

**ratio:**

**Prepared for**  
Planology on behalf of East  
Gippsland Shire Council

**Prepared By**  
Stephen Hunt

Traffic Engineering Expert  
Evidence  
Fingerboards Mineral Sands  
Project  
Inquiry and Advisory Committee  
1 February 2021

**Expert Evidence**

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Our reference 17657T-REP01aFinal

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# 1 Qualifications and Expertise :

## Reference

- 1.1.1 Fingerboards Mineral Sands Project
- 1.1.2 Subject Land: Bairnsdale Dargo Road, Glenaladale

## Name

- 1.1.3 Stephen John Hunt

## Position

- 1.1.4 Principal – Traffic, Ratio Consultants

## Address

- 1.1.5 8 Gwynne Street, Cremorne, VIC 3121

## Qualifications

- Bachelor of Engineering (Civil), 1975, Swinburne University of Technology.
- Graduate Diploma of Highway and Traffic Engineering, 1981, Chisholm Institute of Technology.

## Experience

- 2017 – Present: Principal – Traffic, Ratio Consultants.
- 2010 – 2016: Group Manager – Cardno Victoria
- 2007 – 2010: Consultant, Cardno Grogan Richards.
- 1988 – 2006: Director, Grogan Richards.
- 1975 – 1988: Traffic Engineer with Cities of Doncaster and Templestowe, Caulfield and Prahran.

## Professional Expertise

- 1.1.6 I have worked in the area of Traffic and Transportation Engineering throughout my career. My area of expertise includes traffic advice and assessment of a wide range of land use and development proposals for planning authorities, government agencies, corporations and developers.
- 1.1.7 My training, qualifications and experience including involvement with a wide variety of developments over a number of years, qualifies me to comment on the traffic and parking implications of this proposal.

## Instructions which define the scope of this report

- 1.1.8 I was initially instructed in this matter by Planology on behalf of East Gippsland Shire Council on the 16<sup>th</sup> December 2020 when I was instructed to:
  - review the technical reports and related documents prepared for the Fingerboards Minerals Sands Project Environment Effects Statement (EES), the proposed Works Approval and the proposed planning scheme amendment that are relevant to your expertise, including the scoping requirements for the EES; and
  - prepare a statement of evidence, relevant to your expertise, on:
    - the adequacy of the materials and technical reports prepared by the Proponent, noting the IAC has required the Proponent to prepare additional information;

- the adequacy of the conclusions expressed in the EES and the other supporting documents; and
  - the adequacy of the proposed mitigation measures and whether additional mitigation measures should be considered; and
  - consider the Council’s submission, including the SLR Technical Review and identify any areas of the review to which you disagree.
- 1.1.9 On the 19<sup>th</sup> January 2021 I was provided with further documents submitted by the proponent in response to the IAC request for information which amongst other matters, provided:
- draft plans of proposed road deviations and intersection geometry submitted to Department of Transport on 14<sup>th</sup> January 2021.
  - concept designs for the southern haul road / infrastructure corridor and the Fernbank Rail siding.
- 1.1.10 I was instructed to consider the adequacy and appropriateness of these further drawings.
- 1.1.11 I was further instructed to inspect the area including the roads and intersections that are the subject of these drawings in order to inform my opinions.
- 1.1.12 Subsequently I conducted an inspection of the area of the proposed mineral sands project on the 25<sup>th</sup> January 2021, including:
- roads intended to be deviated in conjunction with the project,
  - intersections proposed to be modified as shown on the plans provided on 14<sup>th</sup> January 2021,
  - the proposed crossing points of the internal haulage road in Post Avon River bridge upgrade - Option 1 to the Ferndale East Siding over Chettles Road and Cowells Lane.
  - haulage route to Bairnsdale rail siding as contemplated in the Post Avon Option 2 scenario.
- 1.1.13 Finally, on the 25<sup>th</sup> January 2021, I was provided with the letter from Kalbar to the IAC in response to Direction No 26, identifying issues raised in submission.

### **Facts, Matters and Assumptions Relied Upon**

- 1.1.14 In the course of preparing this report the facts, matters and assumptions I have relied upon are outlined as follows:
- Site visit on 25<sup>th</sup> January 2021.
  - Sections relevant to my area of expertise of *Fingerboards Mineral Sands Project Environment Effects Statement* prepared by Kalbar Operations Pty Ltd dated August 2020 including *Technical Appendix A012 Traffic and Transport Impact Assessment* by Arup on behalf of Kalbar Operations dated 11<sup>th</sup> April 2020.
  - East Gippsland Shire Council submission to the IAC dated 11<sup>th</sup> December 2020.
  - Fingerboards Mineral Sands project EES Targeted Technical Review dated November 2020 prepared by SLR Consulting on behalf of East Gippsland Shire Council.
  - Department of Transport submission to the IAC dated 28<sup>th</sup> October 2020.
  - Request for Information by the IAC dated 11<sup>th</sup> December 2020.
  - Draft plans of proposed road deviations and intersection geometry submitted to Department of Transport on 14<sup>th</sup> January 2021.
  - Concept designs for the southern haul road / infrastructure corridor and the Fernbank Rail siding.

Letter to the IAC from Kalbar dated 7<sup>th</sup> January 2021 responding to Direction No 26.

**Identity of Persons Undertaking the Work**

- 1.1.15 Stephen Hunt of Ratio Consultants, assisted by Stuart McKenzie also of Ratio Consultants.

**Declaration**

- 1.1.16 I confirm that I have read and that I understand the Planning Panels 'Guide to Expert Evidence' and that I comply with the provisions of that guide.
- 1.1.17 I have no relationship with the client other than a business engagement to comment on this matter.
- 1.1.18 I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

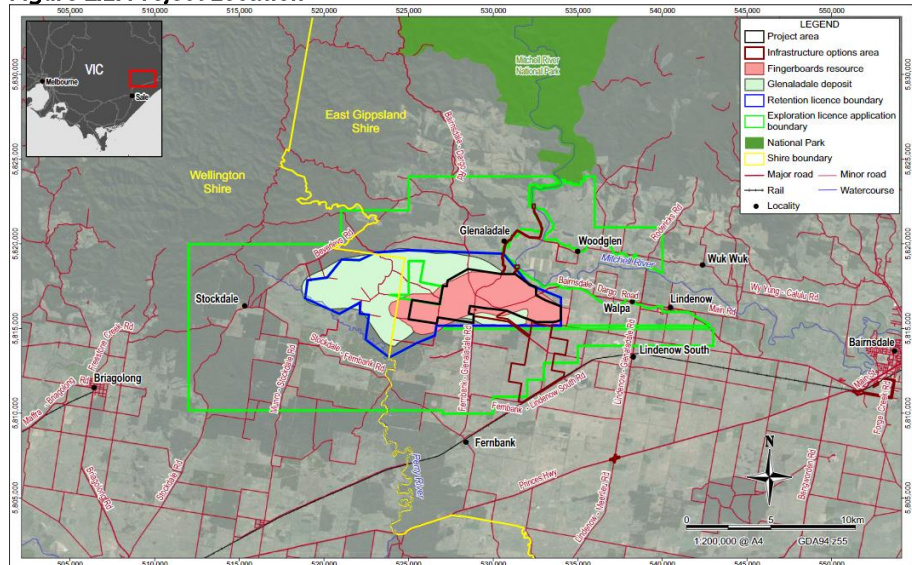


**Stephen Hunt  
Principal: Traffic  
Ratio Consultants**

## 2.1 Site Location

- 2.1.1 Kalbar Operations Pty Ltd proposes to mine mineral sands in the in the Fingerboards area of East Gippsland as shown in Figure 2.1.

**Figure 2.1: Project Location**



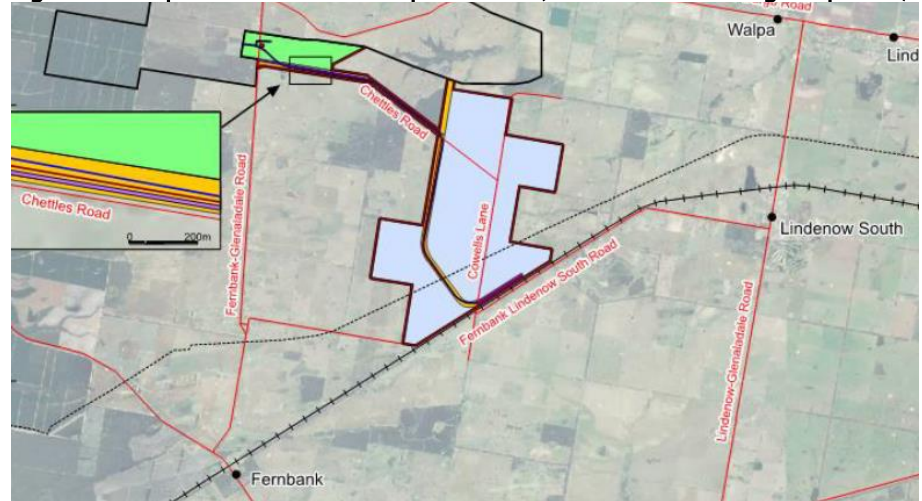
- 2.1.2 Mining is proposed to be undertaken 24 hours a day, 365 days a year, with extracted mineral sands sent to mining unit plants on the site, where it will be processed into concentrates. The concentrates will then be stockpiled on site, prior to being transported for further processing overseas into commercial products.

## 2.2 Transport of Concentrate

- 2.2.1 The Traffic and Transport Impact Assessment (Appendix A012 to the EES Report) (TTIA) identifies that the concentrate will be transported by road, rail or a combination of both to Port Anthony, Barry Beach Marine Terminal or the Port of Melbourne.
- 2.2.2 The TTIA states that the preferred transport option (Post Avon River bridge – Option 1) is to build a purpose-built rail siding close to the project area at Fernbank East and to use a private haulage road within the “infrastructure corridor” to access the siding from the project area as shown in Figure 2.2

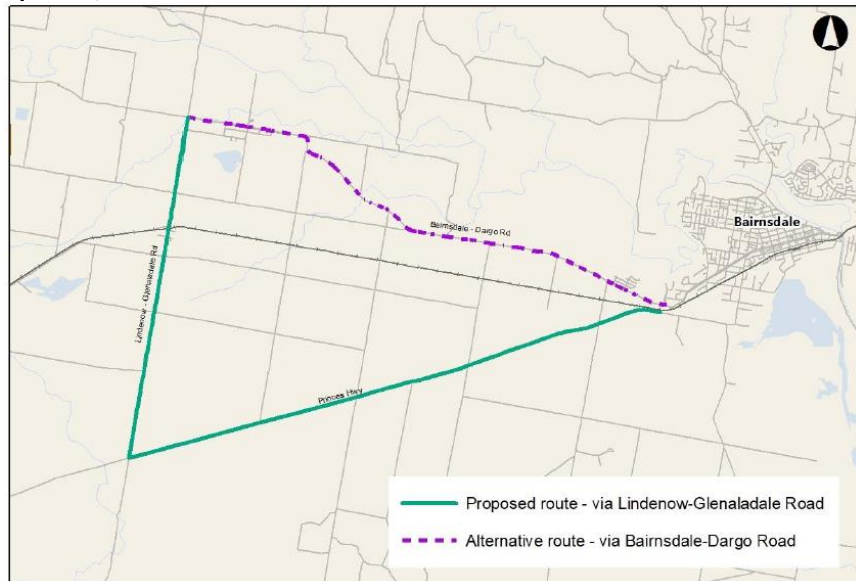


**Figure 2.2: Proposed Infrastructure Options Area (Post Avon River bridge - Option 1)**



- 2.2.3 As an alternative to the construction of a new rail siding at Ferndale East and transport of concentrate to the siding via a private haulage road, the TTIA identifies an option to upgrade the existing rail siding at Bairnsdale and to haul concentrate to the siding via Bairnsdale-Dargo Road, Lindenow-Glenaladale Road to the Princes Highway and then into Bairnsdale.
- 2.2.4 Alternate routes to the Bairnsdale siding are considered in the TTIA for two sections:
- Between the site and Princes Highway, Bairnsdale:
    - Via Lindenow- Glenaladale Road -Princes Highway, and
    - Via Bairnsdale-Dargo Road
  - Between Princes Highway and the siding:
    - Via Racecourse Road, Forge Creek Road South and Bosworth Road,
    - Via Main Street, Collins Street and Bosworth Road, and
    - Via Main Street, Forge Creek Road North and Bosworth Road.
- 2.2.5 The options considered are shown in Figure 2.3 and Figure 2.4.

**Figure 2.3 Alternate Routes to Princes Highway Bairnsdale (Post Avon River Bridge - Option 2)**



**Figure 2.4 Alternate Routes to Bairnsdale Siding (Post Avon River bridge - Option 3)**



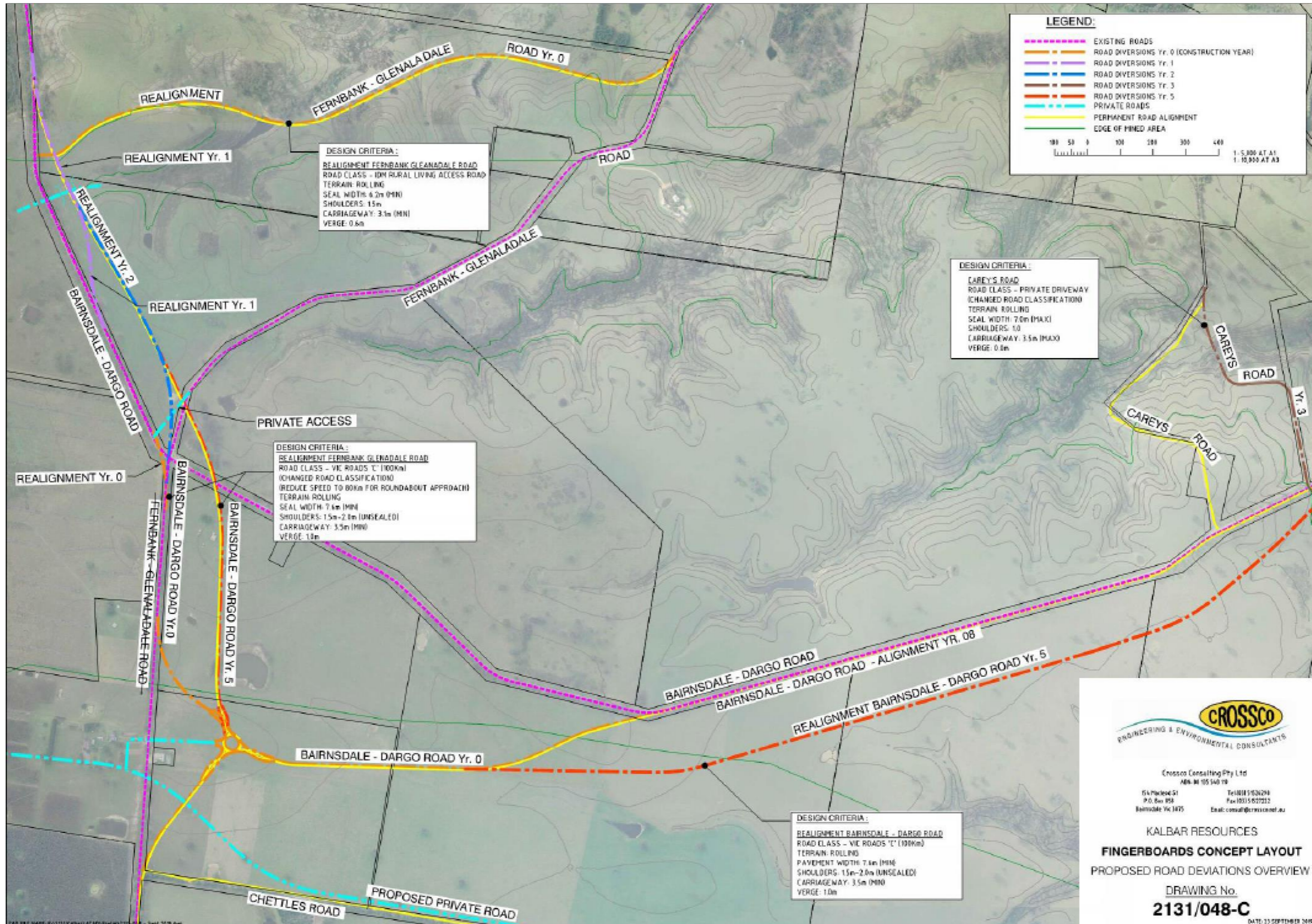
2.2.6 The TTIA report identifies that the transport of concentrate by rail from either the Fernbank East of Bairnsdale rail sidings is dependent upon upgrading of the rail bridge across the Avon River at Stratford which is being undertaken by the State Government, which is now understood to be complete.

2.2.7 In the event that the bridge upgrade was not completed prior to the commencement of mining on site, options for haulage of concentrate by road to Port Anthony and to the existing rail siding at Maryvale are also examined in the TTIA.

### 2.3 Road Deviations

Prior to commencement of mining on the site, it is proposed to realign a number of public roads in the area as shown in Figure 10 of the exhibited TTIA reproduced in Figure 2.5.

Figure 2.5 Proposed Road Deviations



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**KALBAR RESOURCES**  
**FINGERBOARDS CONCEPT LAYOUT**  
 PROPOSED ROAD DEVIATIONS OVERVIEW  
 DRAWING No.  
**2131/048-C**  
 DATE: 15 SEPTEMBER 2018

- 2.3.1 The road deviations, which are understood to be required to facilitate mining activities during different stages of the project are described as follows:
- Removal of the existing Fingerboards Intersection,
  - Construction of a new 4-leg roundabout to the south east of the existing Fingerboards intersection, with the western leg forming the main access road into the site.
  - Realignment of Fernbank-Glenaladale Road to the north of Bairnsdale Dargo Road to the west and between Bairnsdale Dargo Road and Chettles Road to the east to meet the new roundabout.
  - A new intersection on Ferndale- Glenaladale Road with the private haulage road between the new roundabout and Chettles Road, assuming the construction of a purpose-built rail siding at Ferndale East in the Post Avon Option 1 scenario is pursued.

## **2.4 Traffic Generation**

### **Construction Activities**

- 2.4.1 Construction of the site is expected to take approximately 2 years, with a construction workforce of approximately 200 people at peak construction, with a maximum daily workforce of 130 people on site. 24 hour / 7 day a week construction activity is proposed, comprising 12-hour shifts commencing at 6am and 6pm daily.
- 2.4.2 Assuming that each worker drives individually, the TTIA estimates a total of 150 vehicle movements per day at peak construction (2-way), including 20 heavy vehicle movements.

### **Operation Activities**

- 2.4.3 The TTIA estimates that during the 20-year operation of the mine, slightly higher external daily traffic movements will occur than during the construction phase.
- 2.4.4 An onsite work force of up to 120 people per day is estimated, working 12-hour shifts commencing at 6am and 6pm. As with the construction phase, the TIAR estimates a total of 160 vehicle movements per day (2-way) including 120 light vehicle movements assuming that each worker drives independently to and from work.
- 2.4.5 In addition, it is estimated that 40 b-double movements will be generated hauling concentrate from the mine. It is noted that, in the Post Avon River bridge – Option 1, haulage movements would be undertaken to a new rail siding at Fernbank East along a private haulage road, such that external truck movements would be limited to maintenance vehicles and other sundry truck traffic which may be generated.

## **2.5 Site Access**

- 2.5.1 Access to the site for light / medium vehicles is proposed via the western leg of the new roundabout at the Fingerboards intersection, with access controlled by a security gate.
- 2.5.2 The main access is proposed to be sealed however internal access roads linking mining and processing areas on site are not proposed to be sealed.
- 2.5.3 Access for the haulage of concentrate from the site, except if a siding is constructed at Ferndale East in the Post Avon River bridge – Option 1, will also be via the western leg of the roundabout via the security gatehouse.

- 2.5.4 In the Post Avon River bridge - Option 1 scenario, haulage of concentrate to the Fernbank East Siding is provided via a private haulage road, crossing Fernbank-Glenaladale Road at-grade approximately 250m north of Chettles Road and 200m south of the roundabout.
- 2.5.5 It is noted that a heavy vehicle underpass under Bairnsdale-Dargo Road is proposed approximately 800m north-west of the Fingerboards intersection, with a second underpass proposed in the later stages of the project to access the south east portions of the site.

### 3.1 Extent of Review Undertaken

- 3.1.1 As instructed, I have reviewed the technical reports and related documents prepared for the Environmental Effects Statement and assessed:
- the adequacy of the materials and technical reports prepared by the Proponent, noting the IAC has required the proponent to prepare additional information;
  - the adequacy of the conclusions expressed in the EES and other supporting documents; and
  - the adequacy of the proposed mitigating measures and whether additional mitigation measures should be considered.
- 3.1.2 I have also considered the Council's submission to the EES, including the SLR Technical Review, and the submission of the Department of Transport.
- 3.1.3 My review of the EES documents has been limited to:
- EES Appendix A012 – Traffic and Transport Impact Assessment prepared by Arup (August 2020)
  - EES Report Chapter 12 – Environmental Management Framework
  - EES Report Chapter 13 - Conclusions related to Traffic and Access
- 3.1.4 My opinions have been formed through an initial desktop review of the EES Documentation with identification of potential issues informed by the detailed review undertaken by SLR on behalf of Council and my inspection of the site and surrounding road network on the 25<sup>th</sup> January 2021.
- 3.1.5 I have also noted the Advisory Committee request for additional information from the proponent dated 11<sup>th</sup> December 2020, requesting the following pertaining to roads, traffic and transport:
- Advice as to the current status of negotiations with the transport authorities with respect to the establishment of the Fernbank Rail siding and transport of concentrate by rail.
  - The estimated total cost of proposed road and transport infrastructure and rehabilitation.
  - Advice as to status of agreements with affected landowners to enable road realignments to occur.
  - The expected volume, frequency and night-time movements of concentrate by rail.
  - The expected holding period of concentrate at rail sidings.
  - Security and access control at rail sidings.
- 3.1.6 The information sought by the IAC will clarify a number of issues, including whether the preferred option of establishing a rail siding at Fernbank East is feasible. My opinions as expressed in this statement however are not dependent on the response received.
- 3.1.7 I have also reviewed the draft plans of proposed road deviations and intersection geometry submitted to Department of Transport on 14<sup>th</sup> January 2021 and concept designs for the southern haul road / infrastructure corridor and the Fernbank East Rail Siding.

### 3.2 Traffic and Transport Assessment Report

#### Summary of Approach

- 3.2.1 The Traffic and Transport Impact Assessment (TTIA) prepared by Arup on behalf of the proponent seeks to investigate the traffic and transport impacts of the proposed mineral sands mine during both the construction and operation phases of the project.

- 3.2.2 At the time of preparation of the TTIA, (originally published in April 2020), it appears to have been unclear as to whether the Avon River Rail Bridge upgrade at Stratford, being undertaken by the State Government would be completed prior to the commencement of operation of the mine. The bridge, which will upgrade rail capacity east of Sale, was identified as providing the opportunity for the transfer of extracted product to be undertaken by rail, with the stated “preferred option” being via the construction of a new rail siding at Fernbank East, close to the project area and accessed via a private haulage road.
- 3.2.3 This option is referred to as the **Post-Avon River Bridge – Option 1**
- 3.2.4 An alternative option of upgrading to upgrade the existing rail siding at Bairnsdale and transferring product to the siding by B-double trucks via road was also assessed, referred to as **Post-Avon Bridge - Option 2**.
- 3.2.5 It is not clear from the TTIA as to why Option 2 would be pursued over the “preferred option.”
- 3.2.6 In the event that the Avon River Bridge rail bridge was not completed on time, options of transferring product to Maryvale and Port Anthony / Barries Beach Marine Terminal were also investigated, predicated on the assumption that this would cease once the Avon River rail bridge was completed.
- 3.2.7 These options are assessed in detail in the TTIA, referred to as **Pre-Avon Bridge Option**.
- 3.2.8 For each of the three options, a detailed assessment of the implications on the effected road network was considered as follows:
- Identification of potential routes for haulage of material by road to the respective terminals.
  - Review of existing conditions on the identified routes including estimates of existing traffic volumes and road standards.
  - Estimate of additional traffic generated during both the construction and operational phases of the project, including light vehicle traffic associated with staff and haulage movements related to transport of product.
  - Assessment of traffic performance on identified routes based on midblock and key intersection capacity assessments, including some consideration of seasonal variation in traffic demands.
  - Assessment of transport safety along candidate routes, including review of level crossings, intersections and sensitivity of abutting land uses.
  - Identification of standard and additional mitigating measures along haulage routes in association with each option, largely related to treating identified potential road safety issues.
  - A relative risk assessment of the standard and additional mitigating treatments.
- 3.2.9 It is noted that the TTIA does not provide recommendations as to the preferred transport route option in the operational phase, in particular with respect to the two options considered in the Post Avon Bridge scenario.
- 3.2.10 The TTIA also provides a high-level assessment of the proposed staging of deviations of public roads within and in the vicinity of the work site. This includes the proposed deviations to Bairnsdale Dargo Road and Fernbank Glenaladale Road, presumably to facilitate progressive mining of resources across the site and the relocation of the Fingerboards intersection to the south east and conversion to a roundabout.

- 3.2.11 The TTIA also assesses the construction of a fourth (western) leg of the proposed roundabout as a private road, forming the main access to the site.

### **3.3 Comment on Options Tested**

- 3.3.1 The TTIA has sought to comprehensively assess access options to the subject site having regard to consideration of options should the Avon River Rail Bridge not be completed prior to the commencement of mining operations.
- 3.3.2 According to the State Government *Regional Rail Revival* website, as of the 8<sup>th</sup> December 2020 trains are now using the completed bridge. As such, I have assumed for the purposes of my review that the Pre- Avon River Bridge Option is now redundant.
- 3.3.3 In my opinion, the TTIA should be updated accordingly, focusing on the development of the Fernbank East Rail siding adjacent to the site (Post Avon River Bridge Option 1), identified consistently as the “preferred option”.
- 3.3.4 In traffic terms, the development of a new purpose-built rail siding at Fernbank East is clearly the preferred means of transporting concentrate from the site, effectively reducing traffic increases on the road network to staff and maintenance vehicles, with haulage to the rail siding able to be achieved via construction of an internal private road.
- 3.3.5 It is noted that the Committee has sought clarification as to the current status of negotiations with the transport authorities with respect to the establishment of the Fernbank East Rail siding and transport of concentrate by rail.
- 3.3.6 Response to this directive, together with the costs of provision of the infrastructure as also sought by the Committee, can be expected to identify if the “preferred option” is achievable.
- 3.3.7 If so, a more detailed assessment of the provision the East Fernbank Siding and the alignment and treatment of the private haulage road connection to the proposed siding is required.
- 3.3.8 In my opinion, pursuit of haulage via Post-Avon Bridge - Option 2 is the least preferred option as identified in both the assessment undertaken in the TTIA Report and the subsequent review on behalf of Council by SLR and should only be pursued if the Fernbank East siding cannot be achieved, or potentially on an interim basis should mining commence prior to the siding being established.

### **3.4 Review of TTIA**

- 3.4.1 I have reviewed the methodology adopted by Arup in the preparation of the TTIA and I believe it generally satisfies the scoping requirements of the EES.
- 3.4.2 Comments on specific issues in the analysis are as follows.

#### **Existing Traffic Volumes**

- 3.4.3 Estimates of existing traffic volumes in the study area were collated from a variety of sources including VicRoads (now DoT) and Council and were considered to be generally appropriate given “the low traffic environment of a high number of roads in the study area”.
- 3.4.4 Specific count data was collected in the Bairnsdale area in association with the review of Option 2, with turning movement counts undertaken at



key intersections along the Princes Highway in October 2018 for 15 minute periods during commuter peaks on a weekday.

- 3.4.5 Existing turning movement volumes at key intersections for both Option 1 and Option 2 used within the TTIA appear to have been derived through factoring of available data and can only be considered indicative.
- 3.4.6 In my opinion, while traffic capacity is unlikely to be an issue particularly if Opinion 1 is adopted, more comprehensive traffic data needs to be collected as a basis of a more accurate assessment of
  - future traffic volumes,
  - the implications of traffic increases, and
  - the appropriateness of mitigating treatments identified.
- 3.4.7 If Option 2 is retained as an access route option, say as an interim arrangement until the Fernbank East siding is established, far more extensive existing conditions data should be collected on the road network including:
  - Classified tube counts on all roads identified as access routes over at least a 7-day period, identifying hourly volumes across the day and week and existing traffic composition including volumes of vehicles of varying classification including articulated and b-double vehicles.
  - Two hour counts at key intersections during identified peak periods, enabling accurate existing conditions to be established and to form a sounder basis for review of future intersection operation and effectiveness of mitigating works proposed.

### **Traffic Generation and Distribution**

- 3.4.8 Estimates of traffic generation and distribution for the construction and operation phases of the project, are based on advice on staffing levels and truck movements provided by the proponent. For analysis purposes this is considered satisfactory.
- 3.4.9 It is noted that a conservative approach has been taken with respect to staff generation rates with all staff assumed to drive, although some ancillary movements may have been omitted in derived volumes in both the construction and operational phases.
- 3.4.10 Overall estimates of 150 vpd in the construction phase (including 20 heavy vehicles) and 160 vpd in the operational phase (including 40 b-double movements) are considered to provide an appropriate basis for the analysis undertaken.
- 3.4.11 As requested by the Advisory Committee, it is useful to extend the design generated volume estimates to identify key periods across the day, including movements of heavy vehicles across the day (including overnight) and concentrations of light vehicle traffic at staff change over times.
- 3.4.12 Some effort has been made to model the directional distribution of generated traffic including assumptions as to employee home destinations and consequent routes to the site. I am generally comfortable with the methodology adopted for assessing distribution of generated traffic.

## **3.5 Assessment of Traffic Impacts – Option 1**

- 3.5.1 As discussed in Chapter 8 of the TTIA, the completion of the Avon River rail bridge and construction of a rail siding at Fernbank East as contemplated in Option 1 enables movement of concentrate between the

processing area and the rail siding to be undertaken via private haulage roads.

- 3.5.2 As such, that there is no impact on existing public roads by product haulage traffic, other than at crossing points.
- 3.5.3 Chapter 8 of the TTIA focusses on the design of the private access roads and the impact of crossing points of the proposed haulage route across Fernbank–Glenaladale Road, Chettles Road and Cowells Lane.
- 3.5.4 The impact of other vehicle movements to and from the site in the operational phase, including staff vehicle movements and maintenance traffic, is not discussed in Chapter 8, relying on the analysis of these movements in review of the Pre-Avon Bridge Option detailed in Chapter 7.
- 3.5.5 I have reviewed the relevant sections within Chapters 7 in reference to external impacts of Post-Avon Option 1 and provide the following comments in relation to external impacts and mitigating works which may be required for Option 1.

### **Construction Traffic**

- 3.5.6 Table 14 of the TTIA estimates that, during the construction phase the project will generate 150 vehicle movements per day consisting of 130 light vehicle trips and 20 heavy vehicle trips.
- 3.5.7 The estimated volumes are based on the establishment of the mining site and related infrastructure, including the initial road deviations proposed and the establishment of the relocated Fingerboards intersection roundabout and site access.
- 3.5.8 It is however unclear if peak construction volumes would be higher if the Fernbank East railway siding is being constructed simultaneously.
- 3.5.9 The assumed distribution of construction traffic provides for 65% of employee vehicles being generated from the east (predominantly Bairnsdale) with 35% from the west (predominantly from Sale). Heavy vehicle traffic is assumed to be 75% from Bairnsdale and 25% from Sale.
- 3.5.10 It is considered that, in association with a more detailed assessment of Option 1, these estimates should be reviewed and updated to include additional construction traffic which may be generated by the simultaneous construction of the Fernbank East Rail siding and the internal private haulage road.
- 3.5.11 Section 7.2 of the TTIA details findings of the traffic performance impact assessment, including intersection and road link performance.
- 3.5.12 The analysis is based only on the operational phase however and hence in the Pre-Avon Bridge scenario, includes movement of concentrate by heavy vehicles to the west to Maryvale and Port Albert. This is hence not relevant for consideration of the construction phase for Option 1.
- 3.5.13 In my opinion, the construction traffic analysis should be redone to consider the impacts of the revised estimates of construction traffic generation for Option 1 and impacts on the following roads and intersections:
  - Fernbank Glenaladale Road between Princes Highway and the site,
  - Bairnsdale Dargo Road between Princes Highway and the site,
  - Princes Highway / Bairnsdale Dargo Road intersection,
  - Princes Highway / Fernbank Glenaladale Road intersection, and
  - Bairnsdale Dargo Road / Lindenow Glenaladale Road intersection.

- 3.5.14 The analysis will inform if there is any requirement for mitigating works to be undertaken to facilitate the construction phase and would form the basis of a Construction Traffic Management Plan.

### **Operational Traffic**

- 3.5.15 In the Option 1 scenario, traffic on the surrounding road network will be predominantly staff movements to and from the site, together with maintenance and service traffic which may be required from time to time.
- 3.5.16 Table 15 of the TTIA estimates that during the operational phase, the site will generate 120 light vehicle movements per day related to staff movements, which is marginally less than during the construction phase.
- 3.5.17 As such, the revised assessment of the construction phase and identified external mitigating works will most likely be adequate to support the ongoing operation of the site. For completeness however, further analysis to take into account background traffic growth on the network during the 20-year operation of the site should be undertaken, to ascertain if works additional works may be warranted over the life of the project.
- 3.5.18 Operational impacts of the movement of concentrate to the Fernbank East siding as proposed in Option 1 is assessed in detail in Section 8 of the TTIA, with the safety of intersections where the private haulage road crosses Fernbank– Glenaladale Road, Chettles Road and Cowells Lane assessed, together with requirements for road lighting.
- 3.5.19 In particular, the report undertakes an analysis of the proposed Fernbank– Glenaladale Road / haulage road intersection based on the guidelines outlined within Austroads Guide to Traffic Engineering Practice – Part 4A.
- 3.5.20 Noting that the exact alignment of the road is still to be refined and agreed, issues identified in the assessment were as follows:
- Spacing of intersections on Fernbank-Glanaladale Road, including the spacing of the private haulage road intersection between the proposed roundabout at the relocated Fingerboards intersection and Chettles Road to the south,
  - Location of security gates within the site to ensure that B-double vehicles using the haulage road do not block the intersection when crossing,
  - The safety risk associated with drivers on Fernbank-Glenaladale Road approaching at high speed when a slowly moving B-double is crossing,
  - The risk of mud and stones being dragged onto Fernbank–Glenaladale Road.
- 3.5.21 Fernbank–Glenaladale Road is proposed to be diverted from north of Chettles Road and the TTIA recommends the following modifications to the initial concept plan to address potential issues identified:
- The spacing of the intersections should be “in the order of 150m to 200m”,
  - The haulage road intersection with Fernbank–Glenaladale Road be upgraded to traffic signals with a reduced speed limit to 80 km/h,
  - Dynamic advanced warning systems be implemented on the Fernbank–Glenaladale Road approaches providing advance warning to approaching drivers when the signals are called by approaching B-doubles on the haulage road.
  - Rumble strips to be provided on the haulage road approaches to Fernbank–Glenaladale Road.

- 3.5.22 With respect to the crossing points of the private haulage with Chettles Road and Cowells Lane, the TTIA recommends that priority be given to public road traffic, with B-doubles required to come to a stop before crossing each road. In addition, it is recommended that both Chettles Road and Cowells Lane be sealed for a short distance (20 to 30 m) either side of the crossing point.
- 3.5.23 Intersection lighting is recommended at the Fernbank–Glenaladale Road intersection but not at either Chettles Road or Cowells Lane due to the “extremely low volumes and the nature of these roads”.
- 3.5.24 In my opinion, the response to these issues is inadequate given that Option 1 is the preferred option and clearly the preferable alternative for transporting concentrate from the site.
- 3.5.25 I consider that the location of the private haulage road intersection between the roundabout and Chettles Road as assessed in the TTIA is problematical and, given the proximity of the haulage road intersection to the roundabout, the provision of traffic signal control as proposed is likely to be confusing to motorists.
- 3.5.26 Further investigation is required as to the alignment of the haulage road if at-grade crossings are to be pursued, informed by the following:
- Updated classified counts on Fernbank–Glenaladale Road.
  - Preparation of functional designs of the haulage road showing the proposed alignment, formation width and details of intersection control and location of security gates.
  - A detailed functional plan of the proposed Fingerboards roundabout.
  - Functional design of diverted Fernbank–Glenaladale Road from south Chettles Road to the Fingerboards roundabout.
- 3.5.27 I note that in conjunction with the development of the site, a heavy vehicle underpass is proposed under Bairnsdale-Dargo Road south of the realigned northern intersection with Fernbank–Glenaladale Road.
- 3.5.28 A similar underpass of the private haulage road at Fernbank–Glenaladale Road is in my opinion the preferred treatment, resolving all issues identified in TTIA.
- 3.5.29 I recommend that detailed investigation of a heavy vehicle underpass forms part of the updated TTIA.

### **3.6 Assessment of Traffic Impacts – Option 2**

- 3.6.1 Chapter 9 of the TTIA focusses on the local and arterial roads which would be impacted if the alternate option of transporting product to the existing Bairnsdale siding is pursued, either in lieu of construction of a new siding at Ferndale East or potentially, in an interim arrangement, prior to the siding being constructed.
- 3.6.2 The impact of vehicle movements to and from the site in the construction phase is not discussed in Chapter 9, relying on the analysis of these movements in review of the Pre-Avon Bridge Option detailed in Chapter 7.
- 3.6.3 My review of the relevant sections within Chapter 7 in reference to external impacts of construction traffic in Option 1 provided above, also applies to Option 2.

#### **Operational Traffic**

- 3.6.4 In the Option 2 scenario, traffic on the surrounding road network will consist of staff and maintenance vehicle movements to and from the site,

together with the haulage of concentrate from the site to the rail siding in Bairnsdale by B-double vehicles.

- 3.6.5 Table 15 of the TTIA estimates that during the operational phase, the site will generate 120 light two-way vehicle movements per day related to staff movements and 40 two-way B-double movements hauling concentrate to the Bairnsdale siding.
- 3.6.6 In the Option 2 scenario, B-double movements to Bairnsdale Siding would be undertaken from the site along the following route:
- East along Bairnsdale Dargo Road via the site access point at the new Fingerboards roundabout,
  - Right into Lindenow Glenaladale Road,
  - Left onto Princes Highway,
  - Right onto Racecourse Road,
  - East along Forge Creek Road,
  - Left into Bosworth Road, and
  - Left into the rail siding.
- 3.6.7 Return movements are assumed to utilise the same route.
- 3.6.8 The report conducted a high-level review of the proposed route, identifying a number of “key considerations” including:
- B-double traffic using local roads, in particular Racecourse Road,
  - Intersection safety and geometry at Princes Highway / Racecourse Road intersection,
  - Road pavement issues in Forge Creek Road and Bosworth Road.
- 3.6.9 The assessment accordingly conducted a high-level review of alternate transport routes to the Bairnsdale siding in the Post Avon Bridge Option 2 scenario, discussed in Section 6.4.2 of the TTIA.
- 3.6.10 The assessment considered the following alternate routes:
- Bairnsdale-Dargo Road to Princes Highway (instead of using Lindenow- Glenaladale Road).
  - Main Street, Forge Creek Road north and Bosworth Road between Princes Highway and the siding (instead of Racecourse Road).
  - Princes Highway, Collins Street and Bosworth Road north between Princes Highway and the siding (instead of Racecourse Road).
- 3.6.11 It is noted that the alternate routes considered sought to use existing declared roads, approved for the use of B-double vehicles avoiding in particular use of Racecourse Road which is currently not a declared B-double route.
- 3.6.12 A risk assessment was undertaken, based on the identified key considerations however, no recommendations are provided with respect to the adoption of these routes as an alternative to the nominated route.
- 3.6.13 The assessment noted however as follows:
- Use of Bairnsdale- Dargo Road
- requires travel through the Bairnsdale Schools Precinct and the growing areas of Bairnsdale west.
  - requires travel on Bairnsdale-Dargo Road east of Lindenow around sharp bends with commensurate safety risk.
  - introduces intersection operation and safety risks at the Bairnsdale-Dargo Road / Princes Highway intersection.
- Use of Main Street / Forge Creek Road

- requires travel in reasonable proximity to the Bairnsdale Schools precinct and into the built-up areas of Bairnsdale, with commensurate risk to pedestrians.

Use of Princes Highway / Collins Street

- requires travel in reasonable proximity to the Bairnsdale Schools precinct and into the built-up areas of Bairnsdale, with commensurate risk to pedestrians.
  - introduces conflicts at the Bosworth Road level crossing.
  - Safety issues for turning B-double vehicles at the intersection of Princes Highway / Collins Street.
- 3.6.14 Chapter 9 of the TTIA details the assessment of the impacts specifically related to the movement of concentrate to the Bairnsdale Siding under Option 2 along the nominated route.
- 3.6.15 The traffic performance impacts assessed in Section 9.2 review the performance of the intersections of Princes Highway / Lindenow-Glenaladale Road and Princes Highway / Racecourse Road only, noting moderate risks at both intersections related to long delays at “busy periods” resulting from additional B-double trucks turning at both intersections.
- 3.6.16 Safety Impacts assessed in Section 9.3 review the intersections road geometry and lighting.
- 3.6.17 The assessment considers the two Princes Highway intersections reviewed in the traffic performance section, as well as the intersections of Forge Creek / Bosworth Road and Bosworth Road and the access to the siding.
- 3.6.18 The review considered a number of safety aspects including:
- Speed differential and traffic composition
  - Acceleration / deceleration lanes
  - Turning treatments
  - Sight distance and
  - approach speeds
- 3.6.19 On the basis of the assessment, the following treatments in association with the use of the Option 2 Route to transport product from the site to Bairnsdale Siding are recommended:
1. Upgrade the intersection of Princes Highway / Racecourse Road to a T junction roundabout.
  2. Upgrade the intersection of Princes Highway / Lindenow-Glenaladale Road to a roundabout.
  3. Install rumble strips and dust suppressant on the unsealed access road to the siding.
  4. Widening of the shoulders at the curve in Forge Creek Road and reinstate linemarking.
  5. Minor works on Racecourse Road such as shoulder improvements to meet B-double standards and enable approval of the road as a B-double Route.
- 3.6.20 If Option 2 is to be pursued, the updated TTIA should provide a more detailed assessment of potential routes including:
- Functional designs of the proposed treatments, including the roundabout at the Princes Highway / Racecourse Road and Princes Highway / Lindenow-Glenaladale Road.

- Updated traffic counts at the intersections and SIDRA analysis of future conditions to demonstrate that satisfactory operation can be achieved.
  - Further review of Bairnsdale-Dargo Road between the site and Lindenow-Glenaladale Road, Lindenow-Glenaladale Road including through Lindenow South and the rail level crossing to Princes Highway to identify additional mitigation and or upgrade works which may be required.
- 3.6.21 In my opinion, given the issues identified, including along the nominated route via Racecourse Road, the transport of concentrate to Bairnsdale Siding under Option 2 remains problematic and requires considerable further investigation if it is to be pursued.
- 3.6.22 In particular, I consider the proposed construction of roundabouts at the Princes Highway intersections with Lindenow-Glenaladale Road and Racecourse Road as proposed in the “preferred option” to be inappropriate, having regard to classification of the local roads and the impact on traffic movements along the highway, particularly at Lindenow-Glenaladale Road.
- 3.6.23 In addition, given the alignment of the Racecourse Road approach to Princes Highway, a T junction roundabout accommodating B-double turning movements may not be achievable.

### **3.7 EES Environmental Management Framework**

- 3.7.1 Chapter 12 of the EES Report presents the proposed environmental management framework (EMF) proposed to be implemented in association with the project.
- 3.7.2 In relation to traffic during construction and operation, it is identified in Table 12.6 that the objectives of the EMF will be “to maintain road safety and performance during construction and operation of the project”, with specific indicators being:
- Number of incidents on roads used by project traffic (I36).
  - Number of community complaints related to project traffic (I37), including traffic noise emissions.
  - Regular engagement with key stakeholders (I3), including East Gippsland and Wellington Shires and department of Transport.
- 3.7.3 Section 12.4.5 of the EMF proposes a series of management plans to be prepared, including a Traffic Management Plan in association with the planning scheme amendment required under the Planning and Environment Act.
- 3.7.4 Table 12.8 details proposed risk treatments and sub-plans to be prepared for the project including a Traffic Management Plan to be prepared to the satisfaction of Council and DoT which is proposed to include the following contents:
- Roads and associated infrastructure at risk of damage, deterioration or dilapidation arising from construction and operation of the project.
  - Inspection program during construction to identify road safety hazards and maintenance works necessary as a result of construction traffic.
  - Program to rehabilitate existing road infrastructure to a safe and useable condition during construction, operations and closure of the mine.

- Road widening and upgrades required to accommodate additional traffic or oversize vehicles during the project.
  - Responsibility for, and frequency of, reviews of the management plan.
- 3.7.5 Section 12.4.8 and Table 12.9 detail a proposed monitoring and reporting program to measure project performance during construction, operation and closure, including for traffic and transport.
- 3.7.6 Section 12.4.7 refers to a detailed list of mitigation measures proposed by Kalbar provided in Attachment H of the EES, with relevant measure to be included in each of the management plans and sub-plans.

### 3.8 Attachment H

- 3.8.1 Attachment H to the EES details a “Mitigation Register” which includes a range of Traffic and Transport measures listed in Appendix C.
- 3.8.2 I have reviewed the list of mitigating measures proposed and note that it is comprehensive, specifying a number of overall measures in relation to road deviation and associated intersection works and design standards, which I consider to be generally satisfactory.
- 3.8.3 A number of upgrade treatments are specified which apply specifically to the Pre Avon River rail bridge, the Post Avon Rail bridge – Option 1 or the Post Avon Rail bridge – Option 2 scenarios considered in the TTIA.
- 3.8.4 Works applying specifically to each option are noted as “if required under the road and rail scenario”.
- 3.8.5 In my opinion, treatments related to the Pre Avon River rail bridge scenario should be deleted as being no longer relevant, with works identified to facilitate the Post Avon River rail bridge - Option 2 scenario, only being included if this option is to be pursued with identified mitigating works subject to further analysis and consultation with Council recommended in my review of the TTIA in Section 3.6 above.
- 3.8.6 Works associated with the development of the Fernbank East rail siding and construction of the private haulage road should include grade separation of the haulage road at Fernbank-Glenaladale Road as recommended in Section 3.5 above.

### 3.9 EES Conclusions

- 3.9.1 Chapter 13 of the EES Report draws together conclusions with respect to the environmental impact of the project and compliance of the assessment with scoping requirements issued by the Minister of Planning.
- 3.9.2 Section 13.1.5 of the EES report summarizes social, land use and infrastructure in relation to the scoping requirement – ***To minimize potential adverse social and land use effects, including on agriculture (such as dairy, irrigated horticulture and grazing) forestry, tourism industries and transport infrastructure.***
- 3.9.3 With respect to traffic impact and transport infrastructure the report states as follows:

*“The project will include a number of changes to the road network, including upgrades and relocations of existing roads and some intersections. Permanent diversions/upgrades are proposed for sections of Bairnsdale-Dargo Road and Fernbank-Glenaladale Road. Temporary diversions are proposed for Careys Road and Bairnsdale-Dargo Road. The*



*Bairnsdale-Dargo Road/Fernbank-Glenaladale Road intersection will be upgraded to a roundabout and relocated. Where roadworks associated with the project require road closures, Kalbar will work in consultation with East Gippsland Shire Council and VicRoads. A traffic management plan will be developed and implemented in accordance with VicRoads and local requirements to monitor potential traffic-related impacts.*

*Overall, traffic generation is expected to be low for both construction and operations activities compared to existing volumes. During construction, light vehicle traffic associated with the movement of workers will make the largest contribution to traffic volumes, with a small volume of heavy vehicles. Workforce traffic will comprise 30 return light vehicle movements per day during construction. In operations, for the preferred transport option (Fernbank East rail scenario), the vast majority of potential safety risks will be avoided as B-doubles will not travel along the public road network. These trucks will travel from the project area to the proposed Fernbank East rail siding via a dedicated private haulage road. Workforce traffic will comprise 120 return light vehicle movements per day during operations.*

*In the event that the preferred option of the Fernbank East rail siding cannot proceed, the preferred alternative is the Bairnsdale rail siding option. Under this option, concentrate would be transported along local roads and the Princes Highway, increasing heavy vehicle volumes, particularly through towns such as Lindenow South. Under this scenario more traffic delays are expected, and the risk of crashes will increase, due to road works and B-double movements on public roads.*

*If the Bairnsdale rail scenario cannot proceed, concentrate would be transported by road to Maryvale and Port Anthony/Barry Beach Marine Terminal. This option will similarly increase the risk of crashes. The road and rail scenario will decrease pedestrian safety in Lindenow South due to an additional 80 heavy vehicle movements per day through the town (an increase of 108%).*

*Some sections of the road network and intersections are currently sub-standard. Works proposed as part of the project to some roads, rail crossings and intersections will mean the upgraded infrastructure will be able to meet current standards. Once the proposed road and intersection works are complete, the overall impact would be a safer transport network for communities in the project area and surrounds”.*

- 3.9.4 The conclusions are informed by the TTIA contained in the Technical Appendix and are largely consistent with the analysis and the risk assessments undertaken in that report.
- 3.9.5 While the summary recognises the clear benefits clear of construction of the Fernbank East rail siding as the preferred transport option, avoiding the vast majority of potential safety risks, it does not commit to the construction of the siding in association with the project or identify factors which would inform a decision to not proceed with the siding and private haulage route.
- 3.9.6 In my opinion, if there remains doubt as to the development of the siding in association with the proposed mining operation, a higher level of assessment of alternate haulage routes is required to satisfy the scoping requirements of the EES, including the nominated alternate proposal to upgrade the rail siding at Bairnsdale.

### 4.1 Council Submission

- 4.1.1 Planology on behalf of East Gippsland Shire Council lodged a submission to the IAC dated the 11<sup>th</sup> December 2020, advising that Council had resolved on the 1<sup>st</sup> December 2020 to oppose the proposed Fingerboards Mineral Sands Mine as proposed by Kalbar Operations.
- 4.1.2 Council commissioned SLR Consulting Pty Ltd to prepare a targeted review of various technical reports contained in the EES documentation including the Traffic and Transport Impact Assessment.
- 4.1.3 Council received the report, dated November 2020, at its meeting of the 1<sup>st</sup> December, with the report forming part of Council's submission to the IAC as Attachment 2.

### 4.2 SLR Targeted Technical Review

#### Summary of Traffic and Transport Issues

- 4.2.1 SLR conducted a review of the TTIA report, with issues identified detailed in Section 3.7 of the Technical Review and summarised in Table 7.
- 4.2.2 I have reviewed the issues raised and provide my comments and opinions on each issue in Table 4.1 on the following page.

**Table 4.1: Review of Traffic and Transport Issues – SLR Consulting**

	Issue	Response
1	Intersection performance analysis has not been presented for the Post-Avon Bridge options and as such, it is not possible to confirm whether modified intersections, specifically the proposed roundabout at Princes Highway Racecourse Road will operate with an appropriate level of service.	<p><u>Agree</u> As stated in Section 3.6 above, if the Post Avon -Option 2 scenario is to be pursued, I recommend that updated classified counts be undertaken at the intersection of Princes Highway with Racecourse Road and Lindenow-Glenaladale Road and SIDRA analysis be undertaken to demonstrate that satisfactory operation can be achieved with the roundabout upgrades</p>
2	The proposed use of Racecourse Road under the Post Avon Bridge – Option 2 routing scenario is inconsistent with Council planning intent for the Main Street / Collins Street / Bosworth Road route to be the preferred freight route to Bairnsdale Siding.	<p><u>Noted</u> In my opinion, if Option 2 is to be pursued, given the issues identified in the TTIA, including along the nominated route via Racecourse Road, the transport of concentrate to Bairnsdale Siding under Option 2 remains problematic and requires considerable further investigation. Council and DoT advice should inform the choice of route.</p>
3	It is unclear if Option 2 would be relied on only as an interim measure prior to the construction of the Ferndale East Siding.	<p><u>Agree</u> This needs to be clarified.</p>
4	Estimates of heavy vehicle traffic volumes during the construction phase need to be validated, beyond the nominal 20 vehicles per day adopted in the TTIA.	<p><u>Agree</u> I anticipate that, should approval be given for the project, a construction management plan will be required to be prepared, nominating truck movements over various stages of the 2-year construction phase and designated access routes. The updated TTIA should provide additional detail on construction traffic movements.</p>
5	Heavy vehicle forecasts for the operational phase only include allowance for haulage trucks, and do not include other truck movements including maintenance vehicles, waste collection and delivery of operational requirements such as diesel fuel.	<p><u>Agree</u> The updated TTIA should provide additional detail on all expected traffic activity generated during the operational phase.</p>
6	Detailed intersection modelling as only been completed for the Pre-Avon Option and it is not possible to determine if the proposed roundabout at Princes Highway / Racecourse Road in Post Avon – Option 2 will operate satisfactorily.	<p><u>Agree</u> See Item 2 comments above</p>

7	Intersection analysis has been undertaken using Cap-X method which is simplistic and not widely used in Australia.	<u>Agree</u> I recommend that intersection analysis in the Post Avon Options be undertaken based on updated traffic volume data and utilising SIDRA, which is the industry standard software used most commonly in Australia.
8	Limited information is provided to validate the turn warrants assessment presented in the Pre-Avon Option from a safety perspective and no turn warrant assessment has been completed for the two Post-Avon Options.	<u>Agree</u> The determination of intersection and access treatments in all options should consider warrants for provision of auxiliary turning lanes from am operations and road safety perspective. This should be incorporated into the updated TTIA.
9	Insufficient geometric detail has been provided to substantiate the proposed road alignments from a road safety perspective. More advanced engineering drawings are required including long-sections.	<u>Agree</u> It is considered that the revised TTIA should provide detailed functional plans for all intersection treatments, and cross-section and where appropriate longitudinal sections of proposed road deviations. I note that plans of the proposed private haulage route in the Post-Avon Option 1 scenario, including an alignment plan, cross-sections and long section have now been provided to DoT and the IAC, together with plans for the revised alignment of Fernbank – Glenaladale Road and the relocated Fingerboards intersection roundabout.
10	The ability to achieve suitable intersection spacings between the intersection of the Private Haulage Road / Ferndale-Glenaladale Road intersection and the Fingerboards roundabout needs to be confirmed together with the ability to safely introduce the proposed signalized intersection control.	<u>Agree</u> As discussed in Section 3.6, I consider the provision of traffic signal control at the intersection of the Haulage Road / Fernbank-Glenaladale Road intersection is problematic given the proximity to the proposed Fingerboards roundabout. In my opinion, an underpass should be considered, similar to heavy vehicle underpasses of public roads elsewhere within the site.
11	No consideration has been given to amenity impacts potentially associated with product haulage.	<u>Agree</u> The updated TTIA should consider amenity impacts resulting from truck volume increases, particularly if the Post Avon Option 2 Scenario is to be pursued.
12	Only a basic assessment has been completed to quantify the impact on pavement service life of increased truck movements on Council managed roads.	<u>Agree</u> Detailed assessment on the impact of additional truck traffic should be undertaken for the construction phase in all options, and in

		particular the operational phase should the Post Avon Option 2 Scenario be pursued either in the interim or over the operational life of the project.
13	The proposed roundabouts along Princes Highway in the Post Avon – Option 2 have been justified based on safety considerations, the appropriateness if the outcome from a road hierarchy perspective has not been assessed, resulting in the lower order road being afforded priority over highway traffic for some movements	<u>Agree</u> I consider the proposed construction of roundabouts at the Princes Highway intersections with Lindenow-Glenaladale Road and Racecourse Road as proposed in the “preferred option” to be inappropriate from an hierarchical perspective and the impact on traffic movements along the highway through minor road traffic having priority.
14	Functional plans of the proposed roundabouts should be prepared to determine if there is sufficient space within the road reserve to accommodate the treatment.	<u>Agree</u>

### 5.1 Preamble

- 5.1.1 On the 19<sup>th</sup> January 2021, I was provided with further documents provided by Kalbar which I understand have been prepared in response to the RFI issued by the EES in December.
- 5.1.2 The documents include proposed variations to road deviations proposed to be undertaken to facilitate the proposed mining operations and a concept design for the southern haul road, infrastructure and Fernbank East Rail Siding.
- 5.1.3 The modified road alignment plans, the proposed cross-section of the southern haulage road and the proposed layout of the Fernbank East Rail Siding are attached in Appendix A.
- 5.1.4 I have sought for CAD versions of these plans to be provided which I received on 28<sup>th</sup> January 2021. I have not had the opportunity to review the plans in detail in the time available and hence my opinions on the updated designs at this stage are only based on a preliminary overview of the plans in pdf format.
- 5.1.5 I note that the plans progress the investigations of the development of a rail; siding at Fernbank East and a private haulage road between the site and the new siding. It remains unclear however in the context of my review of the EES documentation, as to whether the “preferred” Post-Avon River bridge Option 1 scenario is proposed to be adopted in association with the construction and ongoing operation of the project.

### 5.2 Revised Road Alignment Plans

- 5.2.1 Details of the proposed modifications to the road alignment and the rationale behind the changes are detailed in an email from Wave International to the Department of Transport dated 14<sup>th</sup> January 2021, attached in Appendix B-
- 5.2.2 In summary it appears that the redesign has been undertaken seeking to:
- Provide for road diversions to be on land either owned by Kalbar or landowners “open to transactions”,
  - Avoid permanent diversion of Fernbank–Glenaladale Road north,
  - Reduce upfront pro-operational road diversions, and
  - Refine designs to conform with Austroad’s Design Guidelines.
- 5.2.3 It is noted that the redesign, while continuing to relocate the Fingerboards intersection to the south and convert it to a roundabout, seeks to retain the existing alignment of Fernbank-Glenaladale Road south, with the intersection forming a three-leg roundabout as shown in Figure 5.1
- 5.2.4 Site access appears to now be contemplated from Fernbank-Glenaladale Road via a T junction, located 220m south of the roundabout and 130m north of the haulage road intersection.
- 5.2.5 While the revised road alignment reduces to extent of deviations required and appears to remove the issue of land acquisition from other landowners, it does not in my opinion resolve the issue of the separation of intersections along Fernbank-Glenaladale Road or the control of the intersection of the private haulage road and Fernbank-Glenaladale Road.

5.2.6 Clarification should be provided with respect to:

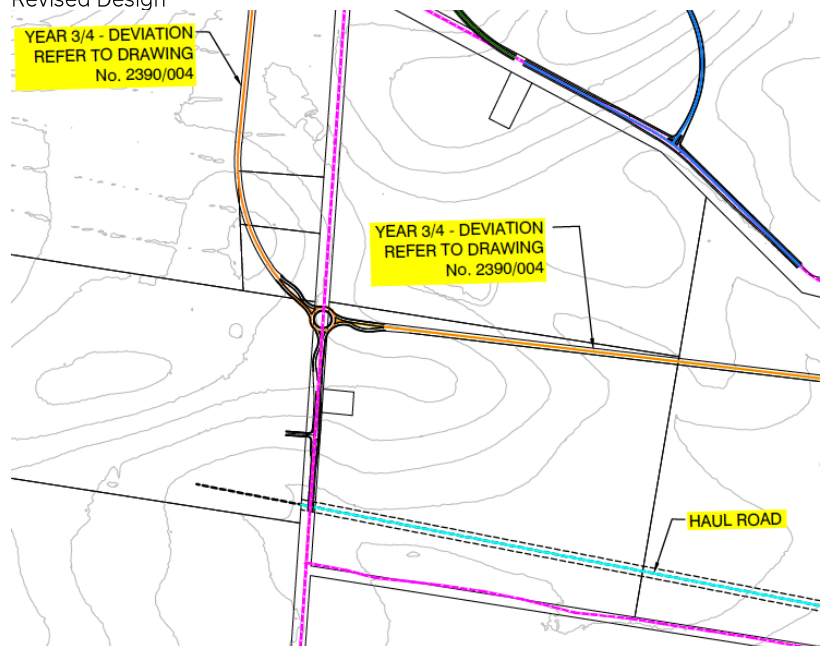
- The proposed relocation of the site access to the south of the Fingerboards roundabout rather than as a fourth leg to the roundabout as exhibited,
- The need for the Fingerboards intersection as a three leg intersection to be roundabout control,
- The control of the proposed site access point and separation from the intersection.

**Figure 5.1 Revised Fingerboards Roundabout Design**

Exhibited Design



Revised Design



- 5.2.7 In my opinion in association with the modified road deviations and access arrangements to the site, the intersection of the Private Haulage Road and Fernbank- Glenaldale Road should be grade separated.
- 5.2.8 While I have not had the opportunity to review the revised road deviation plans in detail, the following initial observations are provided for further discussion:
- Sight distance appears to be calculated based on 100km/h design speed (default unposted speed limit) whereas 110km/h is the typically accepted 85<sup>th</sup> percentile speed;
  - The proposed curve radii (250 – 425m) are well below the AGRD recommended minimum radii (2000m with 3% adverse crossfall, 1050m with 3% superelevation or 550m with 6% superelevation); and
  - The roundabout approaches appear tight and may require greater than 20km/h speed reduction between curves.

### **5.3 Fernbank East Rail Siding and Haulage Road Design**

- 5.3.1 Subject to a detailed review of the design, and assuming the haulage route passes under Fernbank-Glenaldale Road, I am generally satisfied with the proposed design of the haulage route.
- 5.3.2 The proposed cross-section options for the haulage road, providing for a 7.5m sealed road with 1.5m shoulder on each side is considered satisfactory from a road design perspective.



## 6.1 Summary and Conclusions

### Overview

- 6.1.1 The Traffic and Transport Impact Assessment prepared by Arup, forming Appendix A012 of the exhibited EES, seeks to investigate the traffic and transport impacts of the proposed mineral sands mine during both the construction and operation phases of the project.
- 6.1.2 At the time of preparation of the TTIA, (originally published in April 2020), it appears to have been unclear as to whether the Avon River Rail Bridge upgrade at Stratford, being undertaken by the State Government would be completed prior to the commencement of operation of the mine. The bridge, which will upgrade rail capacity east of Sale, was identified as providing the opportunity for the transfer of extracted product to be undertaken by rail, with the stated “preferred option” being via the construction of a new rail siding at Fernbank East, close to the project area and accessed via a private haulage road.
- 6.1.3 An alternative option of upgrading to upgrade the existing rail siding at Bairnsdale and transferring product to the siding by B-double trucks via road was also assessed.
- 6.1.4 In the event that the Avon River Bridge rail bridge was not completed on time, options of transferring product to Maryvale and Port Anthony / Barries Beach Marine Terminal were also investigated, predicated on the assumption that this would cease once the Avon River rail bridge was completed.
- 6.1.5 It is understood that the Avon River Rail Bridge has now been completed and as such, the pre Avon Bridge Scenario is now redundant.

### Post Avon River Bridge - Option 1 (Fernbank East Rail Siding)

- 6.1.6 In my opinion, the TTIA should be updated, focusing on the development of the Fernbank East Rail siding adjacent to the site (Post Avon River Bridge - Option 1), identified consistently as the “preferred option”.
- 6.1.7 In traffic terms, the development of a new purpose-built rail siding at Fernbank East is clearly the preferred means of transporting concentrate from the site, effectively reducing traffic increases on the road network to staff and maintenance vehicles, with haulage to the rail siding able to be achieved via construction of an internal private road.
- 6.1.8 Haulage of concentrate to an upgraded rail siding at Bairnsdale is the least preferred option and should only be pursued if the Fernbank East siding cannot be achieved, or on an interim basis if the siding is unable to be completed prior to operation commencing.
- 6.1.9 I consider that the updated TTIA should include more comprehensive existing conditions traffic data on the effected road network including:
  - Classified tube counts on all roads identified as access routes over at least a 7-day period, identifying hourly volumes across the day and week and existing traffic composition including volumes of vehicles of varying classification including articulated and b-double vehicles.
  - Two hour counts at key intersections during identified peak periods, enabling accurate existing conditions to be established and to form a sounder basis for review of future intersection operation and effectiveness of mitigating works proposed.
- 6.1.10 In association with a more detailed assessment of Option 1, estimates of construction traffic should be reviewed and updated to include additional

construction traffic which may be generated by the simultaneous construction of the Fernbank East Rail siding and the internal private haulage road and to consider the impacts in the construction periods on the following roads:

- Fernbank Glenaladale Road between Princes Highway and the site,
- Bairnsdale Dargo Road between Princes Highway and the site,
- Princes Highway / Bairnsdale Dargo Road intersection,
- Princes Highway / Fernbank Glenaladale Road intersection, and
- Bairnsdale Dargo Road / Lindenow Glenaladale Road intersection.

6.1.11 The analysis will inform if there is any requirement for mitigating works to be undertaken to facilitate the construction phase and would form the basis of a Construction Traffic Management Plan.

### **Alternate Road Realignment Plans**

6.1.12 Preliminary alternate designs for road network deviations and the alignment of the private haulage road to a new rail siding at Fernbank East were submitted to the Department of Transport in January 2021 which seek to:

- Provide for road diversions to be on land either owned by Kalbar or landowners “open to transactions”,
- Avoid permanent diversion of Fernbank–Glenaladale Road north,
- Reduce upfront pro-operational road diversions, and
- Refine designs to conform with Austroad’s Design Guidelines.

6.1.13 It is noted that the redesign, while continuing to relocate the Fingerboards intersection to the south and convert it to a roundabout, seeks to retain the existing alignment of Fernbank-Glenaladale Road south, with the intersection forming a three-leg roundabout. Separate access to the site is contemplated from Fernbank-Glenaladale Road via a T junction, located 220m south of the roundabout and 130m north of the haulage road intersection.

6.1.14 While the revised road alignment reduces to extent of deviations required and appears to remove the issue of land acquisition from other landowners, it does not resolve the issue of the separation of intersections along Fernbank-Glenaladale Road or the control of the intersection of the private haulage road and Fernbank-Glenaladale Road.

6.1.15 Clarification should be provided with respect to:

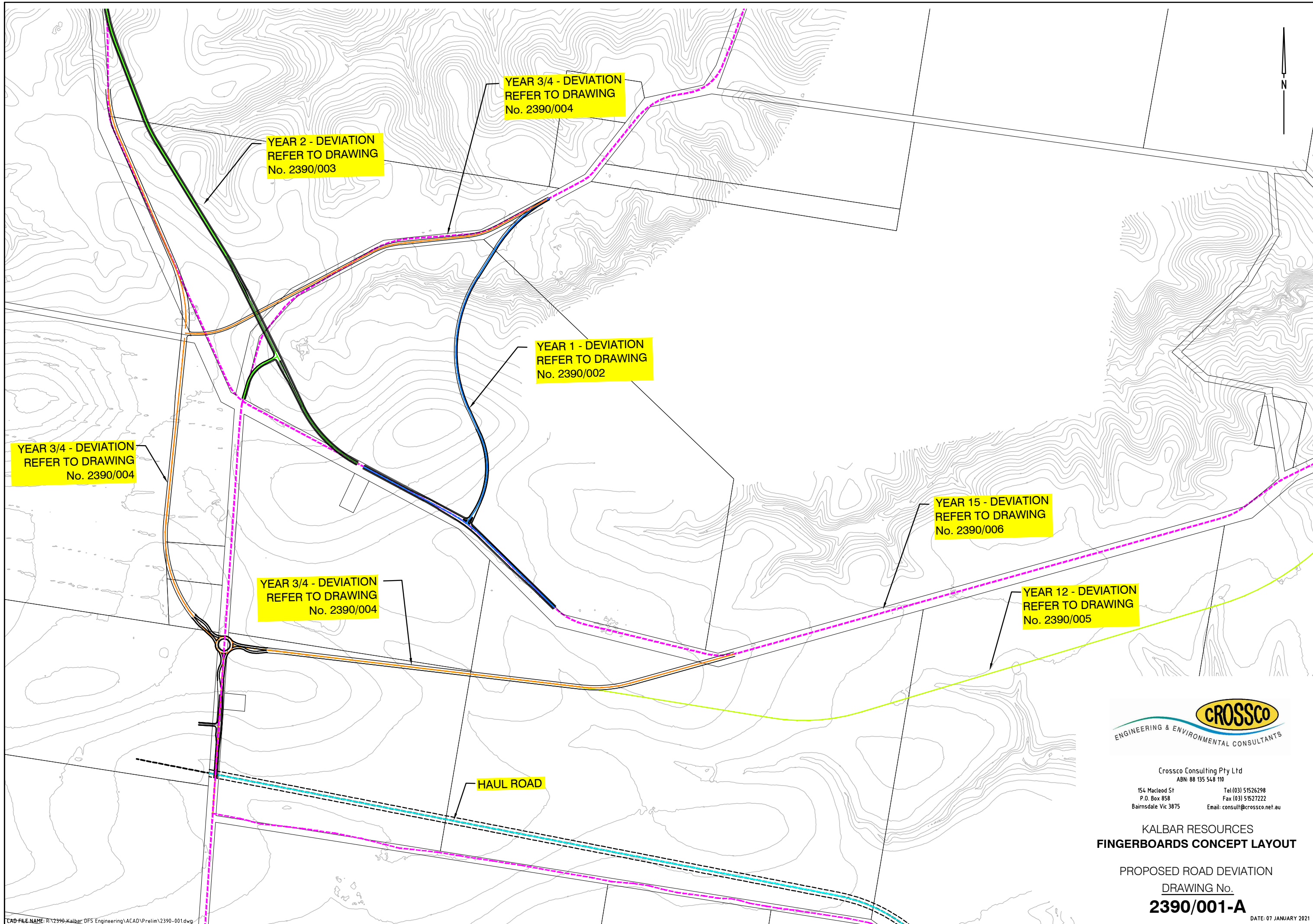
- The proposed relocation of the site access to the south of the Fingerboards roundabout rather than as a fourth leg to the roundabout as exhibited,
- The need for the Fingerboards intersection to be roundabout control,
- The control of the proposed site access point and separation from the intersection.

6.1.16 In my opinion, the Private Haulage Road should be designed to pass under Fernbank – Glenaladale Road.

### **Post Avon River Bridge Option 2 (Bairnsdale Rail Siding)**

- 6.1.17 In the Option 2 scenario, B-double movements to Bairnsdale Siding would be undertaken from the site along the following route:
- East along Bairnsdale Dargo Road via the site access point at the new Fingerboards roundabout,
  - Right into Lindenow Glenaladale Road,
  - Left onto Princes Highway,
  - Right onto Racecourse Road,
  - East along Forge Creek Road,
  - Left into Bosworth Road, and
  - Left into the rail siding.
- 6.1.18 The report conducted a high-level review of the proposed route, identifying a number of “key considerations” including:
- B-double traffic using local roads, in particular Racecourse Road,
  - Intersection safety and geometry at Princes Highway / Racecourse Road intersection,
  - Road pavement issues in Forge Creek Road and Bosworth Road.
- 6.1.19 The assessment considered the following alternate routes:
- Bairnsdale-Dargo Road to Princes Highway (instead of using Lindenow- Glenaladale Road).
  - Main Street, Forge Creek Road north and Bosworth Road between Princes Highway and the siding (instead of Racecourse Road).
  - Princes Highway, Collins Street and Bosworth Road north between Princes Highway and the siding (instead of Racecourse Road).
- 6.1.20 If Option 2 is to be pursued, the updated TTIA should provide a more detailed assessment of potential routes including:
- Functional designs of the proposed treatments, including the roundabout at the Princes Highway / Racecourse Road and Princes Highway / Lindenow-Glenaladale Road.
  - Updated traffic counts at the intersections and SIDRA analysis of future conditions to demonstrate that satisfactory operation can be achieved.
  - Further review of Bairnsdale-Dargo Road between the site and Lindenow-Glenaladale Road, Lindenow-Glenaladale Road including through Lindenow South and the rail level crossing to Princes Highway to identify additional mitigation and or upgrade works which may be required.
- 6.1.21 In my opinion, given the issues identified, including along the nominated route via Racecourse Road, the transport of concentrate to Bairnsdale Siding under Option 2 remains problematic and requires considerable further investigation if it is to be pursued.
- 6.1.22 In particular, I consider the proposed construction of roundabouts at the Princes Highway intersections with Lindenow-Glenaladale Road and Racecourse Road as proposed in the “preferred option” to be inappropriate, having regard to classification of the local roads and the impact on traffic movements along the highway, particularly at Lindenow-Glenaladale Road.
- 6.1.23 In addition, given the alignment of the Racecourse Road approach to Princes Highway, a T junction roundabout accommodating B-double turning movements may not be achievable.

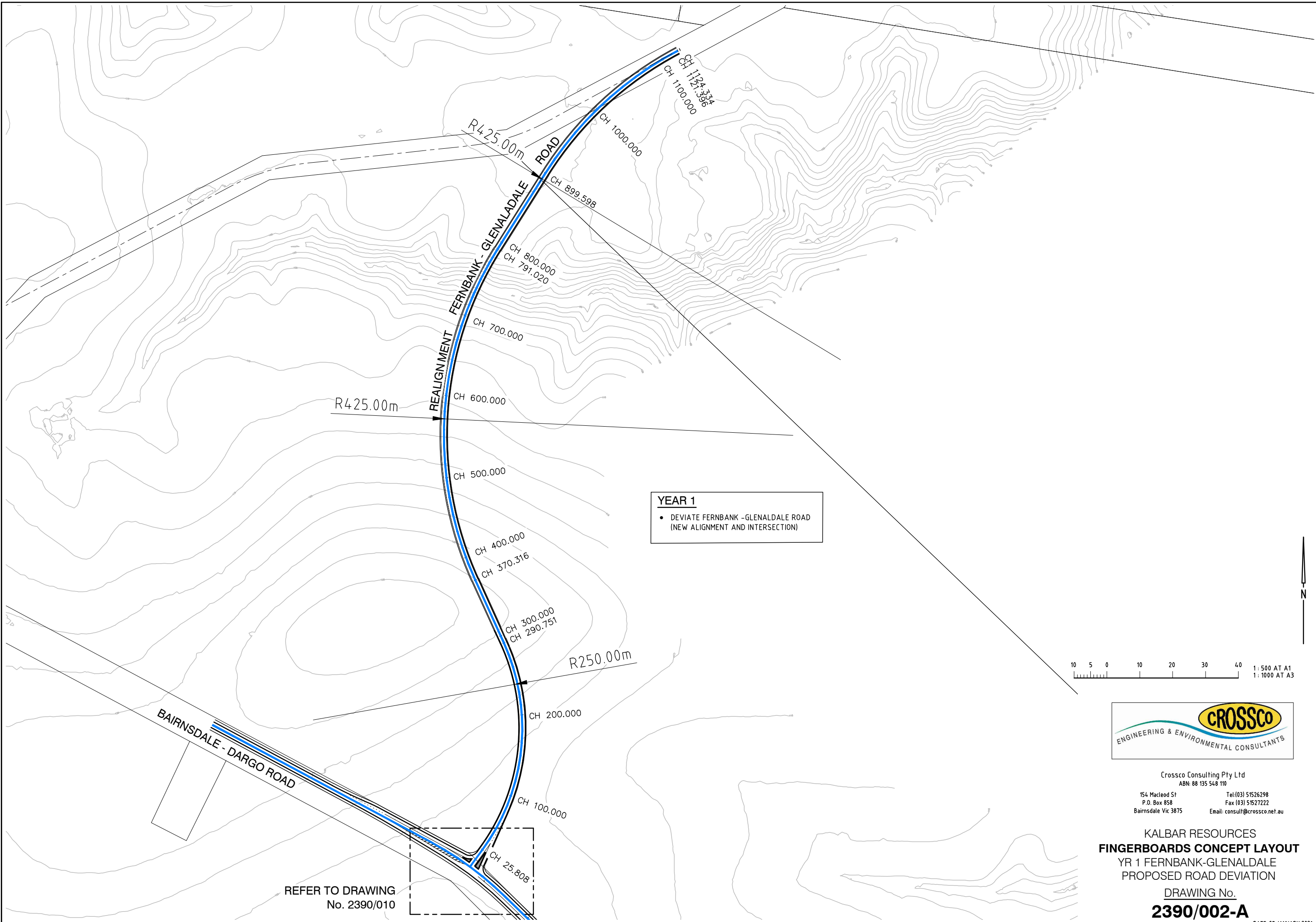
# Appendix A Revised Plans



Crossco Consulting Pty Ltd  
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 Email: consult@crossco.net.au

**KALBAR RESOURCES  
 FINGERBOARDS CONCEPT LAYOUT**

PROPOSED ROAD DEVIATION  
 DRAWING No.  
**2390/001-A**



**YEAR 1**

- DEVIATE FERNBANK - GLENALDALE ROAD (NEW ALIGNMENT AND INTERSECTION)

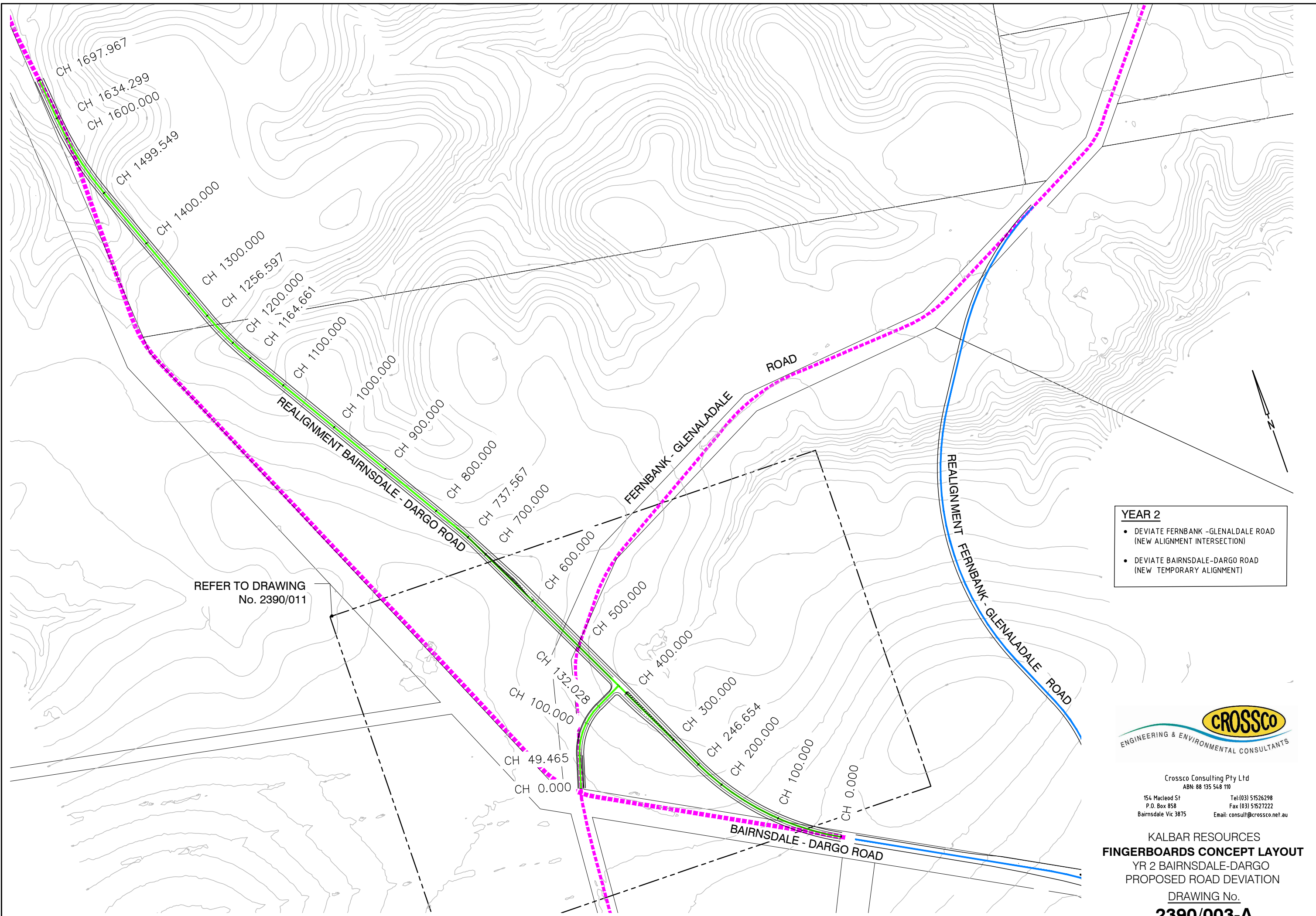
**BAIRNSDALE - DARGO ROAD**

REFER TO DRAWING  
No. 2390/010



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**KALBAR RESOURCES**  
**FINGERBOARDS CONCEPT LAYOUT**  
 YR 1 FERNBANK-GLENALDALE  
 PROPOSED ROAD DEVIATION  
 DRAWING No.  
**2390/002-A**



REFER TO DRAWING  
No. 2390/011

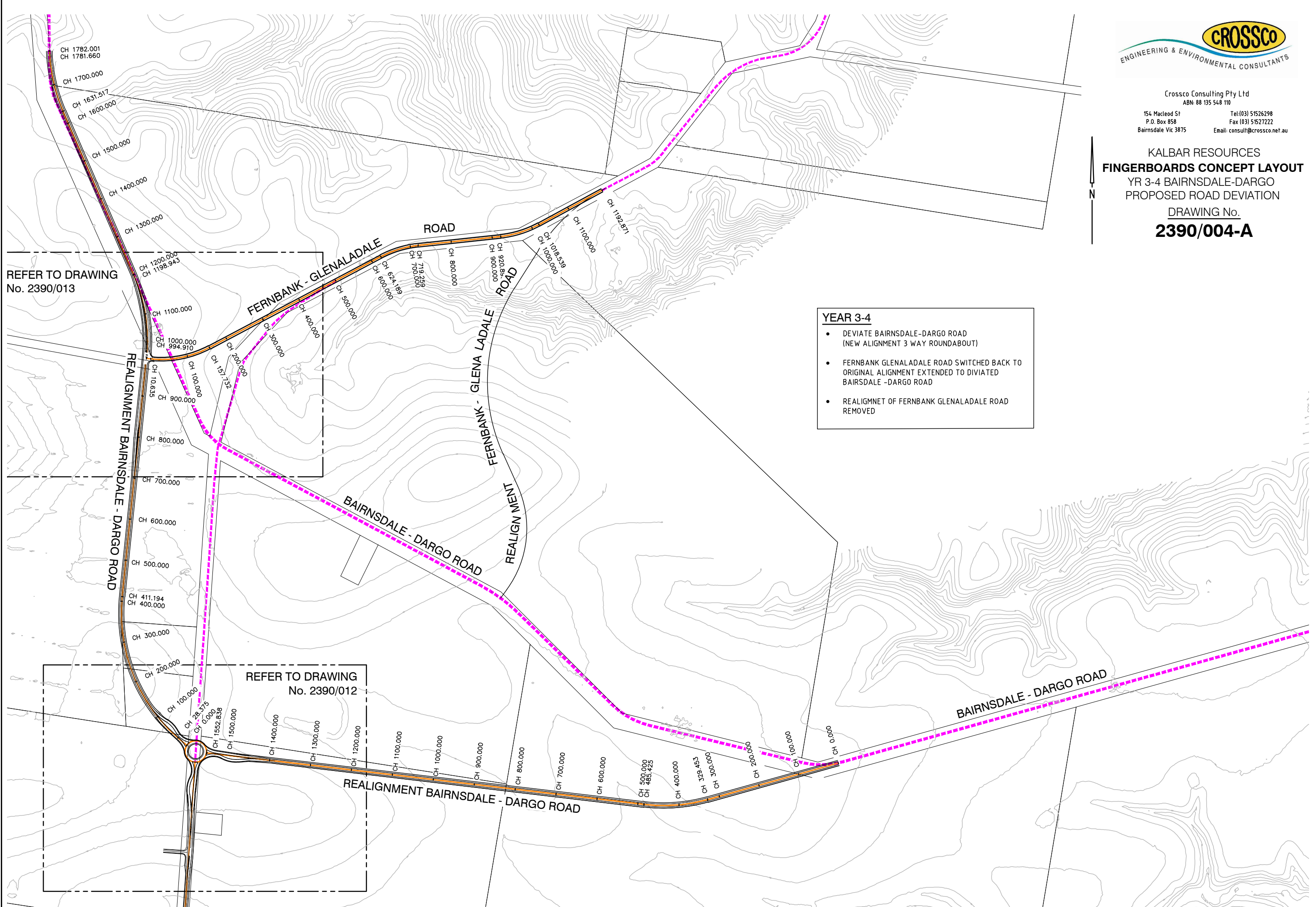
- YEAR 2**
- DEVIATE FERNBANK - GLENALADALE ROAD (NEW ALIGNMENT INTERSECTION)
  - DEVIATE BAIRNSDALE - DARGO ROAD (NEW TEMPORARY ALIGNMENT)



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KALBAR RESOURCES  
**FINGERBOARDS CONCEPT LAYOUT**  
 YR 2 BAIRNSDALE-DARGO  
 PROPOSED ROAD DEVIATION  
 DRAWING No.  
**2390/003-A**

KALBAR RESOURCES  
**FINGERBOARDS CONCEPT LAYOUT**  
YR 3-4 BAIRNSDALE-DARGO  
PROPOSED ROAD DEVIATION  
DRAWING No.  
**2390/004-A**



- YEAR 3-4**
- DEVIATE BAIRNSDALE-DARGO ROAD (NEW ALIGNMENT 3 WAY ROUNDABOUT)
  - FERNBANK GLENALADALE ROAD SWITCHED BACK TO ORIGINAL ALIGNMENT EXTENDED TO DIVIATED BAIRNSDALE -DARGO ROAD
  - REALIGNMENT OF FERNBANK GLENALADALE ROAD REMOVED

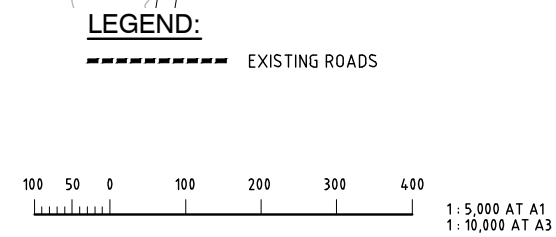
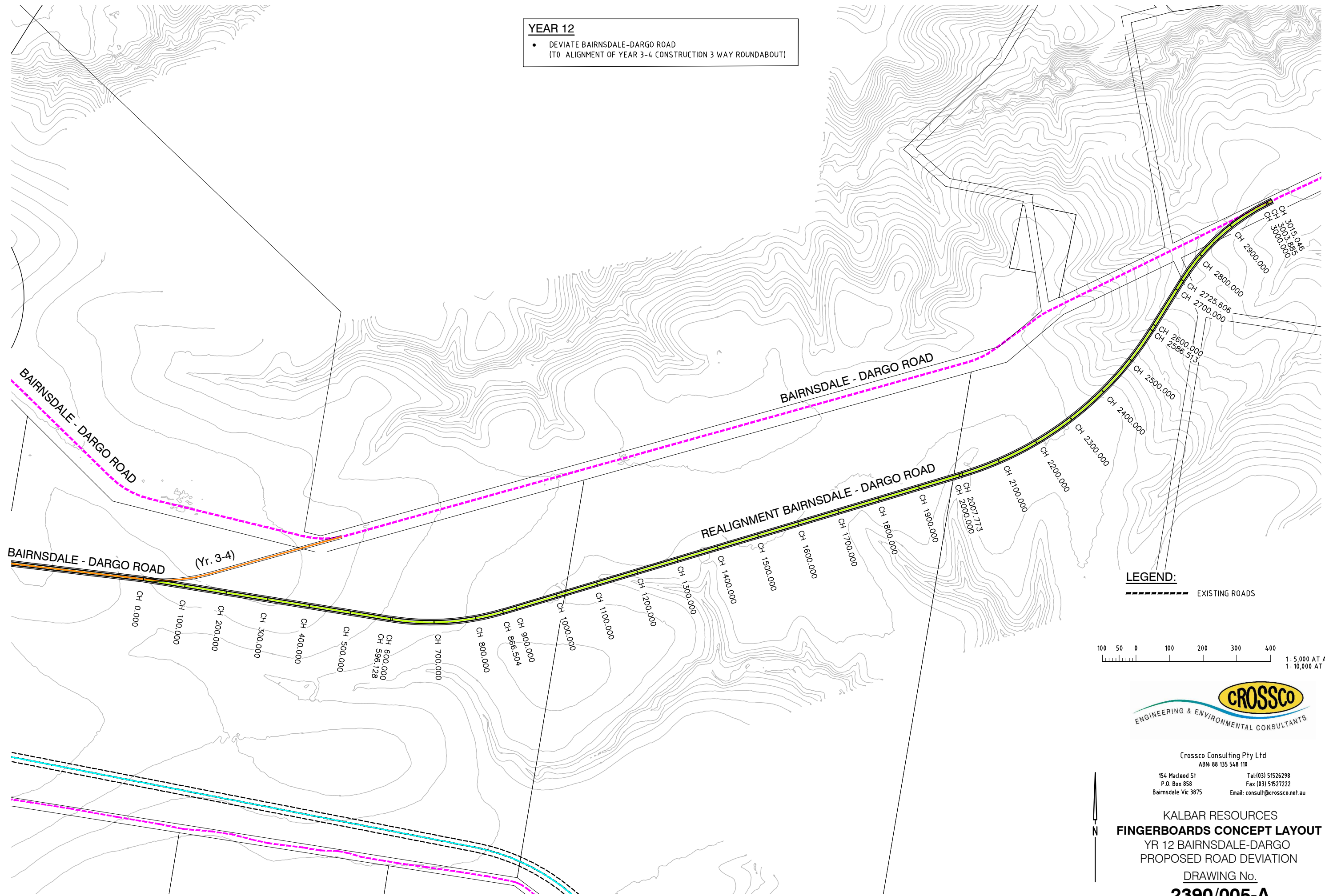
REFER TO DRAWING  
No. 2390/013

REFER TO DRAWING  
No. 2390/012



**YEAR 12**

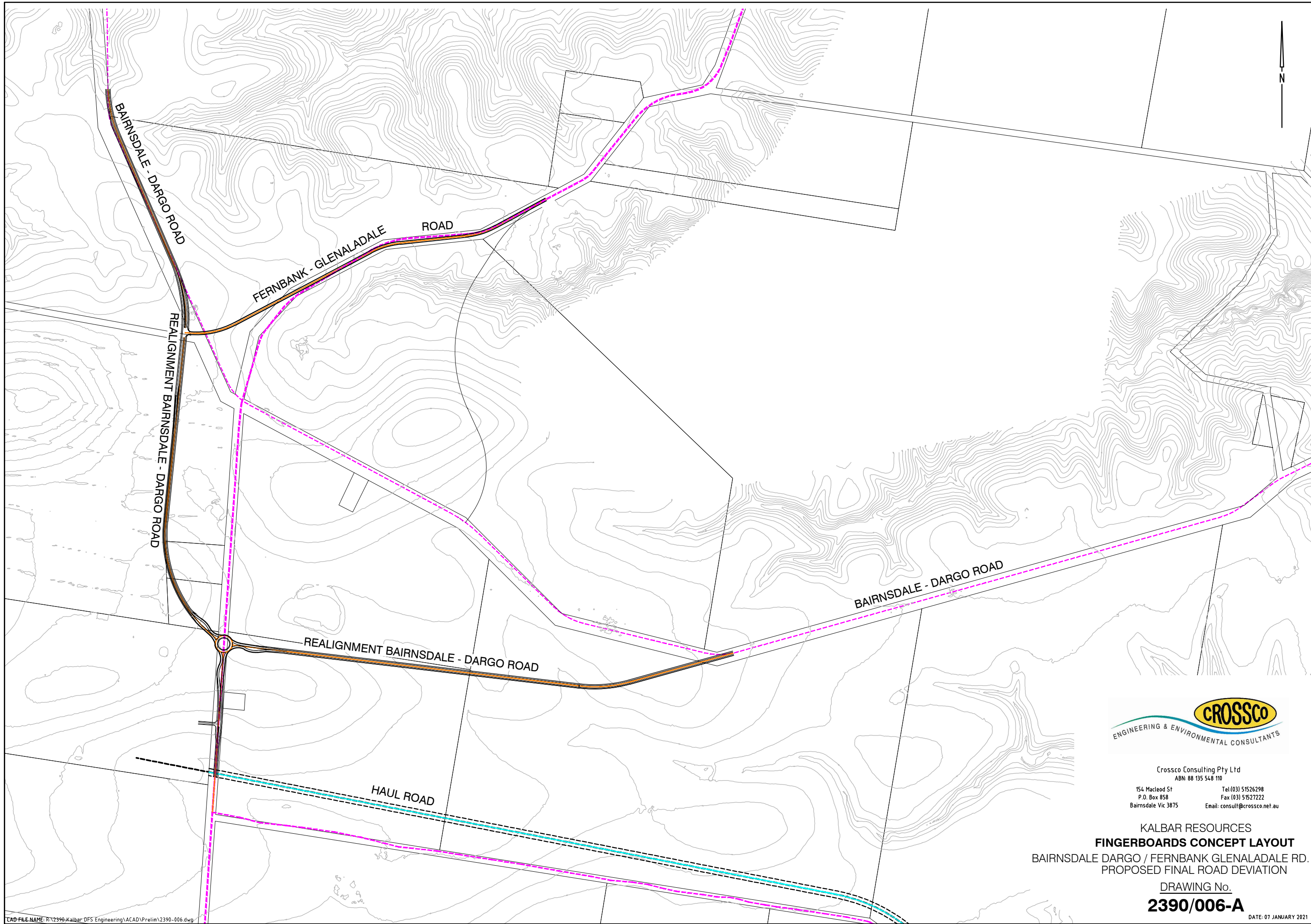
- DEVIATE BAIRNSDALE-DARGO ROAD  
(TO ALIGNMENT OF YEAR 3-4 CONSTRUCTION 3 WAY ROUNDABOUT)



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**KALBAR RESOURCES**  
**FINGERBOARDS CONCEPT LAYOUT**  
 YR 12 BAIRNSDALE-DARGO  
 PROPOSED ROAD DEVIATION  
 DRAWING No.  
**2390/005-A**

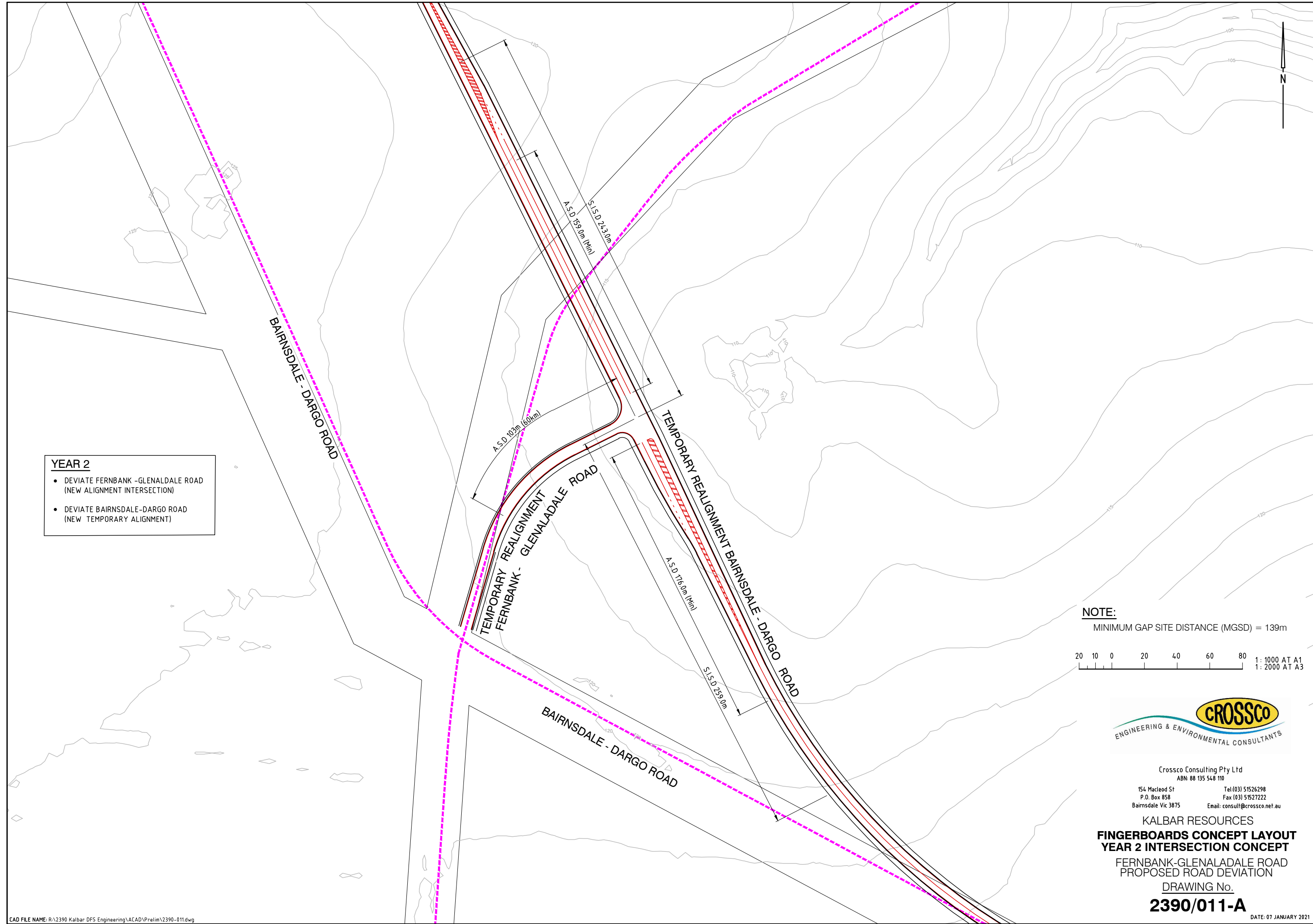


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 Bairnsdale Vic 3875 Email: consult@crossco.net.au

**KALBAR RESOURCES**  
**FINGERBOARDS CONCEPT LAYOUT**  
 BAIRNSDALE DARGO / FERNBANK GLENALADALE RD.  
 PROPOSED FINAL ROAD DEVIATION

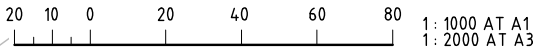
DRAWING No.  
**2390/006-A**

DATE: 07 JANUARY 2021



- YEAR 2**
- DEVIATE FERNBANK -GLENALDALE ROAD (NEW ALIGNMENT INTERSECTION)
  - DEVIATE BAIRNSDALE-DARGO ROAD (NEW TEMPORARY ALIGNMENT)

**NOTE:**  
MINIMUM GAP SITE DISTANCE (MGSD) = 139m



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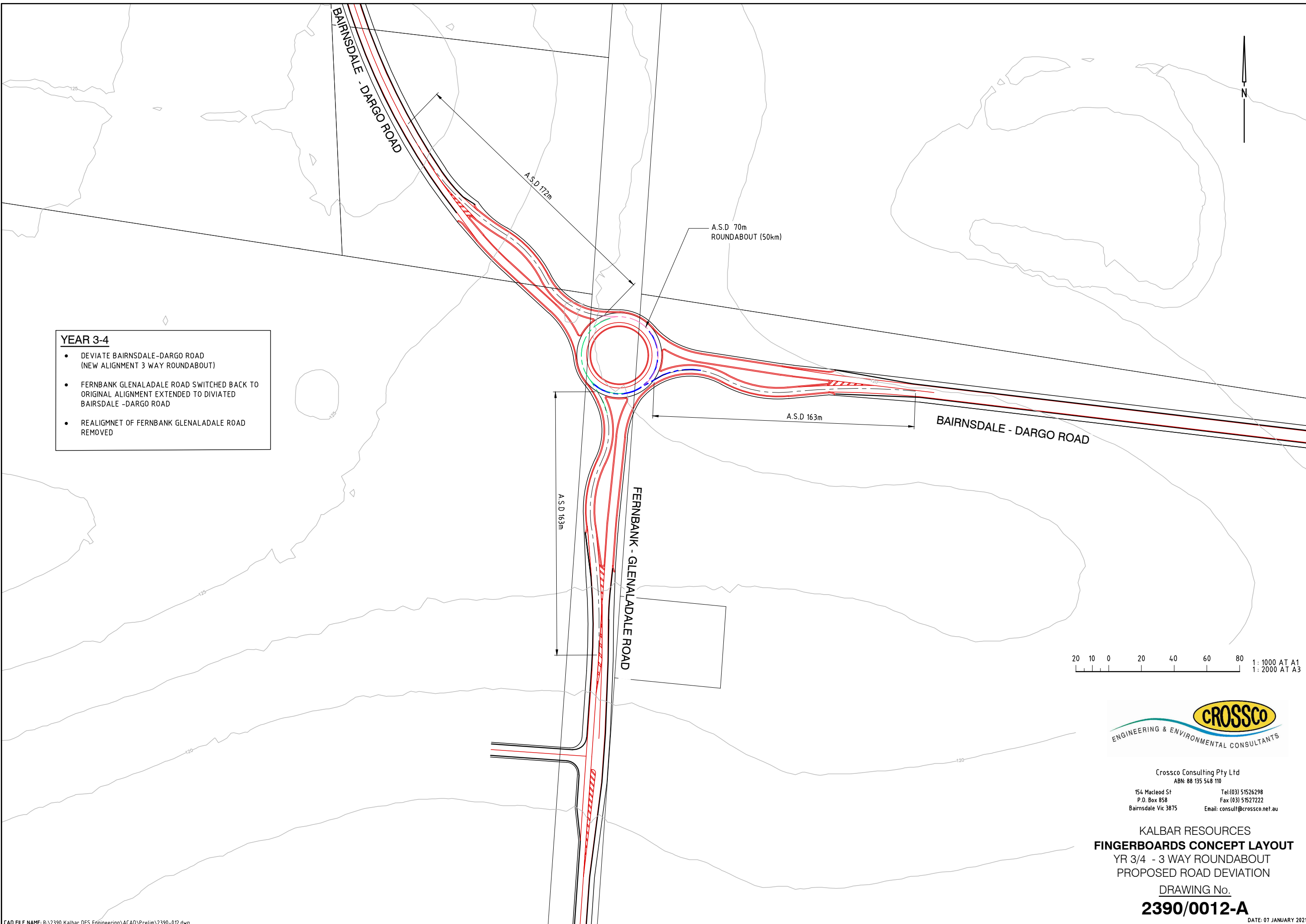
**KALBAR RESOURCES  
 FINGERBOARDS CONCEPT LAYOUT  
 YEAR 2 INTERSECTION CONCEPT**

FERNBANK-GLENALADALE ROAD  
 PROPOSED ROAD DEVIATION

DRAWING No.

**2390/011-A**

DATE: 07 JANUARY 2021



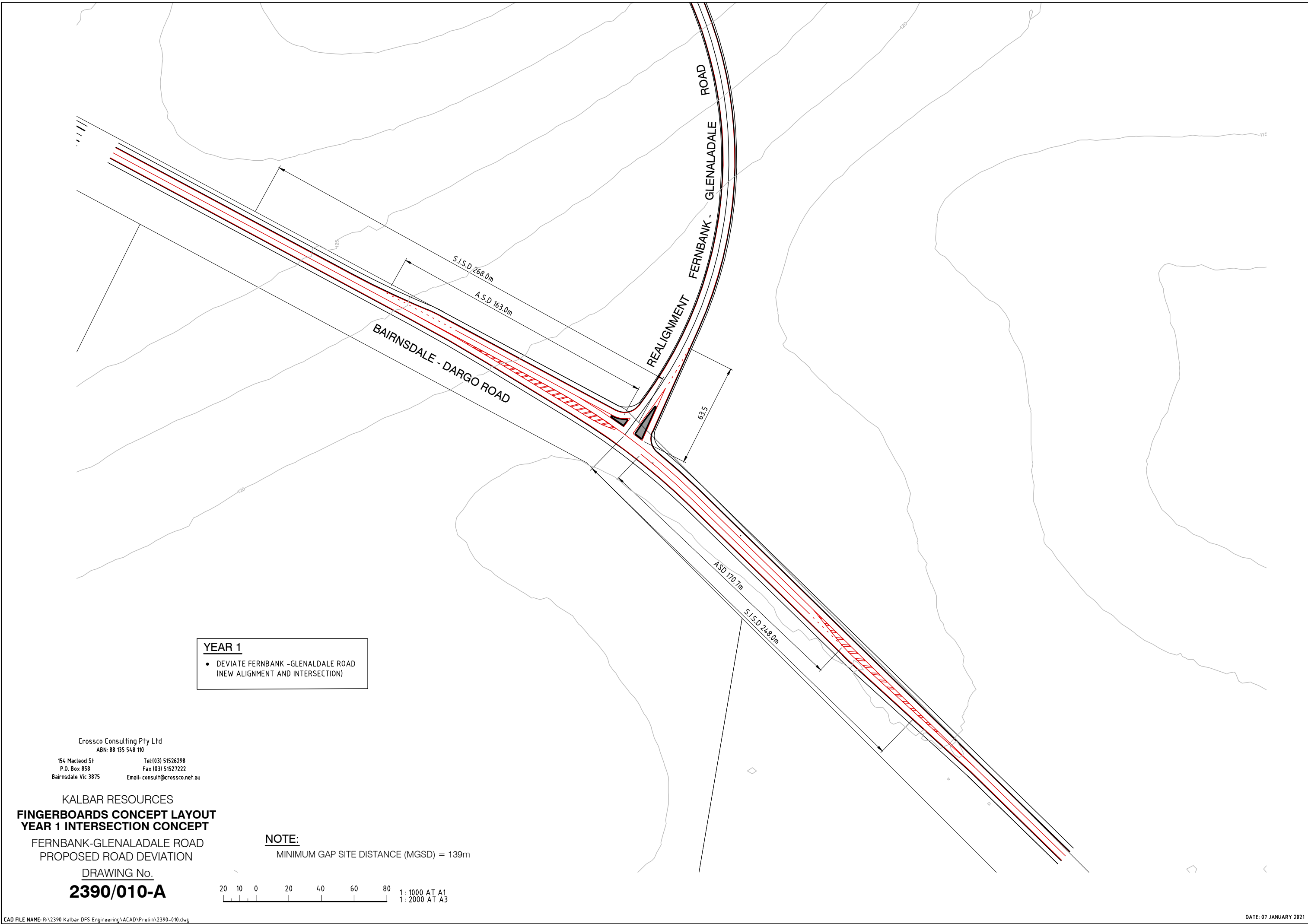
- YEAR 3-4**
- DEVIATE BAIRNSDALE-DARGO ROAD (NEW ALIGNMENT 3 WAY ROUNDABOUT)
  - FERNBANK GLENALADALE ROAD SWITCHED BACK TO ORIGINAL ALIGNMENT EXTENDED TO DIVIATED BAIRNSDALE -DARGO ROAD
  - REALIGNMET OF FERNBANK GLENALADALE ROAD REMOVED

20 10 0 20 40 60 80 1 : 1000 AT A1  
1 : 2000 AT A3



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KALBAR RESOURCES  
**FINGERBOARDS CONCEPT LAYOUT**  
 YR 3/4 - 3 WAY ROUNDABOUT  
 PROPOSED ROAD DEVIATION  
 DRAWING No.  
**2390/0012-A**



**YEAR 1**

- DEVIATE FERNBANK - GLENALDALE ROAD (NEW ALIGNMENT AND INTERSECTION)

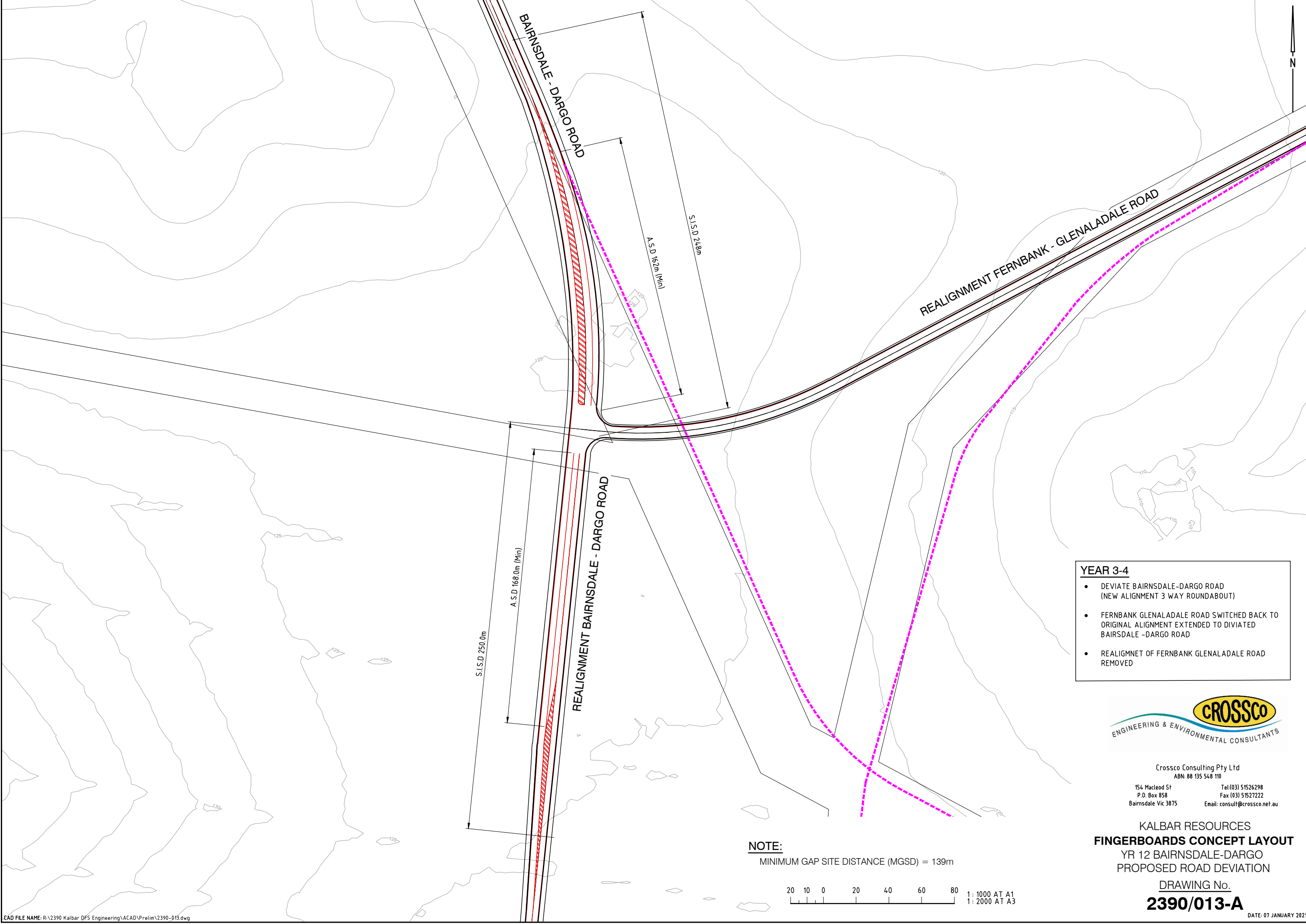
Crossco Consulting Pty Ltd  
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 Bairnsdale Vic 3875 Email: consult@crossco.net.au

KALBAR RESOURCES  
**FINGERBOARDS CONCEPT LAYOUT**  
**YEAR 1 INTERSECTION CONCEPT**  
 FERNBANK-GLENALDALE ROAD  
 PROPOSED ROAD DEVIATION

**NOTE:**  
 MINIMUM GAP SITE DISTANCE (MGSD) = 139m

DRAWING No.  
**2390/010-A**

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 1: 2000 AT A3



- YEAR 3-4**
- DEVIATE BAIRNSDALE-DARGO ROAD (NEW ALIGNMENT 3 WAY ROUNDABOUT)
  - FERNBANK GLENALADALE ROAD SWITCHED BACK TO ORIGINAL ALIGNMENT EXTENDED TO DIVIATED BAIRNSDALE -DARGO ROAD
  - REALIGNMENT OF FERNBANK GLENALADALE ROAD REMOVED



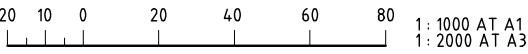
Crossco Consulting Pty Ltd  
 ABN: 88 135 548 110  
 154 Macleod St P.O. Box 858 Bairnsdale Vic 3875  
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 Email: consult@crossco.net.au

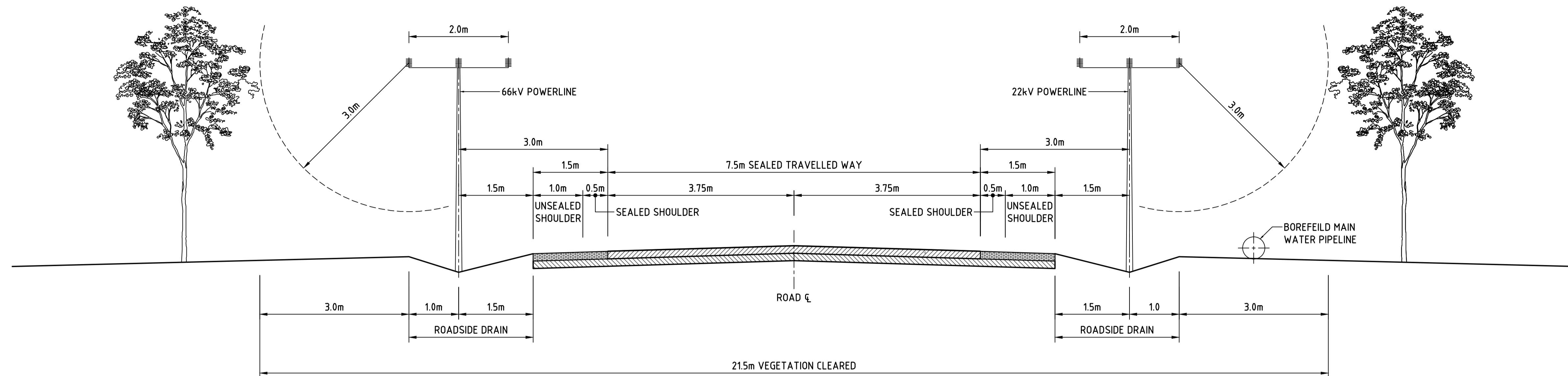
**KALBAR RESOURCES**  
**FINGERBOARDS CONCEPT LAYOUT**  
 YR 12 BAIRNSDALE-DARGO  
 PROPOSED ROAD DEVIATION

DRAWING No.  
**2390/013-A**

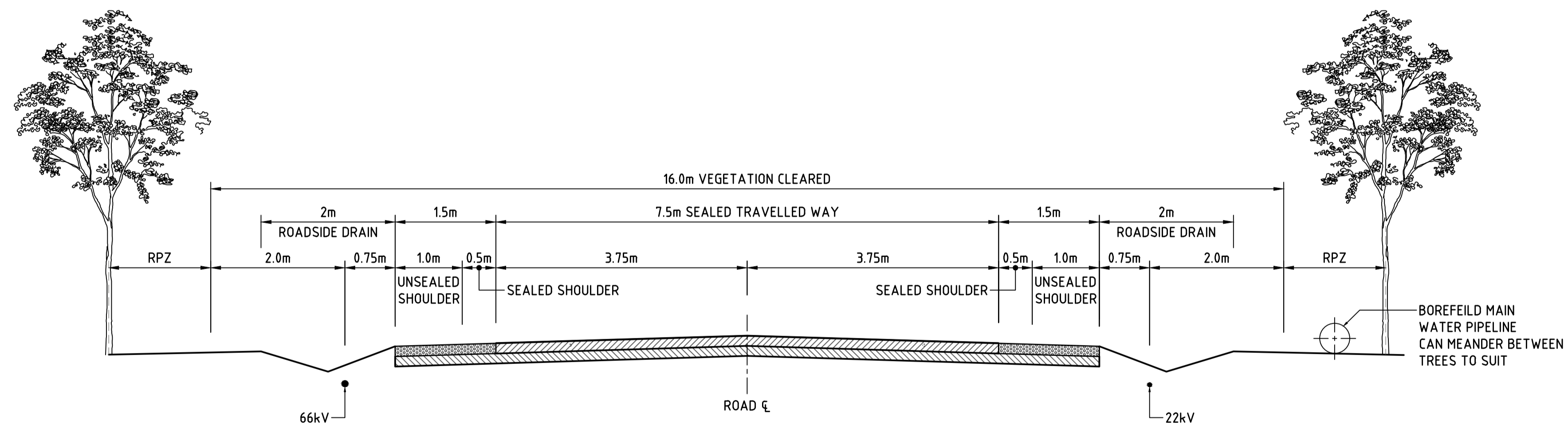
DATE: 07 JANUARY 2021

**NOTE:**  
 MINIMUM GAP SITE DISTANCE (MGSD) = 139m





TYPICAL ROAD CROSS SECTION:  
SCENARIO 1:  
ABOVE GROUND POWER LINES  
SCALE 1:50



TYPICAL ROAD CROSS SECTION:  
SCENARIO 2:  
UNDERGROUND POWER LINES  
SCALE 1:50

PRELIMINARY FOR  
CLIENT REVIEW

DRAWING NUMBER	DESCRIPTION

**KALBAR**

REV	DATE	ISSUED FOR REVIEW	REVISION DESCRIPTION	DRAWN	CHECKED	ENGINEER	APPROVED	APPROVED	DATE
A		ISSUED FOR REVIEW		J.G					

IN THE ABSENCE OF THE APPROVED SIGNATURE, THIS DRAWING SHALL BE TREATED AS PRELIMINARY

DRAWN	DATE
J.GREEFF	11.11.2020
DESIGNED	
CHECKED	
ENGINEER	
APPROVED	



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CLIENT	KALBAR OPERATION PTY LTD
PROJECT	FINGERBOARDS MINERAL SANDS
TITLE	HAUL ROAD TYPICAL CROSS SECTIONS

DRAWING STATUS	ISSUED FOR REVIEW		
CLIENT DWG NO	AS1100:1992 ALL DIMENSIONS IN mm		
SCALE	GRID	DATUM	SIZE
NTS			A1
DWG NO	5253-40-DWG-CI-51308	REV	A



**NOTES:**  
 1. ALL NOTE IN METERS U.N.O

**PRELIMINARY UNCHECKED**      **PRELIMINARY FOR INFORMATION ONLY**

DRAWING NUMBER	DESCRIPTION
1	DRAWING REFERENCE



REV	DATE	REVISION DESCRIPTION	DRAWN	CHECKED	ENGINEER	APPROVED	APPROVED	DATE
A	07.12.2020	ISSUED FOR INFORMATION	AE					

DRAWN	AE	DATE	7.12.2020
DESIGNED		DATE	
CHECKED		DATE	
ENGINEER		DATE	
APPROVED		DATE	



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CLIENT	KALBAR OPERATIONS PTY LTD
PROJECT	FINGERBOARDS MINERAL SANDS DFS
TITLE	RAIL SIDING GENERAL ARRANGEMENT

DRAWING STATUS			
PRELIM FOR INFORMATION			
CLIENT DWG NO			
SCALE	GRID	DATUM	SIZE
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DWG NO	REV		
5253-40-DWG-CI-54401	A		





## Appendix B Email from Wave International

## Maxine Krause

---

**From:** Stefan Wolmarans <SWolmarans@waveinternational.com>  
**Sent:** Thursday, 14 January 2021 12:58 PM  
**To:** Stuart Fenech; Chris Padovan; Michael.Mattingley@roads.vic.gov.au  
**Cc:** Loretta Fallaw; Power, Tim; Campbell, Kirsty; Chris Cook; Jozsef Patarica  
**Subject:** Fingerboards Mineral Sands - Proposed road and intersection geometry  
**Attachments:** 2390-001.pdf; 2390-002.pdf; 2390-003.pdf; 2390-004.pdf; 2390-005.pdf; 2390-006.pdf; 2390-010.pdf; 2390-011.pdf; 2390-012.pdf; 2390-013.pdf

All ,

Attached please find concept designs and a summary of current roads designs for discussion at this afternoon's meeting. The attached plans reflect Kalbar's current thinking about the road layout, and in some respects differ from the road layout exhibited in the EES. While Kalbar is not abandoning the layout exhibited in the EES, during the concept design process we have been exploring ways in which to optimise the layout. We would welcome the Department's views.

Set out below is a brief summary of differences between the attached designs against the designs exhibited in the EES below.

- **FERNBANK – GLENALADALE ROAD NORTH (FGR-North)**

**EES** - Proposed to be permanently diverted to the north of the Stage 1 mining area with a new intersection on the Bairnsdale Dargo Road, north of the Fingerboards intersection

**Proposed Design** – FGR-North to be temporarily diverted to the south, with a new intersection on the Bairnsdale Dargo Road, east of the Fingerboards intersection. Road returns to current alignment after 3 years

**Reasons for changes** –

- Topography of the land to the north is undulating with several drainage creek crossings.
- Reduced speed limit to 70kph likely for intersection SISD.
- Landowner resistance to the permanent relocation of the road (Stephenson land).
- Topography for the southern diversion is flat with good intersection sight distance on BDR intersection.
- Temporary relocation return FGR-North to its current alignment after year 3-4 and resolves land tenure concerns.

- **BAIRNSDALE DARGO ROAD – NORTH (BDR-North)**

**EES** – Proposed to be permanently diverted to the east of current alignment in three stages. Connects with BDR-East and FGR-South with a new permanent roundabout to the south of the current Fingerboards intersection.

**Proposed Design** – BDR-North is temporarily moved to the east for a period of ~18 months, during which the existing alignment is mined and then moved back to its current alignment north of the Fingerboards intersection. The section of road not returned to the current alignment, is moved permanently to the west of the current alignment with a new roundabout constructed to connect the FGR-South, BDR-East and BDR-North.

**Reasons for changes** –

- Landowner resistance to the permanent relocation of the road (Stephenson land).
- Removes a road relocation stage on the FGR-South in year 12.
- Overall less relocation stages and FGR south alignment remains unchanged.
- Permanent relocation of road to the west of current alignment is now located on land 100% owned by Kalbar.

- **BAIRNSDALE DARGO ROAD – East (BDR-East)**

- **EES** – Proposed to be permanently diverted to the south of current alignment. Connects with BDR-North and FGR-South with a new permanent roundabout to the south of the current Fingerboards intersection. Road is temporarily moved off the current alignment for a period to enable mining, after which it is returned back to the current alignment.
- **Proposed Design** – Generally identical to the EES proposal with only change being that the new roundabout has moved further to the West onto the current FGR-South alignment.
- **Reasons for changes** –
  - Generally similar to the EES
  - Roundabout moved further west to avoid diversions to the FGR-South.
- **FERNBANK GLENALADALE ROAD– South (FGR-South)**
- **EES** – Road is diverted to the east to enable connection to the new roundabout with the BDR- East and North.
- **Proposed Design** – Road is no longer diverted as the roundabout moved west to the current FGR-South alignment.
- **Reasons for changes** –
  - Advantageous to undertake less disturbance to the existing road.
- **SUMMARY**
- All relocations in land currently owned by Kalbar or landholders that are open to a future transaction.
- FGR-North no longer permanently diverted.
- Less road upfront pre-operational road diversion stages.
- All designs and intersections confirmed to be Austroads design guidelines compliant.

Regards

Stefan Wolmarans

Principal



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# Appendix C Mitigation Register – Traffic & Transport

**Fingerboards Mineral Sands Project**  
**Environment Effects Statement**  
August 2020

**Attachment H**  
**Mitigation Register**



Identifier	Mitigation measure
TE48	Currently known extant populations of gaping-leek orchid will be avoided, and project activities will be designed to minimise potential for indirect impacts to these populations.
TE49	Construction machinery will not be permitted to access Cowells Lane to avoid potential indirect impacts to swamp everlasting, native vegetation and low-lying areas within the infrastructure options area.
TE50	Progressive rehabilitation will aim to increase the extent of native vegetation cover and habitat connectivity within and adjoining the project area prior to clearing and fragmenting habitat in other areas.
TE51	Faunal habitat features, such as logs and hollows, will be included as part of habitat restoration works.
TE52	Populations of listed or rare native plant species from EVCs within the project area will be increased through targeted recovery programs.
TE53	A detailed flora and fauna survey will be undertaken in accordance with relevant state and Commonwealth legislative requirements in the unsurveyed portion of the project area, located in the northwestern corner, prior to commencement of ground disturbance.
TE54	Pre-clearance searches for fauna will be conducted by a competent environmental professional prior to vegetation removal.
TE55	Construction activities will be delayed if significant weather events are forecast.
TE56	Felling of large hollow-bearing trees will be supervised by a competent environmental professional.
<b>Traffic and transport</b>	
TT01	The intersection of Princes Highway and Lindenow-Glenaladale Road will be upgraded to roundabout control to increase road safety and avoid excessive slowing of traffic due to B-doubles turning right from Lindenow-Glenaladale Road onto Princes Highway (if required under the Bairnsdale rail and road and rail scenarios).
TT02	A traffic management plan will be prepared in accordance with industry standards to address general driver awareness and safety for the project workforce and the inherent risks associated with driving; the plan will be updated as required based on annual driver surveys of the project workforce and in response to recommendations from relevant incident investigations.
TT03	Standard road lighting will be provided at the following intersections to increase the visibility on approach to the intersection and improve safety: <ul style="list-style-type: none"> <li>• Fernbank-Glenaladale Road and Bairnsdale-Dargo Road (if required under the road and rail scenario).</li> <li>• Lindenow-Glenaladale Road and Princes Highway.</li> <li>• Fernbank-Glenaladale Road and the private haulage road.</li> <li>• Racecourse Road and Princes Highway (if required under the Bairnsdale rail scenario).</li> </ul>
TT04	Flag lighting (a small number of lights to indicate the presence and location of an intersection without providing lighting to any particular level) will be provided at the following intersections to increase visibility on approach and improve safety: <ul style="list-style-type: none"> <li>• Fernbank-Glenaladale Road and Princes Highway.</li> <li>• Fernbank-Glenaladale Road and private haulage road.</li> </ul>
TT05	Prior to the movement of oversize and overmass vehicles: <ul style="list-style-type: none"> <li>• An audit will be completed to assess route options, safety, and clearance between the vehicle and potential obstructions such as wires, trees, structures and rail crossing infrastructure, and then plan the route accordingly.</li> </ul>

Identifier	Mitigation measure
	<ul style="list-style-type: none"> <li>A permit will be obtained from the relevant road authority to gain access to any roads not approved for oversize and overmass vehicles.</li> </ul>
TT06	Oversize and overmass vehicle movements will avoid peak hours and school bus operation hours.
TT07	A channelised right-turn treatment will be provided at the new intersection of Bairnsdale-Dargo Road and the diverted section of Fernbank-Glenaladale Road north of Bairnsdale-Dargo Road.
TT10	Diverted and realigned roads will be constructed to the same or better standard as existing roads.
TT11	New intersections, including new intersections that have been created by diverted roads, will be constructed to Austroads standards.
TT12	The no overtaking line marking west of the intersection of Lindenow-Glenaladale Road and Bairnsdale-Dargo Road will be extended to just west of Lindenow-Glenaladale Road to reduce the risk of vehicles trying to overtake B-doubles on the approach to the crest of the hill near the intersection.
TT13	Boom gates will be installed at the level crossing on Lindenow-Glenaladale Road in accordance with AS 1742.7 Manual of uniform traffic control standards, Part 7 Railway crossings.
TT14	Rumble or shaker strips will be provided on approach to the new Fingerboards roundabout and on the Fernbank East rail siding access road to prevent mud tracking onto the public road network.
TT15	The proposed new Fingerboards roundabout will be designed so that the angle between each leg is approximately equal, such that the legs are distributed generally evenly around the roundabout.
TT17	Where roadworks require closure of roads, alternative routes will be identified in consultation with East Gippsland Shire Council and Department of Transport to provide the public with adequate access at all times.
TT18	New intersections will be constructed such that through-traffic movements are maintained to the satisfaction of the responsible road authority. Temporary traffic signals will be used as required to safely control traffic flow through the work site.
TT19	Roadworks and temporary traffic management on the public road network will be implemented in accordance with a traffic management plan submitted to and approved by the responsible road authority prior to commencement of works.
TT20	Emergency services will be advised where significant delays are expected and contact details for the operations manager will be provided to allow emergency services to arrange access across an area of delay.
TT21	Roadworks affecting the Princes Highway, if required under the Bairnsdale rail scenario or road and rail scenario, will be avoided during peak periods, including peak hours and peak times such as school and public holidays, wherever practicable.
TT22	The construction environmental management plan and environmental management plan will include measures to encourage personnel to travel to and from the mine site by bus, or to carpool.
TT23	Based on the outcomes of pedestrian surveys at Lindenow South, B-double operating times will be limited (i.e., avoiding peak times), speed limits will be revised and driver training and familiarisation will be undertaken as required to minimise risks to pedestrian safety within the town.

Identifier	Mitigation measure
TT24	Measures developed in consultation with the Department of Transport will be implemented to minimise the risk of B-doubles queuing onto the level crossing at Maryvale rail siding, such as shorter cycle times, leading and lagging right turn phasing and coordinating signals with a detector on the rail line upstream of the crossing (if required under the road and rail scenario).
TT25	Heavy mineral concentrate haulage via Lindenow South will be scheduled to avoid school bus routes during times of school bus movements (i.e., 7:30 a.m. to 9:00 a.m. and 3:20 p.m. to 5:00 p.m. on school days).
TT26	Where any pavement damage occurs and requires immediate treatment, remedial pavement works will be undertaken as agreed with the responsible road authority.
TT28	For B-double movements to Fernbank East rail siding, an operational overlay to the traffic management plan will be introduced that requires B-doubles to stop before crossing Chettles Road and Cowells Lane.
TT29	For B-double movements to Bairnsdale rail siding, shoulders will be widened, and line marking will be reinstated on the Racecourse Road bend to reduce the potential for rear end collisions (if required under the Bairnsdale rail scenario).
TT30	For B-double movements to Bairnsdale rail siding, shoulders will be widened, and line marking will be reinstated on the Forge Creek Road bend to reduce the potential for crashes (if required under the Bairnsdale rail scenario).
TT31	For B-double movements to Bairnsdale rail siding, the intersection of Princes Highway and Racecourse Road will be upgraded to roundabout control to increase road safety and avoid excessive slowing of traffic due to B-doubles turning right from Princes Highway onto Racecourse Road (if required under the Bairnsdale rail scenario).
<b>Visual and landscape</b>	
VL01	Visual bunds and screen plantings will be established at locations around the perimeter of the project area to visually screen project activities from sensitive viewpoints.
VL02	Fixed lighting on plant and buildings will be designed to reduce the potential for light spill through measures such as focussed/targeted lighting and installation of shields or baffles.
VL03	Buildings and roofs will be clad with non-reflective materials of a colour that mimics those found in the landscape to reduce visual contrast with the landscape setting.
VL04	Works will be scheduled wherever practicable during daylight hours to avoid night-time activities in areas directly visible from nearby residences.
VL05	The mine void will be progressively backfilled, and rehabilitation will be progressive to re-instate pre-mining landforms and re-establish vegetation.
VL06	Fixed buildings will be located to take advantage of existing vegetation screening. Additional vegetation screening will be planned to minimise future visual impacts.
VL07	The landscape will be restored to reduce visual impacts from elevated viewpoints.
VL08	Regular slopes and/or sharp transition angles will be rounded to provide a natural appearance to the final landform.
VL09	Disturbed areas (e.g., road reserves) will be revegetated with local indigenous vegetation.
VL10	Displaced plantation timber and vegetation will be replaced around properties in consultation with relevant landholders.
VL11	Topsoil will be managed and maintained throughout rehabilitation activities to promote successful re-grassing and tree planting.