained. Dry to moist. Pale yellow/brown streaked white **(XW)**	**EXTREMELY LOW STRENGTH**
					BH 21 TERMINATED AT 1.2m HAND AUGER REFUSAL ON EXTREMELY WEATHERED ROCK	

Logged By	JED	Date	26/7/96	Checked By	JED	Date	14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 22
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	HAND AUGER	**HOLE DIAMETER:**	65mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			1.0		Silty **CLAY:** High plasticity. Trace of fine to medium grained sand. Moist ($w \approx w_p$). Red/brown (CH)	**STIFF** **VERY STIFF**
					BH 22 TERMINATED AT 1.0m **HAND AUGER REFUSAL ON FLOATER**	

Logged By	JED	Date	9/8/96	Checked By	JES	Date	14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 23
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 1466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
RESIDUAL			1.0		Clayey **SILT:** High plasticity. With fine grained sand. Moist ($w<w_p$). Red/brown **(MH)**	**STIFF** **VERY STIFF**
					BH 23 TERMINATED AT 1.0m IN VERY STIFF CLAYEY SILT	

Logged By	JED	Date	23/7/96	Checked By	Date 14.8.96

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 24
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL**	
FILL			0.7		Clayey SILT: High plasticity. With fine to medium grained sand. Moist ($w<w_p$). Red/brown **(MH)**	**STIFF**
			0.9		Cobbles & Clayey SILT: High plasticity. With fine to medium grained sand & medium to coarse friable gravel. Moist ($w<w_p$). Red/brown **(MH)**	**DENSE/ STIFF**
					BH 24 TERMINATED AT 0.9m **TUNGSTEN CARBIDE REFUSAL ON COBBLES**	

Logged By	JED	Date	24/7/96	Checked By	JGO	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 25
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL**	
FILL			0.7		Clayey **SILT:** High plasticity. With fine to medium grained sand. Moist ($w<w_p$). Red/brown **(MH)**	**STIFF**
			0.9		Cobbles & Clayey **SILT:** High plasticity. With fine to medium grained sand & medium to coarse friable gravel. Moist ($w<w_p$). Red/brown **(MH)**	**DENSE/ STIFF**
					BH 25 TERMINATED AT 0.9m **TUNGSTEN CARBIDE REFUSAL ON COBBLES**	

Logged By	JED	Date	24/7/96	Checked By	JD	Date 14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 26
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
RESIDUAL			1.0		Clayey SILT: High plasticity. With fine grained sand. Moist ($w<w_p$). Red/brown **(MH)**	**STIFF** **VERY STIFF**
					BH 26 TERMINATED AT 1.0m ON FLOATER	

Logged By	JED	Date	23/7/96	Checked By	JES	Date	14.8.96

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 27
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACKRO 200	**HOLE DIAMETER:** 110mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.1		**TOPSOIL**	
	0.4m U50 =12570 PP=250 NMC=13.9 0.8m				Sandy **CLAY:** Medium plasticity. With fine to medium grained sand. With a trace of silt. Moist ($w \approx w_p$). Pale yellow/brown **(CL-CH)**	**STIFF** **VERY STIFF**
RESIDUAL			1.2		Clayey Silty **SAND:** Fine to medium grained. Fines of low to medium plasticity. Moist. Pale yellow streaked white **(SC)**	**VERY DENSE**
NERAN-LEIGH FERNVALE GROUP			2.1		Extremely Weathered **ROCK:** Remoulds to Clayey Silty SAND: Fine to medium grained. Dry to moist. Pale orange blotched pale yellow/ brown **(XW)**	**EXTREMELY LOW STRENGTH**
			4.0		**BH 27 TERMINATED AT 4.0m**	

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BOREHOLE PROFILE

CLIENT: TERRANORA GROUP MANAGEMENT	**BOREHOLE No:** BH 28
PROJECT: TERRANORA RESORT PROJECT	**JOB No:** BT 4466
EQUIPMENT TYPE: JACRO 200	**HOLE DIAMETER:** 100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			0.8		Silty **CLAY:** High plasticity. Trace of fine to medium grained sand. Occasional cobbles. Moist ($w<w_p$). Red/brown **(CH)**	**STIFF**
RESIDUAL			1.3		Sandy **CLAY:** Medium plasticity. Fine to medium grained sand. Trace of fine to medium irregular gravel (ocassional cobbles). Moist ($w<w_p$). Pale yellow/brown **(CL-CH)**	**VERY STIFF**
					BH 28 TERMINATED AT 1.3m ON FLOATER	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 29
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			1.0		**CLAY:** High plasticity. With fine to medium grained sand and silt. Moist ($w<w_p$). Red/brown **(CH)**	**STIFF**
			1.6		Silty **CLAY:** High plasticity. With fine grained sand. Moist ($w \geq w_p$). Orange/brown **(CH)**	**STIFF**
					BH 29 TERMINATED AT 1.6m TUNGSTEN CARBIDE REFUSAL ON FLOATER OR BEDROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**BOREHOLE No:**	BH 30
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	JACRO 200	**HOLE DIAMETER:**	100mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency / Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			0.8		Silty **CLAY:** High plasticity. With fine grained sand. Moist ($w \leq w_p$). Red/brown **(CH)**	**STIFF**
			1.5		Silty **CLAY:** High plasticity. With fine grained sand Moist ($w < w_p$). Red/brown **(CH)**	**VERY STIFF**
					BH 30 TERMINATED AT 1.5m **TUNGSTEN CARBIDE REFUSAL ON FLOATER**	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 1
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL**	
RESIDUAL	PP>400 0.4m				Clayey SILT: High plasticity, Trace of fine grained sand, Moist ($w<w_p$). Red/brown **(MH)**	VERY STIFF
			1.1			
	PP>400 1.5m				Silty **CLAY:** High plasticity, Trace of fine grained sand, Occasional cobbles, Moist ($w \leq w_p$). Red/brown **(CH)**	VERY STIFF
			1.8			
LAMINGTON VOLCANICS					Extremely Weathered **ROCK:** Remoulds to matrix of frequent cobbles & Sandy Silty CLAY: Medium plasticity, Fine to coarse grained sand, Moist ($w<w_p$). Pale orange/brown (XW)	EXTREMELY LOW STRENGTH
			2.4			
					TP 1 TERMINATED AT 2.4m BUCKET REFUSAL ON FLOATER OR BEDROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 2
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
			1..4		Clayey **SILT:** High plasticity. Trace of fine grained sand. Moist ($w \leq w_p$). Red/brown **(MH)**	**STIFF**
RESIDUAL			2.4		Silty **CLAY:** High plasticity. Trace of fine grained sand. Occasional cobbles. Moist ($w < w_p$). Red/brown **(CH)**	**VERY STIFF**
			4.0		Silty **CLAY:** Medium plasticity. With fine grained sand. Moist ($w \leq w_p$). Orange/brown **(CL-CH)**	**VERY STIFF**
LAMINGTON VOLCANICS			4.7		Extremely Weathered **ROCK:** Remoulds to Silty CLAY: Medium plasticity. With fine to medium grained sand. Moist ($w < w_p$). Red/brown blotched grey **(XW)**	**EXTREMELY LOW STRENGTH**
					TP 2 TERMINATED AT 4.7m LIMIT OF MACHINE	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 3
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.4		**TOPSOIL & COBBLES**	
	PP=200				Clayey **SILT:** High plasticity. Trace of fine grained sand. Moist ($w \geq w_p$). Red/brown **(MH)**	**STIFF**
	0.6m		0.8			
					Clayey **SILT:** High plasticity. Trace of fine to medium grained sand. Occasional cobbles. Moist ($w < w_p$). Red/brown **(MH)**	**VERY STIFF**
			1.6			
	PP>400					
	1.8m					
RESIDUAL					Silty **CLAY:** Medium to high plasticity. Trace of fine to medium grained sand. Occasional cobbles. Moist ($w < w_p$). Orange/brown **(CL-CH)**	**VERY STIFF**
			3.2			
					Silty **CLAY:** Medium to high plasticity. Frequent cobbles. Moist ($w < w_p$). Orange/brown **(CL-CH/CH)**	**STIFF/ DENSE**
			3.8			
					TP 3 TERMINATED AT 3.8m BUCKET REFUSAL ON MATRIX OF FREQUENT COBBLES & SILTY CLAY	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 4
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
FILL			1.2		Clayey **SILT:** High plasticity. Trace of fine grained sand. Occasional cobbles. Moist ($w \leq w_p$). Red/brown **(MH)**	**STIFF**
RESIDUAL			1.9		Silty **CLAY:** High plasticity. Trace of silt. Frequent cobbles and boulders. Moist ($w < w_p$). Red/ brown **(CH)**	**VERY STIFF**
					TP 4 TERMINATED AT 1.9m BUCKET REFUSAL ON FREQUENT COBBLES & BOULDERS	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 5
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
FILL			0.9		Clayey **SILT:** High plasticity. With rubbble (Bricks & Timber) & occasional cobbles. Moist ($w \leq w_p$). Red/brown **(MH)**	**STIFF**
RESIDUAL			1.7		Clayey **SILT:** High plasticity. Trace of fine grained sand. Occasional cobbles. Moist ($w < w_p$). Red/brown **(MH)**	**STIFF**
			2.8		Silty **CLAY:** Medium to high plasticity. Trace of fine to medium grained sand. Moist ($w \leq w_p$). Orange/red/brown **(CL-CH/CH)**	**STIFF**
RESIDUAL SOIL/ROCK STRUCTURE			3.8		Sandy **CLAY:** Medium plasticity. With silt. Fine to medium grained sand. Moist ($w \leq w_p$). Pale Orange blotched grey **(CL-CH)** (Some rock structure evident)	**VERY STIFF/ HARD**
LAMINGTON VOLCANICS			4.2		Extremely Weathered **ROCK:** Remoulds to Sandy Clayey GRAVEL: Fine to coarse rounded & irregular gravel. Some friable particles & cobbles. Dry to moist. Grey blotched pale Red/brown **(XW)**	**EXTREMELY LOW STRENGTH**
					TP 5 TERMINATED AT 4.2m BUCKET REFUSAL ON COBBLES	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 6
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			0.4		Gravelly **CLAY:** Medium plasticity. With fine to coarse grained sand. Fine to coarse angular gravel. Some friable particles. Moist ($w \leq w_p$). Pale grey streaked pale orange **(CL-CH)**	**STIFF**
LAMINGTON VOLCANICS			1.0		Extremely Weathered **ROCK:** Remoulds to Clayey GRAVEL: Fine to coarse angular gravel. Some friable particles **(XW)**	EXTREMELY **LOW STRENGTH**
			1.4		Distinctly Weathered **ROCK:** Fine to medium grained particle size. Pale grey. Dry **(DW)**	**LOW STRENGTH**
					TP 6 TERMINATED AT 1.4m TUNGSTEN CARBIDE REFUSAL ON BEDROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 7
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL		1	0.2		**TOPSOIL**	
		2			Silty **CLAY:** High plasticity, Trace of fine grained sand, Moist ($w \leq w_p$), Red/ brown **(CH)**	**STIFF**
RESIDUAL		3	0.7			
		4			Gravelly **CLAY**/Clayey **GRAVEL:** Fine to coarse angular rounded gravel in matrix, With highly plastic silty clay, Moist ($w < w_p$), Red/brown **(CH/GC)**	**VERY STIFF/ VERY DENSE**
		5	1.1			
LAMINGTON VOLCANICS (BASALTIC)		6			Extremely Weathered **ROCK:** Remoulds to Clayey GRAVEL: Fine to coarse angular gravel, Exfoliated basalt particles in silty clay of high plasticity, Frequent cobles & boulders **(XW)**	**EXTREMELY LOW STRENGTH**
		7				
		8				
		9	1.9			
		0			**TP 7 TERMINATED AT 1.9m BUCKET REFUSAL ON BOULDERS OR BEDROCK**	
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		8				
		9				
		0				
		1				
		2				
		3				

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 8
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL & COBBLES**	
RESIDUAL			1.3		Silty **CLAY:** High plasticity. Trace of fine grained sand. Frequent cobbles. Moist ($w \leq w_p$). Red/brown **(CH)**	**STIFF**
					TP 8 TERMINATED AT 1.3m BUCKET REFUSAL ON BOULDERS OR BEDROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 9
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL:** With occasional cobbles	
COLLUVIUM			0.6		**CLAY:** Medium to high plasticity. With fine to medium grained sand. Moist ($w \leq w_p$). Grey **(CL-CH/CH)**	**STIFF**
RESIDUAL			2.6		Silty **CLAY:** High plasticity. Trace of fine grained sand. Moist ($w < w_p$). Red/brown **(CH)**	**VERY STIFF**
	3.6m		3.6		Silty **CLAY:** Medium plasticity. Trace of fine grained sand. Moist ($w \geq w_p$). Pale orange streaked red/brown and grey **(CL-CH)**	**STIFF**
	Disturbed PP=200				Silty **CLAY:** Medium to high plasticity. With fine to medium grained sand. Trace of fine to medium friable gravel. Moist ($w \leq w_p$). Pale grey mottled red/brown and orange/brown (Some structure evident) **(CL-CH/CH)**	**STIFF**
	4.0m		4.7			
					TP 9 TERMINATED AT 4.7m	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 10
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
			0.6		Clayey Sandy **SILT**: Medium plasticity. Fine to medium grained sand. Moist ($w \leq w_p$). Pale grey **(ML-MH)**	**STIFF**
RESIDUAL			1.4		Sandy **CLAY:** Medium plasticity. With silt and fine to medium grained sand. Dry to moist ($w < w_p$). Pale grey/white **(CL-CH)** (Some rock structure evident)	**VERY STIFF / HARD**
LAMINGTON VOLCANICS (RHYOLITE)			1.8		Extremely Weathered **ROCK:** Remoulds to Silty CLAY: Medium plasticity. With silt. Dry ($w < w_p$). Pale grey white **(XW)**	**EXTREMELY LOW STRENGTH**
					TP 10 TERMINATED AT 1.8m BUCKET REFUSAL	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	TEST PIT No:	TP 11
PROJECT:	TERRANORA RESORT PROJECT	JOB No:	BT 4466
EQUIPMENT TYPE:	CASE 550	HOLE DIAMETER:	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		TOPSOIL	
RESIDUAL	PP = >400		0.9		CLAY: Medium plasticity. Trace of fine to medium grained sand. Moist ($w<w_p$). Pale grey (CL-CH)	VERY STIFF
LAMINGTON VOLCANICS (RHYOLITE)			1.4		Extremely Weathered ROCK: Remoulds to Clayey SAND: Fine to medium grained. Dry. Pale grey/white (XW)	EXTREMELY LOW STRENGTH
					TP 11 TERMINATED AT 1.4m BUCKET REFUSAL ON DISTINCTLY WEATHERED ROCK	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 12
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL**	
COLLUVIUM	PP = 200		0.6		**CLAY:** Medium plasticity. With fine to medium grained sand. Moist ($w<w_p$). Pale grey **(CL-CH)**	**STIFF**
	0.7m				**CLAY:** Medium plasticity. With silt and fine to medium grained sand. Moist ($w \leq w_p$). Pale grey/brown **(CL-CH)**	**STIFF**
			1.6			
RESIDUAL	PP=150				Clayey **SILT:** Medium plasticity. Trace of fine grained sand. Moist ($w \geq w_p$). Pale grey **(ML-MH)**	**FIRM / STIFF**
	1.9m					
			2.8			
	PP=>400				Sandy Silty **CLAY:** Medium plasticity. Fine to medium grained sand. Moist ($w<w_p$). Pale orange brown blotched grey **(CL-CH)** (Rock structure evident)	**VERY STIFF**
	3.0m					
			3.6			
LAMINGTON VOLCANICS (TUFF)					Extremely Weathered **ROCK:** Remoulds to Sandy Silty CLAY: Medium plasticity. With fine to coarse friable gravel. Dry to moist. Pale grey/white **(XW)**	**EXTREMELY LOW STRENGTH**
			4.0			
					TP 12 TERMINATED AT 4.0m LIMIT OF MACHINE	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 13
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		**TOPSOIL**	
COLLUVIUM	PP = 180 0.6m		0.6		**CLAY:** Medium to high plasticity. Trace of silt & fine grained sand. Moist ($w \leq w_p$). grey **(CL-CH)**	**STIFF**
RESIDUAL	Disturbed Bulk Sample = 12565 0.9m		2.0		**CLAY:** High plasticity. Trace of silt & fine grained sand. Moist ($w < w_p$). Red brown **(CH)**	**VERY STIFF**
					TP 13 TERMINATED AT 2.0m	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	**TEST PIT No:**	TP 14
PROJECT:	TERRANORA RESORT PROJECT	**JOB No:**	BT 4466
EQUIPMENT TYPE:	CASE 550	**HOLE DIAMETER:**	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
	0.4m U50 =12564 PP=150 FMC=33.4					**STIFF**
	0.9m					
RESIDUAL	PP = >400				**CLAY:** High plasticity. Trace of fine grained sand. Occasional cobbles and boulders. Moist ($w<w_p$). Red/brown **(CH)**	**VERY STIFF**
	2.3m					
	3.8m					**VERY STIFF**
	Disturbed = 12568		4.2			
	4.2m				**TP 14 TERMINATED AT 4.2m**	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	TEST PIT No:	TP 15
PROJECT:	TERRANORA RESORT PROJECT	JOB No:	BT 4466

EQUIPMENT TYPE: CASE 550 HOLE DIAMETER: 450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.1		TOPSOIL	
	0.4m Disturbed =12566 NMC=14.4				Sandy CLAY: Medium plasticity. With fine to medium grained sand. With a trace of silt. Moist ($w \approx w_p$). Pale yellow/brown (CL-CH)	STIFF
	0.8m		1.2			
RESIDUAL					Clayey Silty SAND: Fine to medium grained. Fines of low to medium plasticity. Moist. Pale yellow streaked white (SC)	VERY DENSE
			2.1			
NERAN-LEIGH FERNVALE GROUP					Extremely Weathered ROCK: Remoulds to Clayey Silty SAND: Fine to medium grained. Dry to moist. Pale orange blotched pale yellow/ brown (XW)	EXTREMELY LOW STRENGTH
	3.8m Disturbed = 12567		4.0			
	4.0m				TP 15 TERMINATED AT 4.0m	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	TEST PIT No:	TP 16
PROJECT:	TERRANORA RESORT PROJECT	JOB No:	BT 4466
EQUIPMENT TYPE:	CASE 550	HOLE DIAMETER:	450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type. Structure	Consistency/ Rel. Density
TOPSOIL			0.3		TOPSOIL	
RESIDUAL			2.6		Silty **CLAY:** High plasticity. Trace of fine grained sand. Moist ($w \approx w_p$). Red brown **(CH)**	**STIFF**
			3.8		Sandy Silty **CLAY:** High plasticity. Fine to medium grained sand. Trace of fine to medium friable gravel. Moist ($w < w_p$). Red/brown **(CH)** (Some rock structure evident)	**VERY STIFF**
LAMINGTON VOLCANICS (BASALTIC)			4.3		Extremely Weathered **ROCK:** Remoulds to Sandy CLAY: Medium plasticity. With silt. Moist ($w < w_p$). Red/brown blotched grey **(XW)**	**EXTREMELY LOW STRENGTH**
					TP 16 TERMINATED AT 4.3m	

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BOREHOLE PROFILE

CLIENT:	TERRANORA GROUP MANAGEMENT	TEST PIT No:	TP 17
PROJECT:	TERRANORA RESORT PROJECT	JOB No:	BT 4466

EQUIPMENT TYPE: CASE 550 HOLE DIAMETER: 450mm

Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		**TOPSOIL**	
RESIDUAL			0.6		Clayey Sandy **SILT**: Medium plasticity. Fine to medium grained sand. Moist ($w \leq w_p$). Pale grey **(ML-MH)**	STIFF
			1.2		Sandy **CLAY:** Medium plasticity. With silt and fine to medium grained sand. Dry to moist ($w < w_p$). Pale grey/white **(CL-CH)** (Some rock structure evident)	VERY STIFF / HARD
LAMINGTON VOLCANICS			1.4		Extremely Weathered **ROCK:** Remoulds to Silty CLAY: Medium plasticity. With silt. Dry ($w < w_p$). Pale grey white **(XW)**	EXTREMELY LOW STRENGTH
					TP 17 TERMINATED AT 1.4m BUCKET REFUSAL	

Logged By JED Date 31/7/96 Checked By FCD Date 14.8.96

Form R18 Issue 1

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Appendix B

Laboratory Sample Test Results

Tabulation of Results
Report No. 2510 - Triaxial Test Results
Certificate No. 8448 - Soaked CBR Test Results
Certificate No. 8449 - Material Classification Test Results
Certificate No. 8459 - Material Classification Test Results

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Table D1 - Summary of Test Results

Sample Location	Sample Number	Geological Origins	NMC	LL	PL	PI	LS	S/S	c	Φ	OMC	MDD	CBR	% Passing Sieve Size			
														9.5 mm	2.36 mm	300 μm	75 μm
BH 9 0.5 to 1.0 m.	12485	Rhyolitic		38	27	11	5.0							100	98	90	79
BH 9 1.5 to 1.9 m.	12486	Rhyolitic		35	22	13	6.0								100	90	82
BH 8 0.5 to 1.0 m.	12508	Basaltic		71	44	27	16.0								100	99	85
BH 15 7.5 to 7.7 m.	12517	Basaltic		52	39	13	8.0								100	94	74
TP 13 0.6 to 0.9 m.	12565	Basaltic	28.5								37.5	1.29	9				
TP 14 0.4 to 0.9 m.	12569	Basaltic	33.4					1.4									
BH 15 4.2 to 4.55 m.	7171	Basaltic							110	18							
BH 15 5.7 to 5.92 m.	7172	Basaltic							70	24							

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Table D2 - Summary of test Results

Sample Location	Sample Number	Geological Origins	NMC	LL	PL	PI	LS	S/S	c	Φ	OMC	MDD	CBR	% Passing Sieve Size			
														9.5 mm	2.36 mm	300 μm	75 μm
BH 20 1.0 to 1.5 m.	12547	Meta - Sedimentary		39	23	16	8.0								100	94	81
BH 21 0.5 to 1.0 m.	12548	Meta - Sedimentary		42	25	17	8.0							100	98	90	79
TP 15 0.4 to 0.8 m.	12566	Meta - Sedimentary	14.5								16.5	1.76	15				
BH 27 0.4 to 0.8 m.	12570	Meta - Sedimentary	13.9					0.9									

Legend :

NMC = Natural Moisture Content (%)
LL = Liquid Limit (%)
PL = Plastic Limit (%)
PI = Plasticity Index (%)
LS = Linear Shrinkage (%)

S/S = Shrink / Swell Index (%)
c = Cohesion (kPa)
ϕ = Internal Angle of Friction (^{o})
OMC = Optimum Moisture Content (%)
MDD = Maximum Dry Density - Standard Compaction (t/m^3)

CBR = Soaked Californian Bearing Ratio (%)

EOTEST
ERING SERVICES PTY LTD
1935

Unit 2 / 37 Queens Rd, Everton Hills Q. 4053
P.O. Box 387, FERNY HILLS Q. 4055
PHONE: (07) 3353 4266
MOBILE: 018 733 795
FAX: (07) 3353 4409

REPORT NO : 2510
SHEET : 1 of 2

TRIAXIAL TEST RESULTS

TESTED IN ACCORDANCE WITH BISHOP & HENKEL & GEOTEST INTERNAL METHOD

CLIENT : BORDER - TECH

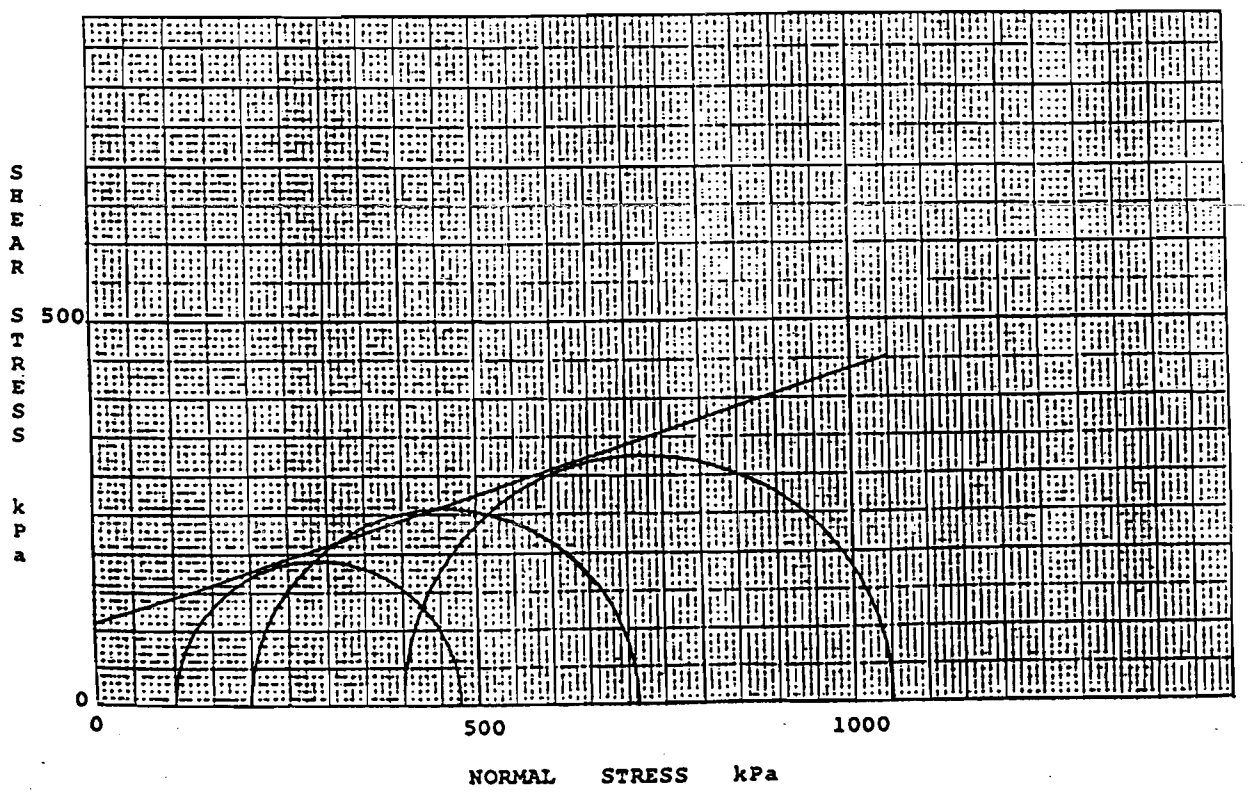
JOB NO : G066/3

PROJECT : TERRANORA LAKES DEVELOPMENT

DATE : 29.07.96

RESULTS

SAMPLE NUMBER		7171	HOLE NUMBER	15	
TEST TYPE/SAMPLE TYPE		Quick Undrained, Staged 50mm Undisturbed	DEPTH (m)	4.20 to 4.55	
EFFECTIVE CONFINING STRESS		100	200	400	kPa
INITIAL MOISTURE CONTENT		46.6	-	-	%
WET DENSITY		1.76	-	-	t/cu.m
DRY DENSITY		1.20	-	-	t/cu.m
MAXIMUM DEVIATOR STRESS		380	512	643	kPa
AXIAL STRAIN AT FAILURE		5.5	12.5	18.5	%
VISUAL CLASSIFICATION		SILTY CLAY : medium plasticity, red brown and light brown.			
COHESION (c)	110 kPa	INTERNAL FRICTION ANGLE (ϕ)			18



664

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29 JUL 1996

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71935

Unit 2 / 57 Queens Rd, Everton Hills Q. 4053
P.O. Box 387, FERNY HILLS Q. 4055
PHONE: (07) 3353 4266
MOBILE: 018 733 795
FAX: (07) 3353 4409

TRIAXIAL TEST RESULTS

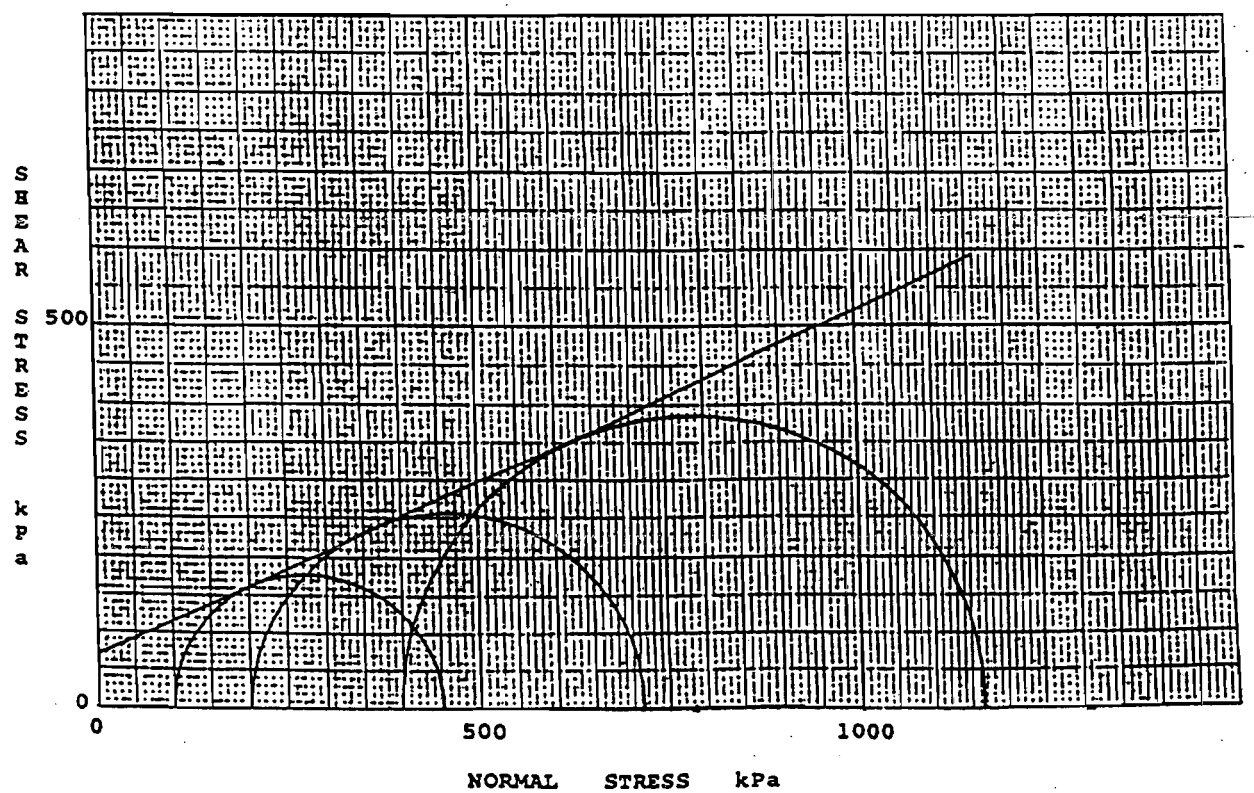
TESTED IN ACCORDANCE WITH BISHOP & HENKEL & GEOTEST INTERNAL METHOD

CLIENT : BORDER - TECH JOB NO : G066/3

PROJECT : TERRANORA LAKES DEVELOPMENT DATE : 29.07.96

RESULTS

SAMPLE NUMBER		7172	HOLE NUMBER	15	
TEST TYPE/SAMPLE TYPE		Quick Undrained, Staged 50mm Undisturbed	DEPTH (m)	5.7 to 5.92	
EFFECTIVE CONFINING STRESS		100	200	400	kPa
INITIAL MOISTURE CONTENT		39.3	-	-	%
WET DENSITY		1.83	-	-	t/cu.m
DRY DENSITY		1.31	-	-	t/cu.m
MAXIMUM DEVIATOR STRESS		338	511	764	kPa
AXIAL STRAIN AT FAILURE		5.0	9.0	14.5	%
VISUAL CLASSIFICATION		SILTY CLAY : low plasticity, brown and grey.			
COHESION (c)	70 kPa	INTERNAL FRICTION ANGLE (ϕ)			24



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echnical Engineering Services
3/12 Greenway Drive
d Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

:ALIFORNIA BEARING RATIO REPORT

		REPORT NUMBER:	8448
LIENT :	TERRANORA GROUP MANAGEMENT	JOB NUMBER :	BT 4466
ROJECT :	TERRANORA RESORT PROJECT	DATE OF ISSUE :	13/8/96

est Methods: AS 1289 F1.1, 2.1.1 - 1977, 5.1.1 - 1993

EST DATA

mple Number	12565	12566		
ate Sampled	31/7/96	31/7/96		
ate Tested	6/8/96	6/8/96		
st Location and Level	TEST PIT TP13 0.6 - 0.9 Below Natural Surface Level	TEST PIT TP15 0.4 - 0.8 Below Natural Surface Level		

ESULTS

.B.R. (%)	9	15		
netration (mm)	5.0	5.0		
ak Period	4 Days	4 Days		
laterial Description	Red Brown Silty CLAY	Pale Yellow Brown Sandy CLAY		

ABORATORY DATA

of rock retained on 19mm sieve	nil	nil		
lass of Rammer (kg)	2.7	2.7		
rop of Hammer (mm)	300	300		
ayers/Blows per Layer	3/53	3/53		
laximum Dry Density (t/m^3)	1.29	1.76		
ry Density Before Soaking (t/m^3)	1.28	1.76		
ry Density After Soaking (t/m^3)	1.28	1.76		
lass of Surcharge (kg)	6.75	6.75		
well (%)	0.0	0.5		

OISTURE CONTENTS

atural (%)	28.5	14.4		
ptimum Moisture (%)	37.3	16.7		
s Compacted (%)	38.0	17.0		
loisture after soak (%)	39.6	18.2		
op 30 mm Layer (%)	43.6	19.7		
ntire depth of Sample (%)	42.3	18.2		

g. No. 2851

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technical Engineering Services
6/12 Greenway Drive
ed Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

MATERIAL CLASSIFICATION

REPORT NUMBER:	8449

LIENT :	TERRANORA GROUP MANAGEMENT	JOB NUMBER :	BT 4466
ROJECT :	TERRANORA RESORT PROJECT	DATE OF ISSUE :	13/8/96

est Methods : AS1289 3.1.1, 3.2.1, 3.3.1, 3.4.1 & 3.6.1 - 1995

est Data				
imple Number	12485	12487	12508	12517
ate Sampled	24/7/96	24/7/96	24/7/96	24/7/96
ate Tested	30/7/96	30/7/96	30/7/96	30/7/96
est Location and Level	Borehole BH 9 0.5 - 1.0 m.	Borehole BH 9 1.5 - 1.9 m.	Borehole BH 8 0.5 - 1.0 m.	Borehole BH15 7.5 - 7.7 m.

LASTICITY INDEX RESULTS

inear Shrinkage (%)	5.0	6.0	16.0	8.0
iquid Limit (%)	38	35	71	52
astic Limit (%)	27	22	44	39
asticity Index (%)	11	13	27	13
ould Length (mm)	250	250	250	150
rumbling / Curling	nil	nil	nil	nil
rying Procedures	air	air	air	air
reparation	dry	dry	dry	dry

ARTICLE SIZE DISTRIBUTION RESULTS

ieve Size -	% Passing	% Passing	% Passing	% Passing
19.0 mm				
9.5 mm				
4.75 mm	100			
2.36 mm	98			
1.18 mm	96	100		100
600 micron	94	95		97
300 micron	90	90		94
150 micron	84	85		86
75 micron	79	82		74

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6/12 Greenway Drive
:d Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

[ATERIAL CLASSIFICATION

REPORT NUMBER:	8459

.IENT :	TERRANORA GROUP MANAGEMENT	JOB NUMBER :	BT 4466
:OJECT :	TERRANORA RESORT PROJECT	DATE OF ISSUE :	13/8/96

st Methods : AS1289 3.1.1, 3.2.1, 3.3.1, 3.4.1 & 3.6.1 - 1995

st Data				
mple Number	12547	12548		
ıte Sampled	26/7/96	26/7/96		
ıte Tested	30/7/96	30/7/96		
st Location and Level	Borehole BH 20 1.0 - 1.5 m.	Borehole BH 21 0.5 - 1.0 m.		

.ASTICITY INDEX RESULTS

near Shrinkage (%)	8.0	8.0		
quid Limit (%)	39	42		
astic Limit (%)	23	25		
asticity Index (%)	16	17		
ould Length (mm)	250	250		
:umbling / Curling	nil	nil		
:ying Procedures	air	air		
'eparation	dry	dry		

ARTICLE SIZE DISTRIBUTION RESULTS

ieve Size -	% Passing	% Passing	% Passing	% Passing
19.0 mm	–			
9.5 mm		100		
4.75 mm		99		
2.36 mm	100	98		
1.18 mm	99	97		
600 micron	98	95		
300 micron	94	90		
150 micron	85	82		
75 micron	81	79		

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Appendix C

Site Plans

Key to Site Plans - Dwg. No. 1

Borehole Location Plan (South East Section) - Dwg. No. 2

Borehole Location Plan (South West Section) - Dwg. No. 3

Borehole Location Plan (North West Section) - Dwg. No. 4

Borehole Location Plan (Gun Club Area) - Dwg. No. 5

Key to Geotechnical Assessment Unit Maps - Dwg. No. 6

Geotechnical Assessment Unit Legend

Geotechnical Assessment Unit Map (North West Section) - Dwg. No. 7

Geotechnical Assessment Unit Map (South West Section) - Dwg. No. 8

Geotechnical Assessment Unit Map (South East Section) - Dwg. No. 9

Geological Explanation Sheet - Dwg. No. 10

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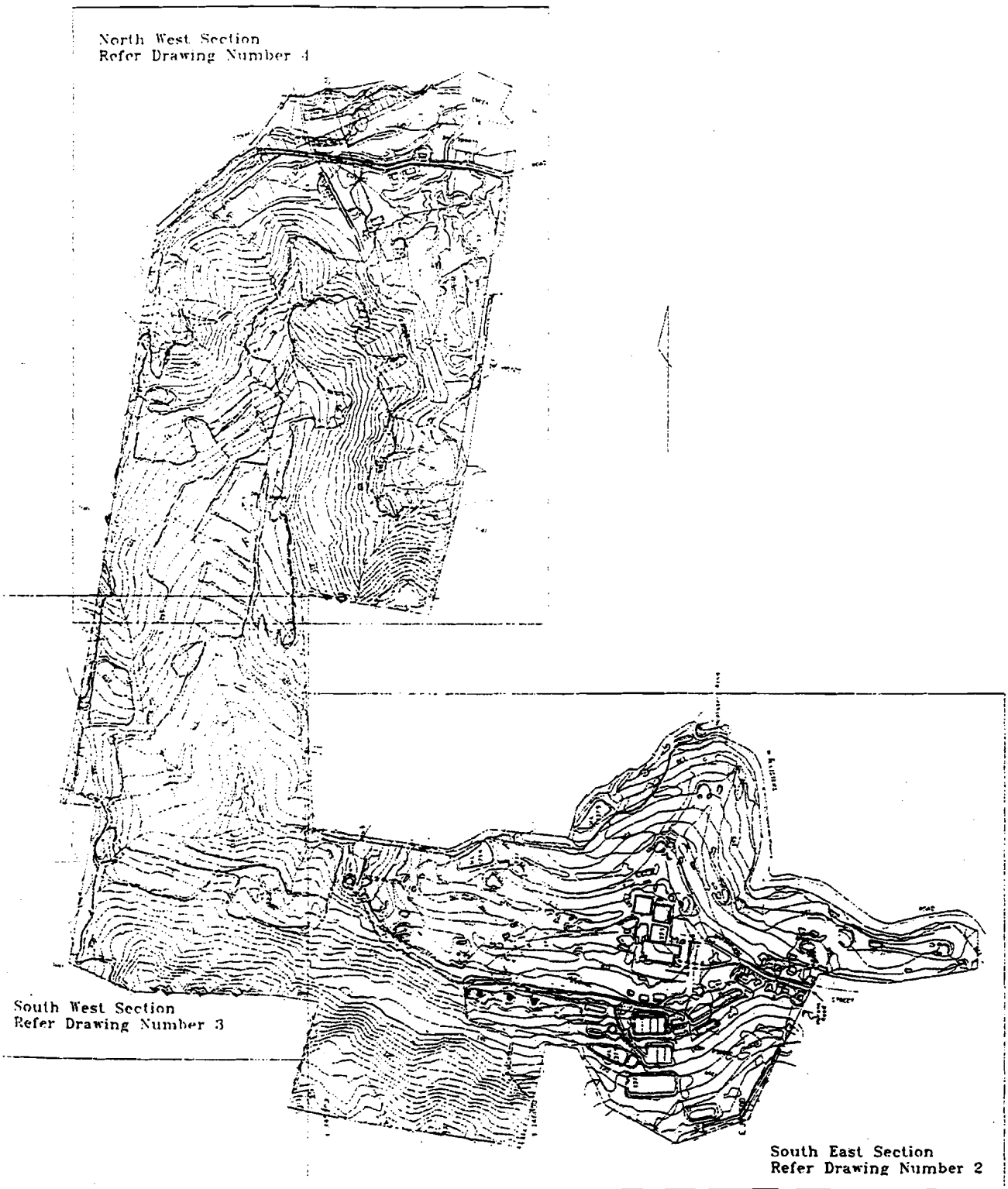
Site Sketch Plan



Client	Terranora Group Management	Title	Terranorra Resort Project Overall Plan Key to Site Plans	Drawing No Date Revision No	1 30/10/96 2

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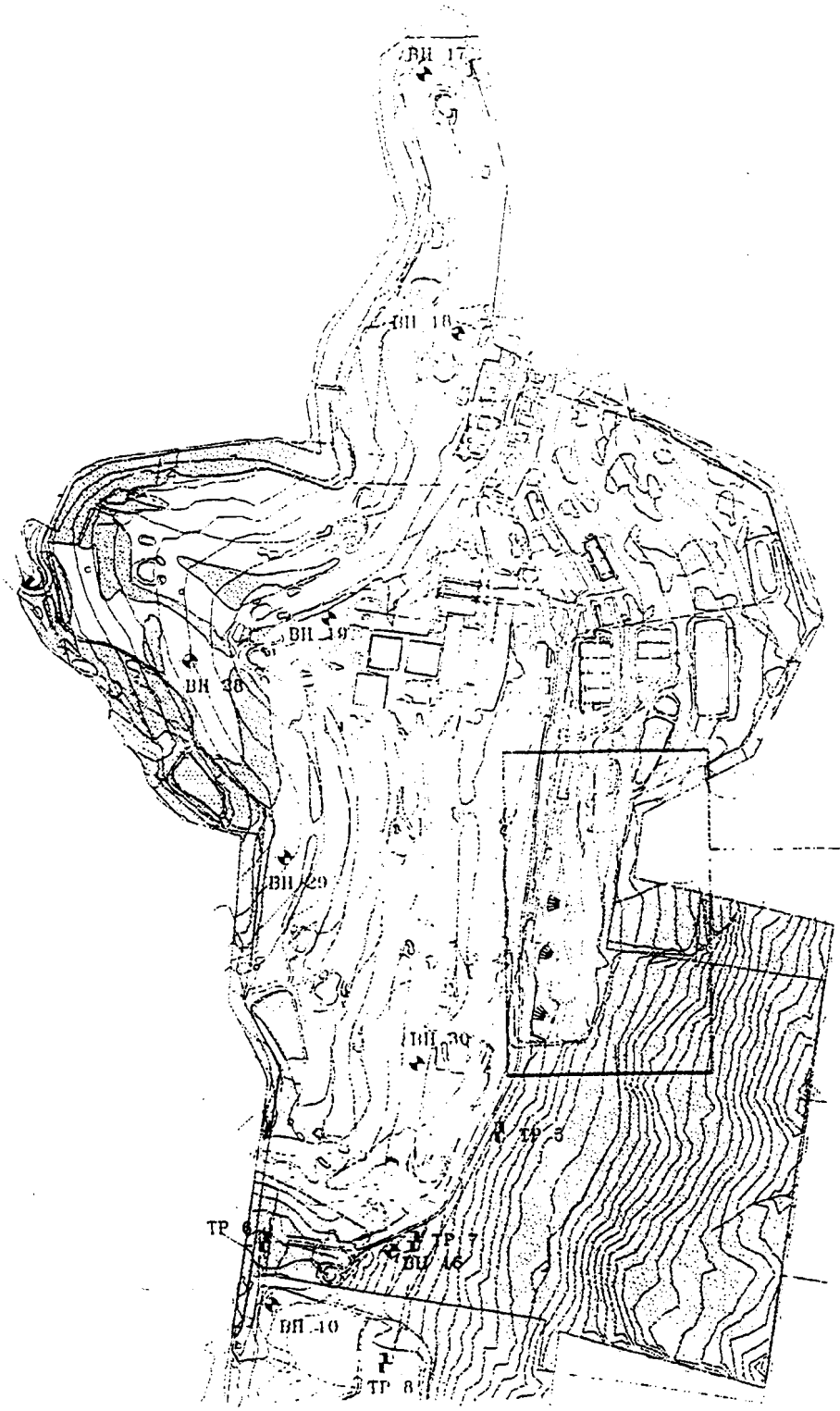
Site Sketch Plan



Legend

- Dense vegetation
- Dam or water course
- Existing access track
- Borehole Location
- Test Pit Location

Client	Terranora Group Management	Title	Terranorra Resort Project Borehole Location Plan South East Section	Drawing No Date Revision No	2 30/10/96 2

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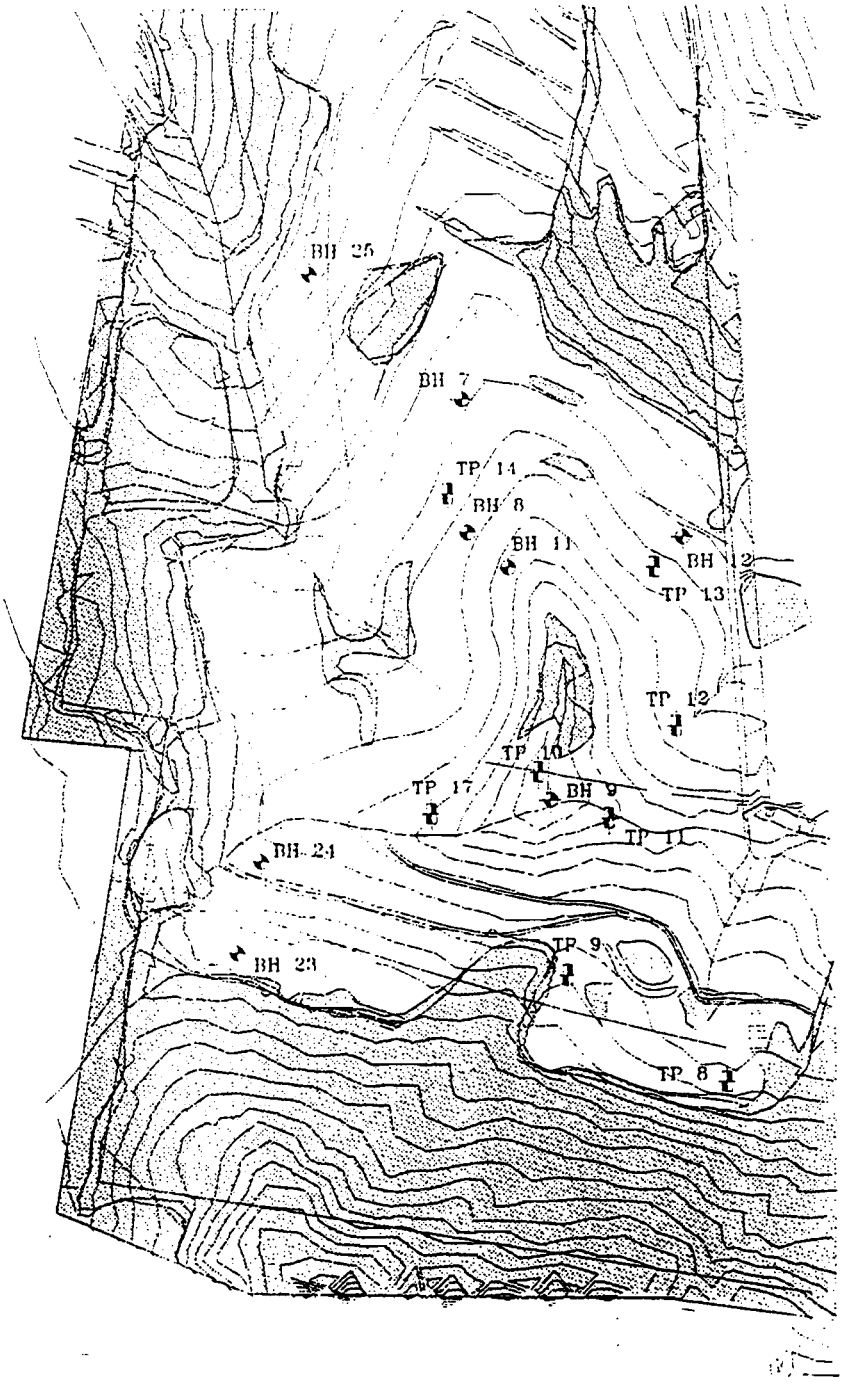
Site Sketch Plan



Legend

- Dense vegetation
- Dam or water course
- Active Spring
- Borehole Location
- Test Pit Location
- Existing access track

Client	Terranora Group Management	Title	Terranorra Resort Project Borehole Location Plan South West Section	Drawing No Date Revision No	3 30/10/96 2

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Site Sketch Plan

Legend

- Dense vegetation
- Dam or water course
- Active Spring
- Borehole Location
- Test Pit Location
- Existing access track

Client	Terranora Group Management	Title	Terranorra Resort Project Borehole Location Plan North West Section	Drawing No Date Revision No	4 30/10/96 2

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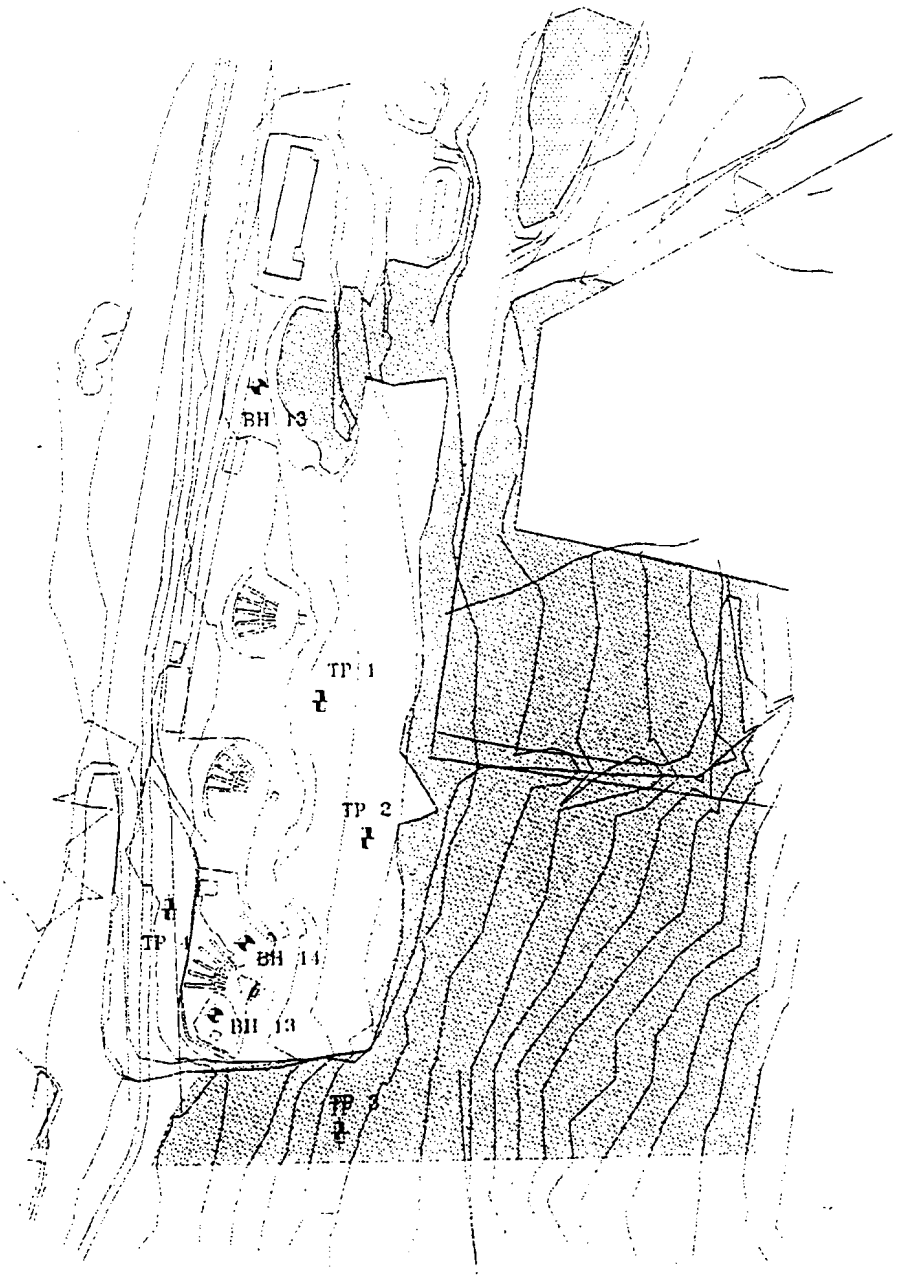
Site Sketch Plan



Legend

- Dense vegetation
- Dam or water course
- Existing access track
- Borehole Location
- Test Pit Location

Client	Terranora Group Management	Title	Terranorra Resort Project Borehole Location Plan Inet From Drawing 2 - Gun Club Area	Drawing No Date Revision No	5 30/10/96 2

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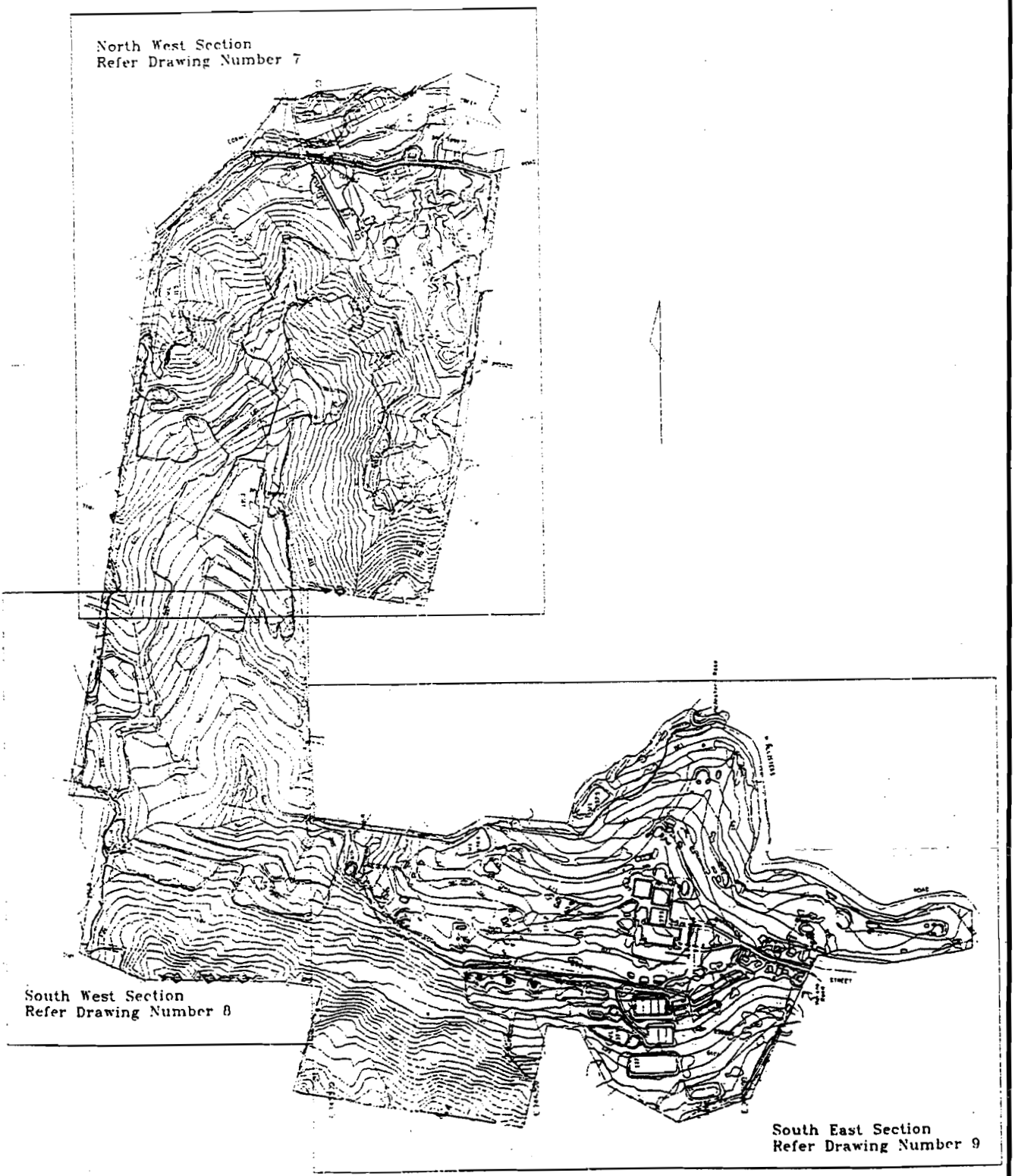
Site Sketch Plan



Client	Terranora Group Management	**Title**	Terranorra Resort Project Overall Plan Key to G.A.U. Maps	Drawing No Date Revision No	6 30/10/96 2

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GEOTECHNICAL ASSESSMENT UNITS.

	GEOTECHNICAL ASSESSMENT UNIT		GEOTECHNICAL CONSIDERATIONS
1A	1A	RECENT ALLUVIUM 5.0 to 7.0 m (?) river gravels and clay	Possible access road bridge site ? Placement of access road culverts and embankment ?
2A	2A	TUFFACEOUS RHYOLITE 1.5 to 2.0 ML-CI grading to strong rock at 4.0 to 7.0 m	Hotel foundation excavation. Clubhouse-golf cart storage Deep cuts for access roaad Foundations for residential units
2B	2B	PERLITIC RHYOLITE 2.5-4.0+m CL-CH strong bedrock 2.0-> 4.0m ??	Possiby intercepted beneath Hotel if deep foundation Possibly deep cuts for access road Foundation for residential units
3A	3A	BASALT (Undulating topography) 2.0->4.0 m CH grading to strong corestones bedrock.	Possibly deep cuts for access road. Foundation for residential units Landscaping for golf course.
3B	3B	BASALT (Steep Scarps) 1.0->8.5m MH-CH with bands of weathered corestones, very weak to very strong in places	Deep cuts for access road Foundation for residential units
3C	3C	BASALT (mainly treed steep hillslopes) Assume profile as for 3A to 3B	Deep cuts for road access Foundation for residential units
4A	4A	METASEDIMENTS 2.0->4.0m CL-CH overlying strong bedrock	Deep cuts for road access Foundation for site storage building
4B	4B	RESERVOIR SITE	
4C	4C & 4D	RESERVOIR SITE	Proposed enlargement of existing dams at 4C and 4D into main surface storage reservoirs.
D5	D5	POSSIBLE MINOR WATERCOURSE DAM SITE [D_1 to D_5]	(Mainly on 3A and 3C)
	RC	ACCESS ROAD WITH PROPOSED DEEP CUT INVESTIGATION SITE	Major earthworks eg: possible embankments associated with reservoirs.

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Site Sketch Plan

Client	Terranora Group Management	**Title**	Terranorra Resort Project Geotechnical Assesment Unit Map North West Section	Drawing No Date Revision No	7 30/10/96 2

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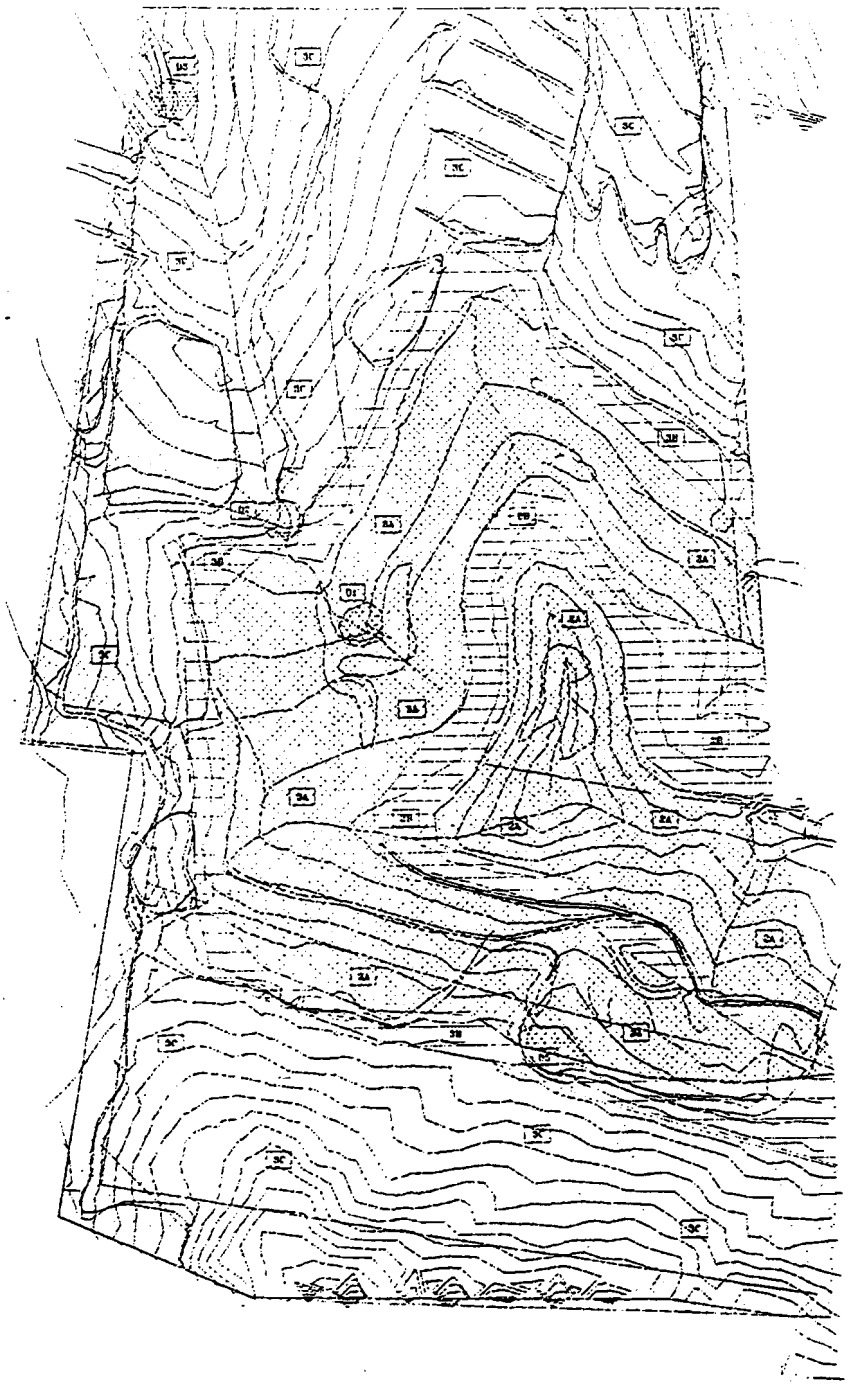
Site Sketch Plan



Client	Terranora Group Management	Title	Terranorra Resort Project Geotechnical Assesment Unit Map South West Section	Drawing No Date Revision No	8 30/10/96 2

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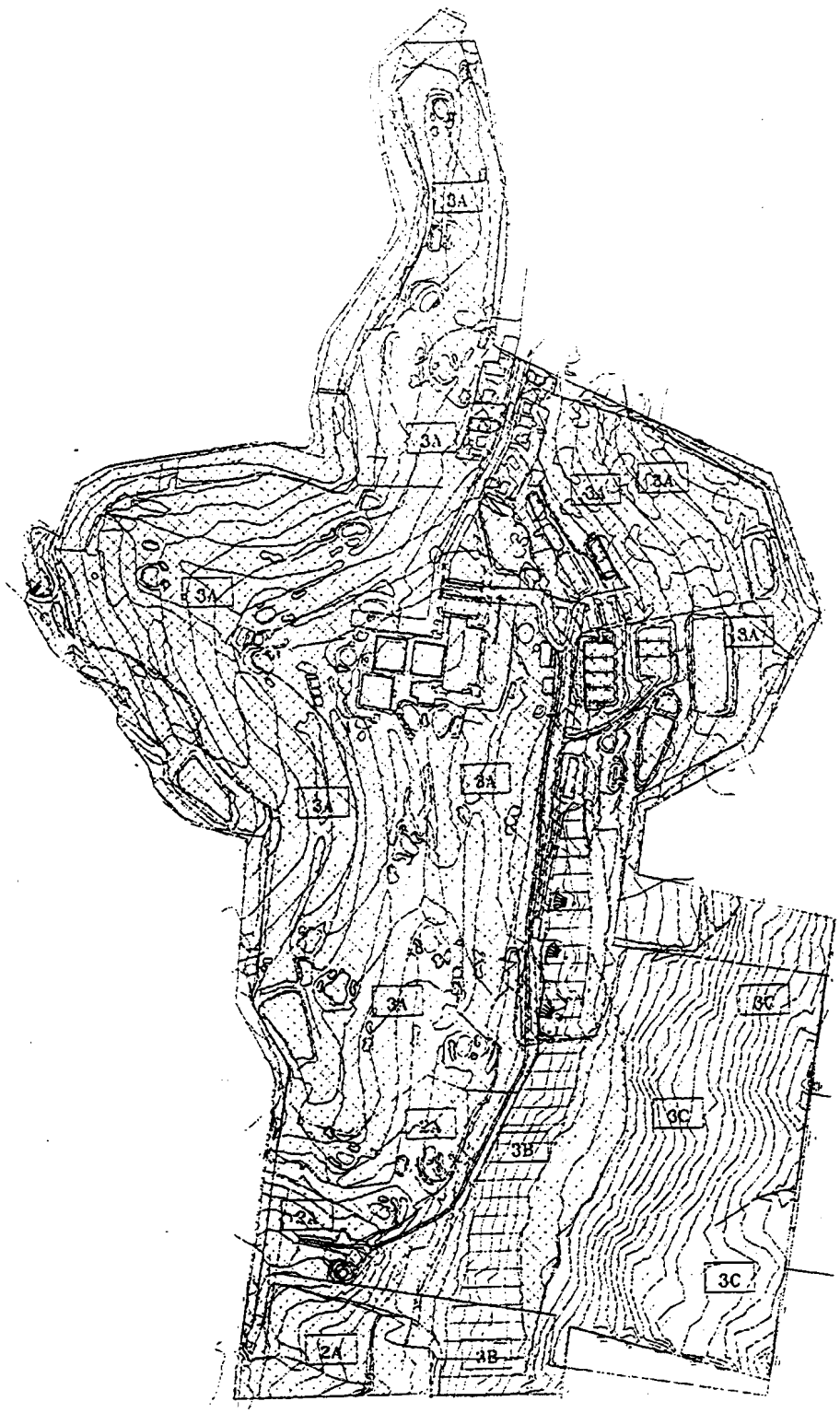
Site Sketch Plan



Client	Terranora Group Management	Title	Terranorra Resort Project Geotechnical Assesment Unit Map South East Section	Drawing No Date Revision No	9 30/10/96 2

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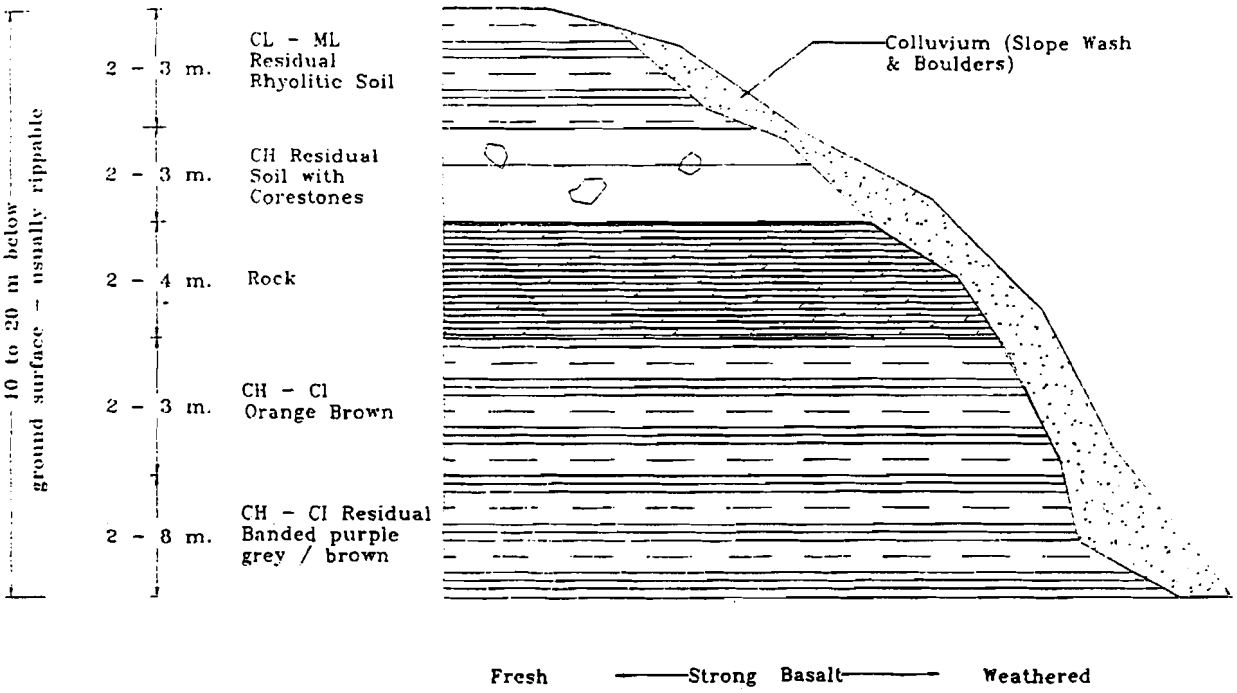
GEOTECHNICAL ENGINEERING SERVICES

Site Sketch Plan

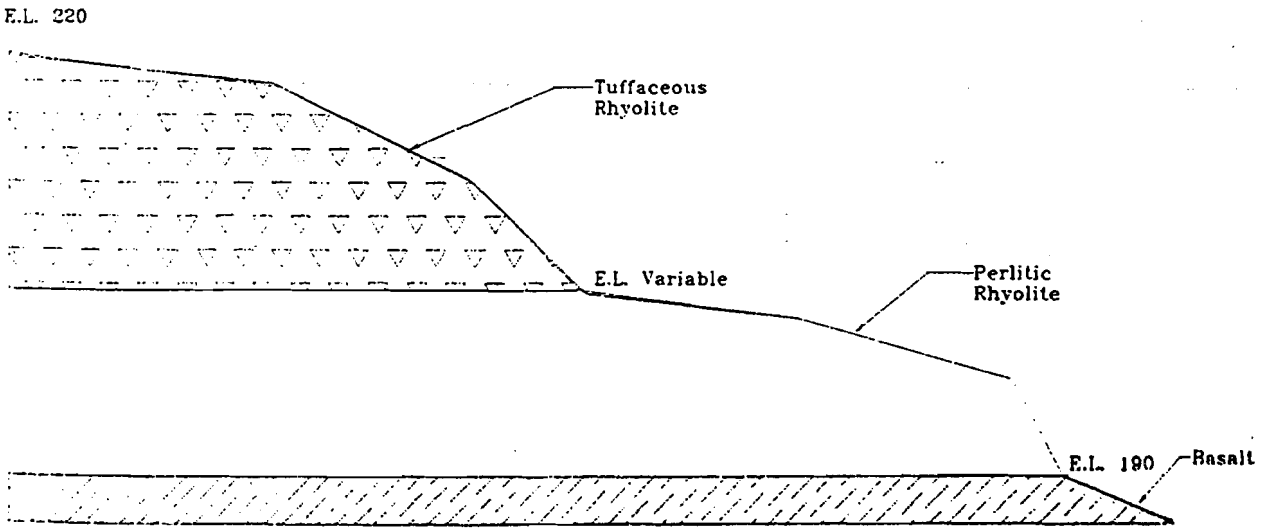
Reverse Weathering Profile in Basalt Scarps

Figure 4



Note This is a typical figure only intended to show typical profile

Relationship Between Tuffaceous Rhyolite and Perlitic Rhyolite / Basalt Contact



Client	Terranora Group Management	Title	Terranorra Resort Project Geological Explanation Sheet	Drawing No Date Revision No	10 30/10/96 2

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Appendix D

Photographic Plates

Plate Number 1 - Borrow Pit Area

This photograph shows the contact between the base of the highly weathered rhyolite overlying the highly weathered leached surface of the basalt flow. (GAU 2A (2B) / 313)

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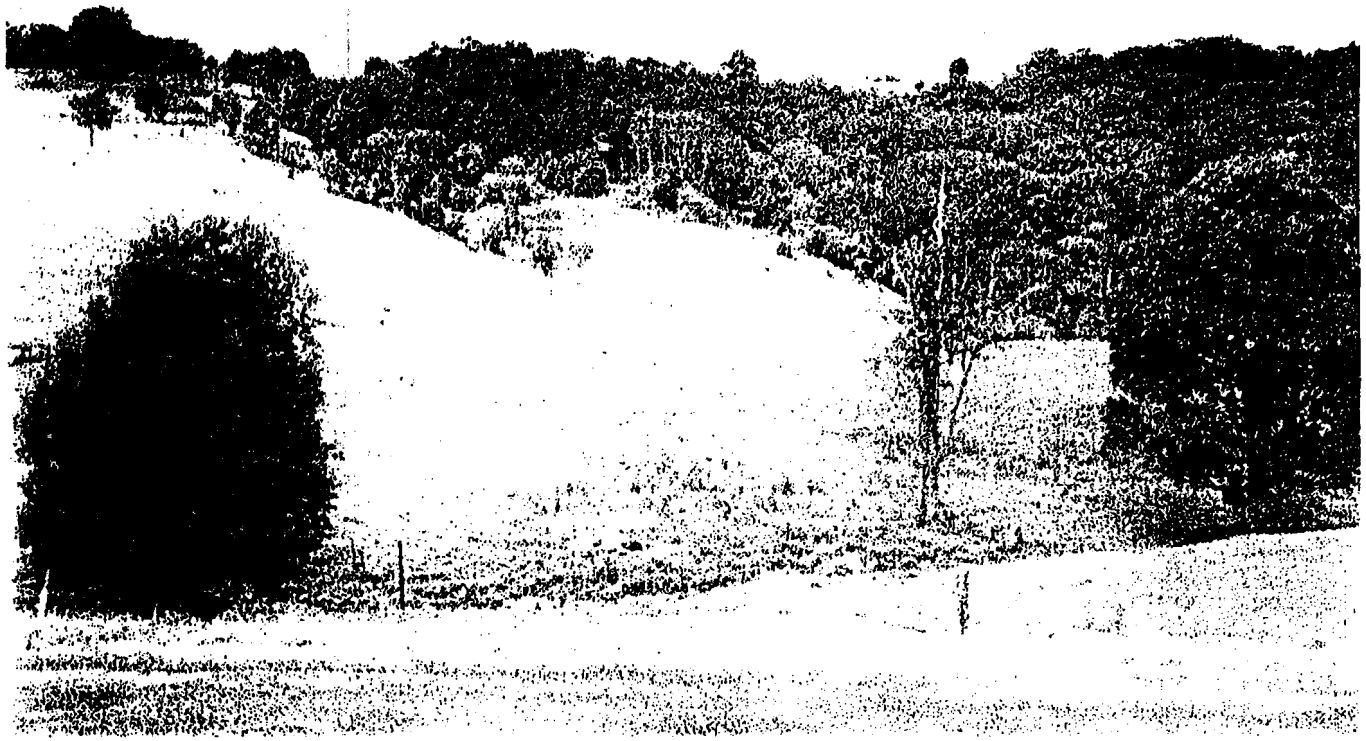
GEOTECHNICAL ENGINEERING SERVICES

Plate Number 2



Erosion in the centre mid ground at the spillway of the large dam neat to Cobaki Road. Treed background is typical of Geotechnical Assessment Unit 3B / 3C

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Plate Number 3

Looking towards the proposed clubhouse area from the proposed Hotel precincts. The proposed access road is to transverse the rhyolitic country (near parallel to the most distant fence line). A deep cut is required in the saddle at approximately mid view.

Plate Number 4

Looking Eastwards towards the proposed Hotel precinct area from gently sloping basaltic area (Geotechnical Assessment Unit 3A). The contact between the rhyolite and basalt is situated at approximately the change in slope angle of the fence line.

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Plate Number 5

Typical steep topography in Geotechnical Assessment Units 3B / 3C. This area has been cleared. This is typical of areas where deep road cuts will be required.

Acid Sulphate Soils
Sampling and Test Results

ORDER-TECH
technical Engineering Services
6/12 Greenway Drive
ed Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

JED:mh:TG-2:BT 4466

29 September, 1996

Terranora Group Management
C- Weathered Howe Pty Ltd
P O Box 1653
SOUTHPORT QLD 4215

Attention: Mr G Dick / Mr B Johnson

Dear Sir

Re: Terranora Resort Project

1. As requested we have visited the above site with the objective of carrying out a limited investigation for the purpose of identifying any acid generated soils on the site. The investigation was based on a random check basis below RL 5.0 (AHD) and involved identifying areas on the site where acid sulphate soils may be present The investigation was not intended as a full acid sulphate soils investigation and is intended to be only indicative of the results presented. The results of the investigation are presented below.

2. The site consists of two properties which are located adjacent to each other in the Terranora / Cobaki area of the Tweed Valley. For the purpose of the investigation the sites are described as the Norville property and the Golf Course Property.

3. The Golf course property has an undulating landscape bounded by basalt scarps facing east, south and southwest. A topographic high is located on the western end of the site where the two sites adjoin. The Norville property has centrally located undulating ground bounded by basalt scarps facing east west and south. The undulating ground

steepens northwards as the land drops down to merge with flatter ground and the flat areas of Cobaki Creek.

4. The site investigation involved auguring six (6) boreholes to 1.5 meters at random locations in the lower lying areas adjacent to Cobaki creek. Samples were taken at 0.5 meter intervals through the soil profile. At some locations tungsten carbide refusal was encountered on cobbles or boulders, where this occurred the borehole was relocated. Samples were taken and stored on ice in an esky to minimise sweating and returned to our Tweed Heads laboratory.

5. The samples were processed at our Tweed Heads Laboratory and analysed for acid generating soils in the form of Total Sulfidic Acidity TSA (Dent and Bowman, 1996) as described in the interim manual for acid sulphate soils. The results of the testing are presented in tabulated report form attached to this report.

6. Should you have any further enquires or require further testing or sampling please do not hesitate to contact this office.

Yours Faithfully
BORDER-TECH

Mark Bolton
Manager

ORDER-TECH

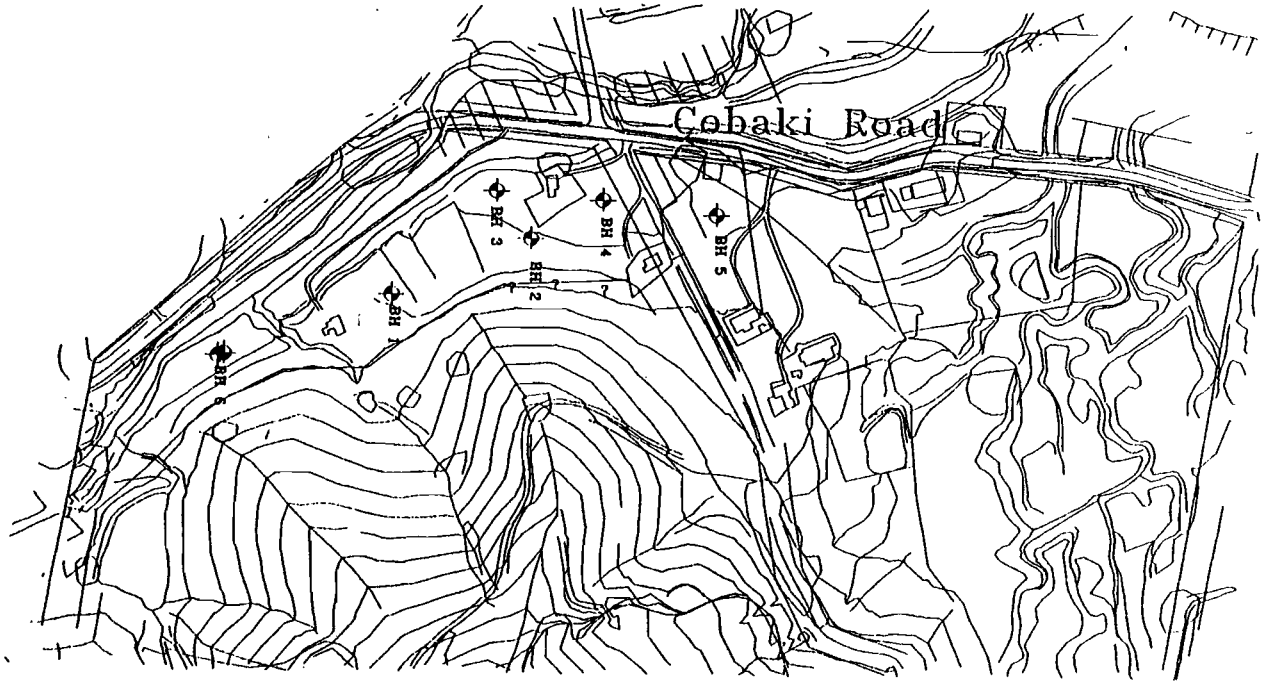
echnical Engineering Services
3/12 Greenway Drive
d Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

ACID SULPHATE TEST

t : **Terranora Group Management**
ct : **Terranora Resort Project**
lo. : **BT 4466**
Method : (Dent and Bowman , 1996)
Issued : 28/9/96

r	Sample Identification	Date Sampled / Date Tested	Initial pH	Total Actual Acidity (mol/m^3 soil)	Total Potential Acidity (mol/m^3 soil)	Total Sulphidic Acidity ($mol H+/m^3$ soil)	Material Description	Reaction to Hydrogen Peroxide
5	Borehole 1 0.0 - 0.4 below natural surface level	25/9/96 26/9/96	3.8	105	106	1	Sandy CLAY, moist, pale yellow brown	nil
)	Borehole 2 0.5 - 0.7 below natural surface level	25/9/96 26/9/96	3.8	85	93	8	Sandy CLAY, moist, pale yellow brown	nil
)	Borehole 2 1.0 - 1.4 below natural surface level	25/9/96 26/9/96	4.8	44	76	32	Sandy CLAY / clayey SAND, wet, pale yellow brown	nil
3	Borehole 3 0.2 - 0.5 below natural surface level	25/9/96 26/9/96	3.8	86	97	11	Sandy CLAY, moist, pale yellow brown	nil
5	Borehole 3 1.3 - 1.5 below natural surface level	25/9/96 26/9/96	3.8	35	30	5	Sandy CLAY, moist/wet, pale yellow brown	nil
7	Borehole 4 0.3 - 0.8 below natural surface level	25/9/96 26/9/96	3.8	30	63	33	Sandy CLAY, moist, pale yellow brown	slight
)	Borehole 1 0.9 - 1.4 below natural surface level	25/9/96 26/9/96	3.8	78	84	6	clayey SAND,wet, brown	nil



Acid Sulphate Soils Investigation

NOTE: NOT TO SCALE

BORDER - TECH 6/12 Greenway Drive, South Tweed Heads 2486	**Client : Terranora Group Management**	**Project : Terranora Resort Project** BT 4466	10/96

Residual Pesticides
Soil Sampling and Test Results

ORDER-TECH

echnical Engineering Services
3/12 Greenway Drive
d Heads South 2486

Telephone: (07) 5524 6199
Facsimile: (07) 5524 6533
P.O. Box 6340
Tweed Heads South 2486

JED:mh:TG-2:BT 4466

15 October, 1996

Terranora Group Management
C- Weathered Howe Pty Ltd
P O Box 1653
SOUTHPORT QLD 4215

Attention: Mr G Dick / Mr B Johnson

Dear Sir

Re: Terranora Resort Project

1. As requested we have visited the above site with the objective of carrying out a limited investigation for the purpose of identifying pesticide residuals. The investigation involved identifying areas on the site where pesticides were used, griding the areas and auguring boreholes for the purpose of obtaining soil samples for testing. The results of the investigation are presented below.

2. The site consists of two properties which are located adjacent to each other in the Terranora / Cobaki area of the Tweed Valley. For the purpose of the investigation the sites are described as the Norville property and the Golf Course Property.

3. The Golf course property has an undulating landscape bounded by basalt scarps facing east, south and southwest. A topographic high is located on the western end of the site where the two sites adjoin. The Norville property has centrally located undulating ground bounded by basalt scarps facing east west and south. The undulating ground steepens northwards as the land drops down to merge with flatter ground and the flat areas of Cobaki Creek.

4. Information obtained from officials of the past golf club and locals indicate the Golf course property was used as grazing land for dairy cattle prior to 1964. The property was previously named "Highfields" before being purchased in 1964 for the purpose off establishing a country club. A nine hole golf course was established at this stage which was expanded to Eighteen holes in 1974. The course has been operating at this level to the present date. From our inquiries there has been no known use of pesticides on this property.

5. Discussions with the Norville family reveal the Norville property has been owned by the family since 1908. The property was used generally for cattle grazing although discussions reveal in 1970 the undulating ground north of the topographic high was terraced using surface boulders and residual soils. Once the ground was rendered relatively level a small cropping operation was carried out. Irrigation was pumped from the existing spring fed dam at the southern end of the Norville property. The small crops grown in this area included corn, sweet potatoes, potatoes, tomatoes, and limited growth of sugar cane for wind breaks. Pesticides were used in this operation although it is unclear as to the exact type of pesticides used. Both sprays and powders were employed and it was indicated these were only used seasonally . The small cropping operation was ceased in 1978.

6. The site investigation involved griding the four terraced areas, each on a 20 meter grid. One randomly selected sector was drilled to a depth of 1.5 meters and samples were taken at 0.5 meter intervals through the soil profile. At some locations tungsten carbide refusal was encountered on basalt cobbles or boulders, where this occurred the borehole was relocated. Samples were taken and stored on ice in an esky to minimise sweating and returned to our Tweed Heads laboratory.

7. The samples were forwarded by courier to Australian Laboratory Services, Brisbane Laboratory for analysis for residual organophosphate and organochloride pesticides. The results of the testing are presented in tabulated report form attached to this report.

8. Should you have any further enquires or require further testing or sampling please do not hesitate to contact this office.

Yours Faithfully
BORDER-TECH

Mark Bolton
Manager

[redacted]

AUSTRALIAN
LABORATORY
SERVICES P/L

ORGANICS QUALITY CONTROL REPORT

:H No. : EB6250

DATE BATCH RECEIVED : 07/10/96

NT : Border-Tech

DATE BATCH COMPLETED : 14/10/96

ethod ode	Test	Matrix	Method Reference		QC Lot Number	Date Samples Extracted	Date Samples Analysed
			Extraction	Analysis			
-068	Pesticides	Soil	Tumbler	USEPA 8270B	OCOPS440	08/10/96	10/10/96

AUSTRALIAN LABORATORY SERVICES P/L

A.C.N. 009 936 029

[redacted]

ANALYTICAL REPORT

CONTACT: MR J DICK
CLIENT: BORDER-TECH
ADDRESS: P O BOX 6340
TWEED HEADS SOUTH 2486

LABORATORY: ENV BRISBANE
BATCH NUMBER: EB6250
SUB BATCH: 0
No. OF SAMPLES: 4
DATE RECEIVED: 04/10/96
DATE COMPLETED: 14/10/96

No.: BT 4466 SAMPLE TYPE: SOIL PROJECT:

nalysis description	Units	LOR	12992	12993	12994	12995
oisture Content (dried @ 103°C)	%	0.1	25.5	22.6	24.9	23.9
RGANOCHLORINE PESTICIDES						
-BHC	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
DB	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
- & g-BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
-BHC	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
eptachlor	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ldrin	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
eptachlor epoxide	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
hlordane - trans	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ndosulfan 1	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
hlordane - cis	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ieldrin	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
DE	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ndrin	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ndosulfan 2	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
DD	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ndrin aldehyde	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ndosulfan sulfate	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
DT	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
ndrin ketone	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ethoxychlor	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
RGANOPHOSPHORUS PESTICIDES						
ichlorvos	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
ementon-S-methyl	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
onocrotophos	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
imethoate	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
iazinon	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
hlorpyrifos-methyl	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
alathion-methyl	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2

S:

amples analysed on an as received basis. Results reported on a dry weight basis.

Final Report which supersedes any preliminary reports with this batch number. • Results apply to sample(s) as submitted by client.

Brisbane
Phone: (07) 3243 7222 Fax: (07) 3243 7218
Sydney
Phone: (02) 841 9500 Fax: (02) 841 9530
Melbourne
Phone: (03) 9853 5299 Fax: (03) 9853 0730
Perth
Phone: (09) 249 2988 Fax: (09) 249 2942

Laboratories also in:
Singapore
Malaysia
Thailand
Hong Kong
New Zealand

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

AUSTRALIAN LABORATORY SERVICES P/L

A.C.N. 009 936 029

[redacted]

ANALYTICAL REPORT

CONTACT: MR J DICK
CLIENT: BORDER-TECH
ADDRESS: P O BOX 6340
TWEED HEADS SOUTH 2486

LABORATORY: ENV BRISBANE
BATCH NUMBER: EB6250
SUB BATCH: 0
No. OF SAMPLES: 4
DATE RECEIVED: 04/10/96
DATE COMPLETED: 14/10/96

O.: BT 4466 SAMPLE TYPE: SOIL PROJECT:

Analysis description	Units	LOR	12992	12993	12994	12995
lathion	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
thion	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
lorpyrifos	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
etnion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
riachos-ethyl	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
lorfenvinphos E	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
lorfenvinphos Z	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
mophos-ethyl	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
naiphos	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
thiofos	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
hion	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
rbophenothion	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
inphos-methyl	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Kristy Harp

inal Report which supersedes any preliminary reports with this batch number. • Results apply to sample(s) as submitted by client.

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Hong Kong
New Zealand

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BATCH QUALITY CONTROL

ALS EP-068 : PESTICIDES

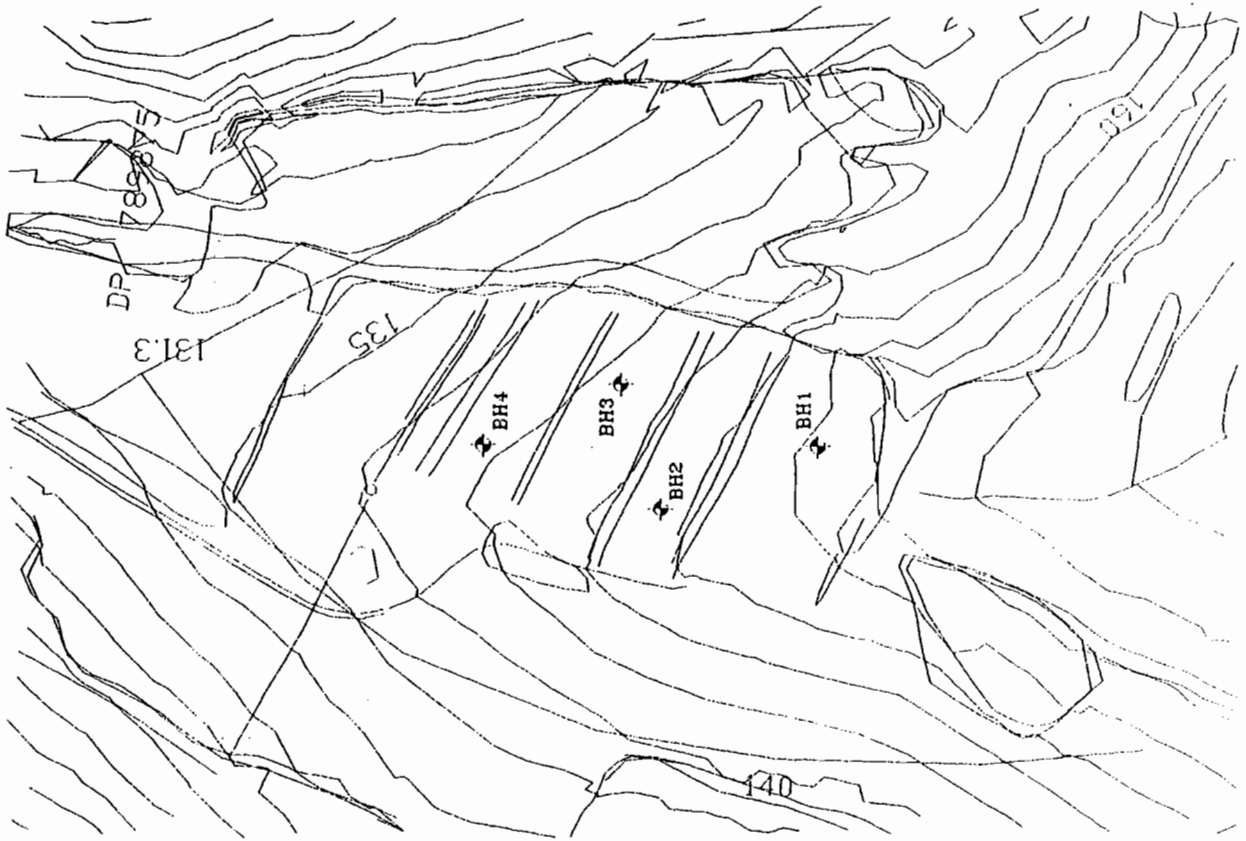
QC LOT No. : OCOPS440 ANALYST: G. Greenland
MATRIX: Soil

COMPOUND	Blank Conc	Spike Level	SPIKE QC RESULTS				Control Limits		
			SCS Conc	DCS Conc	Average Rec.	RPD	Rec.		RPD
	mg/kg	mg/kg	mg/kg	mg/kg	%	%	Low	High	%
EP-068A : ORGANOCHLORINE PESTICIDES									
a-BHC	<LOR	0.25	0.24	0.23	94	1	83	101	20
HCB	<LOR	0.25	0.23	0.24	94	1	79	101	20
b- & g-BHC	<LOR	0.50	0.51	0.51	101	0	83	106	20
d-BHC	<LOR	0.25	0.24	0.23	94	2	82	104	20
Heptachlor	<LOR	0.25	0.24	0.24	97	2	82	106	20
Aldrin	<LOR	0.25	0.24	0.23	93	3	80	105	20
Heptachlor epoxide	<LOR	0.25	0.24	0.23	94	2	80	107	20
trans-Chlordane	<LOR	0.25	0.24	0.24	94	1	79	110	20
Endosulfan 1	<LOR	0.25	0.23	0.22	91	3	81	109	20
cis-Chlordane	<LOR	0.25	0.24	0.24	96	4	81	108	20
Dieldrin	<LOR	0.25	0.23	0.22	90	5	80	107	20
DDE	<LOR	0.25	0.24	0.23	94	2	82	106	20
Endrin	<LOR	0.25	0.20	0.22	85	12	81	108	20
Endosulfan 2	<LOR	0.25	0.23	0.23	92	2	82	107	20
DDD	<LOR	0.25	0.24	0.23	93	2	80	107	20
Endrin aldehyde	<LOR	0.25	0.26	0.24	99	9	76	103	20
Endosulfan sulfate	<LOR	0.25	0.24	0.24	96	1	80	109	20
DDT	<LOR	0.25	0.25	0.26	101	4	80	112	20
Endrin ketone	<LOR	0.25	0.27	0.24	102	12	80	108	20
Methoxychlor	<LOR	0.25	0.25	0.27	104	6	80	110	20
EP-068B : ORGANOPHOSPHORUS PESTICIDES									
Dichlorvos	<LOR	0.25	0.24	0.24	97	1	80	107	20
Demeton-s-methyl	<LOR	0.25	0.24	0.24	97	1	67	114	20
Monocroptophos	<LOR	0.25	0.23	0.25	94	8	75	124	20
Dimethoate	<LOR	0.25	0.24	0.24	96	2	82	111	20
Diazinon	<LOR	0.25	0.23	0.23	92	4	82	104	20
Chlorpyrifos methyl	<LOR	0.25	0.24	0.24	95	1	81	106	20
Parathion methyl	<LOR	0.25	0.23	0.23	94	0	79	108	20
Malathion	<LOR	0.25	0.24	0.24	96	2	81	107	20
Fenthion	<LOR	0.25	0.24	0.23	94	1	83	105	20
Chlorpyrifos	<LOR	0.25	0.24	0.23	94	2	83	105	20
Parathion	<LOR	0.25	0.23	0.23	93	1	79	109	20
Pirimphos ethyl	<LOR	0.25	0.22	0.24	91	7	81	106	20
Chlorfenvinphos E	<LOR	0.25	N/A	N/A					
Chlorfenvinphos Z	<LOR	0.25	0.24	0.24	96	2	82	109	20
Bromophos ethyl	<LOR	0.25	0.24	0.24	95	2	81	105	20
Fenamiphos	<LOR	0.25	0.23	0.24	93	3	77	114	20
Prothiofos	<LOR	0.25	0.24	0.23	94	3	80	107	20
Ethion	<LOR	0.25	0.24	0.24	96	1	82	107	20
Carbofenthion	<LOR	0.25	0.24	0.24	98	0	76	110	20
Azinphos methyl	<LOR	0.25	0.22	0.25	95	11	58	137	20
EP-068C : TRIAZINE PESTICIDES									
Simazine	<LOR	0.25	0.20	0.24	87	20	79	107	20
Atrazine	<LOR	0.25	0.20	0.24	89	18	77	109	20
EP-068D : SYNTHETIC PYRETHROIDS									
Cypermethrins	<LOR	0.25	0.24	0.23	94	3	68	127	20

COMMENTS:

) The control limits are based on ALS laboratory statistical data. (Method QWI-ORG/07)

) * : Recovery or RPD falls outside of the recommended control limits.



Contaminated Soil Sampling

NOTE: NOT TO SCALE

BORDER-TECH 6/12 Greenway Drive, South Tweed Heads 2486	**CLIENT:** Terranora Group Management	**PROJECT:** Terranora Resort Project	BT 4466

APPENDIX C

Gilbert & Sutherland Report dated December 1997

GILBERT AND SUTHERLAND PTY LTD
Soil and Water Resource Consultants
ACN 077310840

Addendum Report & EMP - Onsite Sewage Treatment & Effluent Reuse

Prepared for Terranora Group Management in Response to issues raised by Tweed Shire Council in association with;

Heilbronn & Partners

December, 1997

Robina Office

South Building
East Quay Corporate Park
34-36 Glenferrie Drive
Robina Q4226

PO Box 857
Robina Q4226

P. 07 5578 9944
F. 07 5578 9945

Brisbane Office

29 Mein Street
Spring Hill
Brisbane Q4000

PO Box 2057
Bardon Q4065

P. 07 3839 3950
F. 07 3839 3530

3.3 Proximity to dwellings and roads

The guidelines state that "Spray irrigation systems should be surrounded by vegetated buffer zones and should not be sited in proximity to dwellings, public roads and parks to avoid nuisance and health problems. Aerosols that result from spraying should be contained on site. In general a buffer zone of 20 metres should be provided around the perimeter of the site."

After ascertaining which areas meet the topographical requirements, a buffer zone 20m wide was imposed around the site boundaries, the proposed internal roads and resort buildings. The remaining areas suitable for spray irrigation were then estimated to be 28.4ha. Further landscaped areas totalling 21.6ha within the buffer zones can be irrigated with a trickle system, buried under pine or tea tree mulch as aerosols associated with the effluent will not prove problematic.

The total area available for effluent disposal therefore equates to 50.0ha.

3.4 Soil classification

The main issues relating to soil types and properties are:

- Type
- Structure
- Permeability
- Drainage
- Depth

An investigation of the soil types on the site has been carried out by BorderTech as part of the original report (1996) and additionally, by Gilbert & Sutherland. Samples were collected from the locations shown on Drawing No GJ9737-1.DG6.

Soils at the site were classified according to the Australian Soil Classification (Isbell, 1996).

A total of three main soil orders (or types) were identified on the site. These were Ferrosols, Dermosols and Kurosols. A brief description of the characteristics of each soil order is given below (Isbell, 1996) and described in the borelogs attached as appendix A.

3.4.1 Ferrosols

These are soils with B2 horizons in which the major part has a free iron oxide content greater than 5% iron in the fine earth fraction (<2mm).

3.4.2 Dermosols

These are soils with a B2 horizon structure more developed than weak and have no clear or abrupt textural B horizons.

3.4.3 Kurosols

These are soils with a clear or abrupt textural B horizon and in which the major part of the upper 0.2m of the B2 horizon is strongly acidic (pH 1:5 H_2O of <5.5).

3.5 Soil distribution

The distribution of soils reflect the overall geology of the site with Ferrosols associated with the Tertiary age basalt lava flows (Lamington Volcanic Group) and Kurosols/Dermosols associated with the younger volcanic rhyolitic lava and the older metasediments of the Neranleigh-Fernvale group.

The low lying land adjacent to Cobaki Road and considered to be of recent alluvium was found to consist of Dermosols, although alluvial sands and gravels are known to historically exist in the vicinity as well.

This distribution is described in more detail below and shown on Drawing No GJ9737-1.DG7.

3.5.1 Ferrosols

Ferrosols were predominantly identified in the areas sampled for effluent disposal purposes (N and P-Sorption) and correspond to those areas, on the Geotechnical Assessment Unit Map supplied by BorderTech[1], as GAU 3A, 3B and 3C.

These soils consisted mainly of dark reddish brown clay loams of depth >0.6m with strong structure and 2-5mm polyhedral peds.

The main distinguishing factor of these soils is the free iron oxide content >5% Fe in the fine earth fraction contributing to the soil's dark reddish colour.

[1] Geotechnical Assessment Unit Map presented as three figures in Site Investigation Report by BorderTech (Attachment E) in Statement of Environmental Effects, 1996.

3.5.2 Kurosols/Dermosols

Soils exhibiting characteristics of both Kurosols and Dermosols were identified in those areas on the Geotechnical Assessment Unit Map as 2A,2B, 4A and 4B that is the metasediments of the Neranleigh-Fernvale Group occurring on the footslopes of the northern property boundary and, the younger rhyolitic lava overlying basalt and forming the high points of the property.

These soils consisted mainly of brown to dull yellowish brown clay loam (fine sandy) A1 horizons of strong structure and 2-5mm angular blocky peds changing to reddish brown light medium clay to medium clay B2 horizons of moderate to strong structure and 2-5mm polyhedral peds.

These soils are very similar, the difference related to slight textural changes between the A and B horizons with an abrupt or clear texture change from A to B horizon being classified as a Kurosol (provided the pH 1:5 H_2O of the upper 0.2m of the B2 horizons of both soils <5.5).

A combination of Kurosols and Dermosols can therefore exist in the same vicinity and be derived from the same parent material. A Kurosol was identified in Borehole 1 with Boreholes 2,3 and 4 having less of a clear texture change from A to B horizons. In the absence of particle size analysis, enough similar characteristics exist between these soils at the site to classify them as Kurosols/Dermosols.

3.5.3 Dermosols

The area of low lying land considered to be of recent alluvium on the northern boundary of the property (Borehole 5) contained soils identified as Dermosols. These soils had no clear textural change from A to B horizon and consisted of brown to bright brown clay loams of moderate to strong structure and 2-5mm angular blocky peds.

3.6 Soil analysis (N and P-Sorption)

Sampling was undertaken in the proposed effluent irrigation areas to determine the Nitrogen and Phosphorus adsorption capacity of the soils.

Eight samples were recovered to 0.6m depth from eight boreholes, the location of which are shown on Drawing No GJ9737-1.DG6. The samples were analysed by Tweed laboratory Centre.

SOIL PROFILE BORELOG NO. 1

Subject: Terranora
Job number: GJ9737-1
Client: Terranora Group Management
Date: 25/11/97

SOIL TYPE
BROWN KUROSOL

Depth NSL (m)	Horizon	Sample Description	pH 1:5	Colour
0.0 – 0.1	A1	Brownish black CLAY LOAM (CLFS); weak to moderate (2-5mm) polyhedral		10YR 3/2
0.1 – 0.4	B21	Dark reddish brown MEDIUM CLAY (MC); weak to moderate (2-5mm) polyhedral	4.49	10YR 4/2
0.4 – 0.6	B22	Dark reddish brown MEDIUM TO HEAVY CLAY (M-HC);with mottled 10YR 4/3 dull yellowish brown; weak to moderate (2-5mm) polyhedral.		2.5YR 3/6

SOIL PROFILE BORELOG NO. 2

Subject: Terranora
Job number: GJ9737-1
Client: Terranora Group Management
Date: 25/11/97

SOIL TYPE
BROWN KUROSOL/DERMOSOL

Depth NSL (m)	Horizon	Sample Description	pH 1:5	Colour
0.0 – 0.3	A1	Brown CLAY LOAM (CLFS); fine sandy; strong angular blocky; weathered rock near surface (pieces).		7.5YR 4/3
0.3 – 0.55	B21	Light dull yellowish brown LIGHT CLAY; strong polyhedral.	4.51	10YR 4/3
0.55 – 0.7	B22	Reddish brown MEDIUM CLAY; strong polyhedral; basalt at depth visible.		5YR 4/4

SOIL PROFILE BORELOG NO. 3

Subject: Terranora
Job number: GJ9737-1
Client: Terranora Group Management
Date: 25/11/97

SOIL TYPE
BRPWN KUROSOL/DERMOSOL

Depth NSL (m)	Horizon	Sample Description	pH 1:5	Colour
0.0 – 0.1	A1	Dull yellowish brown CLAY LOAM (CLFS); strong angular blocky.		10YR 4/3
0.1 – 0.3	B21	Bright brown LIGHT CLAY (LC); moderate (2-5mm) polyhedral.	4.67	7.5YR 5/6
0.3 – 0.6	B22	Reddish brown MEDIUM CLAY (MC); moderate (2-5mm) ployhedral.		5YR 4/6

SOIL PROFILE BORELOG NO. 4

Subject: Terranora
Job number: GJ9737-1
Client: Terranora Group Management
Date: 25/11/97

SOIL TYPE
BROWN KUROSOLS/DERMOSOLS

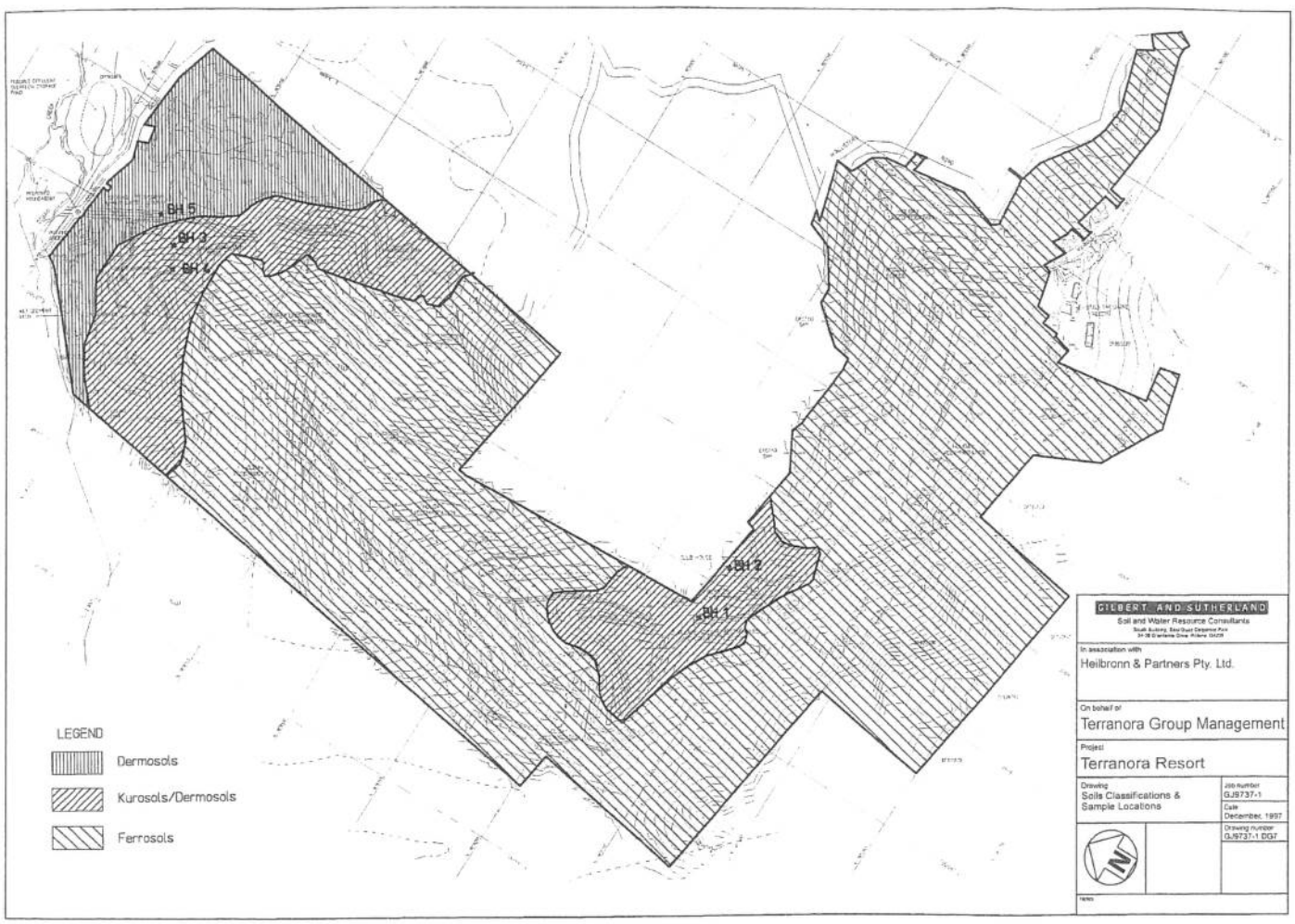
Depth NSL (m)	Horizon	Sample Description	pH 1:5	Colour
0.0 – 0.15	A1	Dull yellowish brown CLAY LOAM (CLFS); strong angular blocky (2-10mm).		10YR 4/3
0.15-0.30	B21	Bright brown LIGHT CLAY (LC); Moderate 2-5mm polyhedral.	4.85	7.5YR 5/6
0.30-0.60	B22	Bright reddish brown LIGHT_MEDIUM CLAY (LMC); moderate (2-5mm) polyhedral.		5YR 5/8

SOIL PROFILE BORELOG NO. 5

Subject: Terranora
Job number: GJ9737-1
Client: Terranora Group Management
Date: 25/11/97

SOIL TYPE
BROWN DERMOSOL

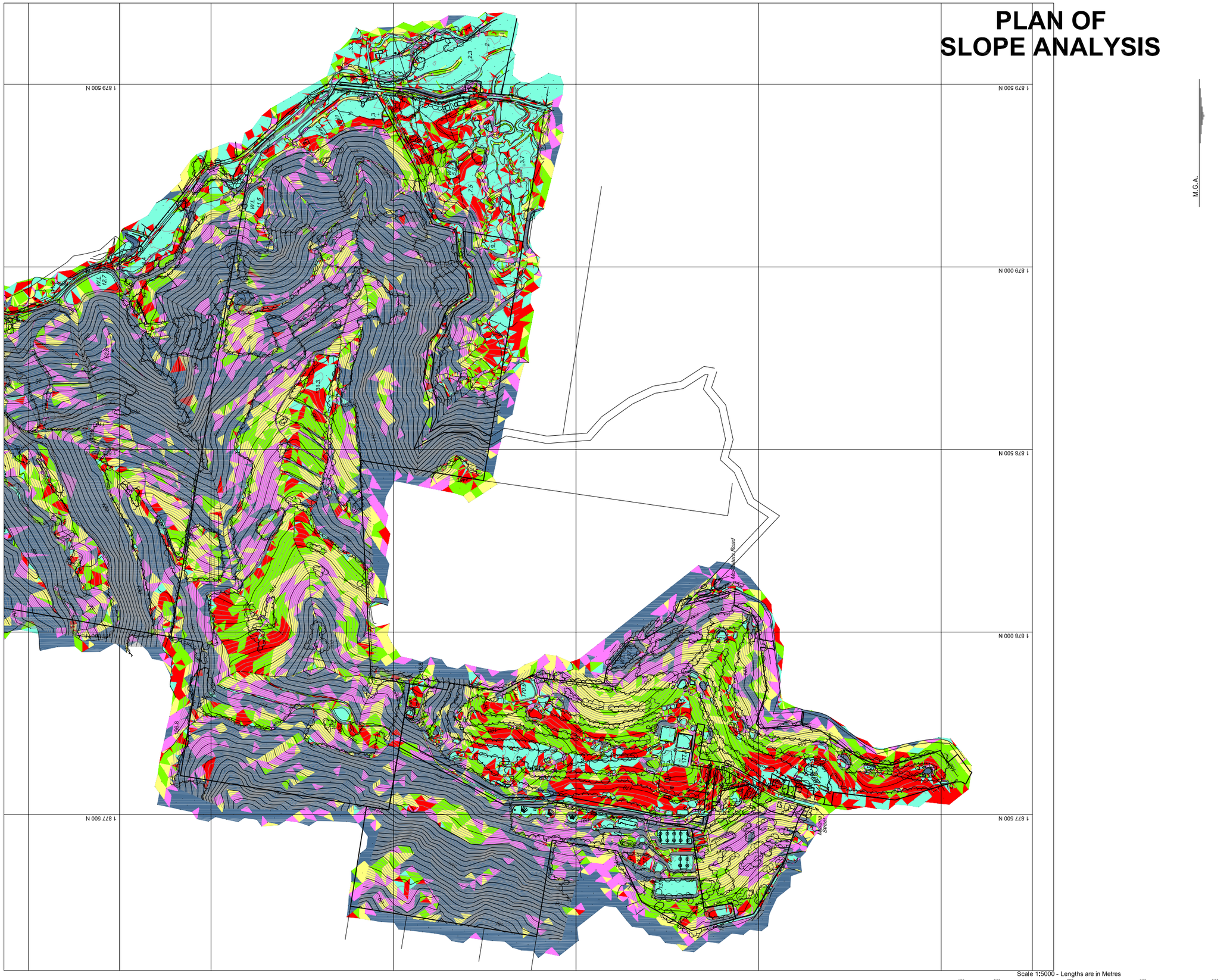
Depth NSL (m)	Horizon	Sample Description	pH 1:5	Colour
0.0 – 0.2	A1	Brown CLAY LOAM (CL); strong angular blocky (2-5mm)		10YR 4/4
0.2 - 0.6	B2	Bright brown CLAY LOAM (CLFS); Moderate to strong angular blocky (2-5mm)	5.32	7.5YR 5/6


BH 5
BH 3
BH 4
BH 2
BH 1
LEGEND
Dermosols
Kurosols/Dermosols
Ferrosols
GILBERT AND SUTHERLAND
Soil and Water Resource Consultants
In association with
Heilbronn & Partners Pty. Ltd.
On behalf of
Terranora Group Management
Project
Terranora Resort
Drawing
Soils Classifications & Sample Locations
Job number
GJ9737-1
Date
December, 1997
Drawing number
GJ9737-1.DGT
Notes

APPENDIX D

Slope Analysis Plan No. 8715-8 prepared by Michel Group Services

PLAN OF SLOPE ANALYSIS



Scale 1:5000 - Lengths are in Metres

100 200 400 600 800m

ISSUE	SUBJECT	BY	DATE
B	RISE LOGO	GL	27/11/08
A	Updated Logo	GL	13/9/2007

AMENDMENTS

NOTES & DISCLAIMERS

Note:
Boundaries & Contour detail from Brown & Pluthero Pty. Ltd. plan 10811A 1/11/1996, Photography date 28/6/1996.

Slope Legend:

- 0% to 5%
- 5% to 10%
- 10% to 15%
- 15% to 20%
- 20% to 25%
- 25% over

ADDITIONAL INFORMATION

RISE®
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MICHEL GROUP SERVICES
A.C.N. 061 750 132

LAND, ENGINEERING & GPS SURVEYING
HYDROGRAPHIC SURVEYING
TOWN PLANNING SERVICES

23 Cotton Street
Nerang
QLD Australia 4211

Telephone 07 5502 2500
Facsimile 07 5500 4890

Email admin@michelservices.com.au

SHEET NUMBER 1 OF 1

PLAN No. 8715-8

ISSUE B

PART D

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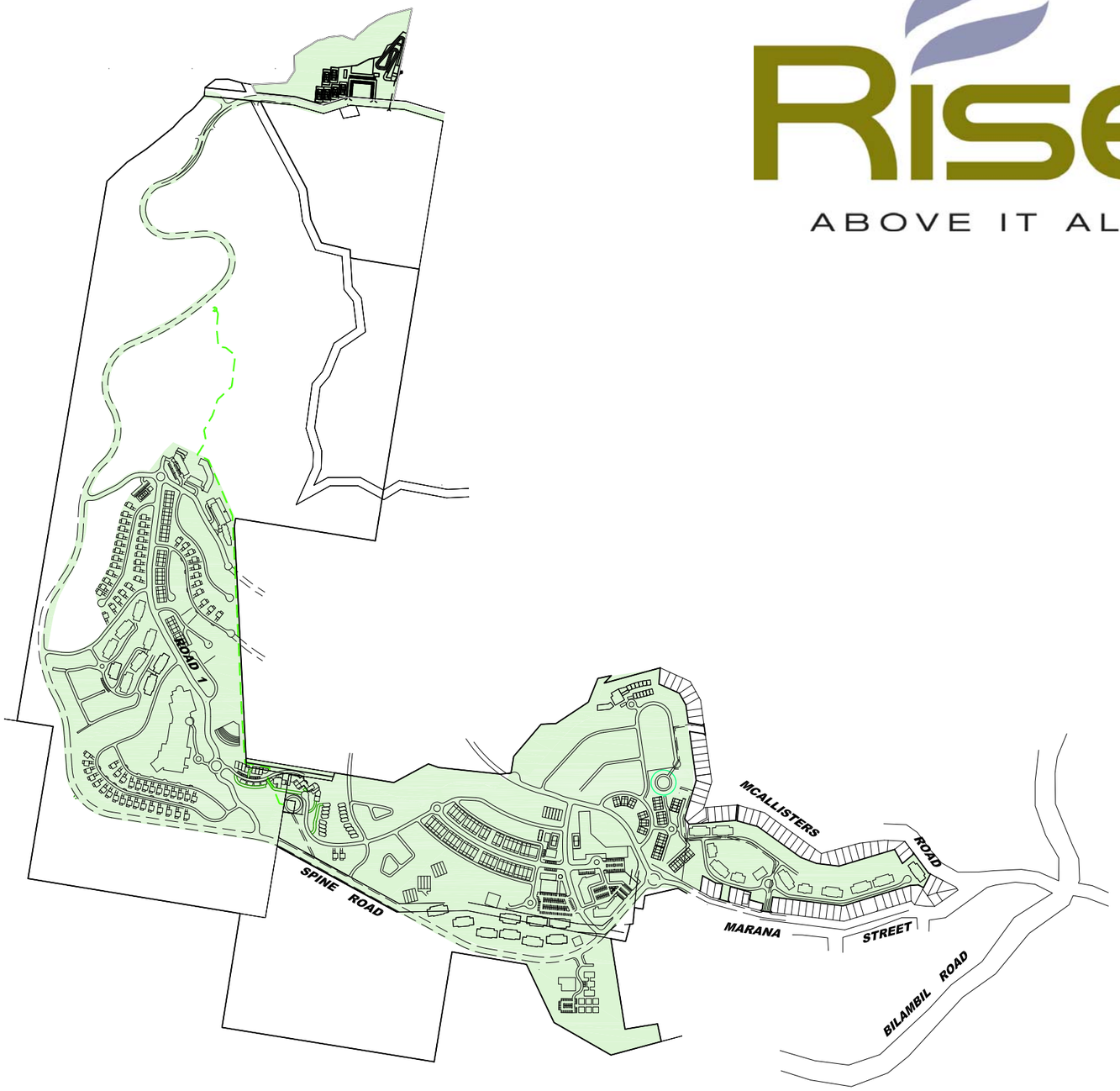

LOCALITY PLAN
SCALE 1:4000

DRAWING LIST

1355 - 07 - SK01 TITLE SHEET
1355 - 07 - SK02 GENERAL LAYOUT
1355 - 07 - SK03 ROAD CLASSIFICATIONS
1355 - 07 - SK04 TYPICAL SECTIONS - SHEET 1 of 2
1355 - 07 - SK05 TYPICAL SECTIONS - SHEET 2 of 2

1355 - 07 - SK06 ROAD LAYOUT PLAN SHEET 1 OF 2
1355 - 07 - SK07 ROAD LAYOUT PLAN SHEET 2 OF 2

1355 - 07 - SK08 STORM WATER LAYOUT
1355 - 07 - SK09 SEWER RETICULATION LAYOUT
1355 - 07 - SK10 SEWER RETICULATION CATCHMENT ZONE PLAN
1355 - 07 - SK11 POTABLE WATER RETICULATION LAYOUT

1355 - 07 - SK12 BULK EARTHWORKS VOLUMES
1355 - 07 - SK13 SITES SECTIONS

1355 - 07 - SK14 RECYCLED STORMWATER LAYOUT

1355 - 07 - SK20 SPINE ROAD LONGITUDINAL SECTIONS SHEET 1 OF 3
1355 - 07 - SK21 SPINE ROAD LONGITUDINAL SECTIONS SHE T 2 OF 3
1355 - 07 - SK22 SPINE ROAD LONGITUDINAL SECTIONS SHEET 3 OF 3
1355 - 07 - SK23 SPINE ROAD CROSS SECTIONS SHEET 1 OF 11
1355 - 07 - SK24 SPINE ROAD CROSS SECTIONS SHEET 2 OF 11
1355 - 07 - SK25 SPINE ROAD CROSS SECTIONS SHEET 3 OF 11
1355 - 07 - SK26 SPINE ROAD CROSS SECTIONS SHEET 4 OF 11
1355 - 07 - SK27 SPINE ROAD CROSS SECTIONS SHEET 5 OF 11
1355 - 07 - SK28 SPINE ROAD CROSS SECTIONS SHEET 6 OF 11
1355 - 07 - SK29 SPINE ROAD CROSS SECTIONS SHEET 7 OF 11
1355 - 07 - SK30 SPINE ROAD CROSS SECTIONS SHEET 8 OF 11
1355 - 07 - SK31 SPINE ROAD CROSS SECTIONS SHEET 9 OF 11
1355 - 07 - SK32 SPINE ROAD CROSS SECTIONS SHEET 10 OF 11
1355 - 07 - SK33 SPINE ROAD CROSS SECTIONS SHEET 11 OF 11

1355 - 07 - SK50 ROAD 1 LONGITUDINAL SECTIONS SHEET 1 OF 3
1355 - 07 - SK51 ROAD 1 LONGITUDINAL SECTIONS SHEET 2 OF 3
1355 - 07 - SK52 ROAD 1 LONGITUDINAL SECTIONS SHEET 3 OF 3
1355 - 07 - SK53 ROAD 2 LONGITUDINAL SECTIONS
1355 - 07 - SK54 ROAD 2 & 3 LONGITUDINAL SECTIONS
1355 - 07 - SK55 ROAD 4 & 5 LONGITUDINAL SECTIONS
1355 - 07 - SK56 ROAD 6 LONGITUDINAL SECTIONS
1355 - 07 - SK57 ROAD 7 & 8 LONGITUDINAL SECTIONS
1355 - 07 - SK58 ROAD 9 LONGITUDINAL SECTIONS
1355 - 07 - SK59 ROAD 14 LONGITUDINAL SECTIONS
1355 - 07 - SK60 ROAD 16 LONGITUDINAL SECTIONS
1355 - 07 - SK61 ROAD 17 LONGITUDINAL SECTIONS
1355 - 07 - SK62 ROAD 18 LONGITUDINAL SECTIONS
1355 - 07 - SK63 ROAD 19 & 20 LONGITUDINAL SECTIONS
1355 - 07 - SK64 ROAD 21 LONGITUDINAL SECTIONS
1355 - 07 - SK65 ROAD 50 LONGITUDINAL SECTIONS
1355 - 07 - SK66 ROAD 50 LONGITUDINAL SECTIONS
1355 - 07 - SK67 ROAD 50, 51 & 52 LONGITUDINAL SECTIONS
1355 - 07 - SK68 ROAD 100 LONGITUDINAL SECTIONS
1355 - 07 - SK69 ROAD 101 & 102 LONGITUDINAL SECTIONS
1355 - 07 - SK70 ROAD 103 LONGITUDINAL SECTIONS
1355 - 07 - SK70 ROAD 104 & 105 LONGITUDINAL SECTIONS
1355 - 07 - SK72 ROAD 106 LONGITUDINAL SECTIONS
1355 - 07 - SK73 ROAD 107 & 108 LONGITUDINAL SECTIONS
1355 - 07 - SK74 ROAD 109 & 110 LONGITUDINAL SECTIONS
1355 - 07 - SK75 ROAD 111 & 113 LONGITUDINAL SECTIONS
1355 - 07 - SK76 ROAD 114 LONGITUDINAL SECTIONS
1355 - 07 - SK77 ROAD 115 & 116 LONGITUDINAL SECTIONS
1355 - 07 - SK78 ROAD 120 123 & 131 LONGITUDINAL SECTIONS
1355 - 07 - SK79 ROAD 125 LONGITUDINAL SECTIONS
1355 - 07 - SK80 ROAD 124 & 126 LONGITUDINAL SECTIONS

1355 - 07 - SK100 ROAD 1 CROSS SECTIONS
1355 - 07 - SK101 ROAD 1 CROSS SECTIONS
1355 - 07 - SK102 ROAD 1 CROSS SECTIONS
1355 - 07 - SK103 ROAD 2 CROSS SECTIONS
1355 - 07 - SK104 ROAD 2 CROSS SECTIONS
1355 - 07 - SK105 ROAD 3 CROSS SECTIONS
1355 - 07 - SK106 ROAD 4 & 5 CROSS SECTIONS
1355 - 07 - SK107 ROAD 6 CROSS SECTIONS
1355 - 07 - SK108 ROAD 7 CROSS SECTIONS
1355 - 07 - SK109 ROAD 8 CROSS SECTIONS
1355 - 07 - SK110 ROAD 9 CROSS SECTIONS
1355 - 07 - SK111 ROAD 14 CROSS SECTIONS
1355 - 07 - SK112 ROAD 16 CROSS SECTIONS
1355 - 07 - SK113 ROAD 17 CROSS SECTIONS
1355 - 07 - SK114 ROAD 18 CROSS SECTIONS
1355 - 07 - SK115 ROAD 18 CROSS SECTIONS
1355 - 07 - SK116 ROAD 19 CROSS SECTIONS
1355 - 07 - SK117 ROAD 20 CROSS SECTIONS
1355 - 07 - SK118 ROAD 21 CROSS SECTIONS
1355 - 07 - SK119 ROAD 50 CROSS SECTIONS
1355 - 07 - SK120 ROAD 50 CROSS SECTIONS
1355 - 07 - SK121 ROAD 50 CROSS SECTIONS
1355 - 07 - SK122 ROAD 51 & 52 CROSS SECTIONS
1355 - 07 - SK123 ROAD 100 CROSS SECTIONS
1355 - 07 - SK124 ROAD 101 & 102 CROSS SECTIONS
1355 - 07 - SK125 ROAD 103 CROSS SECTIONS
1355 - 07 - SK126 ROAD 103 CROSS SECTIONS
1355 - 07 - SK127 ROAD 104 & 105 CROSS SECTIONS
1355 - 07 - SK128 ROAD 106 CROSS SECTIONS
1355 - 07 - SK129 ROAD 107 & 108 CROSS SECTIONS
1355 - 07 - SK130 ROAD 109 CROSS SECTIONS
1355 - 07 - SK131 ROAD 110 CROSS SECTIONS
1355 - 07 - SK132 ROAD 111 & 113 CROSS SECTIONS
1355 - 07 - SK133 ROAD 114 CROSS SECTIONS
1355 - 07 - SK134 ROAD 115 CROSS SECTIONS
1355 - 07 - SK135 ROAD 116 CROSS SECTIONS
1355 - 07 - SK136 ROAD 131 CROSS SECTIONS
1355 - 07 - SK137 ROAD 120 & 123 CROSS SECTIONS
1355 - 07 - SK138 ROAD 130 CROSS SECTIONS
1355 - 07 - SK139 ROAD 124 & 125 CROSS SECTIONS
1355 - 07 - SK140 ROAD 126 CROSS SECTIONS

1355 - 07 - SK150 BORE HOLE & TEST PIT LOCATIONS

1355 - 07 - SK200 WATER RETICULATION STRATEGY - TIMING
1355 - 07 - SK201 SEWER RETICULATION STRATEGY - STAGE 1 EXTERNAL
1355 - 07 - SK202 EXTERNAL TRUNK SEWER LAYOUT
1355 - 07 - SK203 SEWER RETICULATION STRATEGY - INTERNAL

1355 - 07 - SK300 EARTHWORKS STRATEGY PLAN
1355 - 07 - SK301 PLAN OF BULK EARTHWORKS

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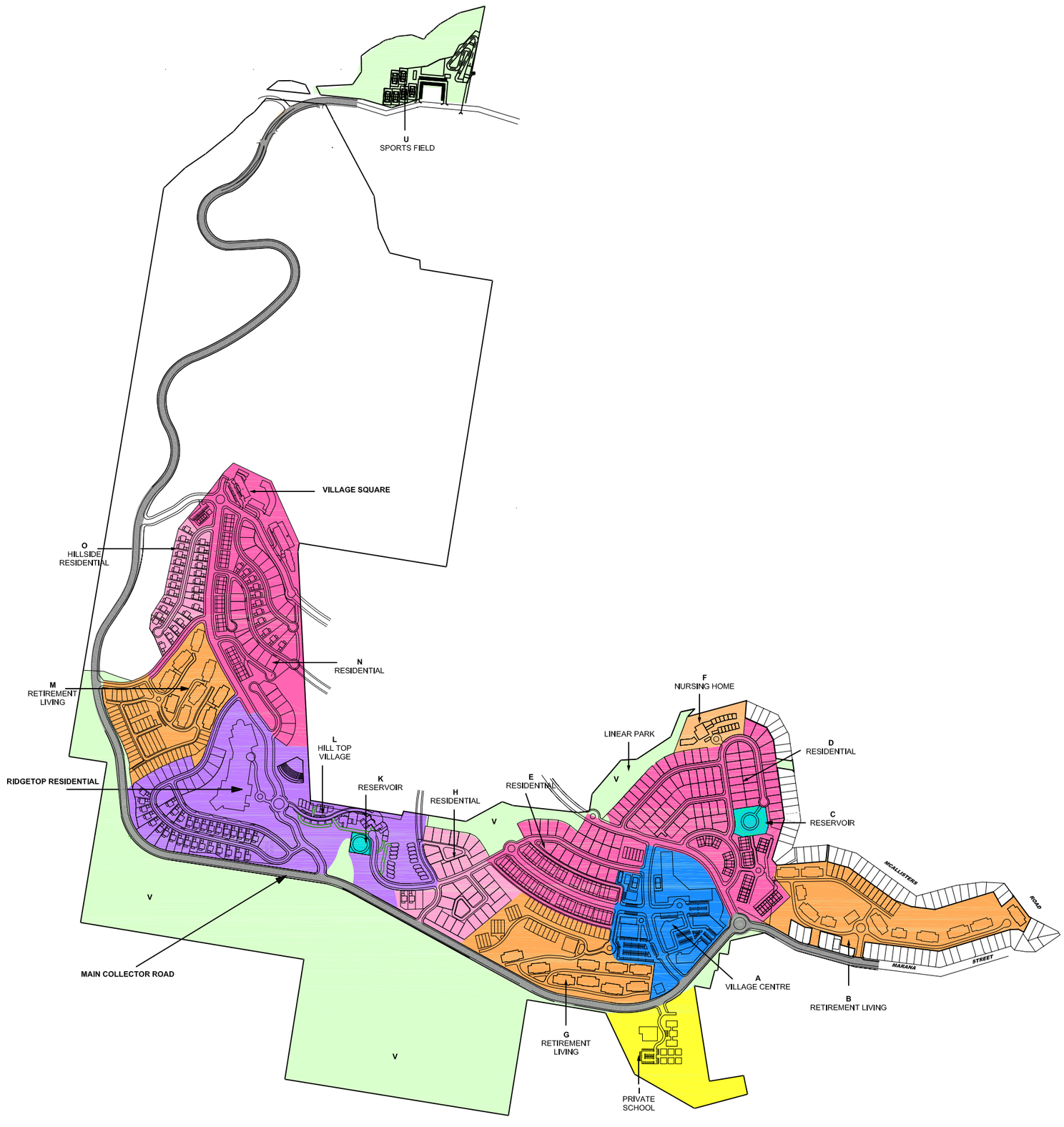
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

DRAWING No 1355 - 07 - 01C

C - 08/10 - PRECINCT J DELETED



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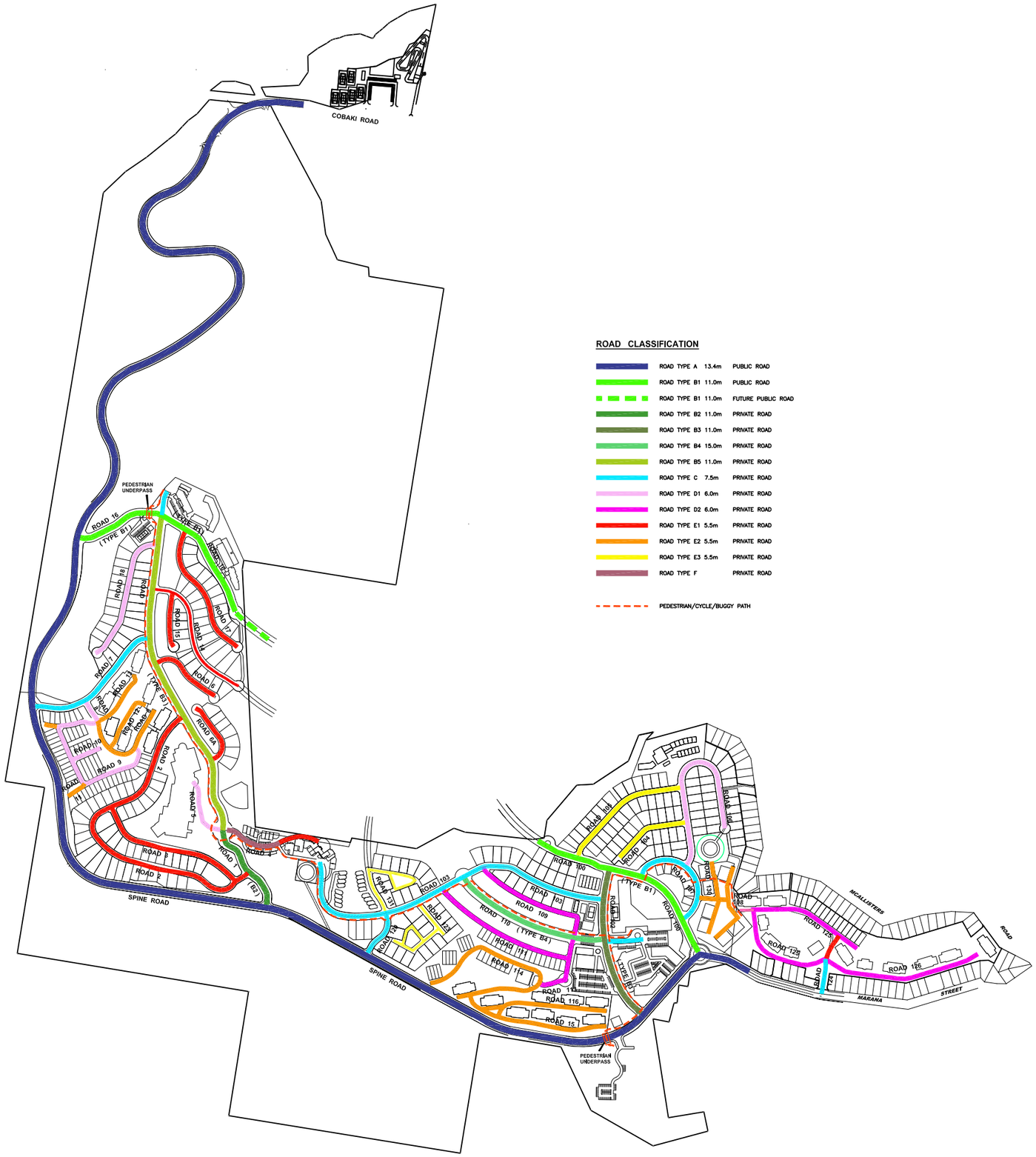
GENERAL LAYOUT

1355 - 07 - SK02 C

0 100 200
1:5000 at A1
1:10000 at A3

C - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



ROAD CLASSIFICATION

ROAD TYPE A	13.4m	PUBLIC ROAD
ROAD TYPE B1	11.0m	PUBLIC ROAD
ROAD TYPE B1	11.0m	FUTURE PUBLIC ROAD
ROAD TYPE B2	11.0m	PRIVATE ROAD
ROAD TYPE B3	11.0m	PRIVATE ROAD
ROAD TYPE B4	15.0m	PRIVATE ROAD
ROAD TYPE B5	11.0m	PRIVATE ROAD
ROAD TYPE C	7.5m	PRIVATE ROAD
ROAD TYPE D1	6.0m	PRIVATE ROAD
ROAD TYPE D2	6.0m	PRIVATE ROAD
ROAD TYPE E1	5.5m	PRIVATE ROAD
ROAD TYPE E2	5.5m	PRIVATE ROAD
ROAD TYPE E3	5.5m	PRIVATE ROAD
ROAD TYPE F		PRIVATE ROAD

PEDESTRIAN/CYCLE/BUGGY PATH

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ABN: 55 114 636 934

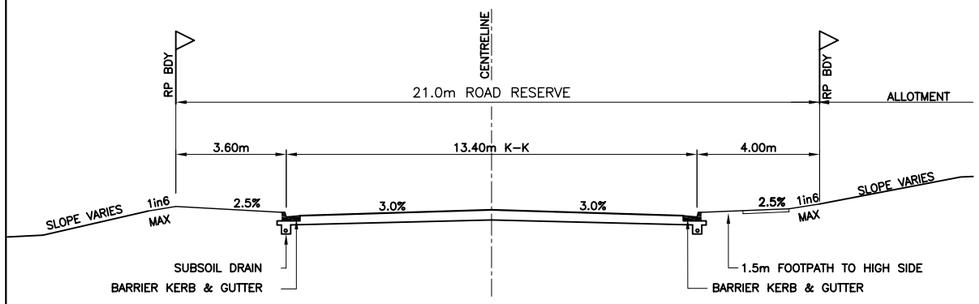
ROAD CLASSIFICATIONS

1355 - 07 - SK03 C

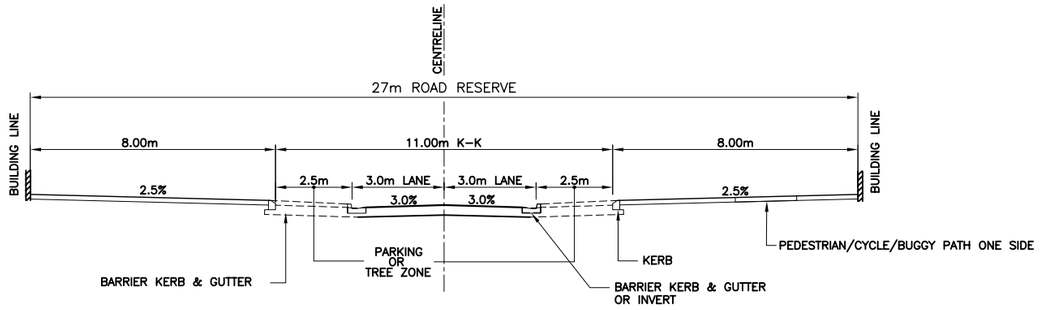
0 100 200
1:5000 at A1
1:10000 at A3

C - 08/10 - PRECINCT J DELETED

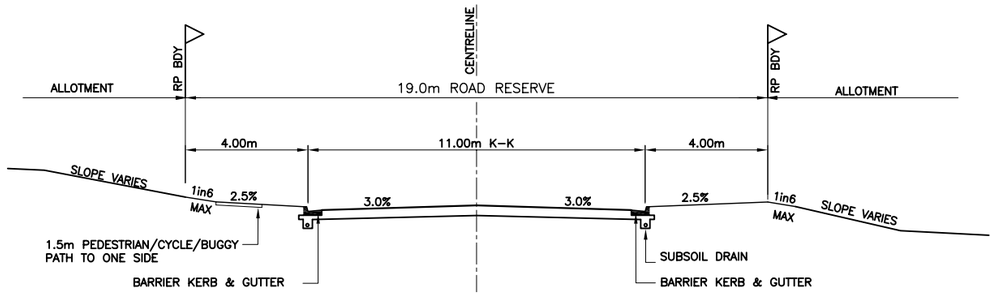
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



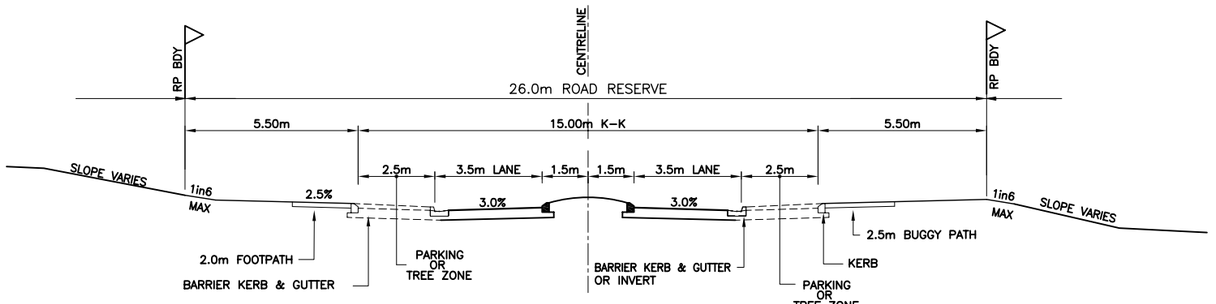
13.40m K-K ROAD - SPINE ROAD TYPE A



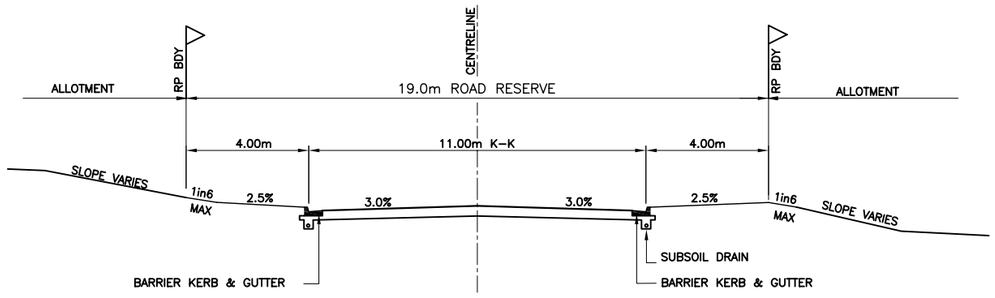
11.00m K-K ROAD - TYPE B3



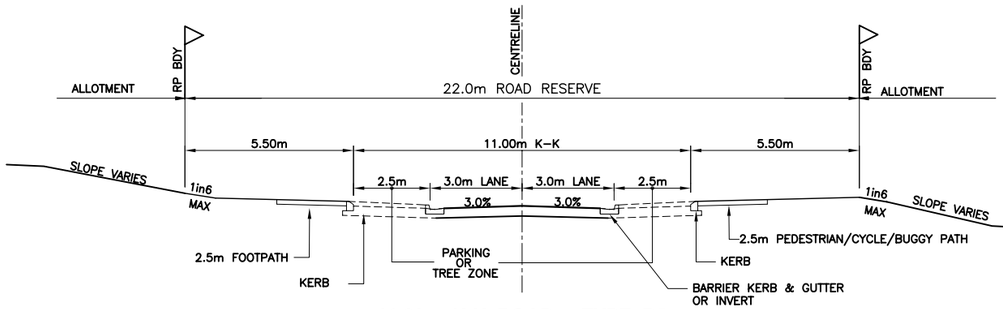
11.00m K-K ROAD - TYPE B1



11.00m K-K ROAD - TYPE B4



11.00m K-K ROAD - TYPE B2



11.00m K-K ROAD - TYPE B5

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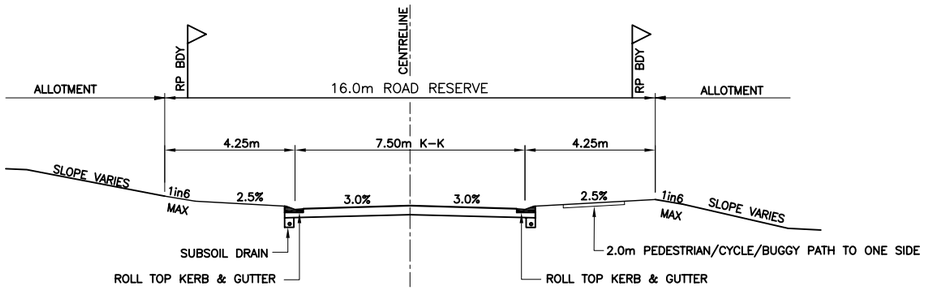
TYPICAL SECTIONS
SHEET 1 OF 2
1355 - 07 - SK04 B

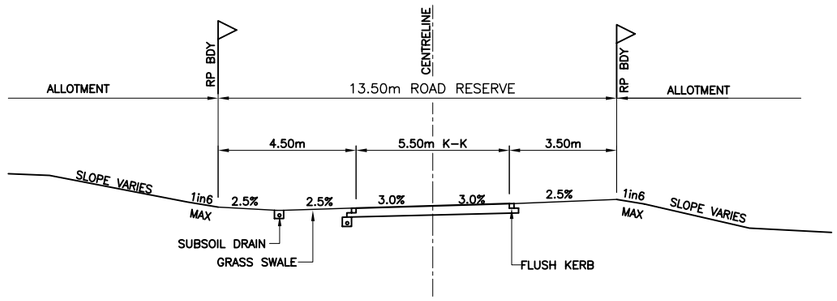
0 1 2 3 4
1:100 at A1
1:200 at A3

B - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

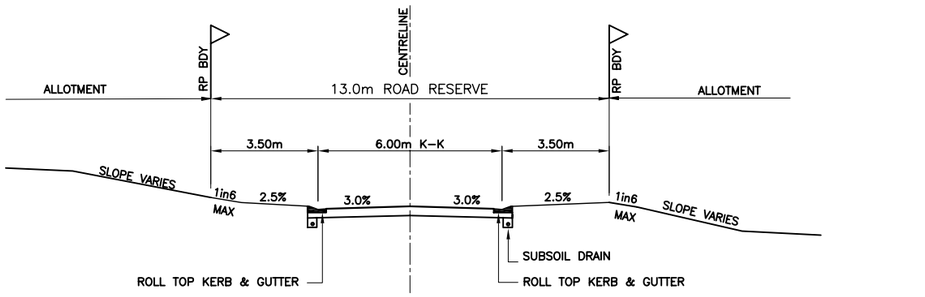
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



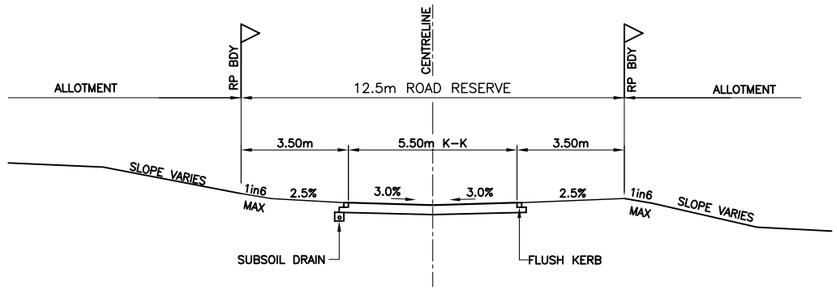
7.50m K-K ROAD - TYPE C



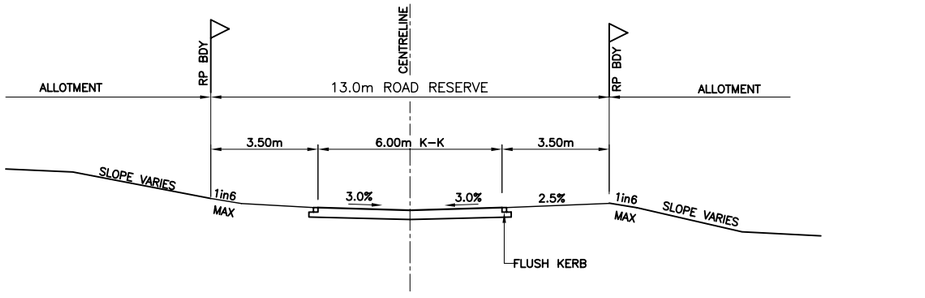
5.50m K-K ROAD - TYPE E1



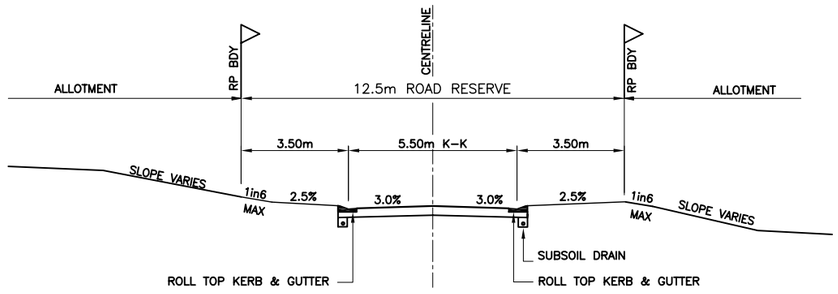
6.00m K-K ROAD - TYPE D1



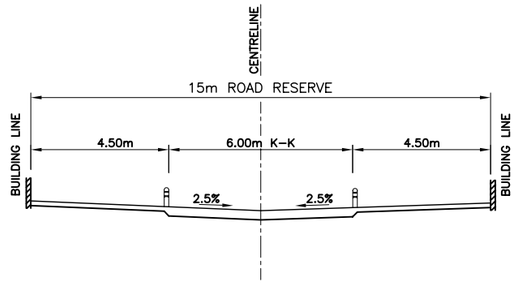
5.50m K-K ROAD - TYPE E2



6.00m K-K ROAD - TYPE D2



5.50m K-K ROAD - TYPE E3



6.00m K-K ROAD - TYPE F

RISE ABOVE IT ALL

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ABN: 55 114 638 934

TYPICAL SECTIONS
SHEET 2 OF 2

1355 - 07 - SK05 B

0 1 2 3 4
1:100 at A1
1:200 at A3

B - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

JOIN SHEET 2 1355 - 07 - SK07

ROAD 16
ROAD 17
ROAD 6
ROAD 6A
ROAD 1
ROAD 4
ROAD 105
ROAD 104
ROAD 100
ROAD 103
ROAD 131
ROAD 123
ROAD 122
ROAD 109
ROAD 110
ROAD 111
ROAD 114
ROAD 113
ROAD 116
ROAD 15
ROAD 102
ROAD 101
ROAD 130
ROAD 106
ROAD 108
ROAD 125
ROAD 126
ROAD 124
EXISTING DEVELOPMENT
MCALLISTERS EXISTING DEVELOPMENT ROAD
EXISTING MARANA DEVELOPMENT STREET
SPINE ROAD
PEDESTRIAN UNDERPASS
A 13
E 13

LEGEND

- DESIGN CONTOURS (1.0m)
- EXISTING CONTOURS (5.0m)
- RETAINING WALL

RISE ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

ROAD LAYOUT SHEET 1 OF 2

1355 - 07 - SK06 D

D - 08/10 - PREINCT J DELETED

0 25 50 75 100
1:2500 at A1
1:5000 at A3

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

JOIN SHEET 1 1355 - 07 - SK06

FILL SITE

FILL SITE

SPINE ROAD

PEDESTRIAN UNDERPASS

ROAD 16

ROAD 10

ROAD 17

ROAD 14

ROAD 15

ROAD 6

ROAD 6A

ROAD 5

ROAD 18

ROAD 1

ROAD 4

ROAD 131

ROAD 2

ROAD 3

ROAD 7

ROAD 13

ROAD 8

ROAD 8

ROAD 12

ROAD 9

ROAD 10

ROAD 11

ROAD 19

SPINE ROAD

D 13

B 13

C 13

LEGEND

- DESIGN CONTOURS (1.0m)
- EXISTING CONTOURS (5.0m)
- RETAINING WALL

RISE
ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

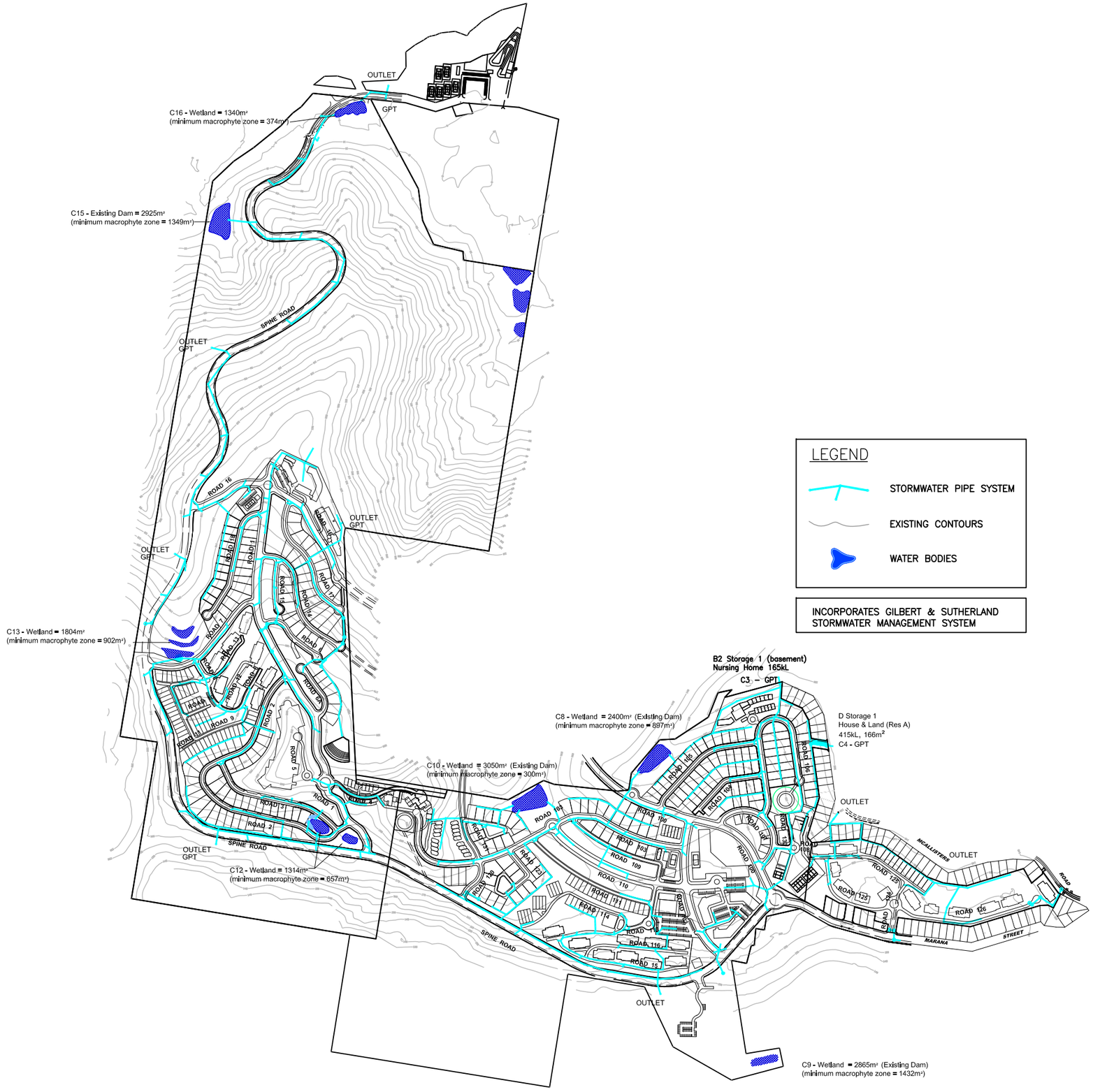
ROAD LAYOUT
SHEET 2 OF 2

0 25 50 75 100
1:2500 at A1
1:5000 at A3

1355 - 07 - SK07 D

D - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LEGEND

- STORMWATER PIPE SYSTEM
- EXISTING CONTOURS
- WATER BODIES

INCORPORATES GILBERT & SUTHERLAND STORMWATER MANAGEMENT SYSTEM

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ABN: 55 114 636 934

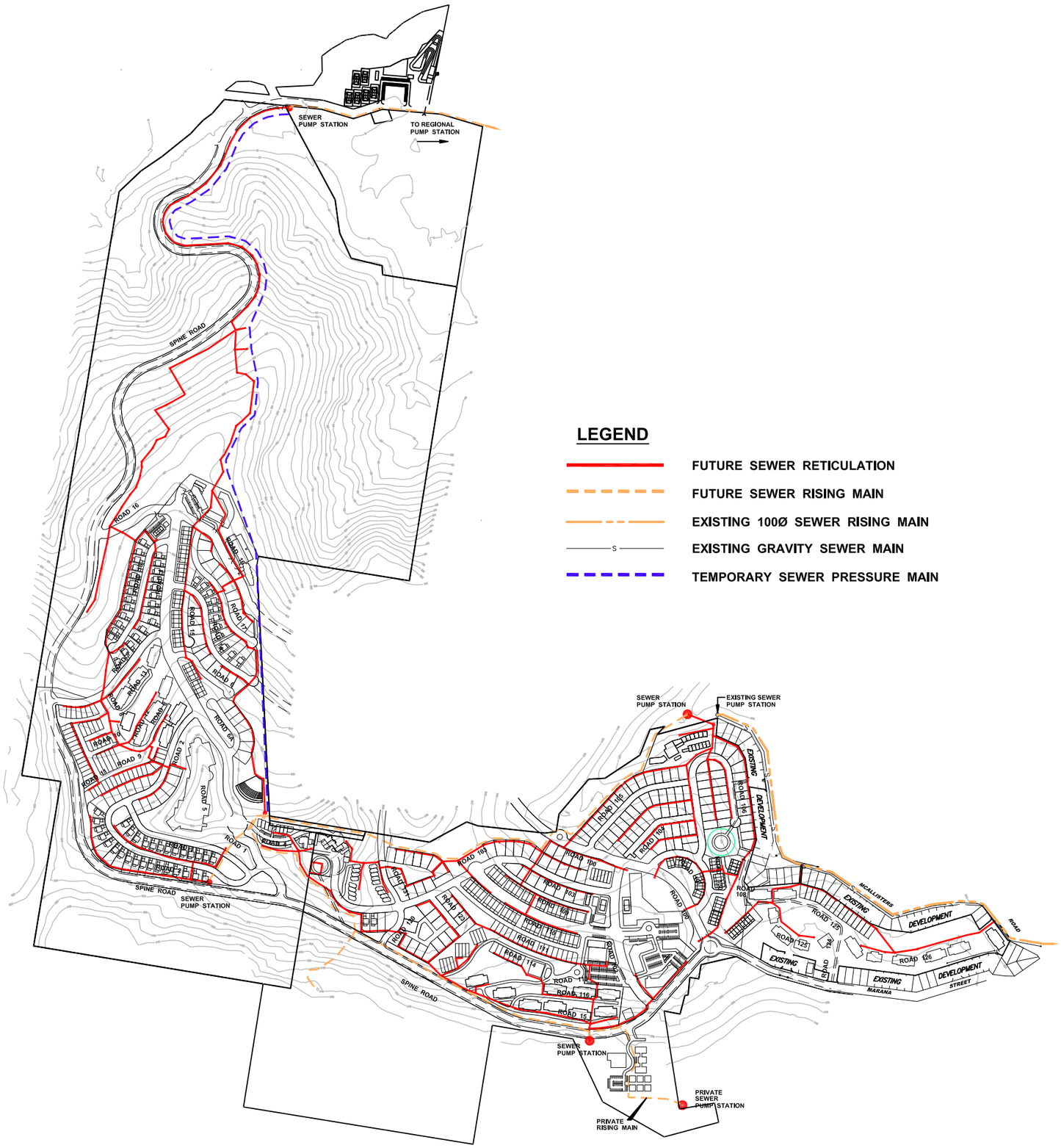
STORMWATER LAYOUT

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK08 D

D - 08/10 - PRECINCT J DELETED



LEGEND

- FUTURE SEWER RETICULATION
- FUTURE SEWER RISING MAIN
- EXISTING 100Ø SEWER RISING MAIN
- EXISTING GRAVITY SEWER MAIN
- TEMPORARY SEWER PRESSURE MAIN

RISE
ABOVE IT ALL

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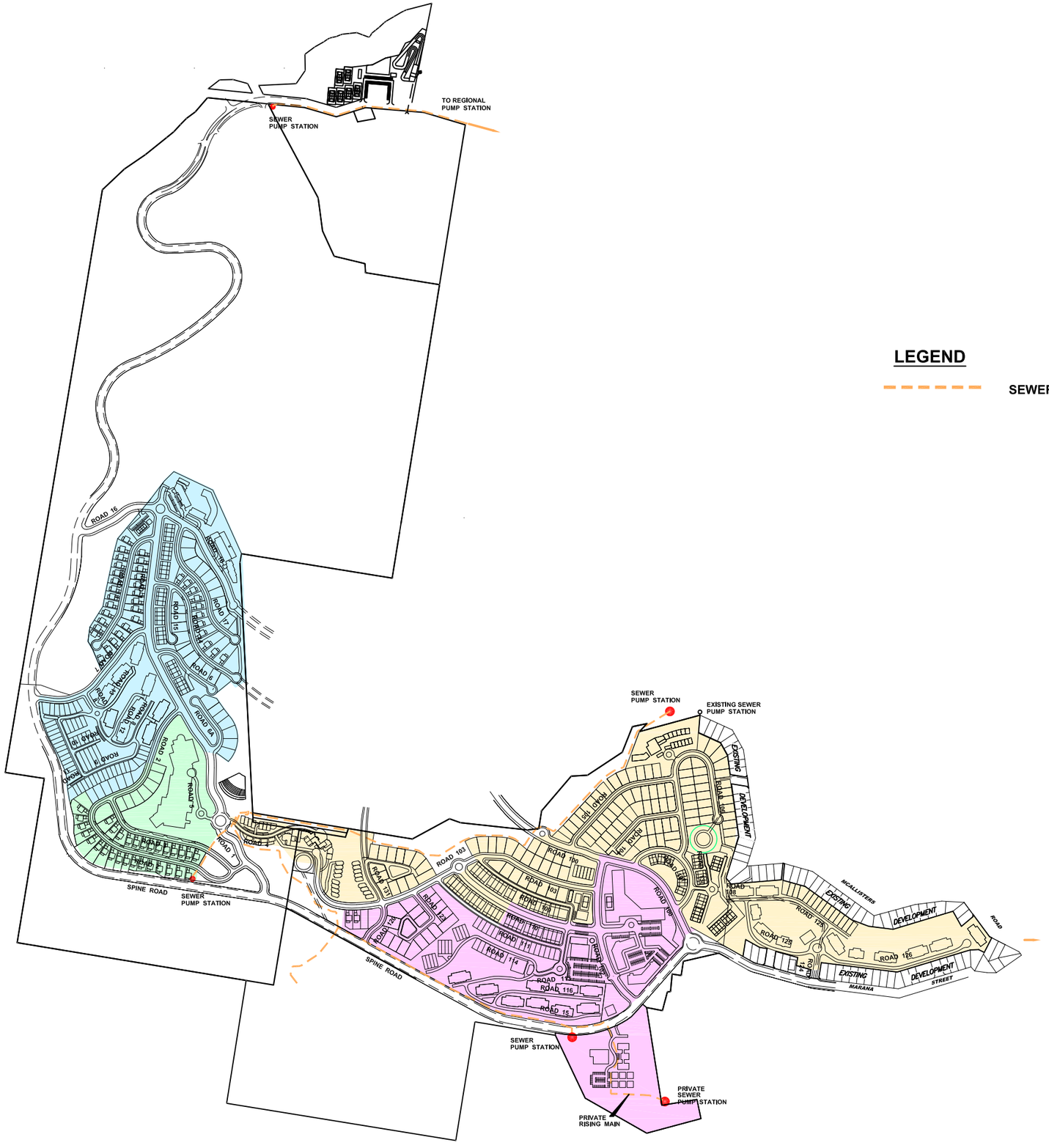
SEWER RETICULATION

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK09 C

C - 08/10 - PREINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LEGEND

SEWER RISING MAIN

RISE
ABOVE IT ALL

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ABN: 55 114 638 934

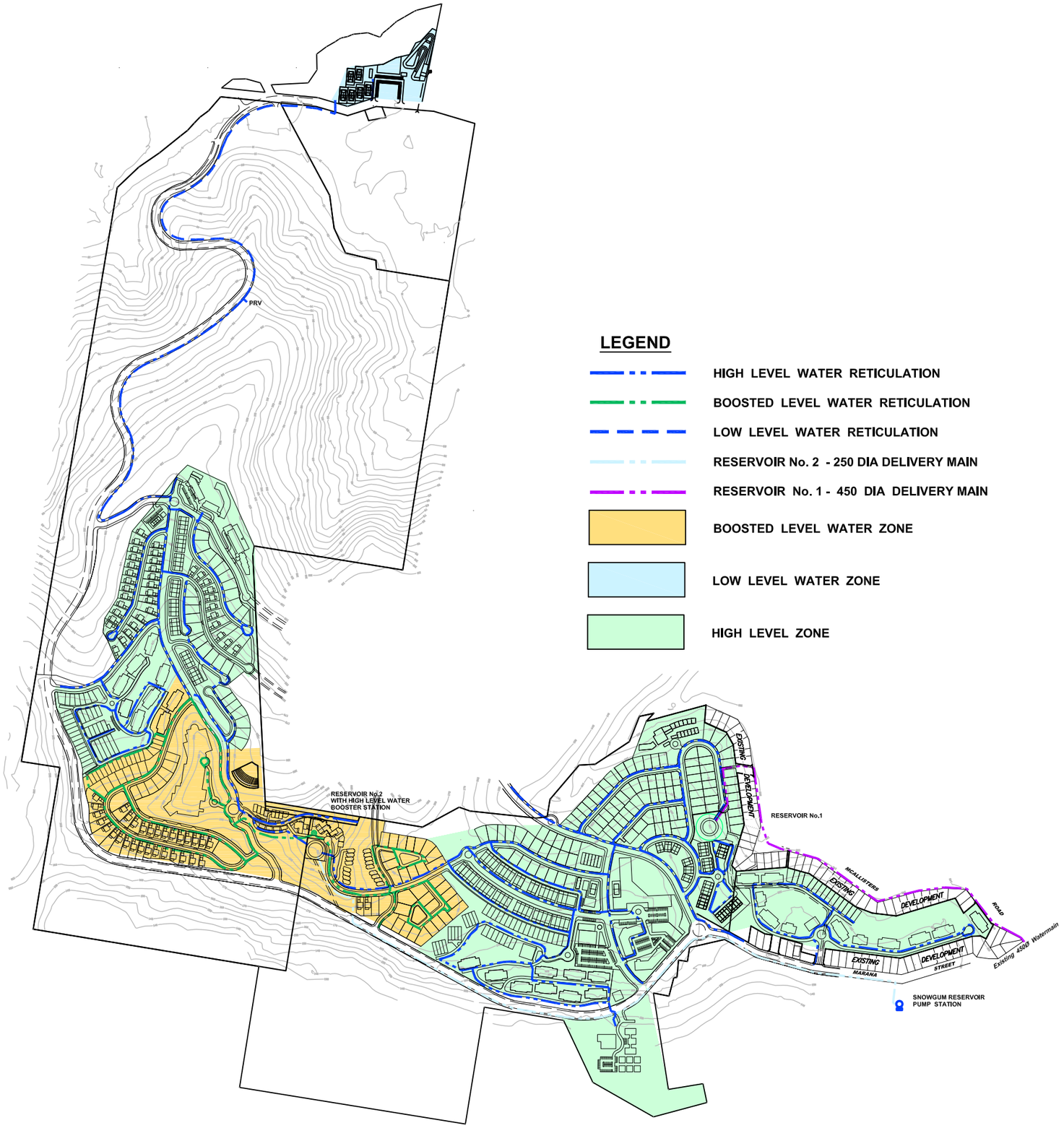
SEWER RETICULATION CATCHMENT ZONE PLAN

1355 - 07 - SK10 C

0 100 200
1:5000 at A1
1:10000 at A3

C - 08/10 - PREINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LEGEND

- HIGH LEVEL WATER RETICULATION
- BOOSTED LEVEL WATER RETICULATION
- LOW LEVEL WATER RETICULATION
- RESERVOIR No. 2 - 250 DIA DELIVERY MAIN
- RESERVOIR No. 1 - 450 DIA DELIVERY MAIN
- BOOSTED LEVEL WATER ZONE
- LOW LEVEL WATER ZONE
- HIGH LEVEL ZONE

RISE
ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

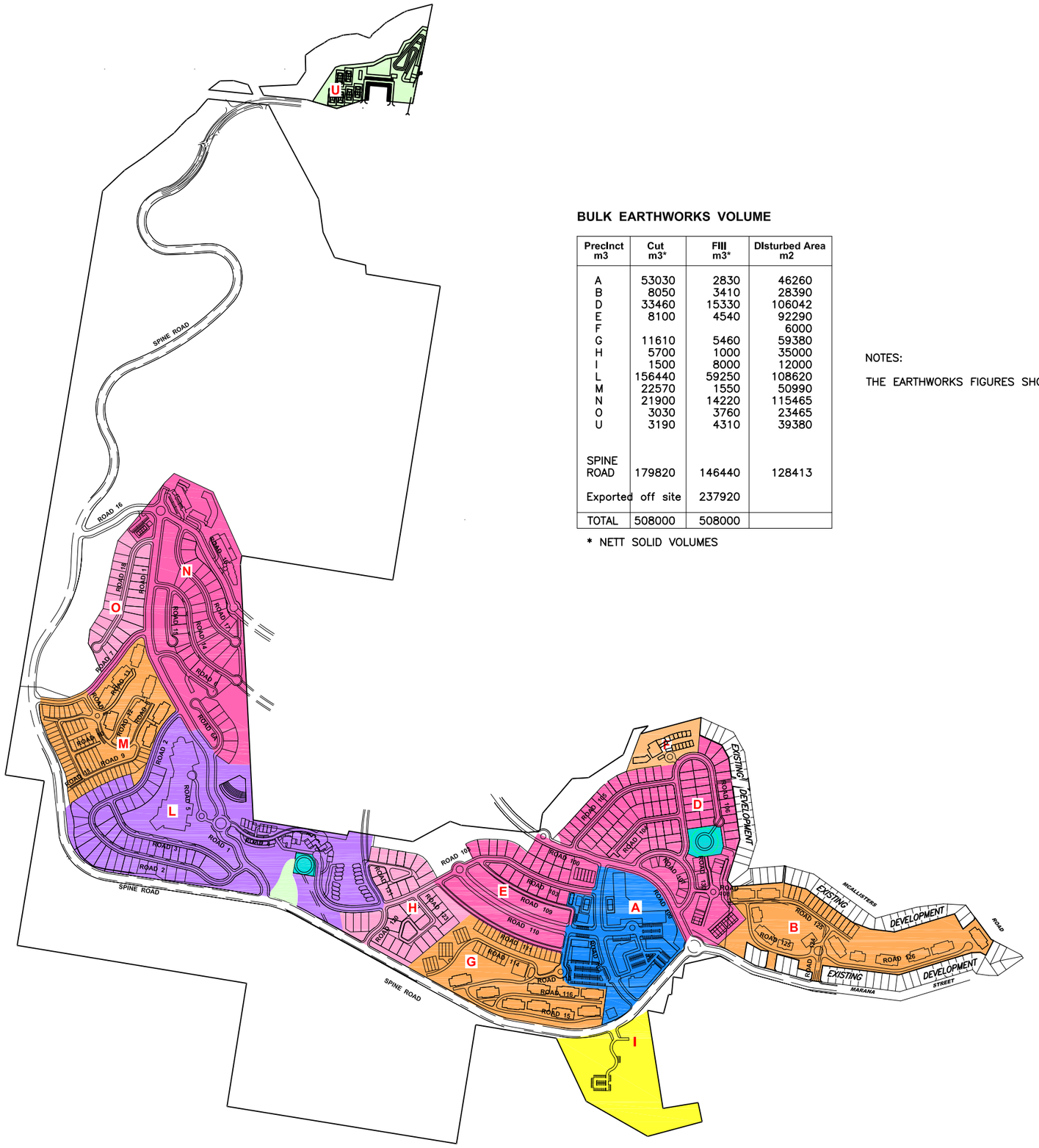
POTABLE WATER RETICULATION

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK11 C

C - 08/10 - PREINCT J DELETED



BULK EARTHWORKS VOLUME

Precinct m3	Cut m3*	Fill m3*	Disturbed Area m2
A	53030	2830	46260
B	8050	3410	28390
D	33460	15330	106042
E	8100	4540	92290
F			6000
G	11610	5460	59380
H	5700	1000	35000
I	1500	8000	12000
L	156440	59250	108620
M	22570	1550	50990
N	21900	14220	115465
O	3030	3760	23465
U	3190	4310	39380
SPINE ROAD	179820	146440	128413
Exported off site		237920	
TOTAL	508000	508000	

* NETT SOLID VOLUMES

NOTES:

THE EARTHWORKS FIGURES SHOWN ARE PRELIMINARY ONLY.

RISE ABOVE IT ALL

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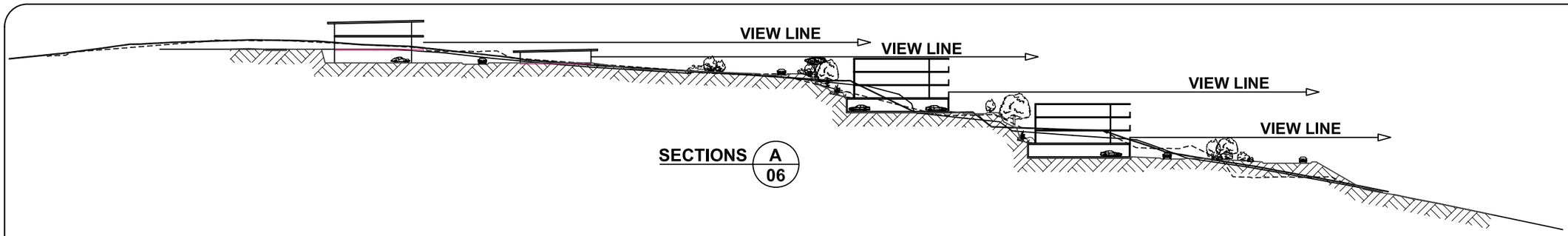
BULK EARTHWORKS VOLUMES

0 100 200
1:5000 at A1
1:10000 at A3

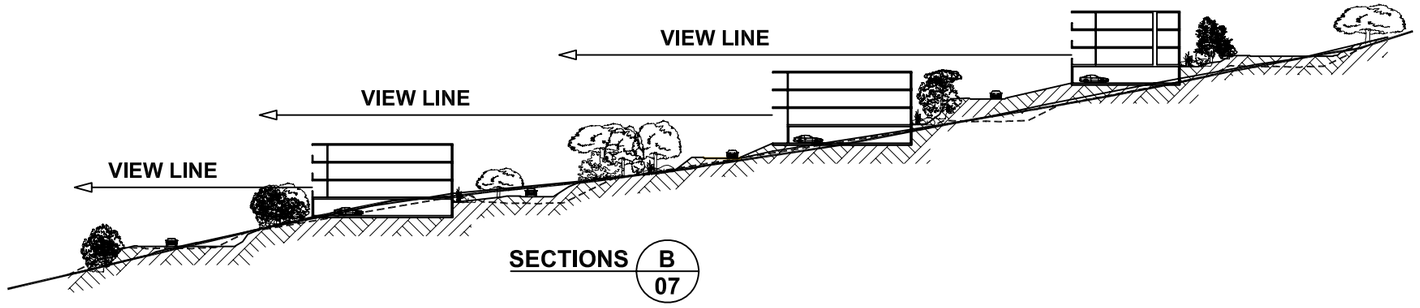
1355 - 07 - SK12 C

C - 08/10 - PRECINCT J DELETED

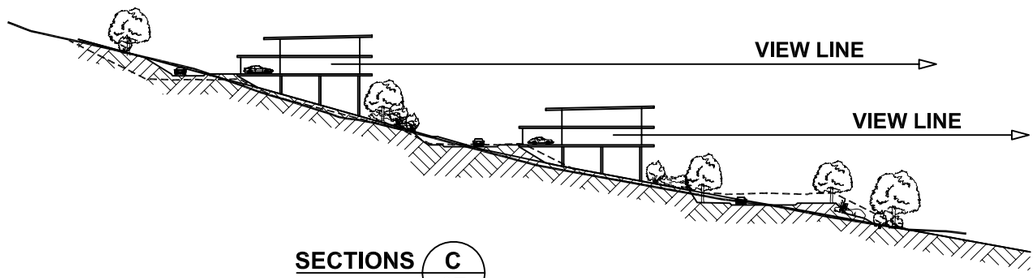
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



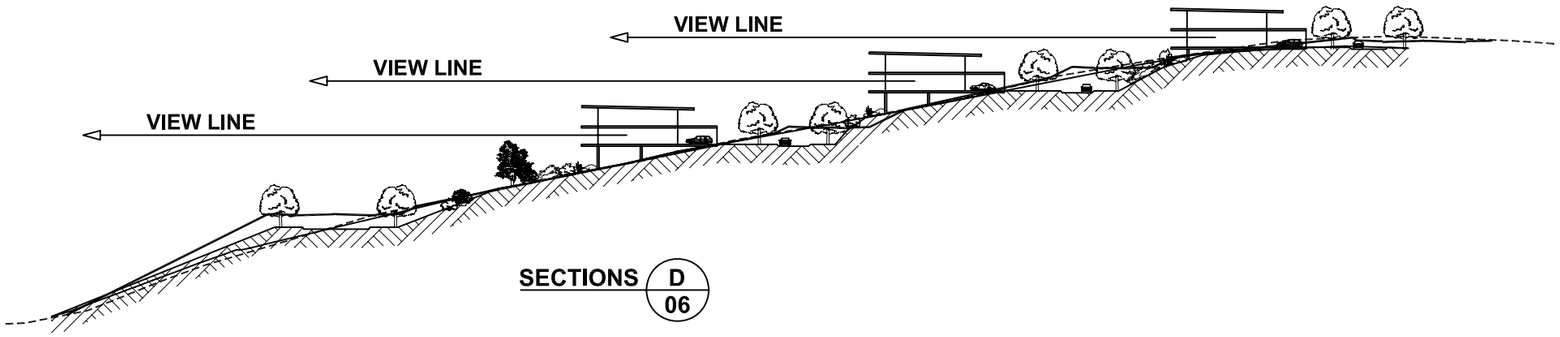
SECTIONS A 06



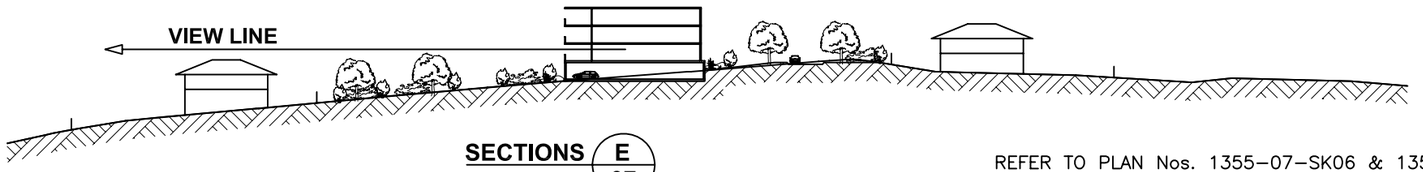
SECTIONS B 07



SECTIONS C 07



SECTIONS D 06



SECTIONS E 07

REFER TO PLAN Nos. 1355–07–SK06 & 1355–07–SK07
FOR LOCATIONS OF SECTIONS

RISE
ABOVE IT ALL

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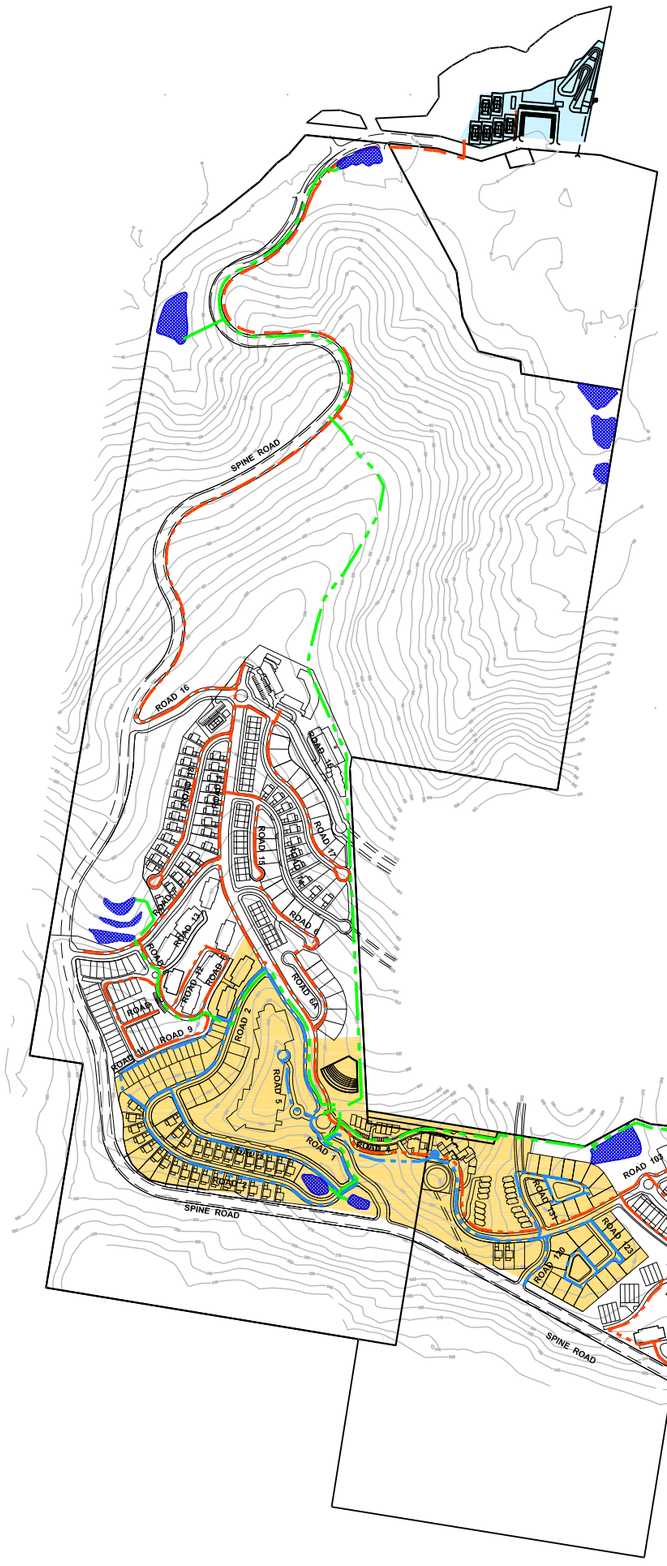
SITE SECTIONS

0 10 20
1:50 at A1
1:100 at A3

1355 - 07 - SK13 A

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LEGEND

- HIGH LEVEL RECYCLED STORMWATER RETICULATION
- BOOSTED LEVEL RECYCLED STORMWATER RETICULATION
- LOW LEVEL RECYCLED STORMWATER RETICULATION
- STORMWATER RISING MAIN
- BOOSTED LEVEL RECYCLED STORMWATER ZONE
- LOW LEVEL RECYCLED STORMWATER ZONE
- HIGH LEVEL RECYCLED STORMWATER ZONE
- STORMWATER WETLANDS

RISE
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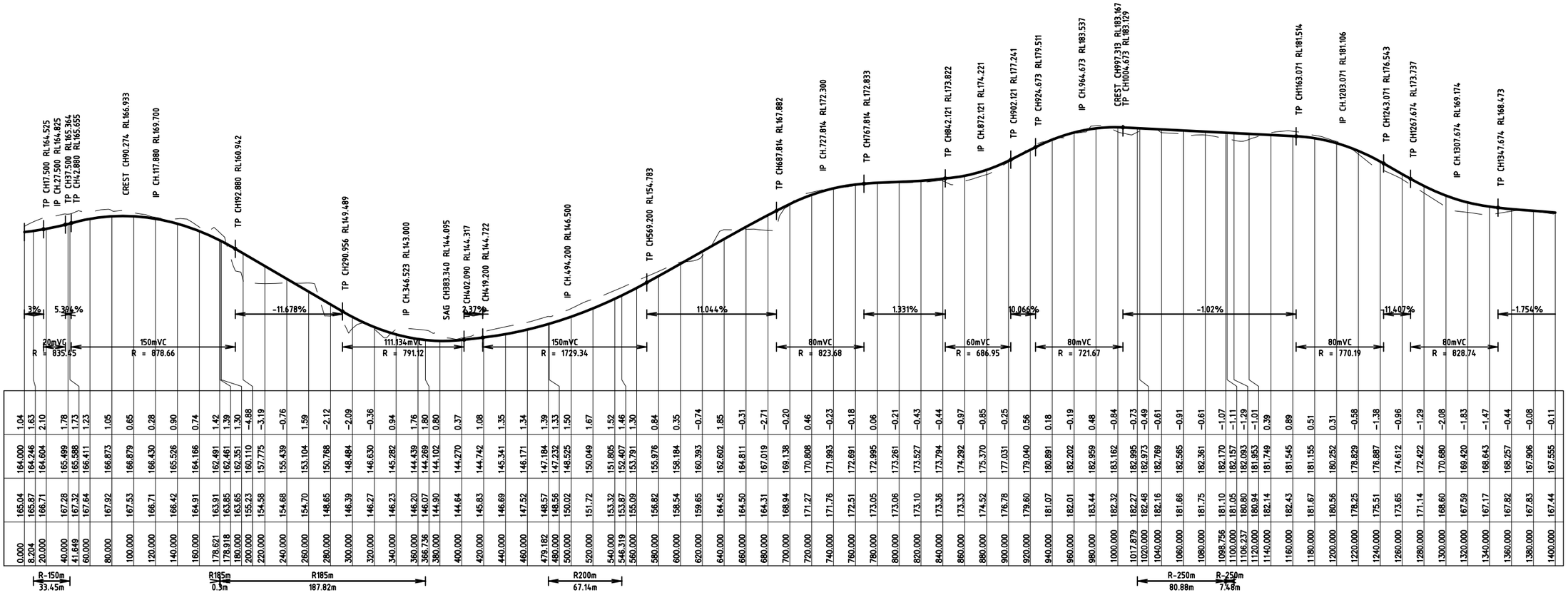
RECYCLED STORMWATER RETICULATION

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK14 A

C - 08/10 - PRECINCT J DELETED



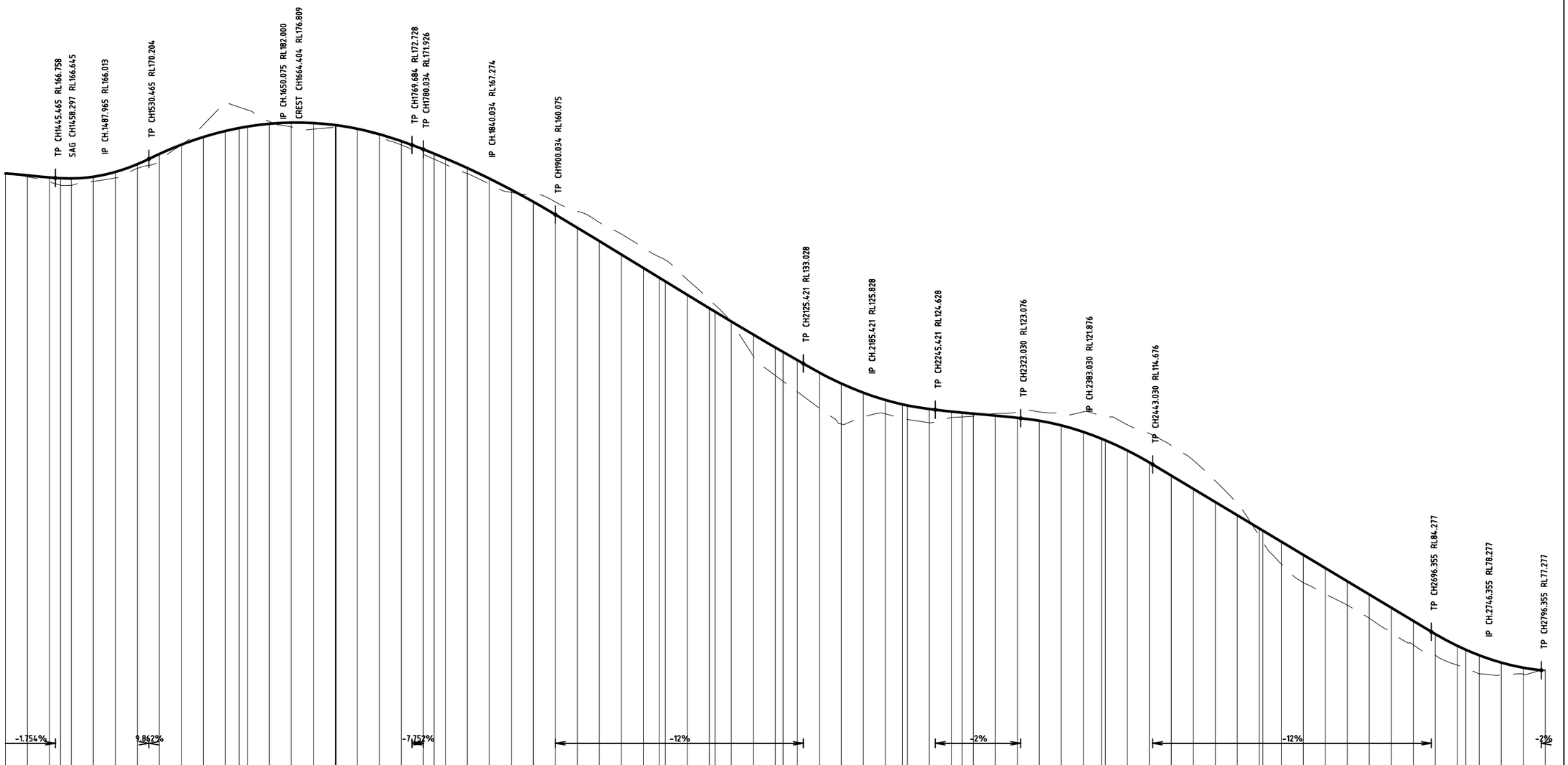
VERTICAL GRADE (%)

VERTICAL CURVE LENGTH (m)

VERTICAL CURVE RADIUS (m)

DATUM RL 135.0

| | | |



VERTICAL GRADE (%): -1.754% | 9.862% | -7.752% | -12% | -2% | -12% | -2%

VERTICAL CURVE LENGTH (m) / VERTICAL CURVE RADIUS (m): 85mVC R = 731.76 | 239.219mVC R = 1358.11 | 120mVC R = 2824.79 | 120mVC R = 1200 | 120mVC R = 1200 | 100mVC R = 1000

DATUM RL 50.0

CONTROL LINE CHAINAGE	DEPTH OF CUT (+ve) HEIGHT OF FILL (-ve)	FINISHED SURFACE LEVEL	EXISTING SURFACE LEVEL
1400.000	-0.11	167.555	167.44
1420.000	-0.25	167.204	166.95
1440.000	-0.74	166.854	166.11
1450.182	-1.27	166.699	165.42
1460.000	-1.24	166.647	165.40
1480.000	-0.84	166.967	166.12
1500.000	-1.10	167.834	166.74
1520.000	-0.75	169.247	168.49
1540.000	-1.23	171.111	169.88
1560.000	-0.05	172.796	172.75
1580.000	2.21	174.186	176.40
1600.000	4.76	175.281	180.04
1612.523	3.80	175.818	179.62
1620.000	3.04	176.083	179.12
1640.000	0.41	176.589	177.00
1660.000	-0.80	176.801	176.00
1680.000	-1.12	176.719	175.60
1700.000	-0.39	176.342	175.95
1700.606	-0.38	176.326	175.95
1720.000	0.01	175.671	175.68
1740.000	-0.38	174.705	174.33
1760.000	-0.69	173.444	172.75
1780.000	-0.89	171.928	171.04
1789.784	-0.99	171.153	170.16
1800.000	-1.09	170.307	169.21
1820.000	-1.02	168.545	167.53
1840.000	-0.99	166.641	165.65
1860.000	-0.50	164.595	164.10
1880.000	1.34	162.408	163.75
1900.000	2.32	160.079	162.40
1920.000	2.96	157.679	160.64
1940.000	3.38	155.279	158.66
1960.000	3.65	152.879	156.53
1980.000	3.60	150.479	154.08
1994.392	3.66	148.752	152.42
2000.000	3.77	148.079	151.85
2020.000	2.57	145.679	148.25
2040.000	1.38	143.279	144.66
2045.070	1.03	142.670	143.70
2060.000	-0.34	140.879	140.53
2080.000	-4.08	138.479	134.40
2100.000	-5.24	136.079	130.84
2107.034	-5.43	135.235	129.80
2120.000	-5.79	133.679	127.88
2140.000	-6.46	131.367	124.91
2160.000	-7.35	129.377	122.02
2180.000	-4.41	127.720	123.31
2200.000	-2.51	126.396	123.89
2215.469	-2.60	125.601	123.00
2220.000	-2.55	125.406	122.86
2240.000	-2.50	124.749	122.24
2260.000	-1.12	124.337	123.22
2269.775	-0.83	124.141	123.31
2280.000	-0.50	123.937	123.44
2300.000	0.38	123.537	123.92
2320.000	1.02	123.137	124.16
2340.000	1.60	122.617	124.21
2360.000	2.12	121.767	123.89
2380.000	3.65	120.584	124.24
2396.567	4.23	119.352	123.58
2400.000	4.35	119.068	123.42
2420.000	4.69	117.219	121.91
2440.000	5.27	115.036	120.31
2460.000	5.50	112.640	118.14
2480.000	5.20	110.240	115.44
2500.000	3.83	107.840	111.67
2520.000	2.14	105.440	107.58
2540.000	-1.39	103.040	101.65
2553.206	-2.04	102.655	100.61
2560.000	-4.07	100.640	96.57
2580.000	-5.06	98.240	93.18
2600.000	-4.71	95.840	91.13
2620.000	-4.34	93.440	89.10
2640.000	-4.30	91.040	86.74
2660.000	-4.45	88.640	84.19
2680.000	-4.34	86.240	81.90
2700.000	-3.81	83.846	80.04
2720.000	-3.52	81.719	78.20
2727.805	-3.35	80.998	77.64
2740.000	-3.38	79.992	76.61
2760.000	-2.26	78.665	76.40
2780.000	-1.16	77.738	76.57
2800.000	0.18	77.204	77.39

HORIZONTAL GEOMETRY: R120m 162.34m | R-200m 89.18m | R280m 204.61m | R135m 50.68m | R-200m 108.44m | R160m 126.79m | R-105m 146.64m | R105m 184.6m | R-600m 257.04m

LONGITUDINAL SECTION

Horizontal scale 1:2000
Vertical scale 1:400

SPINE ROAD
LONGITUDINAL SECTION

0 10 20 30 40 HORIZONTAL
0 1 2 3 4 VERTICAL

RISE ABOVE IT ALL

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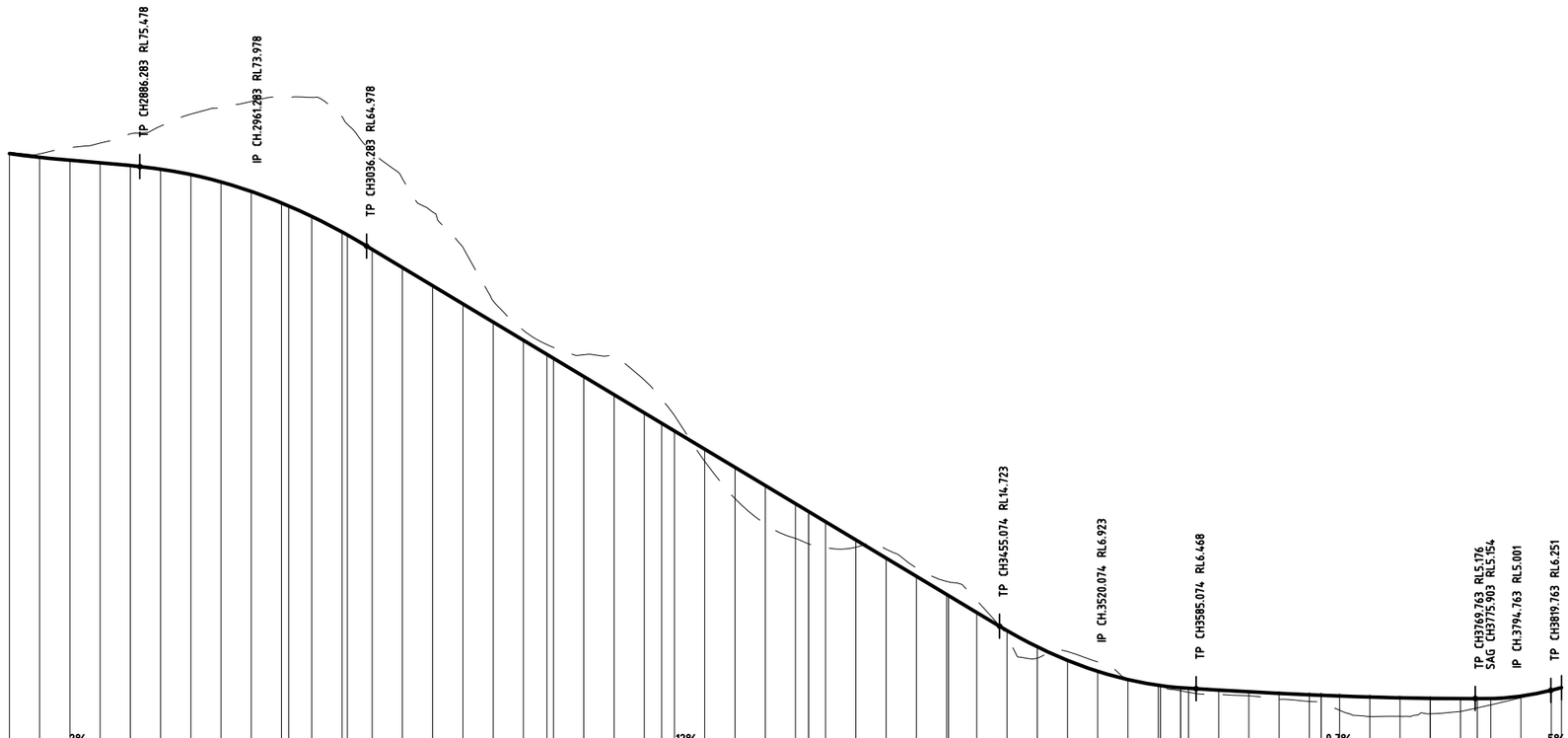
ABN: 55 114 638 934

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

1355 - 07 - SK21



CONTROL LINE CHAINAGE	EXISTING SURFACE LEVEL	FINISHED SURFACE LEVEL	DEPTH OF CUT (+ve) HEIGHT OF FILL (-ve)
2800.000	77.39	77.204	0.18
2820.000	77.17	76.804	0.37
2840.000	78.00	76.404	1.59
2860.000	78.59	76.004	2.59
2880.000	79.82	75.604	4.22
2900.000	80.83	75.141	5.69
2920.000	82.42	74.425	7.99
2940.000	83.29	73.442	9.85
2960.000	84.12	72.193	11.93
2980.000	84.64	70.676	13.97
2984.848	84.66	70.269	14.39
3000.000	84.64	68.894	15.75
3020.000	82.09	66.844	15.25
3023.594	81.08	66.447	14.64
3040.000	77.39	64.532	12.86
3060.000	73.89	62.132	11.76
3080.000	69.49	59.732	9.76
3100.000	64.81	57.332	7.48
3120.000	57.73	54.932	2.80
3140.000	53.85	52.532	1.31
3155.576	51.96	50.663	1.30
3160.000	51.57	50.132	1.44
3180.000	50.61	47.732	2.88
3200.000	50.55	45.332	5.21
3220.000	47.28	42.932	4.34
3231.497	44.73	41.553	3.17
3240.000	42.55	40.532	2.02
3260.000	36.54	38.132	-1.60
3280.000	31.59	35.732	-4.14
3300.000	28.23	33.332	-5.10
3320.000	26.35	30.932	-4.59
3328.745	25.62	29.883	-4.26
3328.745	25.62	29.883	-4.26
3340.000	25.08	28.532	-3.45
3360.000	25.16	26.132	-0.97
3380.000	24.90	23.732	1.17
3400.000	22.42	21.332	1.09
3420.000	20.65	18.932	1.72
3421.299	20.60	18.776	1.82
3421.300	20.60	18.776	1.82
3440.000	18.14	16.532	1.61
3460.000	13.42	14.143	-0.72
3480.000	10.52	12.002	-1.49
3500.000	11.27	10.210	1.16
3520.000	10.02	8.764	1.26
3540.000	7.77	7.667	0.10
3560.000	6.64	6.917	-0.27
3561.498	6.53	6.875	-0.34
3561.498	6.53	6.875	-0.34
3574.826	6.18	6.586	-0.40
3574.826	6.18	6.586	-0.40
3580.000	6.00	6.515	-0.51
3600.000	5.68	6.364	-0.68
3620.000	5.52	6.224	-0.70
3640.000	5.06	6.084	-1.03
3660.000	4.78	5.944	-1.16
3667.814	4.67	5.889	-1.22
3667.814	4.67	5.889	-1.22
3680.000	3.61	5.804	-2.20
3700.000	2.79	5.664	-2.87
3720.000	2.82	5.524	-2.71
3739.848	3.16	5.385	-2.23
3740.000	3.16	5.384	-2.23
3760.000	3.45	5.244	-1.79
3771.108	3.94	5.167	-1.22
3780.000	4.32	5.164	-0.85
3800.000	5.25	5.485	-0.24
3820.000	6.27	6.263	0.01
3826.809	6.60	6.603	0.00

LONGITUDINAL SECTION

Horizontal scale 1:2000
Vertical scale 1:400

RISE
ABOVE IT ALL

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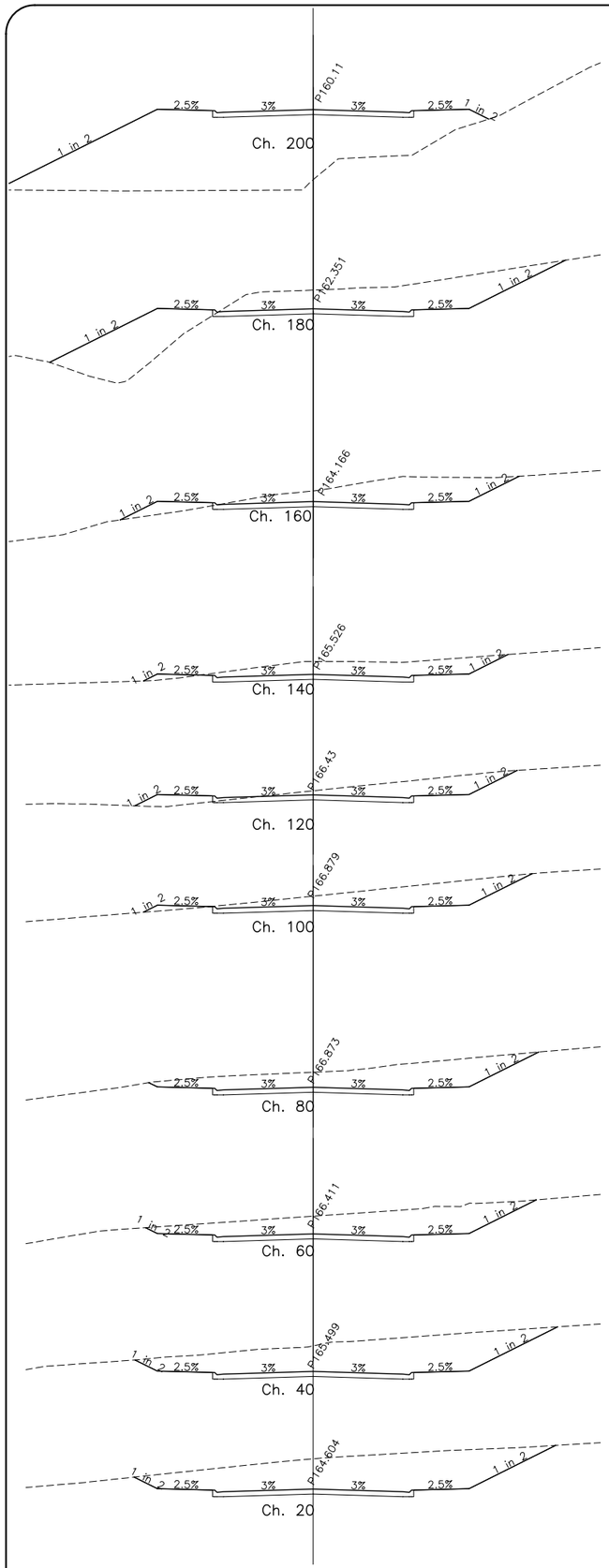
SPINE ROAD
LONGITUDINAL SECTION

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

1355 - 07 - SK22

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



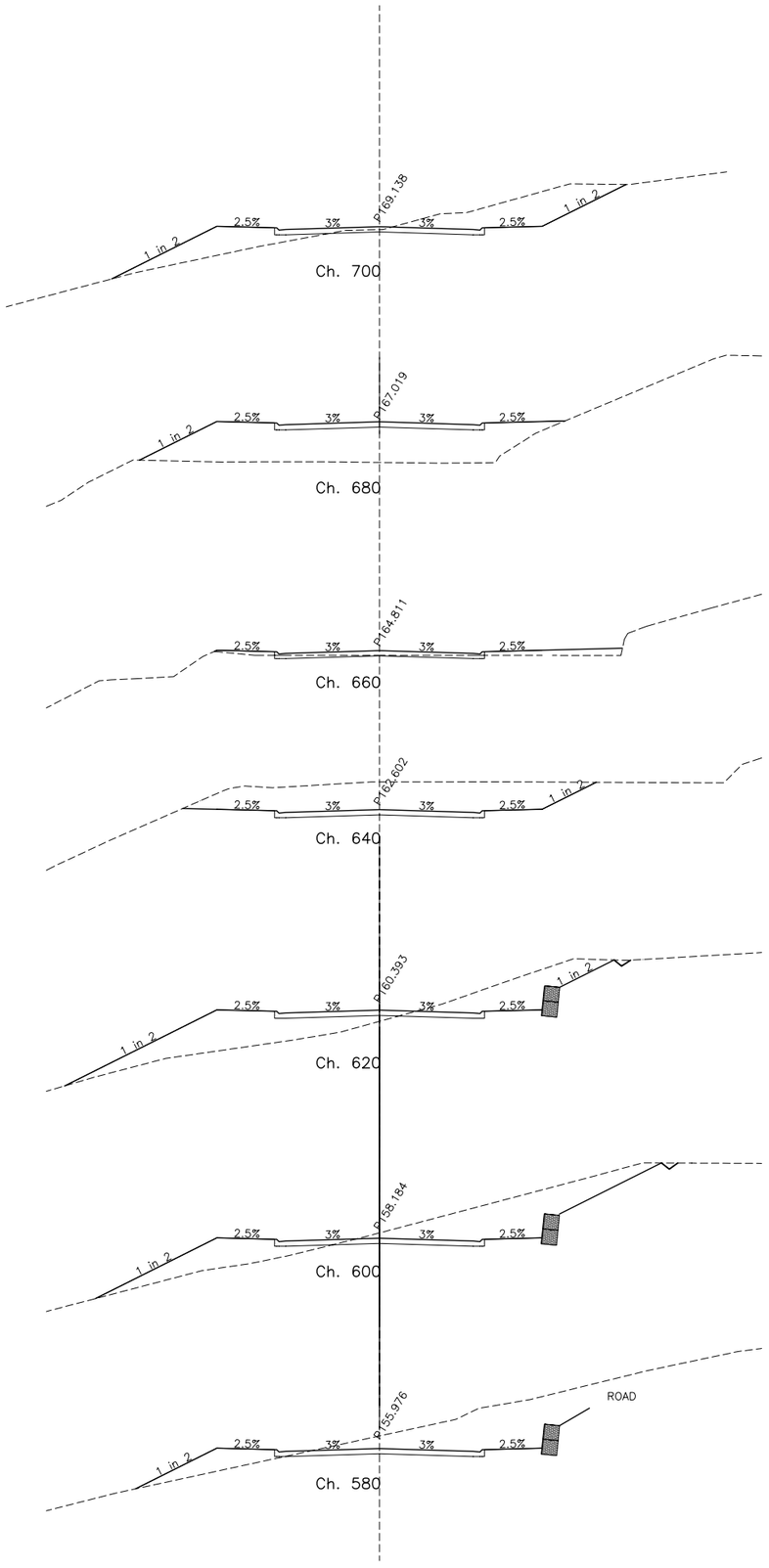
SPINE ROAD CROSS SECTION

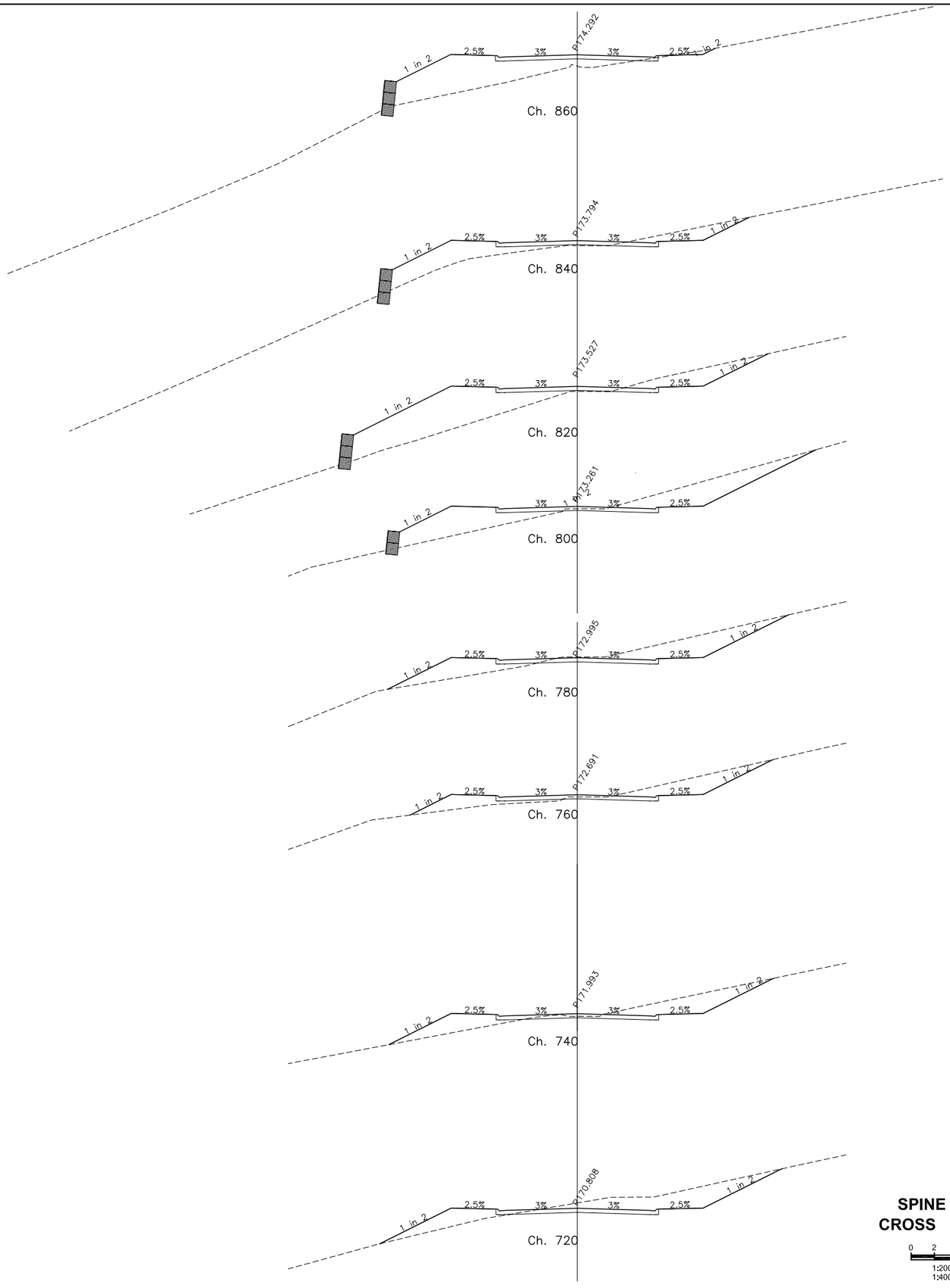
0 2 4 6 8

1:200 at A1
1:400 at A3

1355-07-SK23

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



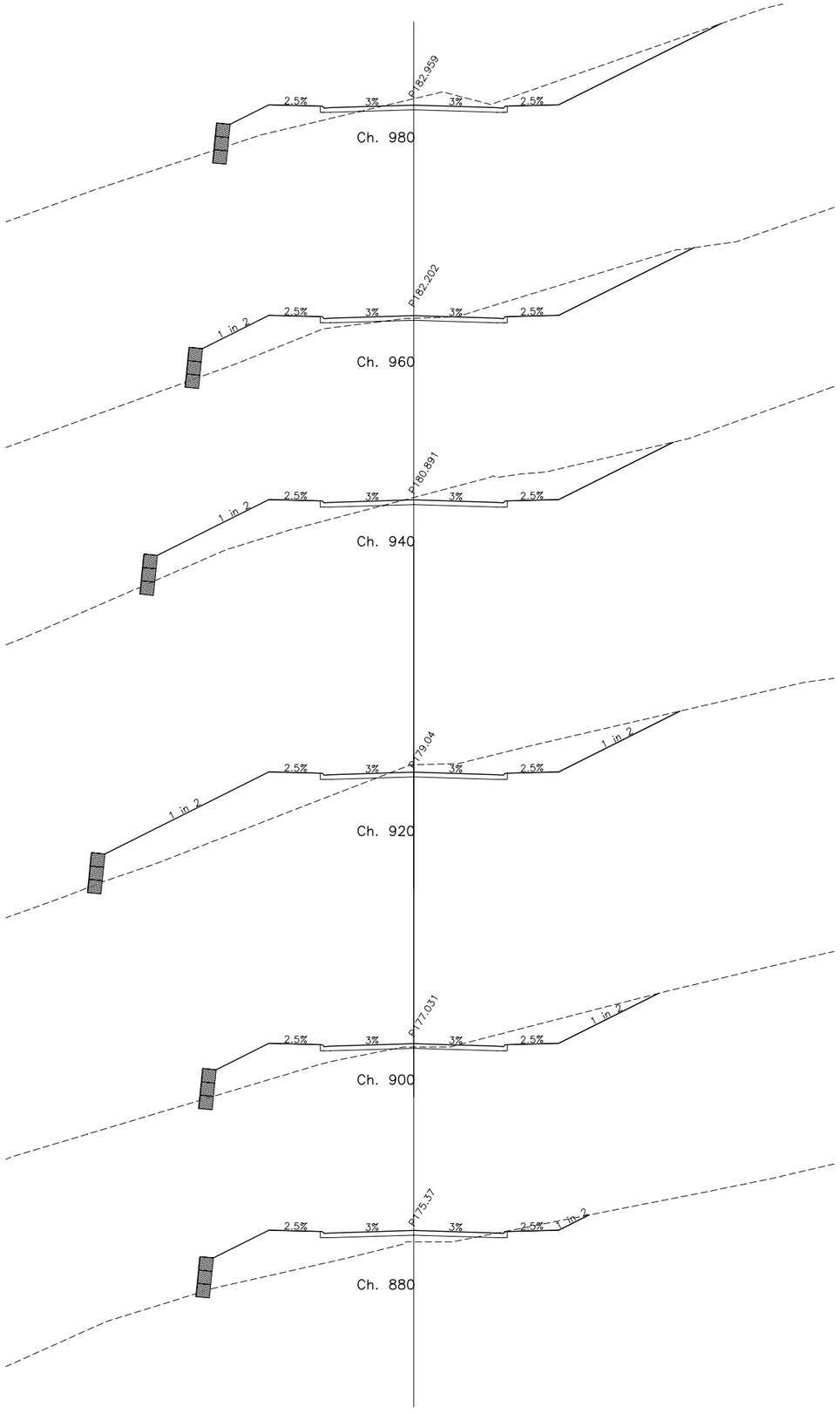


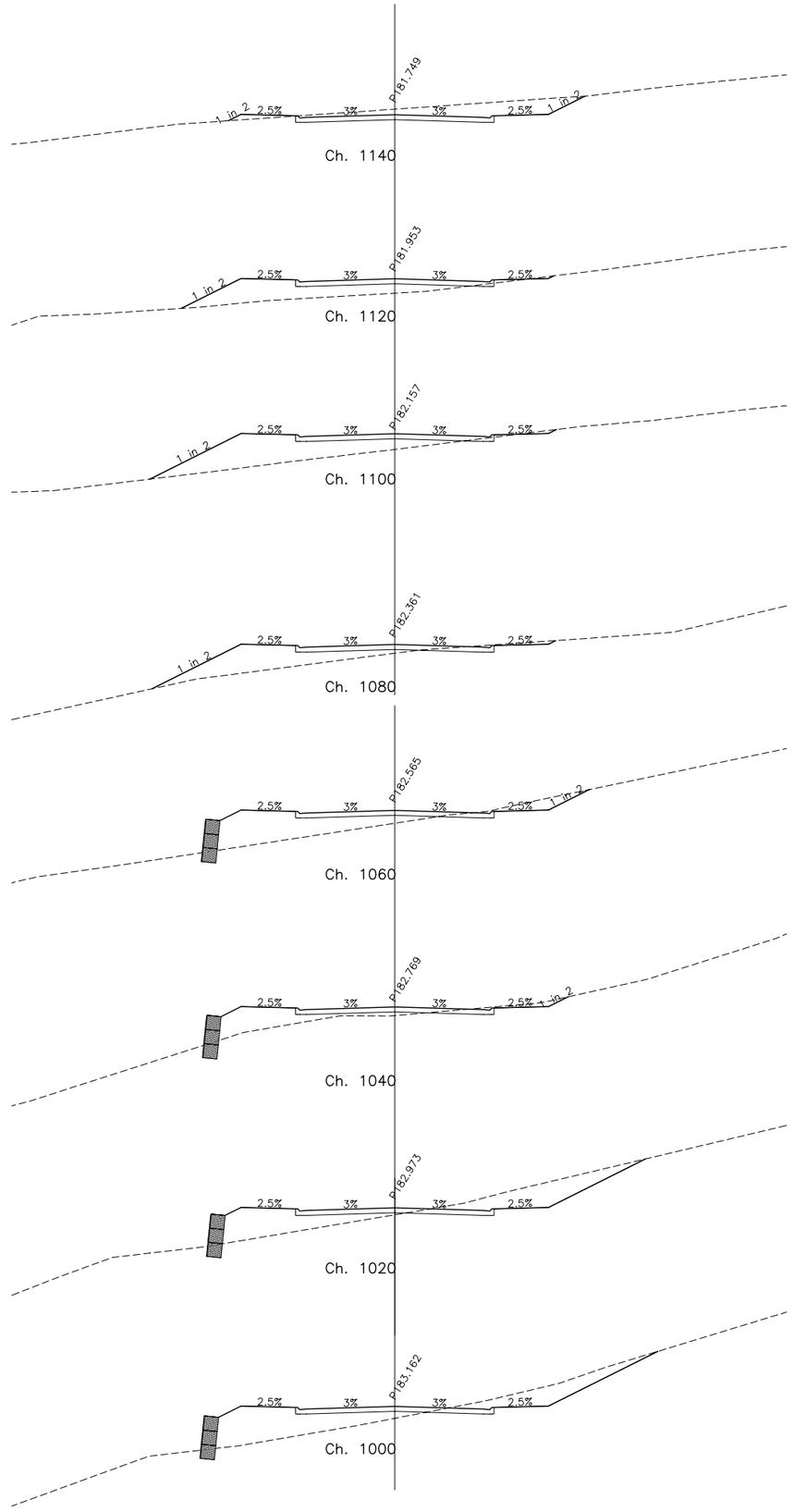
SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

1355-07-SK24

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

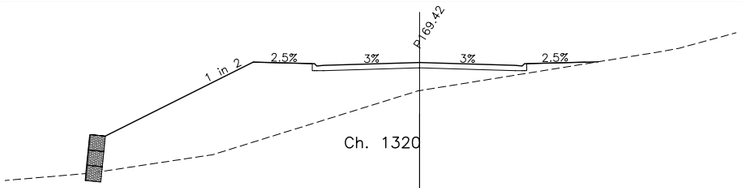




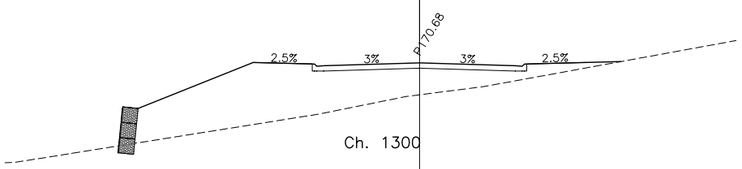
SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

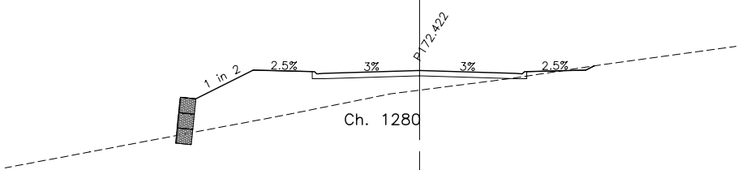
1355-07-SK25



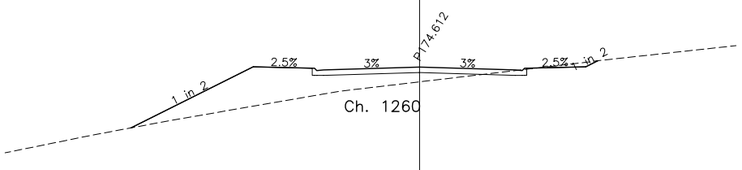
Ch. 1320



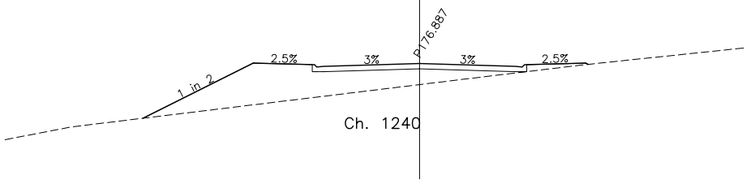
Ch. 1300



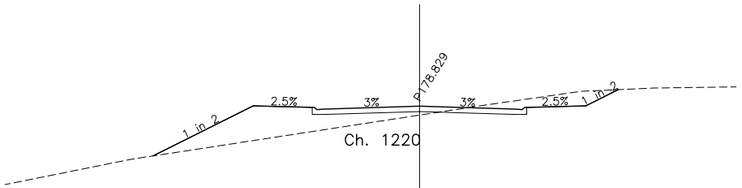
Ch. 1280



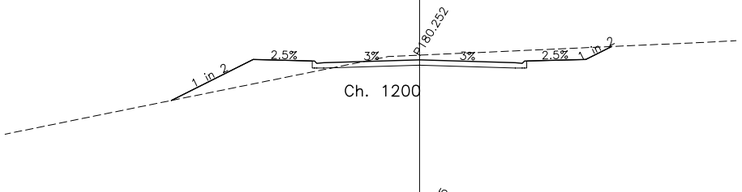
Ch. 1260



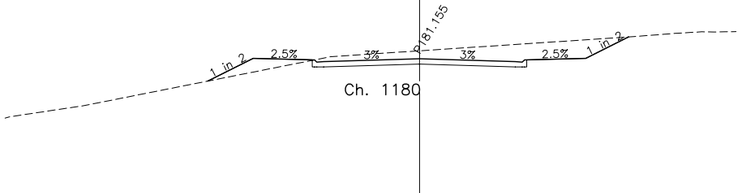
Ch. 1240



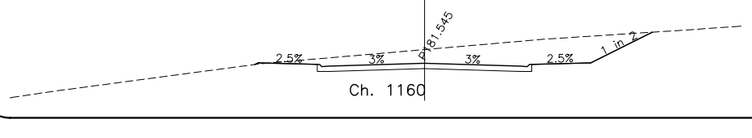
Ch. 1220



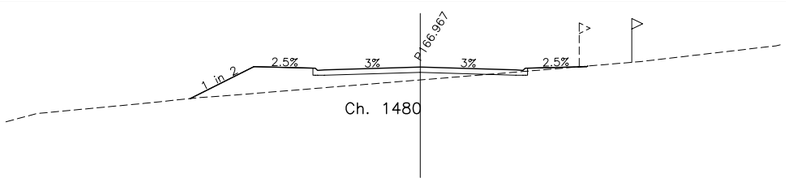
Ch. 1200



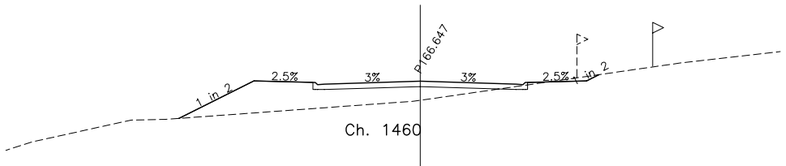
Ch. 1180



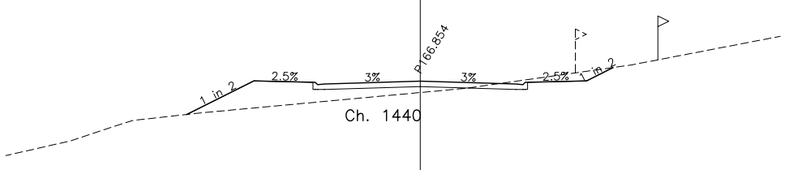
Ch. 1160



Ch. 1480



Ch. 1460



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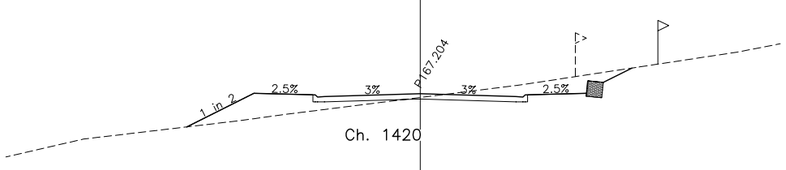
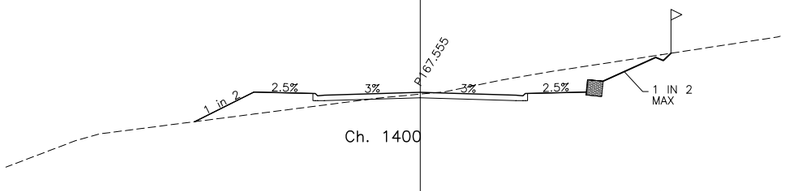
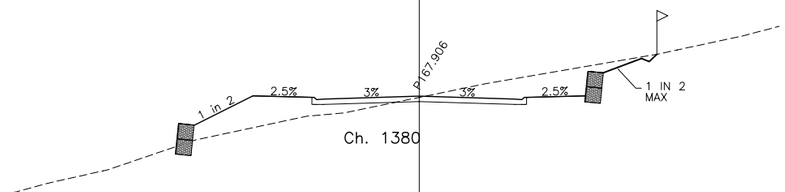


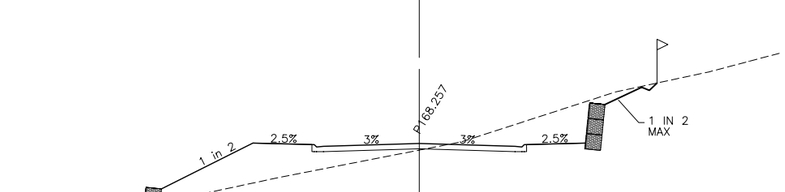
Ch. 1420



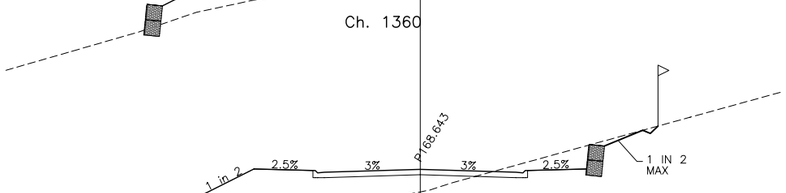
Ch. 1400



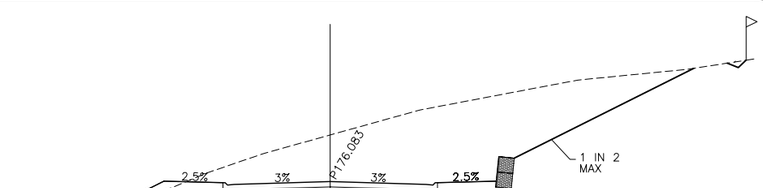
Ch. 1380



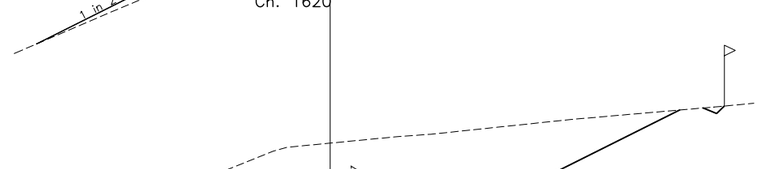
Ch. 1360



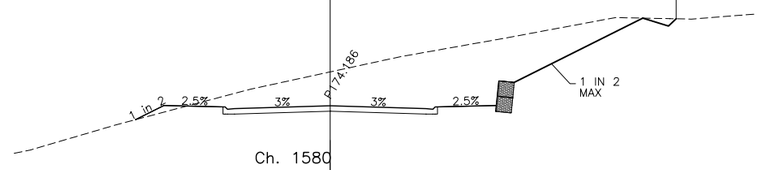
Ch. 1340



Ch. 1620



Ch. 1600



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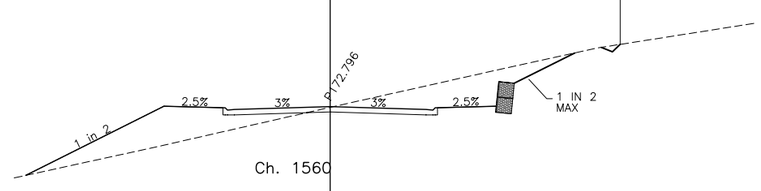
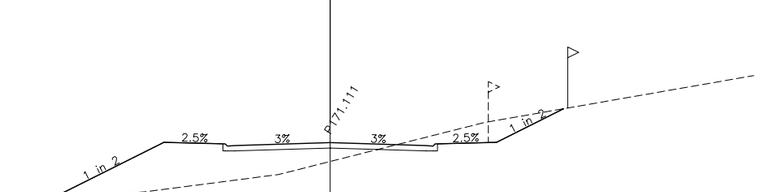


Ch. 1560



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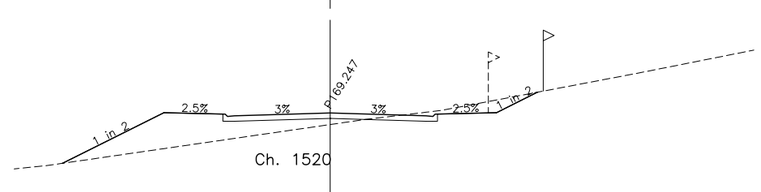
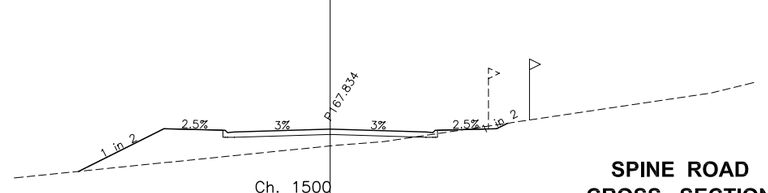


Ch. 1520



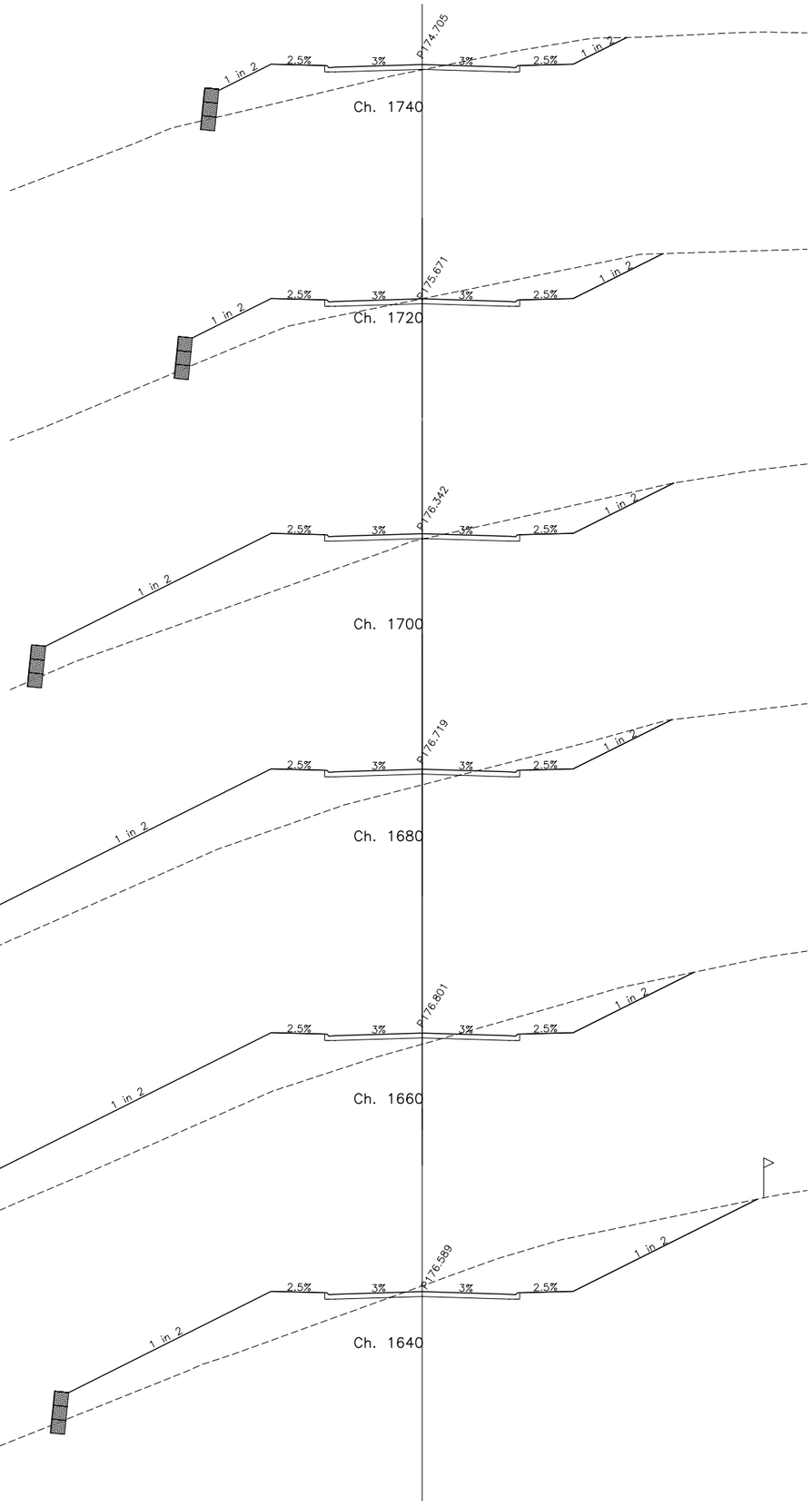
Ch. 1500

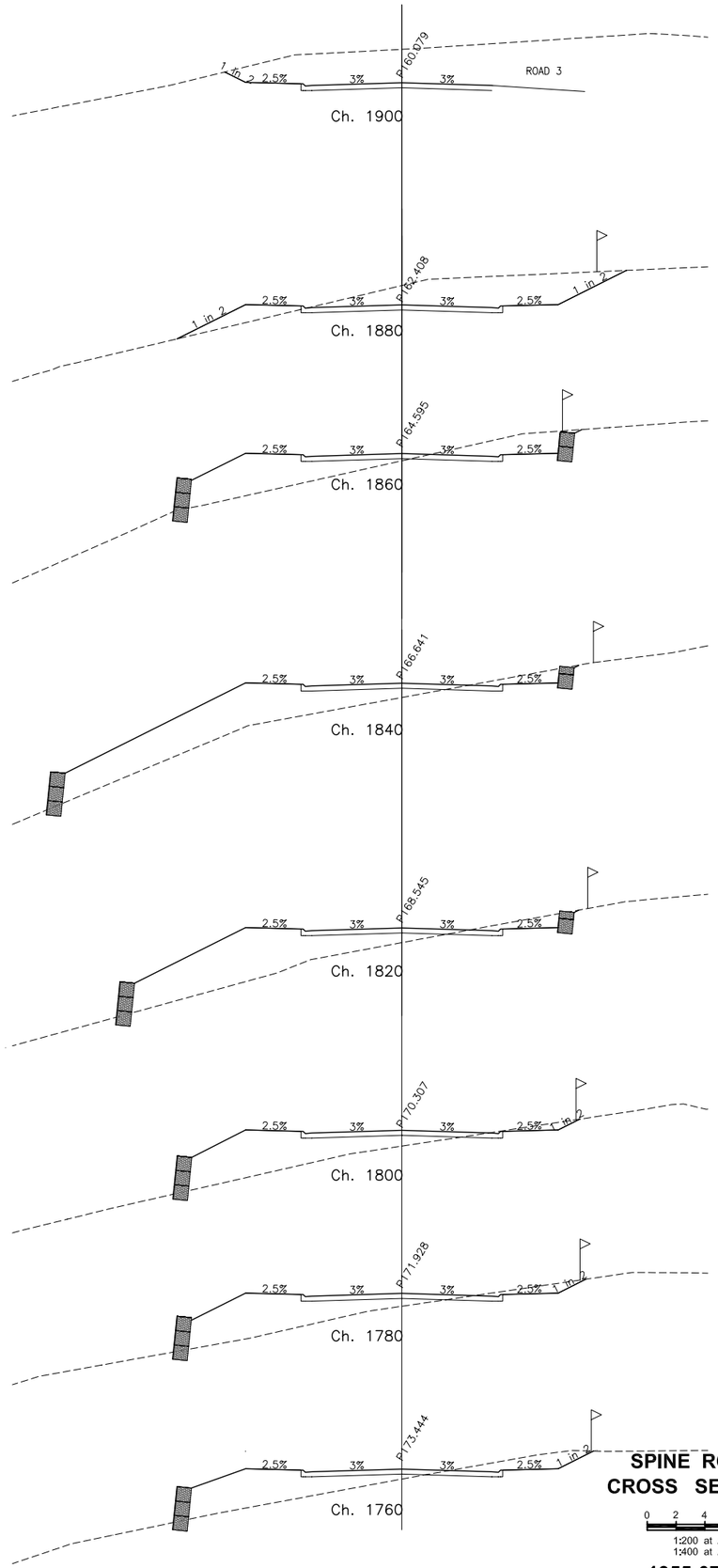
SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

1355-07-SK26





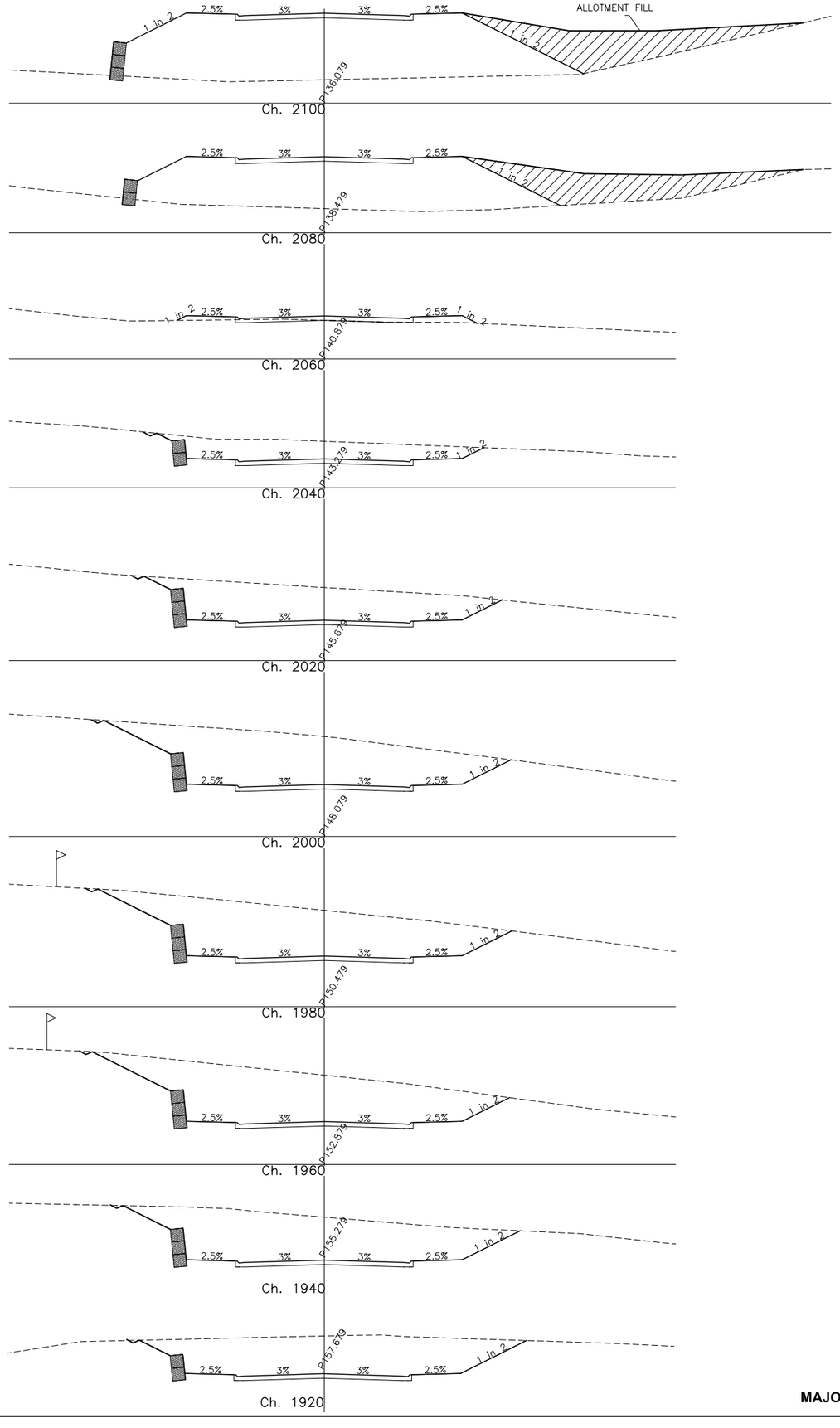
SPINE ROAD CROSS SECTION

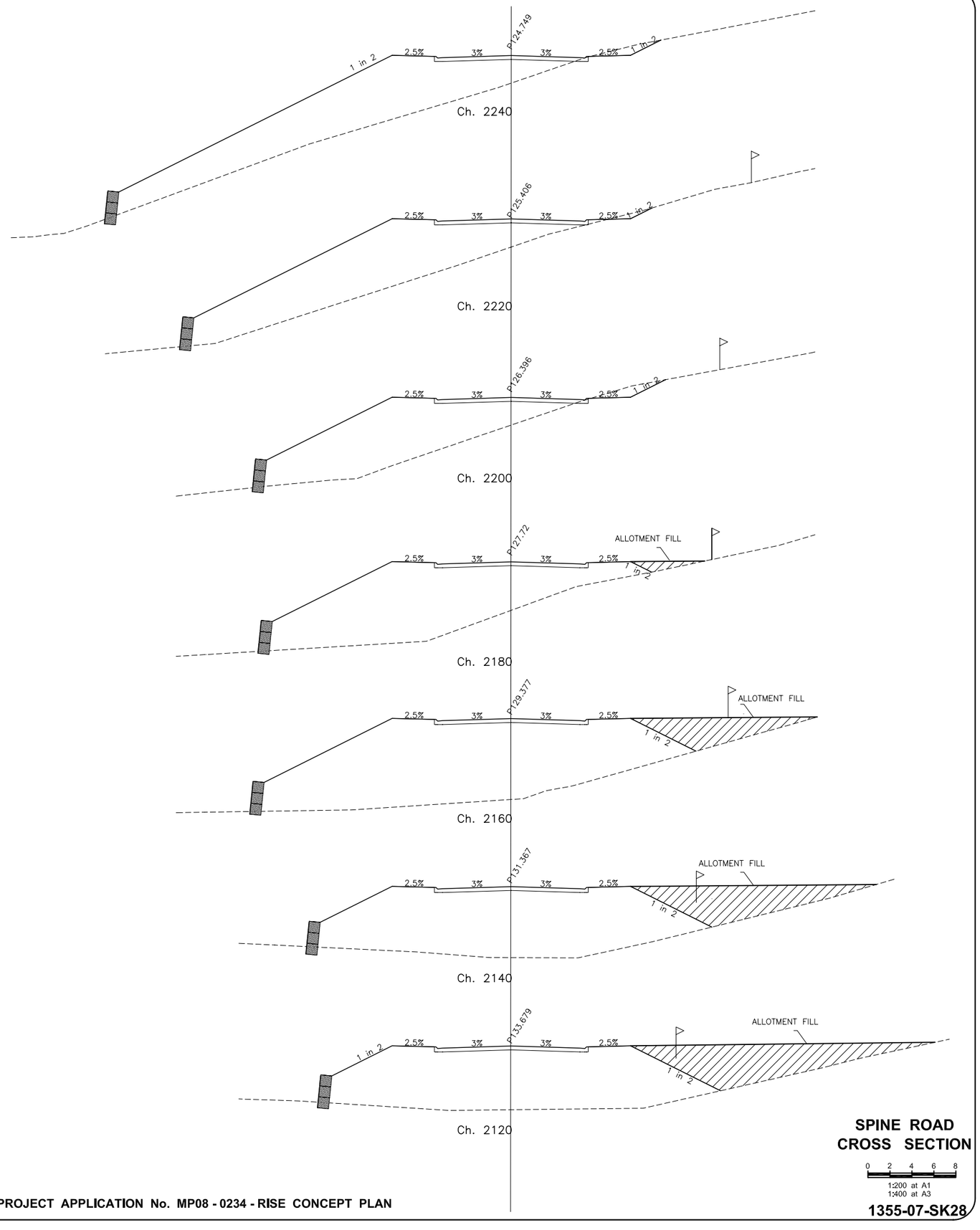
0 2 4 6 8

1:200 at A1
1:400 at A3

1355-07-SK27

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



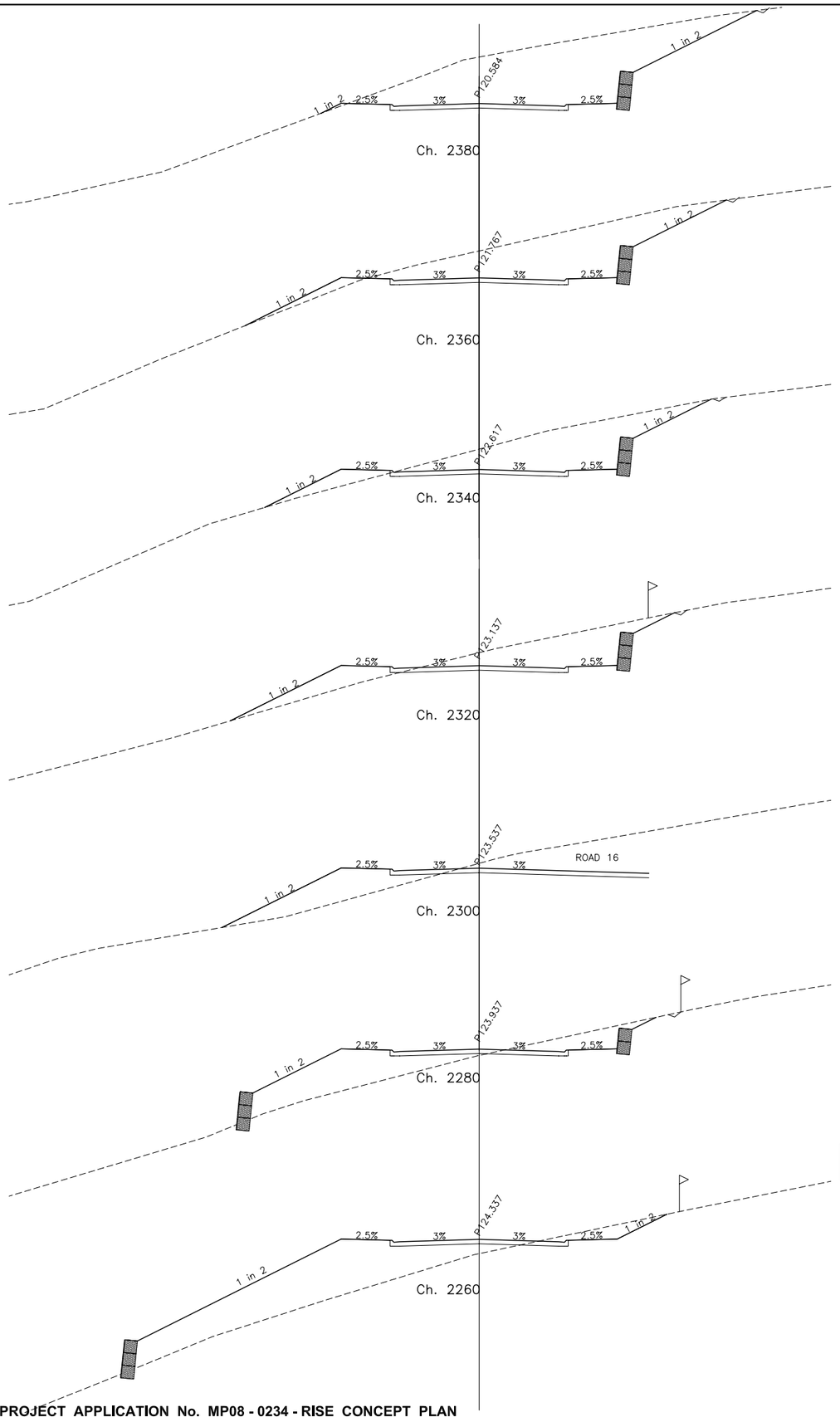


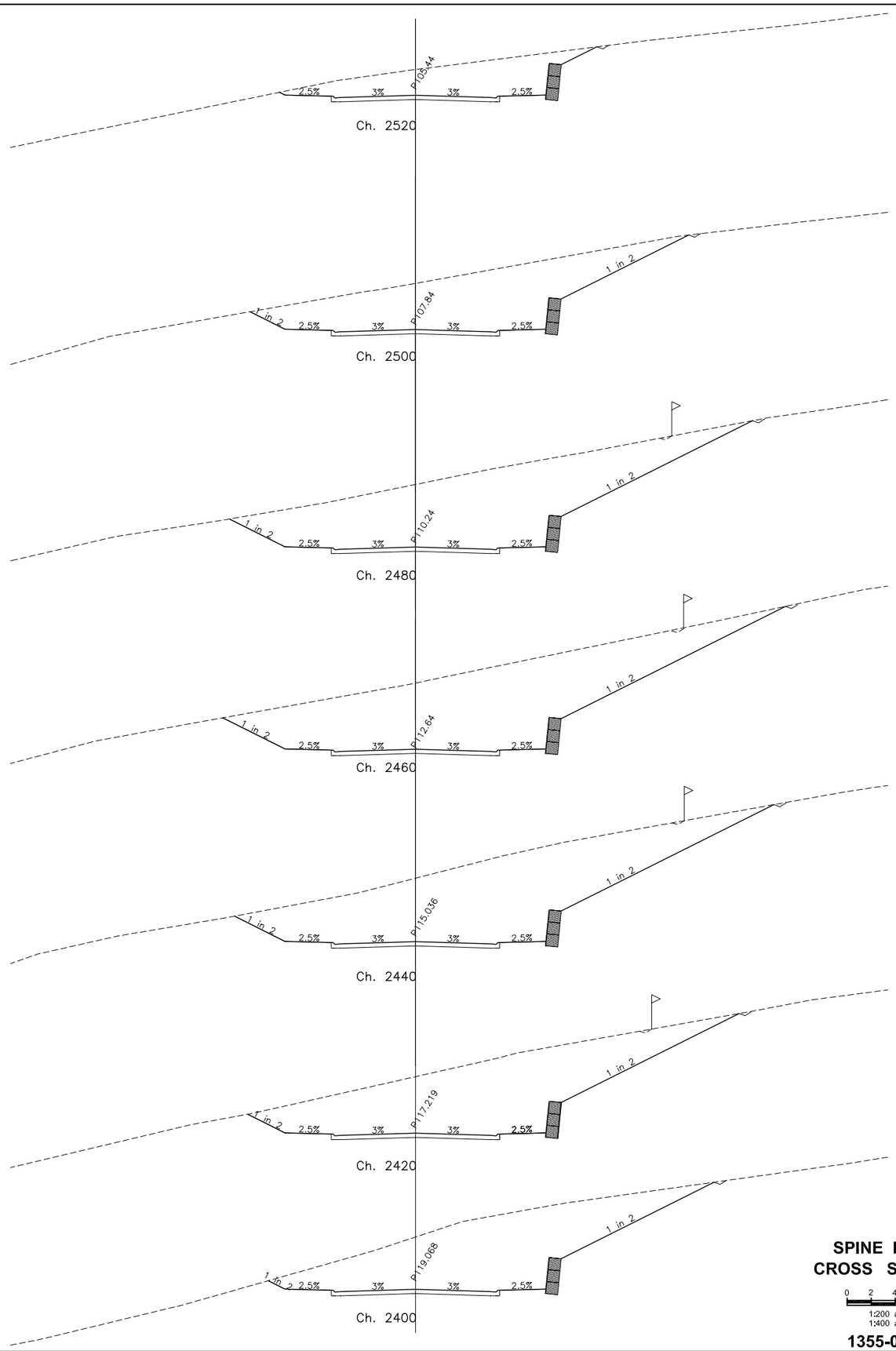
SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

1355-07-SK28



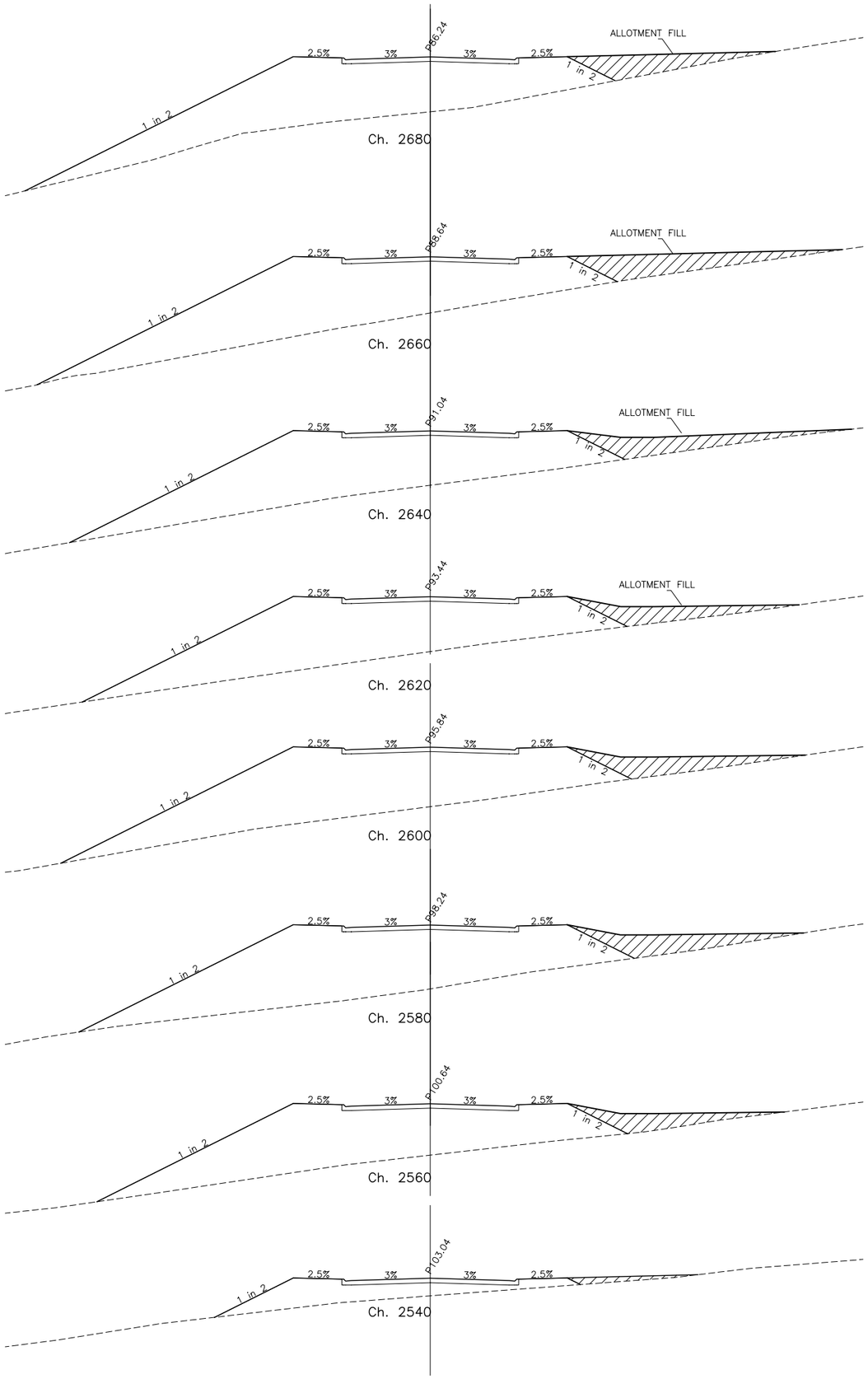


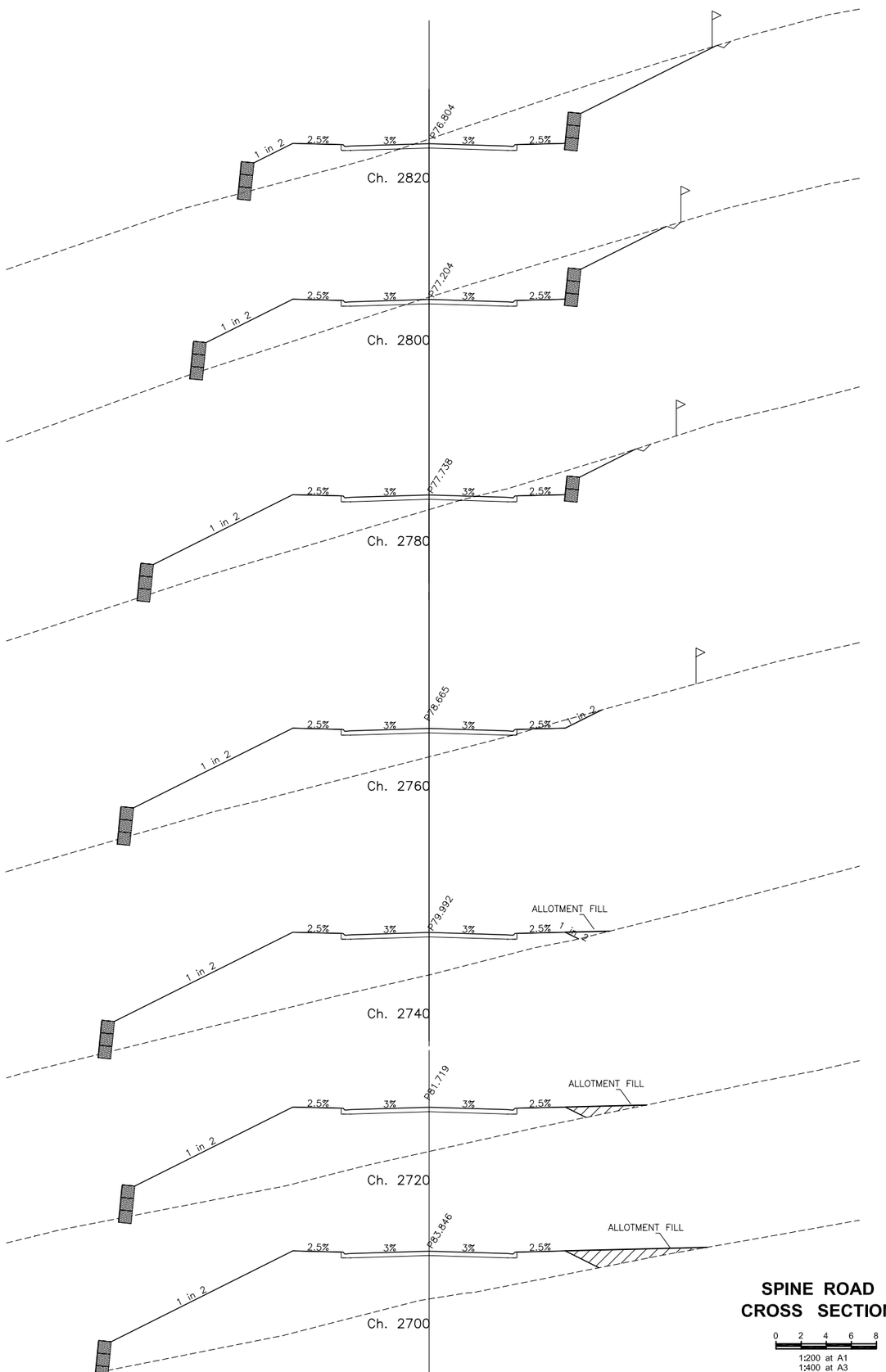
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

1355-07-SK29



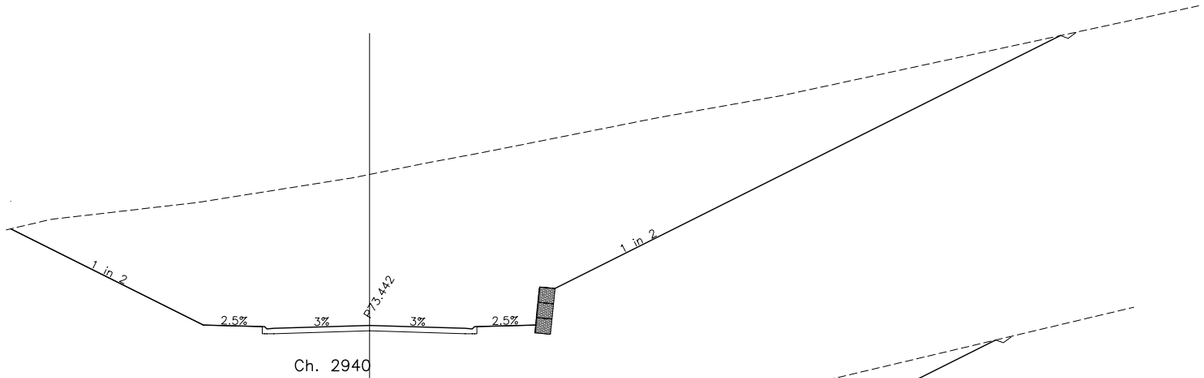


SPINE ROAD
CROSS SECTION

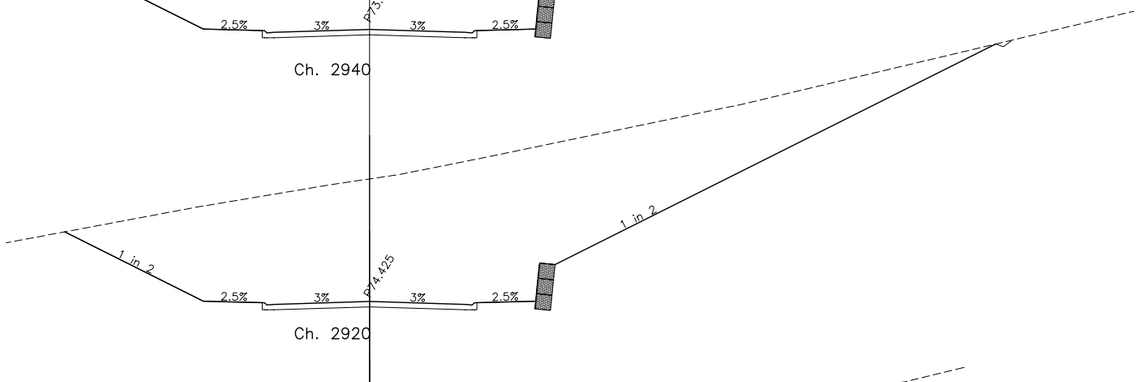
0 2 4 6 8
1:200 at A1
1:400 at A3

1355-07-SK30

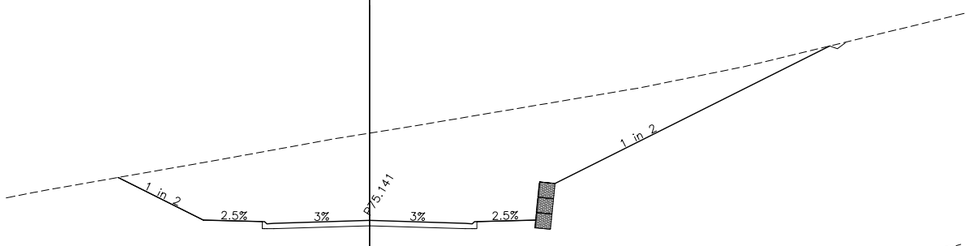
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



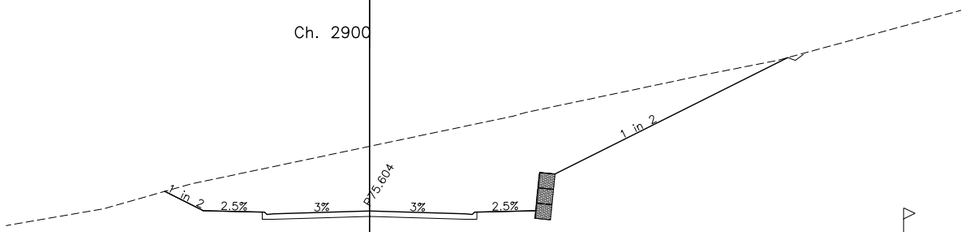
Ch. 2940



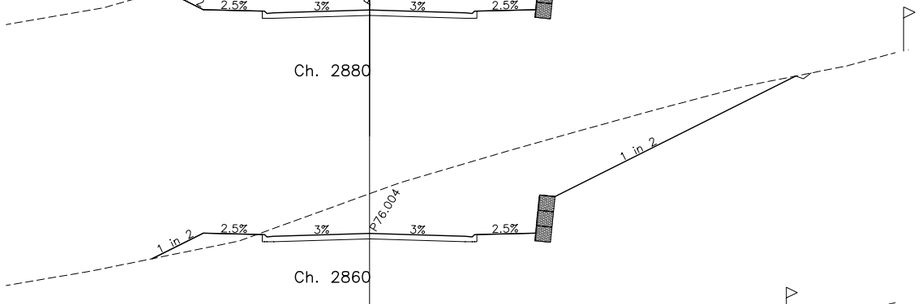
Ch. 2920



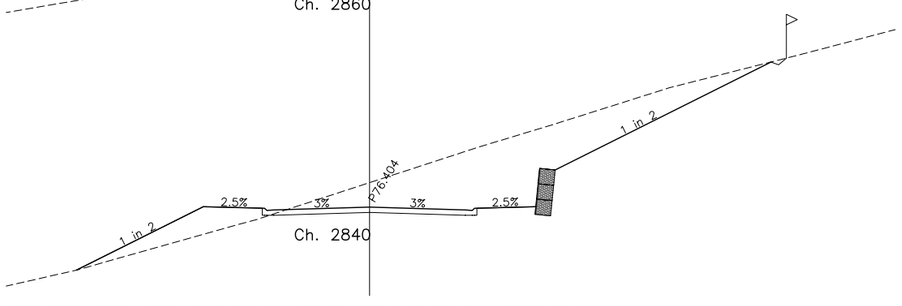
Ch. 2900



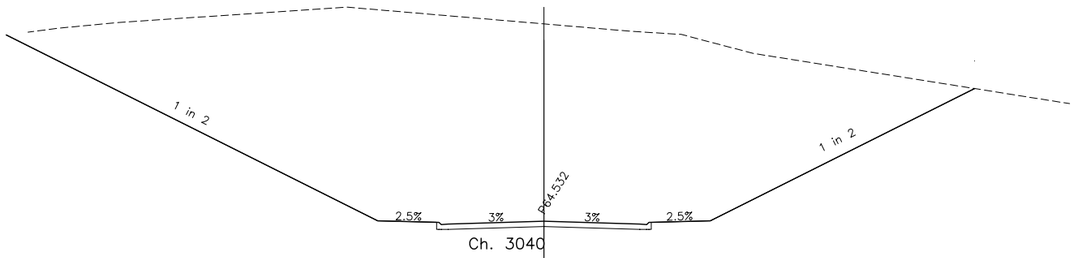
Ch. 2880



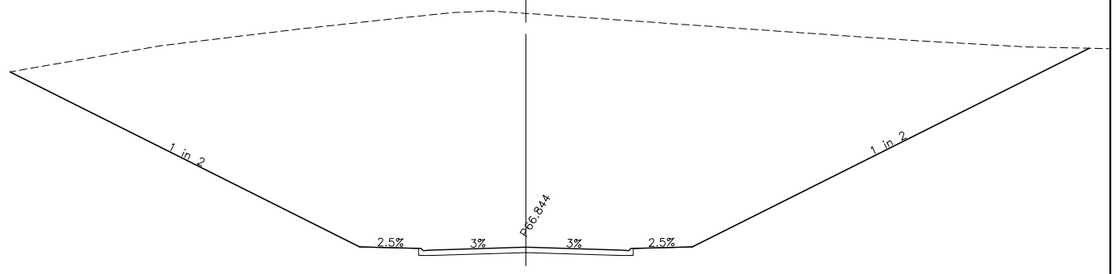
Ch. 2860



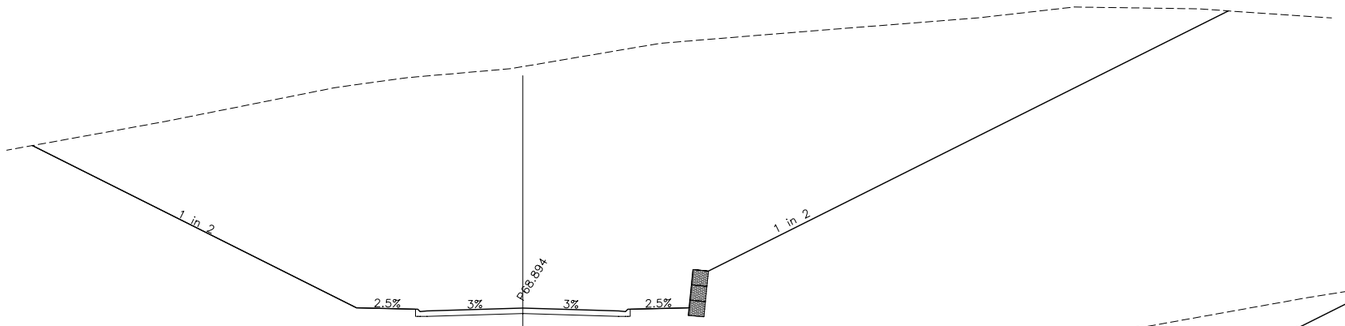
Ch. 2840



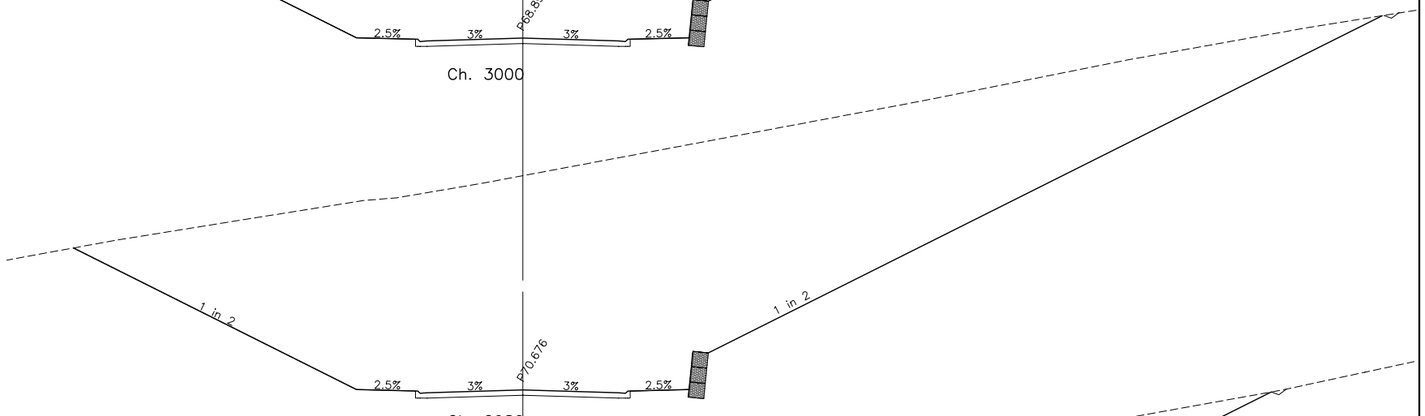
Ch. 3040



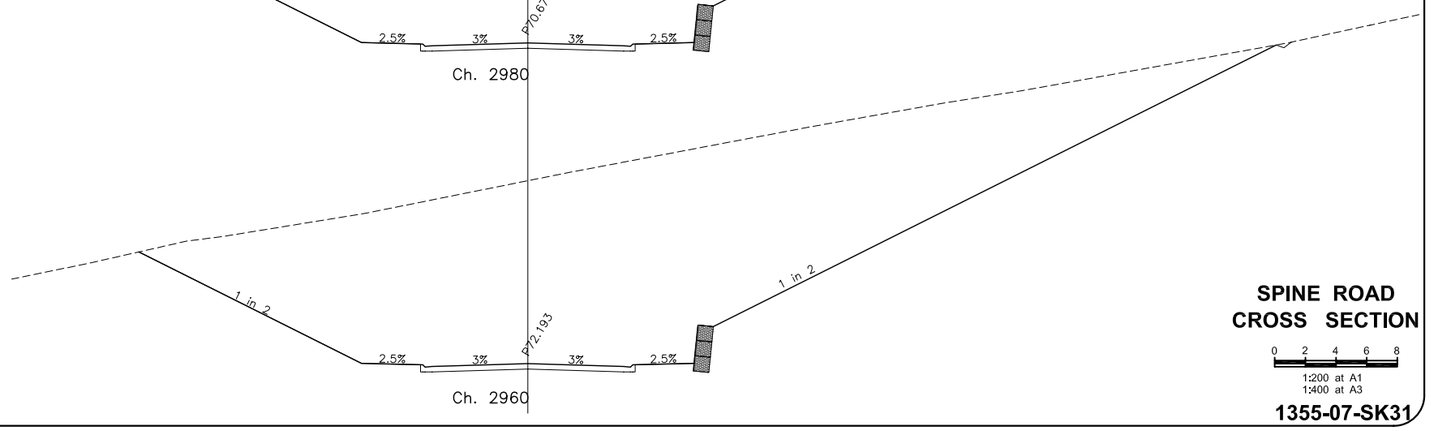
Ch. 3020



Ch. 3000



Ch. 2980



Ch. 2960

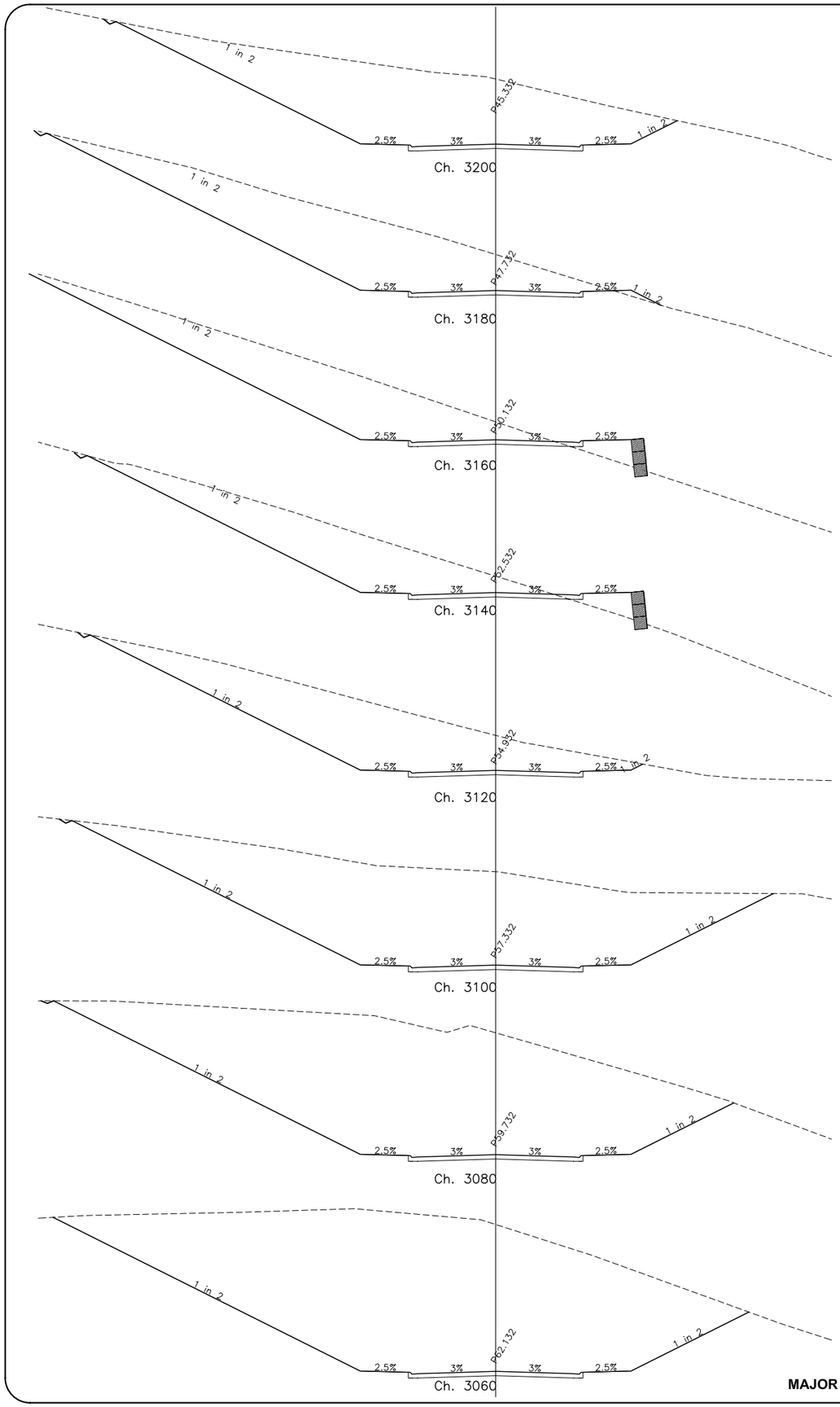
SPINE ROAD
CROSS SECTION

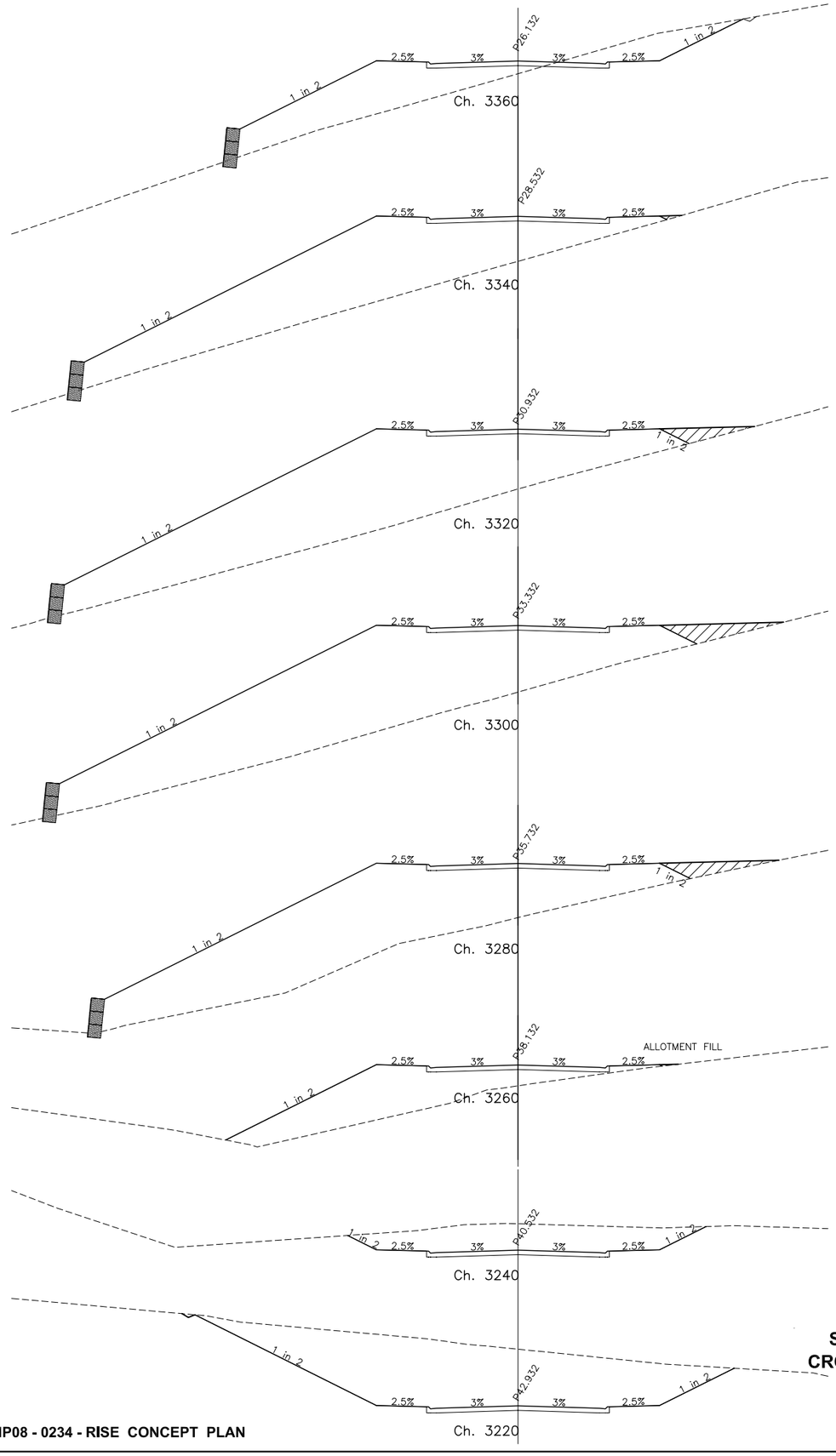
0 2 4 6 8

1:200 at A1
1:400 at A3

1355-07-SK31

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

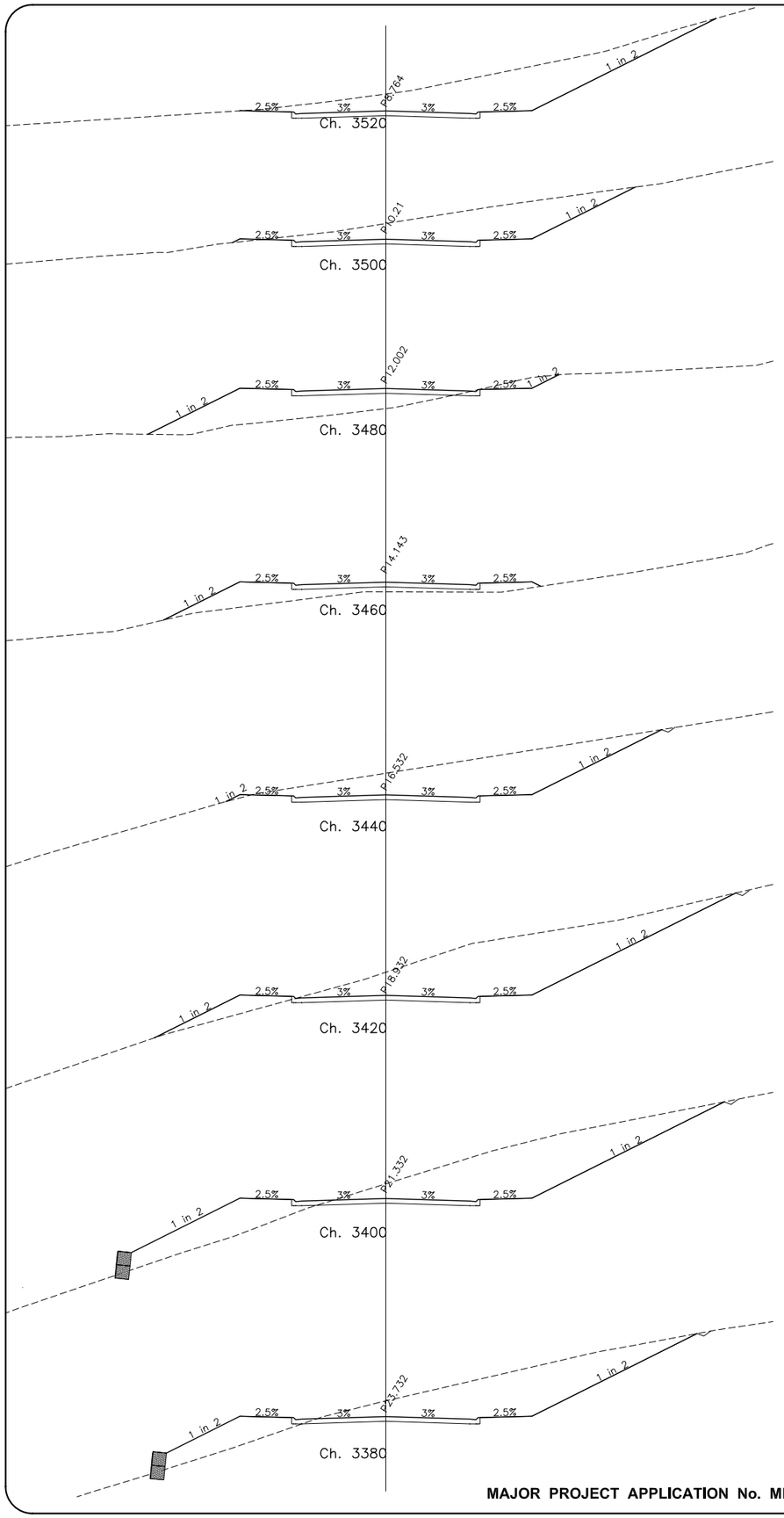


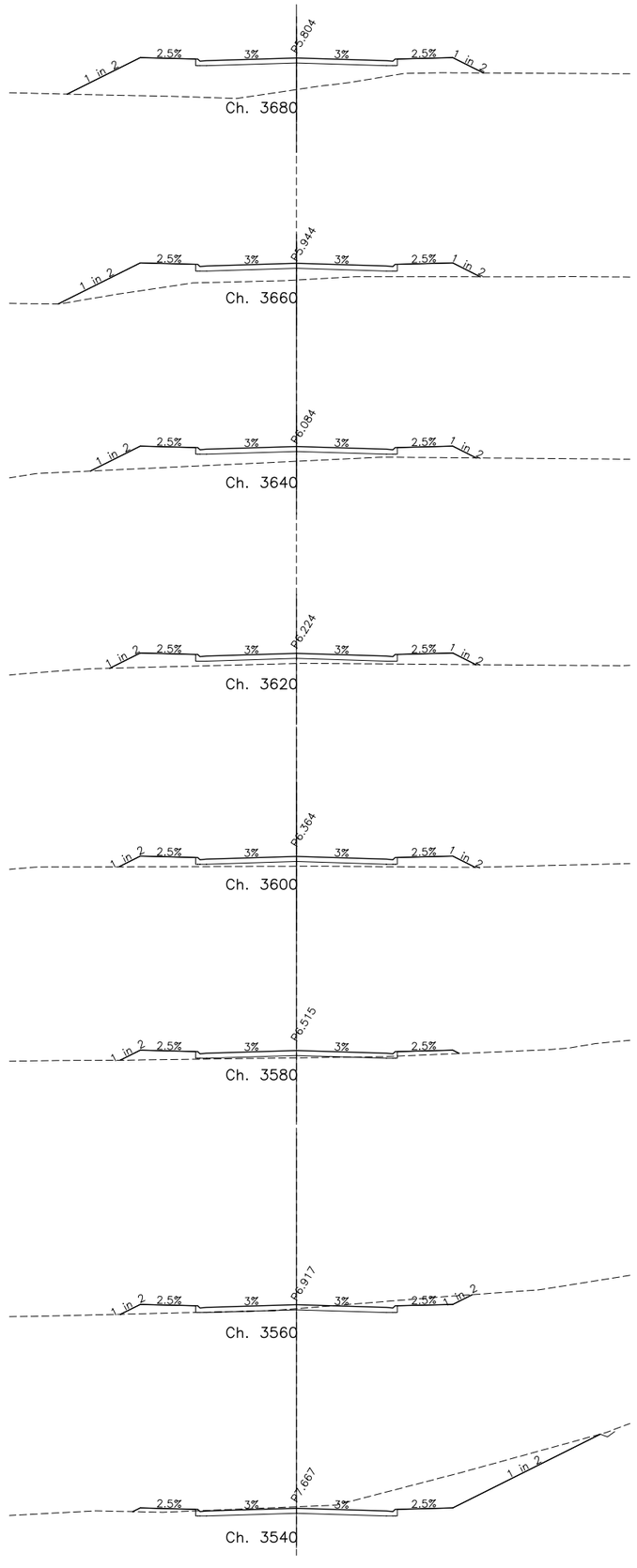


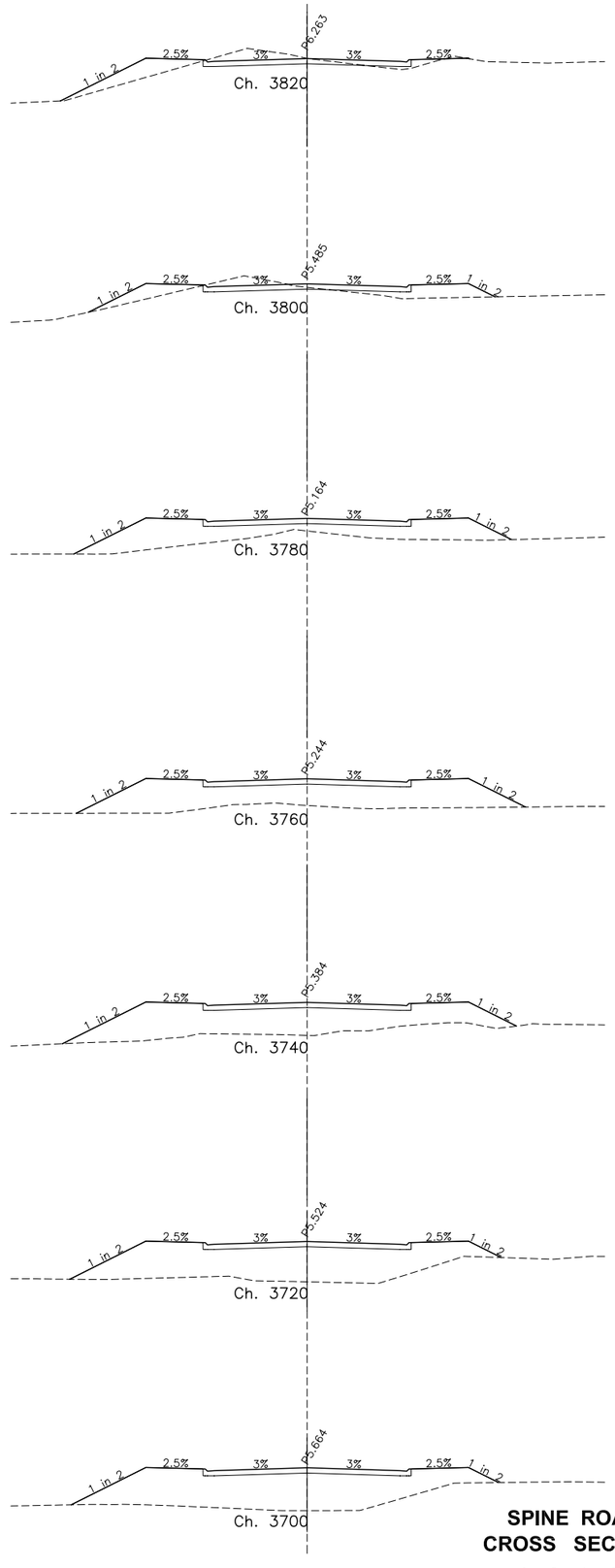
SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

1355-07-SK32





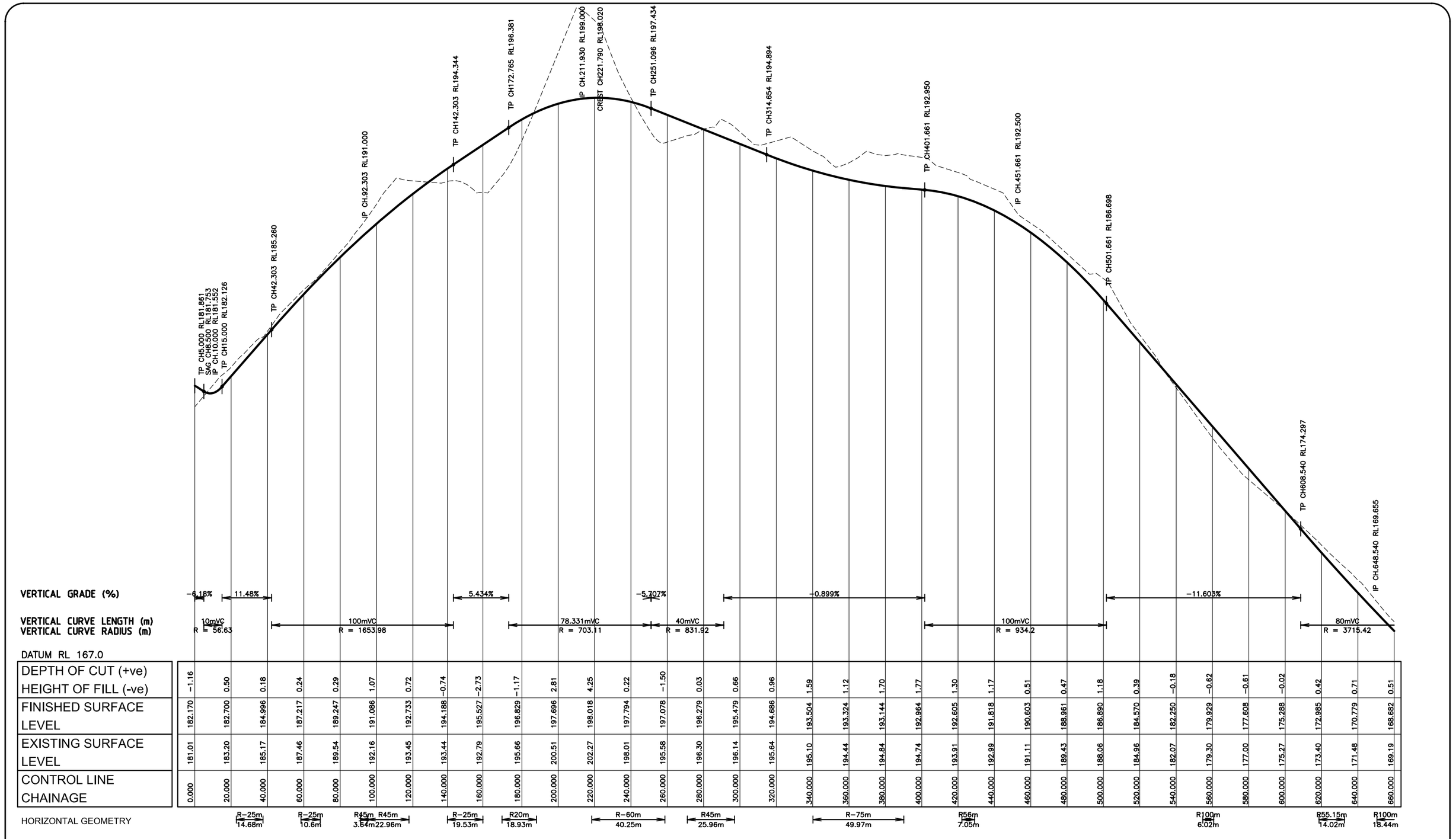


SPINE ROAD
CROSS SECTION

0 2 4 6 8
1:200 at A1
1:400 at A3

1355-07-SK33

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



CONTROL LINE CHAINAGE	EXISTING SURFACE LEVEL	FINISHED SURFACE LEVEL	DEPTH OF CUT (+ve) HEIGHT OF FILL (-ve)
0.000	181.01	182.170	−1.16
20.000	183.20	182.700	0.50
40.000	185.17	184.996	0.18
60.000	187.46	187.217	0.24
80.000	189.54	189.247	0.29
100.000	192.16	191.086	1.07
120.000	193.45	192.733	0.72
140.000	193.44	194.188	−0.74
160.000	192.79	195.527	−2.73
180.000	195.66	196.829	−1.17
200.000	200.51	197.696	2.81
220.000	202.27	198.018	4.25
240.000	198.01	197.794	0.22
260.000	195.58	197.078	−1.50
280.000	196.30	196.279	0.03
300.000	196.14	195.479	0.66
320.000	195.64	194.686	0.96
340.000	195.10	193.504	1.59
360.000	194.44	193.324	1.12
380.000	194.84	193.144	1.70
400.000	194.74	192.964	1.77
420.000	193.91	192.605	1.30
440.000	192.99	191.818	1.17
460.000	191.11	190.603	0.51
480.000	189.43	188.961	0.47
500.000	188.06	186.890	1.18
520.000	184.96	184.570	0.39
540.000	182.07	182.250	−0.18
560.000	179.30	179.929	−0.62
580.000	177.00	177.608	−0.61
600.000	175.27	175.288	−0.02
620.000	173.40	172.985	0.42
640.000	171.48	170.779	0.71
660.000	169.19	168.682	0.51

LONGITUDINAL SECTION - ROAD 1

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

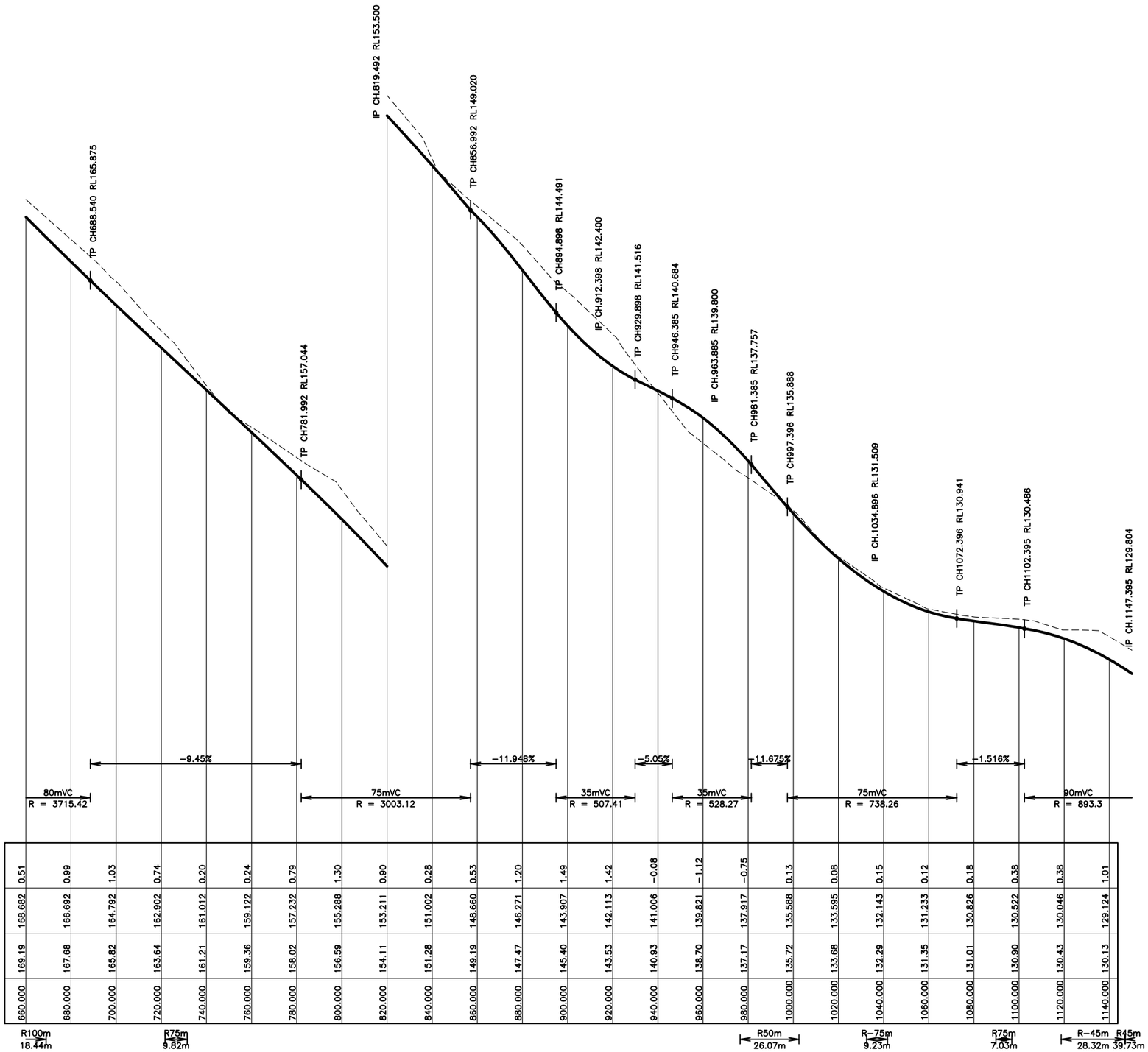
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK50 B
B - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 1

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

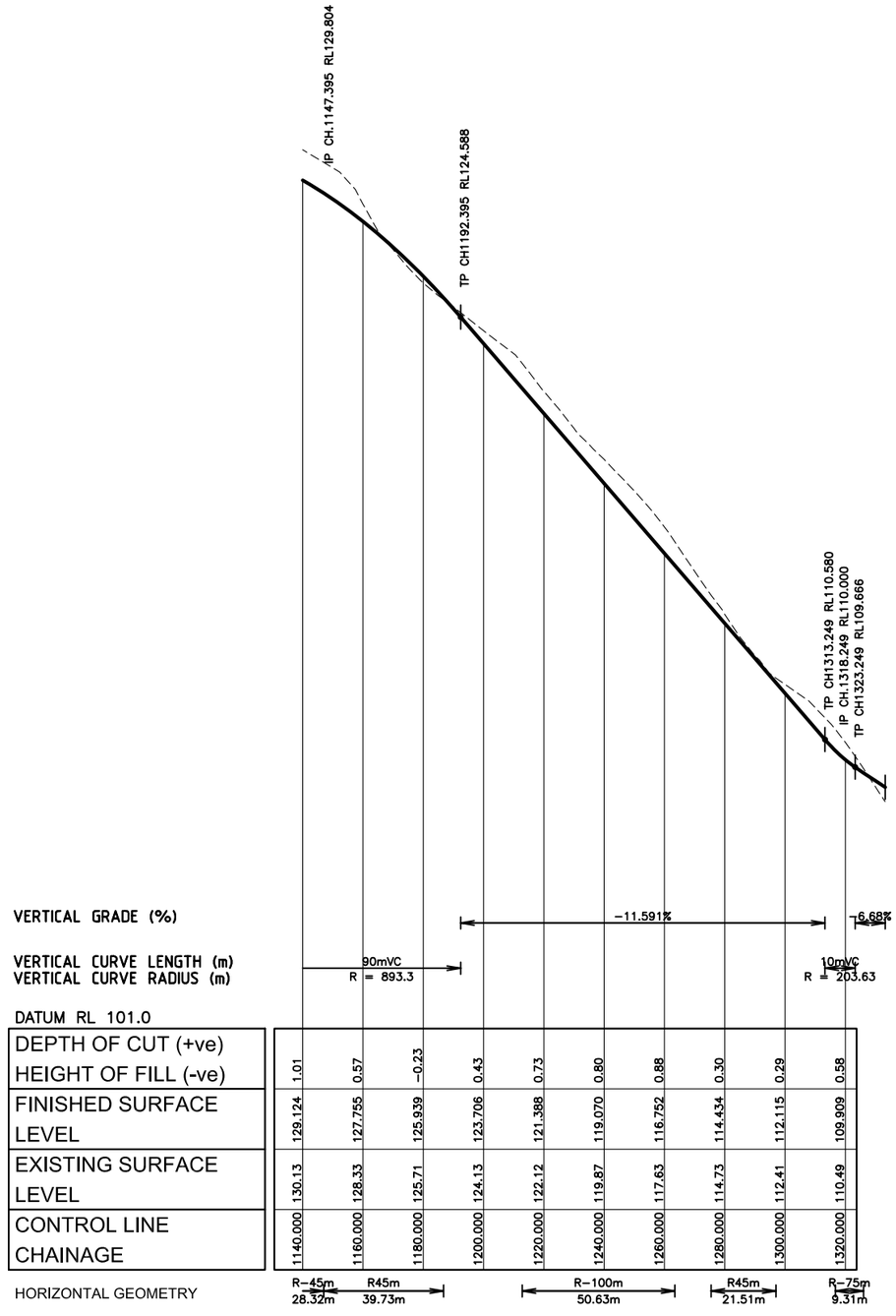
RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK51 A

A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 1

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

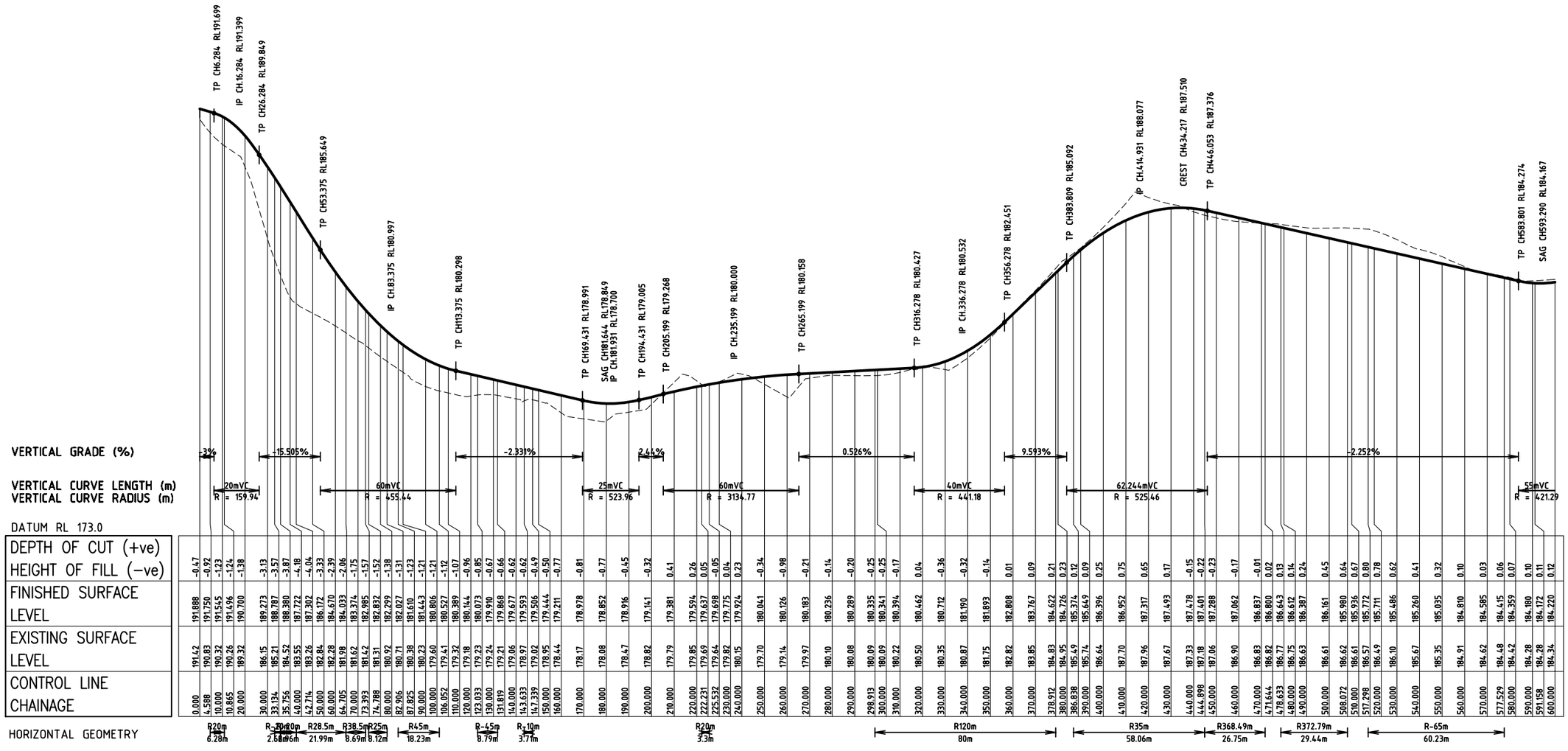
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK52 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



CONTROL LINE CHAINAGE	EXISTING SURFACE LEVEL	FINISHED SURFACE LEVEL	DEPTH OF CUT (+ve) HEIGHT OF FILL (–ve)
0.000	191.42	191.888	–0.47
4.588	190.83	191.750	–0.92
10.000	190.32	191.545	–1.23
10.865	190.26	191.496	–1.24
20.000	189.32	190.700	–1.38
30.000	186.15	189.273	–3.13
33.134	185.21	188.787	–3.57
35.756	184.52	188.380	–3.87
40.000	183.55	187.722	–4.18
42.714	183.26	187.302	–4.04
50.000	182.84	186.172	–3.33
60.000	182.28	184.670	–2.39
64.705	181.98	184.033	–2.06
70.000	181.62	183.314	–1.75
73.393	181.42	182.985	–1.57
74.788	181.31	182.832	–1.52
80.000	180.92	182.299	–1.38
82.906	180.71	182.027	–1.31
87.825	180.38	181.610	–1.23
90.000	180.23	181.443	–1.21
100.000	179.60	180.806	–1.21
106.052	179.41	180.527	–1.12
110.000	179.32	180.389	–1.07
120.000	179.18	180.144	–0.96
123.033	179.23	180.073	–0.85
130.000	179.24	179.910	–0.67
131.819	179.21	179.868	–0.66
140.000	179.06	179.677	–0.62
143.633	178.97	179.593	–0.62
147.339	179.02	179.506	–0.49
150.000	178.95	179.444	–0.50
160.000	178.44	179.211	–0.77
170.000	178.17	178.978	–0.81
180.000	178.08	178.852	–0.77
190.000	178.47	178.916	–0.45
200.000	178.82	179.141	–0.32
210.000	179.79	179.381	0.41
220.000	179.85	179.594	0.26
222.231	179.69	179.637	0.05
225.532	179.64	179.698	–0.05
230.000	179.82	179.775	0.04
240.000	180.15	179.924	0.23
250.000	179.70	180.041	–0.34
260.000	179.14	180.126	–0.98
270.000	179.97	180.183	–0.21
280.000	180.10	180.236	–0.14
290.000	180.08	180.289	–0.20
298.913	180.09	180.335	–0.25
300.000	180.09	180.341	–0.25
310.000	180.22	180.394	–0.17
320.000	180.50	180.462	0.04
330.000	180.35	180.712	–0.36
340.000	180.87	181.190	–0.32
350.000	181.75	181.893	–0.14
360.000	182.82	182.808	0.01
370.000	183.85	183.767	0.09
378.912	184.83	184.622	0.21
380.000	184.95	184.726	0.23
386.838	185.49	185.374	0.12
390.000	185.74	185.649	0.09
400.000	186.64	186.396	0.25
410.000	187.70	186.952	0.75
420.000	187.96	187.317	0.65
430.000	187.67	187.493	0.17
440.000	187.33	187.478	–0.15
444.898	187.18	187.401	–0.22
450.000	187.06	187.288	–0.23
460.000	186.90	187.062	–0.17
470.000	186.83	186.837	–0.01
471.644	186.82	186.800	0.02
478.633	186.77	186.643	0.13
480.000	186.75	186.612	0.14
490.000	186.63	186.387	0.24
500.000	186.61	186.161	0.45
508.072	186.62	185.980	0.64
510.000	186.61	185.936	0.67
517.298	186.57	185.772	0.80
520.000	186.49	185.711	0.78
530.000	186.10	185.486	0.62
540.000	185.67	185.260	0.41
550.000	185.35	185.035	0.32
560.000	184.91	184.810	0.10
570.000	184.62	184.585	0.03
577.529	184.48	184.415	0.06
580.000	184.42	184.359	0.07
590.000	184.28	184.180	0.10
591.158	184.28	184.172	0.11
600.000	184.34	184.220	0.12

LONGITUDINAL SECTION - ROAD 2

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

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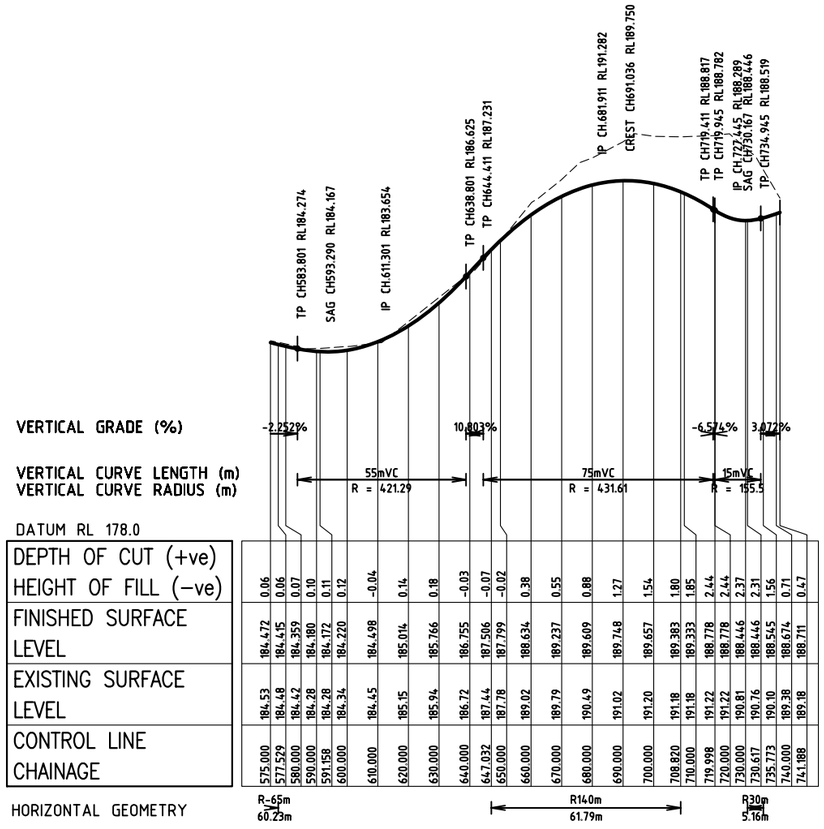
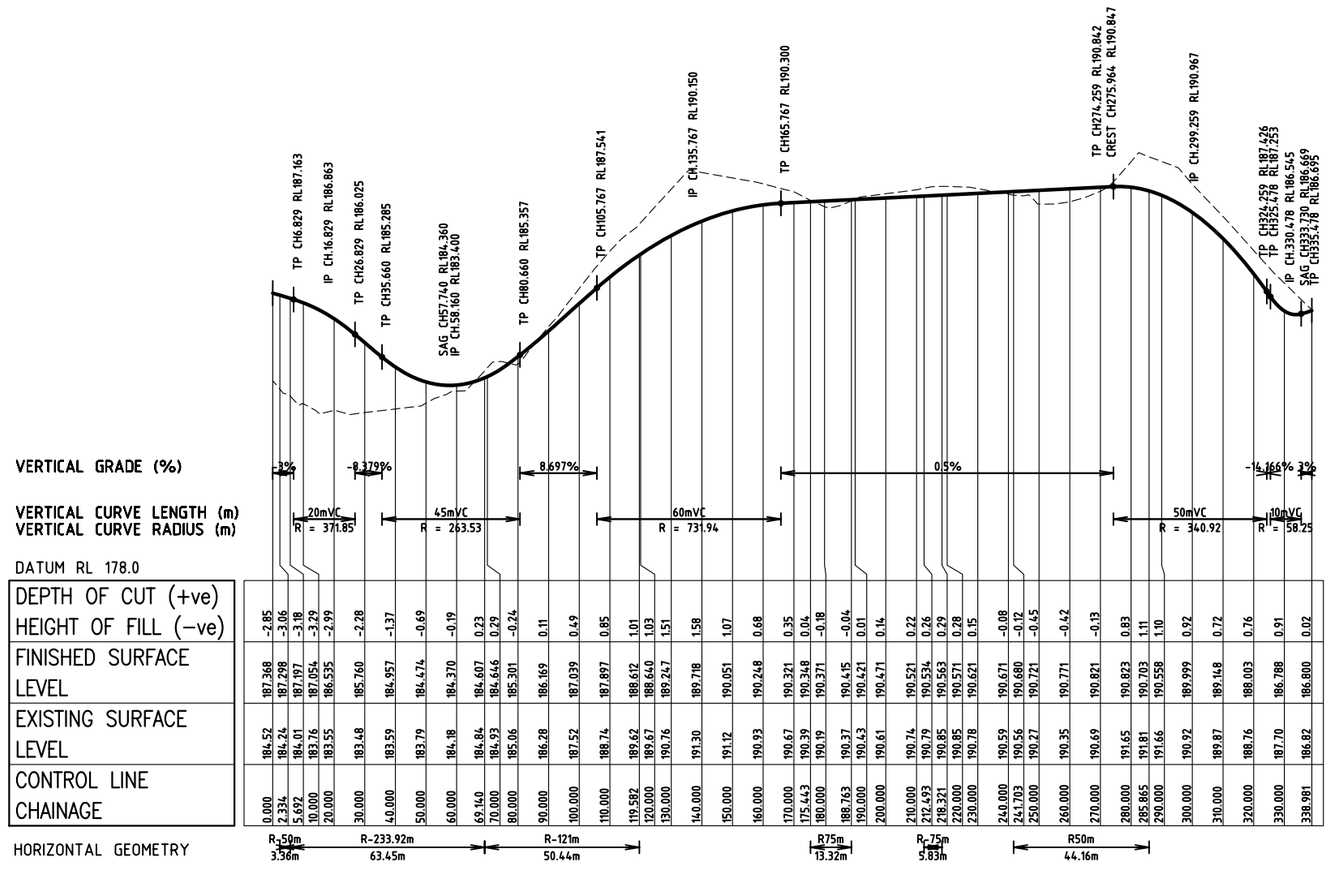
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK53

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 2



LONGITUDINAL SECTION - ROAD 3

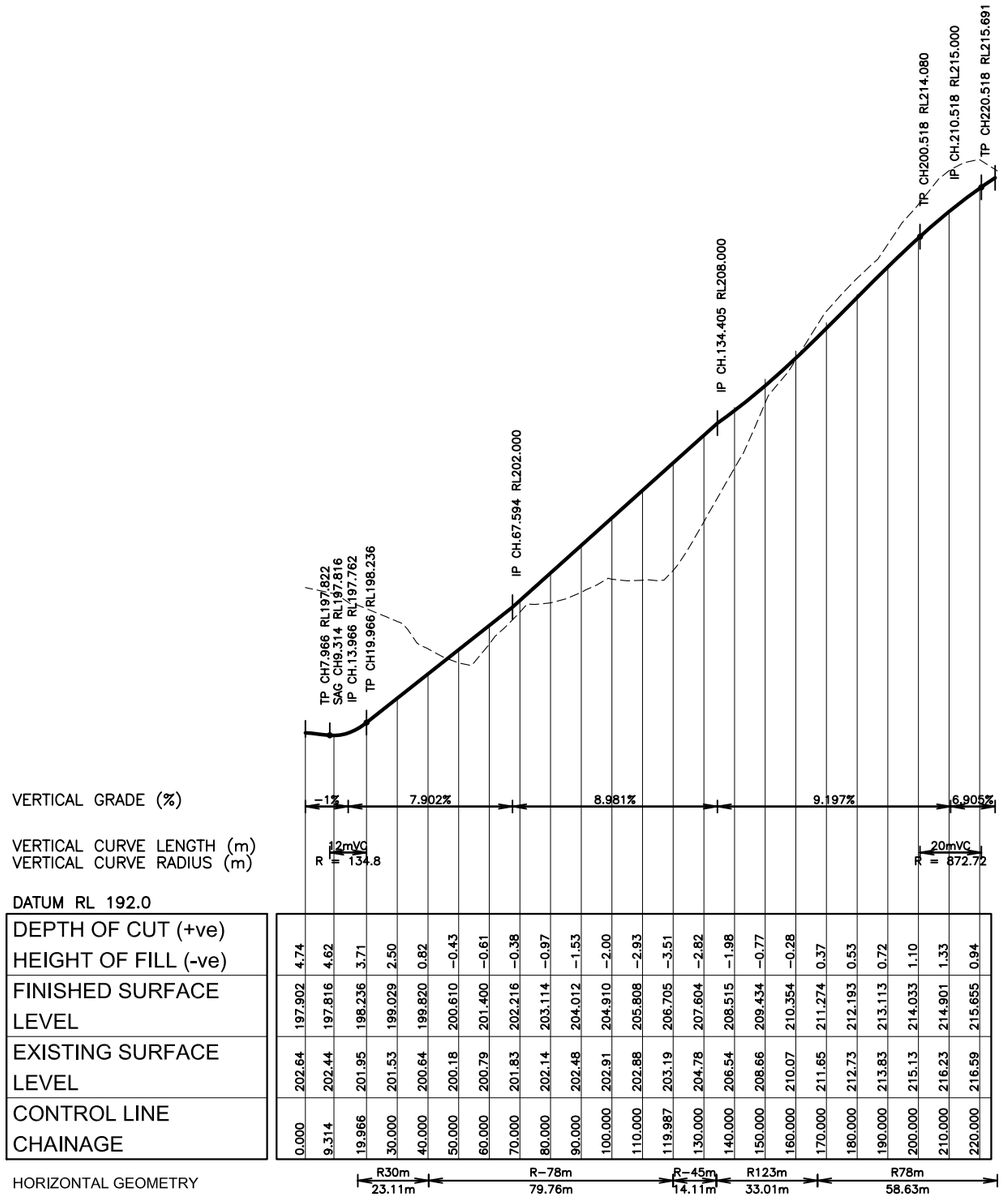
PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

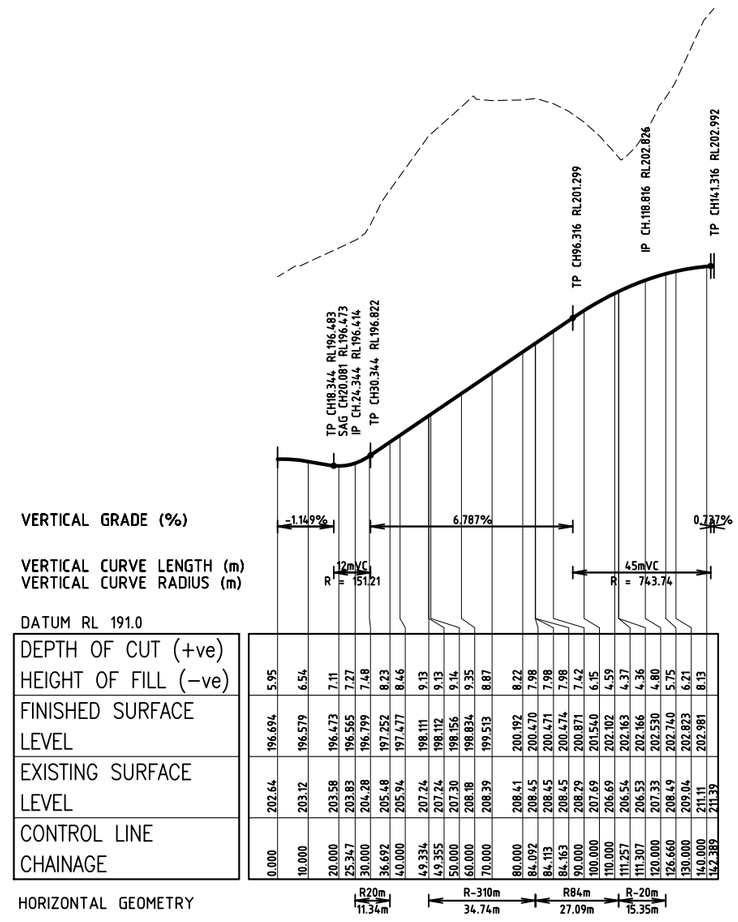
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK54



DEPTH OF CUT (+ve) HEIGHT OF FILL (-ve)	4.74	4.62	3.71	2.50	0.82	−0.43	−0.61	−0.38	−0.97	−1.53	−2.00	−2.93	−3.51	−2.82	−1.98	−0.77	−0.28	0.37	0.53	0.72	1.10	1.33	0.94
FINISHED SURFACE LEVEL	197.902	197.816	198.236	199.029	199.820	200.610	201.400	202.216	203.114	204.012	204.910	205.808	206.705	207.604	208.515	209.434	210.354	211.274	212.193	213.113	214.033	214.901	215.655
EXISTING SURFACE LEVEL	202.64	202.44	201.95	201.53	200.64	200.18	200.79	201.83	202.14	202.48	202.91	202.88	203.19	204.78	206.54	208.66	210.07	211.65	212.73	213.83	215.13	216.23	216.59
CONTROL LINE CHAINAGE	0.000	9.314	19.966	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	119.987	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000

LONGITUDINAL SECTION - ROAD 4



DEPTH OF CUT (+ve) HEIGHT OF FILL (−ve)	5.95	6.54	7.11	7.27	7.48	8.23	8.46	9.13	9.13	9.14	9.35	8.87	8.22	7.98	7.98	7.98	7.42	6.15	4.59	4.37	4.36	4.80	5.75	6.21	8.13
FINISHED SURFACE LEVEL	196.694	196.579	196.473	196.565	196.799	197.252	197.477	198.111	198.112	198.156	198.934	199.513	200.192	200.470	200.471	200.474	200.871	201.540	202.102	202.163	202.166	202.530	202.740	202.823	202.981
EXISTING SURFACE LEVEL	202.64	203.12	203.58	203.83	204.28	205.48	205.94	207.24	207.24	207.30	208.18	208.39	208.41	208.45	208.45	208.45	208.29	207.69	206.69	206.54	206.53	207.33	208.49	209.04	211.11
CONTROL LINE CHAINAGE	0.000	10.000	20.000	25.347	30.000	36.692	40.000	49.334	49.355	50.000	60.000	70.000	80.000	84.092	84.113	84.163	90.000	100.000	110.000	111.457	111.307	120.000	126.660	130.000	140.000	142.389

LONGITUDINAL SECTION - ROAD 5

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

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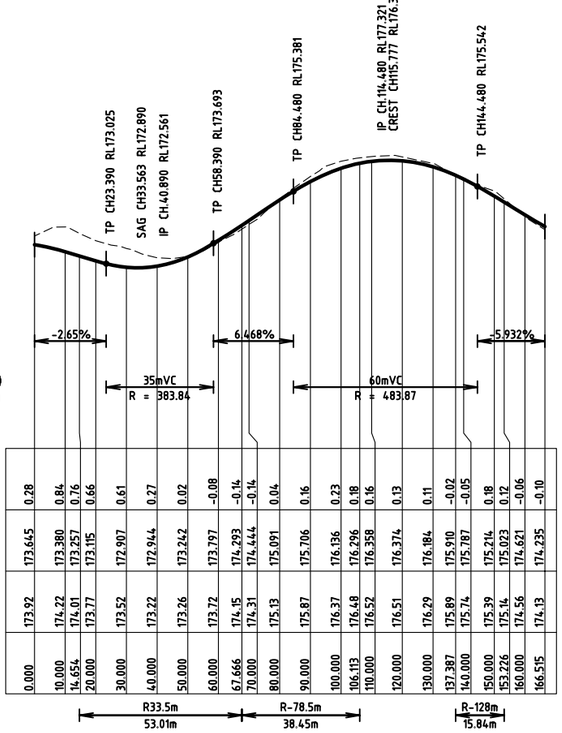
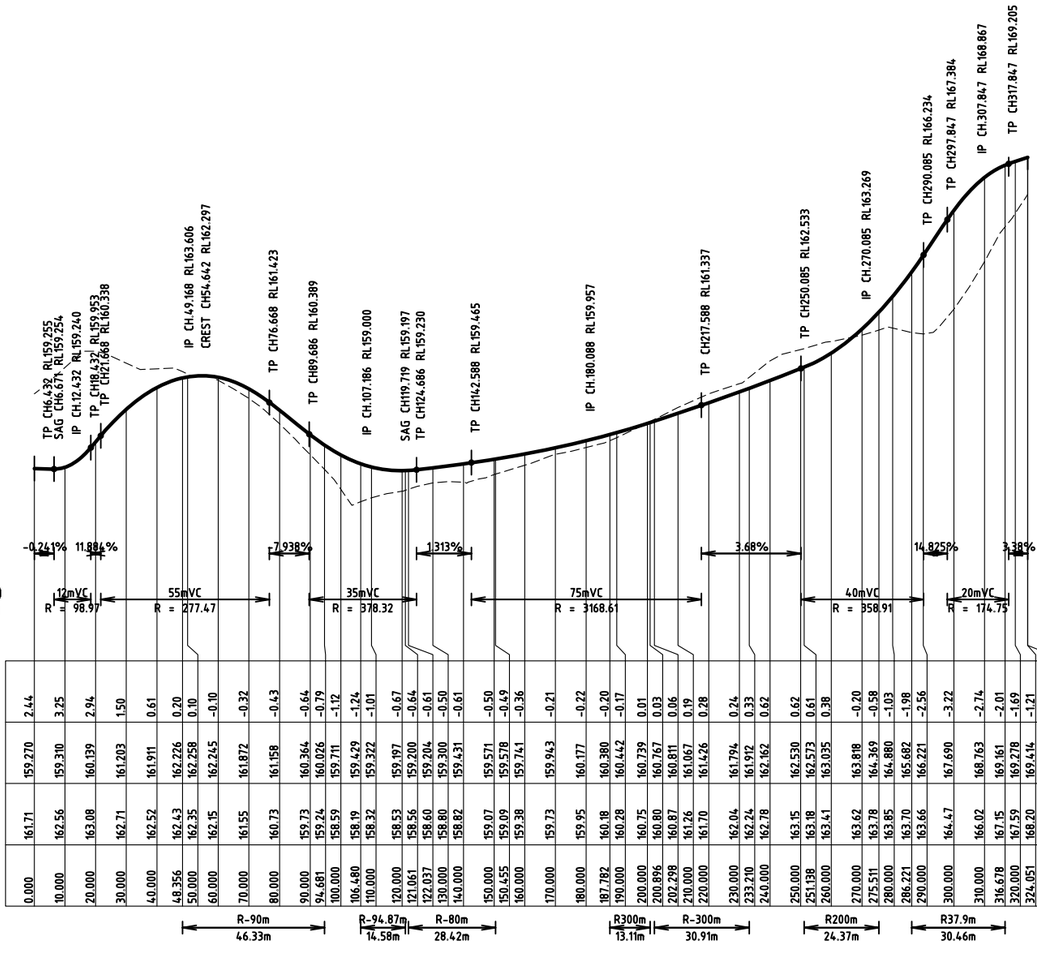
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK55 B
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

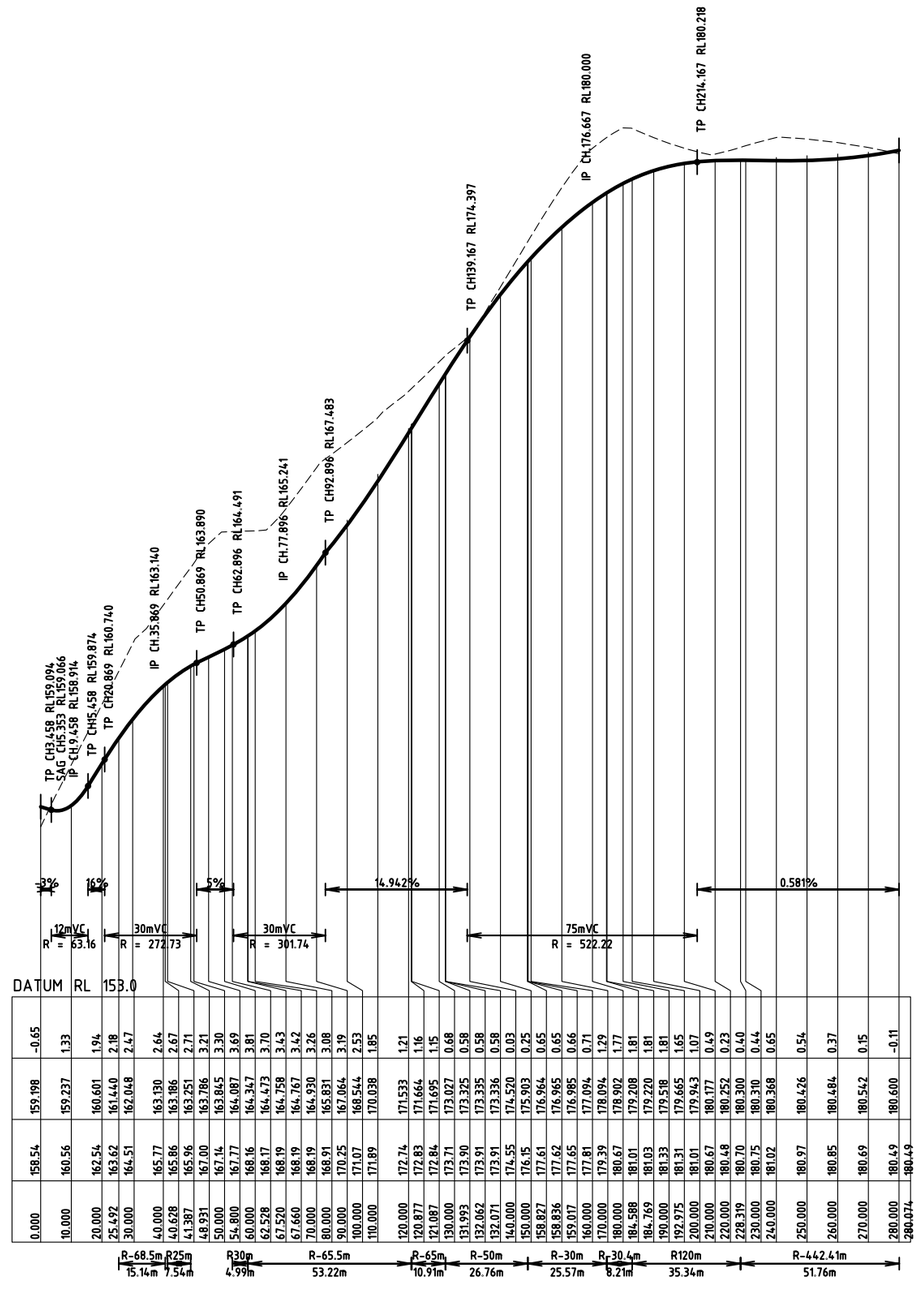
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN


TP CH23.390 RL173.025
SAG CH33.563 RL172.890
IP CH.40.890 RL172.561
TP CH58.390 RL173.693
TP CH84.480 RL175.381
IP CH.114.480 RL177.321
CREST CH115.777 RL176.393
TP CH144.480 RL175.542
VERTICAL GRADE (%)
-2.65%
6.468%
-5.932%
VERTICAL CURVE LENGTH (m)
VERTICAL CURVE RADIUS (m)
35mVC
R = 383.84
60mVC
R = 483.87
DATUM RL 167.0

| | | |



LONGITUDINAL SECTION - ROAD 7



LONGITUDINAL SECTION - ROAD 8

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

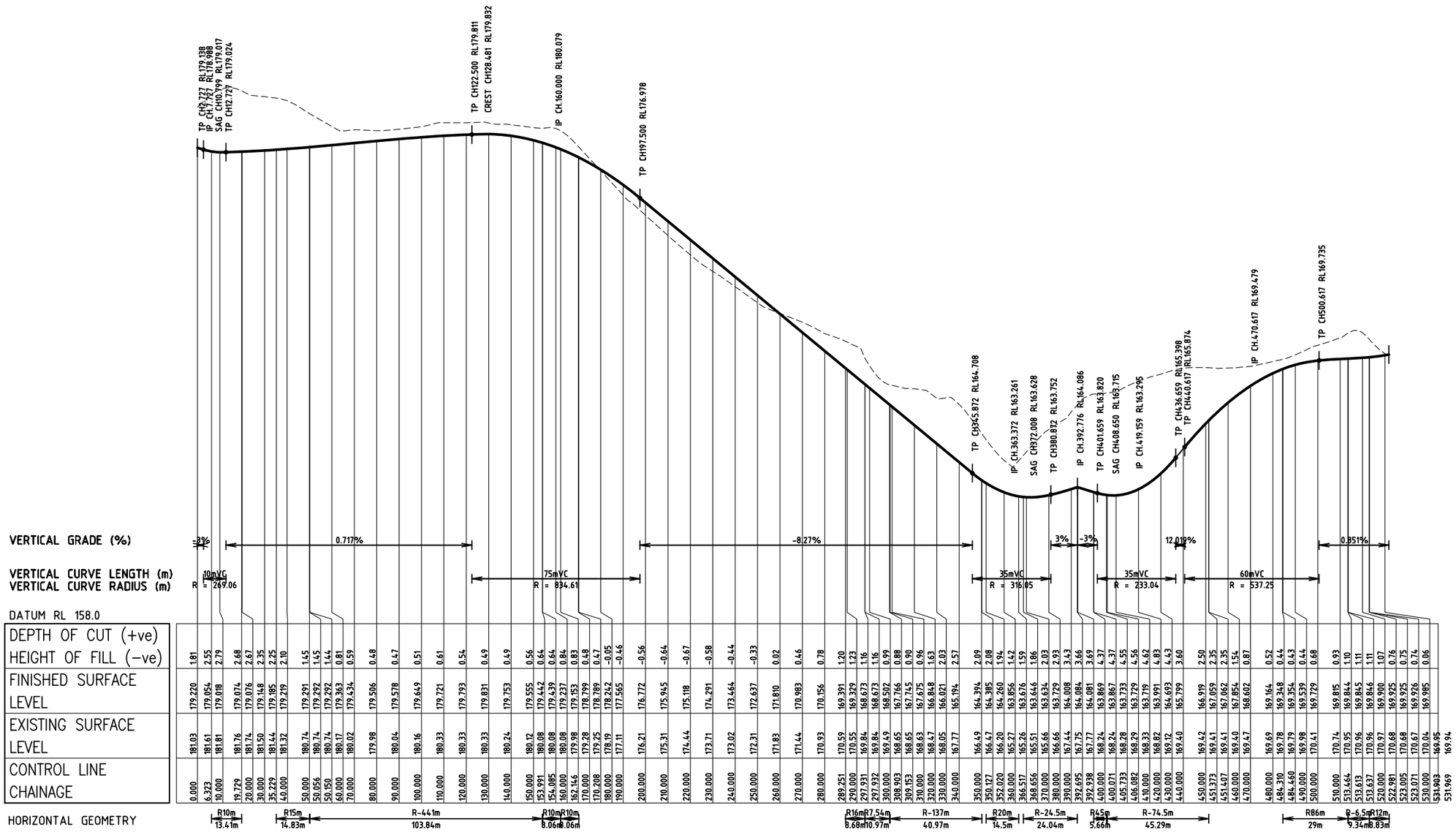
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

LONGITUDINAL SECTIONS
1355 - 07 - SK57



LONGITUDINAL SECTION - ROAD 9

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

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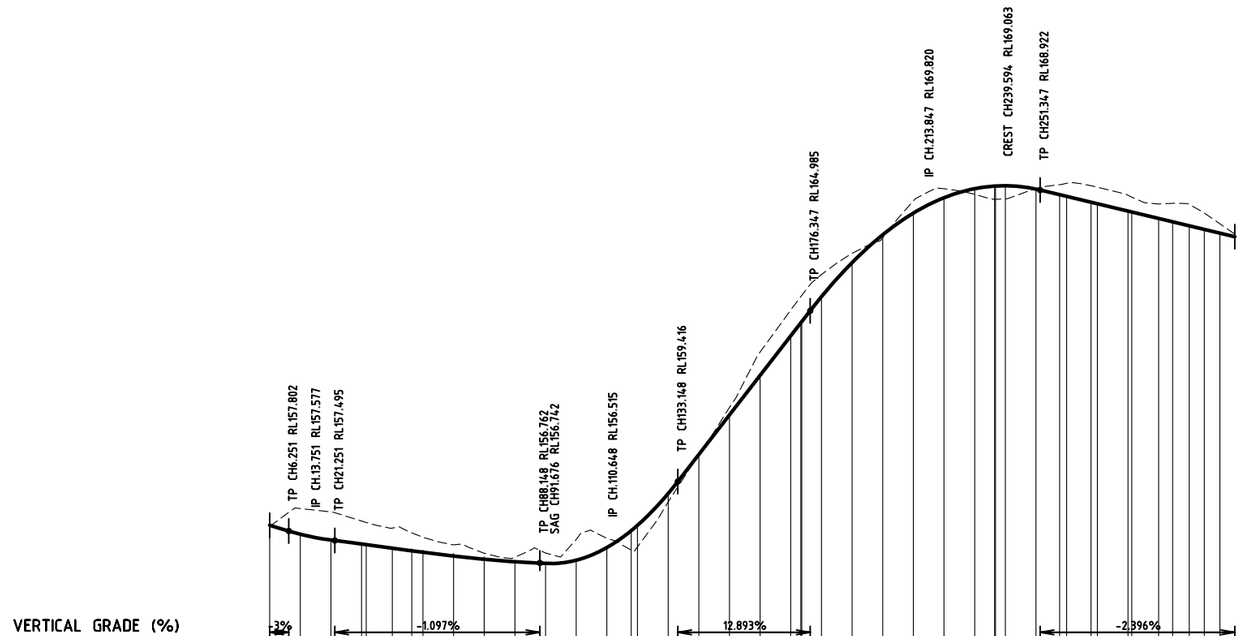
INFRASTRUCTURE ENGINEERING
ABN: 55 114 636 934

LONGITUDINAL SECTIONS
1355 - 07 - SK58



LONGITUDINAL SECTION - ROAD 14

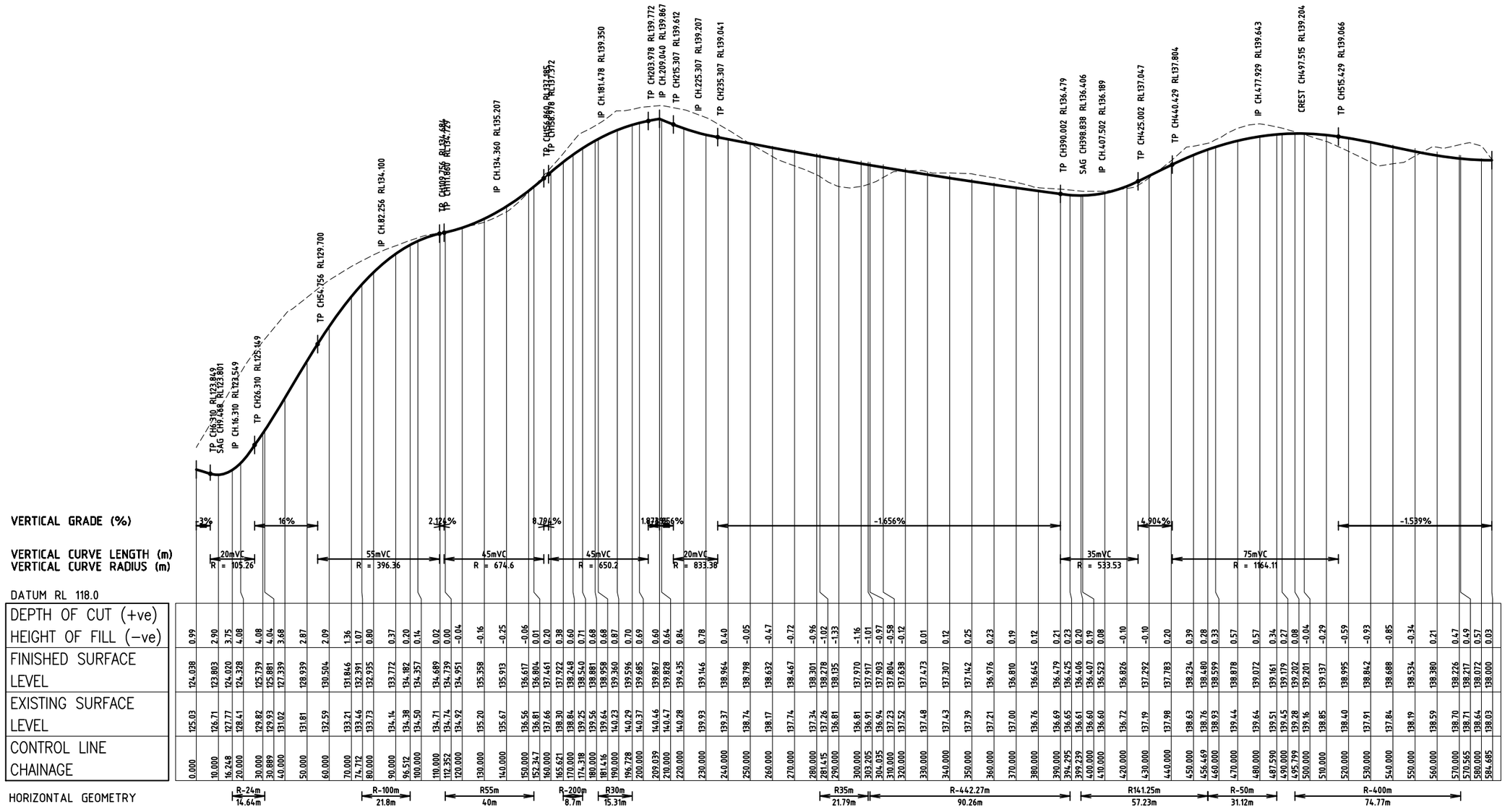
PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK59



LONGITUDINAL SECTION - ROAD 16

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

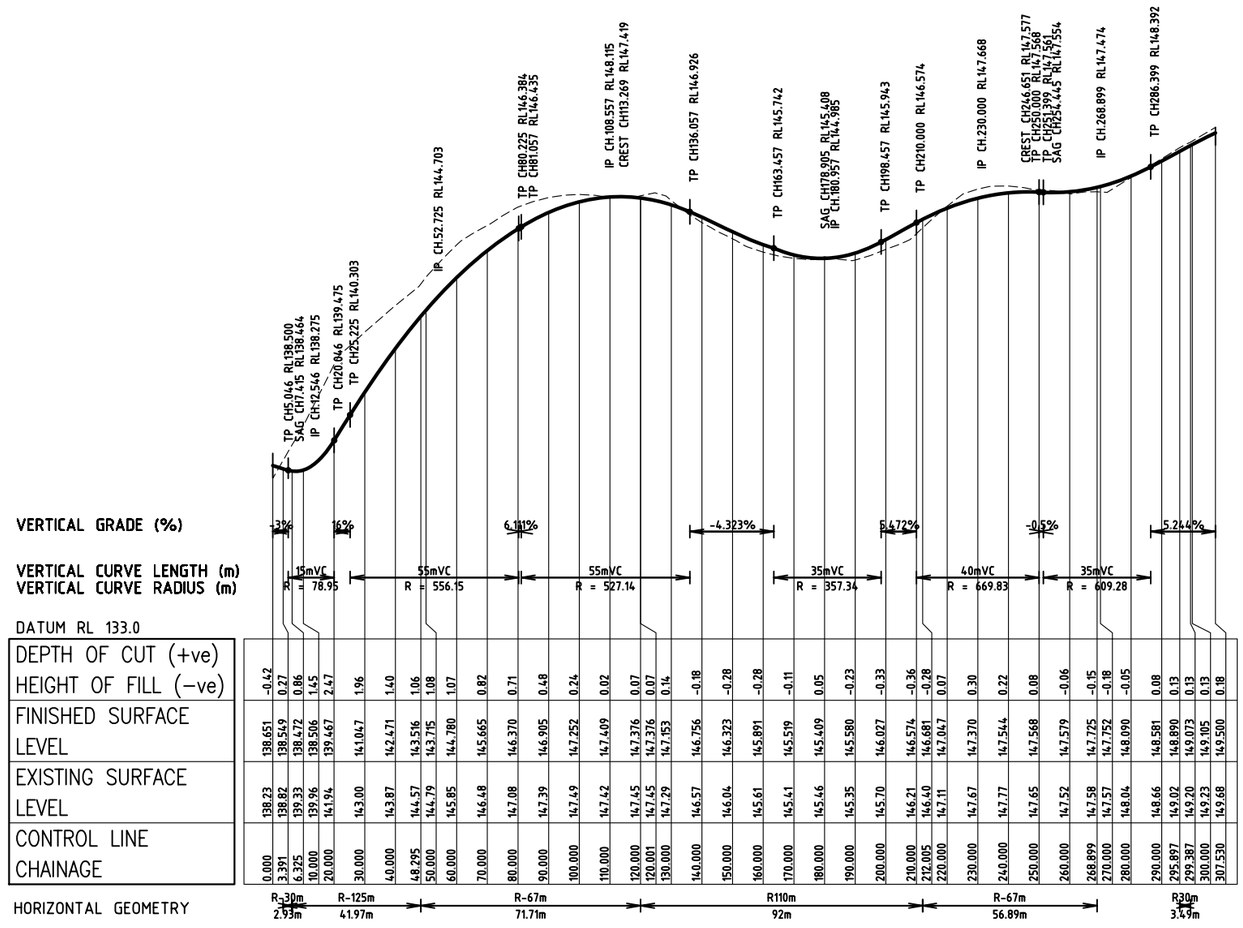
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK60

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

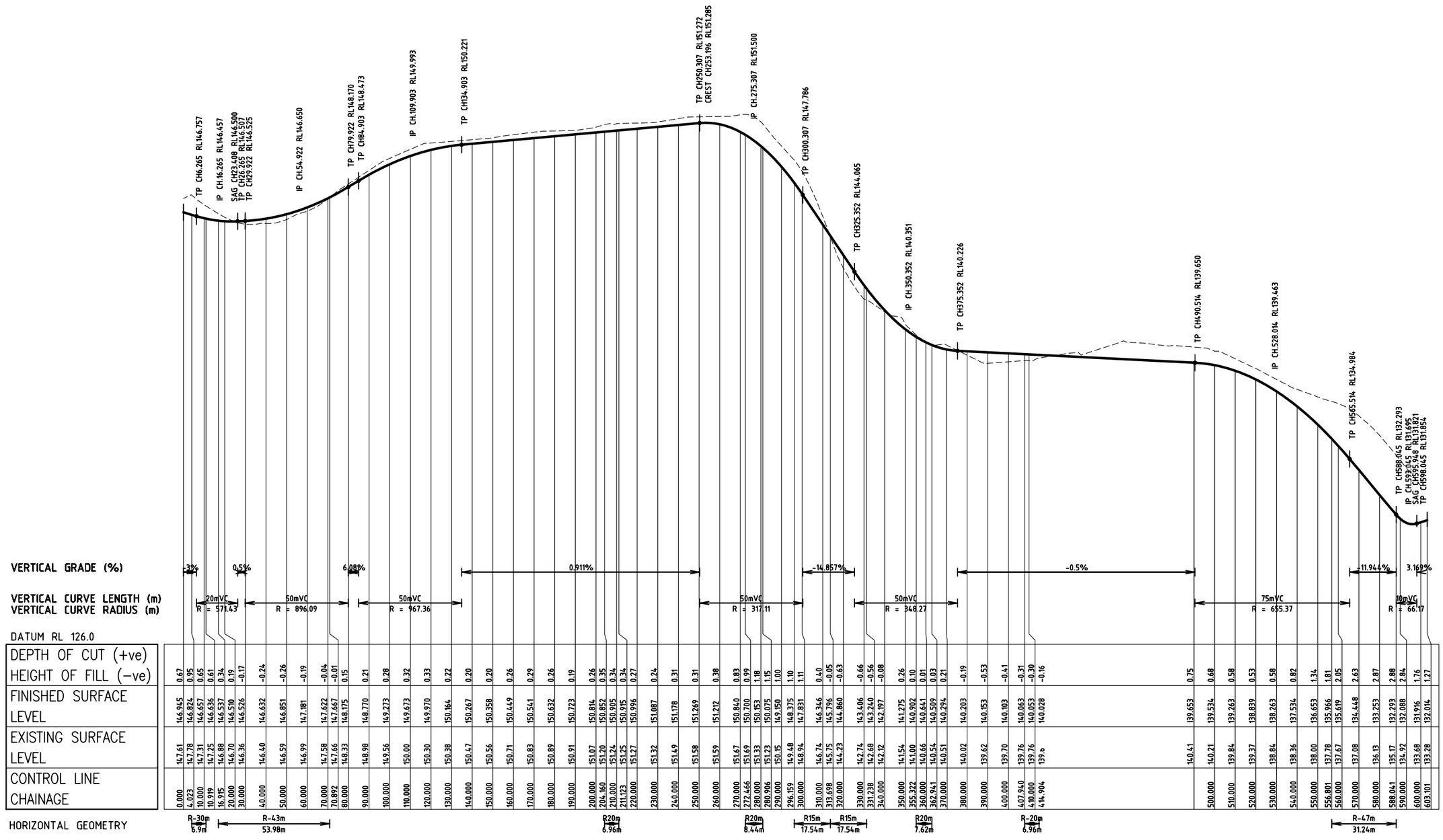


LONGITUDINAL SECTION - ROAD 17

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJEC

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

LONGITUDINAL SECTIONS
1355 - 07 - SK61



LONGITUDINAL SECTION - ROAD 18

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

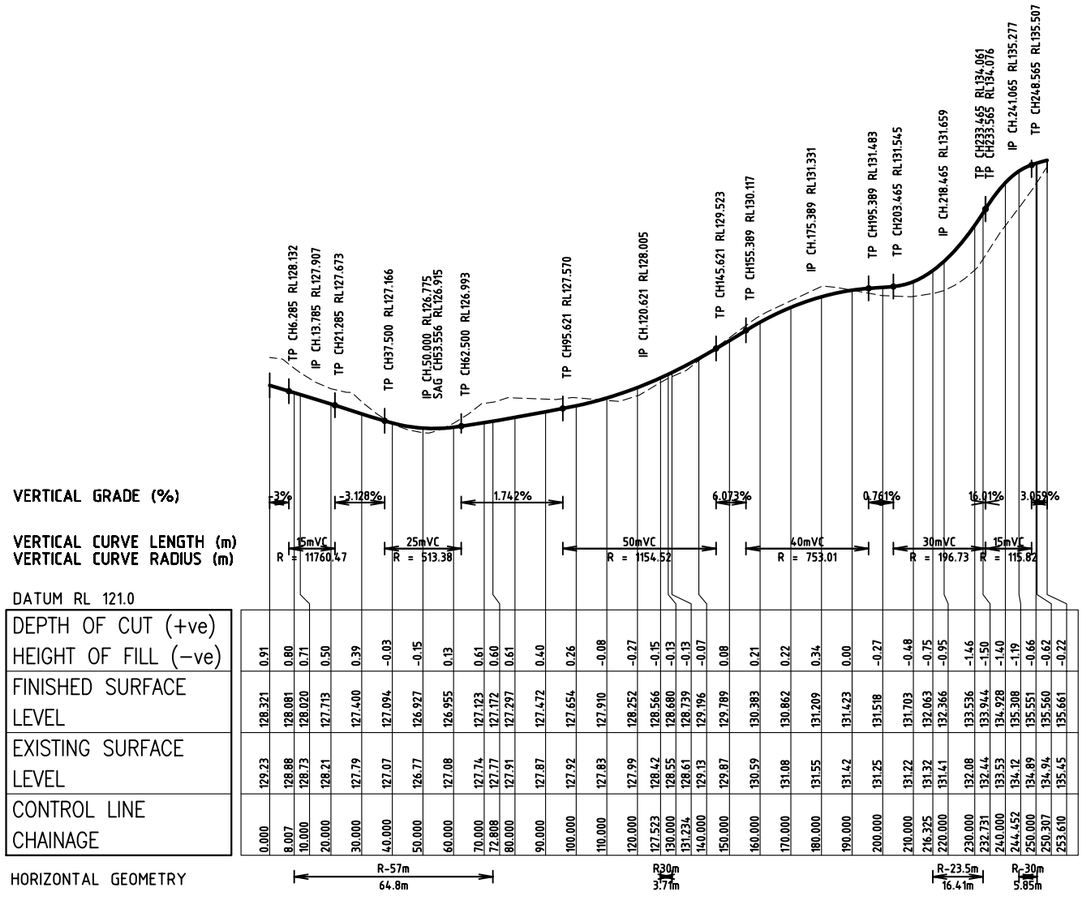
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

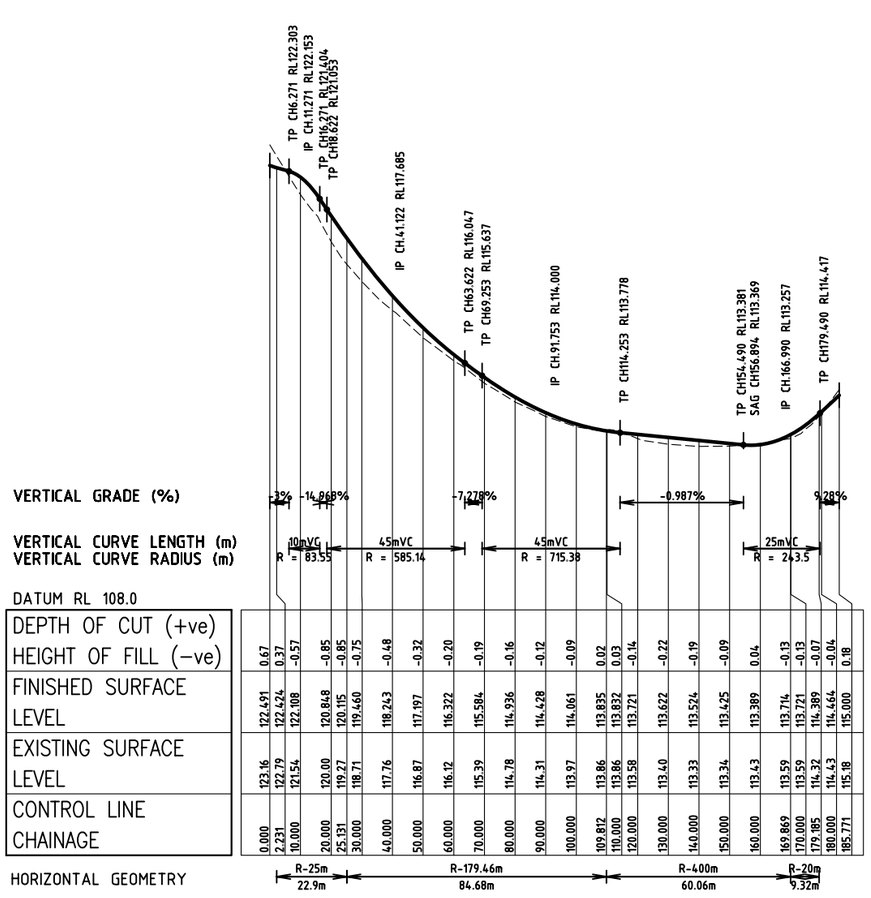
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK62

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 19



LONGITUDINAL SECTION - ROAD 20

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

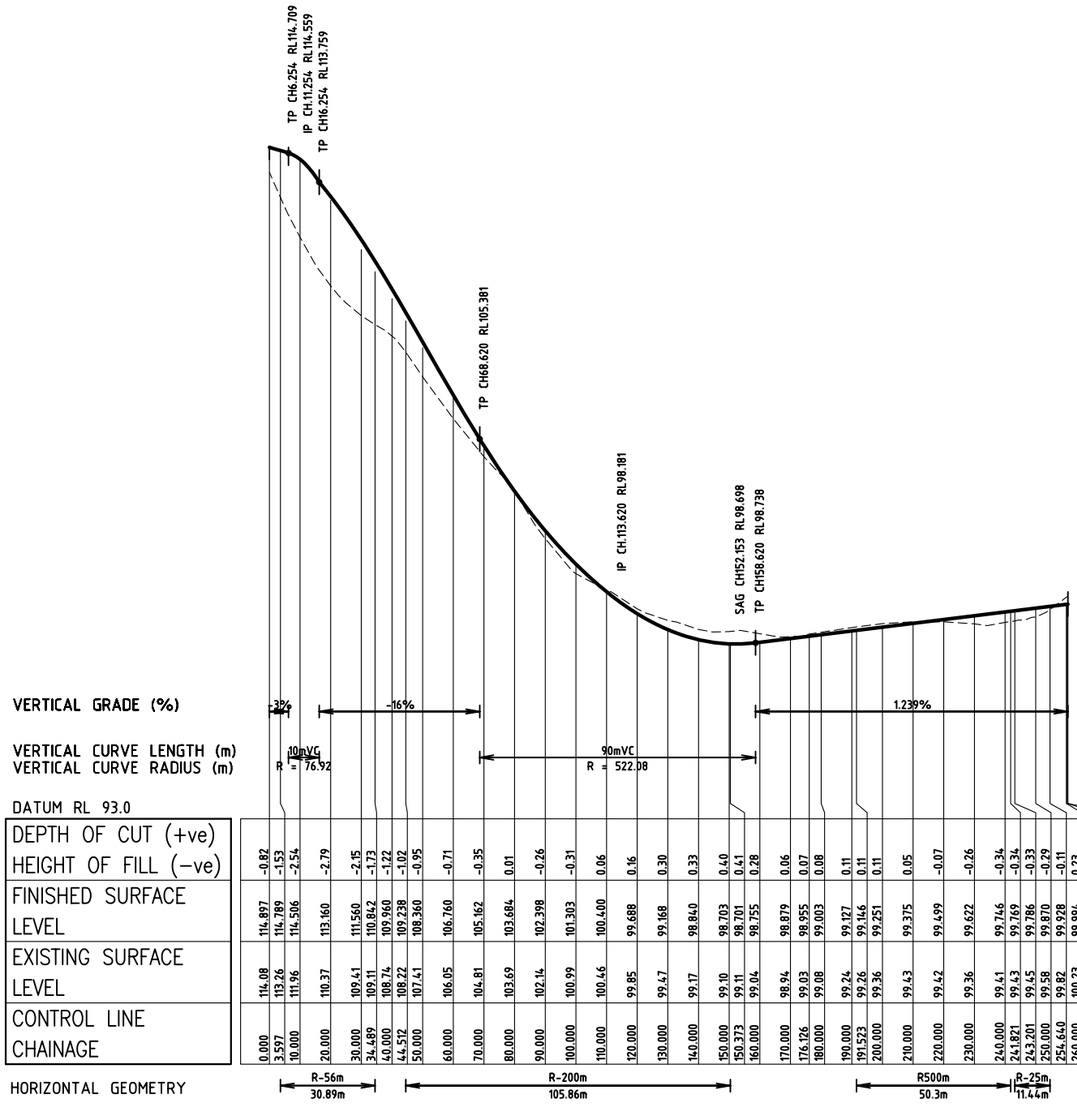
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK63

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 21

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

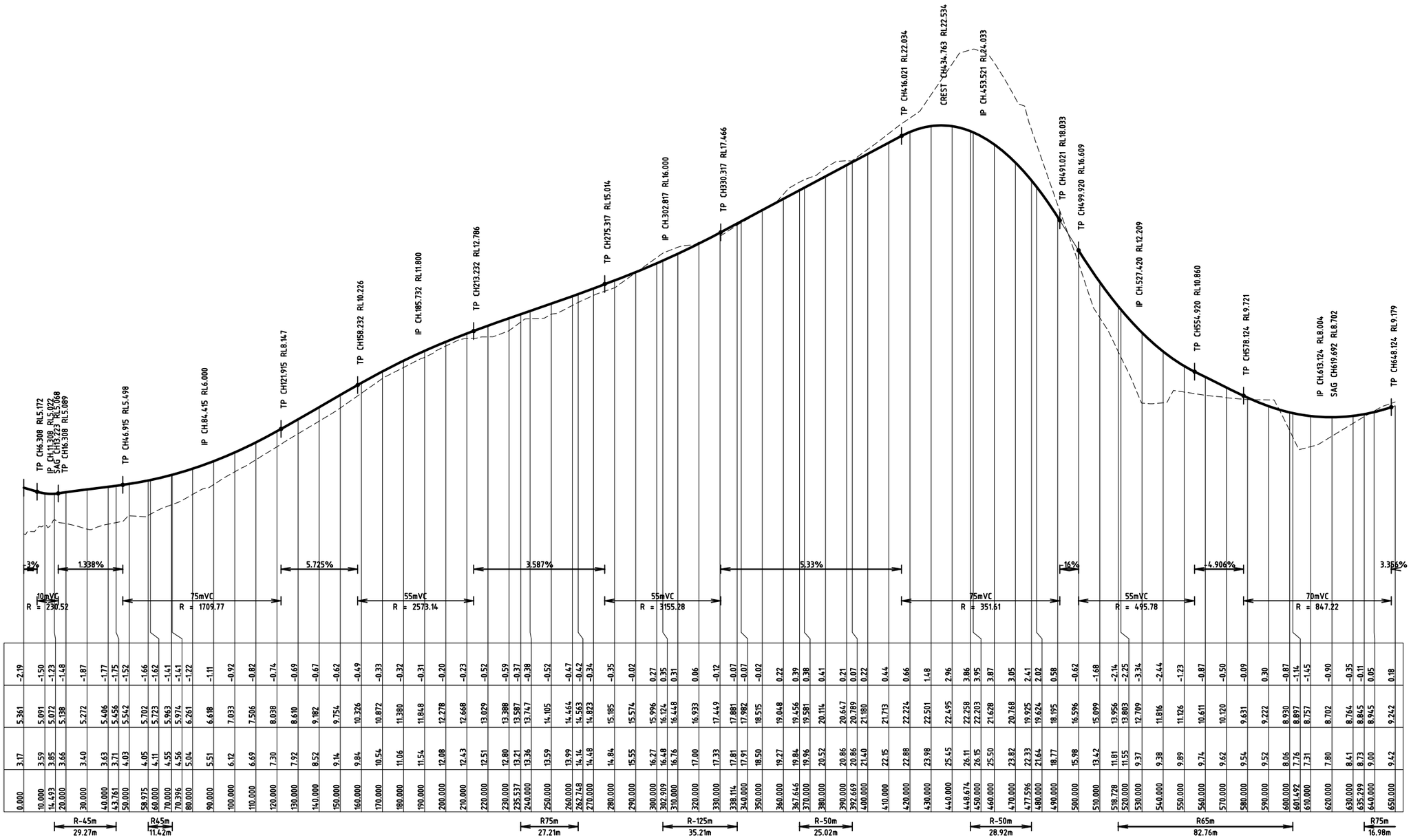
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK64

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 50

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

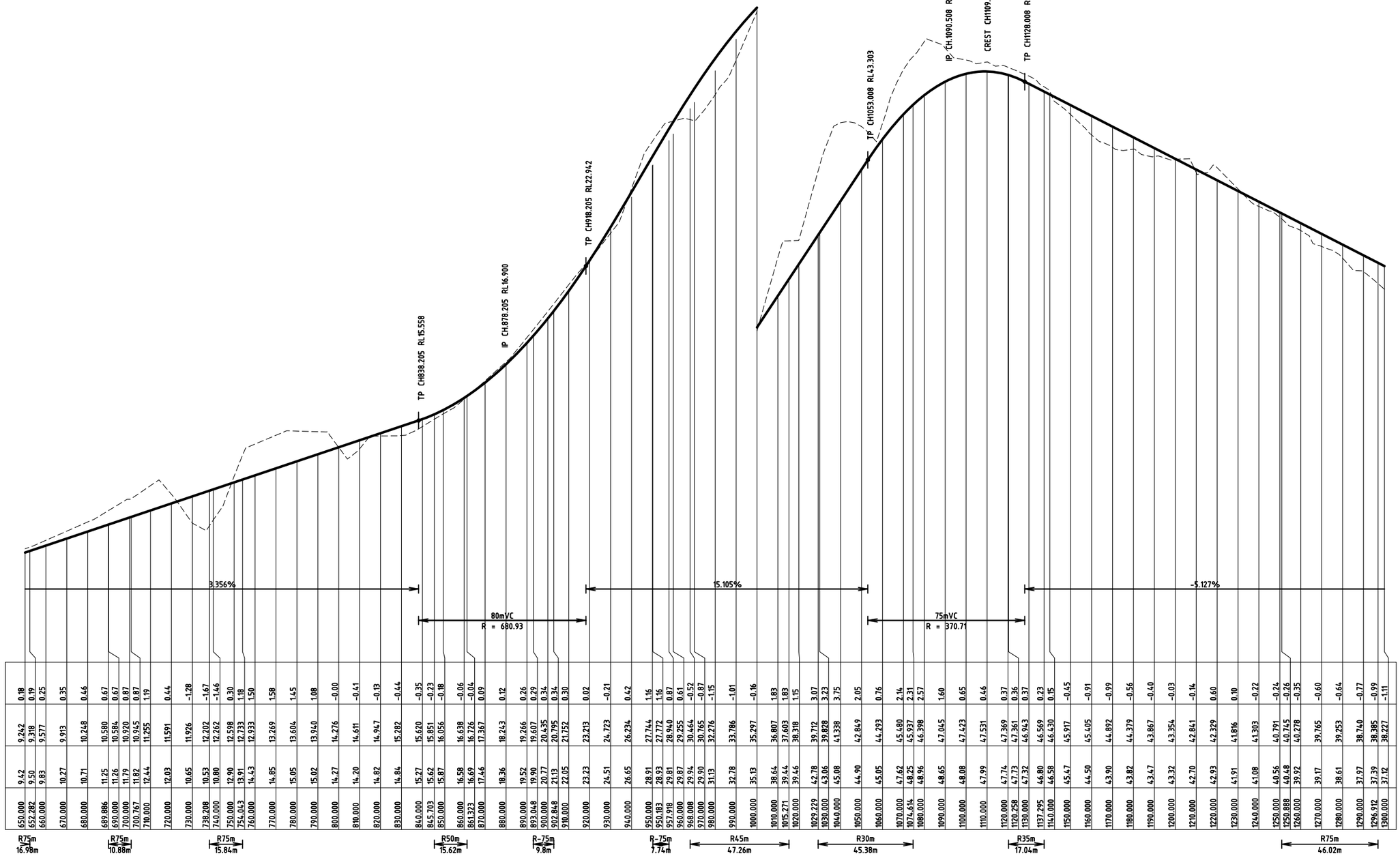
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK65 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



CHAINAGE	DEPTH OF CUT (+ve) / HEIGHT OF FILL (-ve)	FINISHED SURFACE LEVEL	EXISTING SURFACE LEVEL
650.000	0.18	9.242	9.42
652.282	0.19	9.319	9.50
660.000	0.25	9.577	9.83
670.000	0.35	9.913	10.27
680.000	0.46	10.248	10.71
689.886	0.67	10.580	11.25
690.000	0.67	10.584	11.26
700.000	0.87	10.920	11.79
700.767	0.87	10.945	11.82
710.000	1.19	11.255	12.44
720.000	0.44	11.591	12.03
730.000	-1.28	11.926	10.65
738.208	-1.67	12.202	10.53
740.000	-1.46	12.262	10.80
750.000	0.30	12.598	12.90
754.043	1.18	12.733	13.91
760.000	1.50	12.933	14.43
770.000	1.58	13.269	14.85
780.000	1.45	13.604	15.05
790.000	1.08	13.940	15.02
800.000	-0.00	14.276	14.27
810.000	-0.41	14.611	14.20
820.000	-0.13	14.947	14.82
830.000	-0.44	15.282	14.84
840.000	-0.35	15.620	15.27
845.703	-0.23	15.851	15.62
850.000	-0.18	16.056	15.87
860.000	-0.06	16.638	16.58
861.323	-0.04	16.726	16.69
870.000	0.09	17.367	17.46
880.000	0.12	18.243	18.36
890.000	0.26	19.266	19.52
893.048	0.29	19.607	19.90
900.000	0.34	20.435	20.77
902.848	0.34	20.795	21.13
910.000	0.30	21.752	22.05
920.000	0.02	23.213	23.23
930.000	-0.21	24.723	24.51
940.000	0.42	26.234	26.65
950.000	1.16	27.744	28.91
950.183	1.16	27.772	28.93
957.918	0.87	28.940	29.81
960.000	0.61	29.255	29.87
968.008	-0.52	30.444	29.94
970.000	-0.87	30.765	29.90
980.000	-1.15	32.276	31.13
990.000	-1.01	33.786	32.78
1000.000	-0.16	35.297	35.13
1010.000	1.83	36.807	38.64
1015.271	1.83	37.603	39.44
1020.000	1.15	38.318	39.46
1029.229	3.07	39.712	42.78
1030.000	3.23	39.828	43.06
1040.000	3.75	41.338	45.08
1050.000	2.05	42.849	44.90
1060.000	0.76	44.293	45.05
1070.000	-0.45	45.480	47.62
1074.614	-0.91	45.937	48.25
1080.000	-0.99	46.398	48.96
1090.000	-0.56	47.045	48.65
1100.000	-0.40	47.423	48.08
1110.000	-0.03	47.531	47.99
1120.000	-0.14	47.369	47.74
1120.258	0.60	47.361	47.73
1130.000	0.36	46.943	47.32
1137.295	0.37	46.569	46.80
1140.000	0.23	46.430	46.58
1150.000	0.15	45.917	45.47
1160.000	-0.45	45.405	44.50
1170.000	-0.91	44.892	43.90
1180.000	-0.99	44.379	43.82
1190.000	-0.56	43.867	43.47
1200.000	-0.40	43.354	43.32
1210.000	-0.03	42.841	42.70
1220.000	-0.14	42.329	42.93
1230.000	0.60	41.816	41.91
1240.000	0.10	41.303	41.08
1250.000	-0.22	40.791	40.56
1250.888	-0.24	40.745	40.48
1260.000	-0.26	40.278	39.92
1270.000	-0.35	39.765	39.17
1280.000	-0.60	39.253	38.61
1290.000	-0.64	38.740	37.97
1296.912	-0.77	38.385	37.39
1300.000	-0.99	38.227	37.12
	-1.11		

LONGITUDINAL SECTION - ROAD 50

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

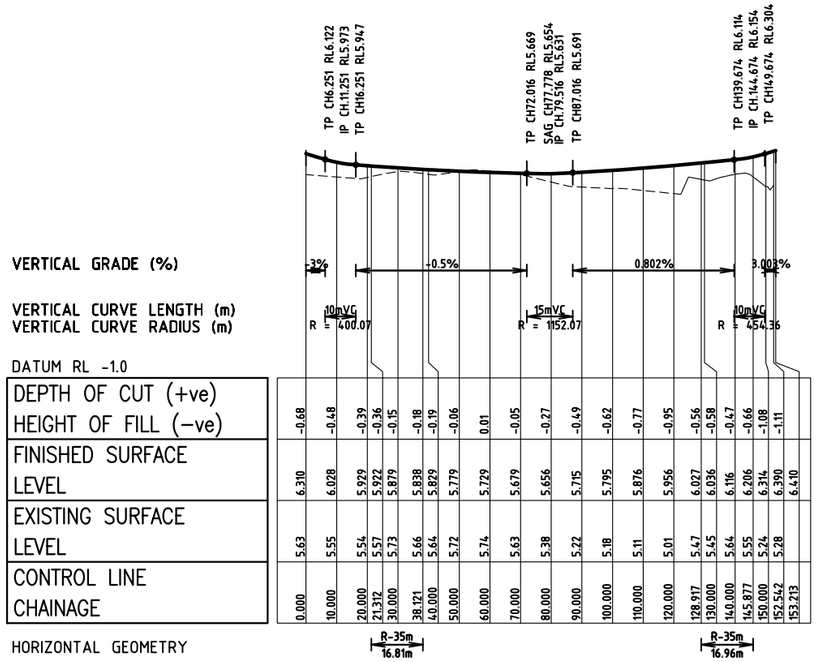
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

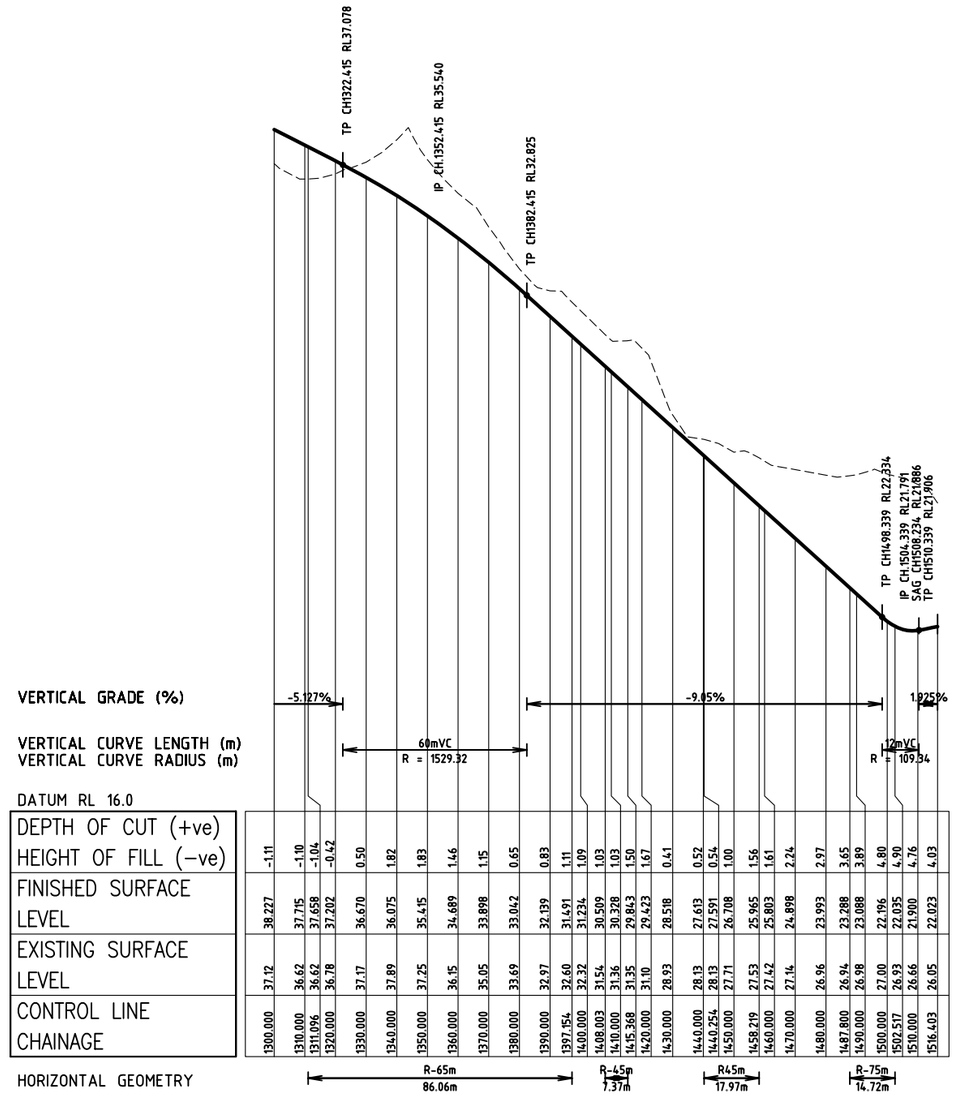
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK66 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS

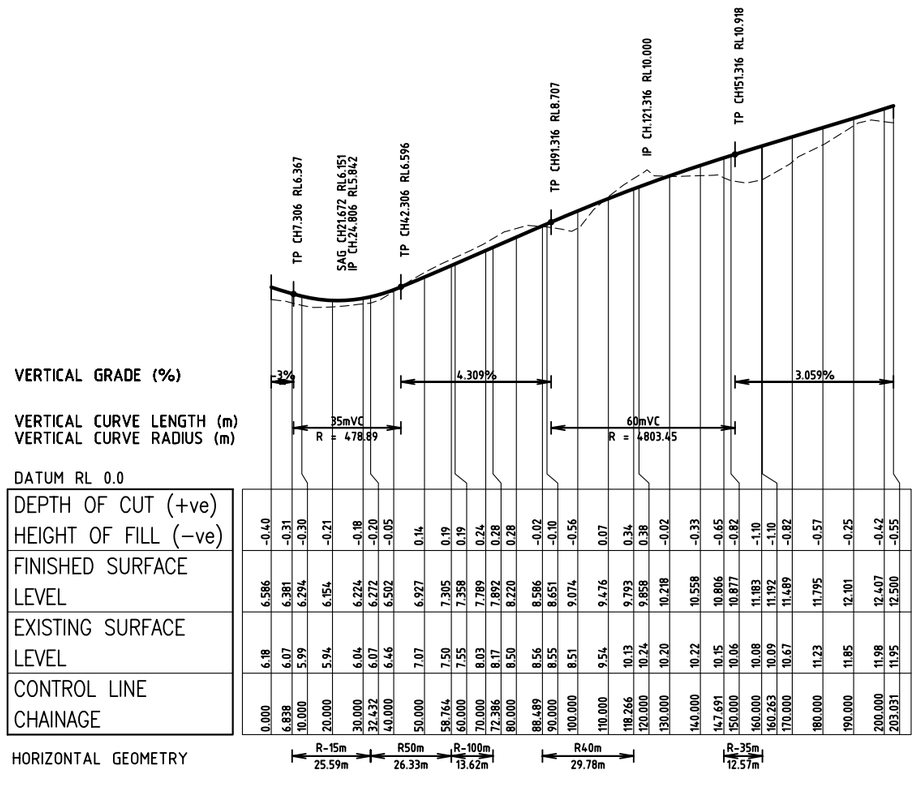
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 51



LONGITUDINAL SECTION - ROAD 50



LONGITUDINAL SECTION - ROAD 52

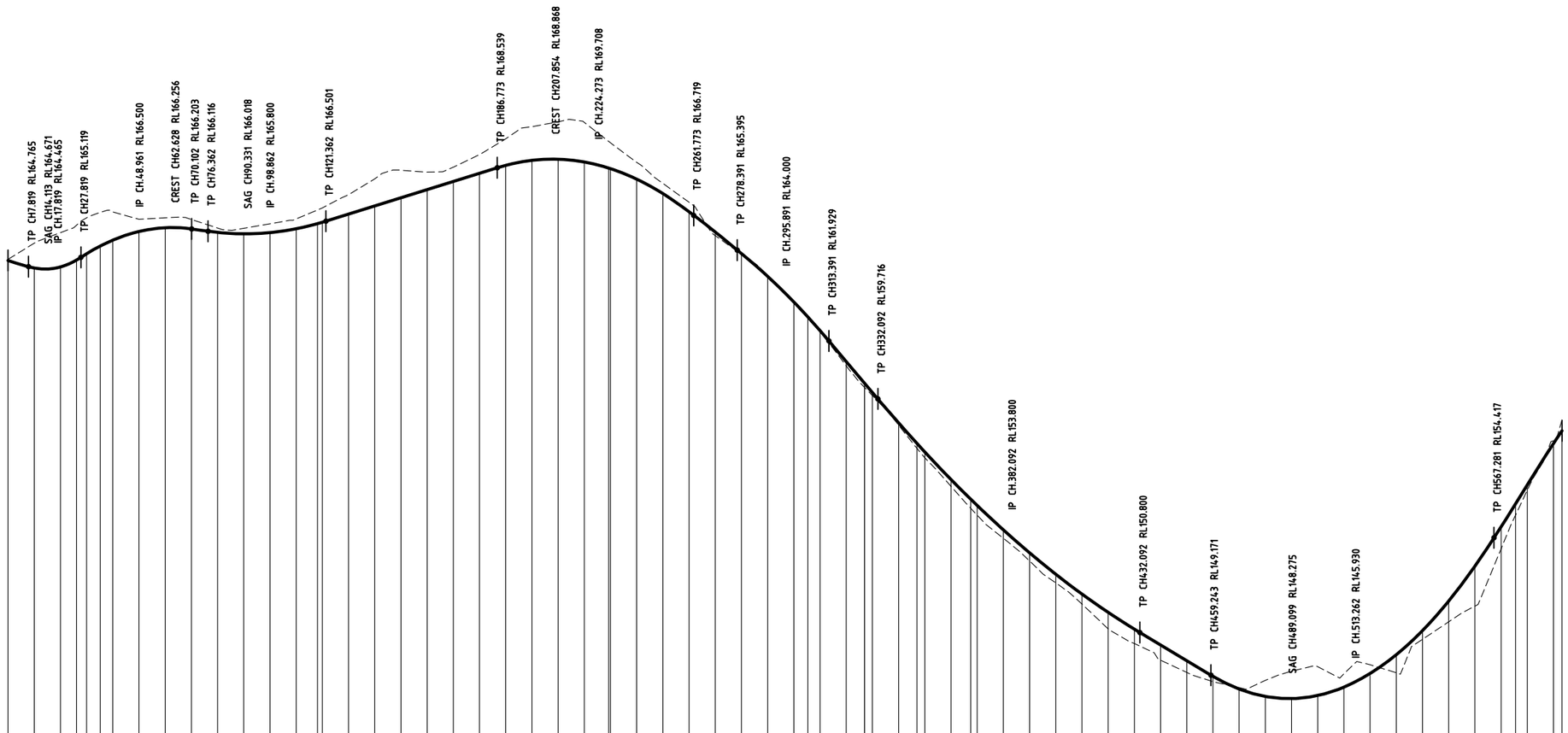
PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK67 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS



VERTICAL GRADE (%)

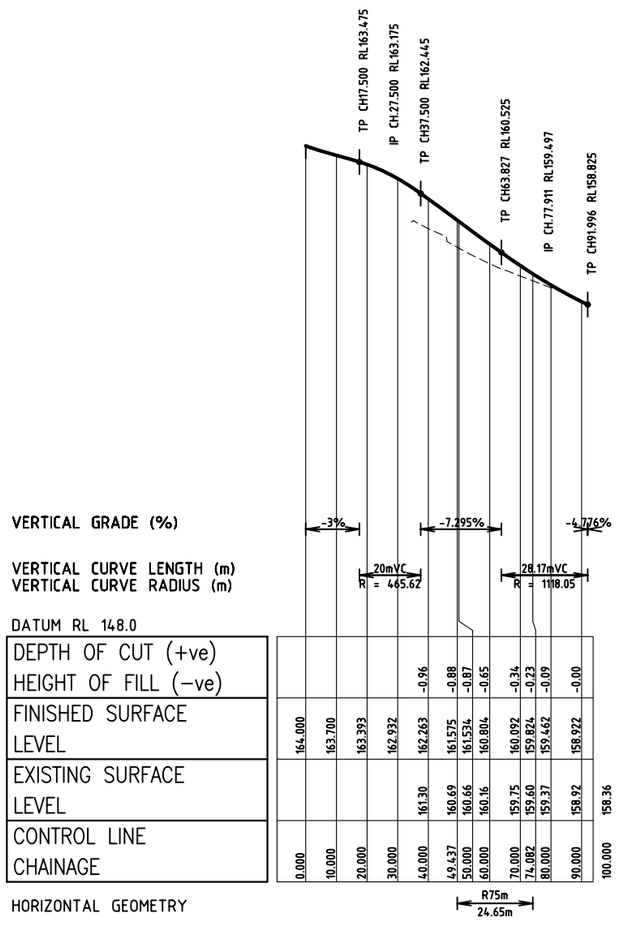
-3% | -1.403% | 3.116% | -7.97% | -11.833% | -6% | 15.712%

VERTICAL CURVE LENGTH (m)
VERTICAL CURVE RADIUS (m)

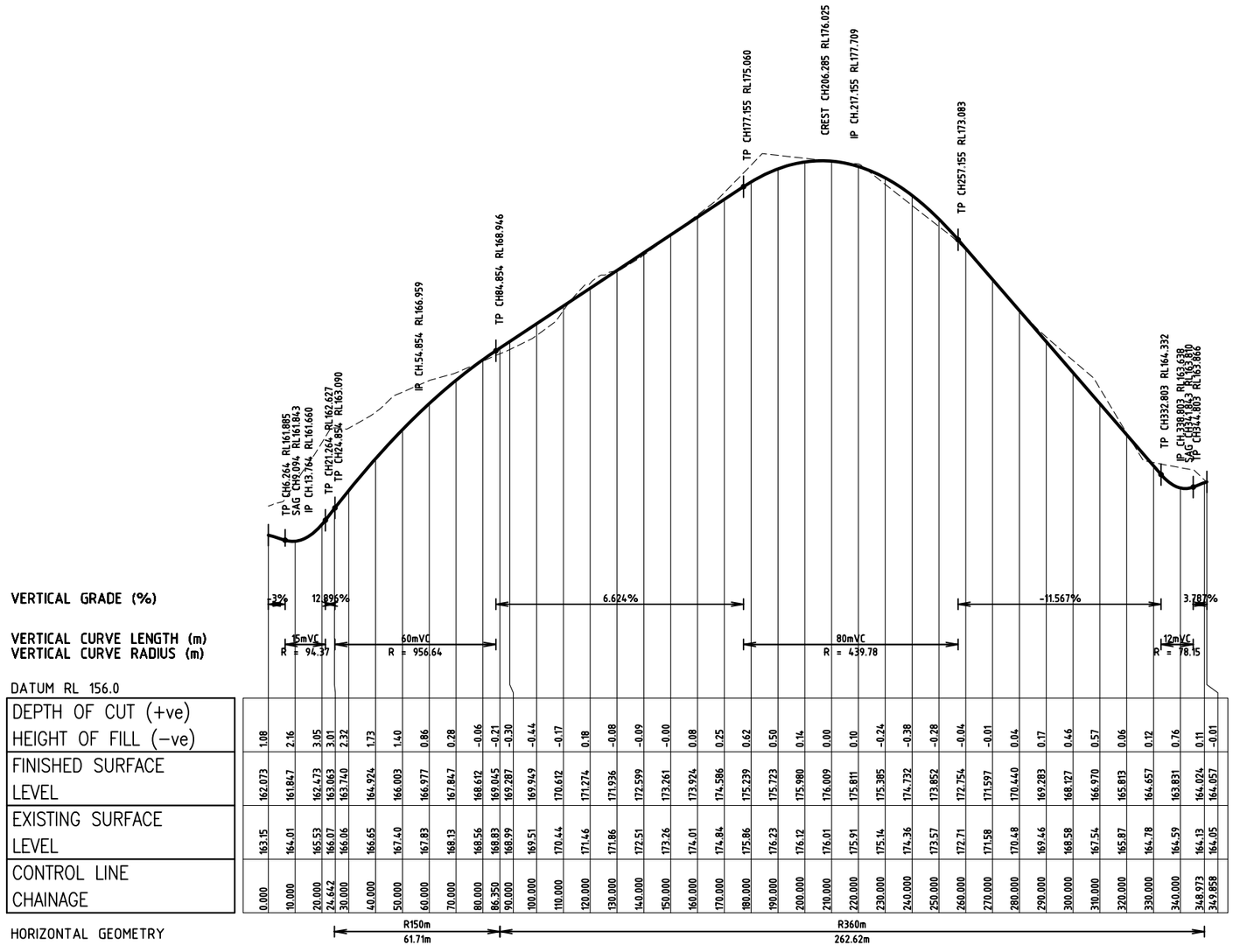
20mVC R = 209.78 | 42.282mVC R = 532.78 | 45mVC R = 995.83 | 75mVC R = 676.53 | 35mVC R = 906.05 | 100mVC R = 1714.44 | 108.038mVC R = 497.6

DATUM RL 140.0

| | | |



LONGITUDINAL SECTION - ROAD 101



LONGITUDINAL SECTION - ROAD 102

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

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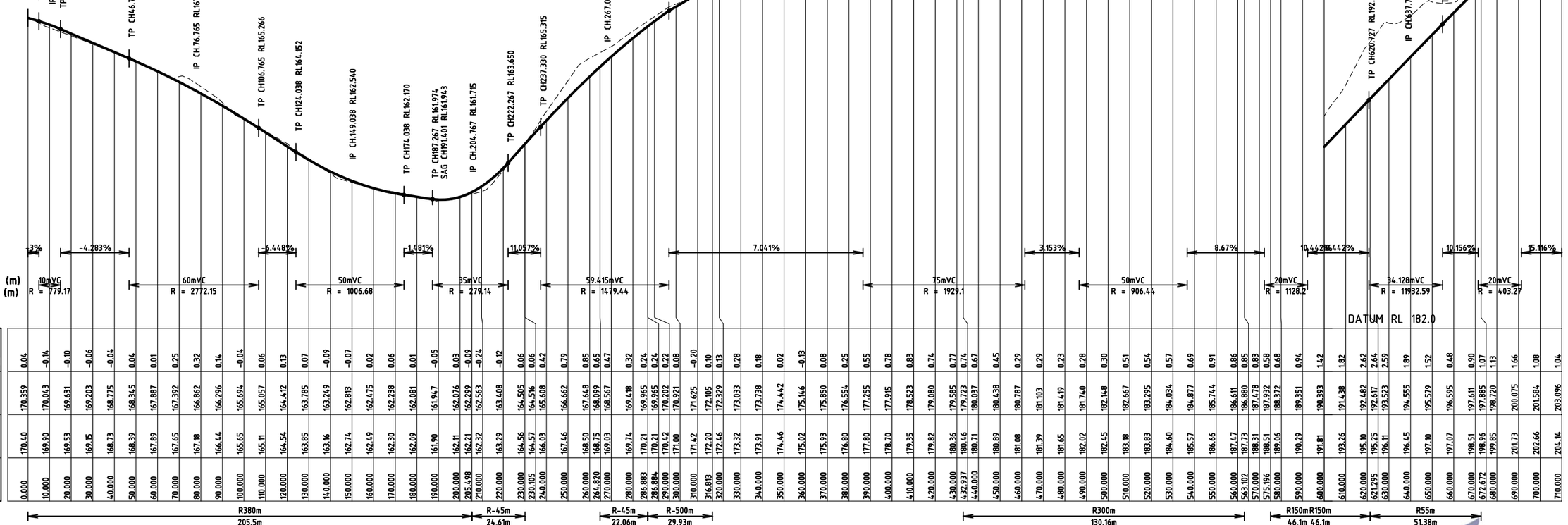
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK69

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 103

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

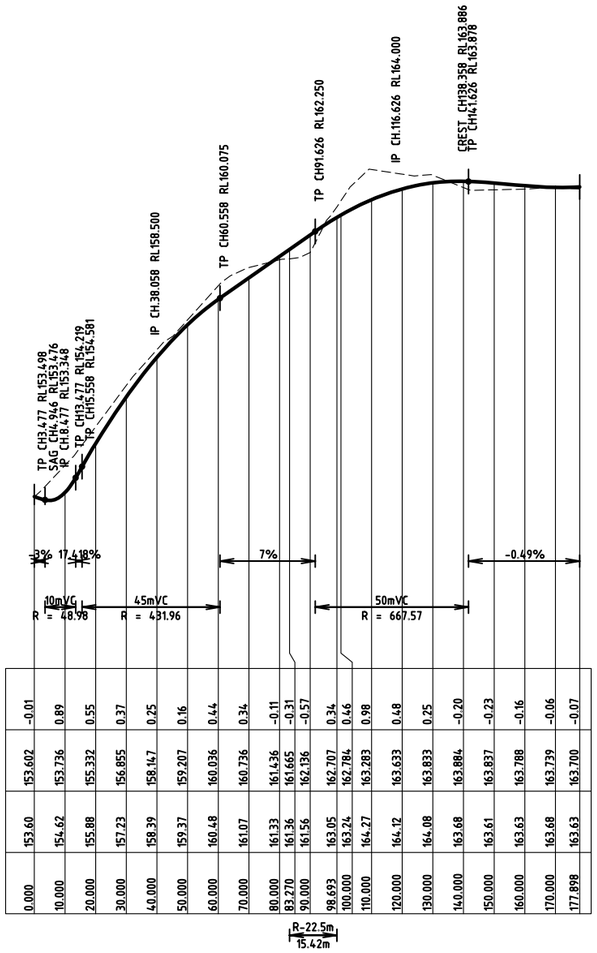
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK70

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

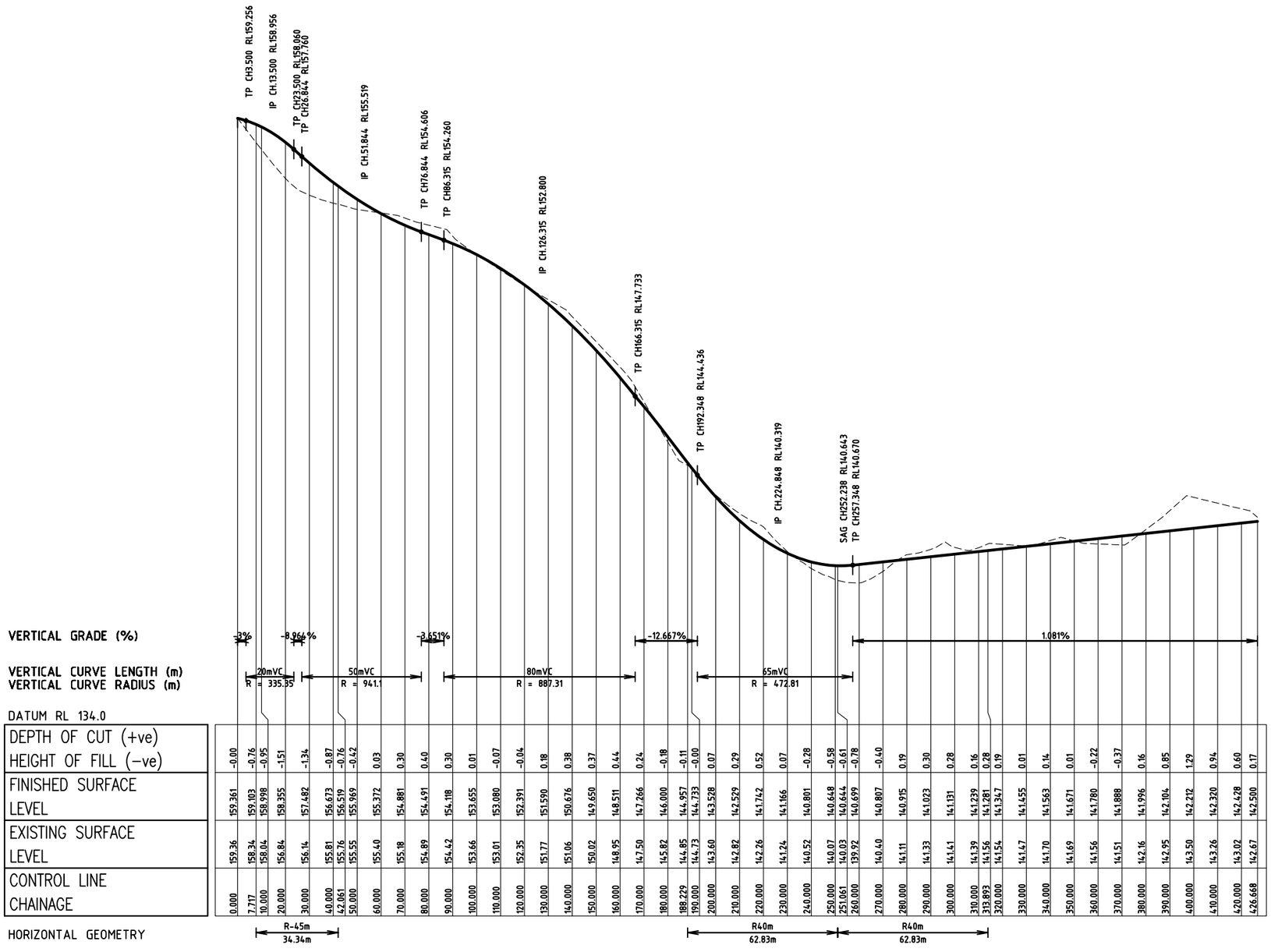


VERTICAL GRADE (%)

VERTICAL CURVE LENGTH (m)
VERTICAL CURVE RADIUS (m)

DATUM RL 148.0

| | | |



CONTROL LINE CHAINAGE	EXISTING SURFACE LEVEL	FINISHED SURFACE LEVEL	DEPTH OF CUT (+ve) HEIGHT OF FILL (–ve)
0.000	159.36	159.361	-0.00
7.717	158.34	159.103	-0.76
10.000	158.04	158.998	-0.95
20.000	156.84	158.355	-1.51
30.000	156.14	157.482	-1.34
40.000	155.81	156.673	-0.87
42.061	155.76	156.519	-0.76
50.000	155.55	155.969	-0.42
60.000	155.40	155.372	0.03
70.000	155.18	154.881	0.30
80.000	154.89	154.491	0.40
90.000	154.42	154.118	0.30
100.000	153.66	153.655	0.01
110.000	153.01	153.080	-0.07
120.000	152.35	152.391	-0.04
130.000	151.77	151.590	0.18
140.000	151.06	150.676	0.38
150.000	150.02	149.650	0.37
160.000	148.95	148.511	0.44
170.000	147.50	147.266	0.24
180.000	145.82	146.000	-0.18
188.229	144.85	144.957	-0.11
190.000	144.73	144.733	-0.00
200.000	143.60	143.528	0.07
210.000	142.82	142.529	0.29
220.000	142.26	141.742	0.52
230.000	141.24	141.166	0.07
240.000	140.52	140.801	-0.28
250.000	140.07	140.648	-0.58
251.061	140.03	140.644	-0.61
260.000	139.92	140.699	-0.78
270.000	140.40	140.807	-0.40
280.000	141.11	140.915	0.19
290.000	141.33	141.023	0.30
300.000	141.41	141.131	0.28
310.000	141.39	141.239	0.16
313.893	141.56	141.281	0.28
320.000	141.54	141.347	0.19
330.000	141.47	141.455	0.01
340.000	141.70	141.563	0.14
350.000	141.69	141.671	0.01
360.000	141.56	141.780	-0.22
370.000	141.51	141.888	-0.37
380.000	142.16	141.996	0.16
390.000	142.95	142.104	0.85
400.000	143.50	142.212	1.29
410.000	143.26	142.320	0.94
420.000	143.02	142.428	0.60
426.668	142.67	142.500	0.17

LONGITUDINAL SECTION - ROAD 106

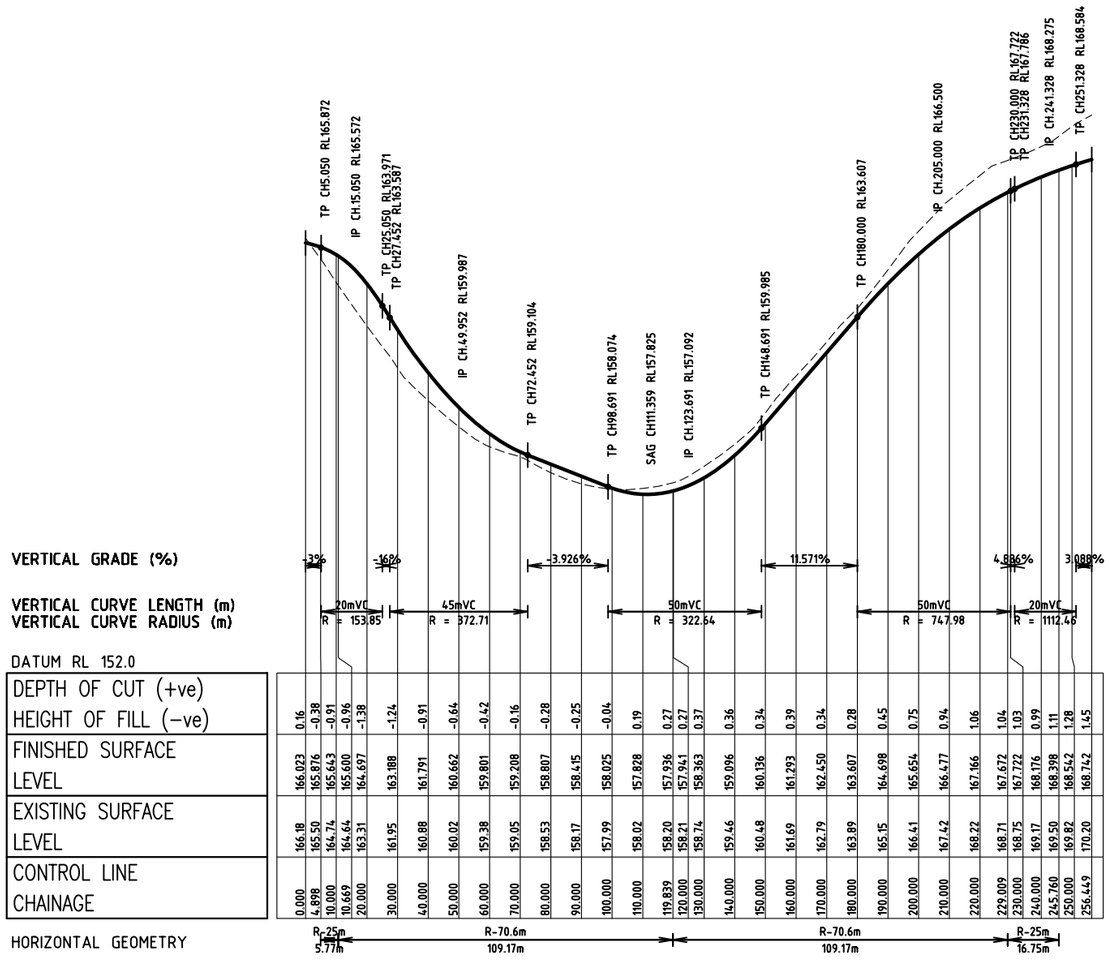
PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

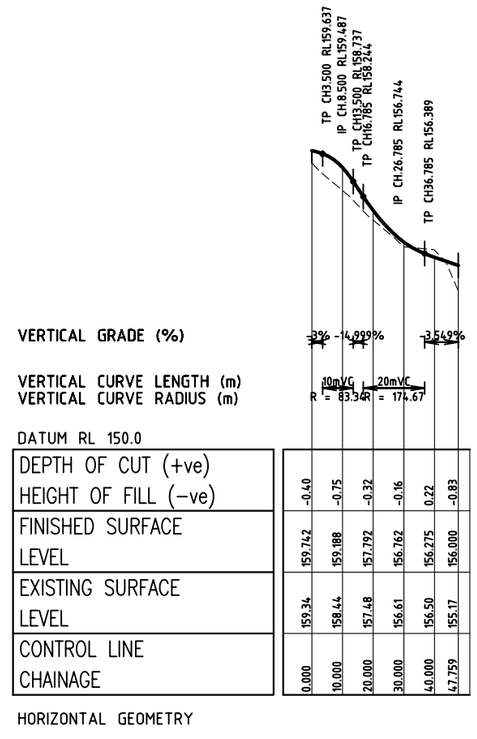
RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK72



LONGITUDINAL SECTION - ROAD 107



LONGITUDINAL SECTION - ROAD 108

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

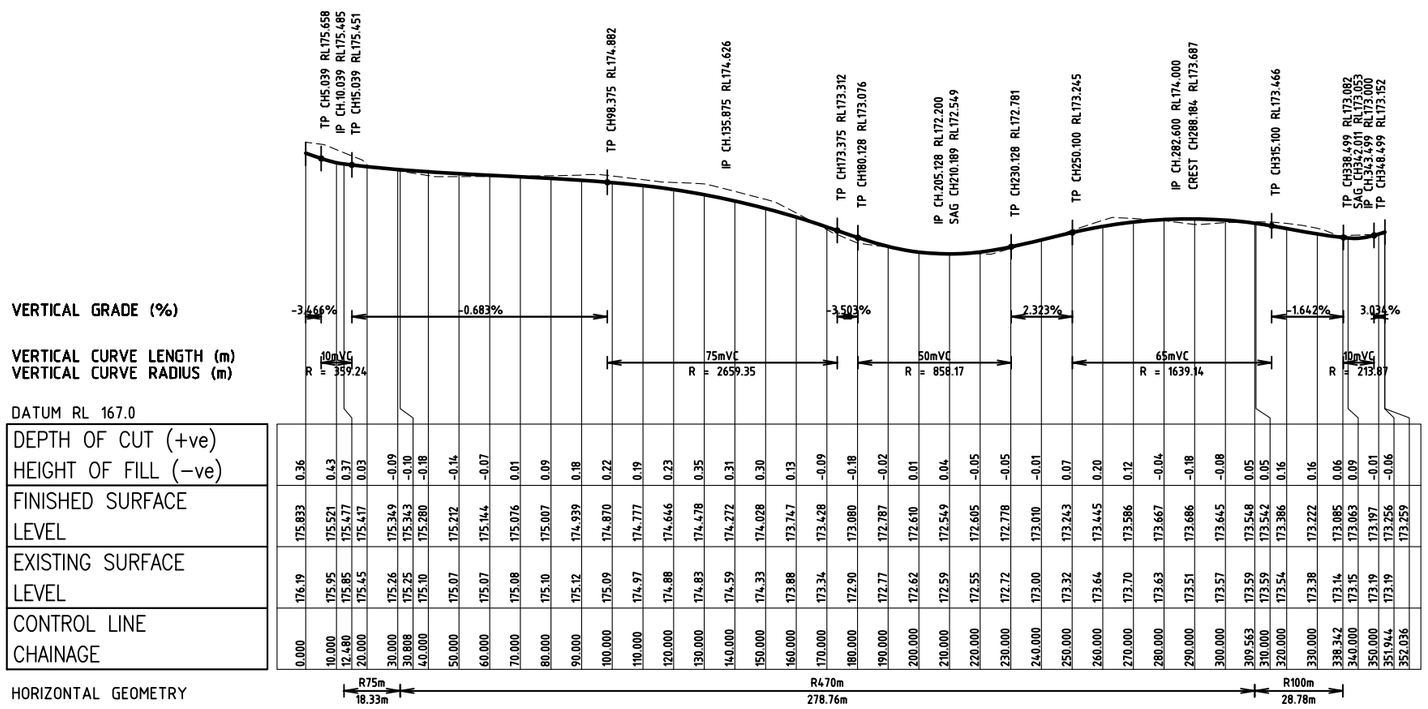
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

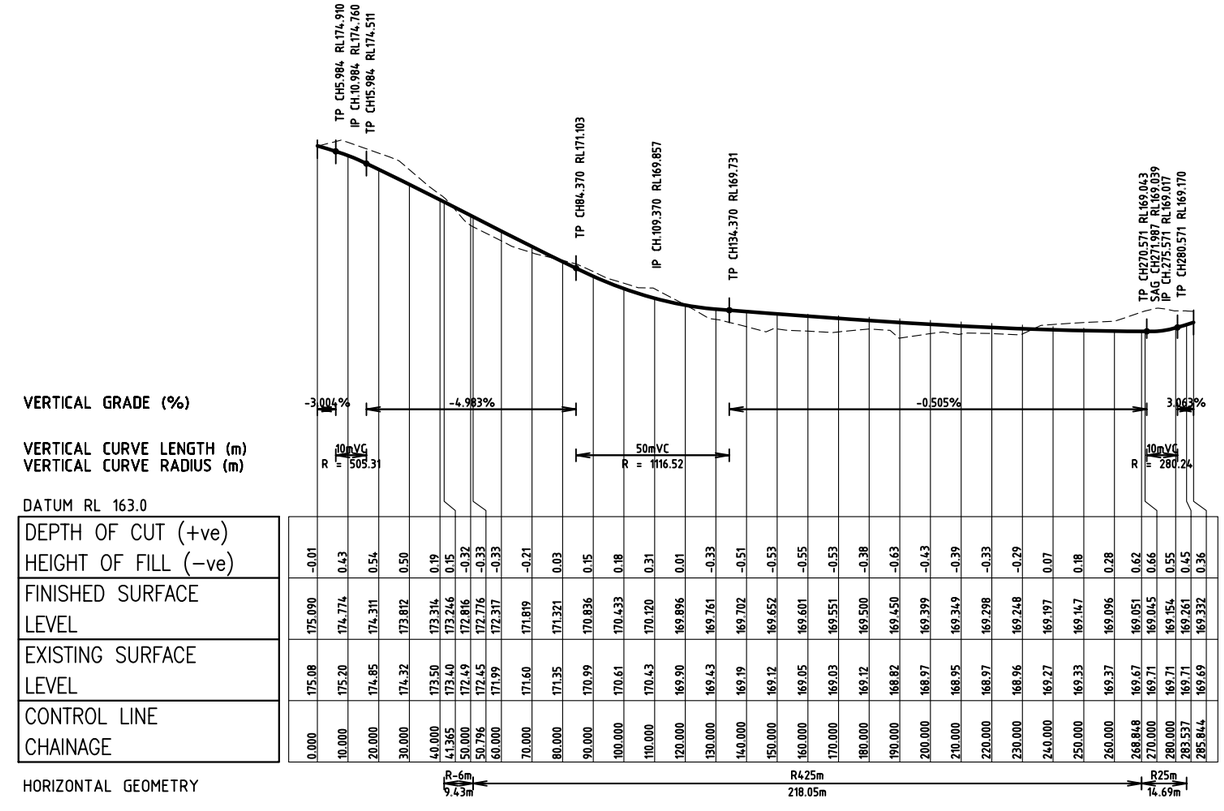
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK73

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 110



LONGITUDINAL SECTION - ROAD 109

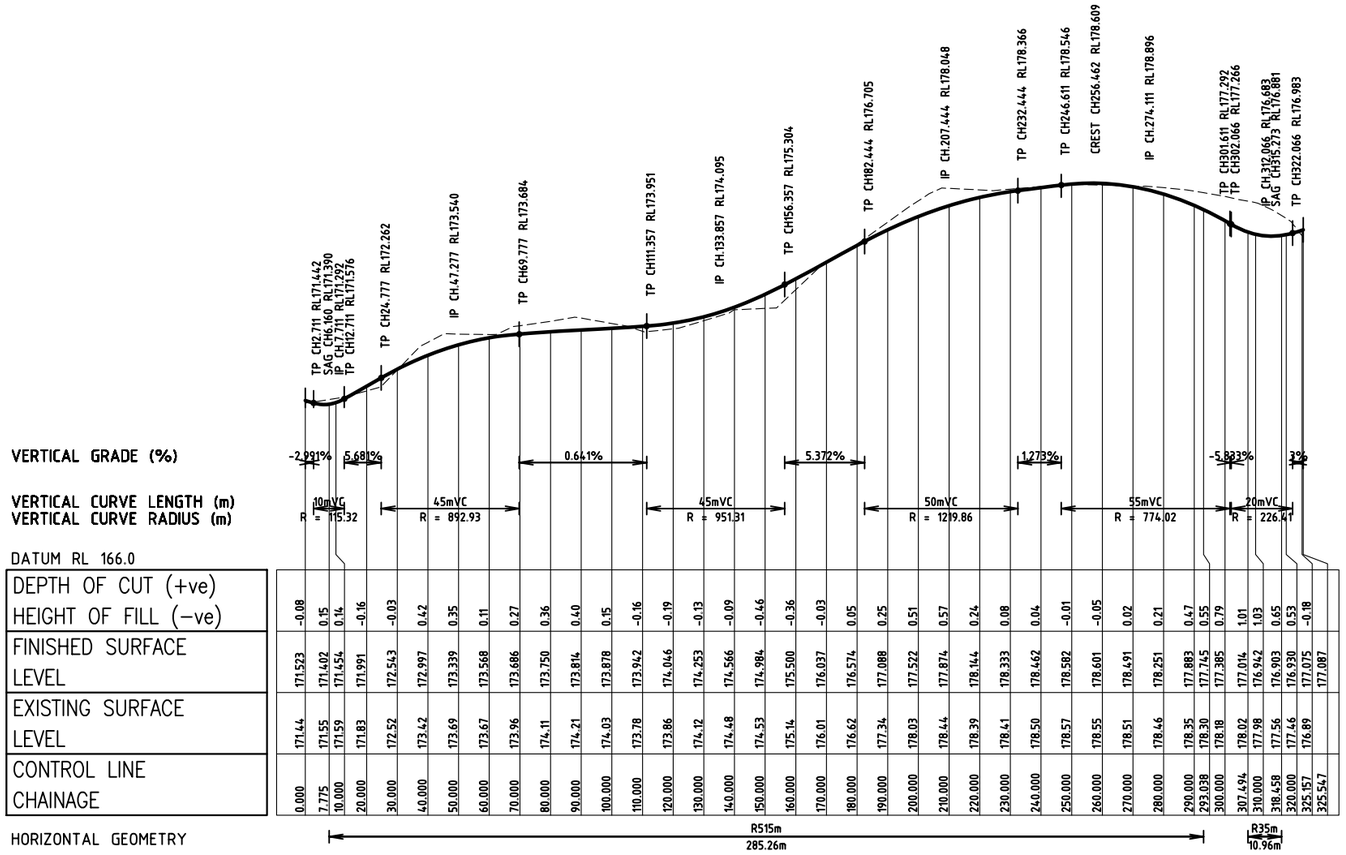
PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

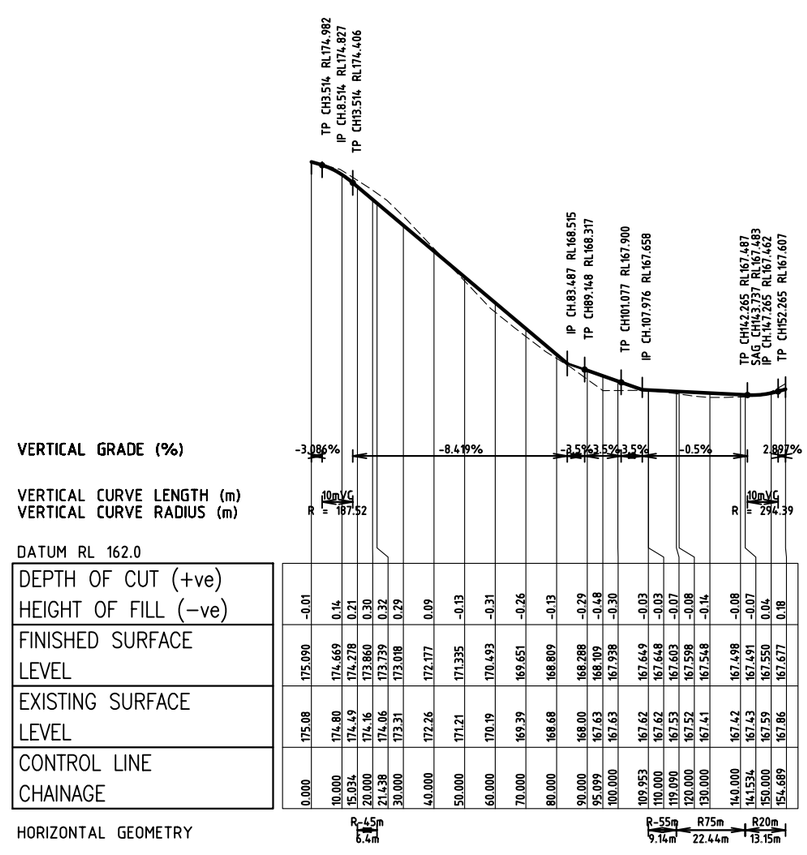
LONGITUDINAL SECTIONS
1355 - 07 - SK74



CHAINAGE	0.000	7.775	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	240.000	250.000	260.000	270.000	280.000	290.000	293.038	300.000	307.494	310.000	318.458	320.000	325.157	325.547
DEPTH OF CUT (+ve) HEIGHT OF FILL (−ve)	-0.08	0.15	0.14	-0.16	-0.03	0.42	0.35	0.11	0.27	0.36	0.40	0.15	-0.16	-0.19	-0.13	-0.09	-0.46	-0.36	-0.03	0.05	0.25	0.51	0.57	0.24	0.08	0.04	-0.01	-0.05	0.02	0.21	0.47	0.55	0.79	1.01	1.03	0.65	0.53	-0.18	
FINISHED SURFACE LEVEL	171.523	171.402	171.454	171.991	172.543	172.997	173.339	173.568	173.686	173.750	173.814	173.878	173.942	174.046	174.263	174.566	174.984	175.500	176.037	176.574	177.088	177.522	177.874	178.144	178.333	178.462	178.582	178.601	178.491	178.251	177.883	177.745	177.385	177.014	176.942	176.903	176.930	177.075	177.087
EXISTING SURFACE LEVEL	171.44	171.55	171.59	171.83	172.52	173.42	173.69	173.67	173.96	174.11	174.21	174.03	173.78	173.86	174.12	174.48	174.53	175.14	176.01	176.62	177.34	178.03	178.44	178.39	178.41	178.50	178.57	178.55	178.51	178.46	178.35	178.30	178.18	178.02	177.98	177.56	177.46	176.89	

HORIZONTAL GEOMETRY

LONGITUDINAL SECTION - ROAD 111



CHAINAGE	0.000	10.000	15.034	20.000	21.438	30.000	40.000	50.000	60.000	70.000	80.000	90.000	95.099	100.000	109.953	110.000	119.090	120.000	130.000	140.000	141.534	150.000	154.689
DEPTH OF CUT (+ve) HEIGHT OF FILL (−ve)	-0.01	0.14	0.21	0.30	0.32	0.29	0.09	-0.13	-0.31	-0.26	-0.13	-0.29	-0.48	-0.30	-0.03	-0.03	-0.07	-0.08	-0.14	-0.08	-0.07	0.04	0.18
FINISHED SURFACE LEVEL	175.090	174.669	174.278	173.860	173.739	173.018	172.177	171.335	170.493	169.651	168.809	168.288	168.109	167.938	167.669	167.648	167.603	167.528	167.548	167.498	167.491	167.550	167.677
EXISTING SURFACE LEVEL	175.08	174.80	174.49	174.16	174.06	173.31	172.26	171.21	170.19	169.39	168.68	168.00	167.63	167.63	167.62	167.62	167.53	167.52	167.41	167.42	167.43	167.59	167.86

LONGITUDINAL SECTION - ROAD 113

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE ABOVE IT ALL

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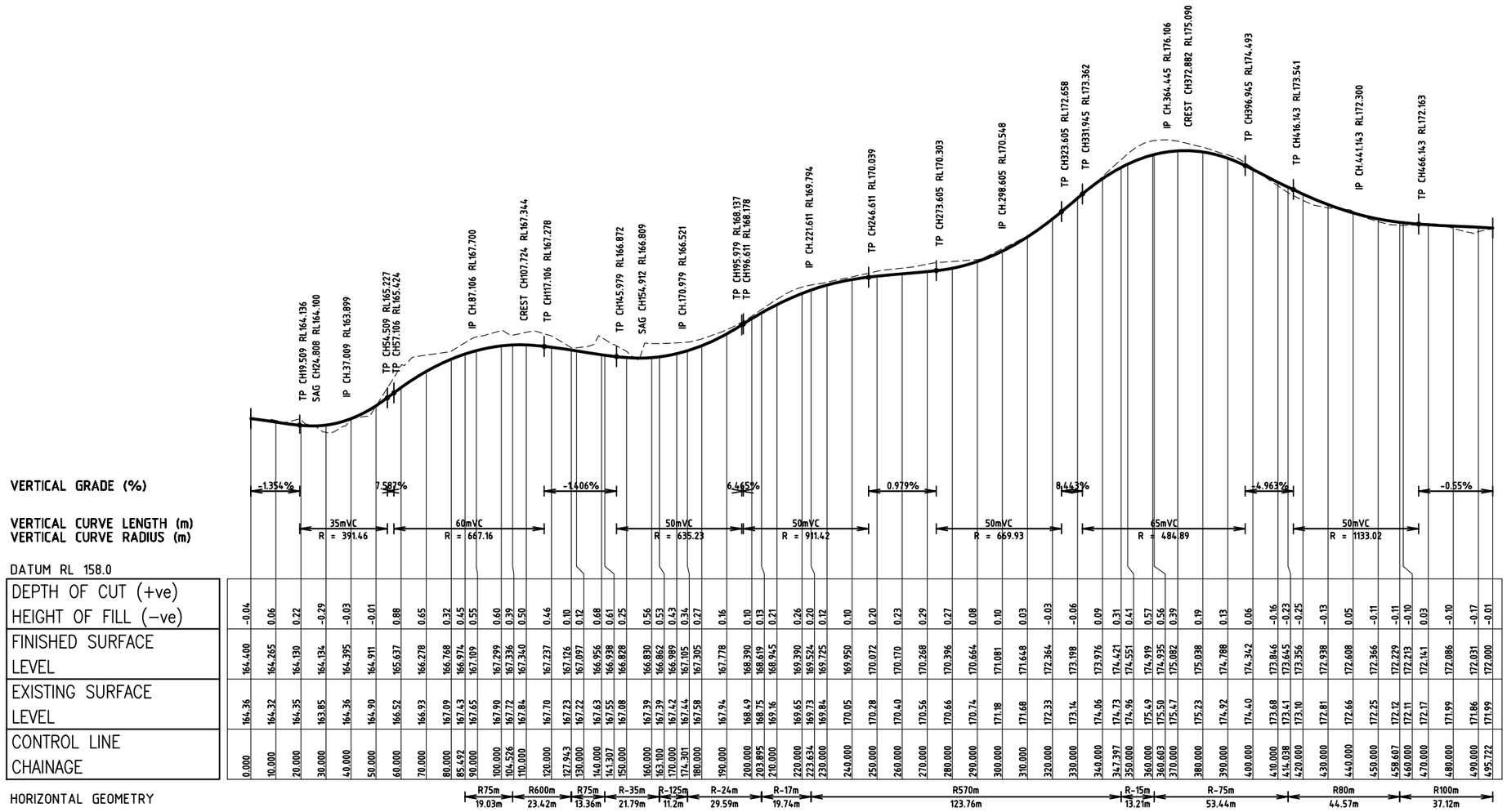
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK75

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 114

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

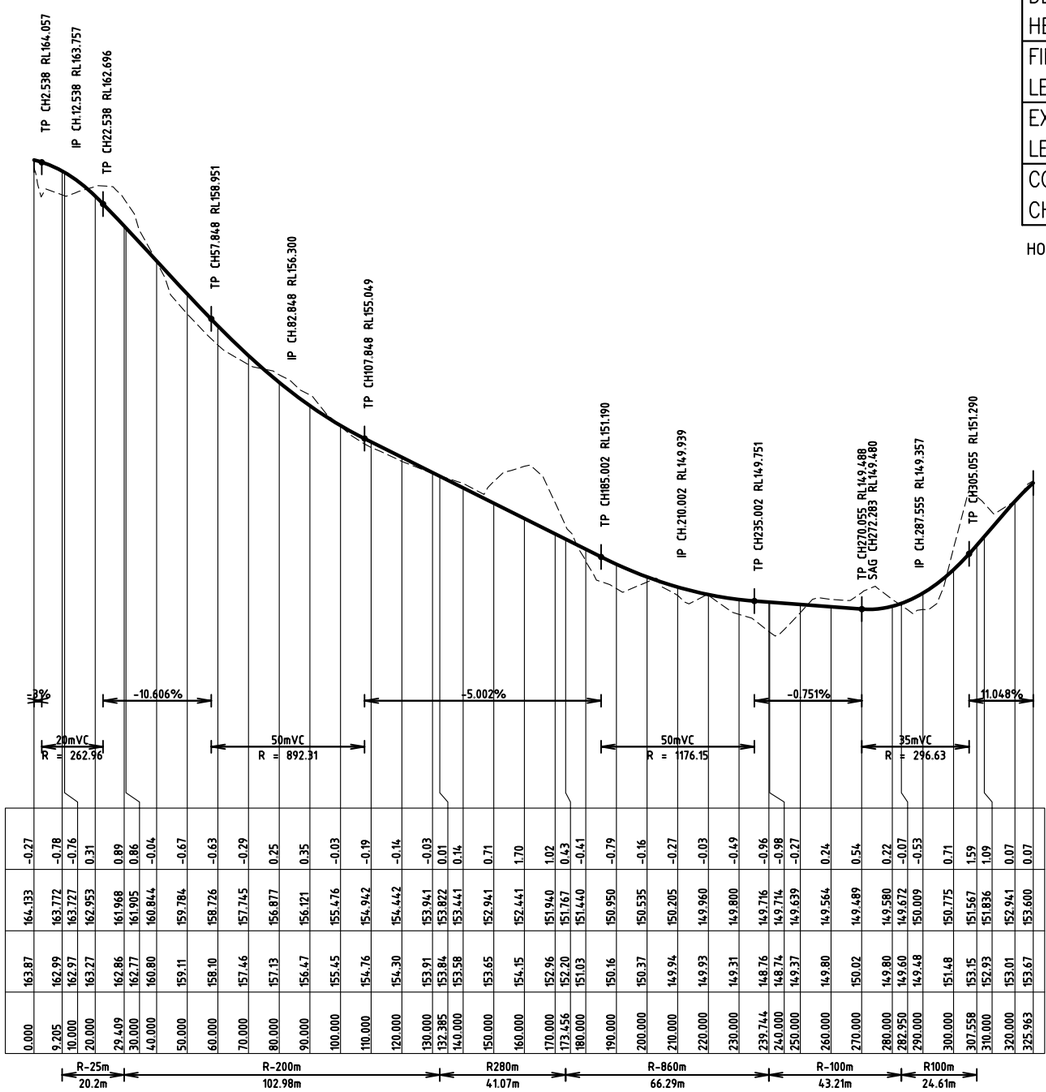
0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

RISE
ABOVE IT ALL

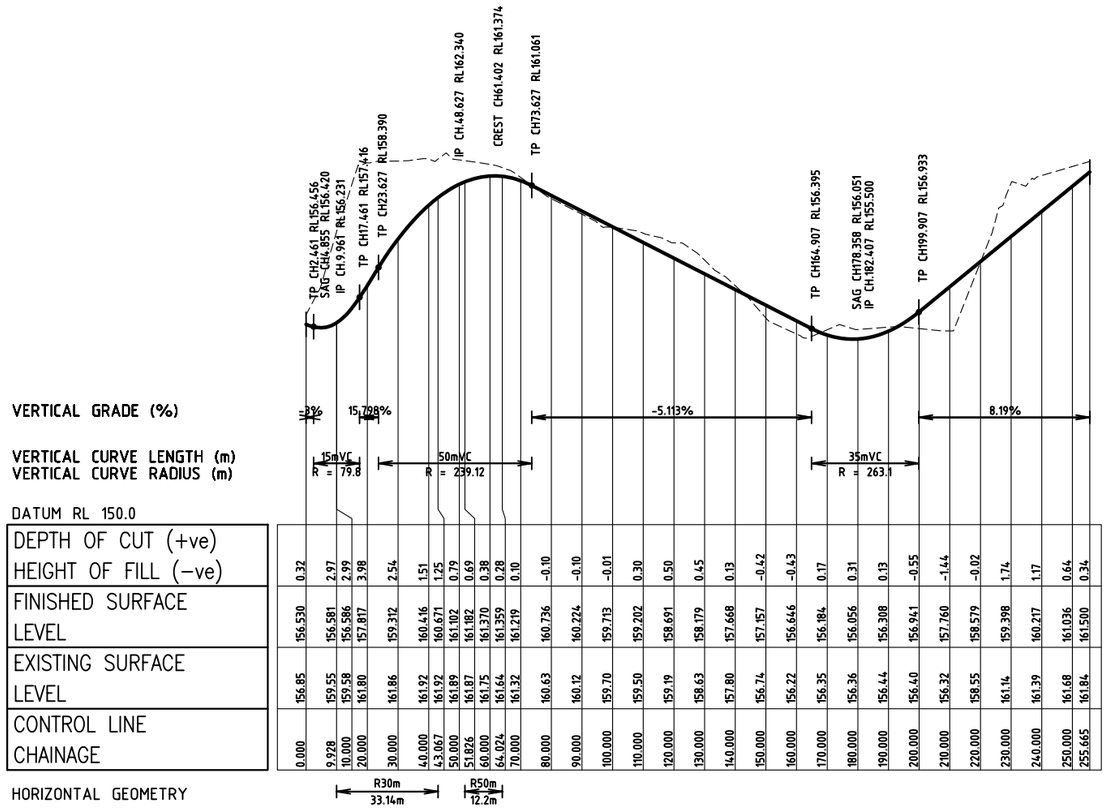
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK76

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



LONGITUDINAL SECTION - ROAD 115



LONGITUDINAL SECTION - ROAD 116

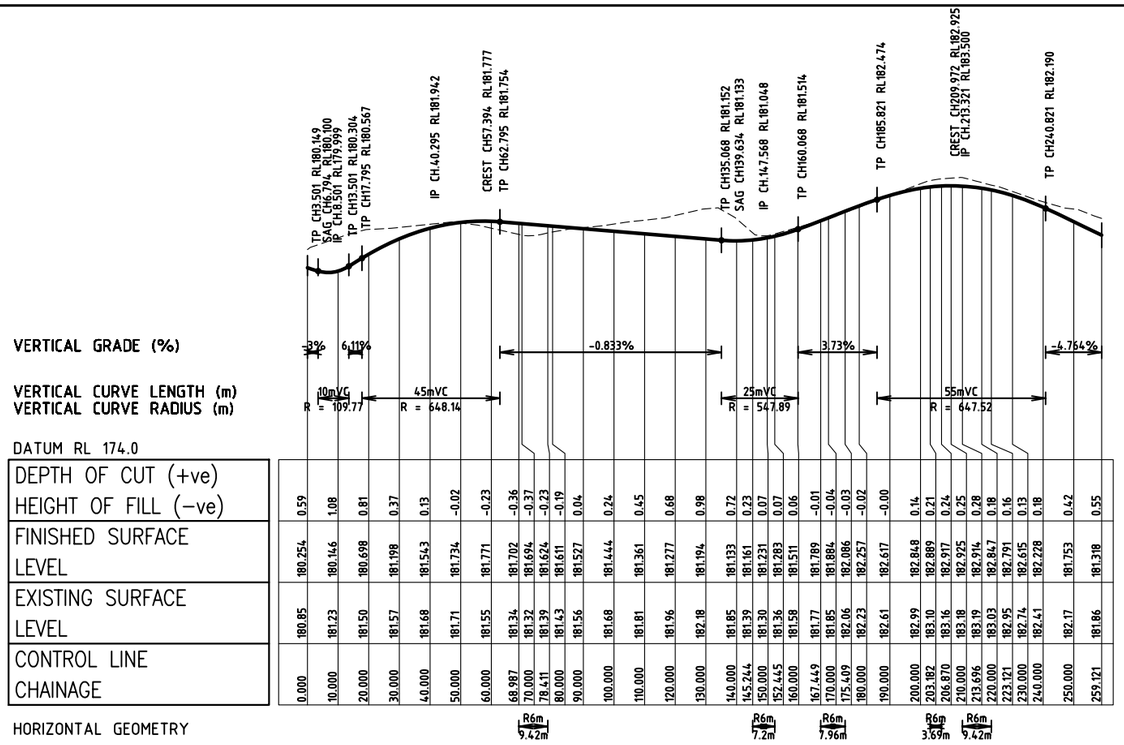
PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

RISE
ABOVE IT ALL

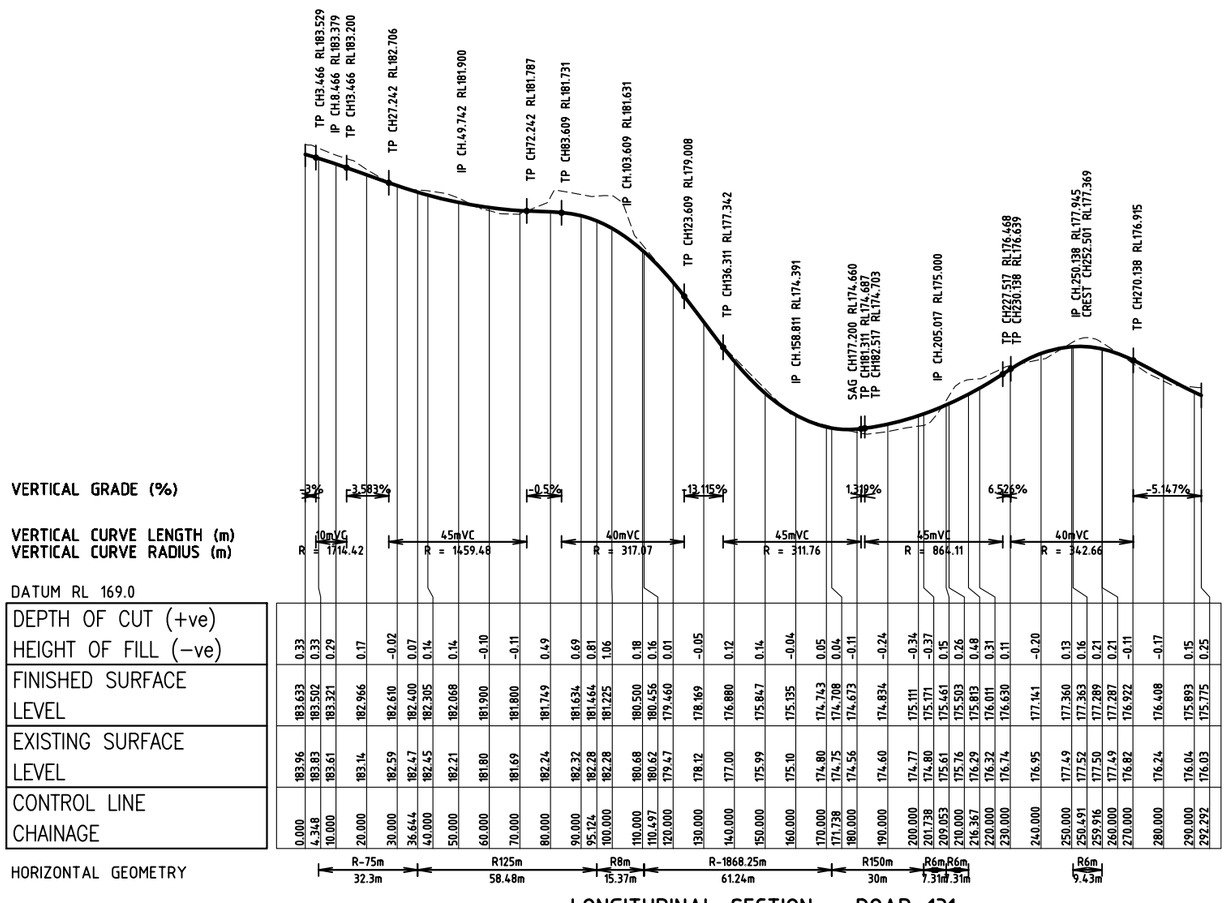
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

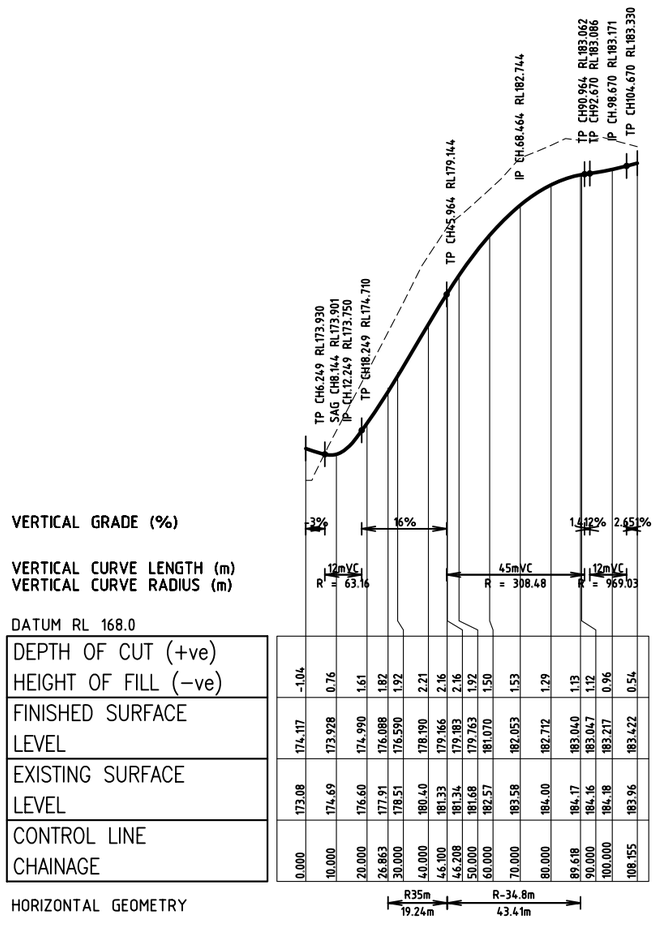
LONGITUDINAL SECTIONS
1355 - 07 - SK77



LONGITUDINAL SECTION - ROAD 123



LONGITUDINAL SECTION - ROAD 131



LONGITUDINAL SECTION - ROAD 120

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

RISE ABOVE IT ALL

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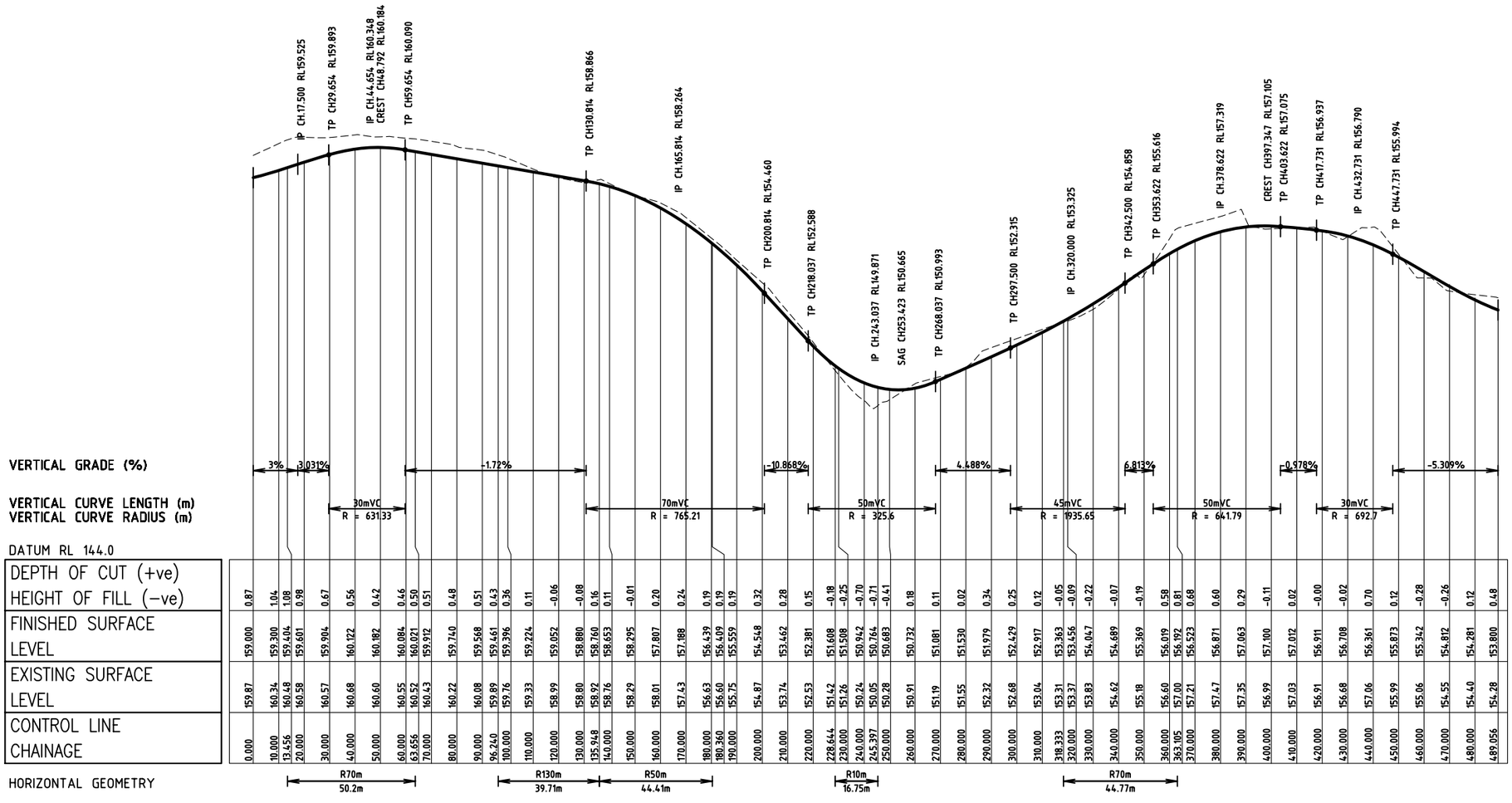
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

0 10 20 30 40
HORIZONTAL
0 1 2 3 4
VERTICAL

LONGITUDINAL SECTIONS
1355 - 07 - SK78



LONGITUDINAL SECTION - ROAD 125

PRELIMINARY DESIGN ONLY
FINAL DESIGN LEVELS SUBJECT TO ARCHITECTS BUILDING DESIGN LEVELS

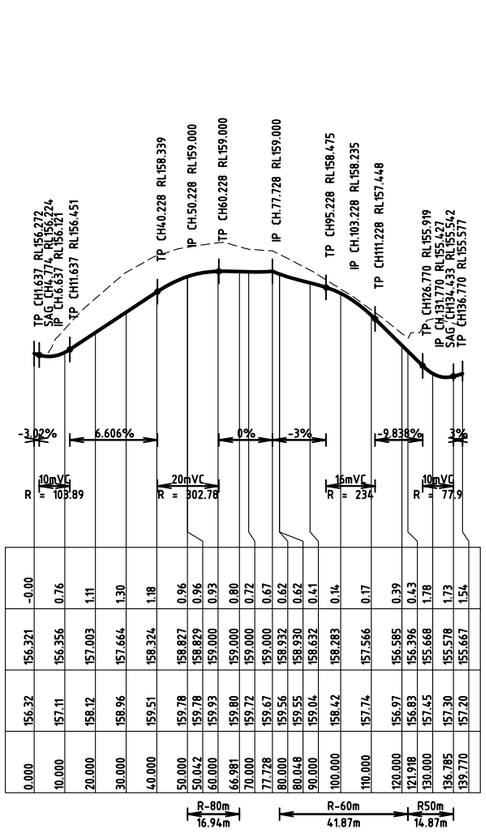
0 10 20 30 40 HORIZONTAL
0 1 2 3 4 VERTICAL

RISE ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

LONGITUDINAL SECTIONS
1355 - 07 - SK79

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

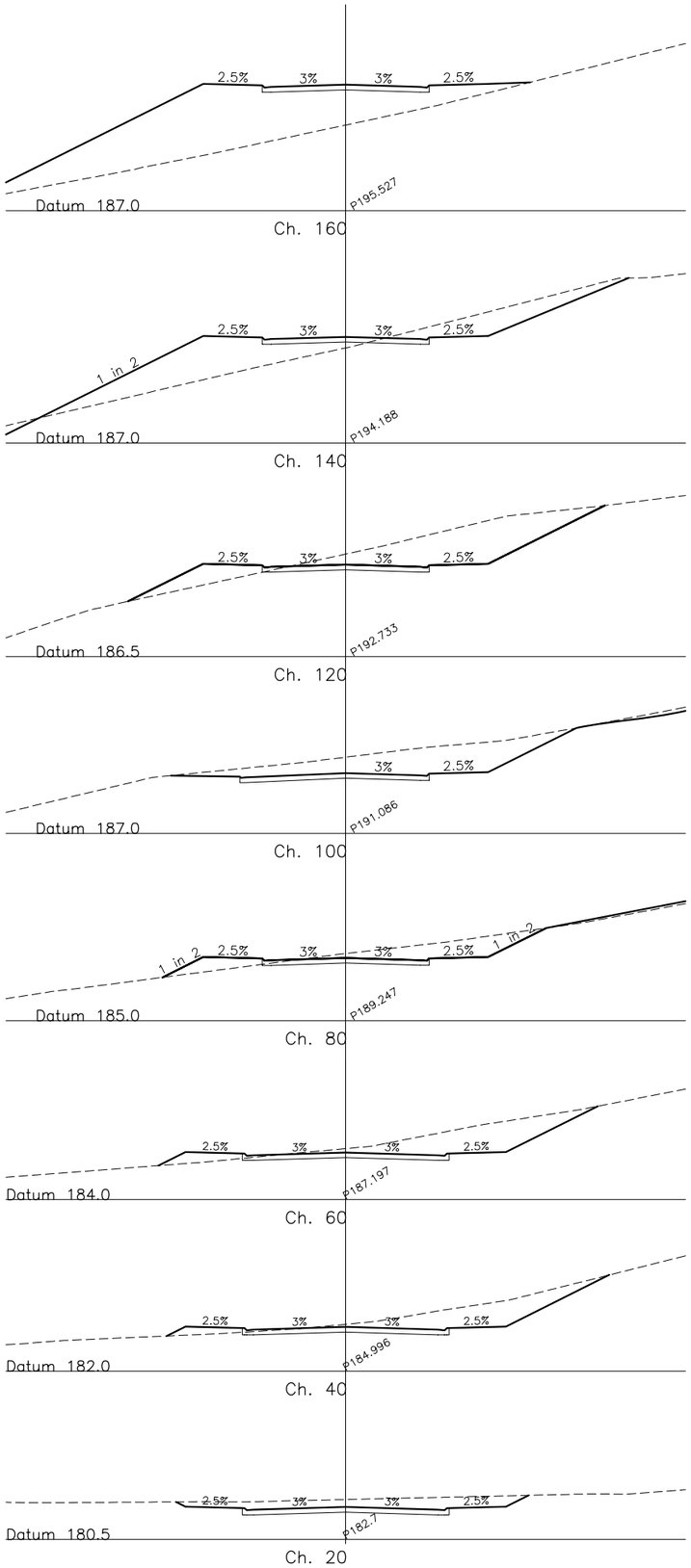


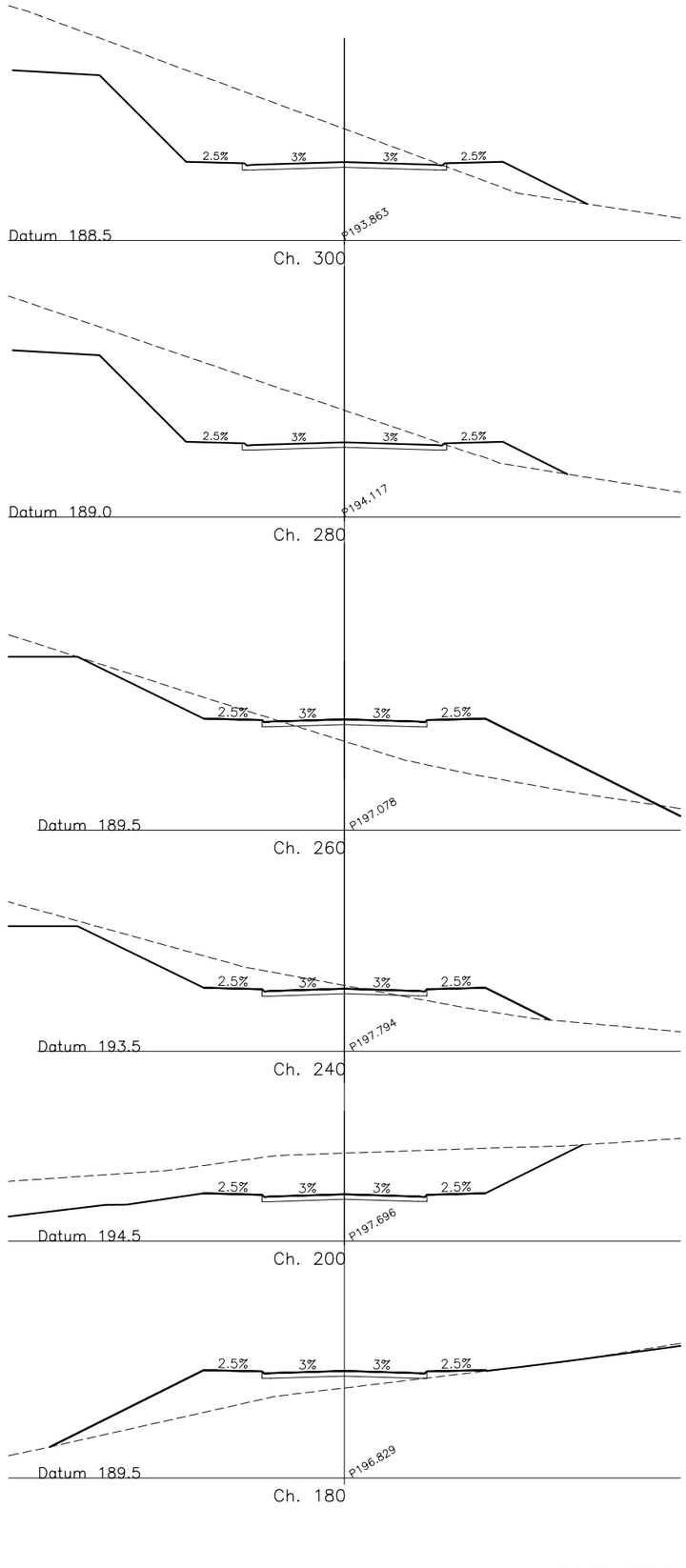
VERTICAL GRADE (%)

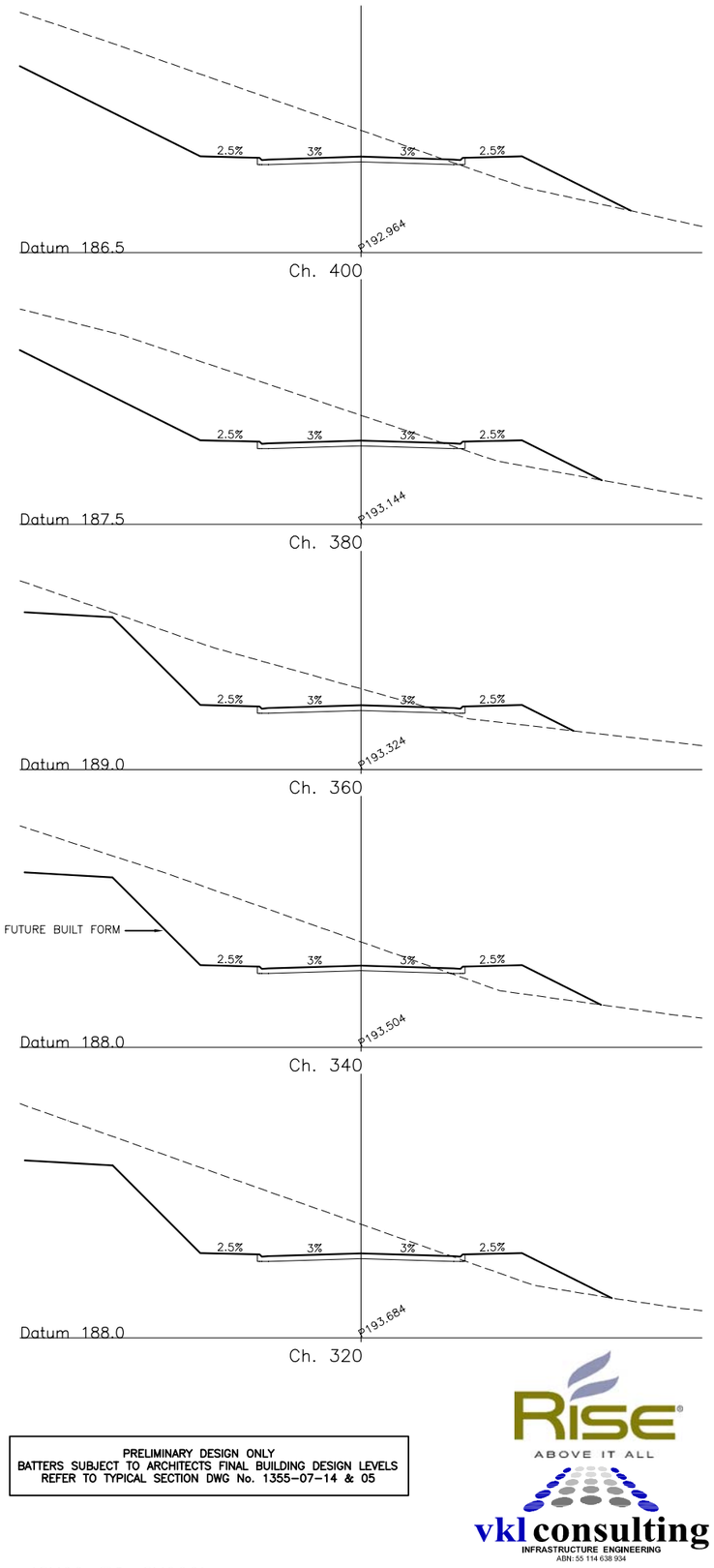
VERTICAL CURVE LENGTH (m)
VERTICAL CURVE RADIUS (m)

DATUM RL 150.0

| | | |







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

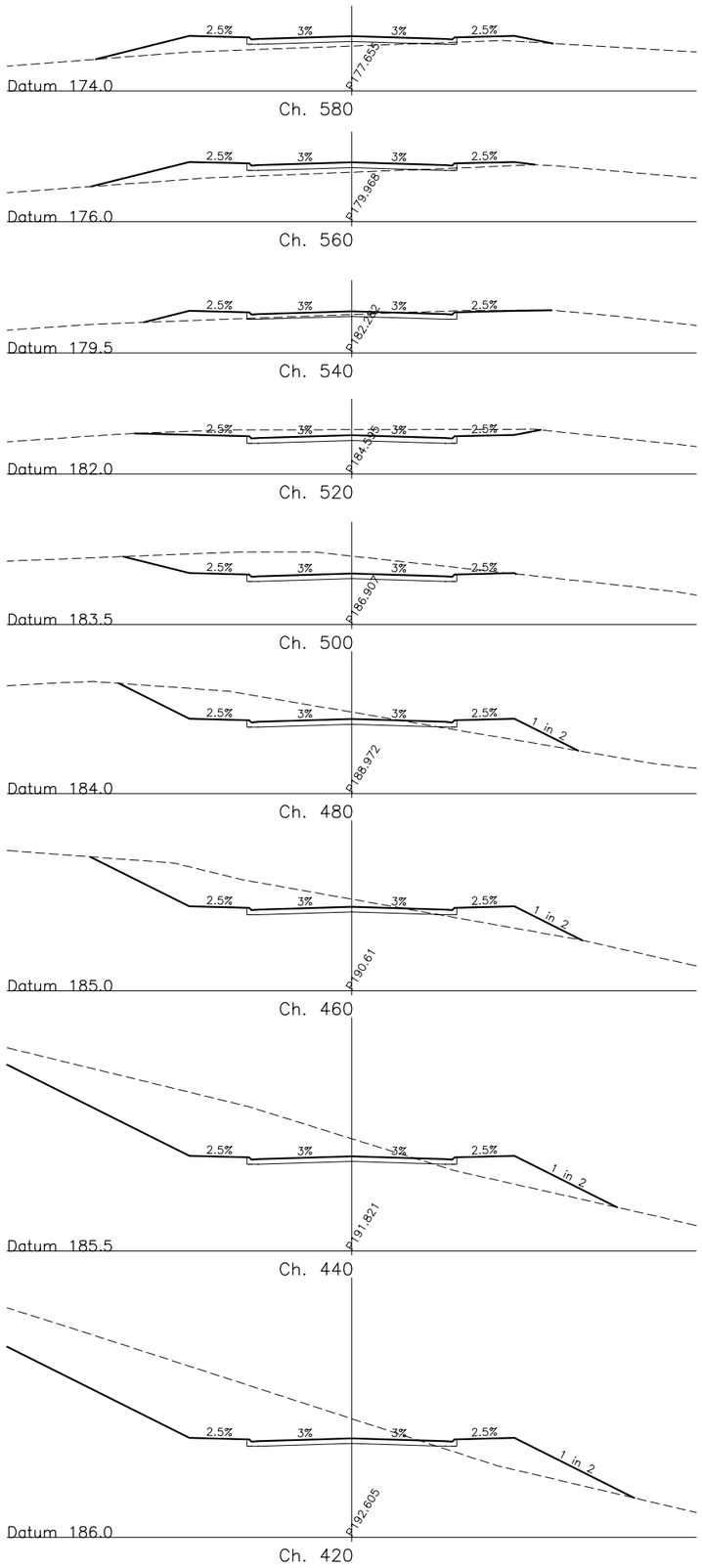
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

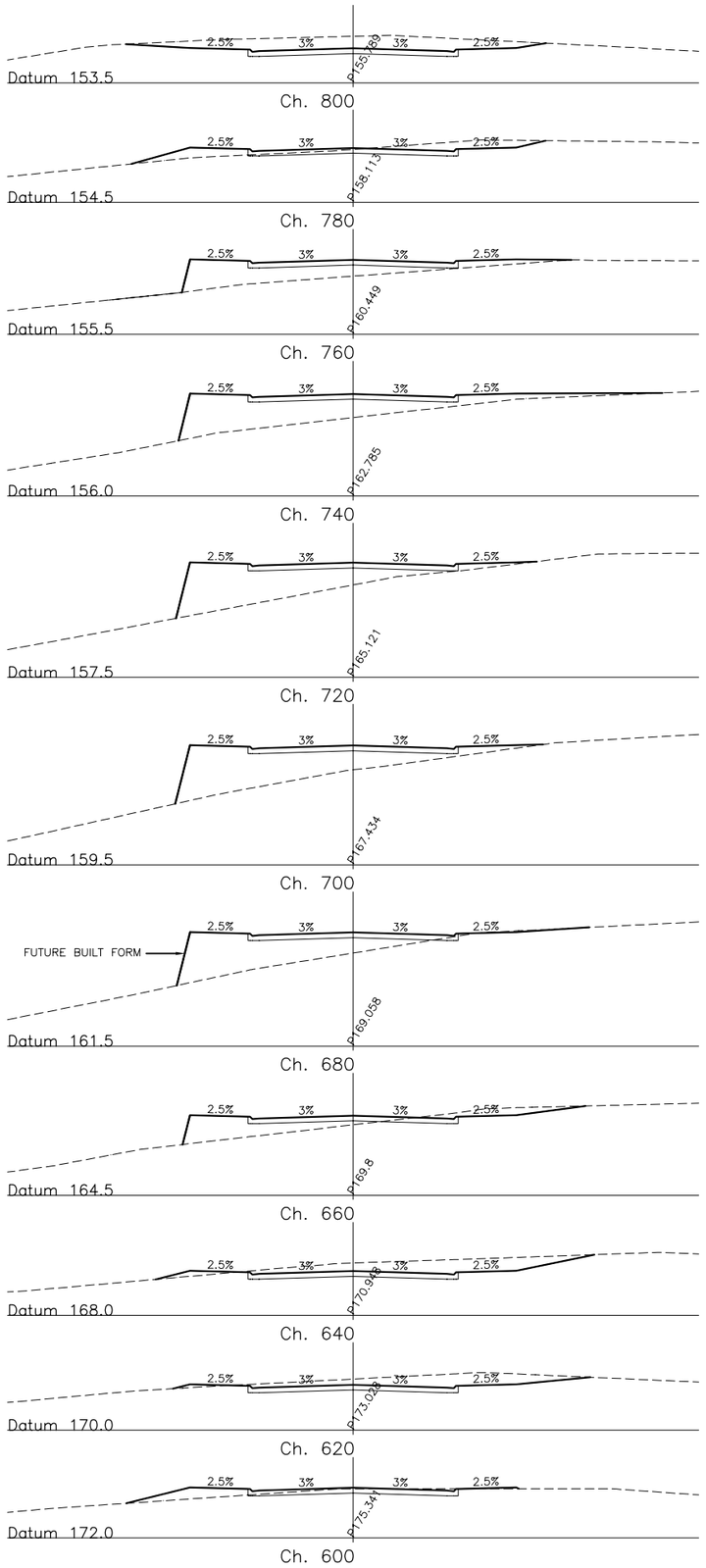
CROSS SECTION - ROAD 1

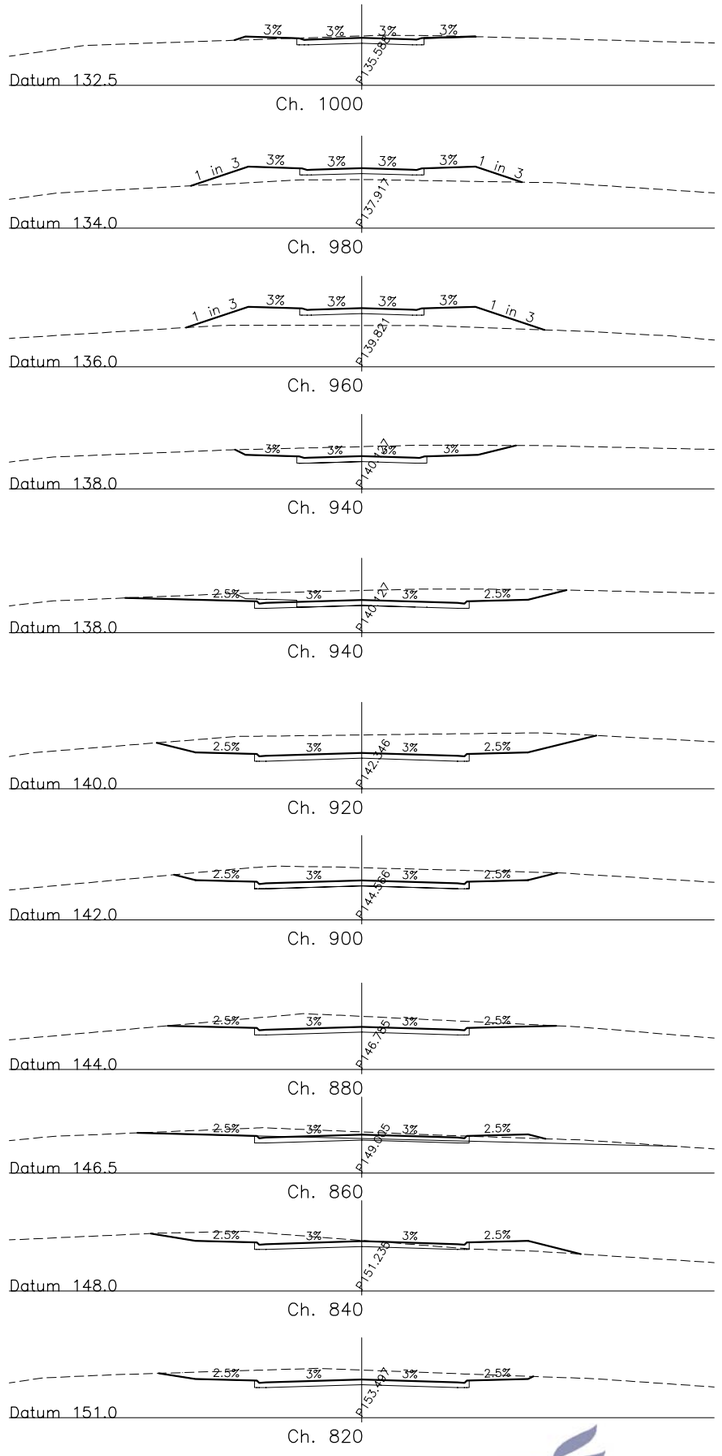
ROAD TYPE B2 11.0m (CH00 TO CH200)
ROAD TYPE B1 11.0m (CH200 TO CH940)

0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK100 A
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

ROAD TYPE B1 11.0m (CH200 TO CH940)
ROAD TYPE D1 6.0m (CH940 TO END)

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

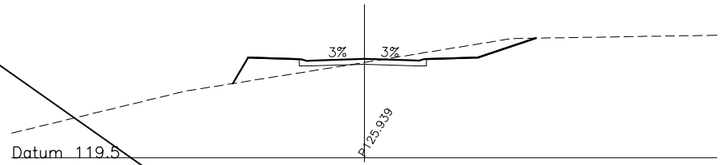
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS
1355 - 07 - SK101 B

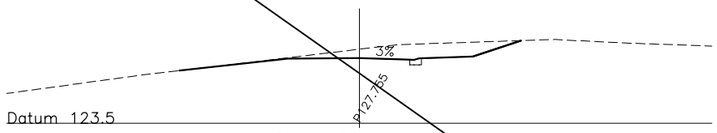
B - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTION - ROAD 1



Ch. 1180



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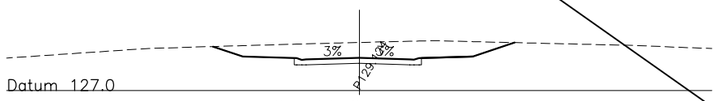
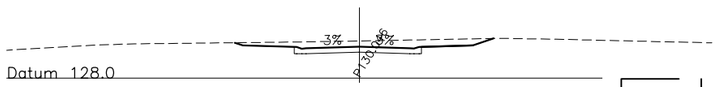
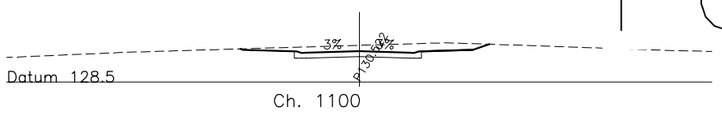


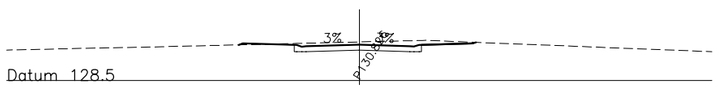
Ch. 1140



Ch. 1120



Ch. 1100



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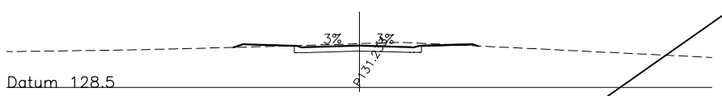

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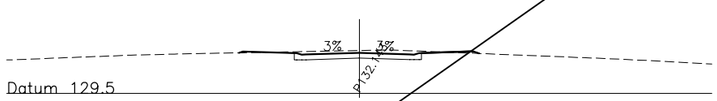

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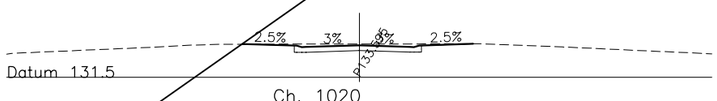
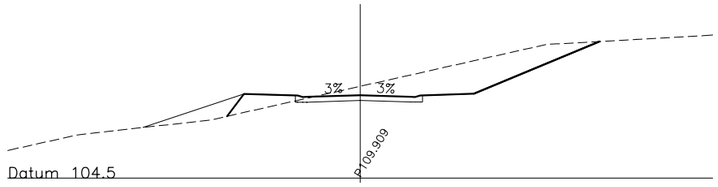
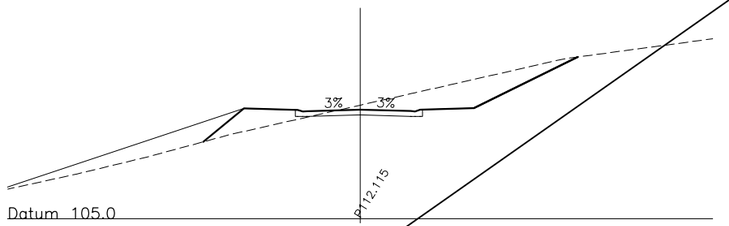


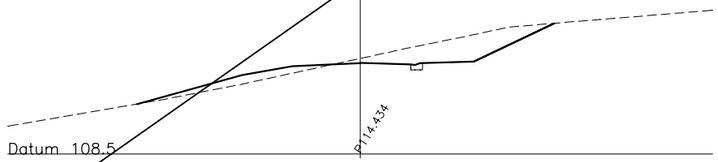
Ch. 1020



Ch. 1320



Ch. 1300



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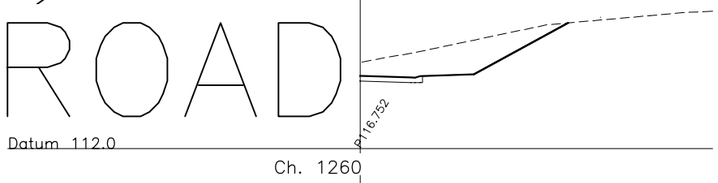

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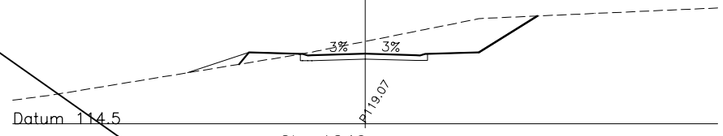
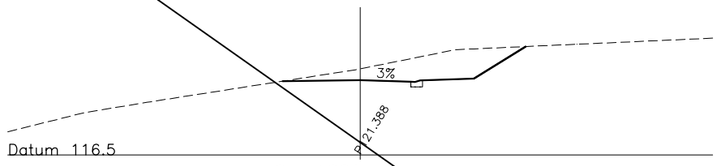
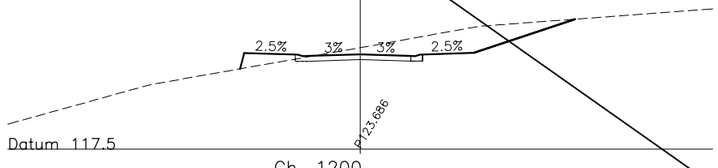


Ch. 1240



Ch. 1220



Ch. 1200

FUTURE ROAD

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 744

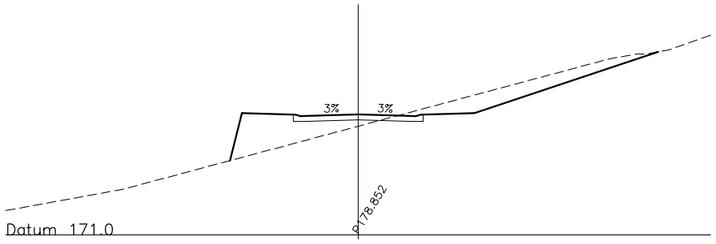
CROSS SECTION - ROAD 1

ROAD TYPE D1 6.0m (CH940 TO END)

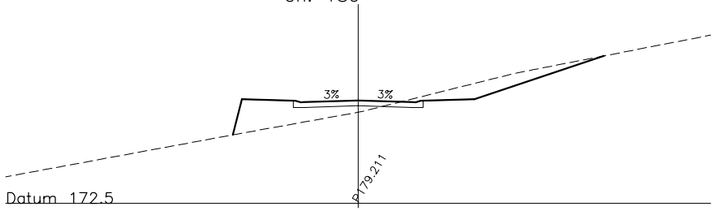
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK102 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS

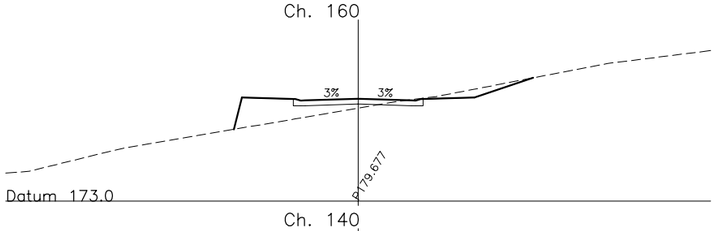
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



Ch. 180



Ch. 160



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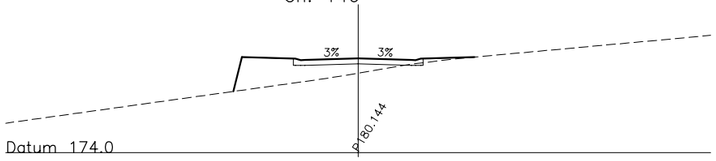

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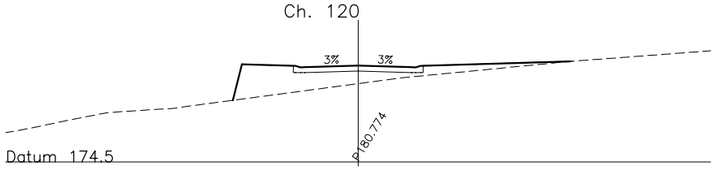
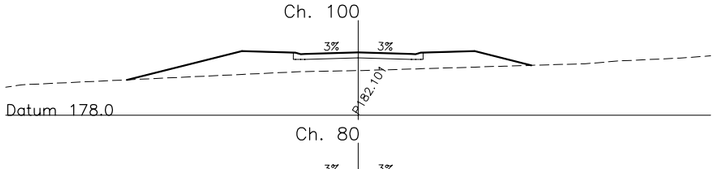
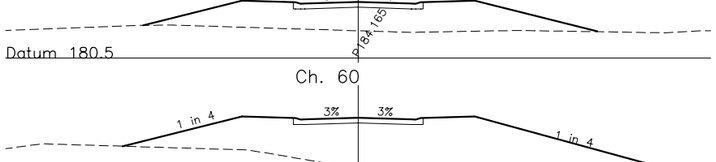


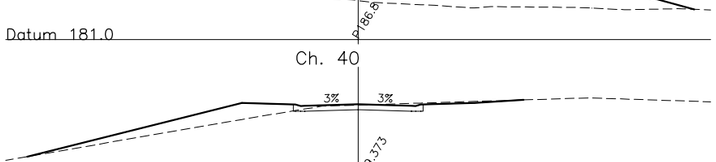
Ch. 100



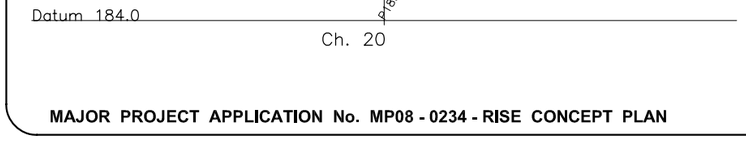
Ch. 80



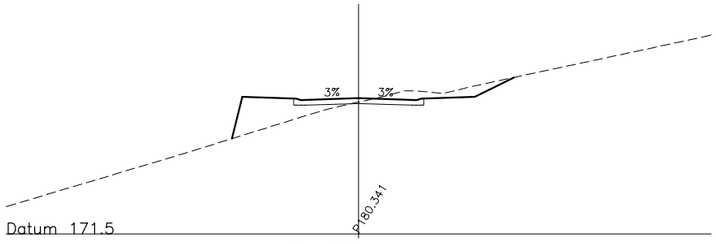
Ch. 60



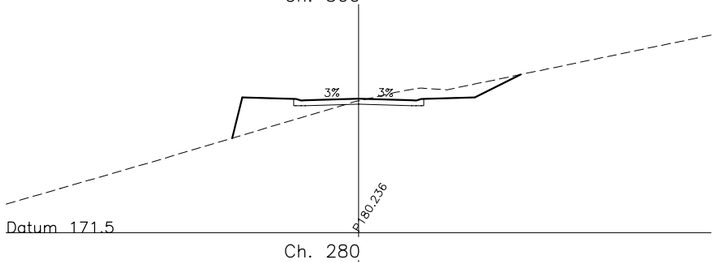
Ch. 40



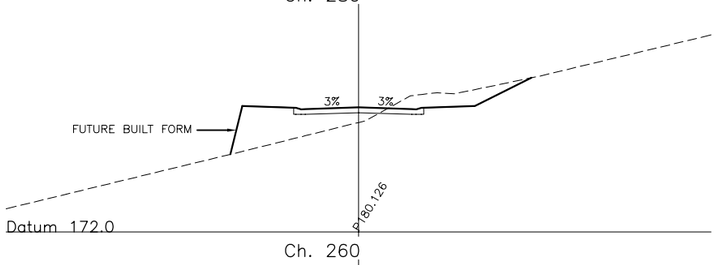
Ch. 20



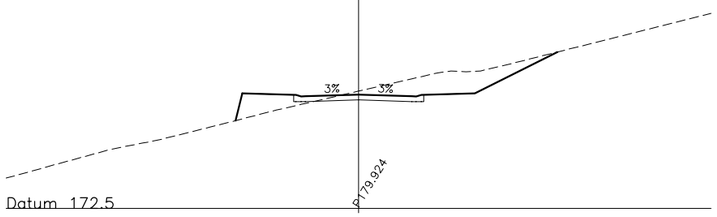
Ch. 300



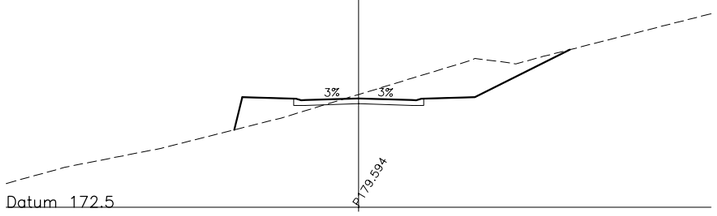
Ch. 280



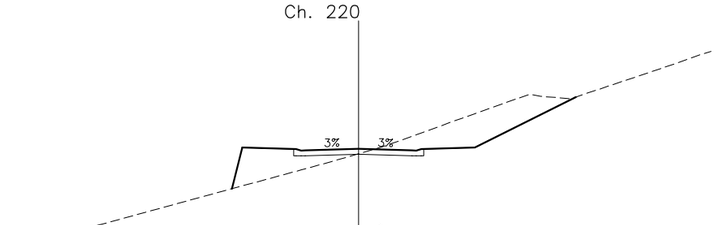
Ch. 260



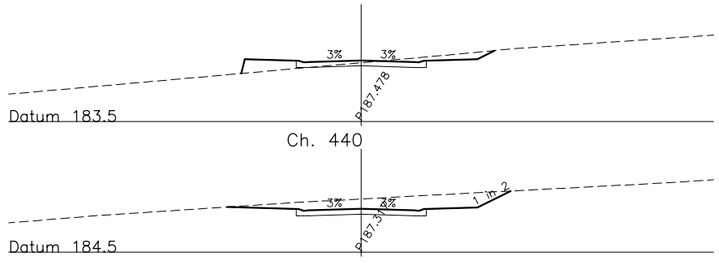
Ch. 240



Ch. 220

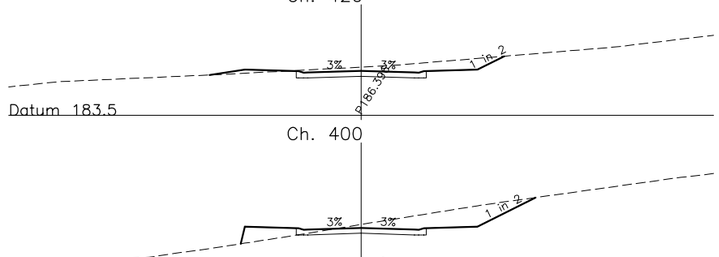


Ch. 200



Ch. 440

Ch. 420



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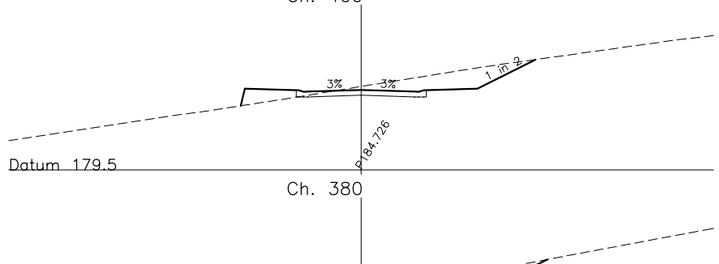
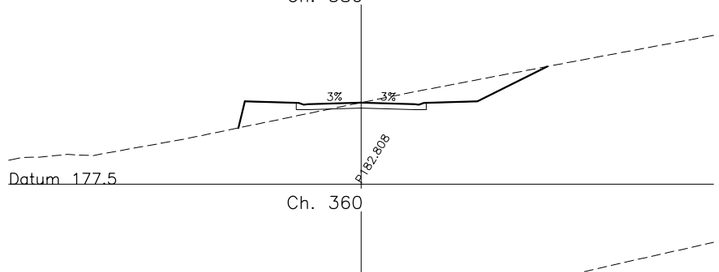
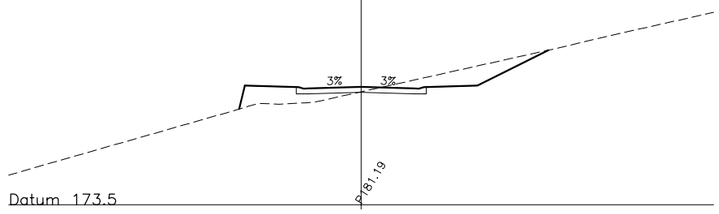


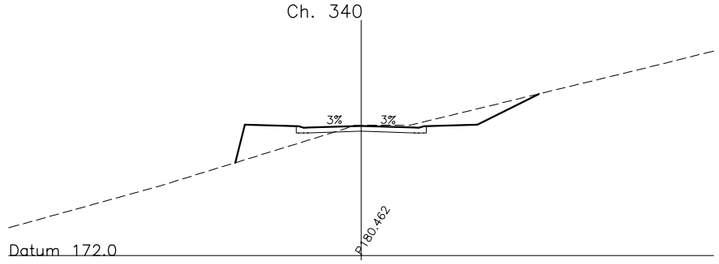
Ch. 380



Ch. 360



Ch. 340



Ch. 320

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

CROSS SECTION - ROAD 2

ROAD TYPE E1 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

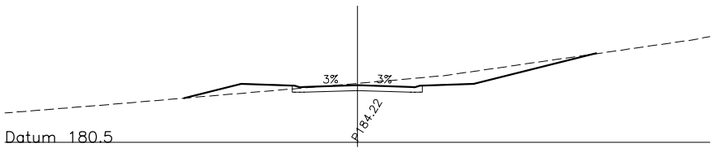
RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

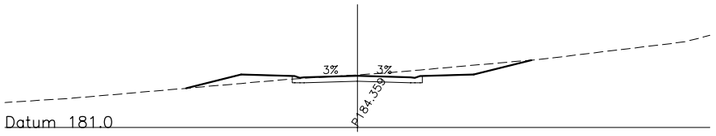
CROSS SECTIONS
1355 - 07 - SK103 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

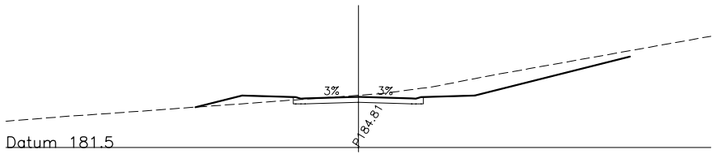
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



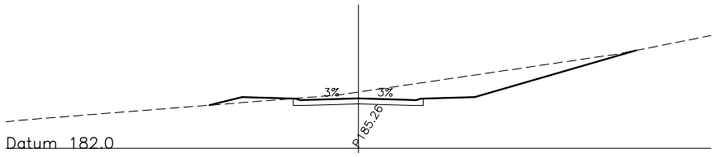
Ch. 600



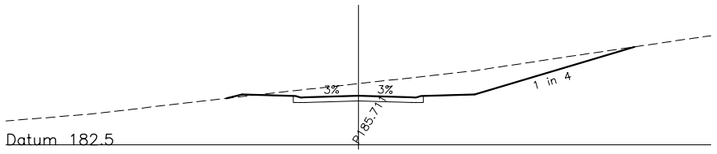
Ch. 580



Ch. 560



Ch. 540



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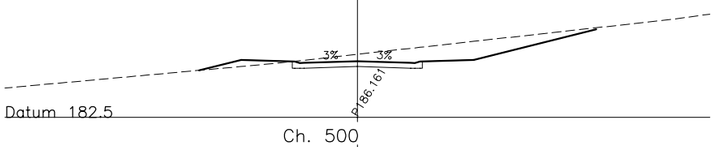
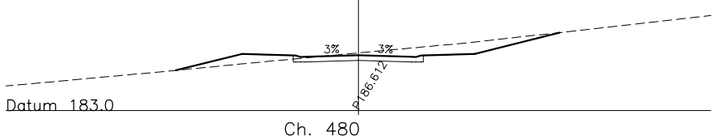
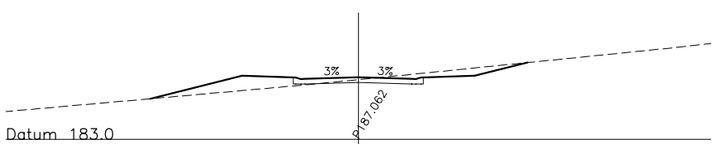


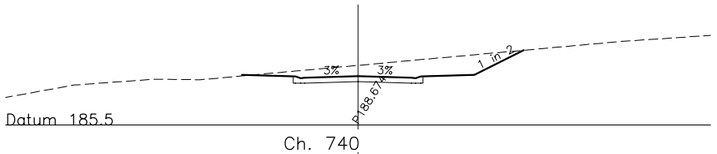
Ch. 500



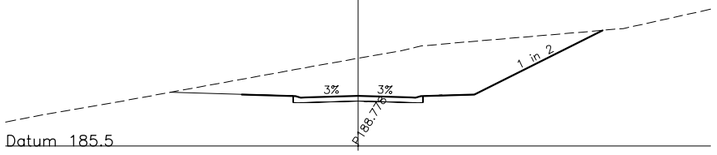
Ch. 480



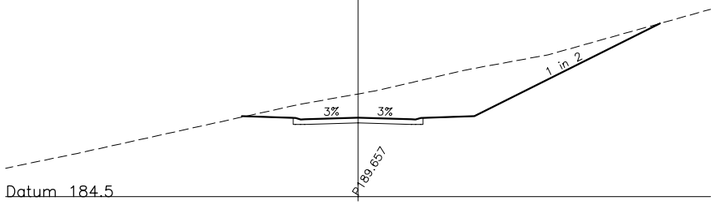
Ch. 460



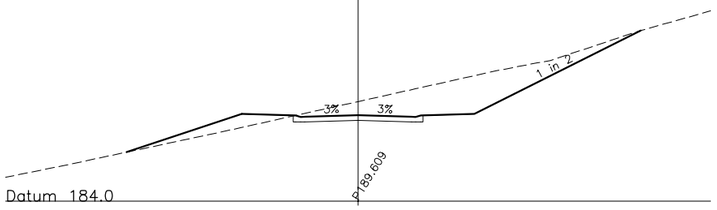
Ch. 740



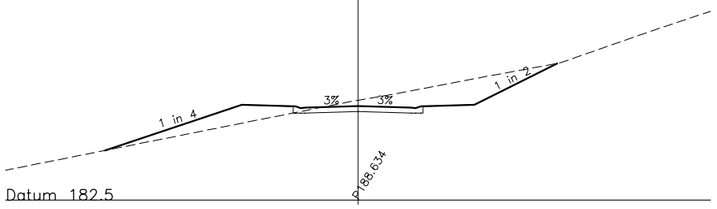
Ch. 720



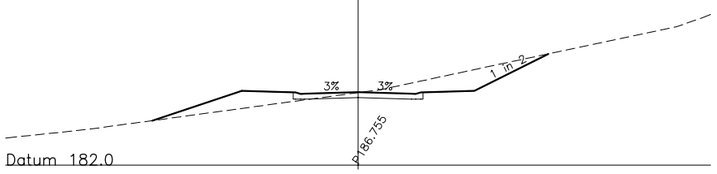
Ch. 700



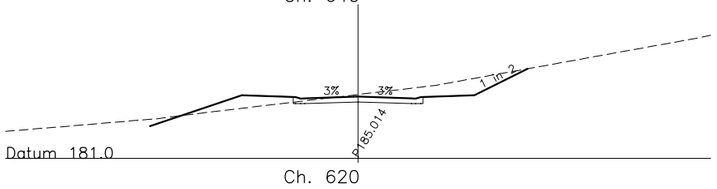
Ch. 680



Ch. 660



Ch. 640



Ch. 620

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

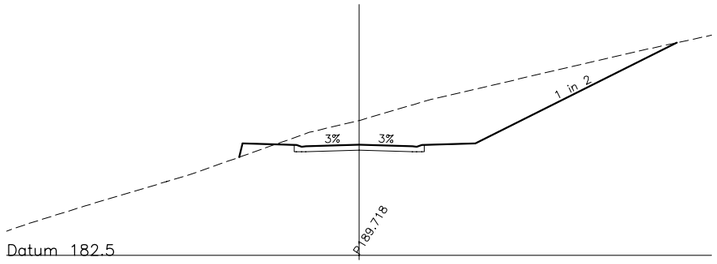
CROSS SECTION - ROAD 2

ROAD TYPE E1 5.5m

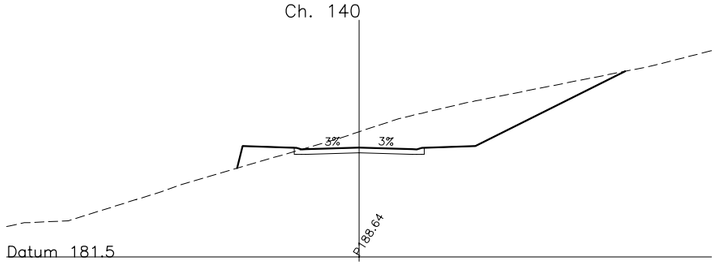
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS

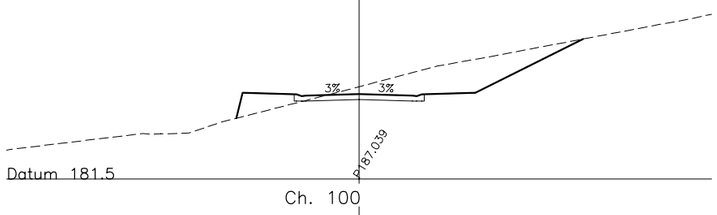
1355 - 07 - SK104



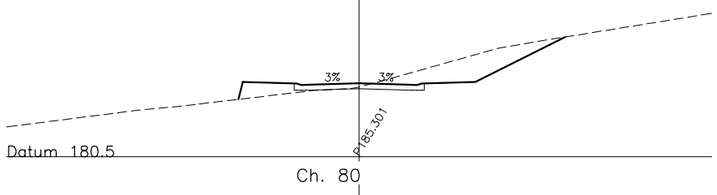
Ch. 140



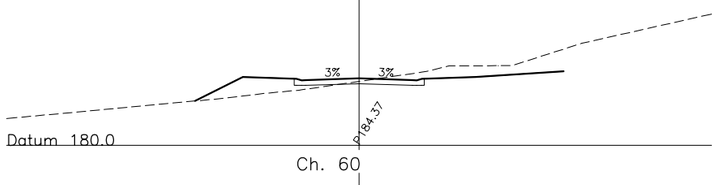
Ch. 120



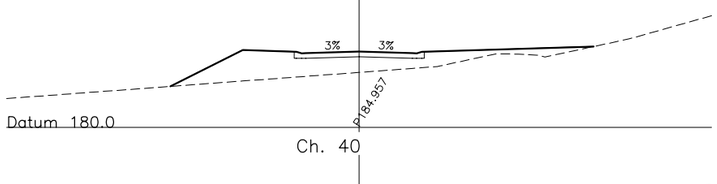
Ch. 100



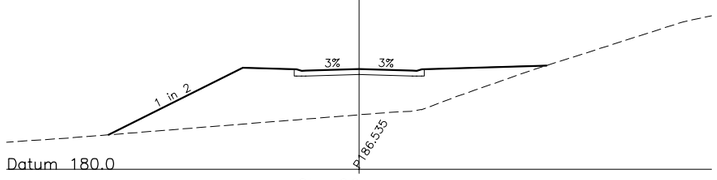
Ch. 80



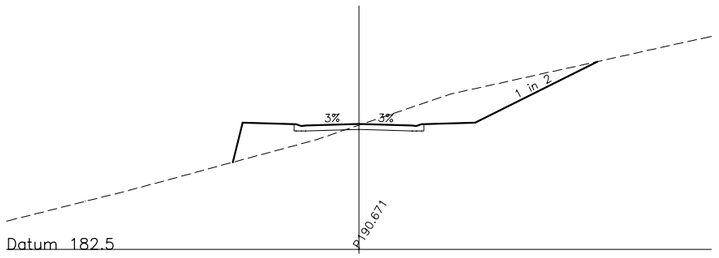
Ch. 60



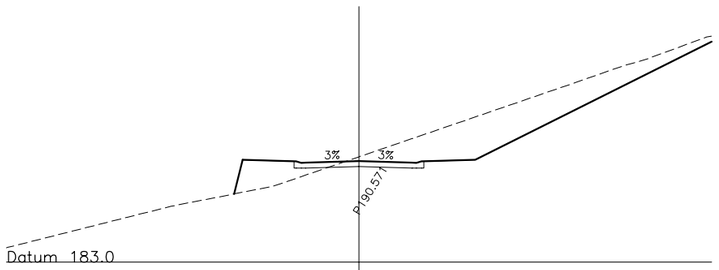
Ch. 40



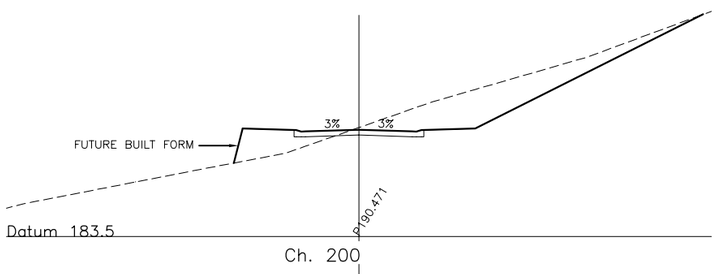
Ch. 20



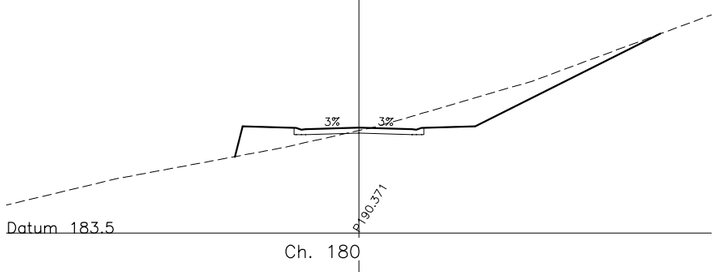
Ch. 240



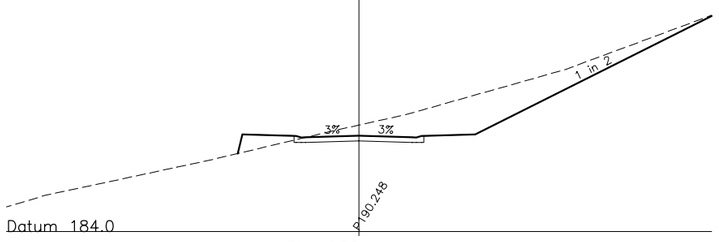
Ch. 220



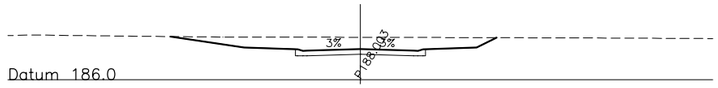
Ch. 200



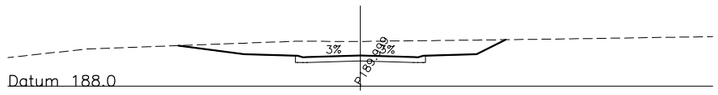
Ch. 180



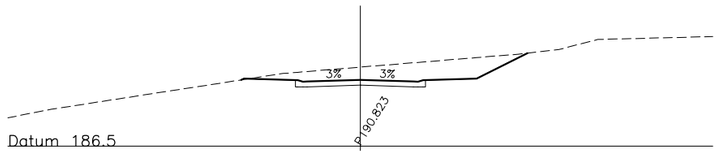
Ch. 160



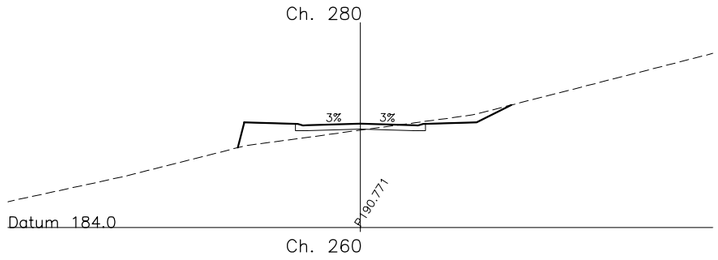
Ch. 320



Ch. 300



Ch. 280



Ch. 260

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
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CROSS SECTIONS

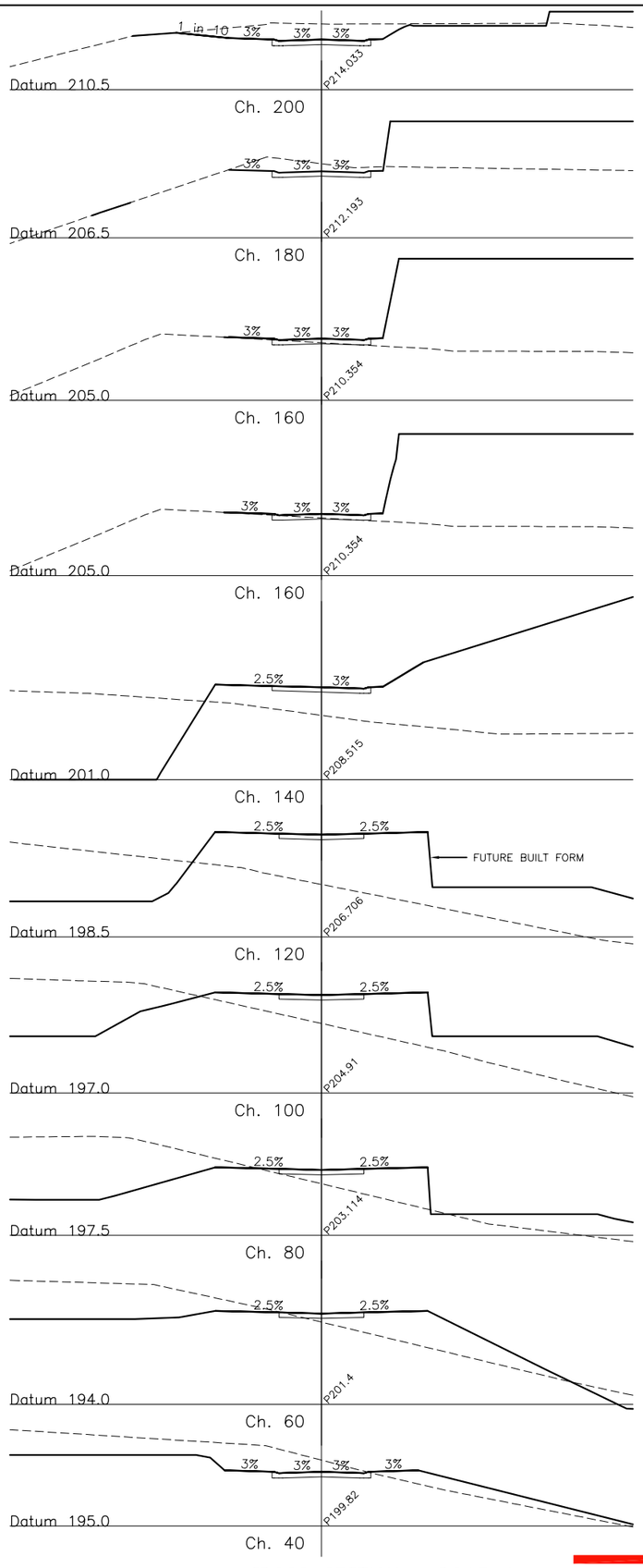
1355 - 07 - SK105 A

CROSS SECTION - ROAD 3

ROAD TYPE E1 5.5m

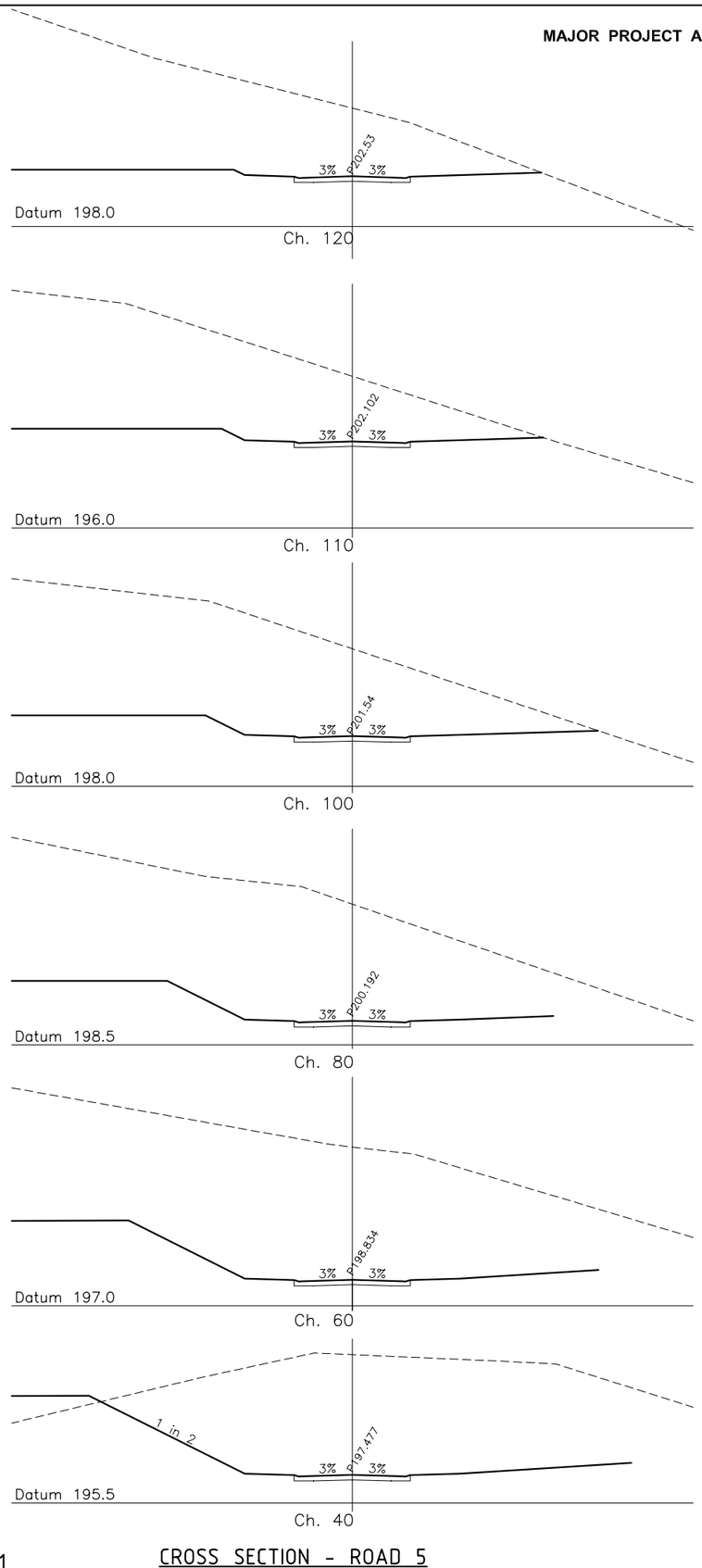
0 2 4 6 8
1:200 at A1
1:400 at A3

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS



CROSS SECTION - ROAD 4

ROAD TYPE E1
ROAD TYPE F



CROSS SECTION - ROAD 5

ROAD TYPE D1 6.0m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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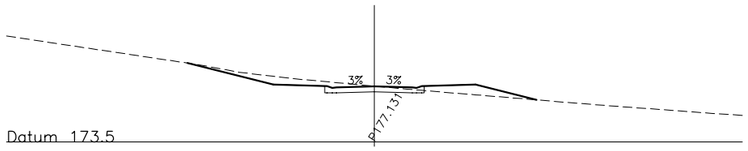
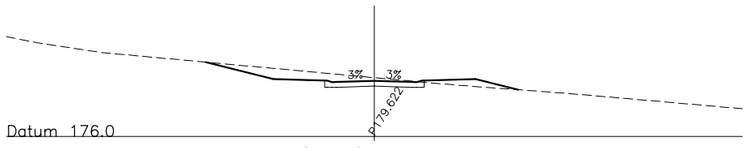
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS
1355 - 07 - SK106 B

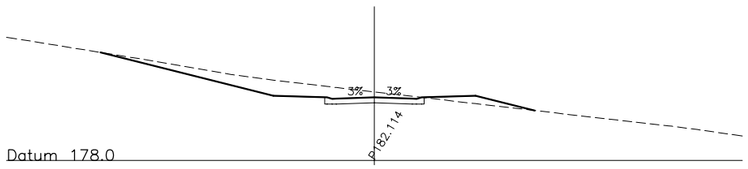
B - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS



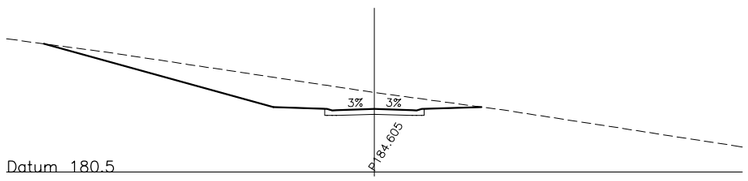
Ch. 140



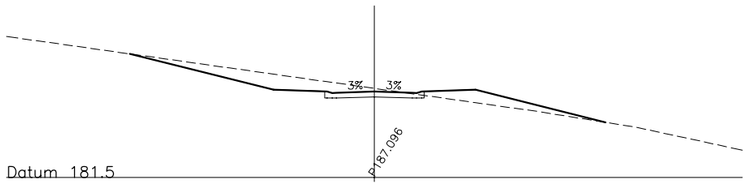
Ch. 120



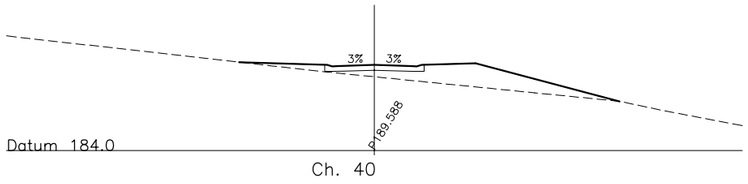
Ch. 100



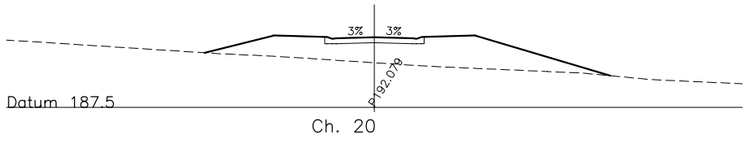
Ch. 80



Ch. 60



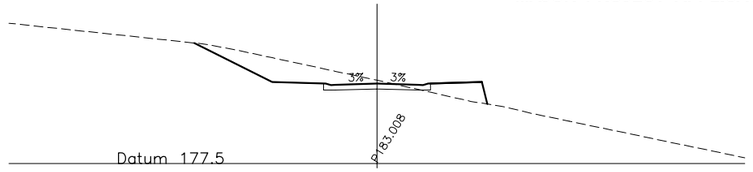
Ch. 40



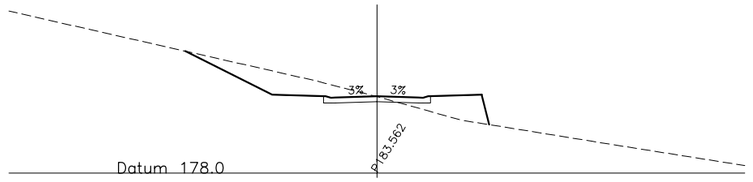
Ch. 20

CROSS SECTION - ROAD 6

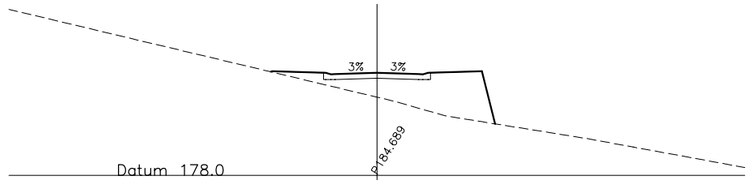
ROAD TYPE E1 5.5m



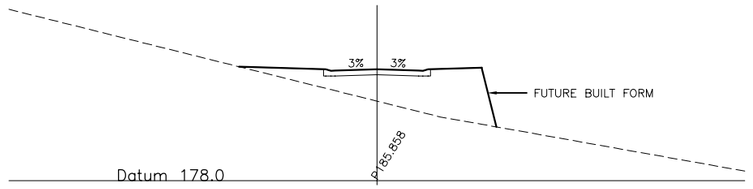
Ch. 140



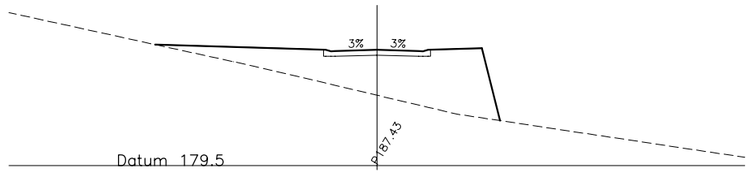
Ch. 120



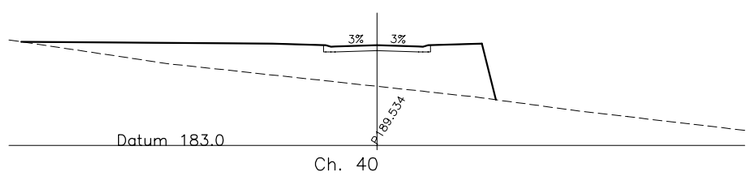
Ch. 100



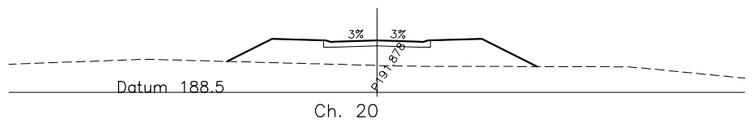
Ch. 80



Ch. 60



Ch. 40



Ch. 20

CROSS SECTION - ROAD 6A

ROAD TYPE E1 5.5m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

0 2 4 6 8

1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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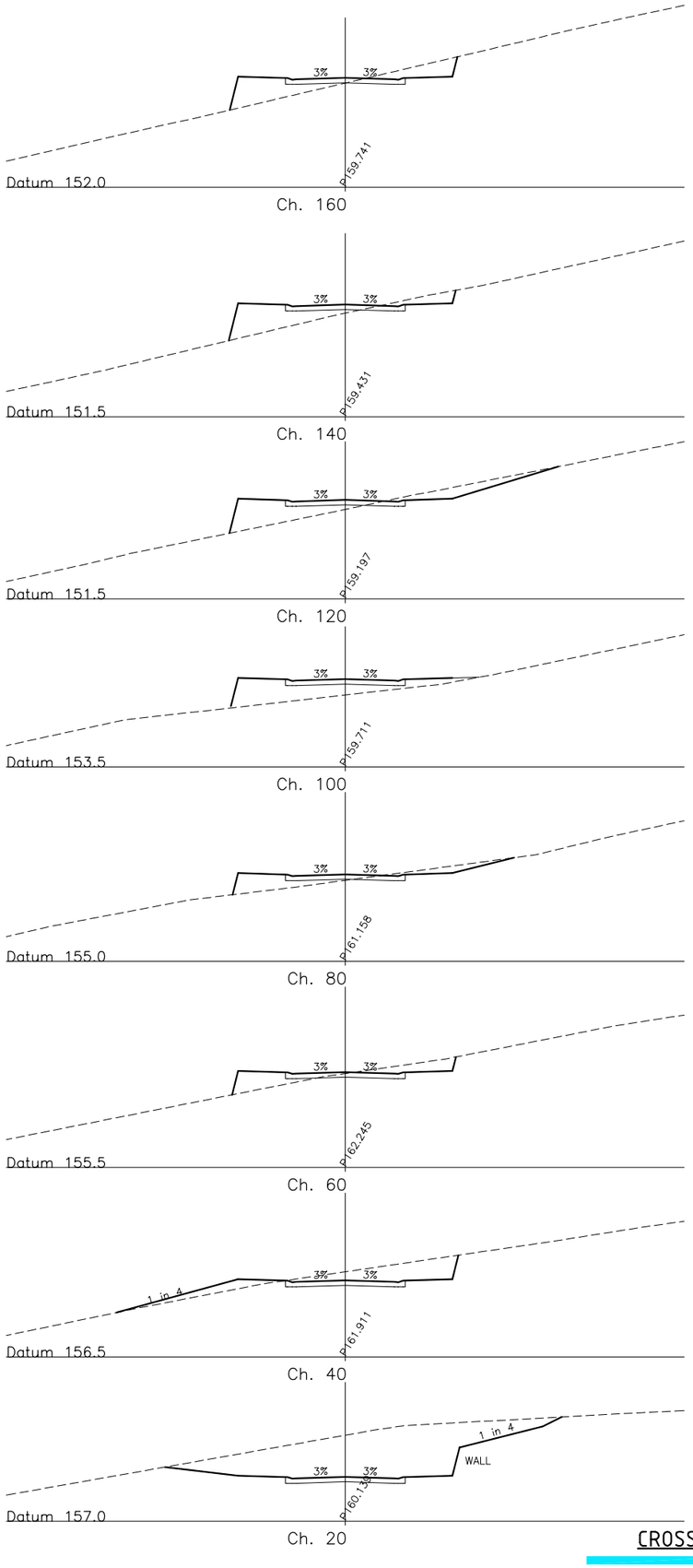
INFRASTRUCTURE ENGINEERING
ABN 35 114 638 934

CROSS SECTIONS

1355 - 07 - SK107 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS



CROSS SECTION - ROAD 7

ROAD TYPE C 7.5m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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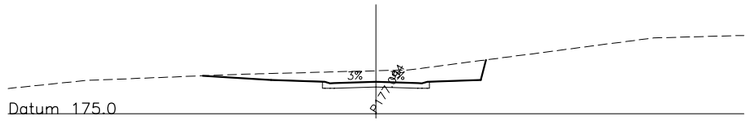
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

0 2 4 6 8
1:200 at A1
1:400 at A3

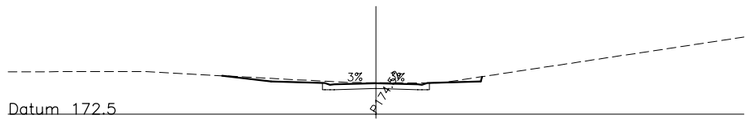
CROSS SECTIONS

1355 - 07 - SK108 A

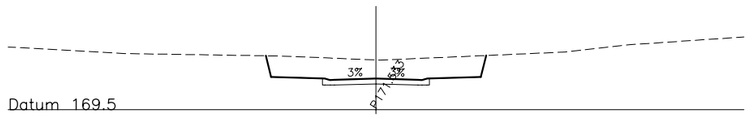
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS



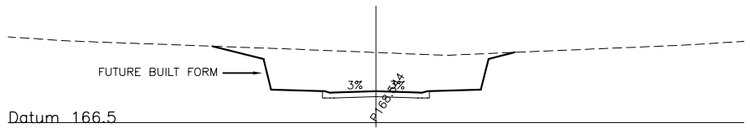
Ch. 160



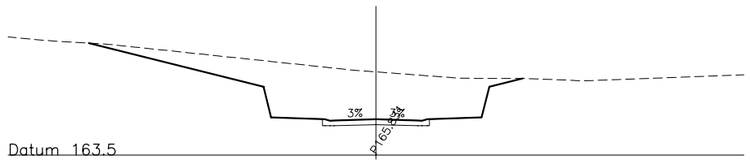
Ch. 140



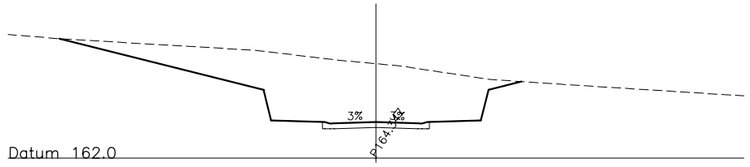
Ch. 120



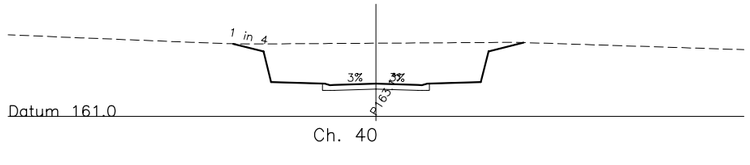
Ch. 100



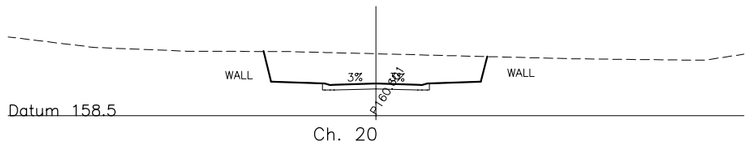
Ch. 80



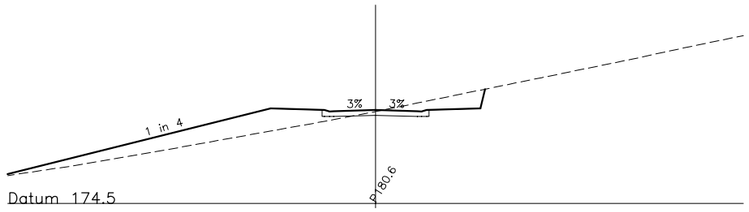
Ch. 60



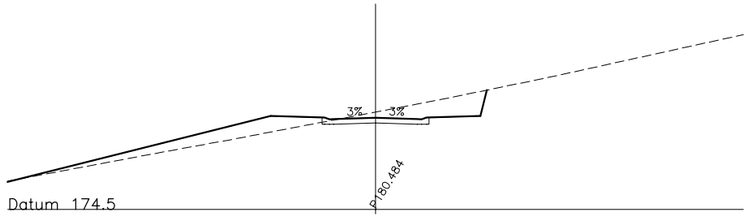
Ch. 40



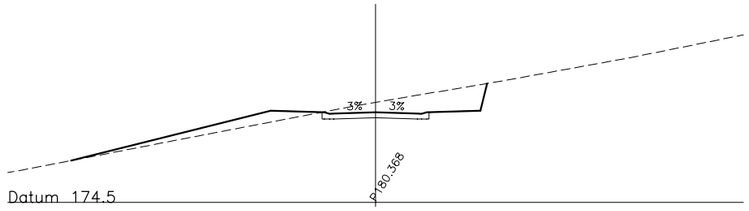
Ch. 20



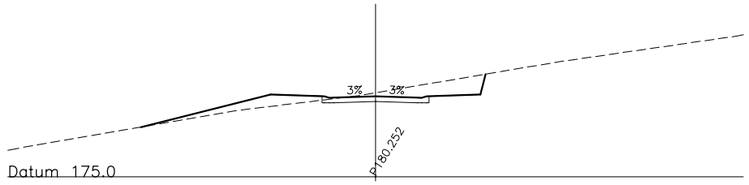
Ch. 280



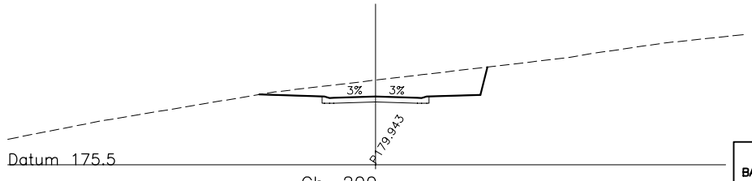
Ch. 260



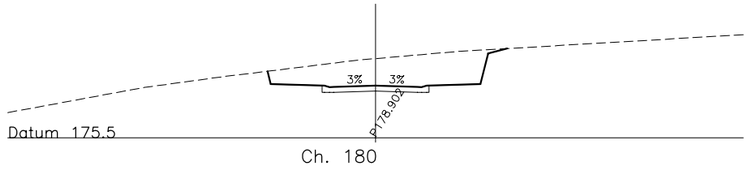
Ch. 240



Ch. 220



Ch. 200



Ch. 180

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS

1355 - 07 - SK109 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

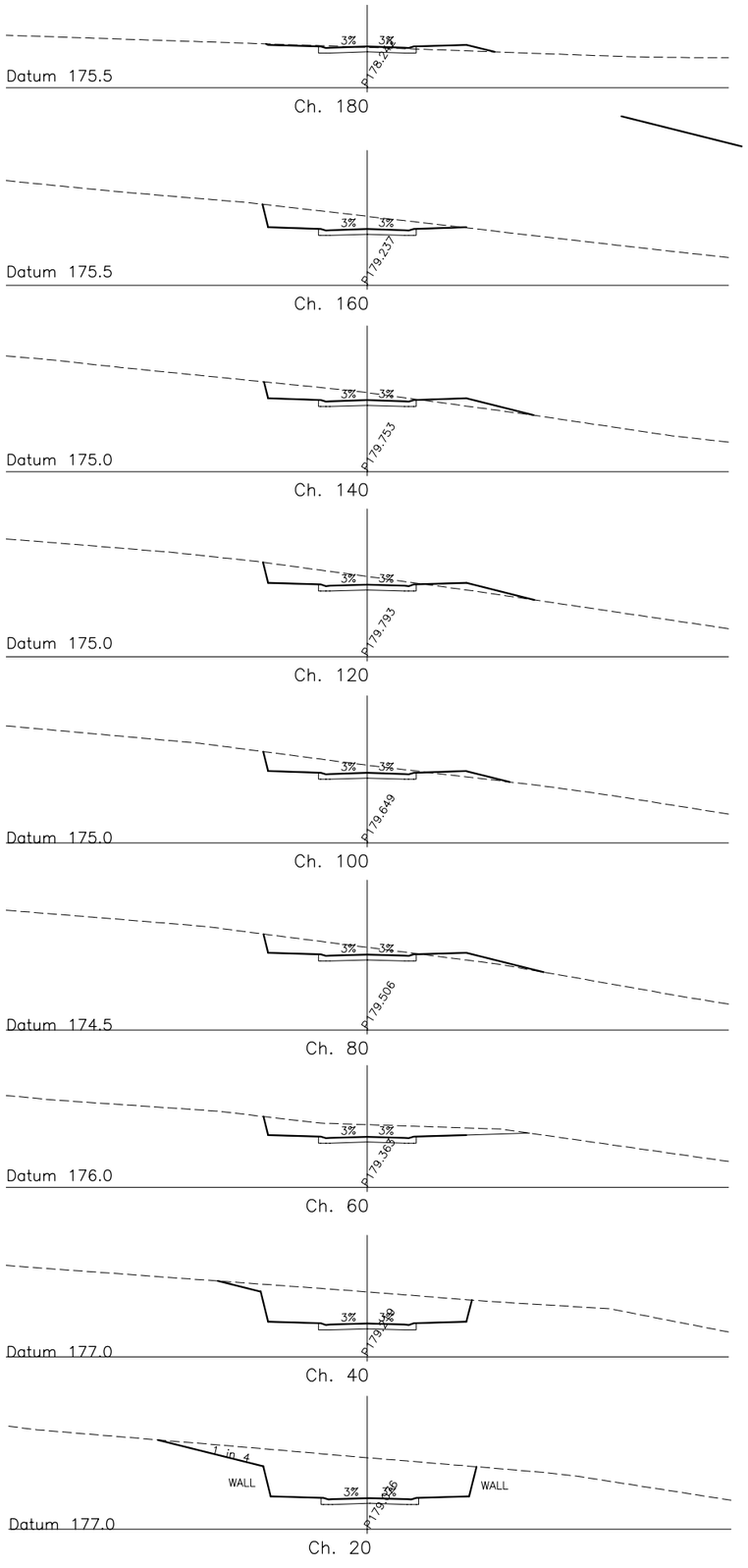
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

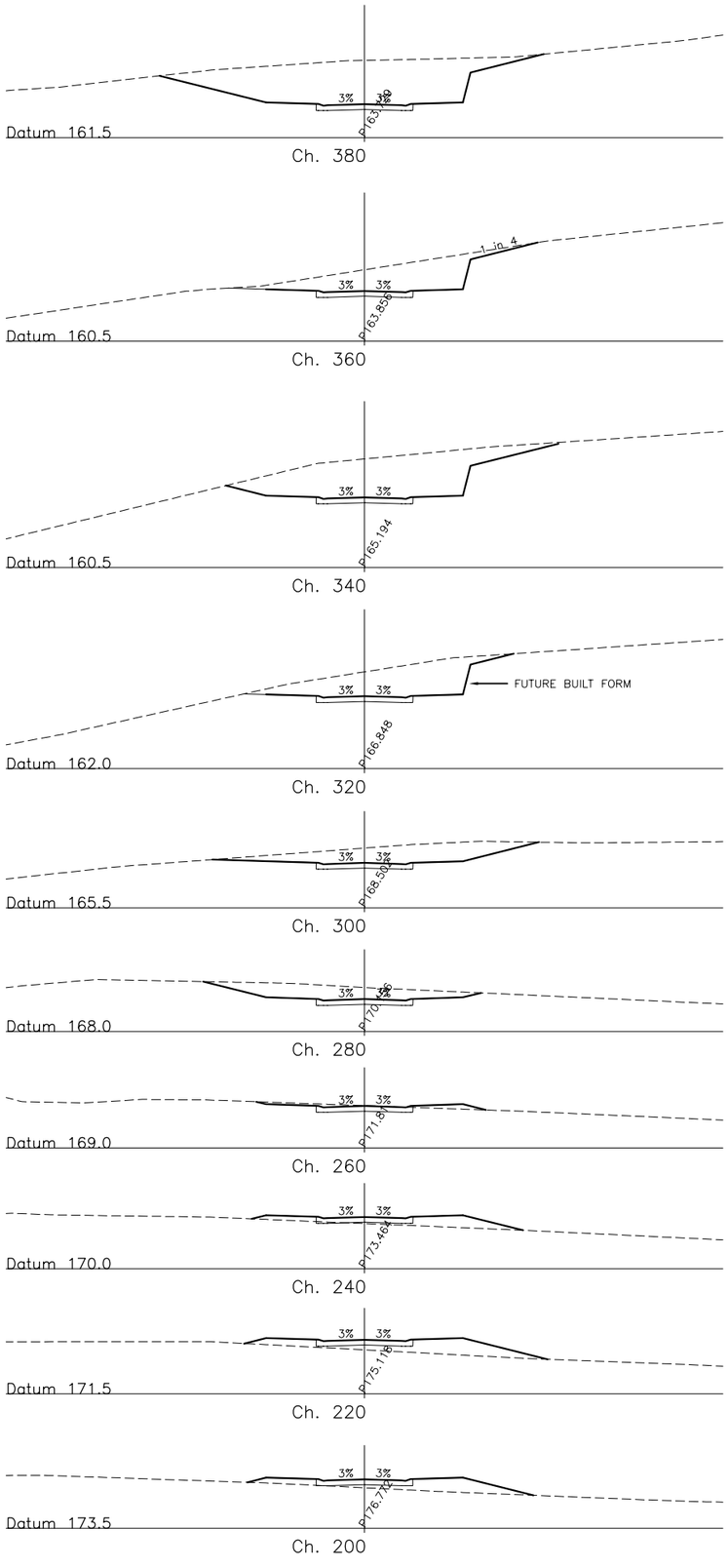
CROSS SECTION - ROAD 8

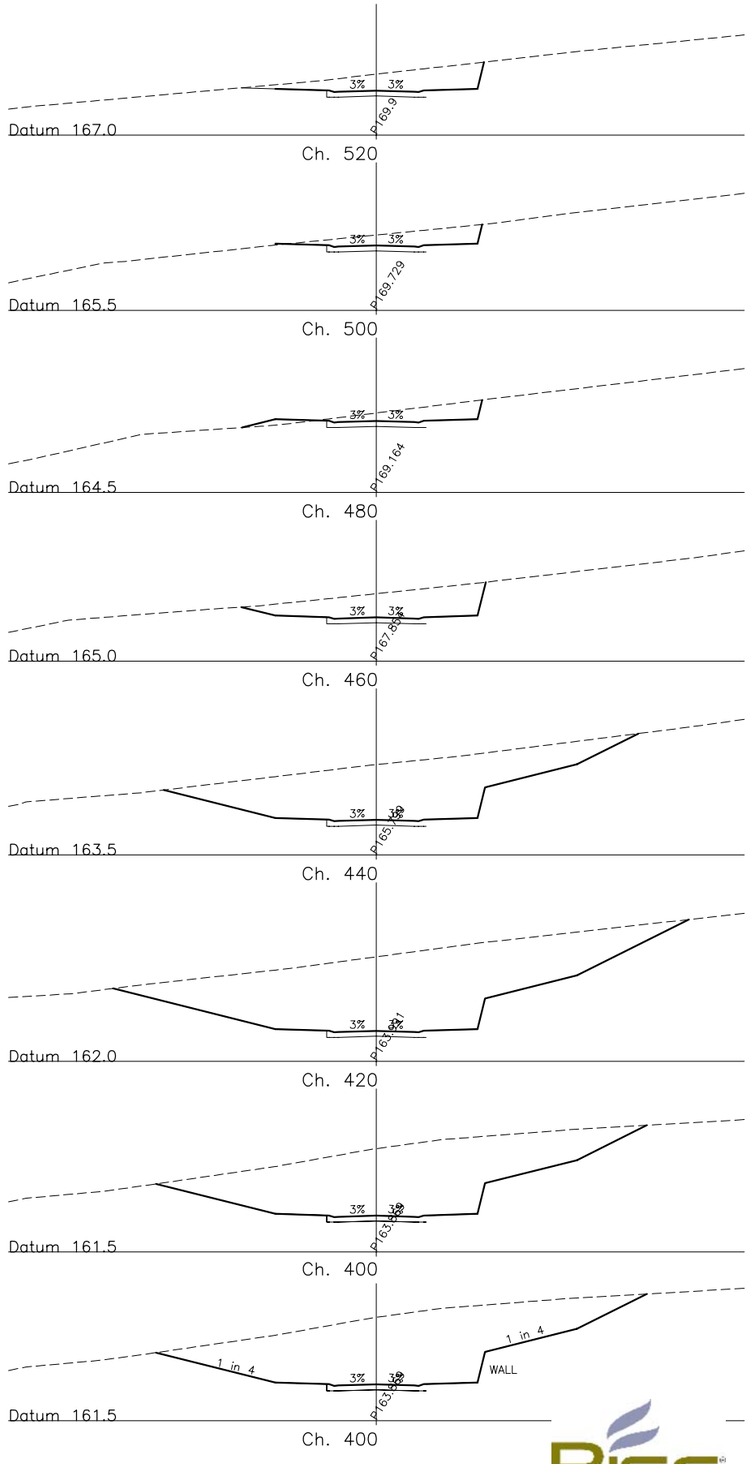
ROAD TYPE E2 5.5m

0 2 4 6 8

1:200 at A1
1:400 at A3







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 9
ROAD TYPE D1 6.0m

0 2 4 6 8
1:200 at A1
1:400 at A3

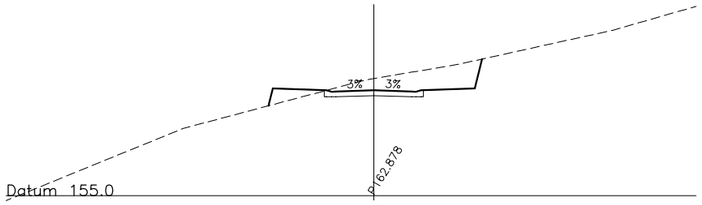
RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

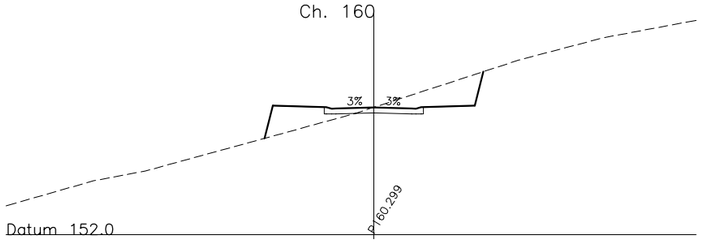
CROSS SECTIONS
1355 - 07 - SK110 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

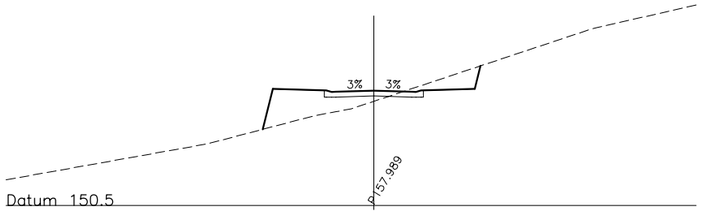
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



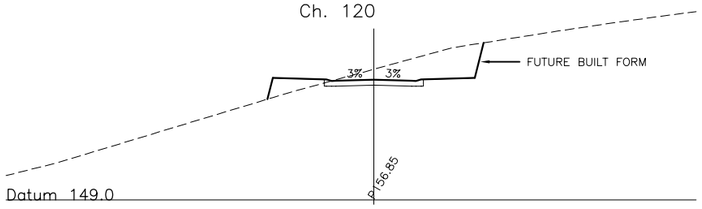
Ch. 160



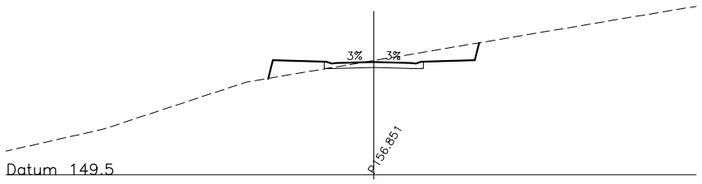
Ch. 140



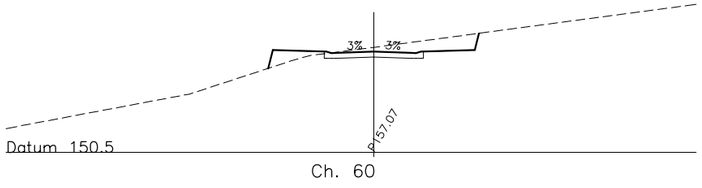
Ch. 120



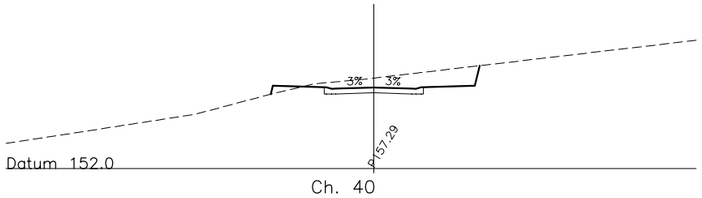
Ch. 100



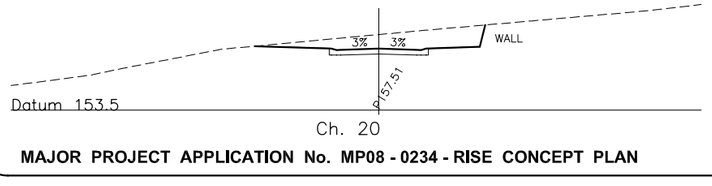
Ch. 80



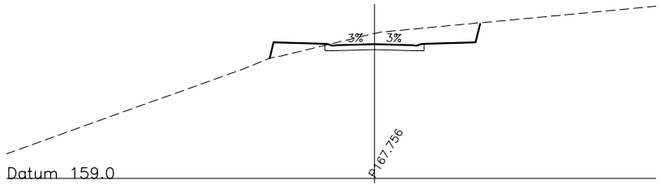
Ch. 60



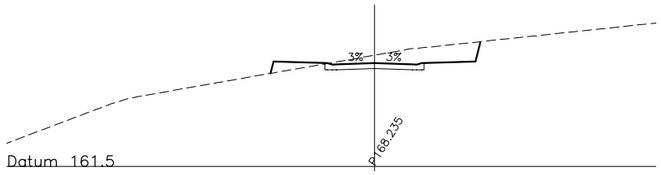
Ch. 40



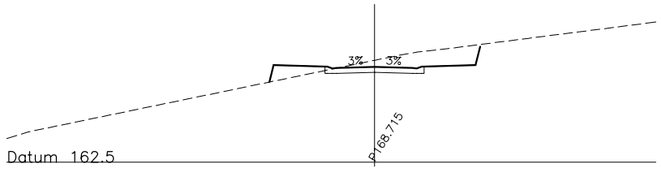
Ch. 20



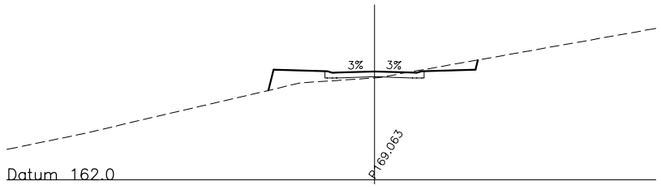
Ch. 300



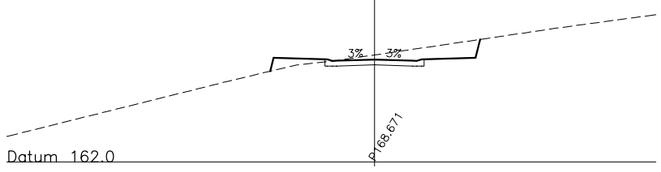
Ch. 280



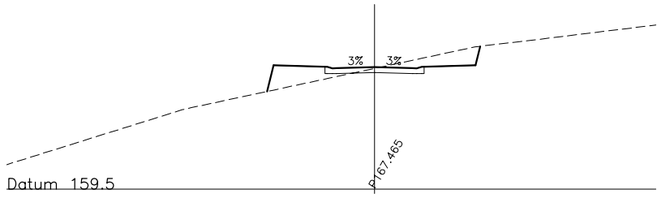
Ch. 260



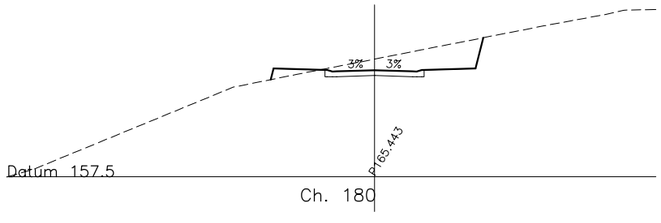
Ch. 240



Ch. 220



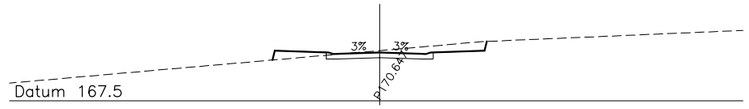
Ch. 200



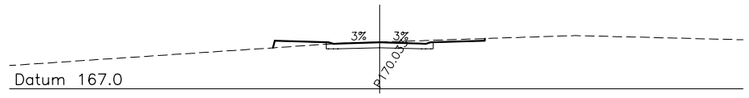
Ch. 180

CROSS SECTION - ROAD 14

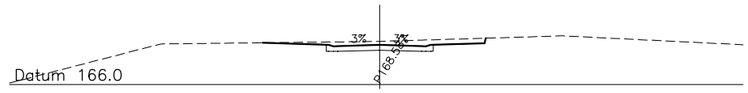
ROAD TYPE E1 5.5m



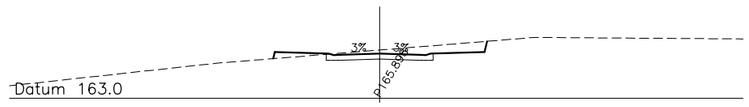
Ch. 120



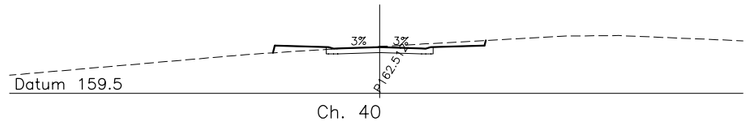
Ch. 100



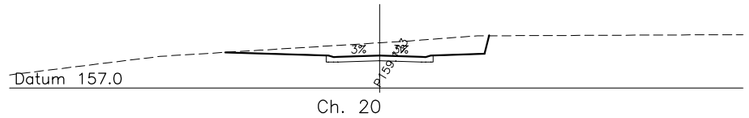
Ch. 80



Ch. 60



Ch. 40



Ch. 20

CROSS SECTION - ROAD 15

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

0 2 4 6 8

1:200 at A1
1:400 at A3

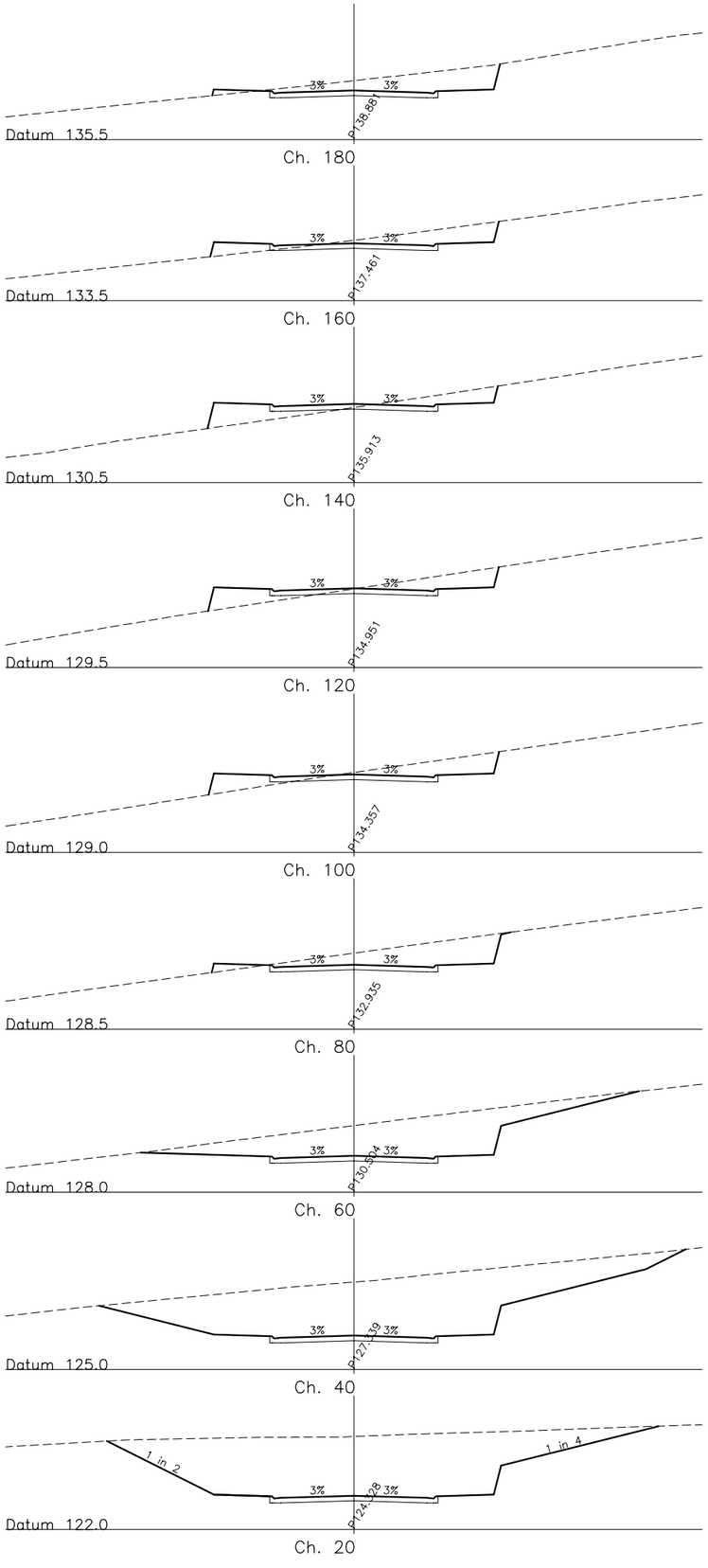
RISE
ABOVE IT ALL

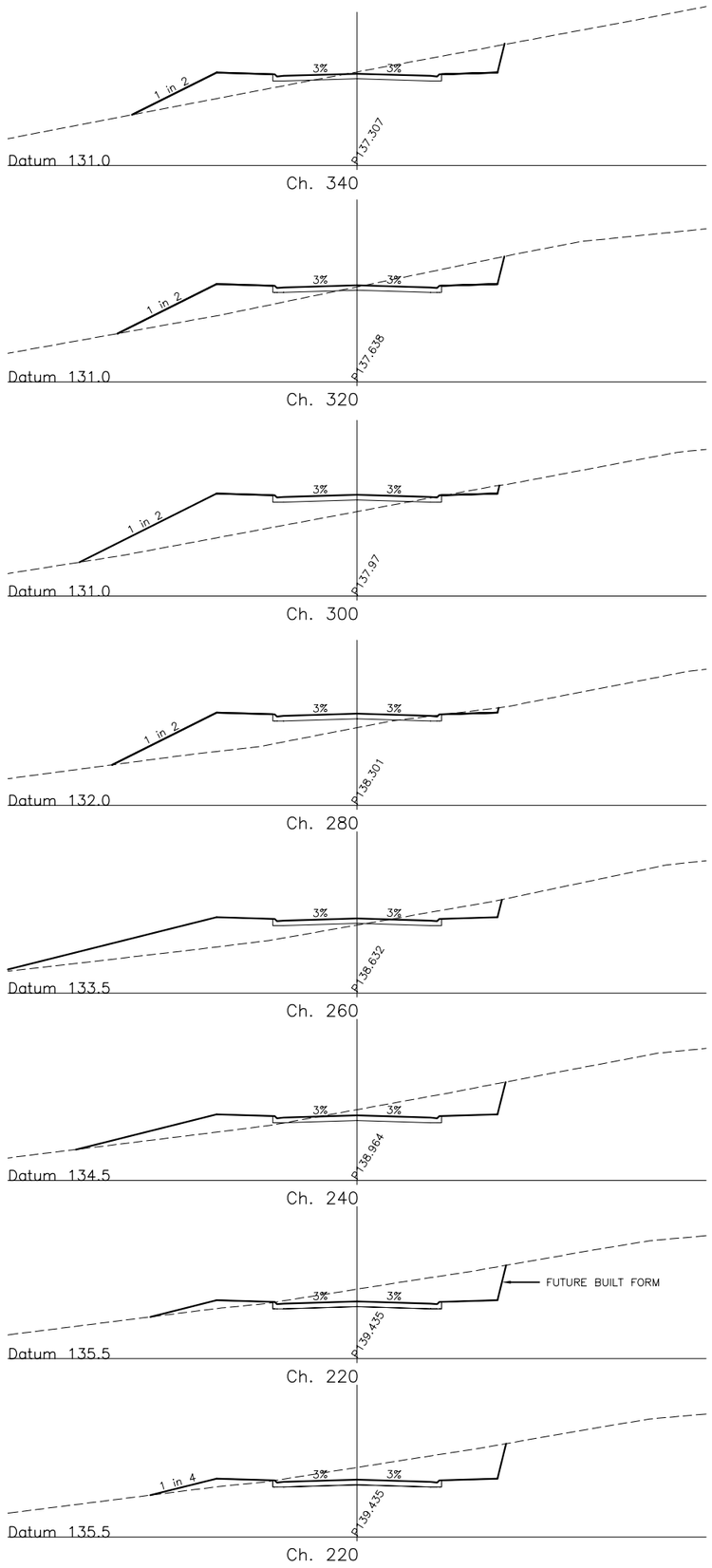
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

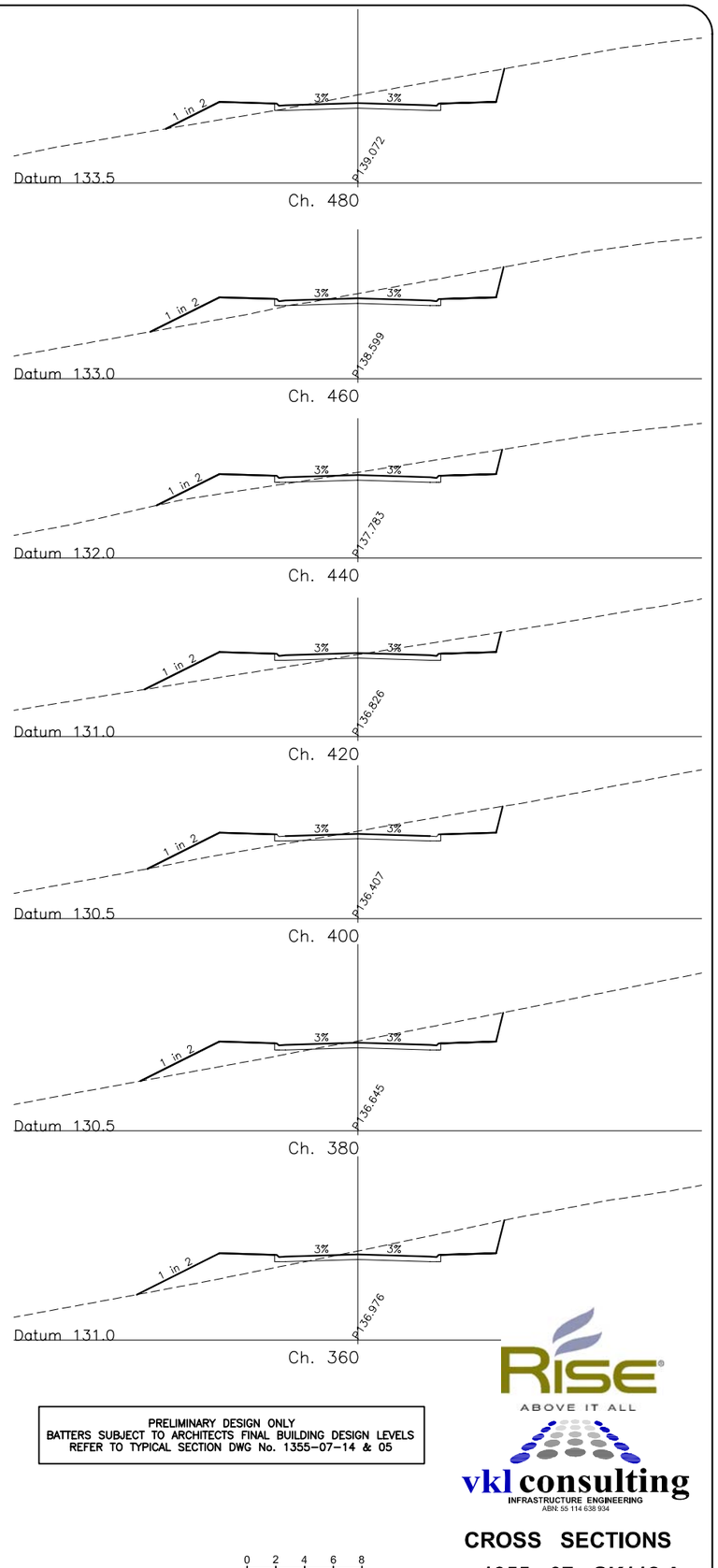
CROSS SECTIONS
1355 - 07 - SK111 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 954

CROSS SECTIONS

1355 - 07 - SK112 A

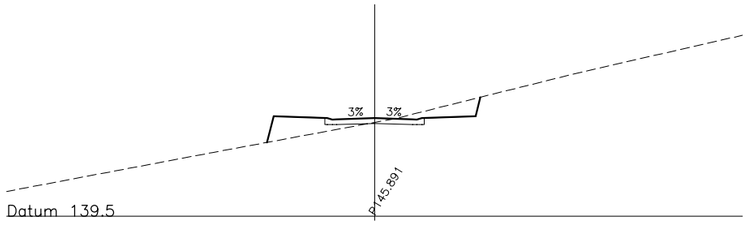
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

0 2 4 6 8
1:200 at A1
1:400 at A3

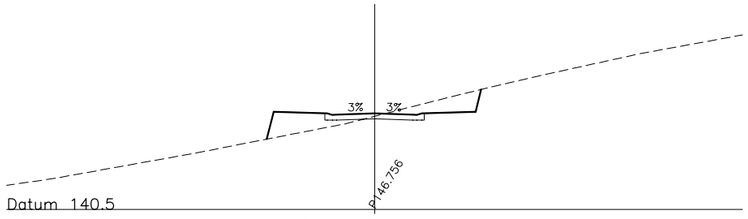
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTION - ROAD 16

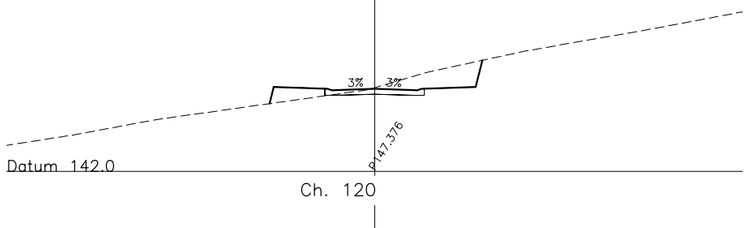
ROAD TYPE B1 11.0m



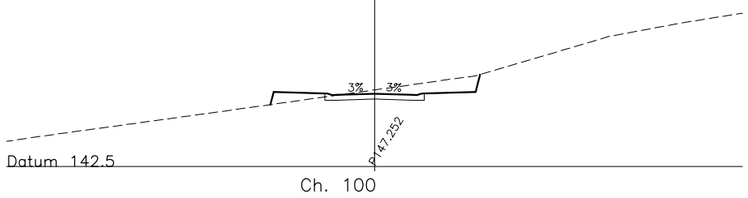
Ch. 160



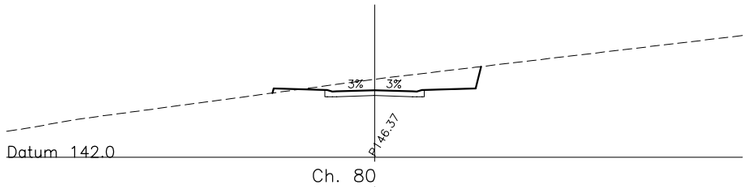
Ch. 140



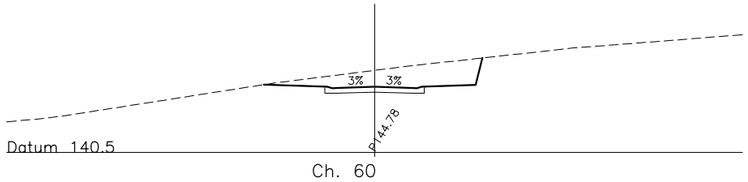
Ch. 120



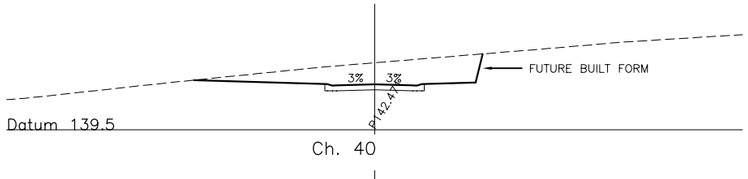
Ch. 100



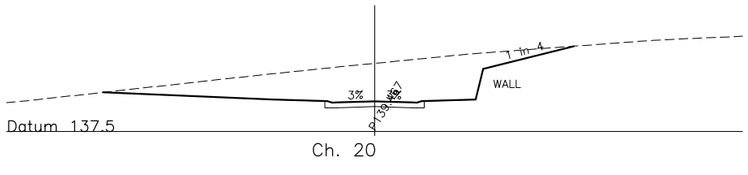
Ch. 80



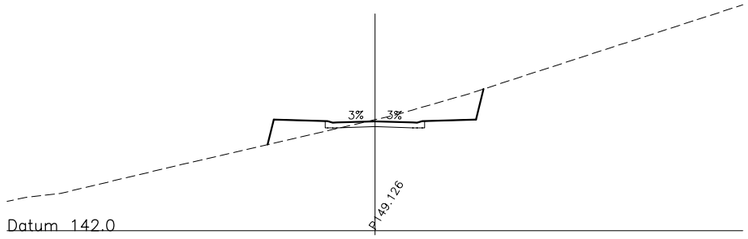
Ch. 60



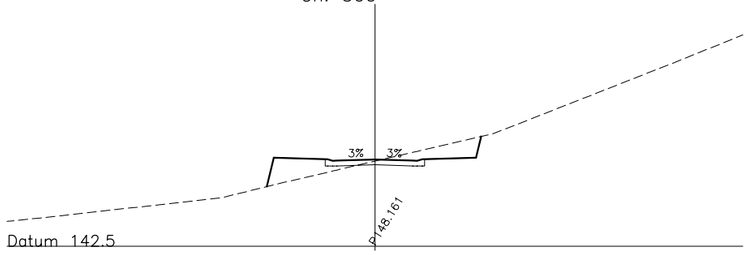
Ch. 40



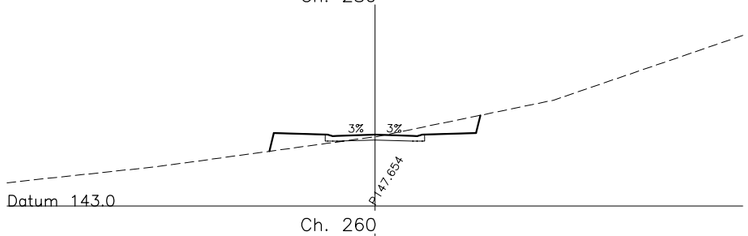
Ch. 20



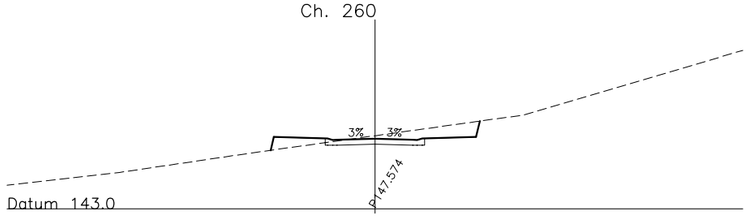
Ch. 300



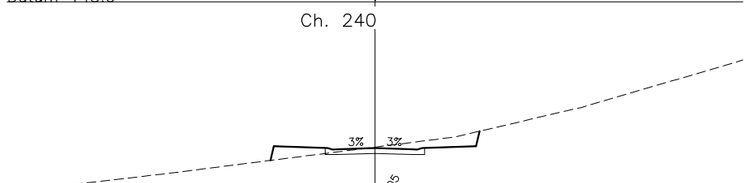
Ch. 280



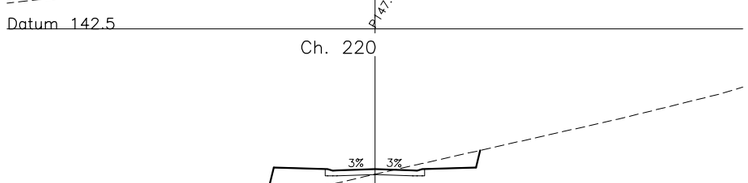
Ch. 260



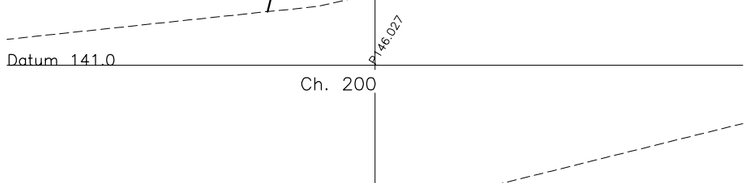
Ch. 240



Ch. 220



Ch. 200



Ch. 180

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 17

ROAD TYPE E1 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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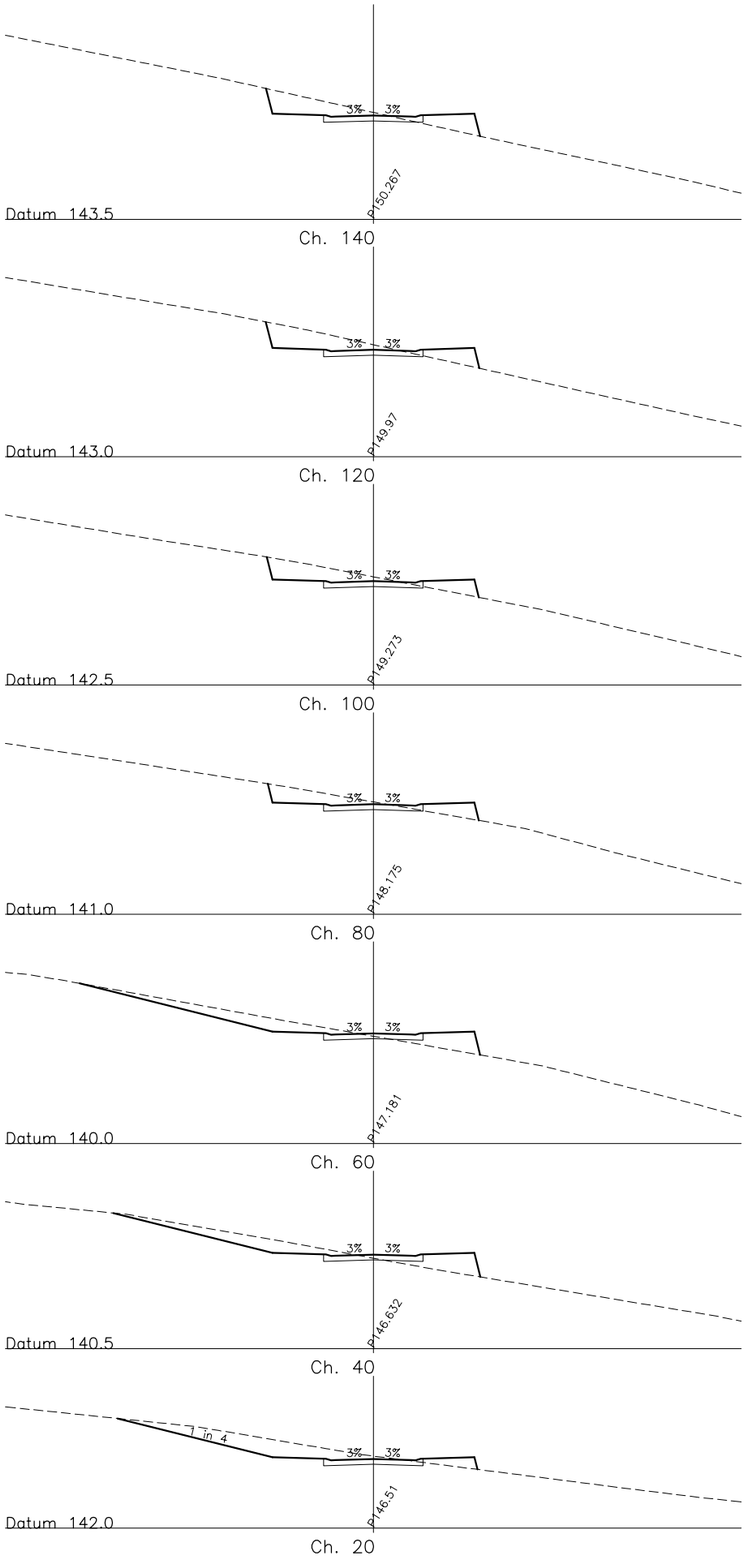
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

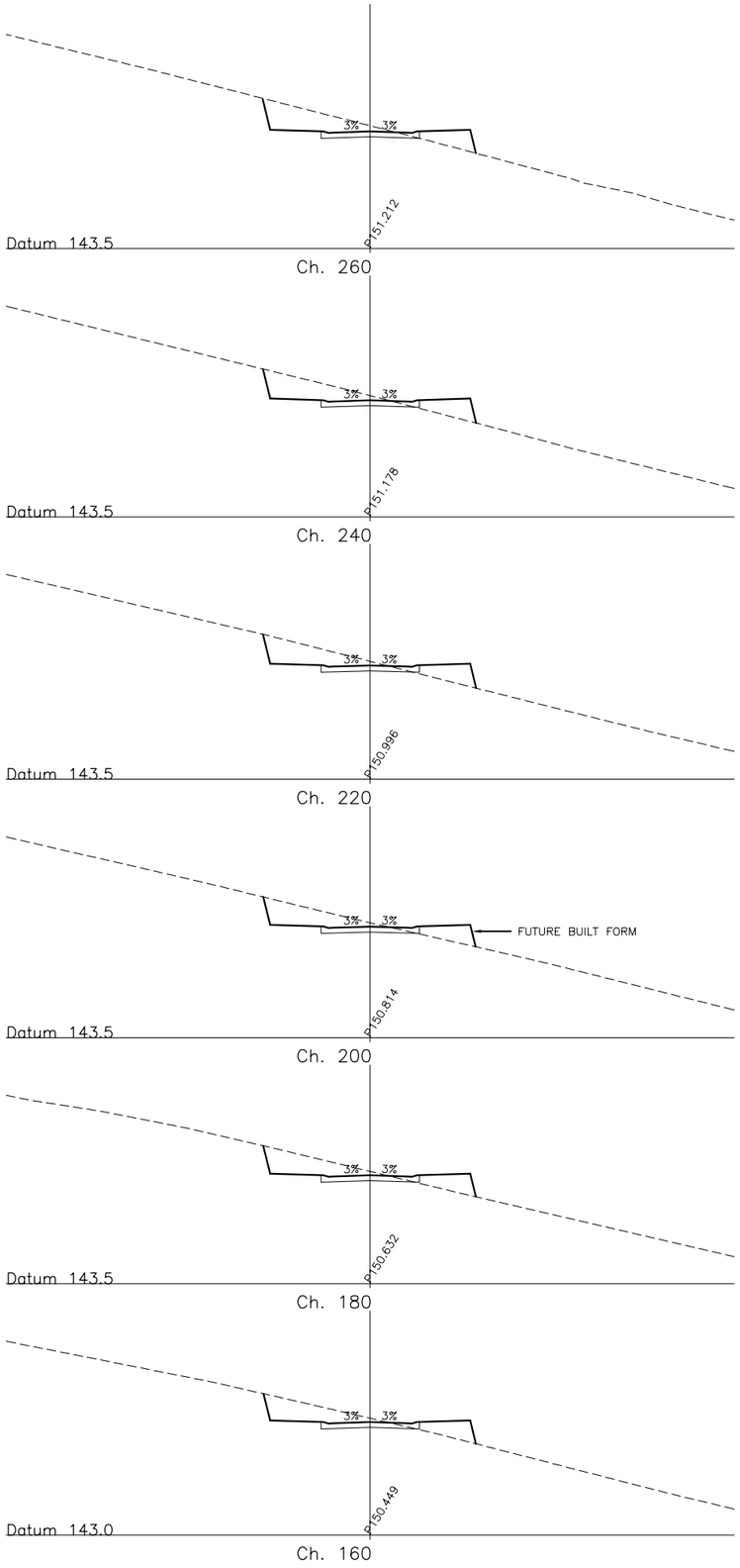
CROSS SECTIONS

1355 - 07 - SK113 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 18

ROAD TYPE D1 6.0m

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

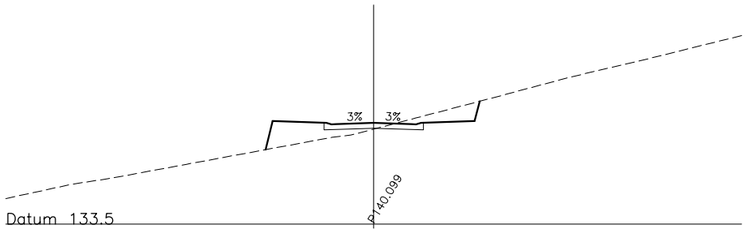
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS

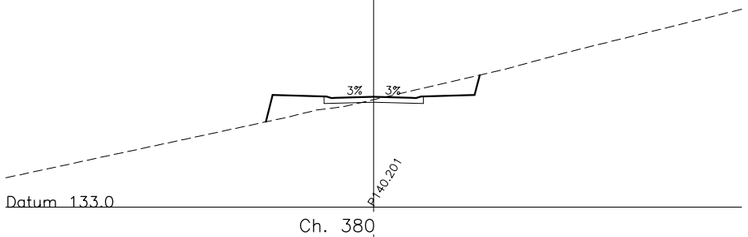
1355 - 07 - SK114 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

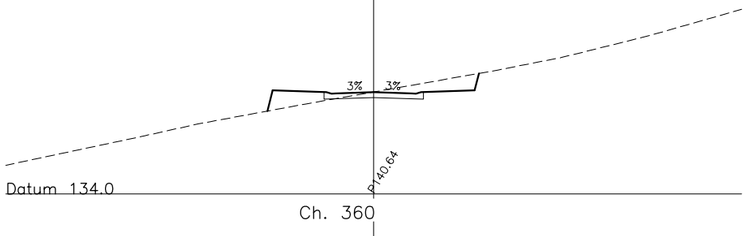
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



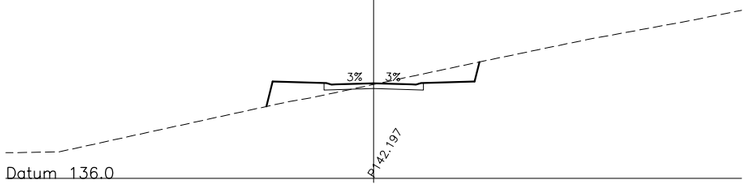
Ch. 400



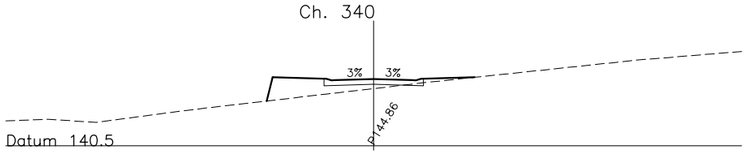
Ch. 380



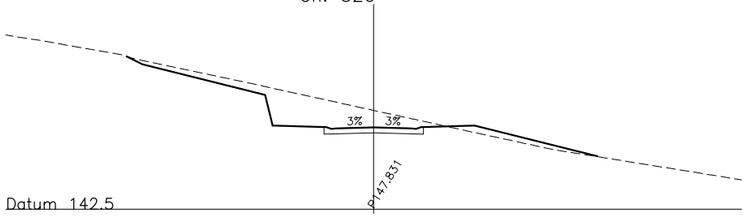
Ch. 360



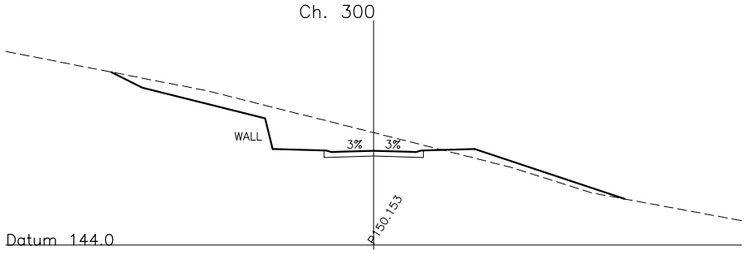
Ch. 340



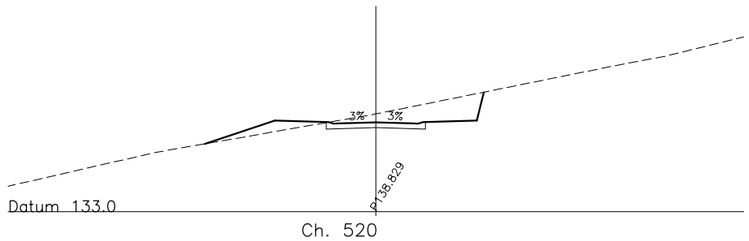
Ch. 320



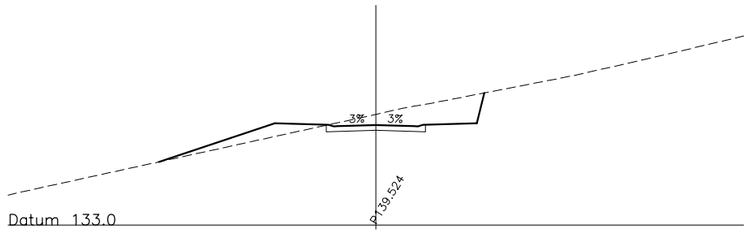
Ch. 300



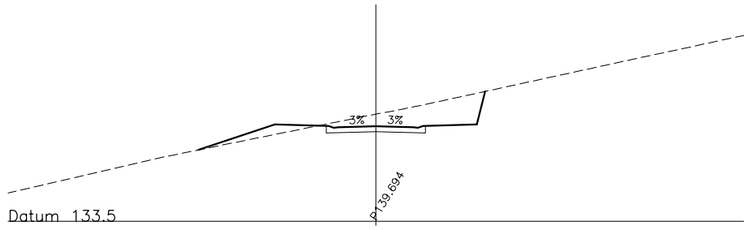
Ch. 280



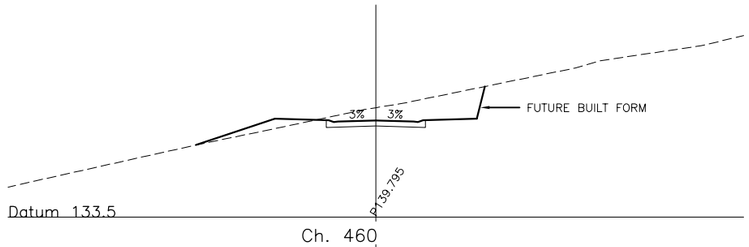
Ch. 520



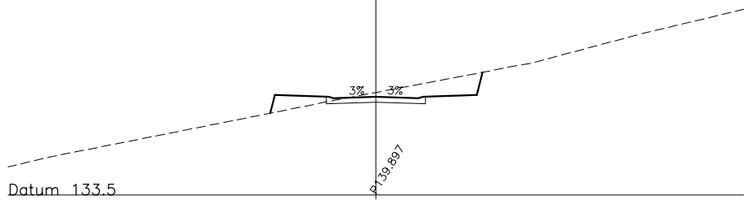
Ch. 500



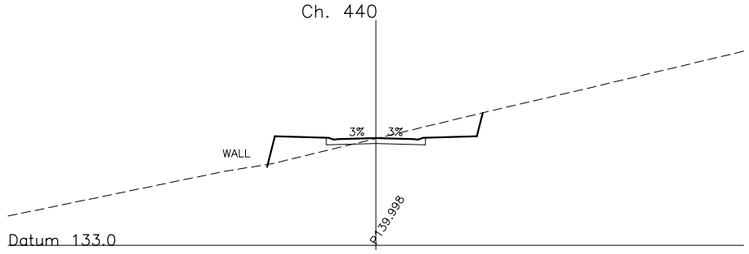
Ch. 480



Ch. 460



Ch. 440



Ch. 420

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS

1355 - 07 - SK115 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

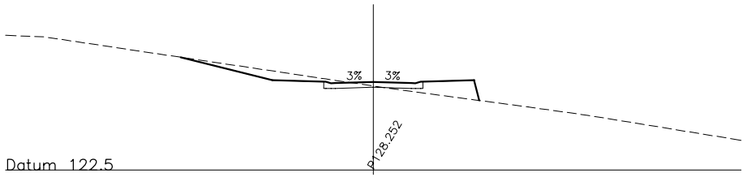
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTION - ROAD 18

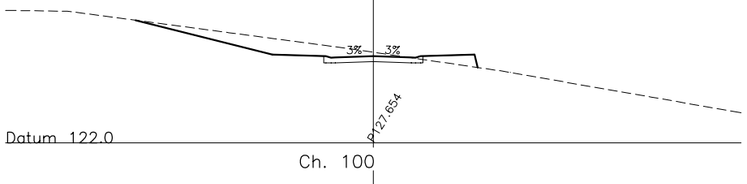
ROAD TYPE D1 6.0m

0 2 4 6 8

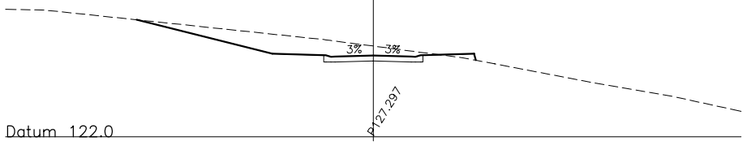
1:200 at A1
1:400 at A3



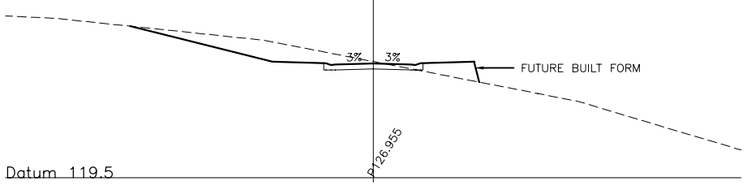
Ch. 120



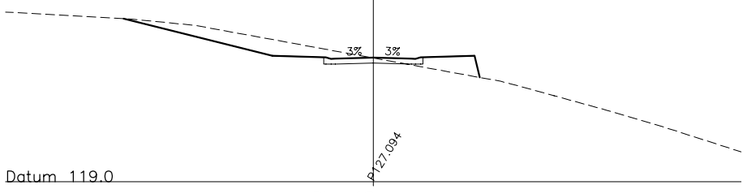
Ch. 100



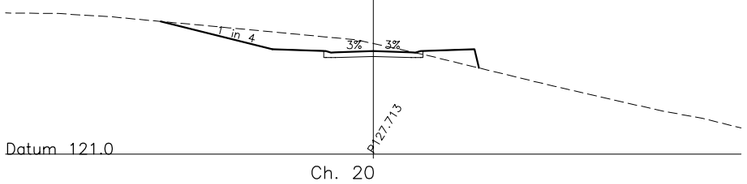
Ch. 80



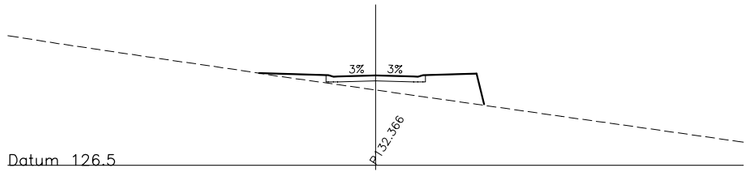
Ch. 60



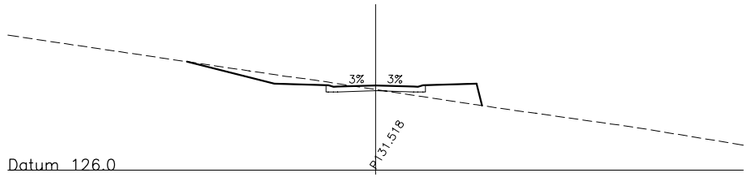
Ch. 40



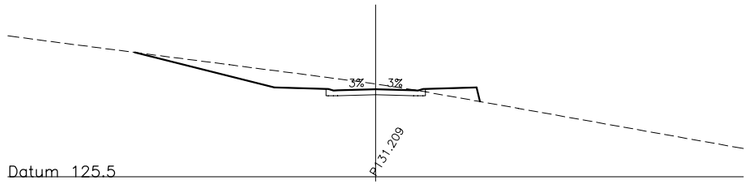
Ch. 20



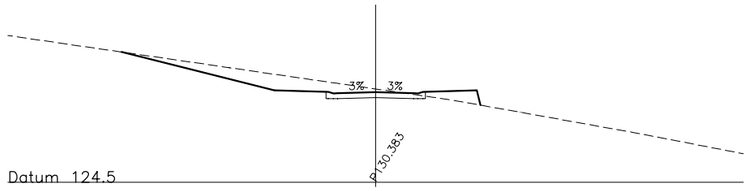
Ch. 220



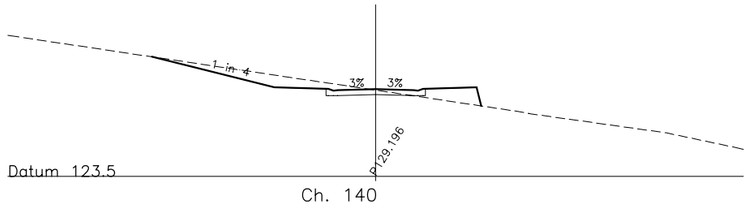
Ch. 200



Ch. 180



Ch. 160



Ch. 140

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTION - ROAD 19

ROAD TYPE E1 5.5m

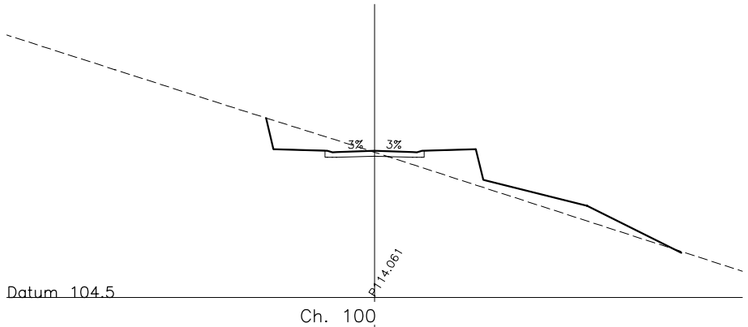
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS

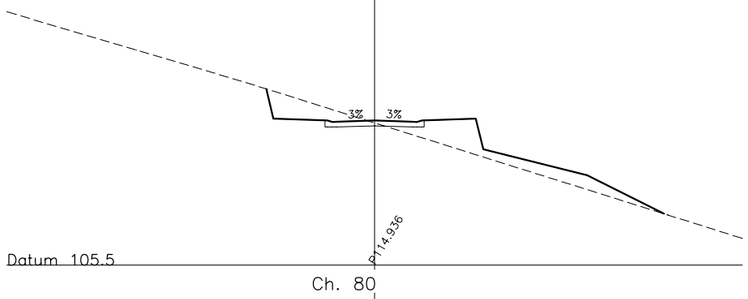
1355 - 07 - SK116 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

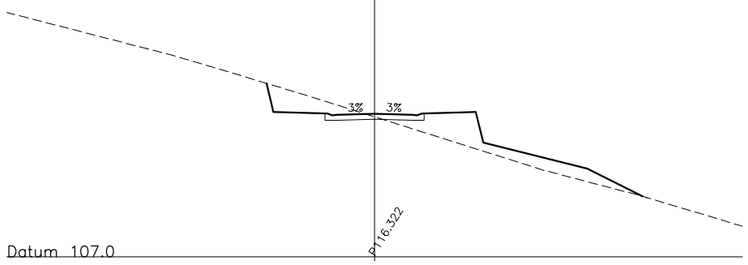
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



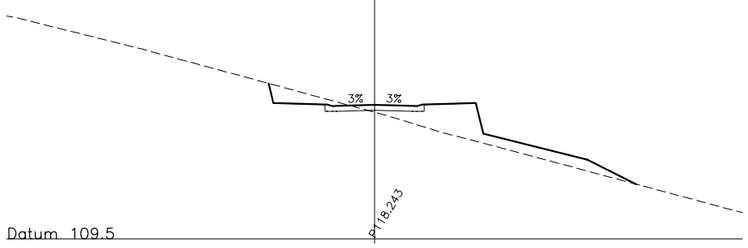
Ch. 100



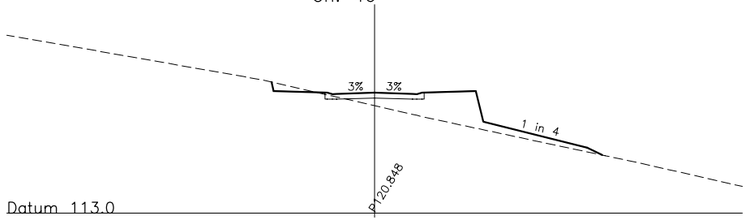
Ch. 80



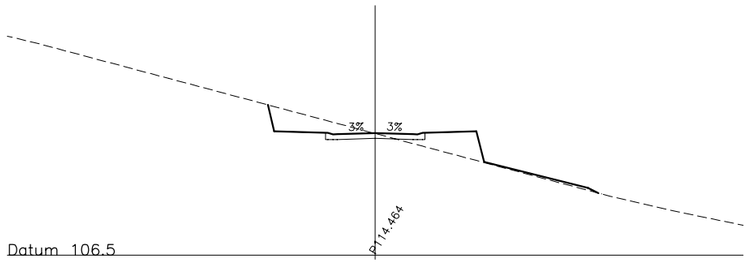
Ch. 60



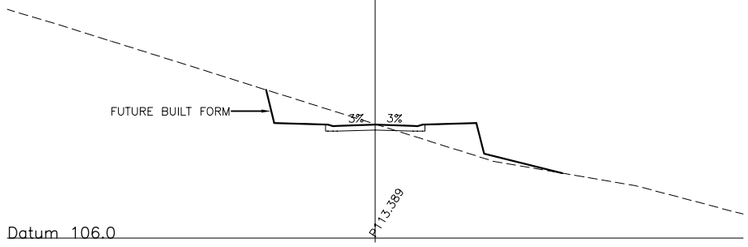
Ch. 40



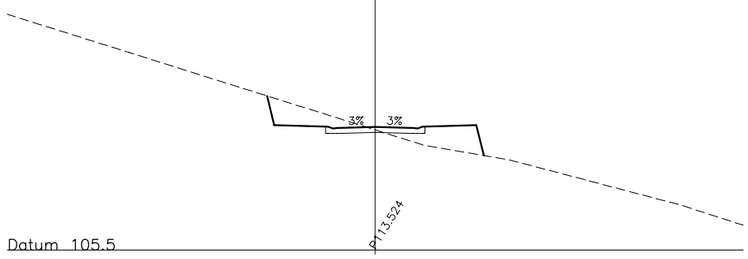
Ch. 20



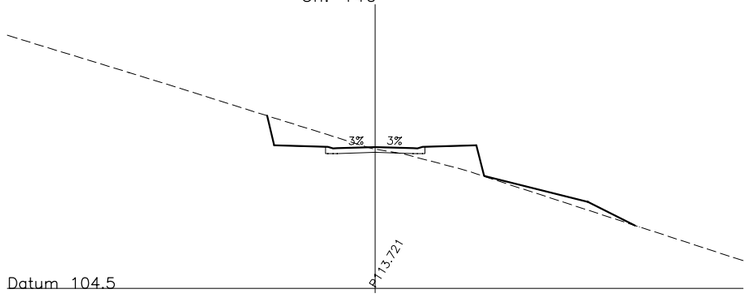
Ch. 180



Ch. 160



Ch. 140



Ch. 120

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

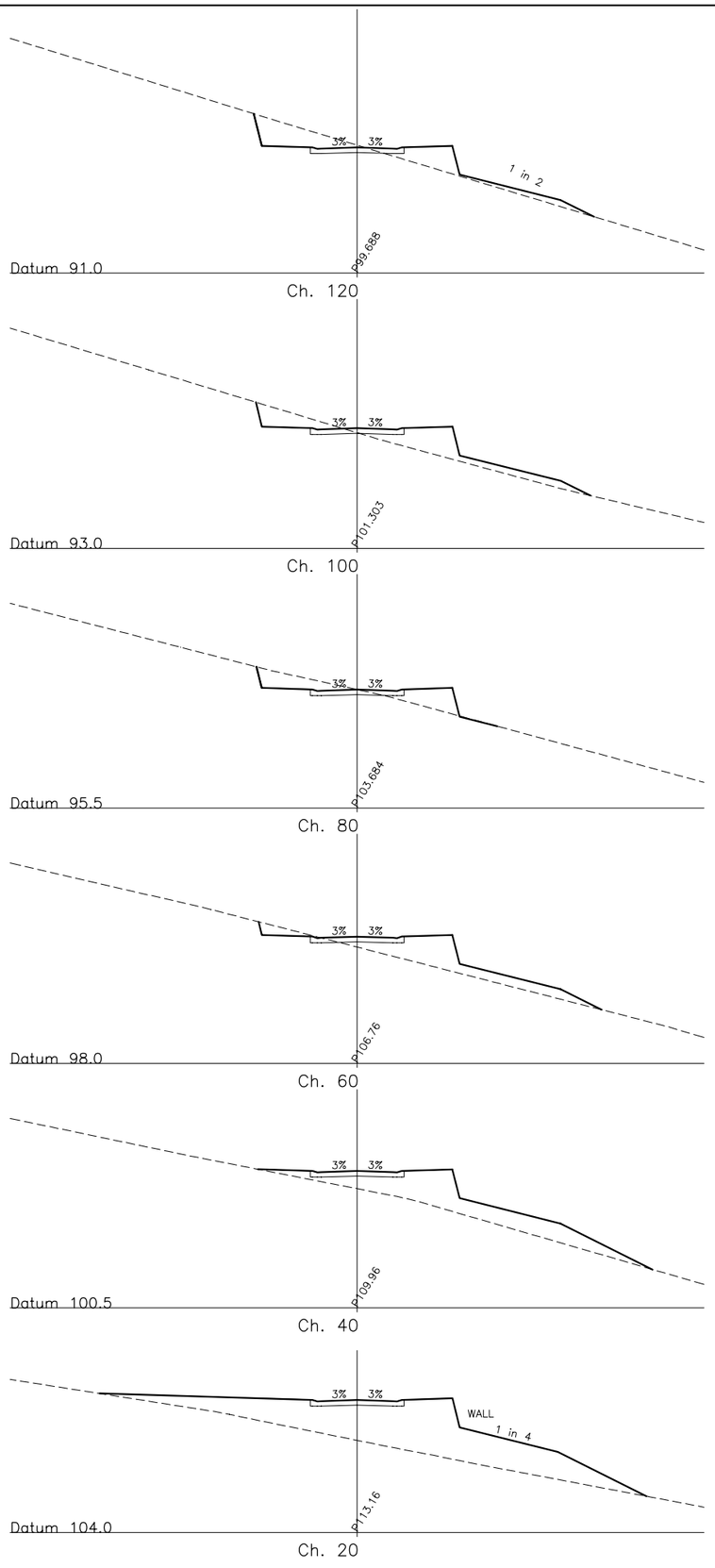
CROSS SECTIONS
1355 - 07 - SK117 A

CROSS SECTION - ROAD 20

ROAD TYPE E1 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS



PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS

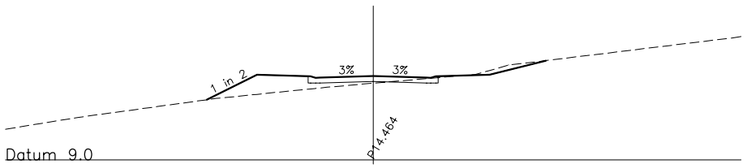
1355 - 07 - SK118 A

0 2 4 6 8
1:200 at A1
1:400 at A3

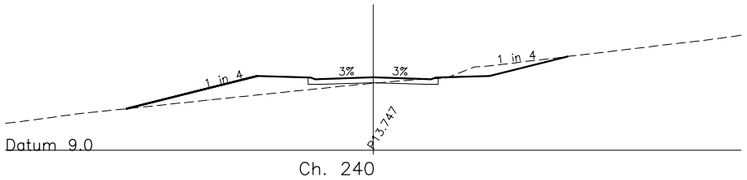
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

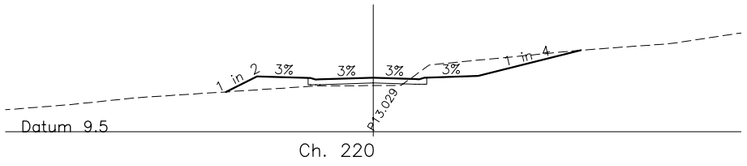
CROSS SECTION - ROAD 21 ROAD TYPE E1 5.5m



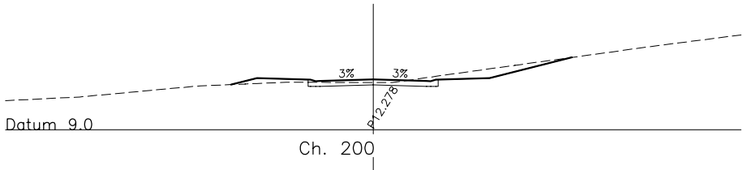
Ch. 260



Ch. 240

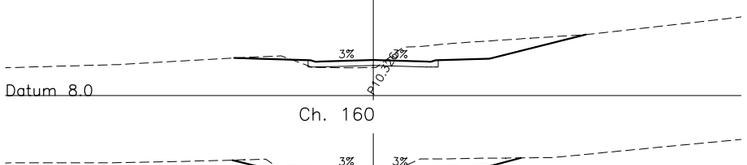


Ch. 220

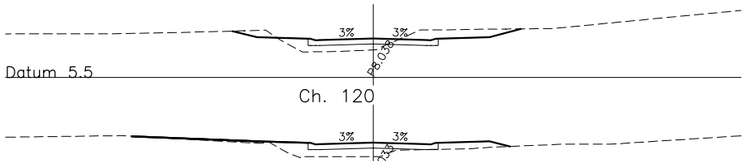


Ch. 200

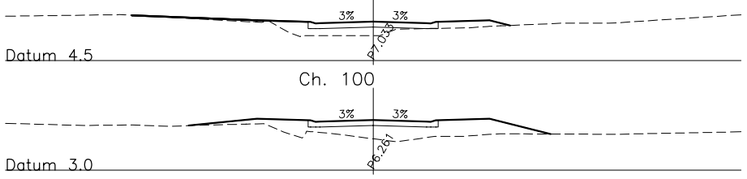
Ch. 180



Ch. 160

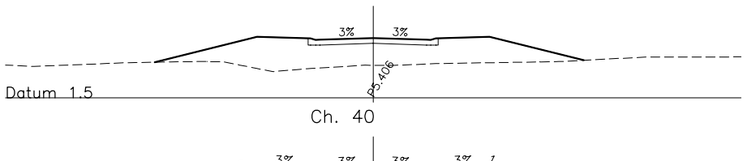


Ch. 120

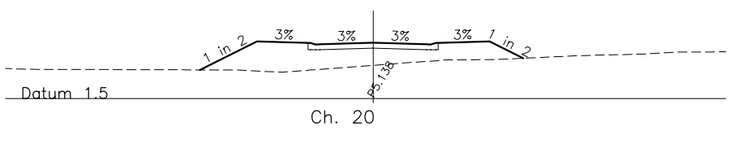


Ch. 100

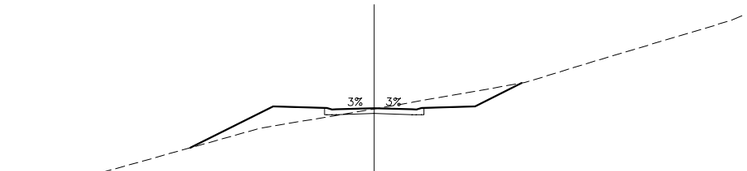
Ch. 80



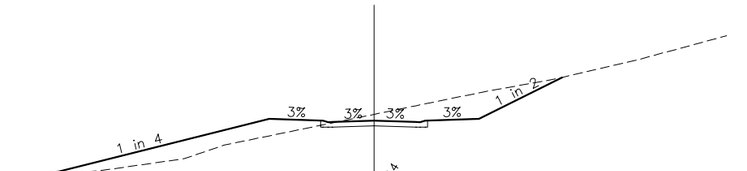
Ch. 40



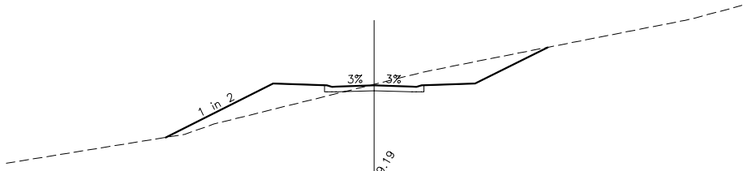
Ch. 20



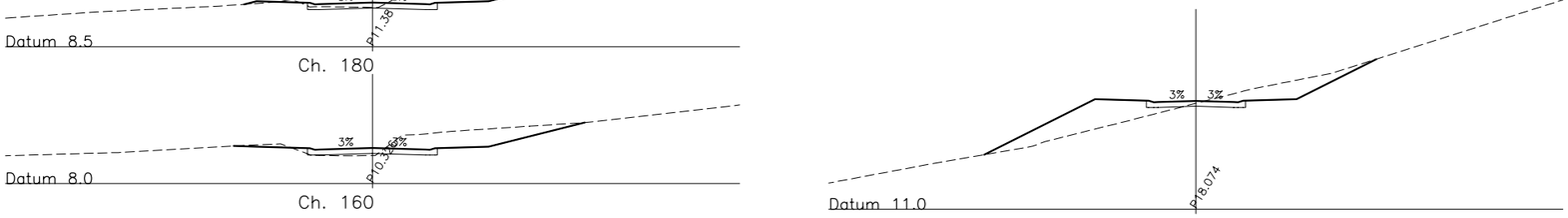
Ch. 400



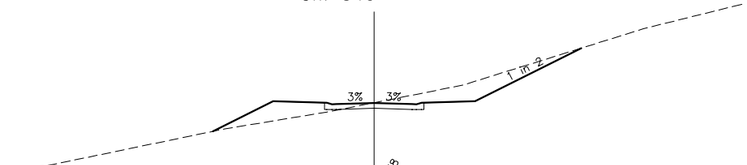
Ch. 380



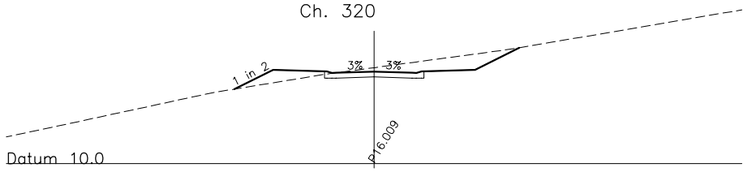
Ch. 360



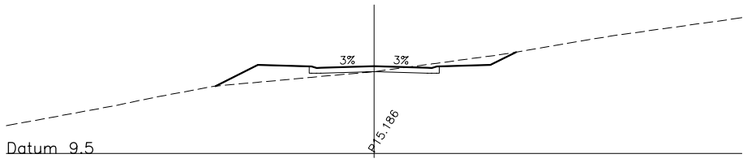
Ch. 340



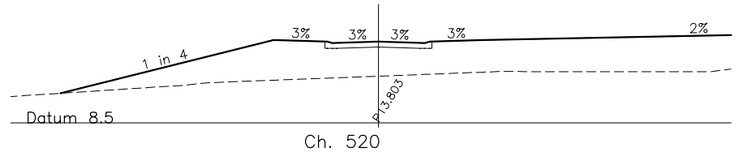
Ch. 320



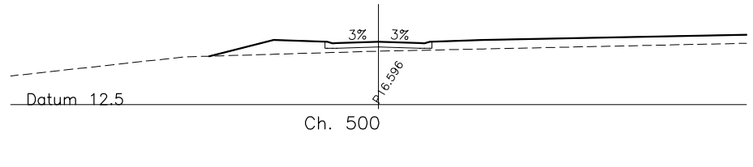
Ch. 300



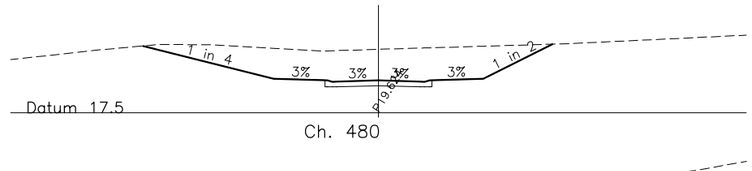
Ch. 280



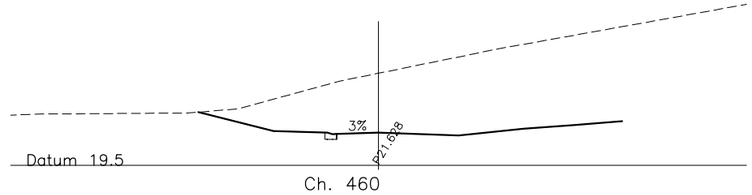
Ch. 520



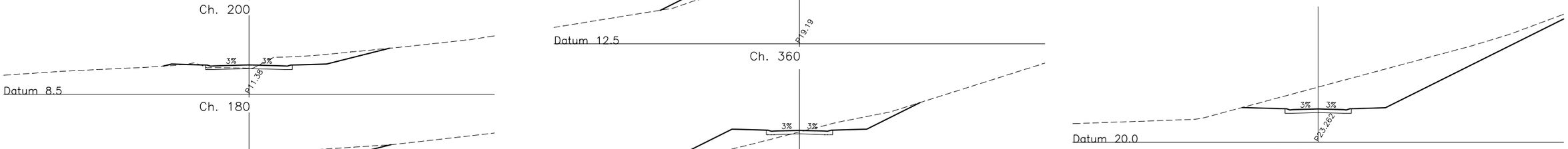
Ch. 500



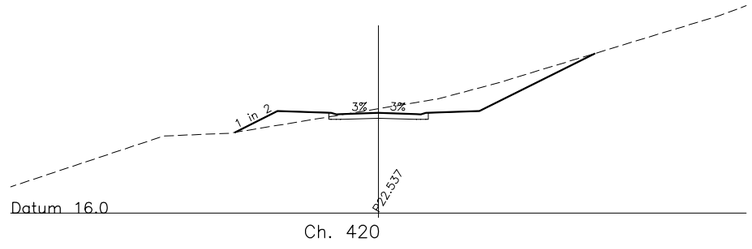
Ch. 480



Ch. 460



Ch. 440



Ch. 420

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

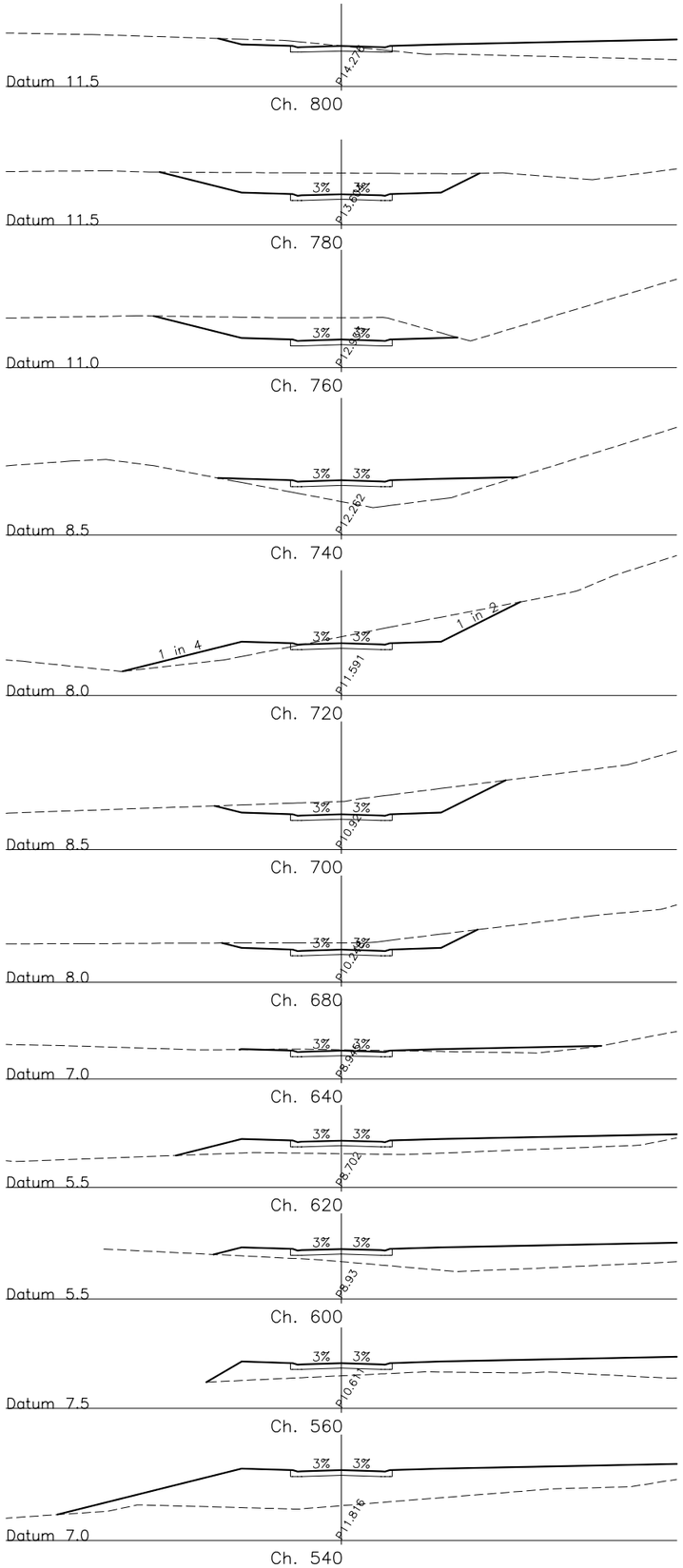
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

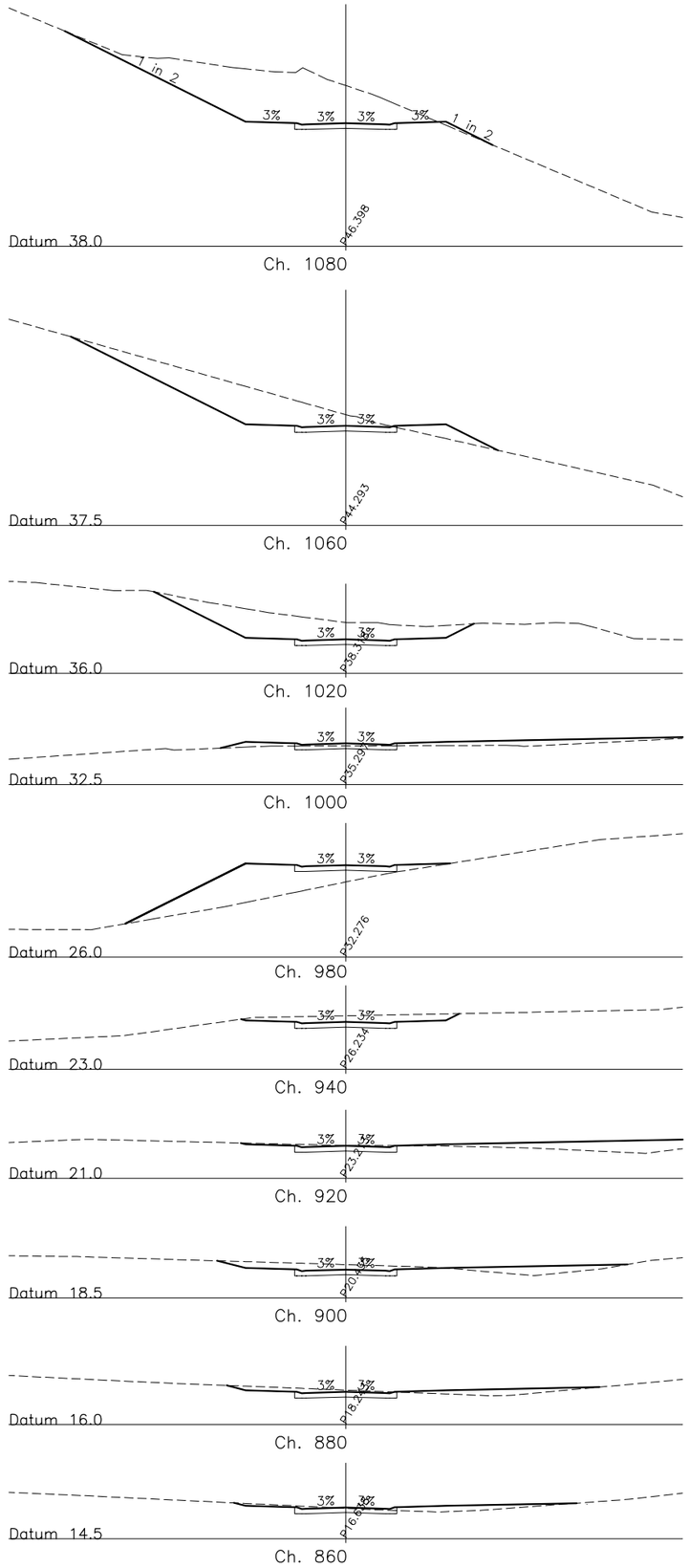
CROSS SECTION - ROAD 50

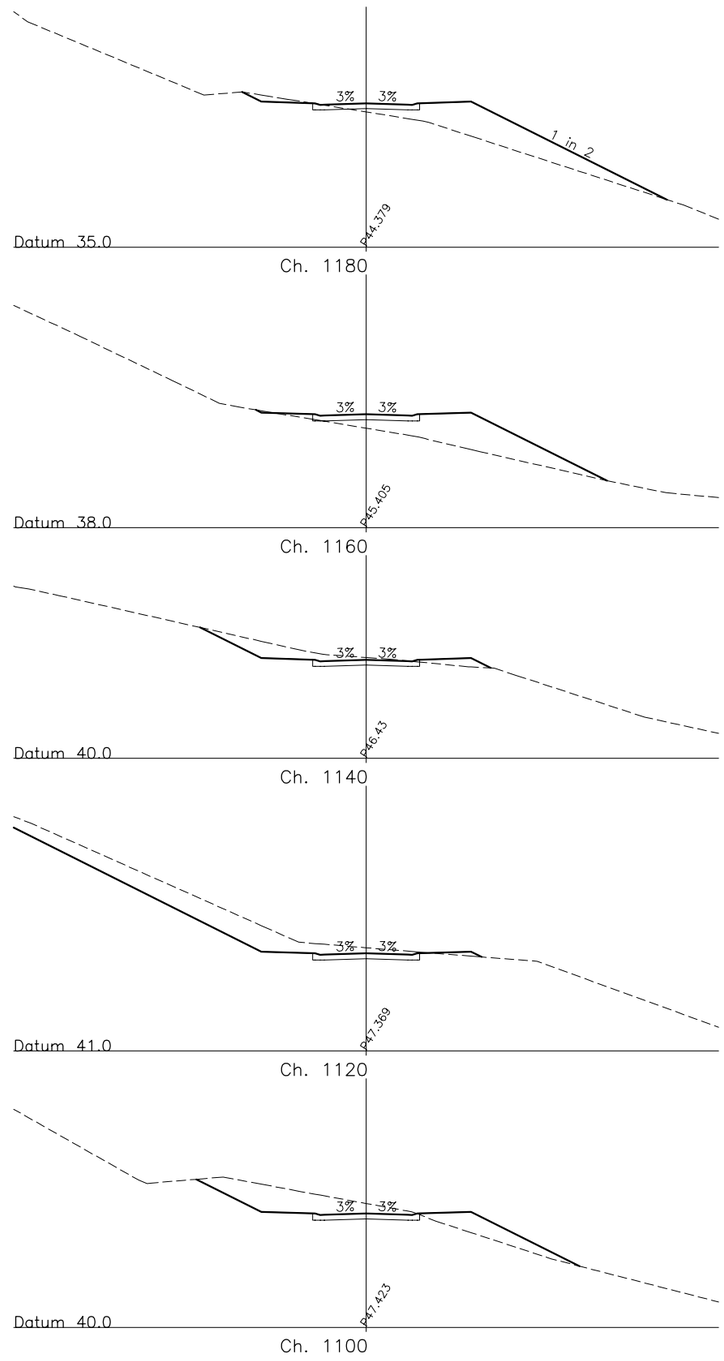
ROAD TYPE C 7.5m CH0 TO CH300
ROAD TYPE D2 6.0m Ch80 TO END

0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK119 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

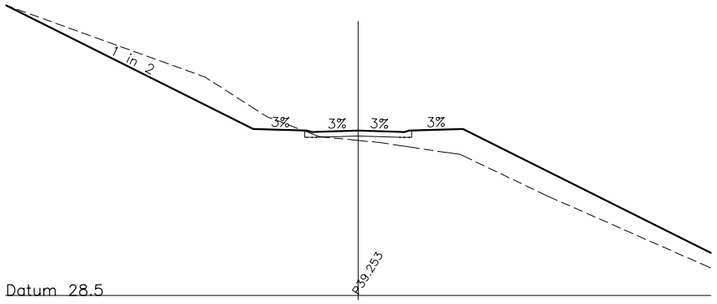
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 639 934

0 2 4 6 8
1:200 at A1
1:400 at A3

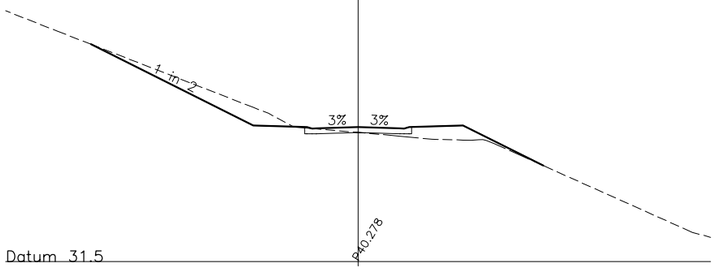
CROSS SECTIONS
1355 - 07 - SK120 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

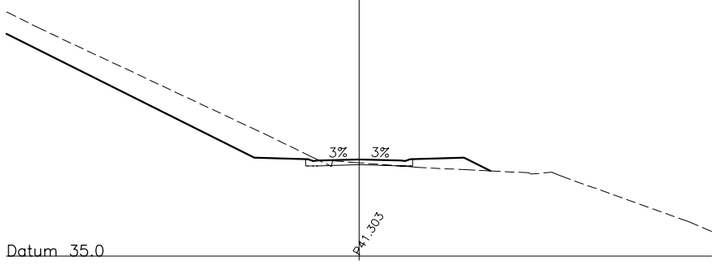
CROSS SECTION - ROAD 50 ROAD TYPE D2 6.0m Ch80 TO END



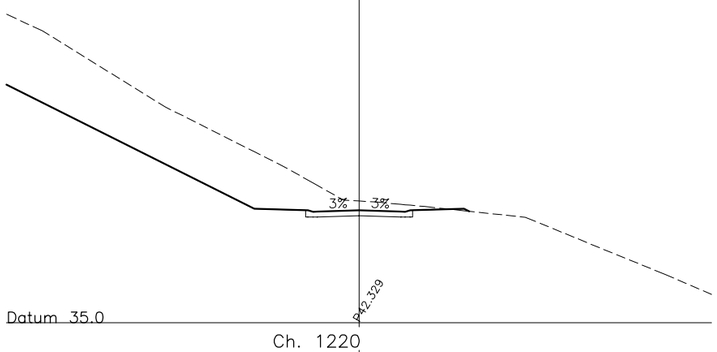
Ch. 1280



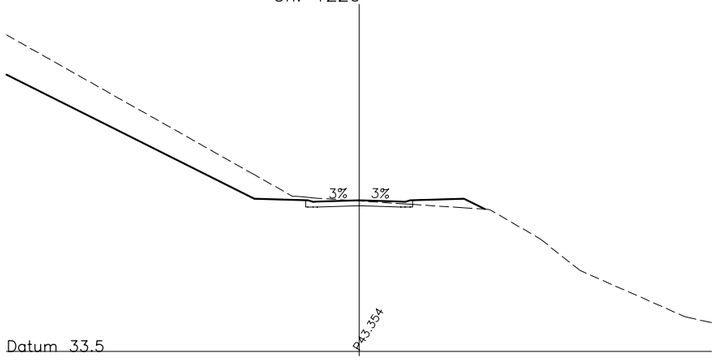
Ch. 1260



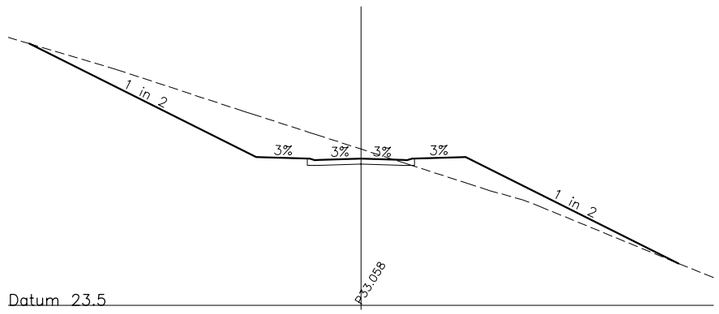
Ch. 1240



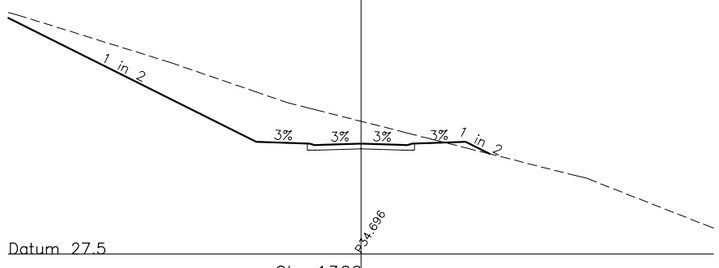
Ch. 1220



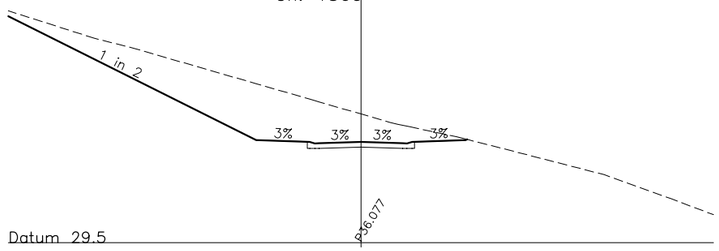
Ch. 1200



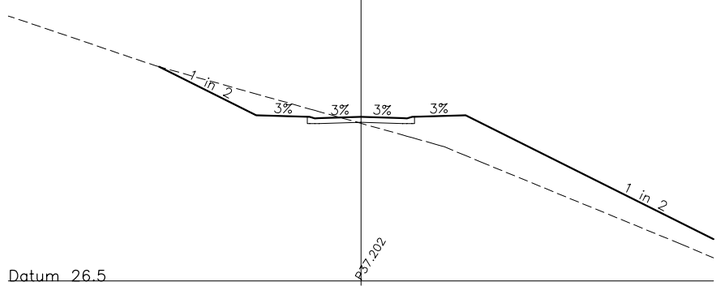
Ch. 1380



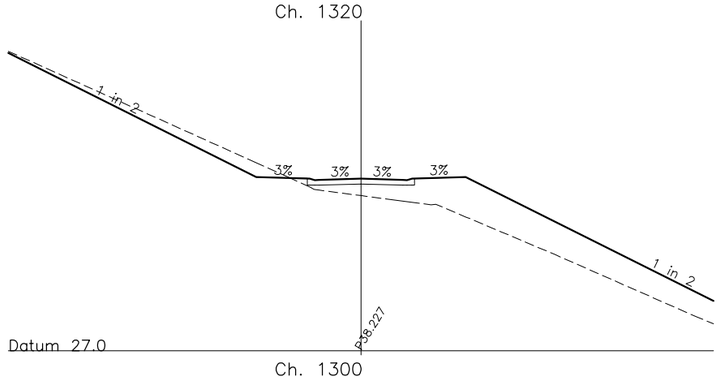
Ch. 1360



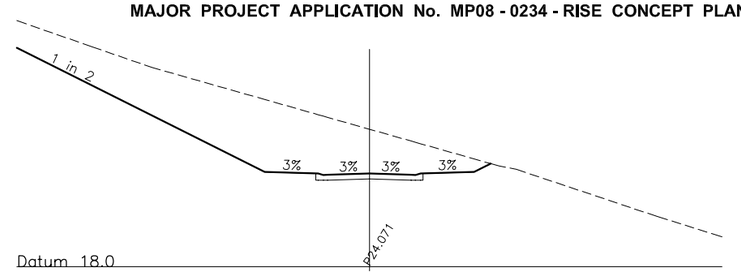
Ch. 1340



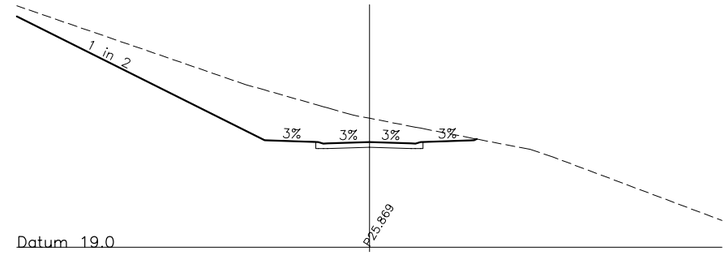
Ch. 1320



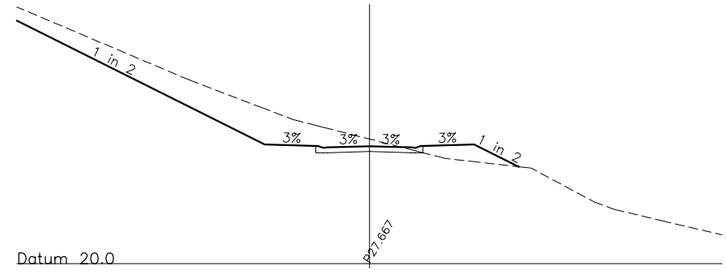
Ch. 1300



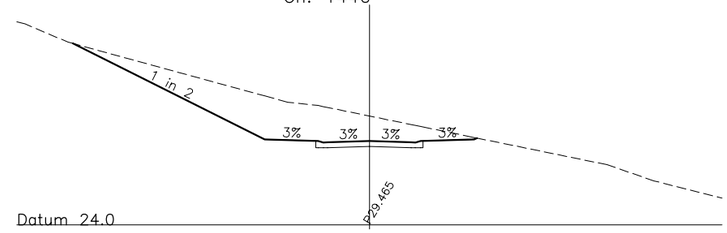
Ch. 1480



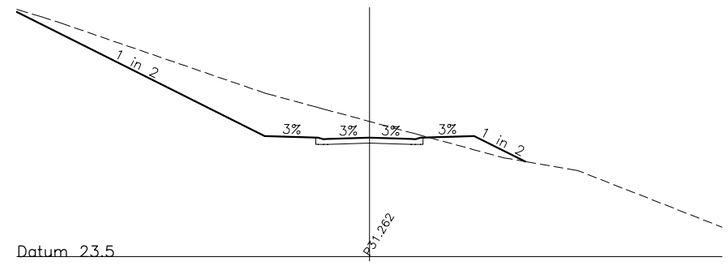
Ch. 1460



Ch. 1440



Ch. 1420



Ch. 1400

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 50

ROAD TYPE D2 6.0m Ch80 TO END

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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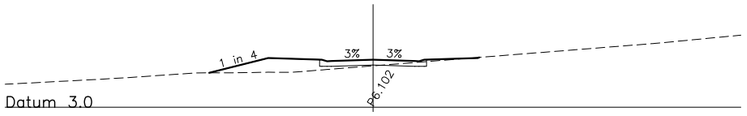
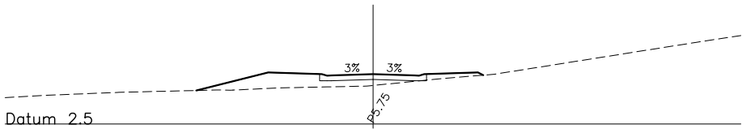
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

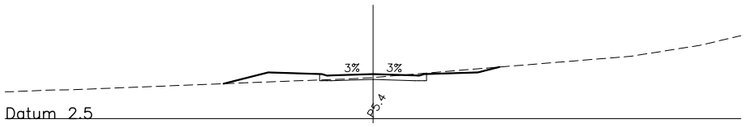
CROSS SECTIONS
1355 - 07 - SK121 A
A - 09/07 - AMENDED TO SUIT NEW ARCHITECTS PLANS



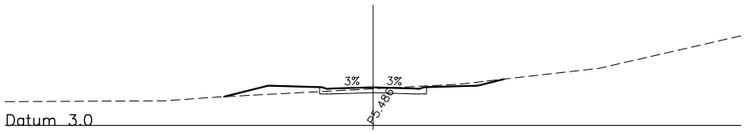
Ch. 160



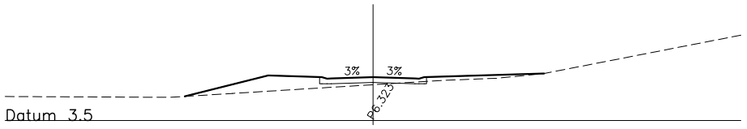
Ch. 140



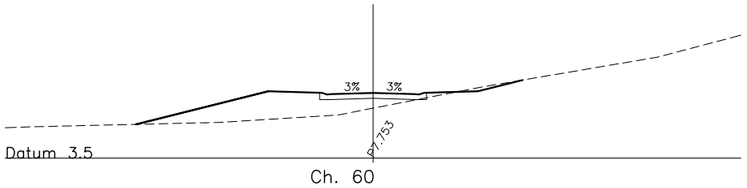
Ch. 120



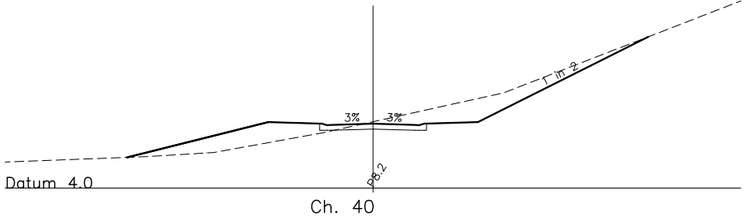
Ch. 100



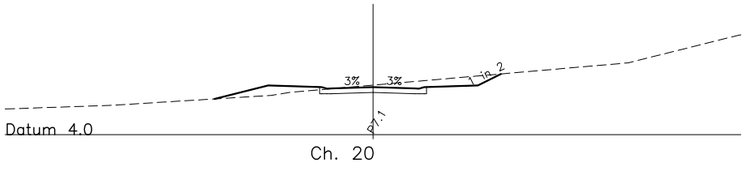
Ch. 80



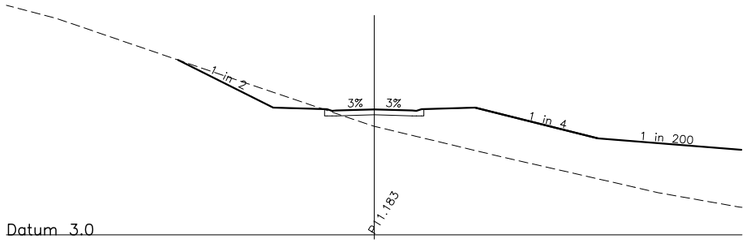
Ch. 60



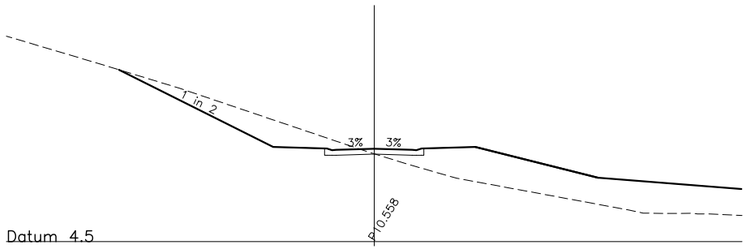
Ch. 40



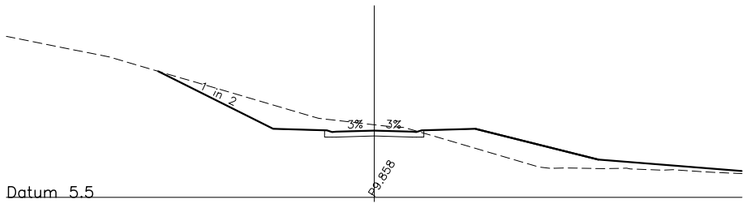
Ch. 20



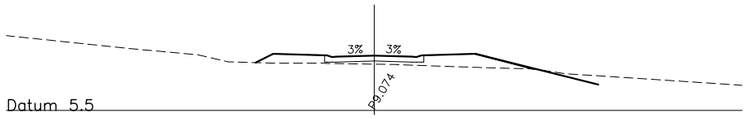
Ch. 160



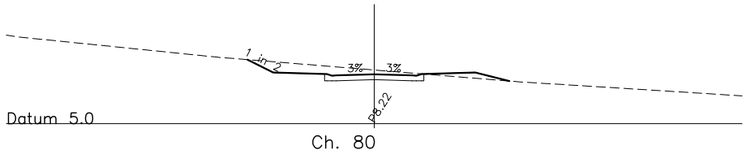
Ch. 140



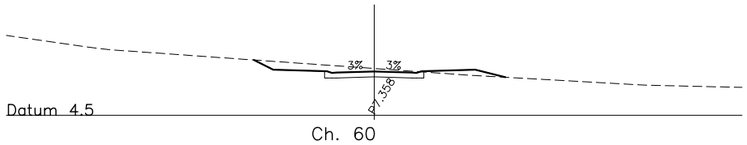
Ch. 120



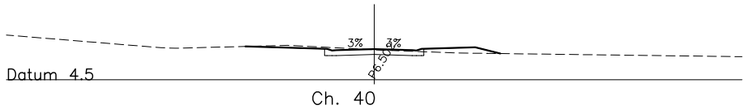
Ch. 100



Ch. 80



Ch. 60



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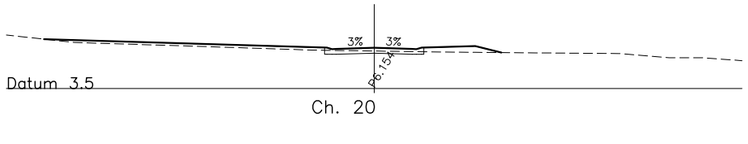
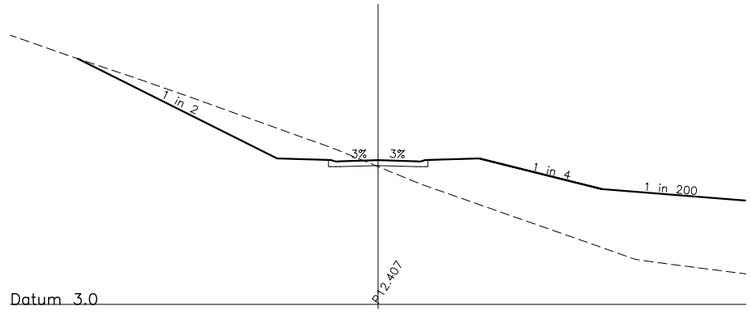
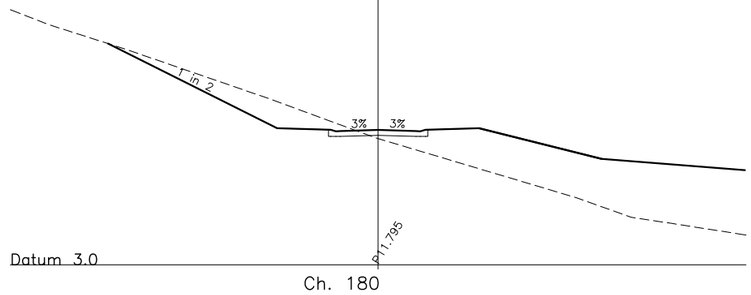


Ch. 20



Ch. 200



Ch. 180

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

CROSS SECTION - ROAD 51
ROAD TYPE D2 6.0m

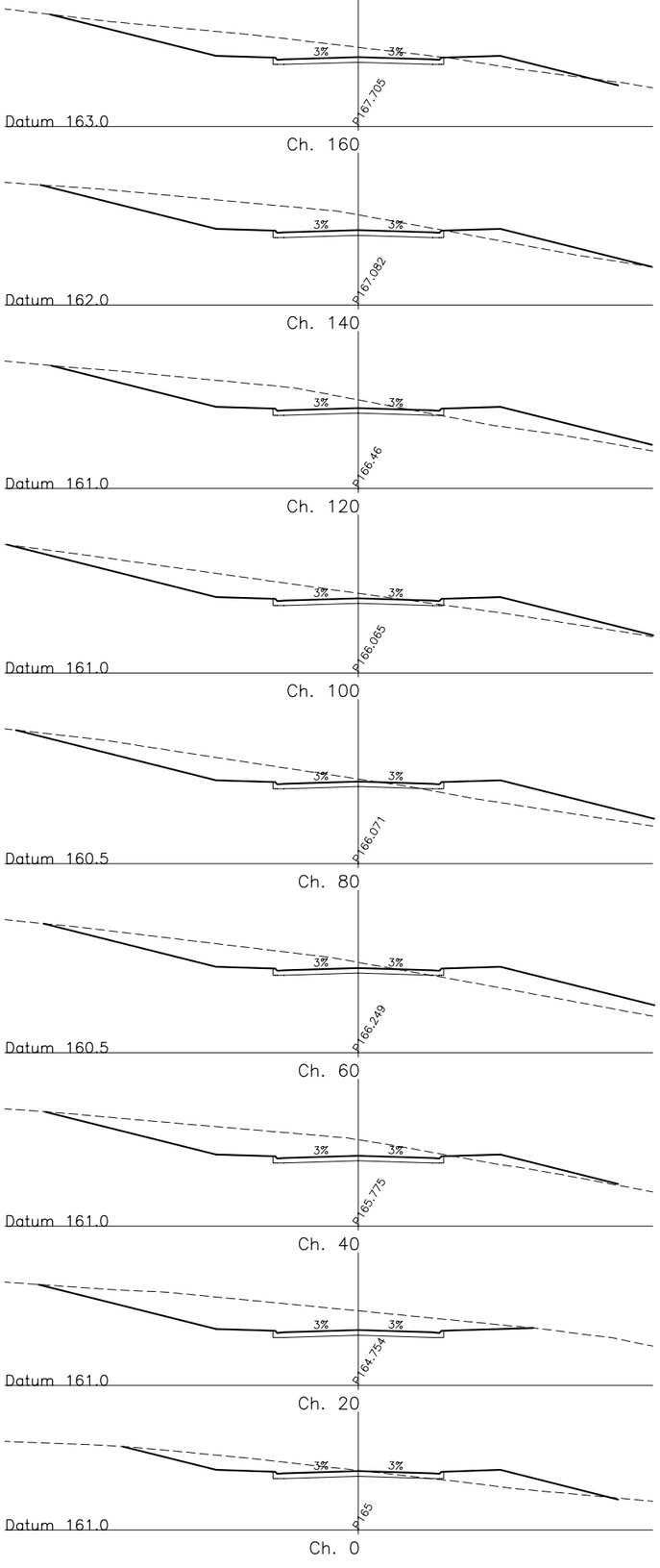
CROSS SECTION - ROAD 52
ROAD TYPE E1 5.5m

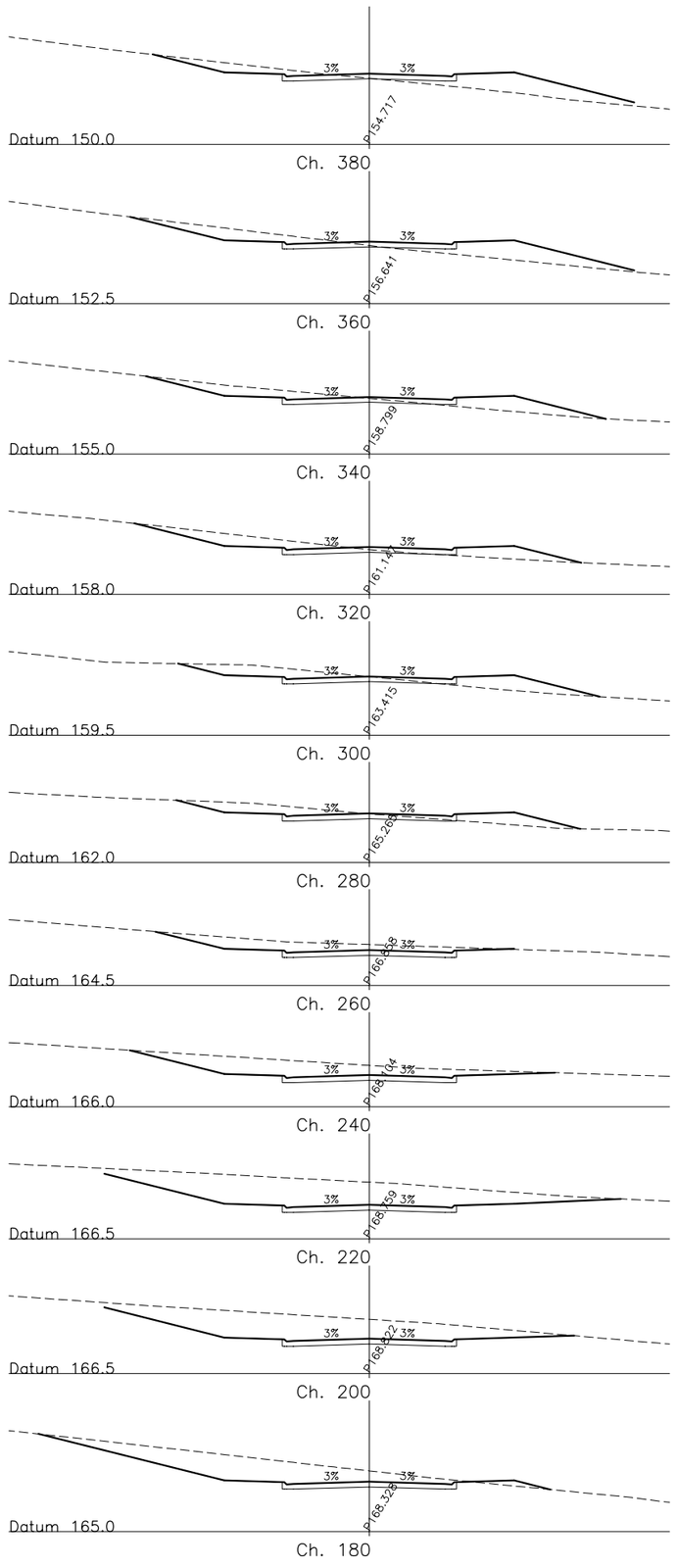
0 2 4 6 8
1:200 at A1
1:400 at A3

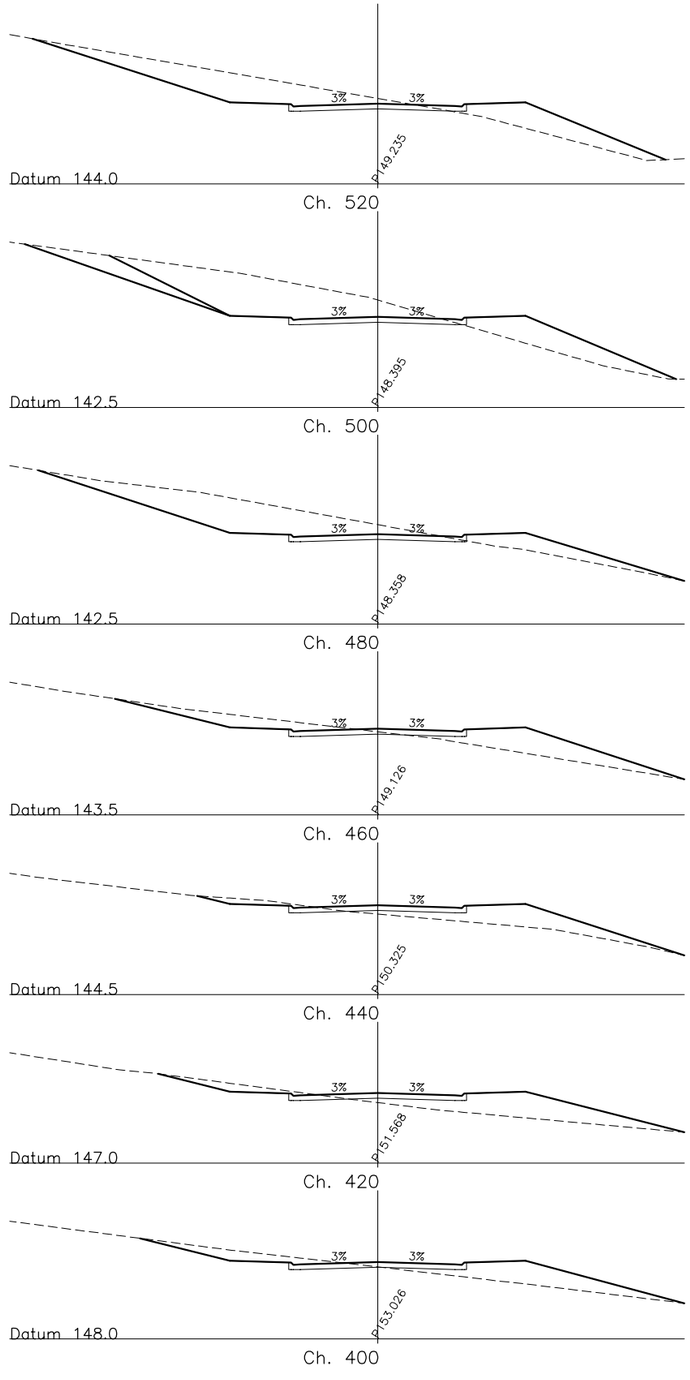
RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS
1355 - 07 - SK122







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 100
ROAD TYPE B5 11.0m

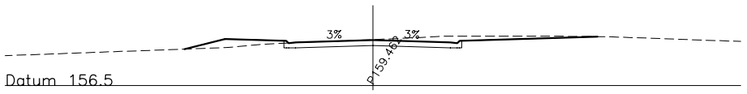
0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

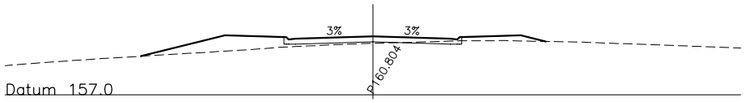
vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS
1355 - 07 - SK123

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN



Ch. 80



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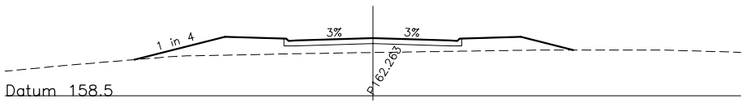
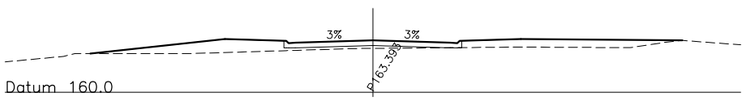
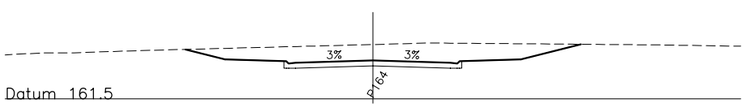


Ch. 40



Ch. 20



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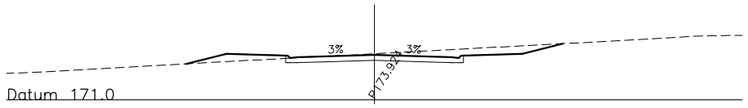
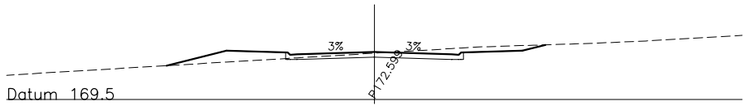


Ch. 160



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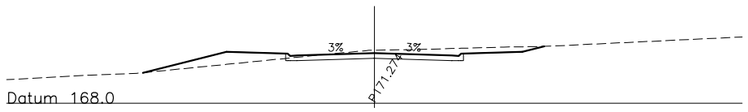
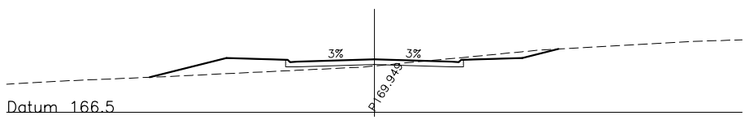


Ch. 120



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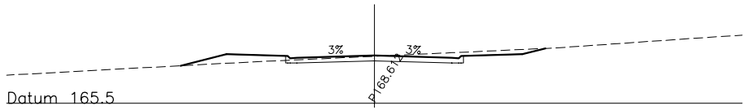

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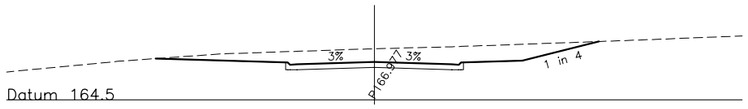

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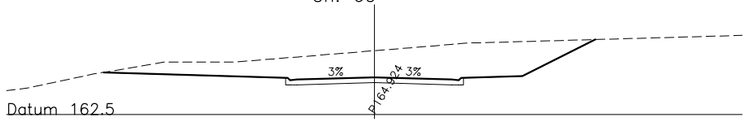

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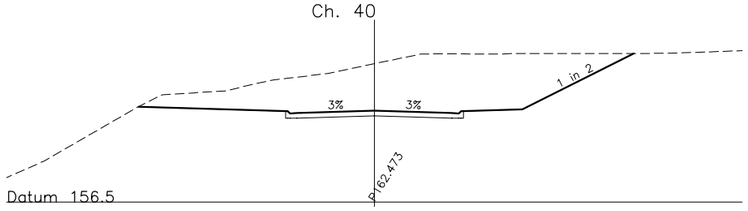

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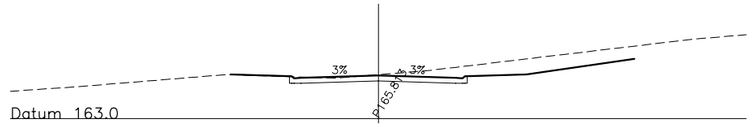
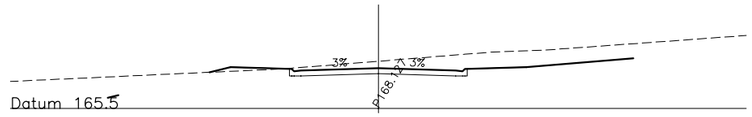
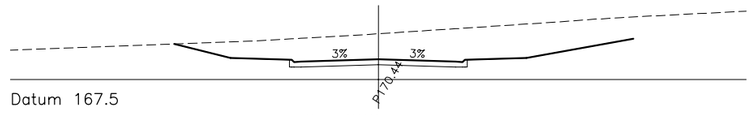


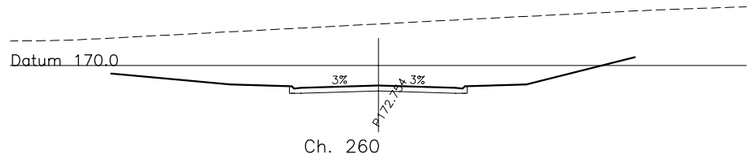
Ch. 320



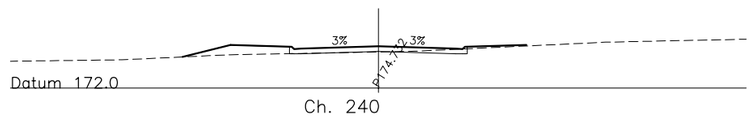
Ch. 300



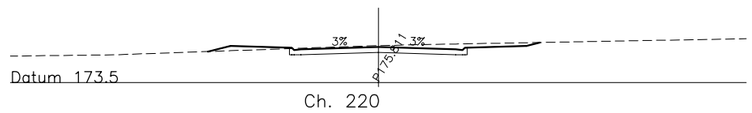
Ch. 280



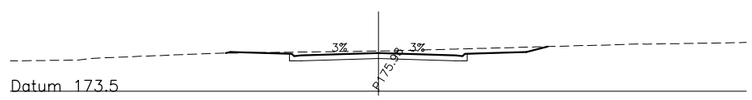
Ch. 260



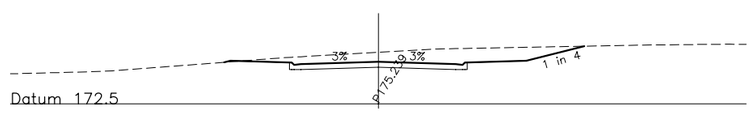
Ch. 240



Ch. 220



Ch. 200



Ch. 180

CROSS SECTION - ROAD 101

ROAD TYPE A 13.4m

CROSS SECTION - ROAD 102

ROAD TYPE B3 11.0m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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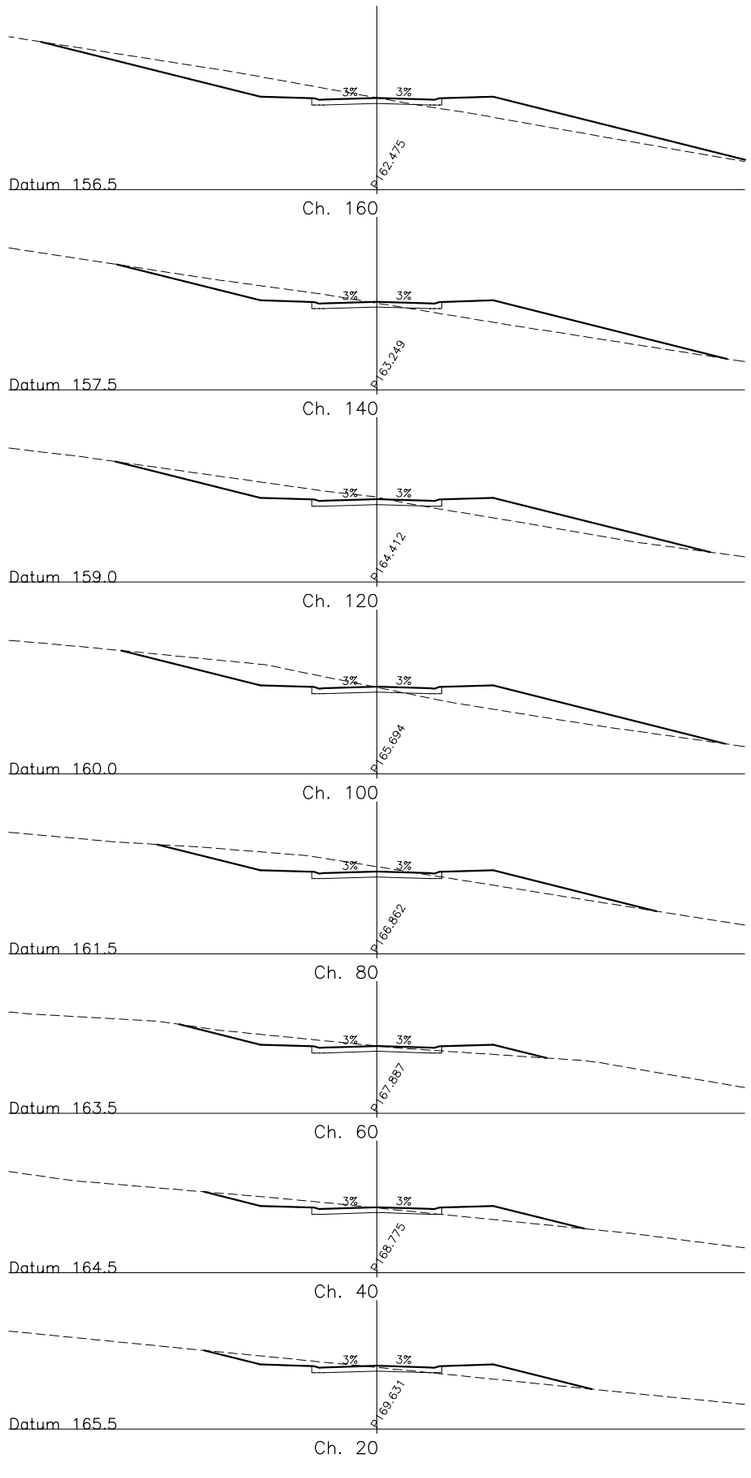
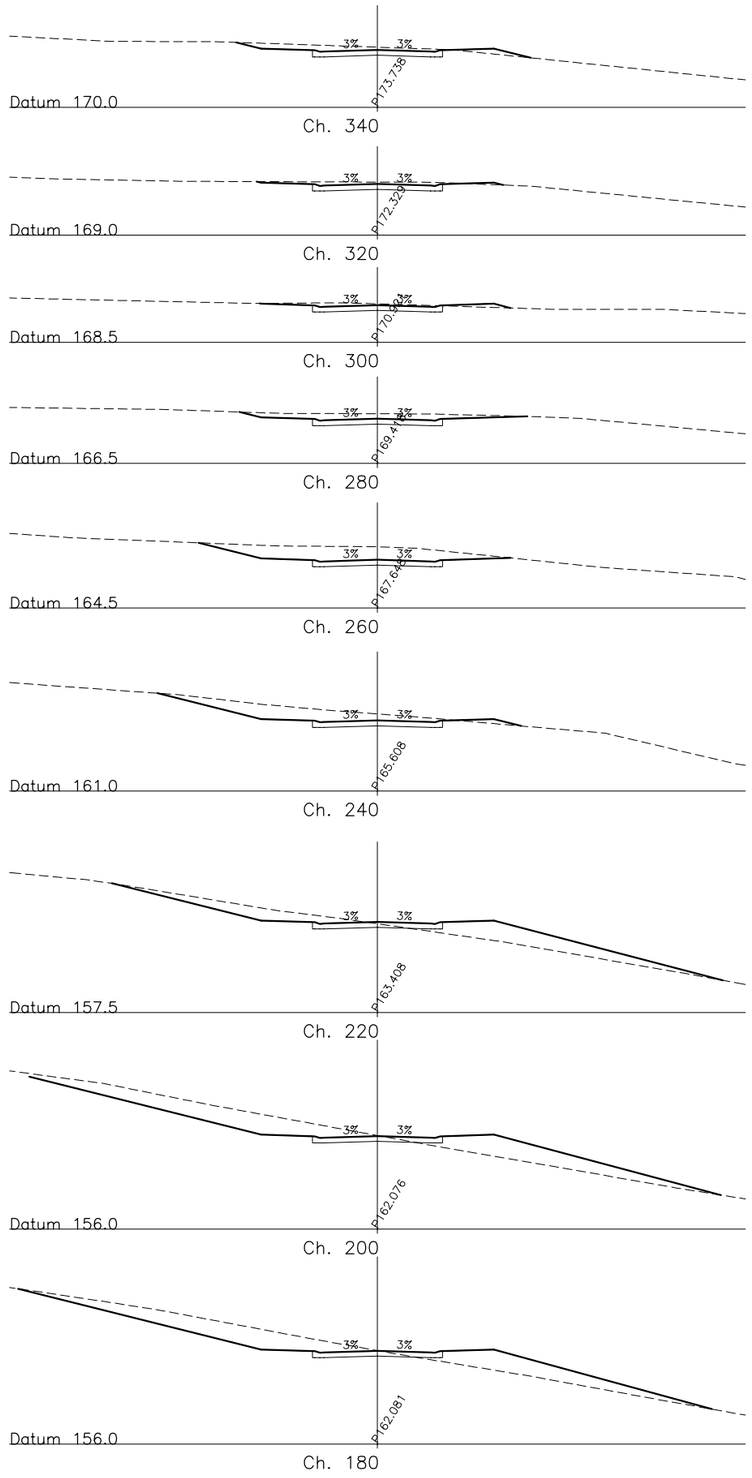
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS

1355 - 07 - SK124

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

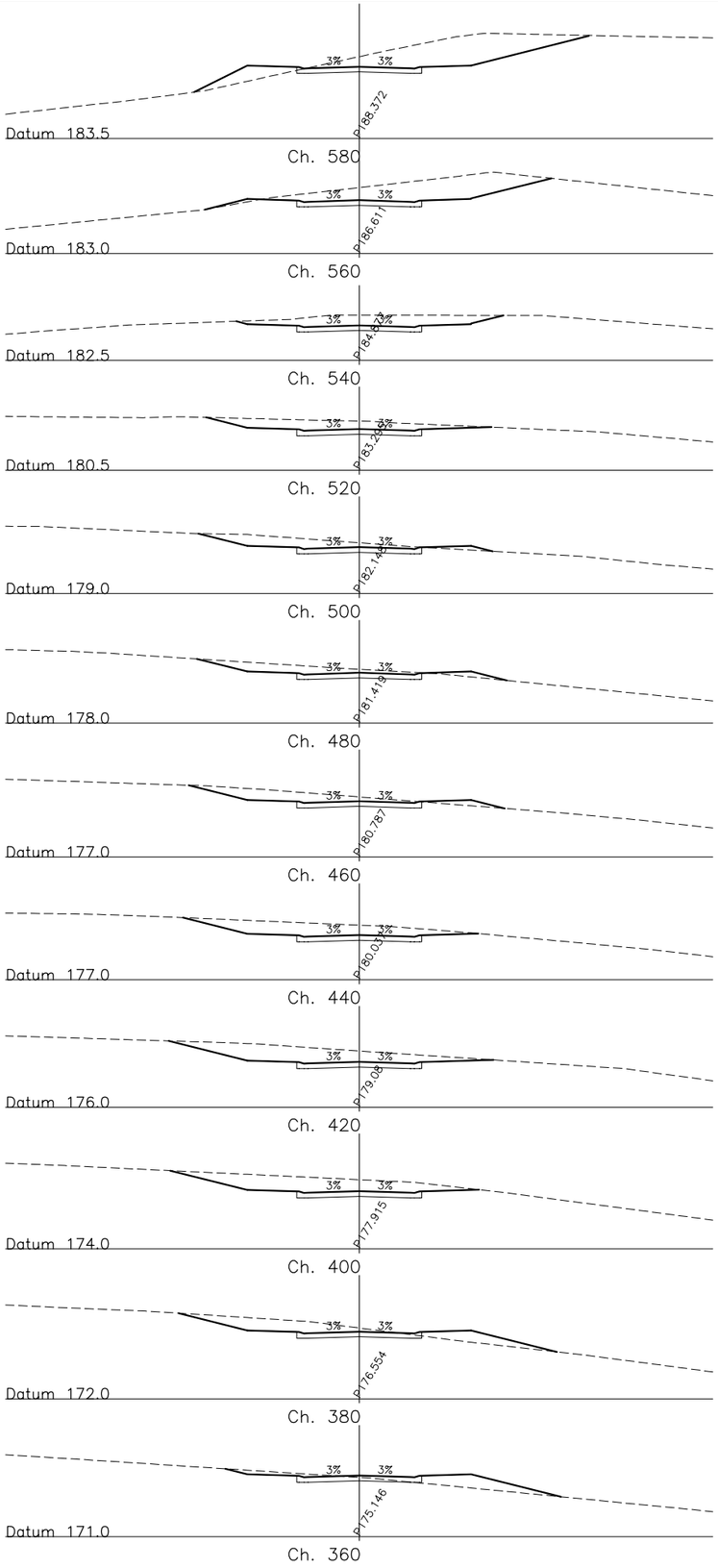
CROSS SECTION - ROAD 103

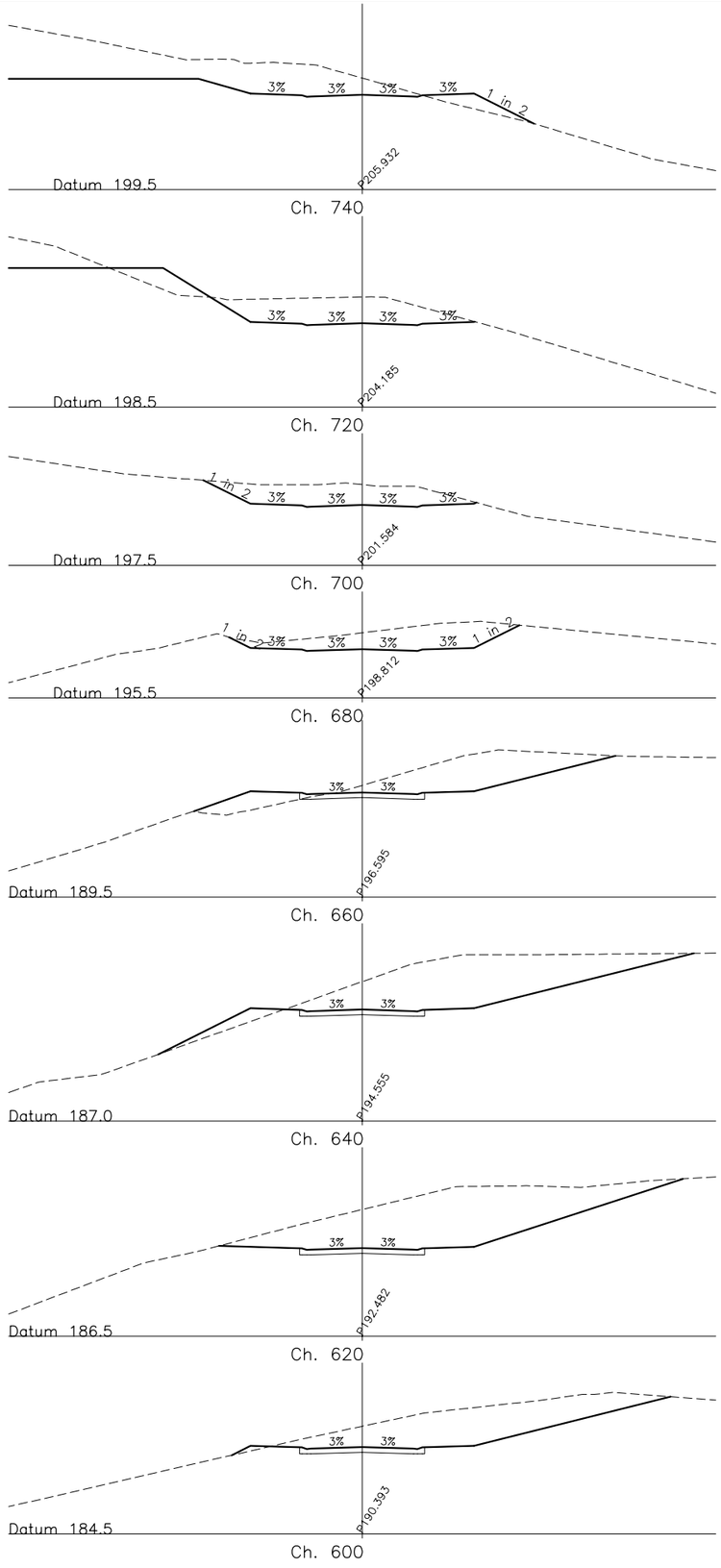
ROAD TYPE C 7.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS

1355 - 07 - SK125





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

CROSS SECTION - ROAD 103

ROAD TYPE C 7.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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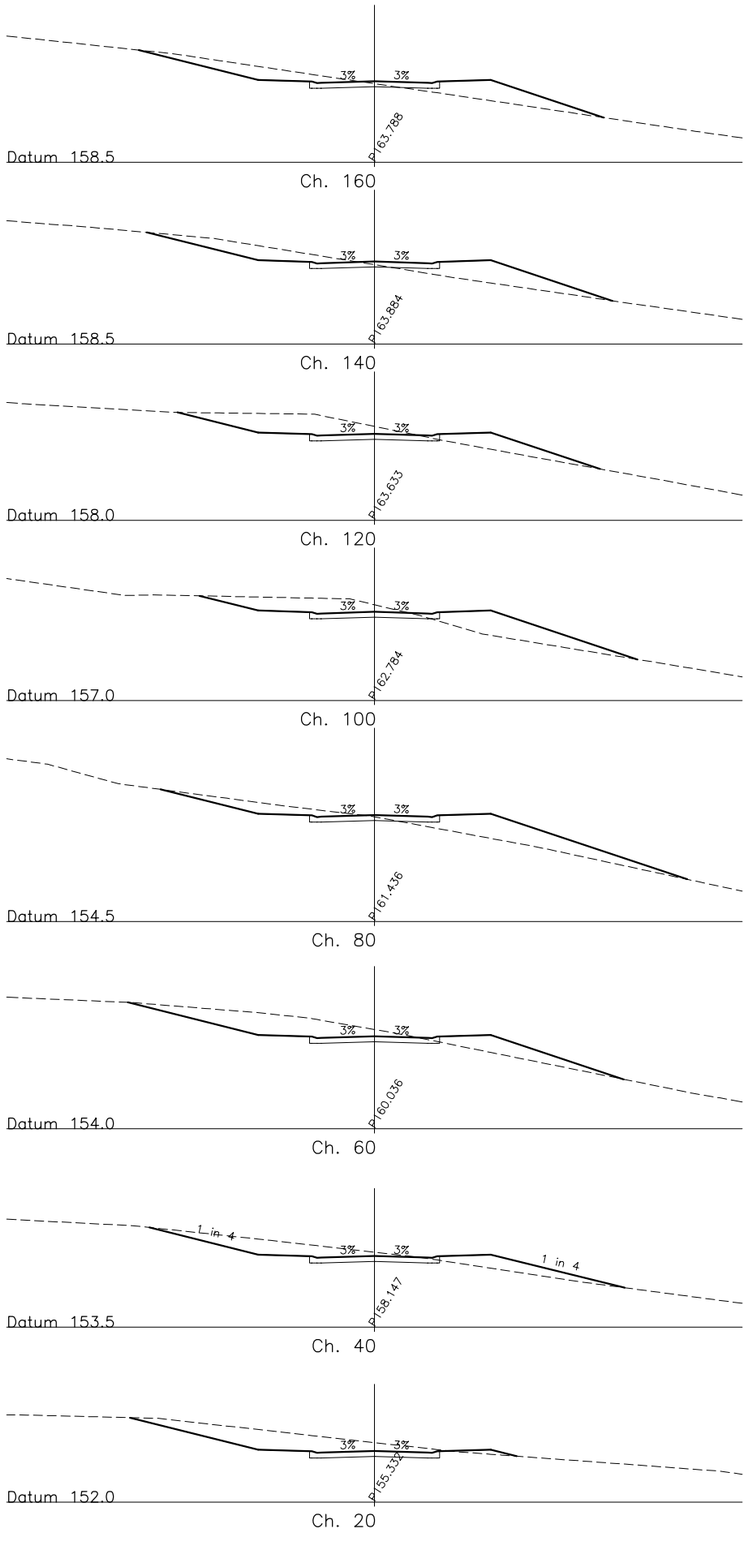
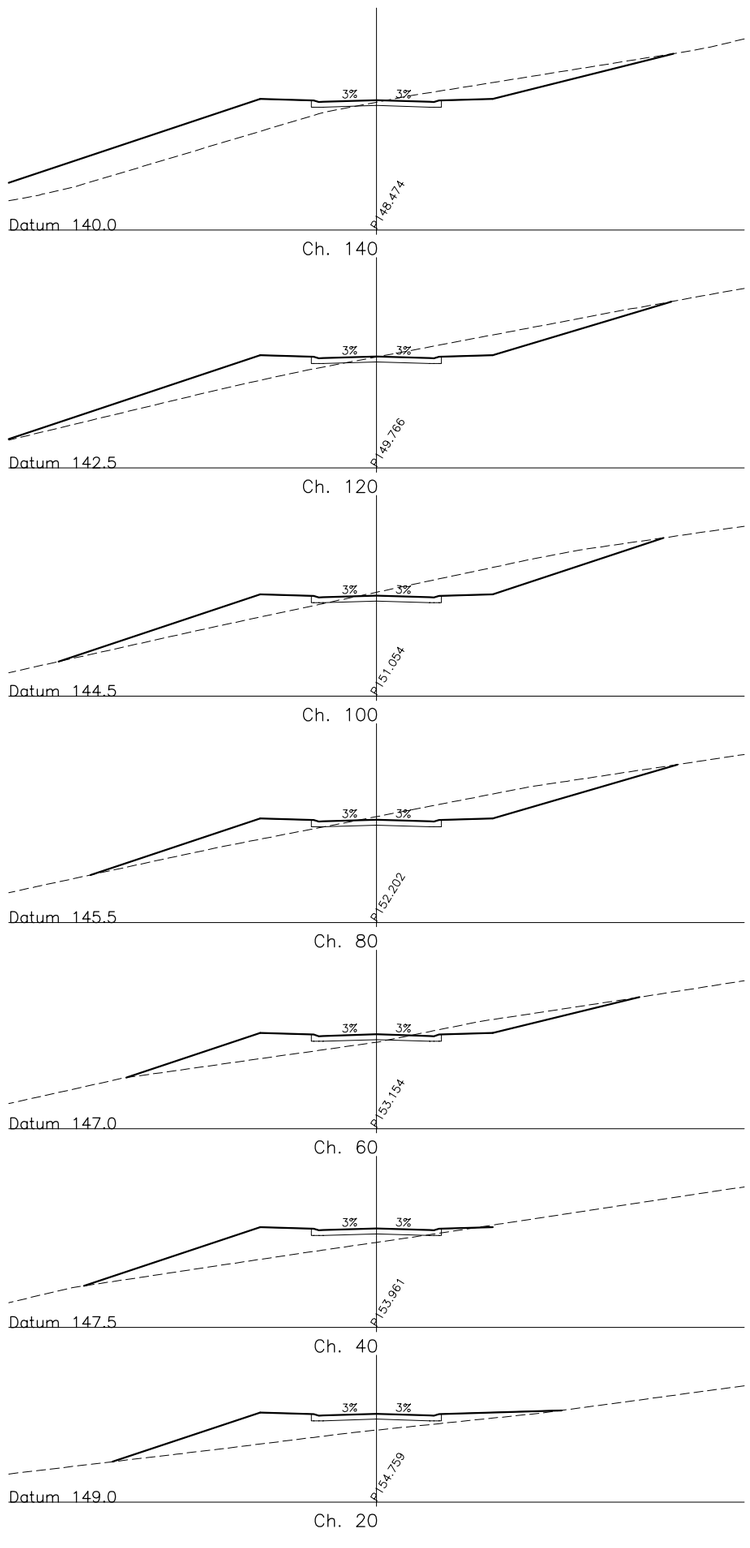
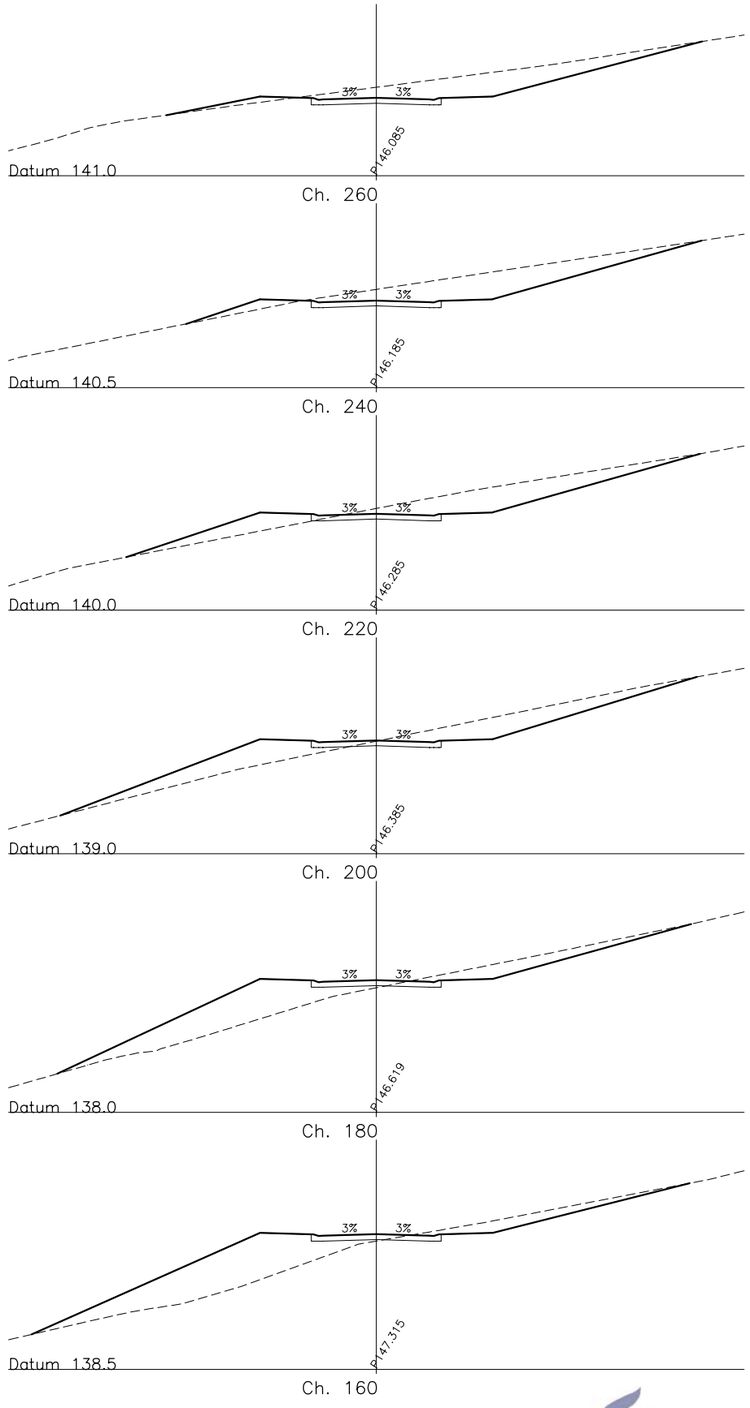
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTIONS
1355 - 07 - SK126 A
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS







PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 104
ROAD TYPE E3 5.5m

CROSS SECTION - ROAD 105
ROAD TYPE E3 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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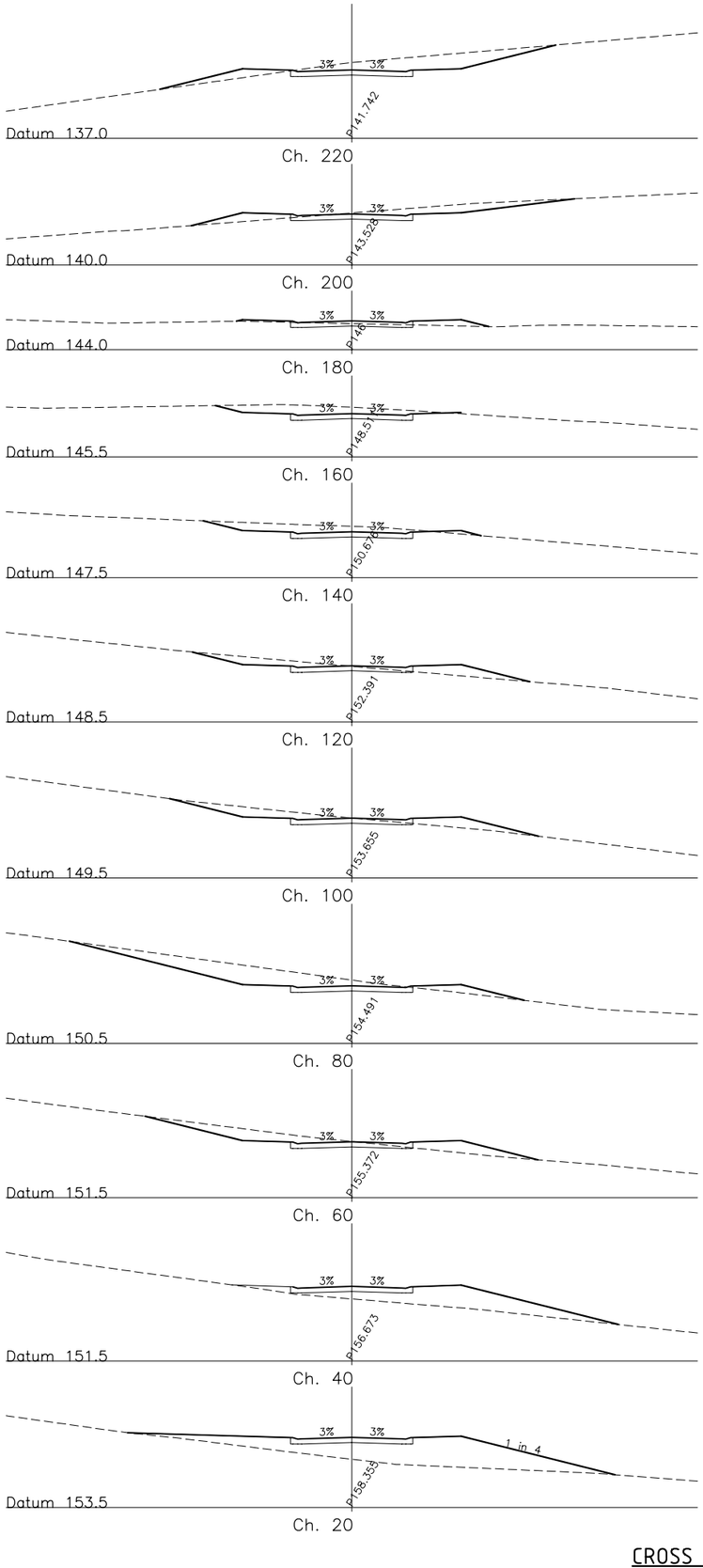
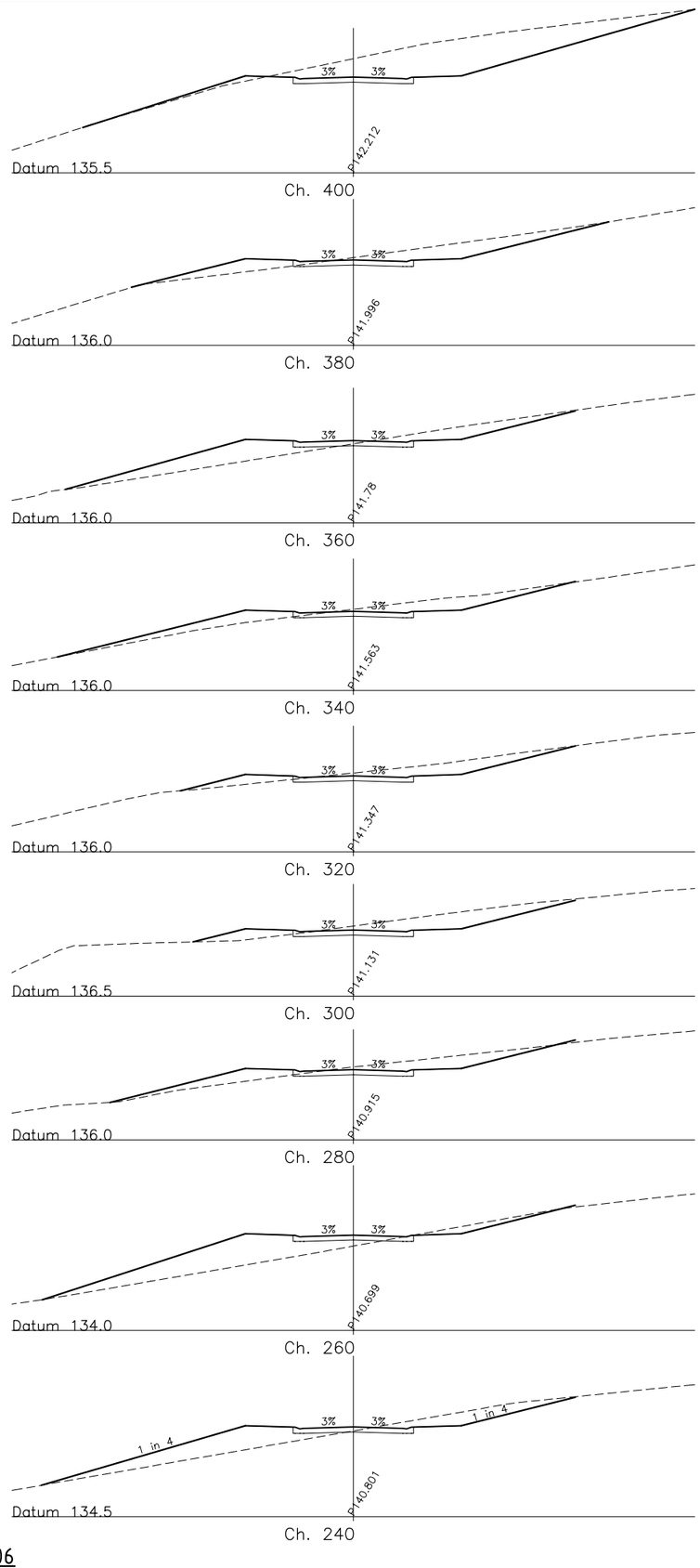
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

CROSS SECTIONS
1355 - 07 - SK127





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

RISE
ABOVE IT ALL

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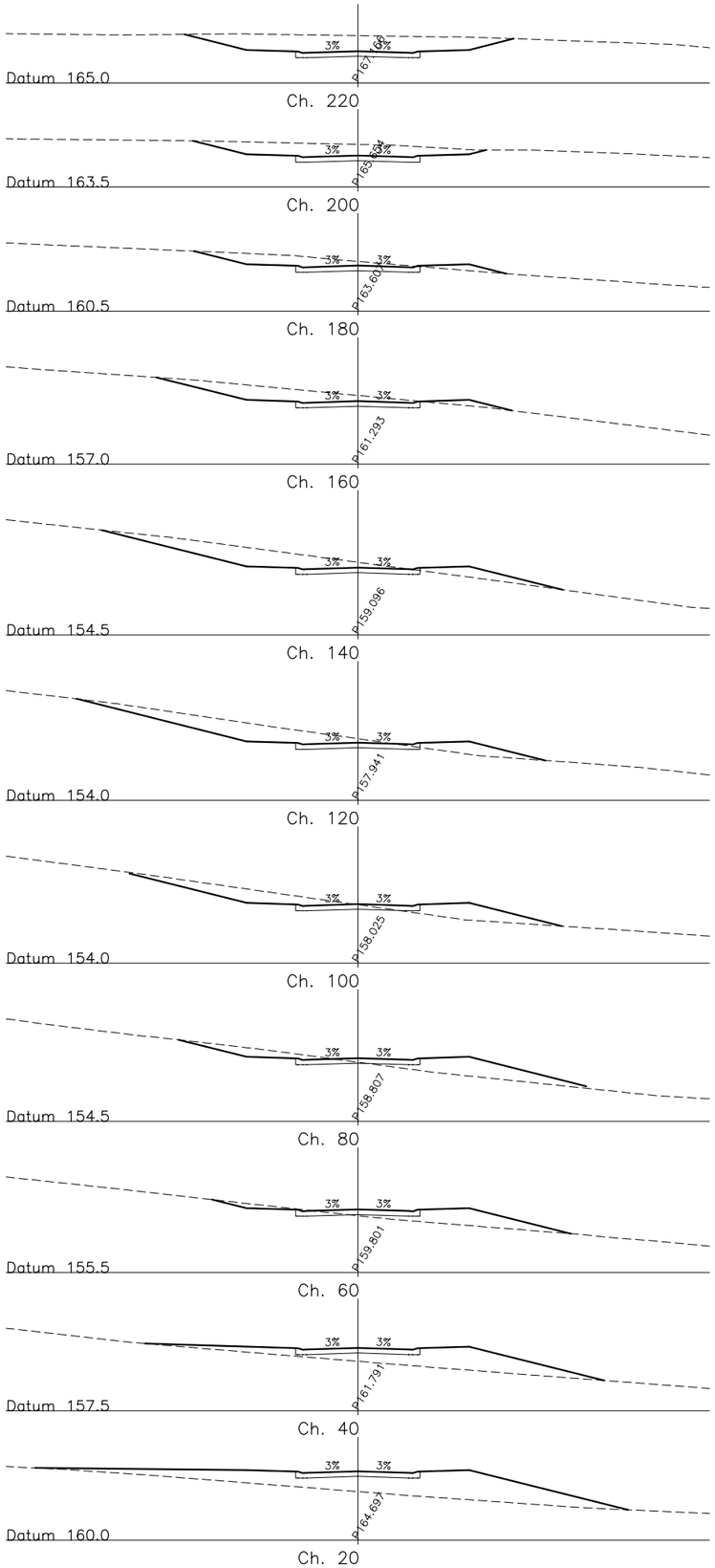
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTION - ROAD 106
ROAD TYPE D1 6.0m

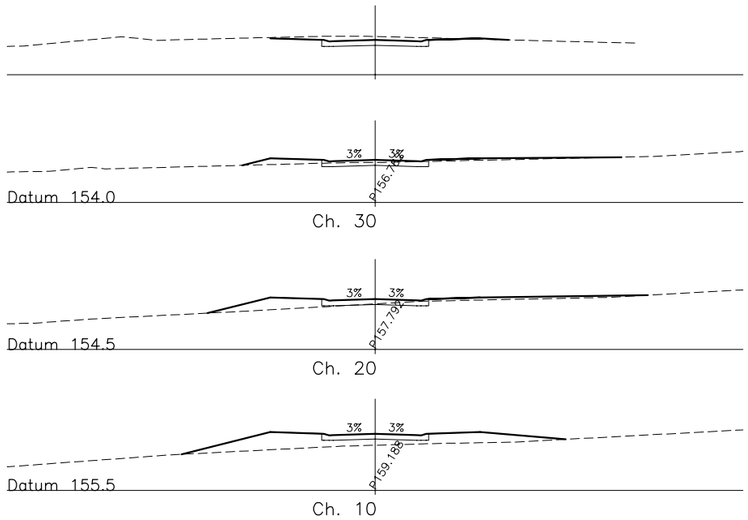
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK128



CROSS SECTION - ROAD 107

ROAD TYPE C 7.5m

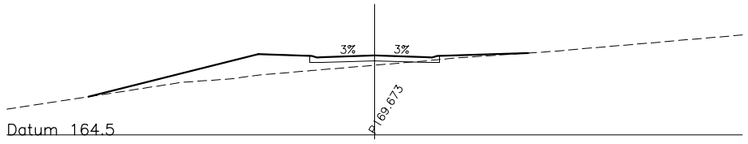


ROAD TYPE E2 5.5m

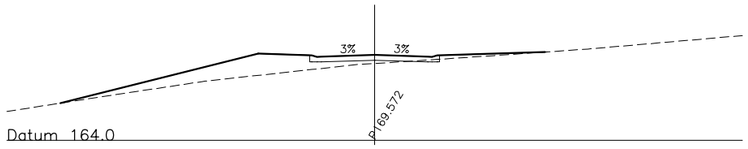
PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

0 2 4 6 8
1:200 at A1
1:400 at A3

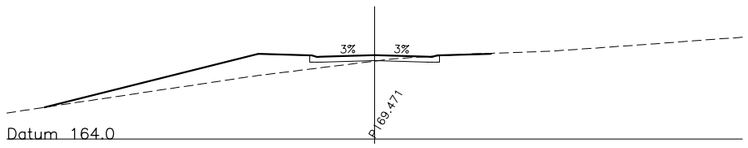
1355 - 07 - SK129



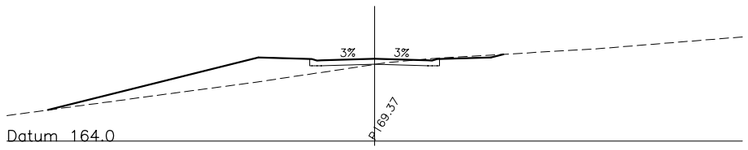
Ch. 140



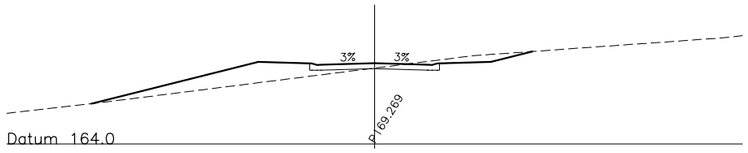
Ch. 120



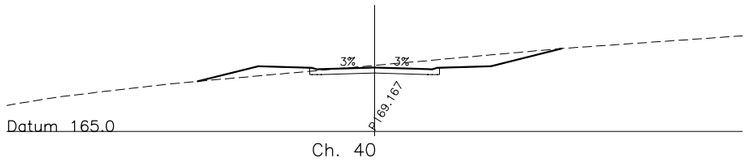
Ch. 100



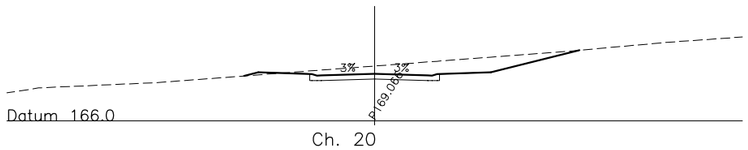
Ch. 80



Ch. 60



Ch. 40



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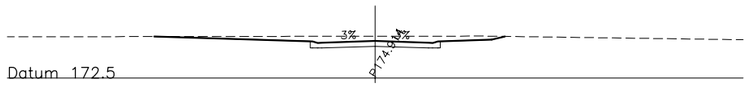
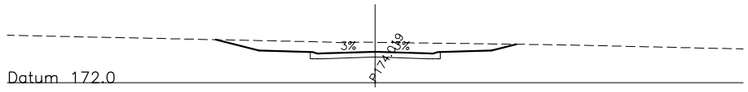
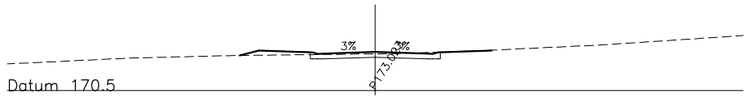


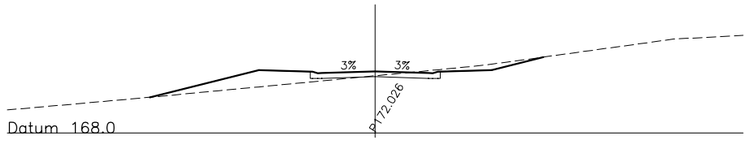
Ch. 280



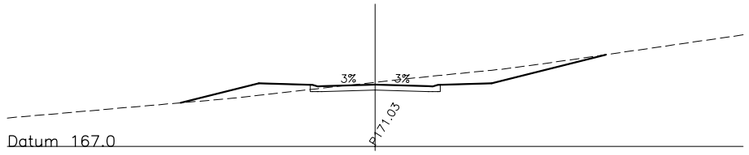
Ch. 260



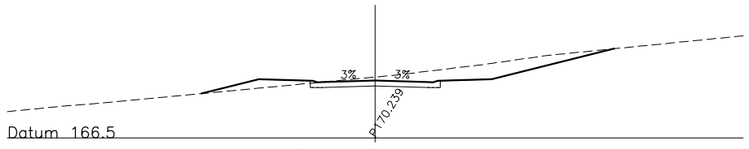
Ch. 240



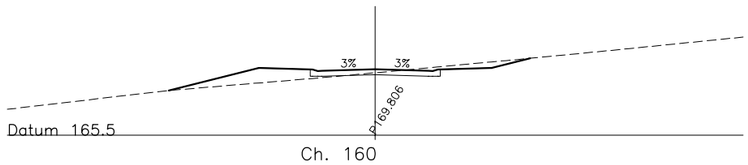
Ch. 220



Ch. 200



Ch. 180



Ch. 160

CROSS SECTION - ROAD 109

ROAD TYPE D2 6.0m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

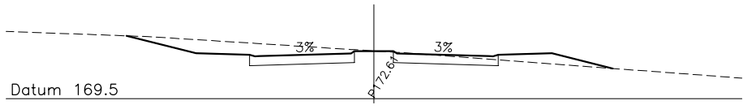
RISE
ABOVE IT ALL

vkl consulting
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

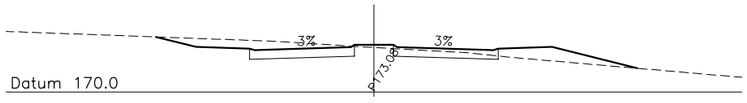
0 2 4 6 8
1:200 at A1
1:400 at A3

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

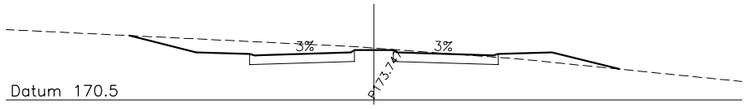
CROSS SECTIONS
1355 - 07 - SK130



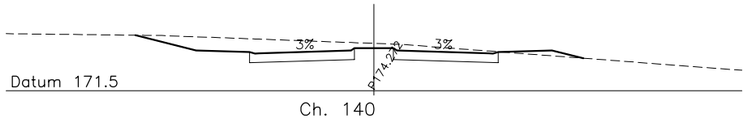
Ch. 200



Ch. 180



Ch. 160



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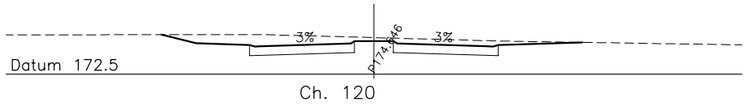

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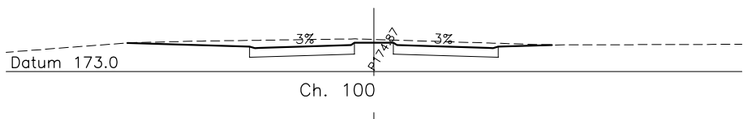
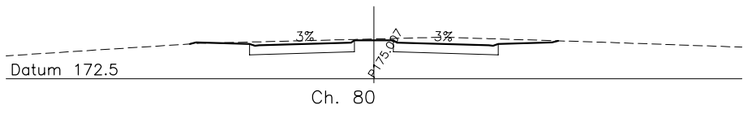
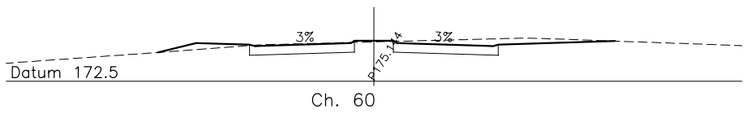


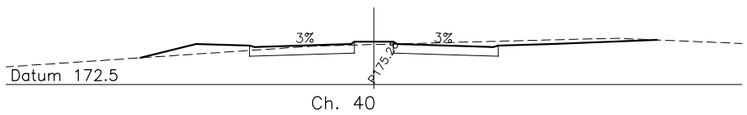
Ch. 100



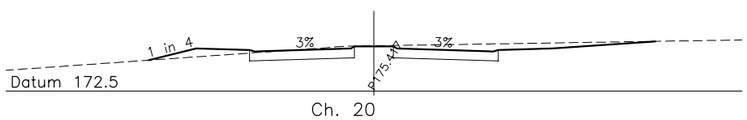
Ch. 80



Ch. 60



Ch. 40



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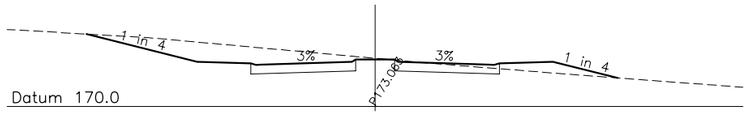
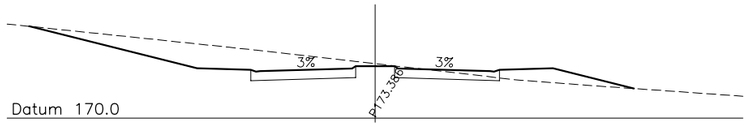
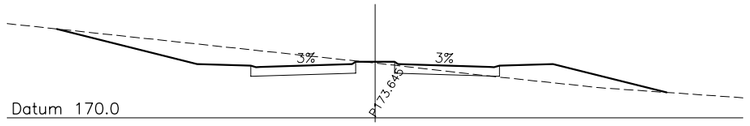


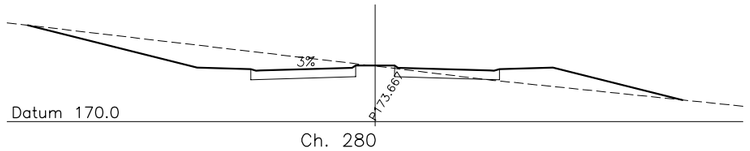
Ch. 340



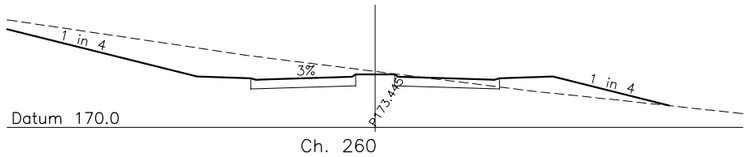
Ch. 320



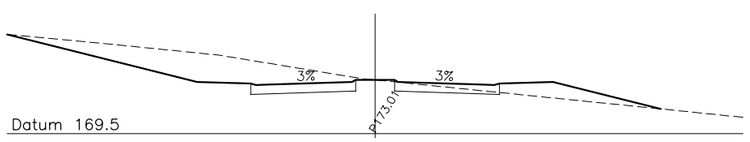
Ch. 300



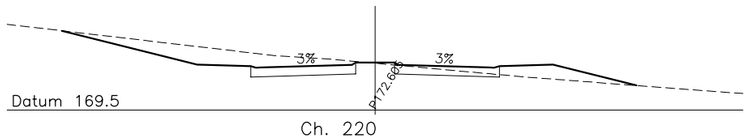
Ch. 280



Ch. 260



Ch. 240



Ch. 220

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 110

ROAD TYPE B4 15.0m

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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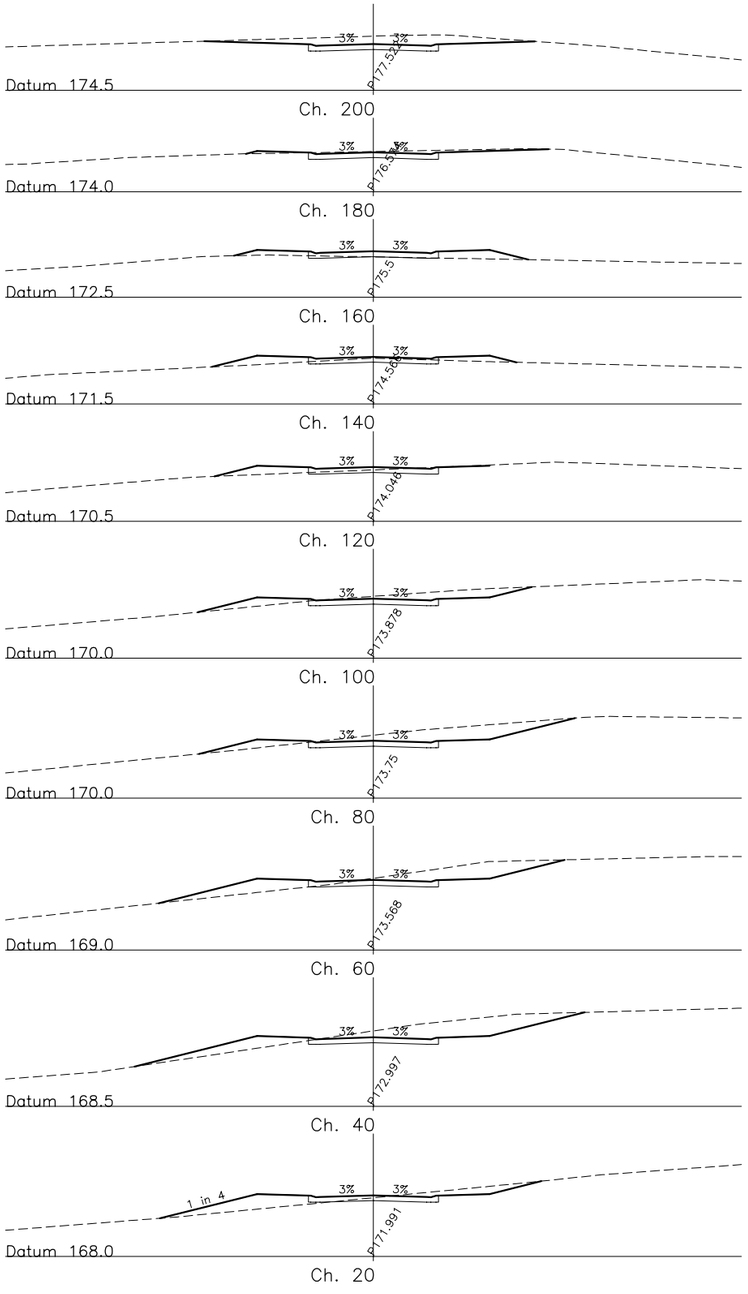
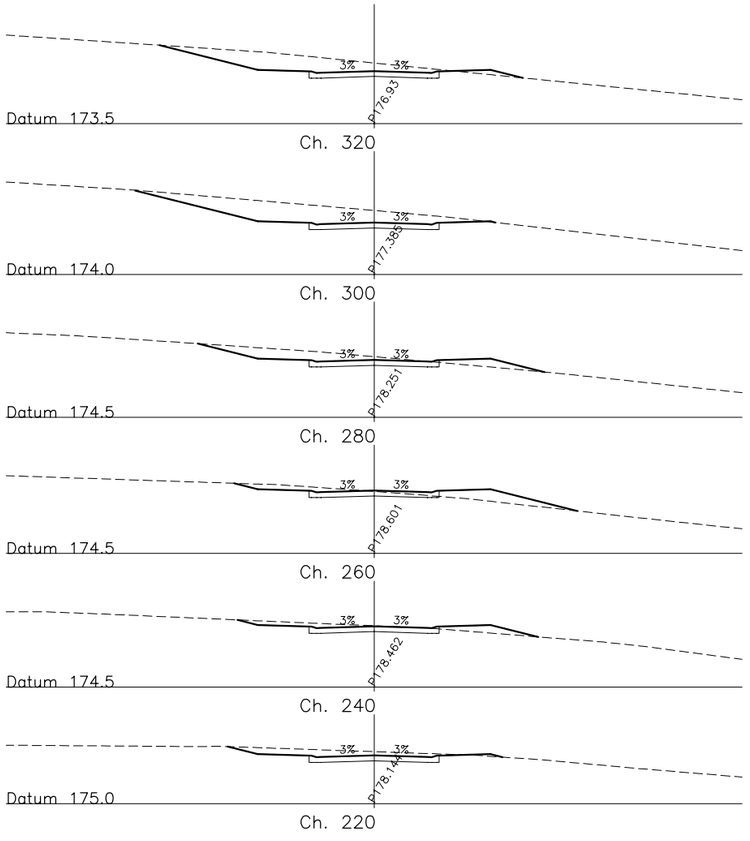
ABN: 55 114 638 934

CROSS SECTIONS
1355 - 07 - SK131

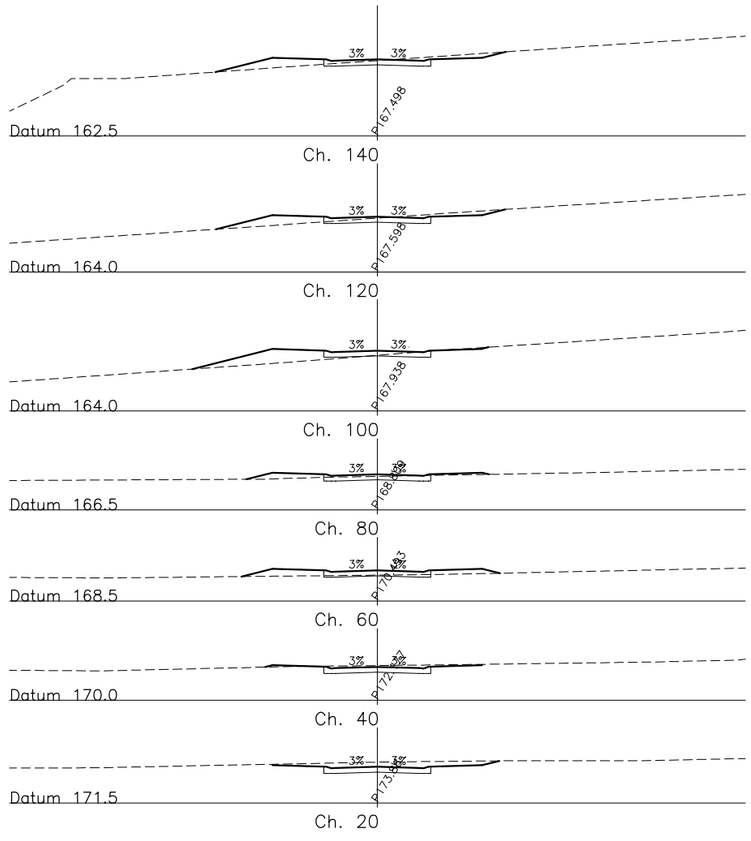
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN





CROSS SECTION - ROAD 111

ROAD TYPE D2 6.0m



CROSS SECTION - ROAD 113

ROAD TYPE D2 6.0m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE ABOVE IT ALL

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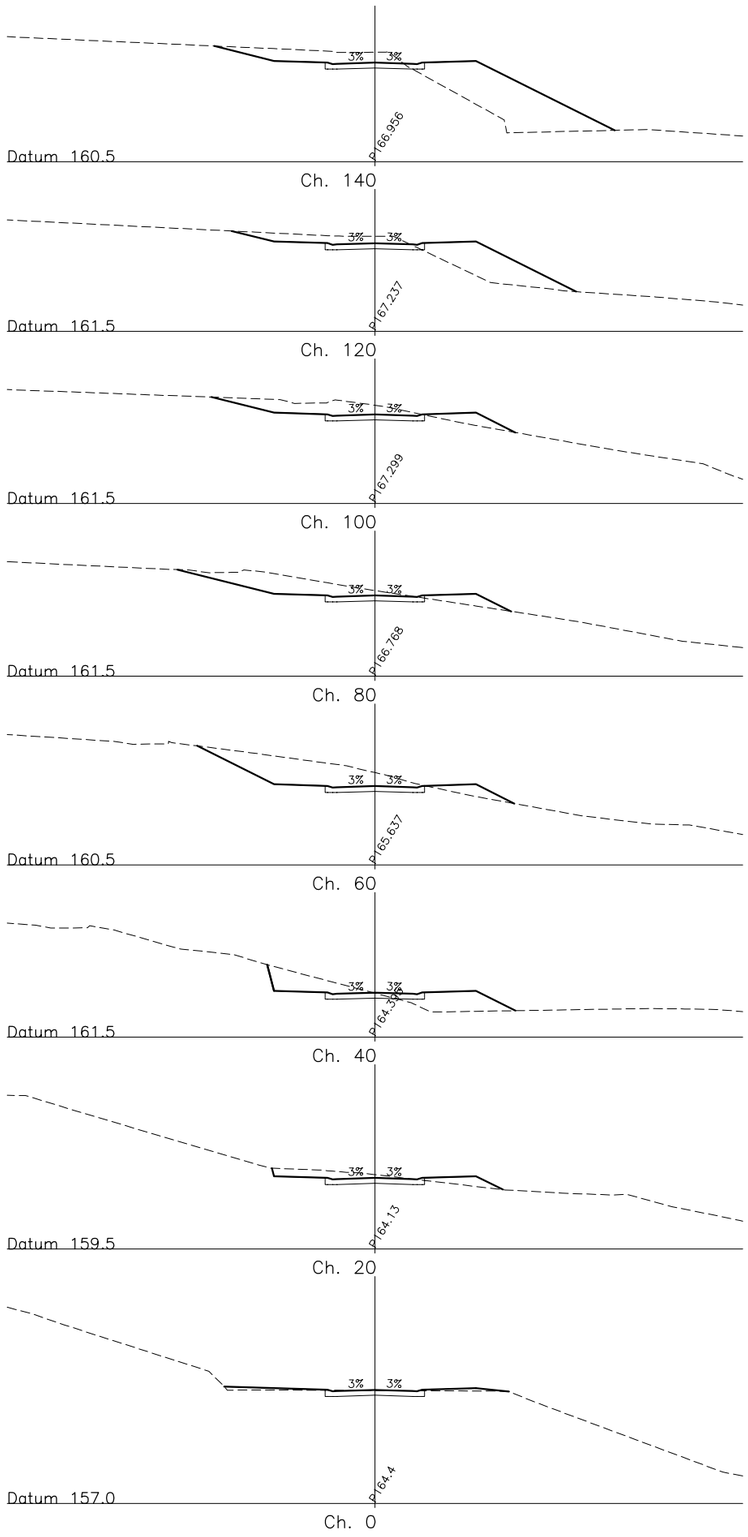
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS

1355 - 07 - SK132



PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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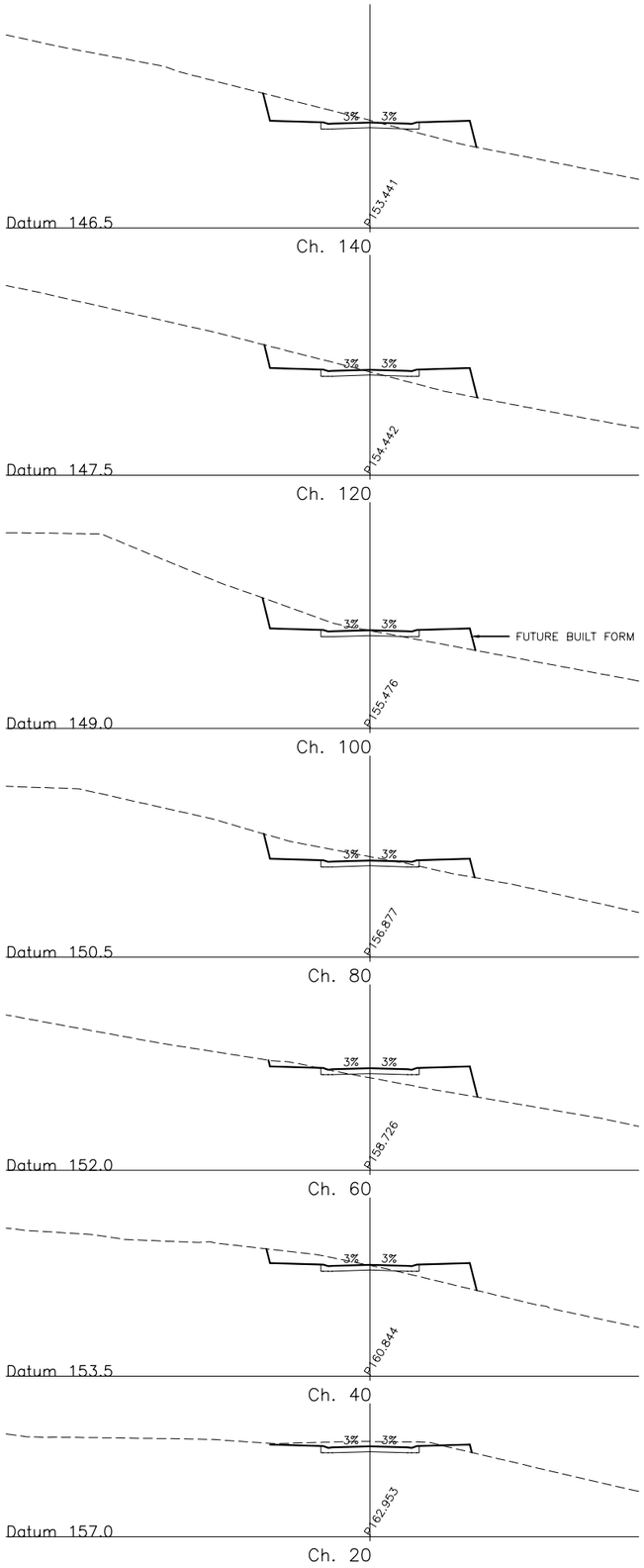
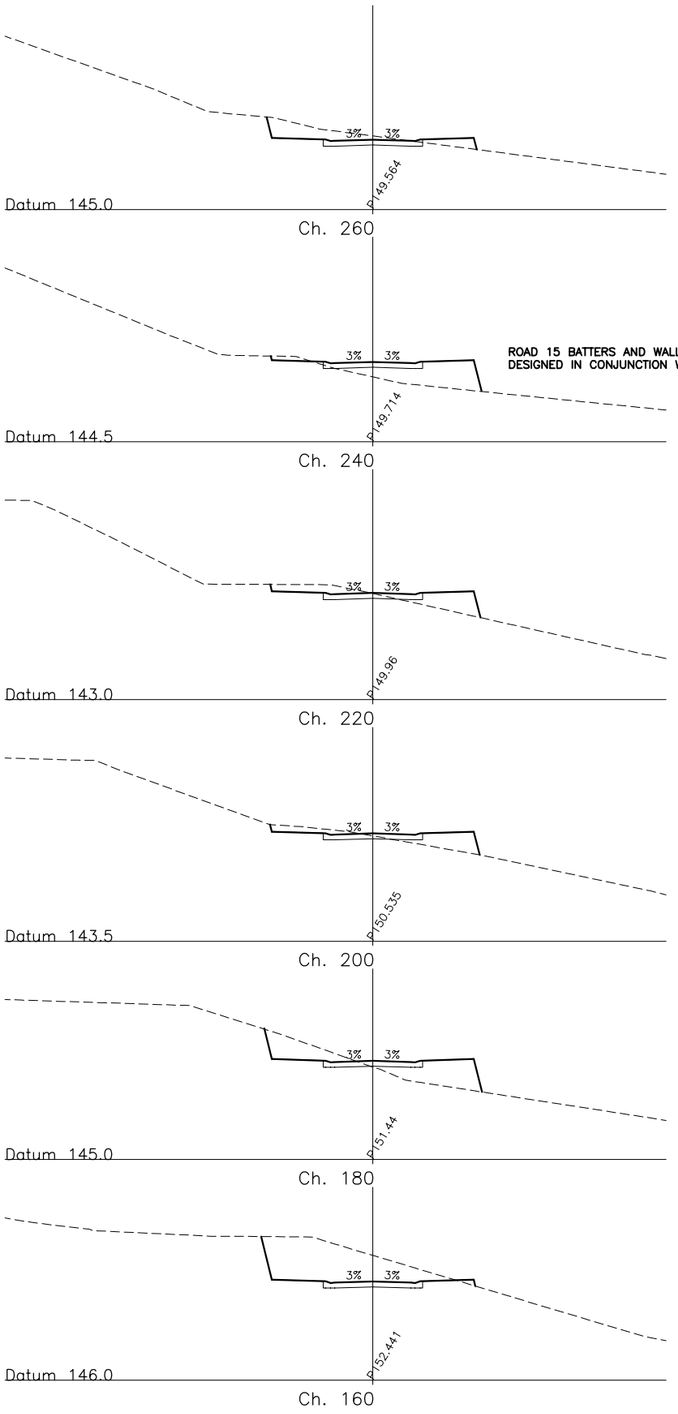
ABN: 55 114 638 934

CROSS SECTION - ROAD 114
ROAD TYPE E2 5.5m

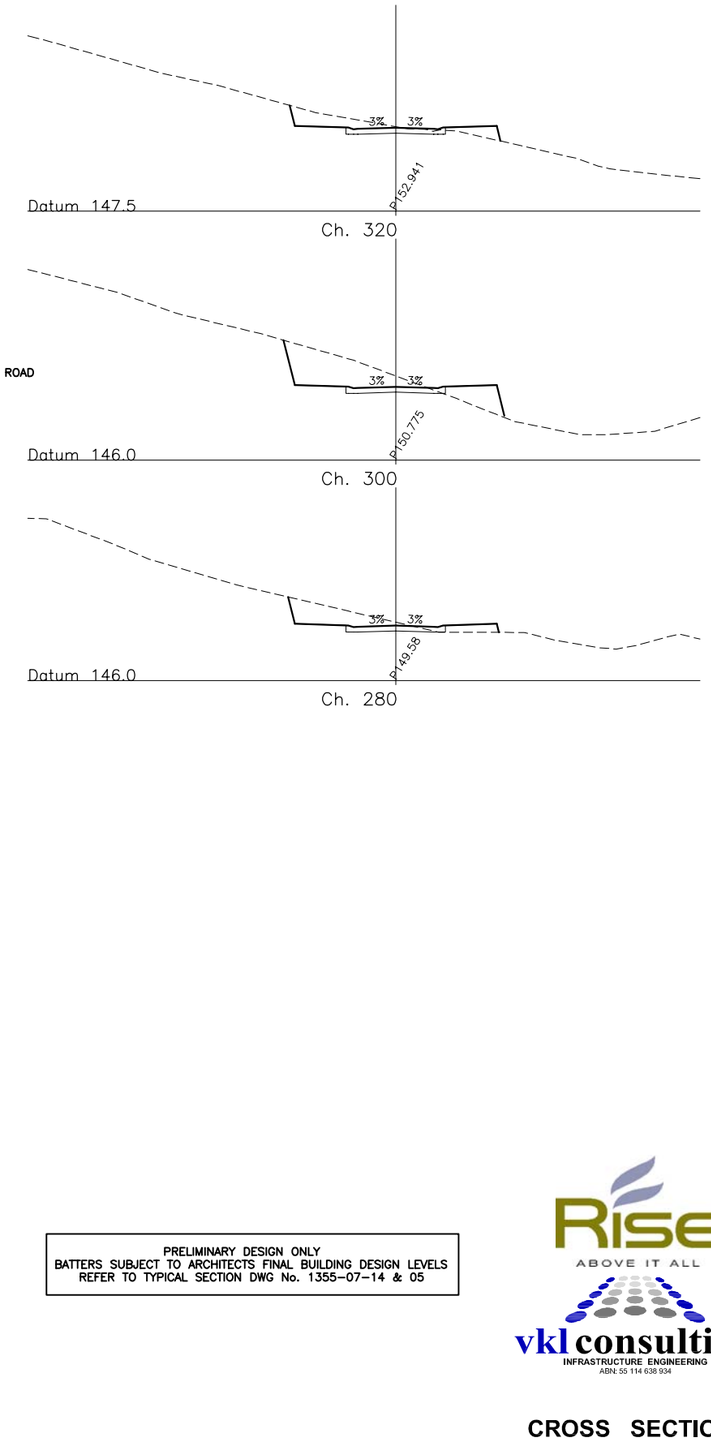
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK133





ROAD 15 BATTERS AND WALLS TO BE DESIGNED IN CONJUNCTION WITH THE SPINE ROAD



PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 115

ROAD TYPE E2 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

RISE
ABOVE IT ALL

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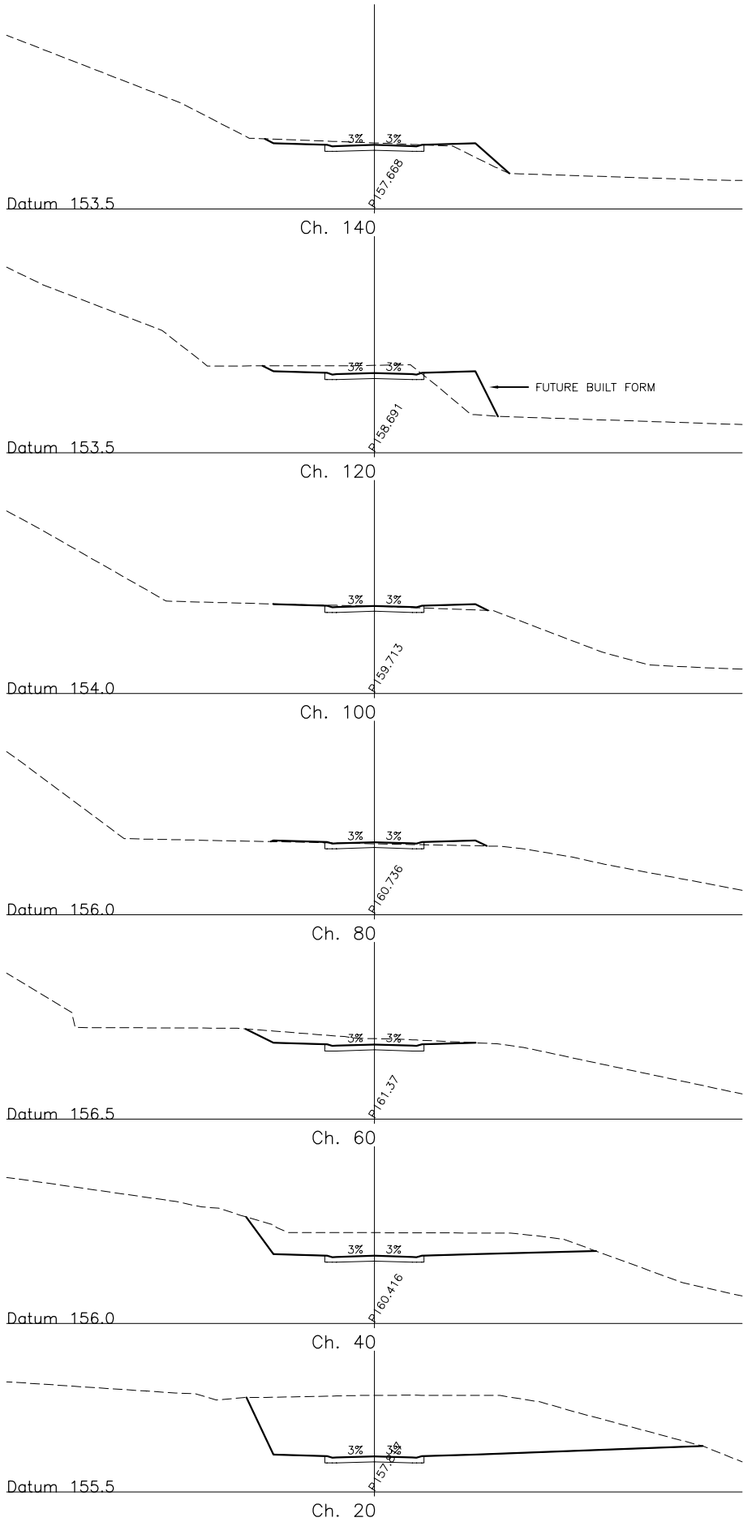
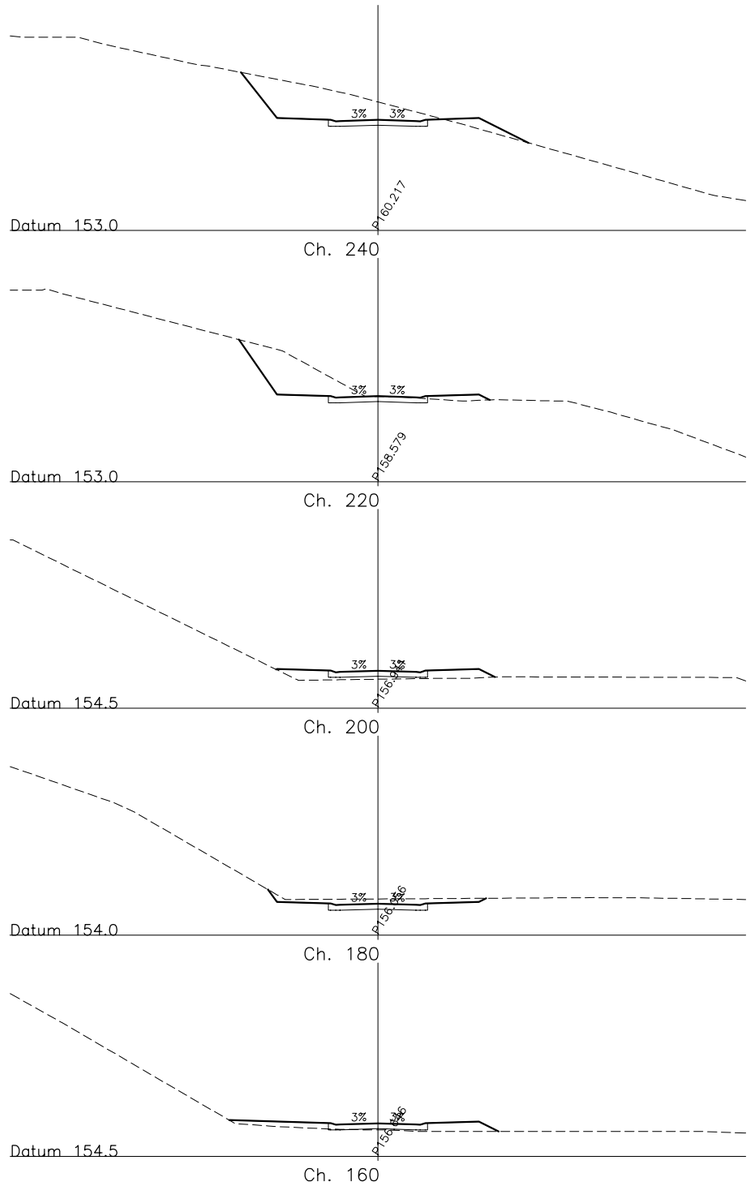
ABN: 55 114 638 934

CROSS SECTIONS

1355 - 07 - SK134 A

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
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ABN: 55 114 638 934

CROSS SECTIONS

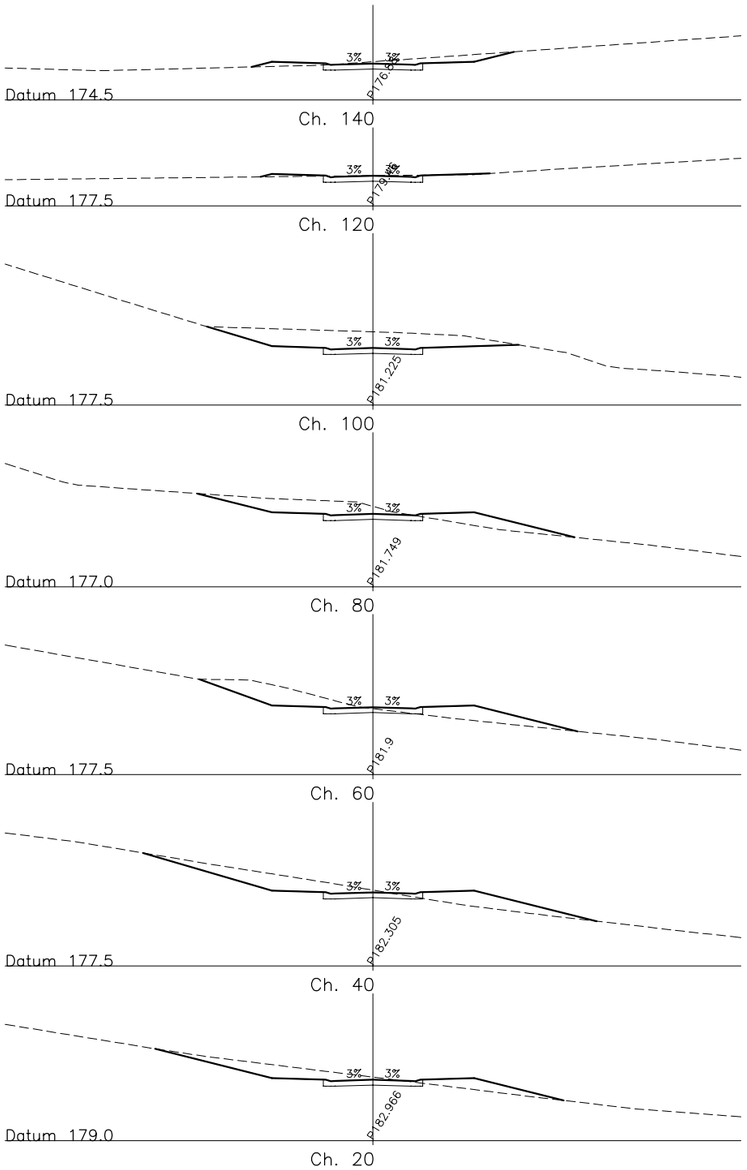
1355 - 07 - SK135 A

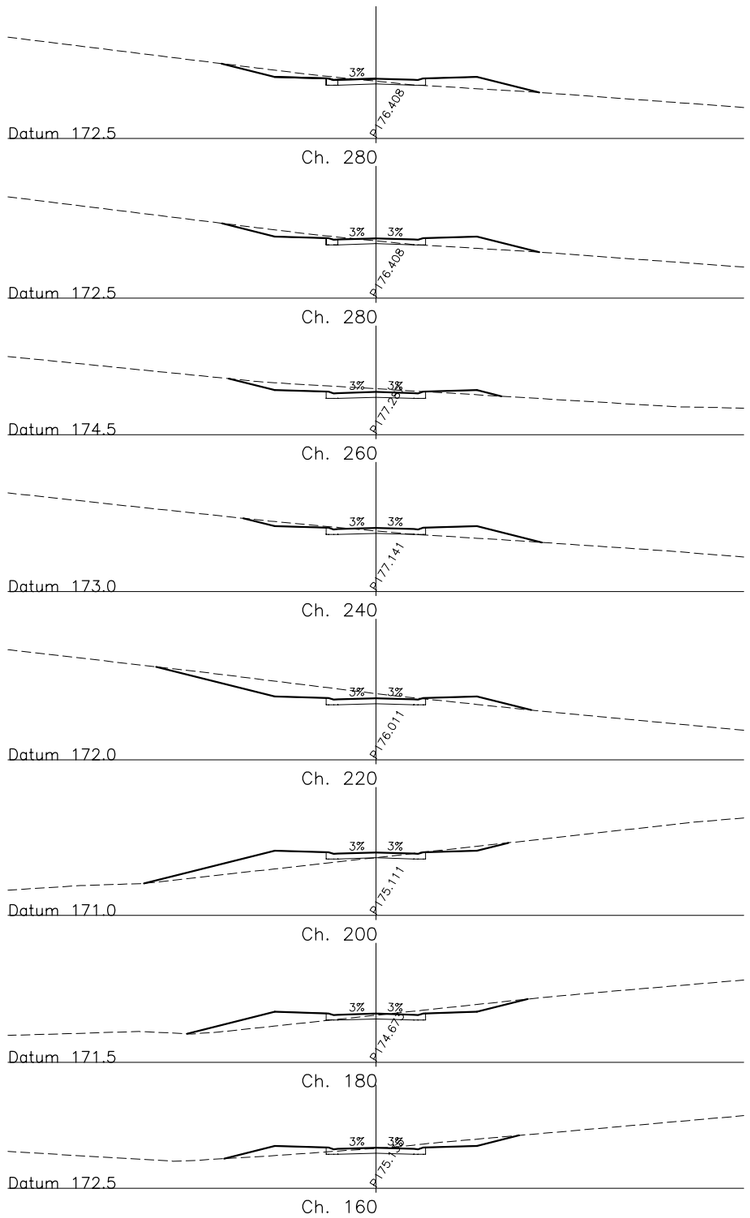
A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTION - ROAD 116
ROAD TYPE E2 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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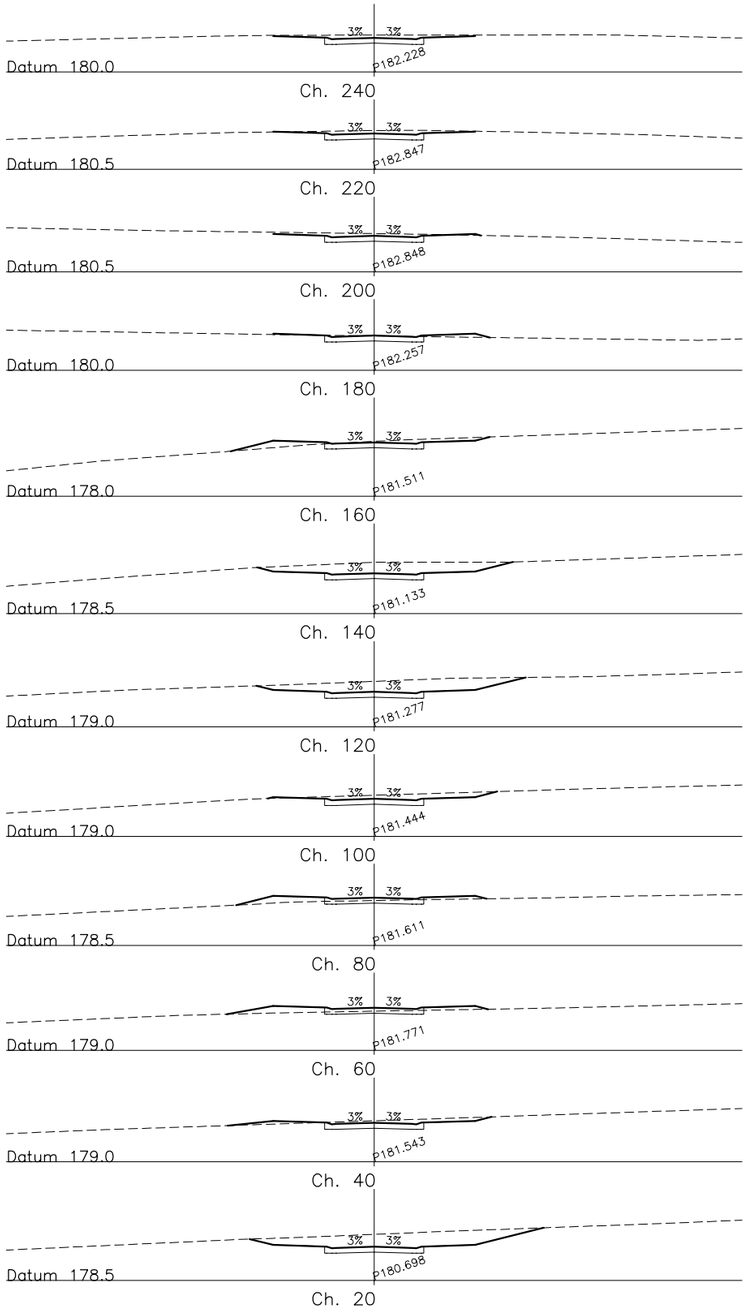
ABN: 55 114 638 934

CROSS SECTION - ROAD 131

ROAD TYPE E3 5.5m

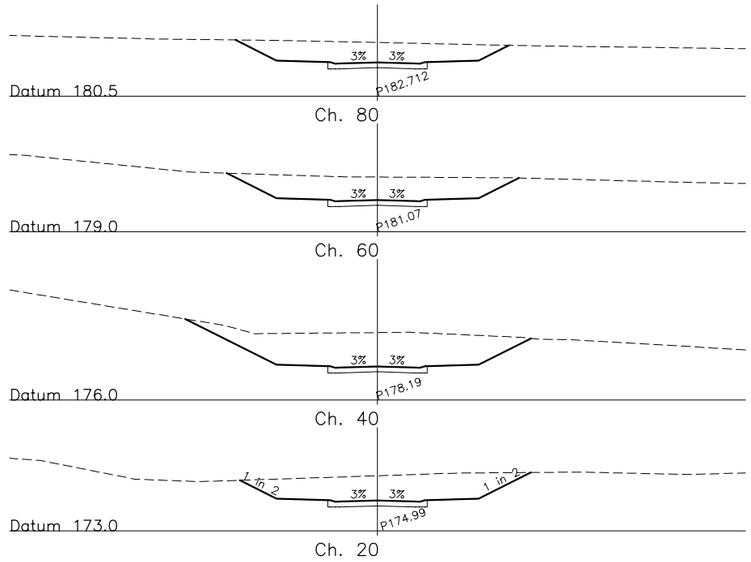
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK136



CROSS SECTION - ROAD 123

ROAD TYPE E3 5.5m



CROSS SECTION - ROAD 120

ROAD TYPE C 7.5m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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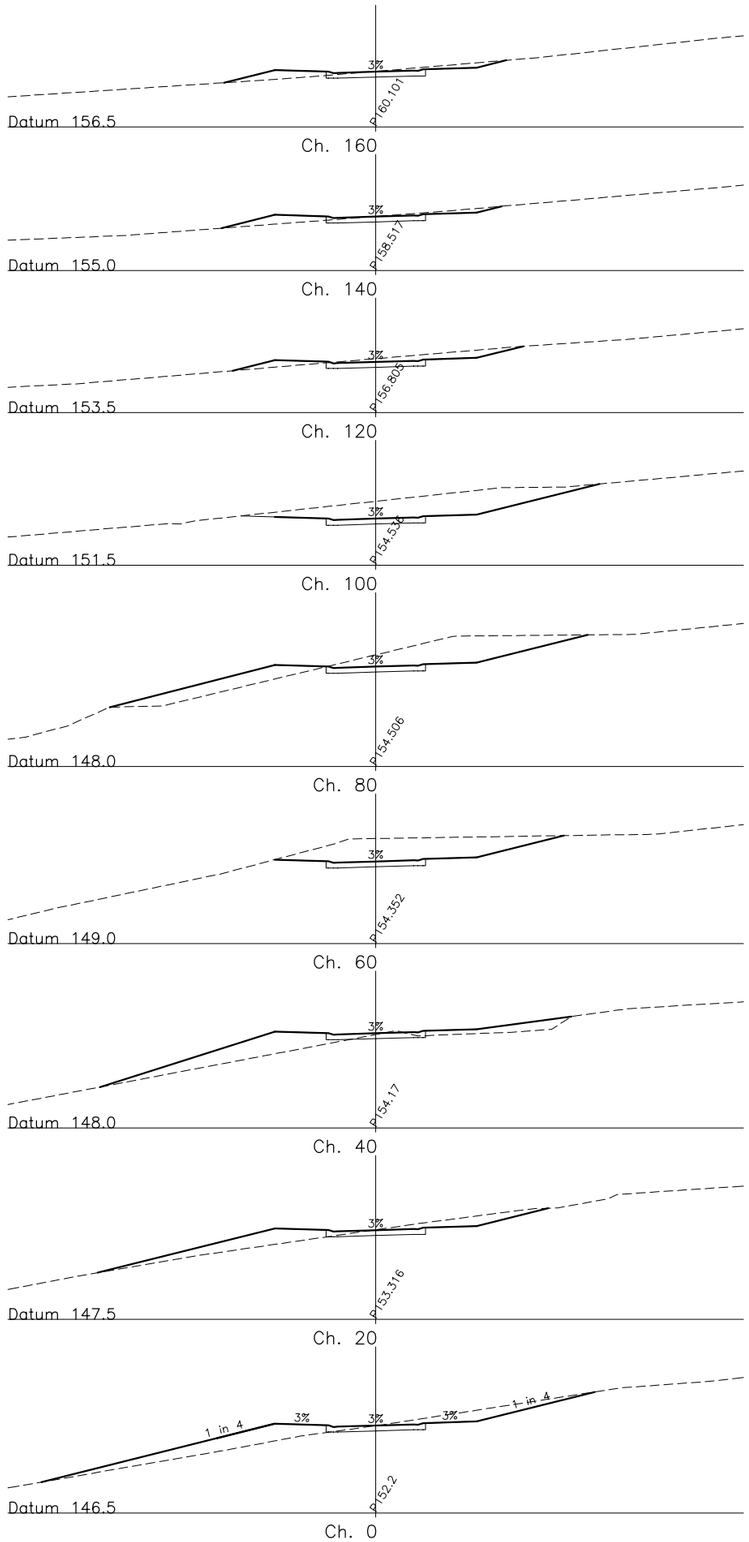
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK137



PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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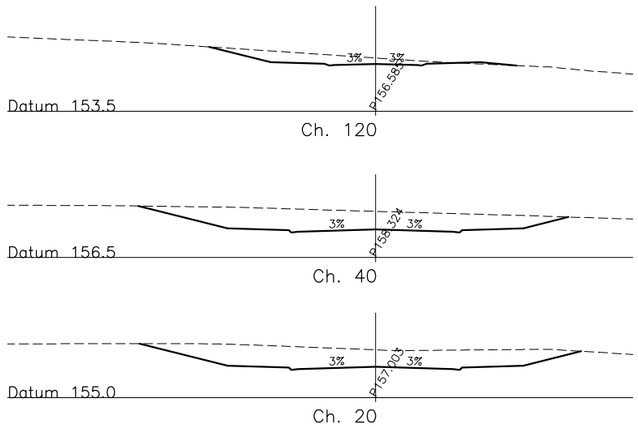
ABN: 55 114 638 934

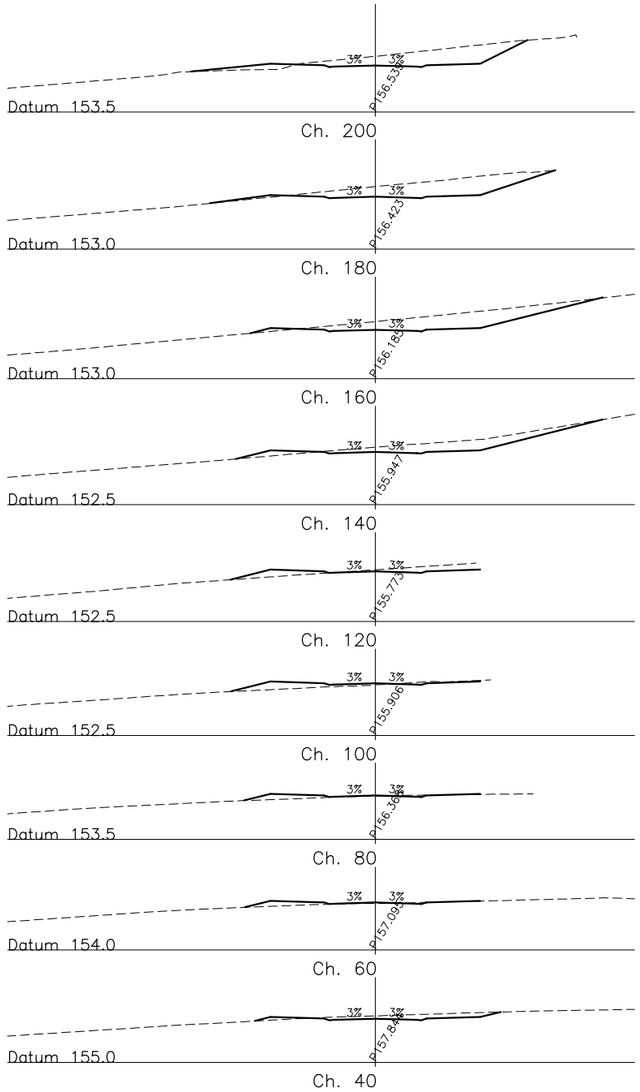
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

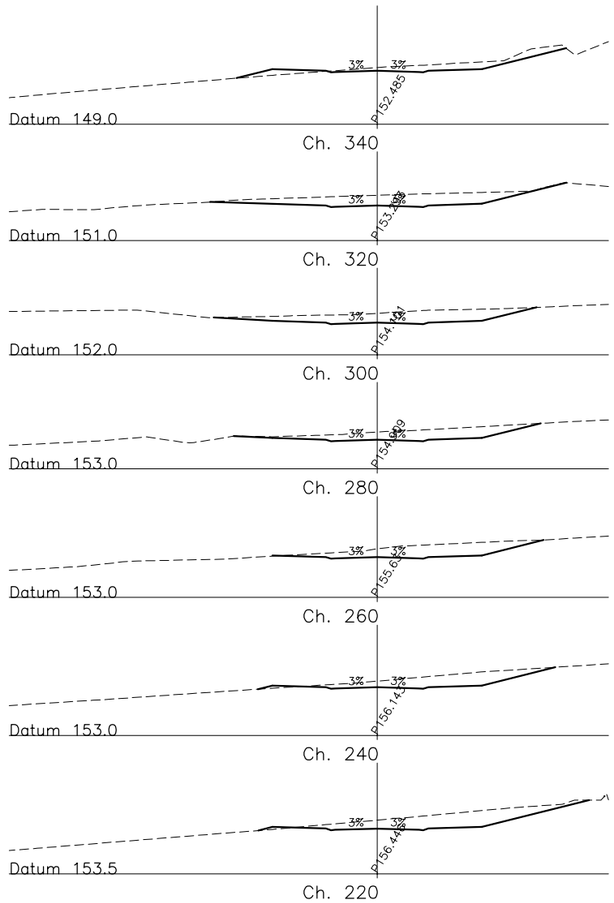
CROSS SECTION - ROAD 130
ROAD TYPE E2 5.5m

0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK138







CROSS SECTION - ROAD 124

ROAD TYPE E1 5.5m

CROSS SECTION - ROAD 125

ROAD TYPE D2 6.0m

PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355-07-14 & 05

RISE
ABOVE IT ALL

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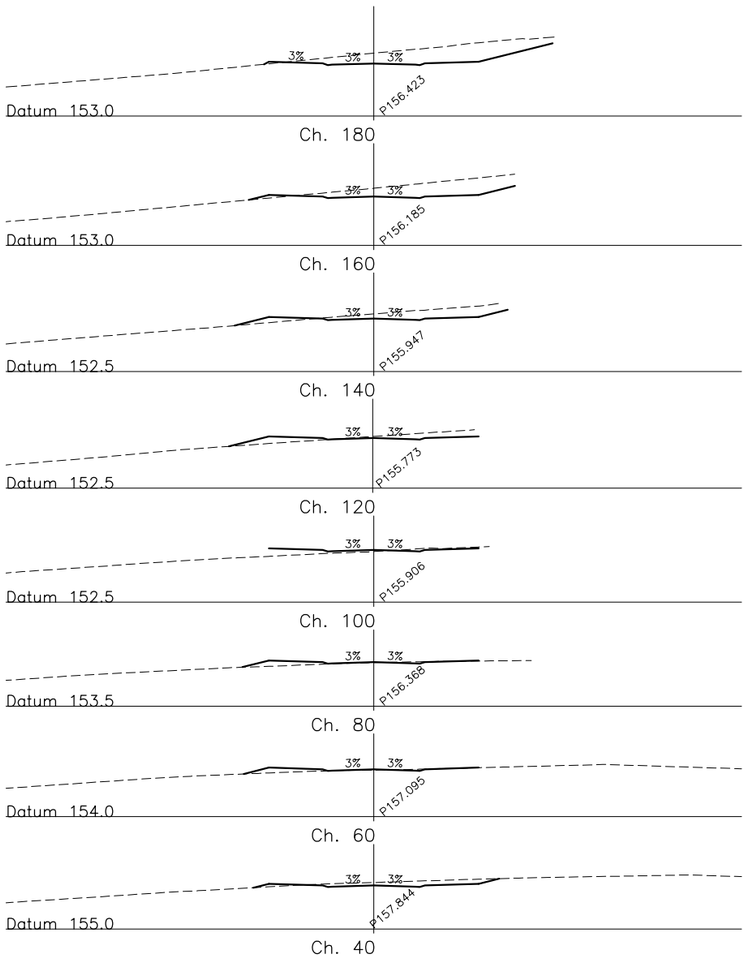
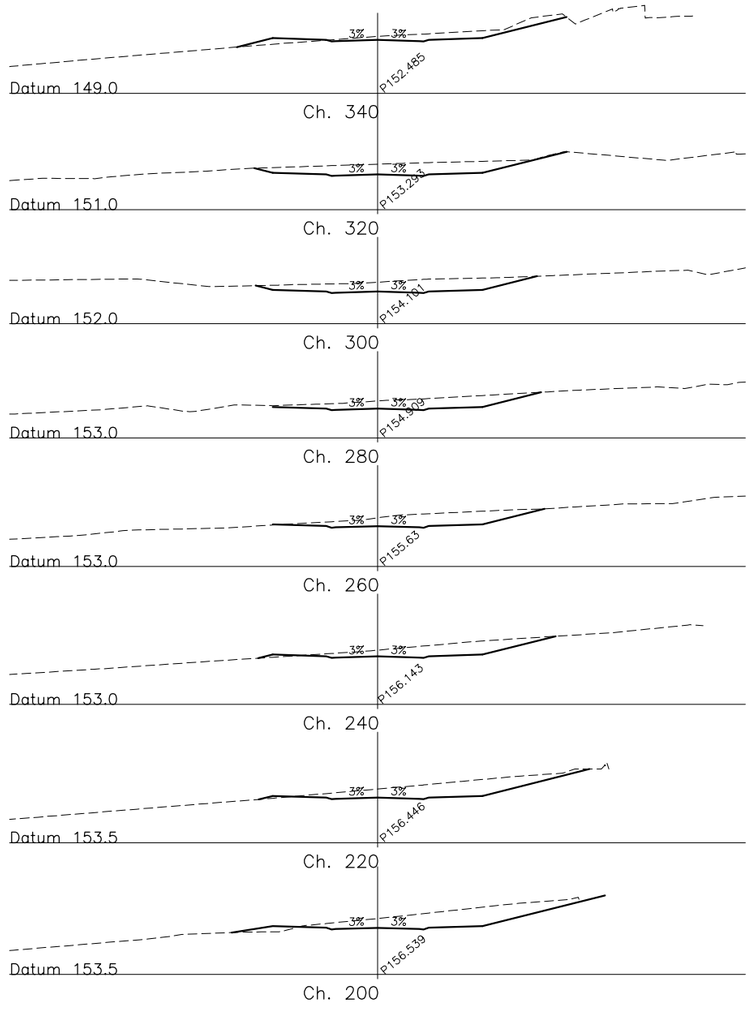
INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

0 2 4 6 8
1:200 at A1
1:400 at A3

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

CROSS SECTIONS
1355 - 07 - SK139





PRELIMINARY DESIGN ONLY
BATTERS SUBJECT TO ARCHITECTS FINAL BUILDING DESIGN LEVELS
REFER TO TYPICAL SECTION DWG No. 1355–07–14 & 05

CROSS SECTION - ROAD 126

ROAD TYPE D2 6.0m

RISE
ABOVE IT ALL

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ABN: 55 114 638 934

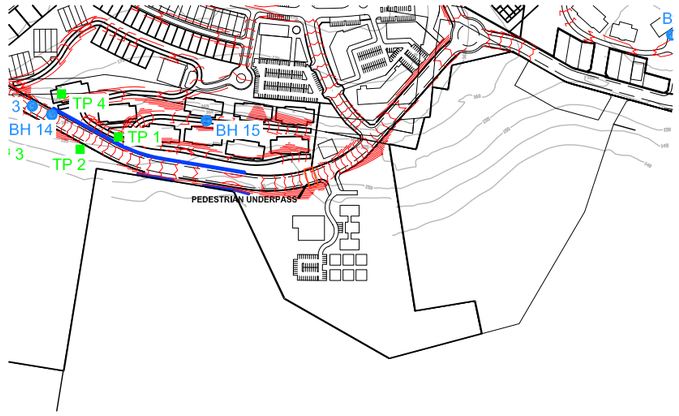
0 2 4 6 8
1:200 at A1
1:400 at A3

CROSS SECTIONS
1355 - 07 - SK140

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

LEGEND

BH 1	BORE HOLE LOCATION FROM BORDERTECH REPORT NOVEMBER 1996
TP 15	TEST PIT LOCATION FROM BORDERTECH REPORT NOVEMBER 1996
GS BH 5	BORE HOLE LOCATION FROM GILBERT & SUTHERLAND REPORT DATED DECEMBER 1997
	FINISHED CONTOURS 1m INTERVALS
	EXISTING CONTOURS 5m INTERVALS



INSET

COMBINED PLAN OF BORE HOLE AND TEST PIT LOCATION BASE ON GEOTECHINCAL INVESTIGATIONS OF BORDER-TECH REPORT DATED NOVEMBER 1996 AND GILBERT & SUTHERLAND REPORT DATED DECEMBER 1997

RISE ABOVE IT ALL

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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934

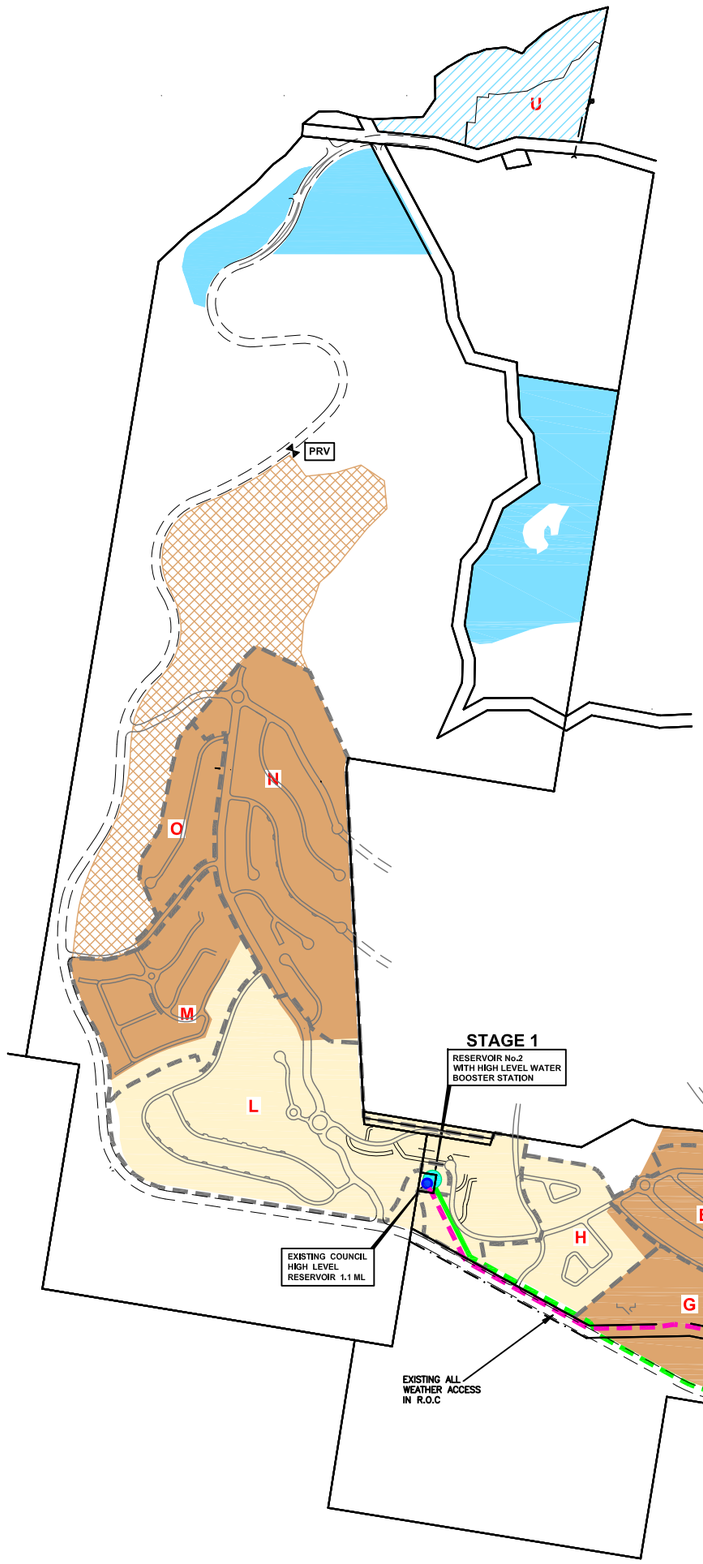
1355 - 07 - SK 150 A

A - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

REFER INSET

0 40 80 120 160
1:4000 at A1
1:8000 at A3



LEGEND

STAGE 2	BOOSTERED PRESSURE ZONE
POSSIBLE FUTURE STAGE	LOW LEVEL ZONE WITHIN POSSIBLE FUTURE DEVELOPMENT T.G.M LAND - SUBJECT TO SEPARATE FUTURE APPLICATION
STAGE 1	LOW LEVEL ZONE WITHIN FUTURE DEVELOPMENT T.G.M LAND MAJOR PROJECT MP08-0234 RISE
STAGE 1	HIGH LEVEL ZONE WITHIN FUTURE DEVELOPMENT T.G.M LAND MAJOR PROJECT MP08-0234 RISE
POSSIBLE FUTURE STAGE	HIGH LEVEL ZONE WITHIN POSSIBLE FUTURE DEVELOPMENT T.G.M LAND - SUBJECT TO SEPARATE FUTURE APPLICATION
STAGE 1	HIGH LEVEL ZONE - EXISTING APPROVALS & MAJOR PROJECT MP08-0234 RISE
STAGE 1	CONSTRUCT DN 250 IN EXISTING R.O.C (SIZE TO BE CONFIRMED)
STAGE 1	CONSTRUCT PERMANENT SIZED MAIN WHERE FINAL LEVEL ESTABLISHED
STAGE 2	FUTURE RELOCATION OF DN 250 OR APPROPRIATE DIAMETER MAIN TO SERVICE ALL OF T.G.M PROPERTY
STAGE 1	CONSTRUCT PERMANENT SIZED MAIN WHERE FINAL LEVEL ESTABLISHED
STAGE SUBJECT TO TSC DETERMINATION	FUTURE CONNECTION MAIN BETWEEN SNOWGUM RESERVOIR & NEW LOW LEVEL RESERVOIR - NOT REQUIRED FOR RISE DEVELOPMENT
	PROPOSED ALIGNMENT OF SPINE ROAD
A, B, D, E, F, G, H, I, L, M, N, O, U	RISE PRECINCT NUMBER

RISE
ABOVE IT ALL

A - 03/09 - AMENDED TO SUIT NEW ARCHITECTS PLANS

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ABN: 55 114 638 934

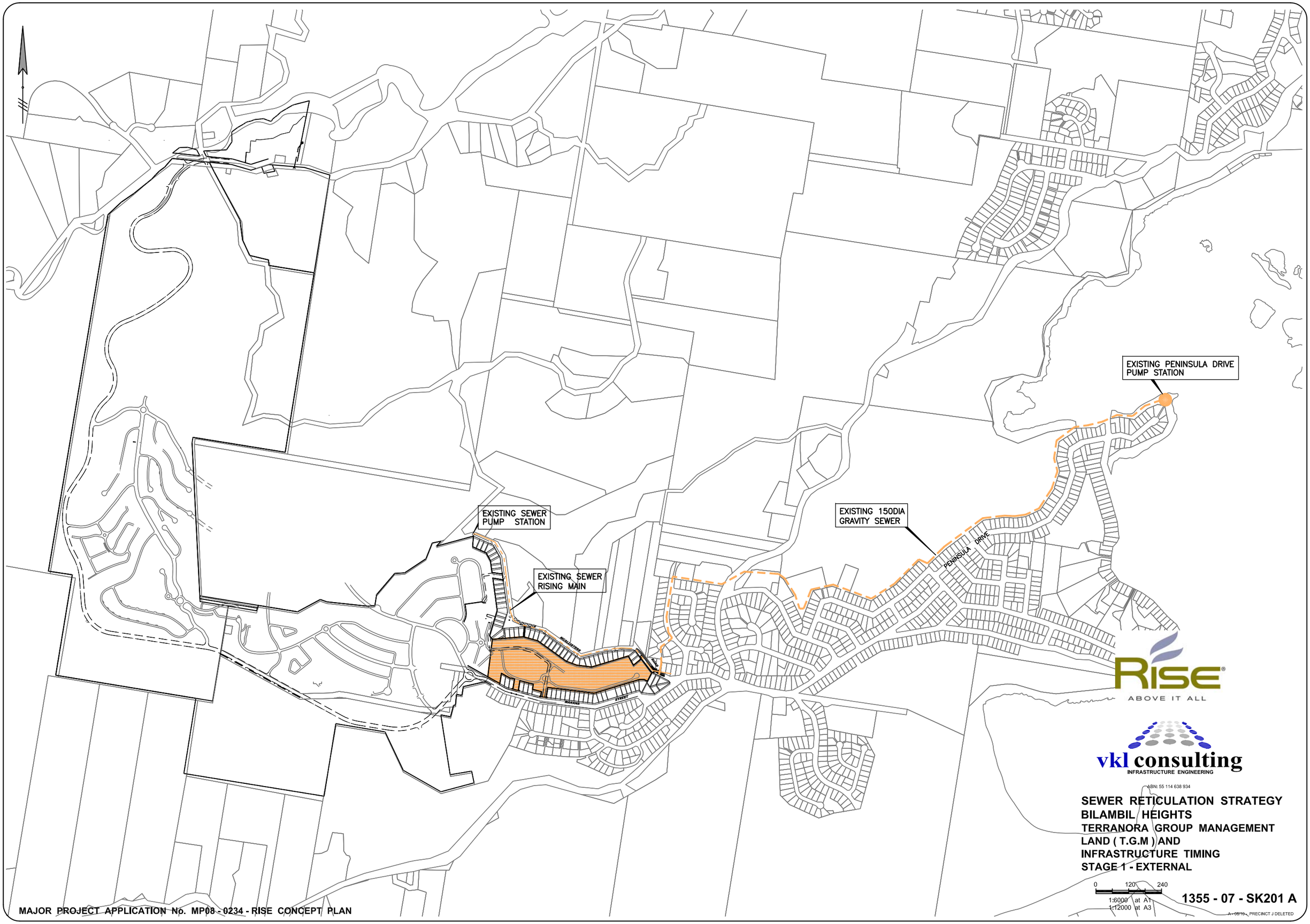
WATER RETICULATION STRATEGY
BILAMBIL HEIGHTS
TERRANORA GROUP MANAGEMENT LAND (T.G.M) AND INFRASTRUCTURE TIMING

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK200 A

A - 08/10 - PRECINCT J DELETED

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN


EXISTING PENINSULA DRIVE
PUMP STATION
EXISTING 150DIA
GRAVITY SEWER
PENINSULA DRIVE
EXISTING SEWER
PUMP STATION
EXISTING SEWER
RISING MAIN
MARIANA STREET
RISE
ABOVE IT ALL
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INFRASTRUCTURE ENGINEERING
ABN: 55 114 638 934
SEWER RETICULATION STRATEGY
BILAMBIL HEIGHTS
TERRANORA GROUP MANAGEMENT
LAND (T.G.M) AND
INFRASTRUCTURE TIMING
STAGE 1 - EXTERNAL
0
120
240
1:6000 at A1
1:12000 at A3
1355 - 07 - SK201 A
A - 08/10 - PRECINCT J DELETED
MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

LEGEND

GRAVITY SEWER

TRUNK SEWER RISING MAIN CONNECTION TO GOLLAN DRIVE REGIONAL PUMP STATION

PROPOSED PUMP STATION

COBAKI LAKES REGIONAL PUMP STATION

EXISTING PUMP STATION

PIGGABEEN ROAD

FUTURE BILAMBIL HEIGHTS URBAN RELEASE AREA SEWERAGE PUMP STATION

FUTURE BILAMBIL HEIGHTS URBAN RELEASE AREA SEWERAGE PUMP STATION

FUTURE BILAMBIL HEIGHTS URBAN RELEASE AREA SEWERAGE PUMP STATION

GOLLAN DRIVE PUMP STATION

GOLLAN DRIVE

COBAKI ROAD

RISE SEWER PUMP STATION

RISE DEVELOPMENT

0 150 300

1:7500 at A1
1:15000 at A3

RISE
ABOVE IT ALL

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EXTERNAL TRUNK SEWER LAYOUT

1355 - 07 - SK202

MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN

RISING MAIN TO REGIONAL SEWERAGE PUMP STATION OR GOLLIN DRIVE IF REGIONAL PUMP STATION NOT COMMISSIONED

U

FUTURE SEWER PUMP STATION

STAGE 2 TEMPORARY SEWER PRESSURE MAIN UNTIL STAGE 3 GRAVITY SEWER CONSTRUCTED AFTER DECOMMISSION AS A SEWER PRESSURE MAIN TO BE USED FOR STORMWATER RECYCLING

T

N

O

STAGE 3

M

L

FUTURE SEWER PUMP STATION

STAGE 2 FUTURE SEWER PUMP STATION

STAGE 1 EXISTING SEWER PUMP STATION UPGRADE

F

D

EXISTING SEWER RISING MAIN

STAGE 1 EXISTING 150DIA GRAVITY SEWER AUGMENTATION

MCALISTER ROAD

MARANA STREET

H

E

A

STAGE 2

B

STAGE 1

I

FUTURE SEWER PUMP STATION

PRIVATE RISING MAIN

PRIVATE SEWER PUMP STATION FOR PRIVATE SCHOOL

EXISTING P1000 PASVEER SEWERAGE TREATMENT PLANT POSSIBLE STAGED STORAGE OPTION

RISE ABOVE IT ALL

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SEWER RETICULATION STRATEGY
BILAMBIL HEIGHTS
TERRANORA GROUP MANAGEMENT LAND (T.G.M) AND INFRASTRUCTURE TIMING - INTERNAL

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK203 A

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LEGEND

FUTURE MAJOR EXTERNAL ROADS BILAMBIL HEIGHTS URBAN RELEASE AREA

POSSIBLE SPOIL SITE (FOR FUTURE ROAD CONSTRUCTION SUBJECT TO DETAILED DESIGN)

HAUL ROAD

RISE DEVELOPMENT

TO COBAKI PARKWAY

PIGGABEEN ROAD

FUTURE BRIDGE

SCENIC DRIVE DIVERSION

EXTENSION

COBAKI CREEK ROAD

COBAKI

STREET

MARANA

RISE DEVELOPMENT

0 150 300

1:7500 at A1
1:15000 at A3

RISE ABOVE IT ALL

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EARTHWORKS STRATEGY PLAN

EXTERNAL HAUL ROUTE & POTENTIAL DISPOSAL SITES

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1355 - 07 - SK300 A

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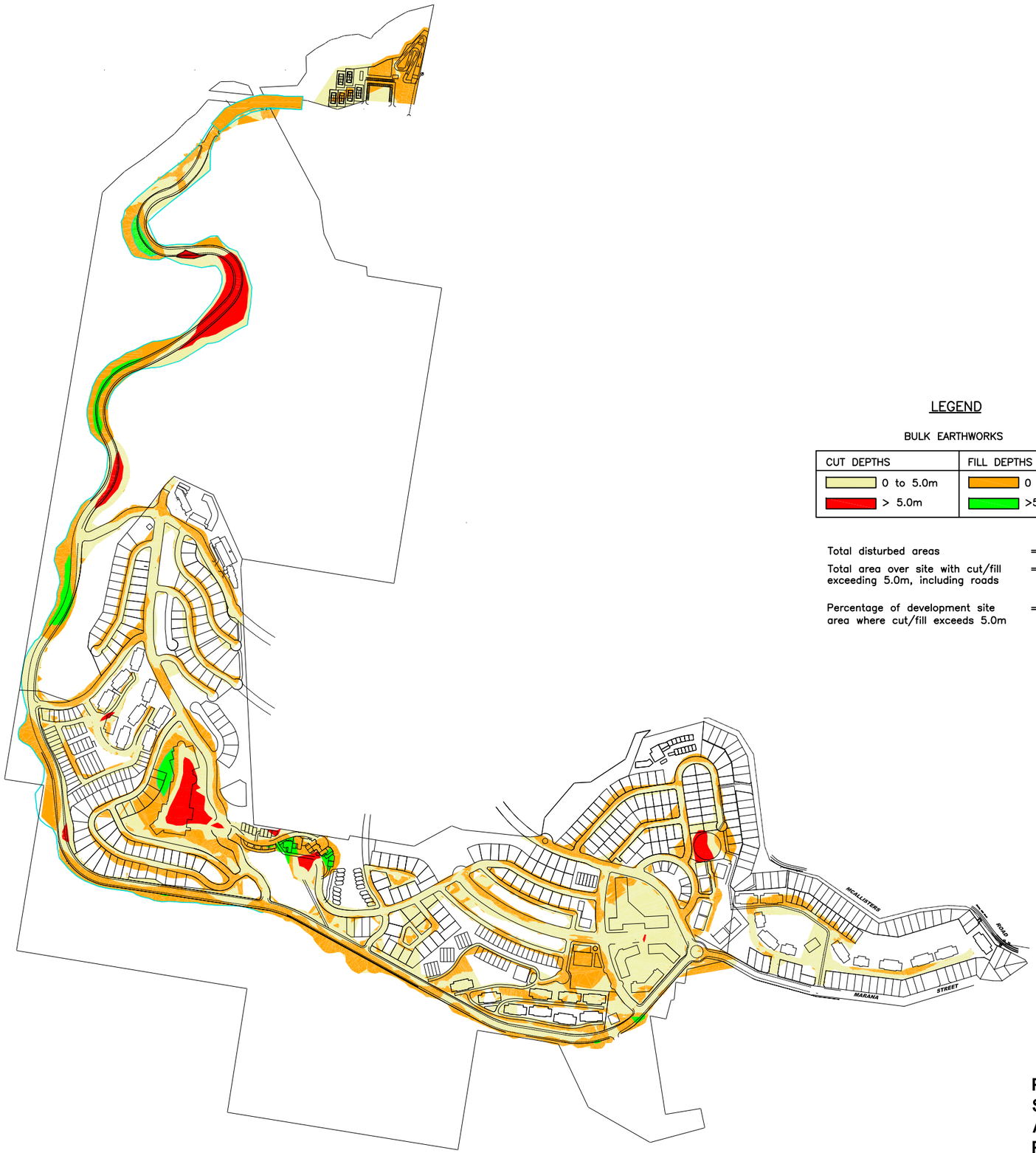

LEGEND

BULK EARTHWORKS

CUT DEPTHS	FILL DEPTHS
0 to 5.0m	0 to 5.0m
> 5.0m	>5.0m

Total disturbed areas = 561180m2

Total area over site with cut/fill exceeding 5.0m, including roads = 36510m2

Percentage of development site area where cut/fill exceeds 5.0m = 6.51%

RISE
ABOVE IT ALL

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PLAN OF BULK EARTHWORKS SHOWING DEPTHS OF CUT/FILL AND AREAS OF DISTURBANCE INCLUDING PUBLIC AND PRIVATE ROADS

0 100 200
1:5000 at A1
1:10000 at A3

1355 - 07 - SK301 A

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MAJOR PROJECT APPLICATION No. MP08 - 0234 - RISE CONCEPT PLAN