

IN THE MATTER

of the Resource Management Act 1991

AND

IN THE MATTER

Of Applications CRC 147665, CRC 147666, CRC 147667 and CRC 151940 to the CANTERBURY REGIONAL COUNCIL and application RC 155004 to the WAIMAKARIRI DISTRICT COUNCIL, by the Waimakariri District Council as Applicant

DECISION OF COMMISSIONERS APPOINTED BY THE CANTERBURY REGIONAL COUNCIL AND THE WAIMAKARIRI DISTRICT COUNCIL SEPTEMBER 2016

Commissioners:

Cindy Robinson (Chair)

Robert Nixon

John Lumsden

The Hearing and Appearances

Hearing Date:	Friday, 13 May 2016 at Rangiora
For the Applicant:	Mr Darryl Millar, Consultant Planner, Resource Management Group Ms Joanne McBride, Project Manager, Waimakariri District Council Mr Gerard Cleary, Manager, Utilities and Roothing, Waimakariri District Council Ms Jeanette Ward, Traffic Engineer, Waimakariri District Council Mr Jeremy Rees, Civil Engineer, Waimakariri District Council Ms Lynn Torgerson, Environmental Engineer, Pattle Delamore Partners Limited Mr Andrew Brough, Environmental Engineer, Consultant
For the Canterbury Regional Council:	Ms Adele Dawson, Senior Consents Planner

For the Waimakariri District Council:	Mr Matthew Bacon, Planner
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Submitters:	Mr Bruce Leslie [REDACTED]
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Abbreviations

The following abbreviations are used in this decision:

Waimakariri District Council	“the Applicant”
The Canterbury Regional Council	“the Regional Council”
The Regional Policy Statement	“the RPS”

The land subject to these applications, being the proposed Northern Arterial Road, is referred to as “the NAR”.

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THE APPLICATIONS AND HEARING

[1] The Hearing took place in Rangiora on 13 May 2016. The applications were described in the Notice of Joint Hearing as follows:

Environment Canterbury

CRC 147665: Discharge permit to discharge stormwater into the Kaiapoi River

Stormwater during the construction phase of the project will be discharged into the existing roadside swales by sediment retention basins. Stormwater after the completion of the road will discharge to Parham's Drain and the Kaiapoi River via new stormwater treatment swales.

CRC 147666: Land use consent to excavate land over the unconfined aquifer

The construction of the new road will involve approximately 12,500 m³ of cut and 25,000 m³ of fill.

CRC 147667: Land use consent to place new structures over a river, and disturb the bed of a river

Two bridges will be installed, one located over the Kaiapoi River and one located over the Ohoka Stream.

CRC 151940: Water permit to divert floodwater

The filling of land to raise the level of the road will restrict the flow of floodwaters resulting in increased flood depth and duration on upstream properties.

[2] A consent duration of 35 years is sought.

Waimakariri District Council

RC 155004: to undertake earthworks exceeding 1000 m² per hectare of the Part Lot 1 DP 1575, Lot 2 DP 44080, Part Lot 1 DP 14099, Lot 3 DP was 67537, Part RS 14549, Part Lot 10 DP 10338, RS 42260 and Part Lot 1 DP 33099, and undertake earthworks within 20 m of the Kaiapoi River (Silverstream) for the purpose of constructing the proposed Northern Arterial Road. The Northern Arterial Road is outlined on Planning Maps 102 and 104 of the Waimakariri District Plan and forms part of the West Kaiapoi outline development plan area.

[3] The land use is required to be given effect to within five years.

National Environmental Standard for Managing Contaminants in Soil to Protect Human Health (NES)

[4] In addition to the above matters the NES controls soil disturbance on land where an activity on the Hazardous Activities and Industries List (HAIL) is being carried out, or is more likely than not

to have been carried out. The application site has been identified as HAIL land and, therefore, the provisions of the NES apply. Pursuant to clause 10 of the NES, the proposed earthworks are a restricted discretionary activity. The Applicant provided details of site investigations undertaken in relation to the site and surrounds and provided copies of Preliminary Site Investigations, Detailed Site Investigations and a Remedial Action Plan as part of the Application and, therefore, meets the requirements of a restricted discretionary activity under the NES.¹

INTRODUCTION AND BACKGROUND

[5] The applications relate to the proposed construction of the NAR, a new arterial route connecting the northern motorway from the intersection between Island Road and Ohoka Road in the south with the northern end of Island Road in the vicinity of the Mill Road intersection, a distance of approximately 1900 m. This route will effectively replace a section of Island Road which currently extends diagonally through the Silverstream subdivision and residential development. This new route will pass to the south and west of this development and provide a physical boundary to the western side of the Kaiapoi urban area. The western side of this new route follows the alignment of Butchers Road.

[6] Two new bridges over the Kaiapoi River and its tributary the Ohoka Stream and three box culverts will be installed. The Council has acquired all the necessary land on which to build the NAR, including 46 Butchers Road which directly adjoins nearly all of the western side of the proposed route.

[7] To provide context with respect to other original submitter's properties (which we address further below), Mill Road extends westwards from the northern end of the proposed NAR into the rural area to the west of Kaiapoi. There are three properties on the southern side of Mill Road, these being (from east to west) [REDACTED] and [REDACTED]. The owner of [REDACTED] was notified, but was not a submitter.

NOTIFICATION AND SUBMISSIONS

[8] The applications were jointly notified on the 25 February 2015. Three submissions were received in opposition to the applications, these being from [REDACTED], Bruce Leslie, and [REDACTED]. A submission was also received in 'support' from the [REDACTED].

¹ Assessment of Environmental Effects, Appendices 7, and 8, dated August 2014.
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██████████, Canterbury Regional Council (Regional Engineer), although this was qualified and sought assurances on various matters.

[9] Subsequent to the close of submissions, the hearing of the applications was adjourned for a considerable period before finally being scheduled for hearing in May 2016. On 15 October 2015 the Hearings Panel issued its First Minute acknowledging the Applicant's proposal to undertake further investigations into potential flooding effects associated with the project, and that this information be of a made available by 18 December 2015 with a hearing to be set down at the end of February 2016. As a result of further work, the hearing was ultimately deferred to a later date.

[10] On 4 April 2016 the Hearings Panel issued its Second Minute directing the Applicant to circulate the updated information to all submitters, and that the officers prepare a response for the Applicant and all submitters prior to the hearing on Friday, 13 May 2016.

[11] In the interim, the Council acquired the ██████████, and his submission and the Warren's provided written approval and their submissions were withdrawn in writing. There was some uncertainty about this immediately prior to the hearing, but the withdrawal of these submissions was confirmed by Environment Canterbury by email on 2 June 2016. The Regional Engineer indicated that he was satisfied with the proposed works and withdrew his right to be heard, although the submission remained in place.

STATUTORY MATTERS

[12] The following regional planning provisions apply to the applications:

Waimakariri River Regional Plan

Rule 7.4 – the construction of the two new road bridges is a discretionary activity under this rule.

Rule 6.1 – because the discharge of stormwater to the Kaiapoi River and the Ohoka stream are not permitted under Rule WQL 7, the discharge of stormwater is a discretionary activity under Rule 6.1 of the WRRP.

Natural Resources Regional Plan (Operative)

Rule WQL 36 – as the excavations will occur over the unconfined/semi-confined aquifer system and there may be less than 1 m between the excavation and the highest groundwater level, the activity is restricted discretionary in status under this rule.

Proposed Canterbury Land and Water Regional Plan – Decisions Version

Rule 5.175 – as excavations will occur within 50m of a surface water body and within 1m of the higher seasonal groundwater level, the activity is restricted discretionary in status.

Rule 5.142 and Rule 5.6 – the diversion of floodwater is a discretionary activity.

[13] Overall, the activity would fall to be considered as a discretionary activity under the applicable regional planning instruments.

[14] The following district planning provisions apply to the application:

Waimakariri District Plan

Rule 23.1.1.8 sets a threshold for earthworks of 1000 m² per hectare, and as the volume of earthworks will exceed this threshold, consent is required as a restricted discretionary activity.

Rule 23.1.1.3 requires that earthworks be located beyond 20 m from any river or lake, and as these earthworks will occur within the bed of the Kaiapoi River, the application is restricted discretionary in status.

Overall, the application falls to be assessed as a restricted discretionary activity under the Waimakariri District Plan.

Section 104 Matters

[15] Section 104 of the Act states as follows:

“104 Consideration of applications

(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to –

(a) any actual and potential effects on the environment of allowing the activity; and

(b) any relevant provisions of –...

(v) a regional policy statement or proposed regional policy statement:

(vi) a plan or proposed plan; and

(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application”.

[16] Other relevant provisions include subsection (3)(ii) which specifies a consent authority must not have regard to any effect on a person who has given written approval to the application, and

section 104B which provides that the consent authority may approve or decline an application for a discretionary activity, and may impose conditions under section 108.

The Evidence

For the Applicant

[17] **Mr Darryl Millar**, a planning consultant, began by clarifying the situation with the status of the various submissions in opposition, noting that Mr Reeve had withdrawn his submission on both applications, that the Warren submission was to be withdrawn on the morning of the hearing, and that the Regional Engineer had formally withdrawn his request to be heard.

[18] He then set out the context of the proposal in terms of the Land Use Recovery Plan (LURP) and the District Plan. He noted that LURP 'Action Point' 47 identified that the proposed NAR was necessary for earthquake recovery, and that the location of the NAR was set out in District Plan Outline Development Plans 164A, 164B and 164C. The LURP includes a specific exclusion from the need to comply with District Plan noise standards, but other effects associated with earthworks and construction were nevertheless 'caught' by the district plan rules. He added that should the applications be granted, that for completeness specific reference should be made to the Resource Management (*National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*) Regulations 2011 (the NES).

[19] He added that following consultation with Te Ngāi Tūāhuriri Rūnanga, no issues of concern to the Rūnanga had arisen.

[20] Mr Millar considered that the proposal aligned with the provisions of the Canterbury Regional Policy Statement as part of an investment in the district's strategic roading network, and providing a defined physical edge to the Kaiapoi urban area. The project would also assist with the provision of housing supply and choice through the removal of constraints on the Silverstream development by redefining Island Road (which bisected this area) as an internal route serving the subdivision, and with the NAR assuming the role as the arterial route to the north-west. He was satisfied that the project was consistent with Part 2 of the RMA.

[21] **Ms Jeanette Ward**, a traffic engineer, addressed some specific points that been raised in submissions. She explained that the proposed posted speed limit of 70 km/hour on the NAR,

increasing to 100 km/hour beyond the northern end of Silverstream subdivision, was appropriate for this type of road having regard to road safety and the way in which the road alignment would be 'read' by motorists. She then addressed a submission seeking that a large redwood tree at the northern end of the NAR could be retained. She said that while it would be possible to retain the tree with the smaller radius curve at the northern end of the NAR, arboriculture advice was that while this was possible, work would have to take place within 12m of the base of the tree. Such work would be highly likely to have an adverse effect on the health of the tree, and a tighter radius curve would also reduce road safety margins.

[22] **Mr Gerard Cleary**, the Utilities and Roading Manager for Waimakariri District Council, emphasised the benefits of the NAR in terms of enabling full development of the Silverstream subdivision, and improving connectivity to Kaiapoi. It would also improve a critical commuter and transport link between the district and Christchurch, providing greater road capacity and safety, and offering a higher level of flood protection than the current route.

[23] **Mr Jeremy Rees**, Civil Engineer, explained that the NAR had been designed for an AADT volume of 13,600 vehicles per day. Accordingly, the design of the NAR had accordingly been developed with regard to relevant design standards for pavement widths, stormwater disposal, geometric alignment, guardrails for safety and lighting. He noted that the purchase of the adjoining Reeve property to the west (46 Butchers Road) had enabled further refinements to the design including improved stormwater run-off from the proposed carriageway, the removal of piped reticulation and the inclusion of swales for stormwater treatment. Importantly, he noted that the alternative of conveying floodwater from the Ohoka Stream to the Kaiapoi River by lowering the finished level of the NAR had been considered, but discounted on the basis that it would not provide a sufficient level of service required for an arterial road. He said that inundation of the carriageway during a 2% AEP event was considered unacceptable for a road of this classification.

[24] **Ms Lynn Torgerson**, an Environmental Engineer and lead author of the Application Assessment of Effects, provided an analysis of the activity status of both applications in terms of the applicable rules, which revealed that there were some differences with those identified by the respective reporting officers for each Council. Firstly, she said that her understanding was that the parties had agreed that filling over the confined aquifer would not involve excavation to a greater in depth than 5m, and there were no regional rules for filling over the coastal confined aquifer. She also said that further information provided at the request of the Regional Council had demonstrated that stormwater discharges would not increase the flows into the Kaiapoi River (or Waimakariri District Council Northern Arterial Road 29-09-2016

the Ohoka Stream) by more than 1% in a 20% AEP event. She also added that notwithstanding the activity status under NRRP Rule WQL36, the activity status of the excavation was still restricted discretionary and the relevant matters for discretion had been assessed. However, she stated that she agreed with the overall activity status as presented by the reporting officer.²

[25] Turning to the relevant district rules, she added that there were two other applicable rules in addition to those referenced in the officer's report. These were Rule 23.1.1.7 which specifies that earthworks in any residential zone shall not exceed more than 300m³ per 1000 m², and Rule 27.1.1.1 that structures shall be set back more than 20 m from the Kaiapoi River. She added that this did not change the activity status from restricted discretionary³.

[26] She identified potential flooding as the primary concern raised in submissions, and that further modelling undertaken by Mr Brough had confirmed that significant areas of rural land are currently flooded up to 1.5m in depth to the west of Kaiapoi, with or without the NAR. She said that apart from slightly raised water levels immediately to the west of the NAR there would be no greater risk of flooding to the properties between Butchers and Mills Roads. She said that all dwellings, other than that at 46 Butchers Road now owned by the Council, would have a freeboard above 300 mm, which was an accepted minimum.

[27] She then addressed concerns raised by the Regional Engineer. This had raised stability issues for structures along the NAR in terms of possible restrictions on flows, and associated scouring or instability. She said this could be addressed by setting a minimum soffit level for the bridges and there was adequate capacity beneath the proposed bridges to cope with flood flows during a 2% AEP event. She added that discussions subsequent to the preparation of the original officers' report had resolved issues relating to water quality and appropriate treatment measures. Site contamination issues were proposed to be addressed through a Remedial Action Plan which had been submitted to the District Council, and which would be further reviewed prior to commencing earthworks.

[28] One unresolved matter that arose was the appropriate length of grass in the stormwater treatment swales proposed. The District Council maintenance standards specify a grass length 'envelope' of 100 to 250mm, which was of concern to the Regional Council who considered that allowing grass growth to a greater depth of 150mm would reduce the efficiency of the swales in

² Evidence of Lynn Torgerson, paragraphs 4.6 to 4.10

³ Evidence of Lynn Torgerson, paragraphs 5.1 to 5.3

intercepting sediment and contaminants. Ms Torgerson was of the view that for those short periods of time when longer grass was present, there would be very little impact on the efficiency of stormwater treatment.

[29] **Mr Andrew Brough**, an Environmental Engineer, stated that considerable effort had been put into modelling the potential effects of the NAR on flood potential and mitigation options (PDP model/model). He explained that the floodplain had been extensively modelled with a two-dimensional numerical flood model which had been tested, developed, and refined, and later subject to a peer review by Opus International Consultants Limited (Opus).

[30] He explained that the model had shown that the influence of the NAR on the affected properties under a 2% AEP scenario was that flood levels would range from 'no increase' to no more than approximately 60mm. He said that modelling of 0.5% AEP event had shown that flood levels might increase by up to 63mm, which was consistent with the results for the 2% AEP event.

[31] Turning to mitigation, he said that the proposed inclusion of three 1m box culverts provided the best option for flood mitigation and would also have the benefit of improving access to properties currently at risk of flooding in extreme events. He said that the NAR would significantly reduce potential flood flows into the existing developed area west of State Highway 1.

For Submitters

[32] Mr Leslie is the owner (albeit not as yet resident) of [REDACTED], to the west of the Butchers Road section of the proposed NAR, beyond the intervening Reeve property and Ohoka Stream. He presented photographs taken of his and neighbouring properties during major flood events, most recently in 2014, which revealed extensive surface flooding in the area. He stated he had taken advice from Woods and Partners Limited, Registered Surveyors, with reference to ground levels, which he maintained had indicated that the modelling information undertaken by the Applicant may have been inaccurate and understated flood levels that would follow the construction of the NAR.

[33] He was concerned that the construction of the NAR would impede the escape of flood waters, particularly bearing in mind the tidal influences in the Kaiapoi River, and harboured doubts about the capacity of bridging and culvert structures to enable the escape of these floodwaters. He was also concerned that the NAR would have the effect of diverting flood flows along the Ohoka Stream in a northerly direction across his property.

Council Officers

[34] **Ms Adele Dawson** provided a Section 42A Report for the Regional council. She explained that the Regional Council had assessed the modelling undertaken by the Applicant, and it was generally satisfied with its accuracy. Ms Dawson concluded on the basis of this information that any increase flood depth on the Warren, Leslie, and Evans properties would be no more than minor, and no mitigation was necessary⁴. However, she was concerned that even without the NAR, the dwelling on the Reeves property would not have the recommended freeboard of 300mm, and the effects on this property would be more than minor. However, this matter was effectively overtaken by events on the date of the hearing as a consequence of the District Council having acquired the property, and the (former) owner having withdrawn their submission, and given their written consent as occupier.

[35] Apart from an issue raised with respect to the proposed depth of grass in the swales, there were no other issues of concern identified in her report. In answer to questions from the Panel, Ms Dawson accepted that there needed to be an amendment to conditions to replace reference to 'trigger levels' with 'limits', to improve the clarity and enforceability of the condition.

[36] **Mr Matthew Bacon's** Section 42A report on behalf of the Waimakariri District Council came to broadly similar conclusions to that of Ms Dawson, and concluded that because of the uncertainties of the effects of flooding on the Reeves property that the application should be declined in the absence of further information. Again, however, this matter was overtaken at the hearing by the advice that the Reeve's property at been acquired by the Council, and that their submission had been withdrawn.

[37] Ms Dawson and Mr Bacon prepared an addendum to their Reports⁵, circulated prior to the hearing which recommended the applications be granted, in light of the further assessment and purchase of the 46 Butchers Road. They were satisfied that the effects on the environment would be minor provided the NAR was constructed and operated in accordance with the suite of conditions appended to the addendum report.

Events post hearing and Hearing Panel's Third Minute

[38] On 18 May 2016 the Hearings Panel issued a third Minute following the matters raised in the evidence of Mr Leslie. This directed that the Applicant undertake discussions with Mr Leslie's

⁴ Section 42A report of Adele Dawson, paragraph 82.

⁵ Addendum to s42A Report circulated on 18 April 2016.

surveyor with respect to the difference between the parties on the basis of survey information and modelled flood levels. Following a supplementary report to be prepared by the Applicant, and the opportunity for both Mr Leslie and the reporting officers to add further comment, it was directed that the Applicant's final right of reply would be submitted to the Hearings Panel by 15 June. As a result of further delays in obtaining the information, this was subsequently deferred to 15 July.

[39] The Applicant's response to the third Minute following a further review of the survey data concluded that although there were acknowledged errors in the survey data, that affected measured floor levels of dwellings identified as affected by the NAR, it did not affect the modelling undertaken because the modelling was based on LiDAR data, not surveyed ground levels.

[40] The revised floor levels were provided to us in correspondence from Davis Ogilvie and Partners Limited (DOL) and Pattle Delamore Limited (PDP).⁶ We also received written confirmation from the Warren's confirming that they wished to maintain their written approvals.⁷ The additional information did not affect the views of the Regional Engineer nor the recommendations of the Council s42a Officers.⁸

[41] Mr Leslie responded to the revised survey levels and reiterated his concerns regarding the lack of co-ordination between the upstream improvements and downstream mitigation.⁹

[42] In closing submissions the Applicant stated:

Notwithstanding the error that has been confirmed, the overall conclusions drawn in the Applicant's evidence on the impact of flooding effects following construction of the NAR remain valid. This includes recognition of improved access provided by the proposed route due to the NAR having a higher level of flood protection compared with the present route.

[43] During our deliberations, we became aware of a media report that indicated that there may have been errors in survey data relied upon to set floor and ground levels in the adjoining Silverstream subdivision. In light of the errors that had occurred in relation to this application raised by Mr Leslie, we considered it prudent to make enquires of the Applicant as to the effects, if any, on the current applications. We requested the Applicant review the survey data for Silverstream

⁶ Correspondence from Davis Ogilvie, 24 June 2016 and 14 July 2016 and from PDP, 6 July 2016.

⁷ Email from the Warrens to Ms Alison Cooper, Ecan, 18 July 2016

⁸ Email from Alison Cooper Ecan, 15 July 2016.

⁹ B Leslie, further comments 22 July 2016.

subdivision and advised what impact that might have on the current applications. We also requested a peer review. The Applicant provided the additional review on 8 September 2016.¹⁰ We attach copies of the relevant correspondence from the Applicant's consultants PDP and DOL in Schedule 2, which we have relied upon in reaching our decision. We discuss the outcome of that review below.

[44] We invited the remaining submitters and Council Officers to comment on the additional material. Mr Leslie responded to the Council maintaining his concerns regarding the impact of the NAR.

Assessment of Effects

Surface water and Flooding

[45] The NAR is to be located in an area with known natural hazard risks from flooding and seismic activity. According to Mr Millar flooding is the primary issue of concern for the NAR. This section of our decision examines the extent to which this risk may or may not be exacerbated by the construction of the NAR. Geotechnical matters are addressed in the Assessment of Effects accompanying the application.¹¹ We received no additional evidence or submissions concerning seismic effects and we conclude that any seismic effects are not likely to be aggravated by the presence of the NAR.

[46] Evidence on the flooding hazard, on behalf of the Applicant was provided by Mr Andrew Brough and Ms Lynn Torgerson. Mr Brough noted¹² the relevance of the Silverstream subdivision, which borders the proposed NAR. He explained that Silverstream subdivision is located adjacent to the Cust Main Drain and the Kaiapoi River confluence. PDP had built a 1D/2D flood model to determine the flood levels on the site using the model that had been used to set the land and floor levels for the Silverstream subdivision. Mr Brough told us that this modelling has been used to assess the impacts of the works on surrounding properties.

[47] Mr Brough said the modelling work identifies that significant areas of land west of Kaiapoi are currently subject to flooding. The modelling results show that floodwater depths of up to 1.5m may

¹⁰ Correspondence from PDP to WDC, 5 September 2016, DO to WDC, 1 September 2016 and Opus to WDC, 7 September 2016.

¹¹ Assessment of Effects, Appendix 9.

¹² A Brough EIC at Para 1.4

occur on the notified properties, with or without the presence of the NAR, however, in the vicinity of dwellings on the properties, this depth is less than 0.25 m. He went on to say that the NAR will raise the water levels slightly at a small localised area immediately to the west although these changes will not result in properties becoming more at risk of flooding¹³.

[48] Mr Brough then told us that:

The floodwater levels on the notified properties, as a result of the 2% Annual Exceedance Probability (AEP) event with the inclusion of the NAR range from no change to increases of no more than 65 mm¹⁴.

[49] He said that based on surveyed finished floor levels, all dwellings other than that at 46 Butchers Road, will have freeboard between the flood level and the floor level of at least 300 mm, which were told is the accepted minimum. The property at 46 Butchers Road, where the projected freeboard would be more like 170-240 mm, as noted above this property is now owned by WDC, and Mr Reeve, as occupier, provided his written approval. As a consequence, the effects on 46 Butchers Road are no longer relevant to our decision.

[50] Mr Brough concluded that, as a result of the modelling work carried out, the impacts of NAR on flood levels is "*less than minor*" and that the council officers agreed with that assessment. We, thus, understand from Mr Brough's assessment, supported by the Council officers, that the impact of the NAR on flood levels will not be significant.

[51] Later in his evidence, Mr Brough told us that the NAR had been modelled such that flood water of any depth will not overtop the road and this reflected a 1% AEP level of service, which is an NZTA standard.

[52] Ms Torgerson, who holds qualifications in hydrology and flood management, adopted Mr Brough's assessment. Her role in this application had been focused on the preparation of the overall assessment of environmental effects; a role which she explained had been her professional focus since joining PDP, rather than providing primary technical evidence on flooding issues. She did offer the opinion that the effects of the diversion, and the displacement of floodwaters arising from construction of the NAR have been adequately addressed and that the potential effects on dwellings is less than minor. In other words, Ms Torgerson reiterated Mr Brough's view that the potential effects of the NAR on flood levels are not significant.

¹³ A Brough EIC at Paras 1.12 et seq.

¹⁴ A Brough EIC at Para 1.14

[53] Figure 1 below shows the location of the notified properties. .

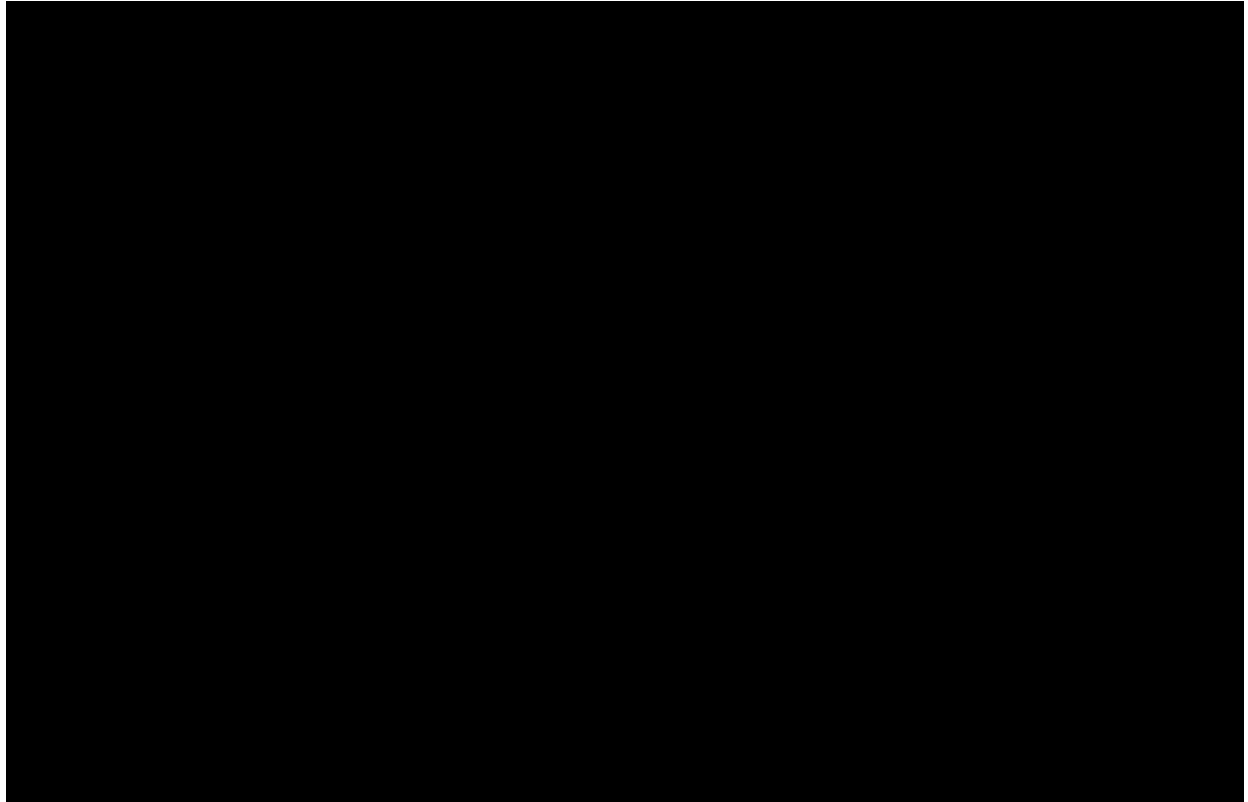


Figure 1: Location of notified properties

[54] Mr Leslie, provided a written statement outlining his submission. This included photographs showing the June 2014 flooding and several pages of correspondence with WDC (Ms Joanne McBride)Mr Leslie explained that he has owned his property at [REDACTED] since 1964. Mr Leslie, told us that a recent survey of his property by Woods Surveyors has shown floor levels significantly (120-110 mm) lower those used in the NAR application. He also said that the Silverstream datum is currently 60-70 mm lower than pre-earthquake levels and this, in his opinion, makes the area far more vulnerable to flooding than the Applicant is suggesting. Mr Leslie said, at a recent meeting with the District Council, the Council had rejected his request for mitigation works to protect his Ohoka Stream boundary from a significant overtopping event. Mr Leslie explained that this was because the Council was of the view that his property is a flood path that he is not allowed to obstruct. He said that the Council advised that the lower land levels made the flood path more critical. To illustrate his concerns, Mr Leslie attached a figure (Fig 3) to his submission showing an identified “localised flooding area” and a possible site on his property for a new dwelling nearby. This, he said, plus increased flood levels as a result of the NAR, makes construction of a house on the property far more difficult.

[55] Mr Leslie went on to say that the wider effects identified in his original submission have the potential to provide a completely different result from that modelled by the Applicant, specifically:

- (a) Failure to redevelop the Kaiapoi River in a manner that will cope with future flood loadings.
- (b) Failure to retain significant development and hard surface run off in the upper catchments to control peak flows.
- (c) Not keeping the river clear of obstructions or maintaining the drainage infrastructure to a proper level

[56] Mr Leslie argued that the effects on his property and those of the land owners in the Ohoka Basin are significant and that the vulnerability of this land should not be ignored.

[57] Mr Leslie maintained that the NAR would be a choke point in a tidal flood plain, obstructing an overland flood path and diverting water into the Ohoka Basin. He said lower land levels in the area should not mean the affected properties get less protection meaning they would have to hold greater volumes of water over longer periods. He believed that:

If the NAR is constructed all development in the upper catchments will be linked to and restricted by this point¹⁵.

[58] In short, Mr Leslie considers that the flooding analysis does not support local observations and does not address future effects of upstream development. We note that, while Mr Leslie is right to be concerned about apparent inaccuracies in the surveyed levels at and around his pump shed, much of his concern related more to existing catchment issues, which are a matter for him to address with the regional council, rather than specific effects on his property that would be caused by the NAR proposal. We agree, however, that the matter of the survey results needs to be resolved between Mr Leslie and the Council.

[59] Ms Adele Dawson appended to her report a supplementary report by Mr Nick Griffiths a Flood Hazard Analyst employed by the Regional Council. The purpose of Mr Griffiths' report was to provide us with advice related to the actual and potential effects of the proposed activity on flooding on adjacent land. In preparing his report, Mr Griffiths considered the relevant sections of the

¹⁵ B Leslie submission at Para 3.3
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assessment of environmental effects (AEE) submitted by the Applicant, including its technical appendices. In particular, he also considered the report 'Silverstream Estates Flood Hazard Assessment' (March 2012) and took into account relevant issues raised by submitters in relation to the effects of flooding. He noted that flood modelling investigations carried out by the Regional and District Councils indicate that parts of the NAR will be within a 'High Hazard' area as defined by the Canterbury Regional Policy Statement 2013.

[60] At Para 12 in his report, Mr Griffiths wrote:

In flood events with return periods up to 50 years, the primary source of flooding is likely to be overflows from the Ohoka Stream and Kaiapoi River. In events larger than this, the site may also be at risk of flooding from Cust Main Drain and Eyre River overflows, and in extreme flood events, from Waimakariri River and Ashley River overflows.

[61] And then at Para 16 in his supplementary report, Mr Griffiths wrote:

In order to assess the likely effects of the proposed NAR in a 50 year flood event, the 2012 model¹⁶ was updated to include the latest available LiDAR topographic data (obtained in 2014) and was re-run. The model topography was then modified to represent the proposed NAR, including the three proposed box culverts. The two sets of results were then compared to establish the likely change in flood depth and flood duration on land in the vicinity of the proposed NAR.

[62] Although the Regional Council did not conduct a full review of the PDP model, Mr Griffiths, in his report, considered that the approach taken by PDP for the Applicant is suitable for determining the likely effects of the proposed NAR.

[63] By subtracting the pre-NAR flood levels from the post-NAR flood levels, the areas where there is a change in flood depth resulting from the NAR were determined. Flood depth increases of greater than 50 mm were shown to be limited to a relatively localised area upstream of the proposed NAR. This area includes two dwellings; one on the Reeve (now WDC) property at 46 Butchers Road and one on the Warren property at 27 Mill Road. A comparison of the surveyed floor levels of these dwellings and the PDP model results indicate post-NAR flood levels to be approximately 390 mm¹⁷ below the floor level of the Warren dwelling and 210-290 mm below the floor level of the Reeve dwelling. Mr Griffiths went on to say in his report that, because culverts that

¹⁶ Model developed in March 2012 to quantify the flood risk to the Silverstream Estates development.

¹⁷ We note here, that following the additional review of survey data, by Davis Ogilvie, as explained in correspondence dated 24 June 2015, 14 July 2016 and from Pattle Delamore dated 6 July 2016, the surveyed floor levels in fact show a freeboard of less than 300mm for the Warren Dwelling. The Warrens were advised of this error, but confirmed their written approval to the applications on 18 July 2016.

are to be installed as part of the proposed NAR, he considered that the NAR will be more likely to aid drainage of the upstream areas, rather than inhibit it. Therefore, if anything, the increases in flood duration determined by the PDP model are considered more likely to be shorter, rather than longer.

[64] PDP initially proposed bunding at the Reeve property to prevent floodwaters from affecting this property and concluded that construction of a stopbank along the true left bank of the Ohoka Stream to protect the Warren property would not be effective. It appears from Mr Griffiths' report that other forms of flood mitigation have not been explored.

[65] Mr Griffiths concluded that because of potential uncertainties associated with the PDP model (or with any flood model) it cannot be expected that the results will reflect the precise change in flood depth or duration associated with a 50-year return period flood event. However, he did say that the PDP model results are the best available information and are considered able to provide a reasonable indication of the effect the proposed NAR will have on flooding in the area.

[66] We note that Mr Griffiths had nothing to tell us about flooding at the Leslie property, a matter that, not surprisingly, was of concern to Mr Leslie. Ms Dawson noted that Mr Leslie is concerned about the direct and cumulative impact the NAR will have on his land. Mr Leslie considers that the flooding analysis does not support local observations and does not address future effects of upstream development.

[67] Based on the information provided by the Applicant and in Mr Griffiths' supplementary report, Ms Dawson concluded that the only structures that would experience flooding in the 2% AEP event are Mr Reeves' shed where the floor level is at ground level and Mr Leslie's pump shed. Based on the total estimated flood depth post-NAR and as the increase in depth due to the NAR is estimated to be less than 75mm, both of these structures would be flooded in the pre-NAR scenario. Overall she considered that the effects of the increased flood depth on the Warren, Leslie and Evans properties will be no more than minor and she did not consider that any mitigation is necessary.

[68] We note that the modelling work carried out by PDP for the Applicant was reviewed by Mr Mark Groves of Opus. Mr Groves, in his peer review, considered that, in this situation, the appropriate freeboard would be a minimum of 300 mm.¹⁸

¹⁸ s42A WDC Report, Appendix V: Mr Mark Groves, Opus International Consultants Ltd, Written Statement of Evidence, 15 September 2015; at para 32
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[69] Ms Dawson then went on to discuss the duration of flooding and concluded that total flood duration time on the submitter's properties is shown to be between about 24 to 72 hours in both the pre and post NAR scenarios. Given this extensive duration and that the area of the increased duration is quite limited; she considered the potential effects on the submitters properties will be of a minor nature. Mr Bacon reached similar conclusions.

[70] As noted above at [43], we were alerted to a report in the Christchurch Press suggesting that survey errors had led to the benchmark flood levels for the Silverstream subdivision being about 150 mm too low. While we were uncertain if this finding would have any impact on the modelling of the flood impacts for the proposed NAR, given that a submitter, Mr Leslie had found errors in the survey of building floor levels at his property, we sought, confirmation, or otherwise, from the Applicant that the information we have received regarding flooding impacts remains valid and sufficient for us to be able to decide this application.¹⁹

[71] On 8 September 2016 the Applicant's response to our Minute was received. This included a letter from PDP that discussed the implications of the incorrect Silverstream Estates benchmarks; a discussion of the survey discrepancies from DOL; and also a peer review of the PDP response by Opus.

[72] In their letter in response to our Minute, PDP confirmed that the existing survey benchmark levels at Silverstream Estates are incorrect and it is now understood that the development has been constructed at an average of 90 mm lower than designed and that this includes ground levels, roads and other infrastructure.

[73] This was confirmed by DOL in their letter dated 1 September 2016 to Waimakariri District Council. This same letter confirmed that the DOL design levels for the NAR are correct although minor design adjustments may be needed where the NAR intersects various roads, during the engineering design approval process. PDP went on to acknowledge that the flood modelling work carried out for the NAR had been based on the flood model constructed for the Silverstream Estates development. This model had calculated floodwater depths and flows relative to a digital representation of the earth's surface, known as a Digital Elevation Model (DEM) that, we are told, is based on a LiDAR ground elevation survey and, as such, is completely independent of any local topographical survey. PDP concluded that the overall integrity of the modelling work carried out for the NAR is not compromised by the construction variation or survey benchmark issue at Silverstream

¹⁹ Minute Five.

Estates. Because of the lower ground levels, there may now be additional flood storage available within Silverstream Estates, which could have the effect of causing a small reduction in design flood levels for the NAR. PDP concluded that the existing evidence presented with respect to flooding remains applicable and appropriate in assessing the application when considered in conjunction with the additional information contained in their letter.

[74] The response from PDP was peer reviewed by Opus who confirmed PDP's conclusions and found no errors in PDP's analysis.

[75] Mr Leslie provided a response to the PDP and DOL correspondence.²⁰ We understand that Mr Leslie remains concerned that the NAR will operate as a barrier to flood water flows in the Ohoka basin and there is insufficient drainage capacity for water to flow through it and, therefore, will increase flooding on his property. Mr Leslie disputes that the impact is as small as indicated by PDP.

Conclusion on flooding effects

[76] This application has been subject to a number of delays to address additional information. Errors were also identified in the surveyed floor levels for dwellings initially identified as affected by the applications. We requested additional information and peer review of the information provided by the Applicant. We are satisfied that notwithstanding the errors, that the PDP model is an acceptable method to assess actual and potential effects of flooding before and after the construction of the NAR.

[77] Having considered the application, the expert evidence and submissions concerning the impacts of the NAR on flooding we accept the Applicant's evidence, as expressed by Mr Brough and Ms Torgerson, that the effects of the NAR on flooding will not be significant. We note that this view was supported by the reporting officers for the consent authorities.

[78] We are satisfied on the evidence that the effects arising from the construction of the NAR on Mr Leslie are not significant when considered in the context of the existing highly flood prone environment. There is an already identified building site for construction of a dwelling on Mr Leslie's property which takes account of the existing flood prone environment. Although Mr Leslie considered it might be more difficult for him to build on that area, we had no engineering evidence to suggest he could no longer build due to the construction of the NAR. Even if it became more

²⁰ Response from B Leslie 12 September 2016
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complex, and more costly to build, it is clear from what Mr Leslie told us, that irrespective of the construction of the NAR, he would require detailed engineering design to meet current building standards for his intended dwelling. While there may be an increase in flooding on Mr Leslie's property as a result of the construction of the NAR, we consider that effect, does not outweigh the positive benefits to be derived from the construction of the NAR.

Management of Swales

[79] During the hearing there was a difference of opinion between Ms Dawson and Ms Torgerson around proposed Condition 24b which addressed the length of grass within swales and the optimum length to ensure appropriate treatment of contaminated stormwater. Ms Dawson proposed a length of 100 mm to 150 mm was based on a literature review of appropriate swale design. Ms Torgersen noted that the District Council maintained swales throughout the District based on practical maintenance contract management schedule, which resulted in grass length between 50 - 250 mm. There did not appear to be any reported issues arising from this practice. We are satisfied that, although there may be an optimum grass length in the literature, the variability in seasonal growth, the short retention period where grass levels may be longer than 150 mm, and the maintenance schedules would appear to make compliance and enforcement with Ms Dawson's condition unreasonable. We are satisfied that the compliance limits for water quality imposed by the conditions provide an appropriate enforcement threshold to protect water quality and ecology and that the maintenance of swale grass length should be set on a more flexible basis, acknowledging local practice. If compliance issues do arise, then we have included swale management as matter that could be reviewed should the need arise.

Other effects

[80] We are satisfied that the proposed conditions adequately address the effects of constructing the NAR. We accept the evidence the Council s42A Officers and the Applicant on those matters.

Positive effects

[81] The construction of the NAR will provide for planned roading improvements in the Waimakariri District. The construction is provided for in the Land Use Recovery Plan and in the Waimakariri District Plan. We accept the evidence of the Applicant and Council s42A Reporting Officers that the NAR will improve access to the area because it offers a higher level of flood

protection than the existing route. We are also satisfied on the evidence that it will make a safe and efficient contribution to the transport network for the district and region.

Section 107 matters

[82] We are satisfied on the evidence heard that the grant of resource consents for discharges associated with the construction and operation of the NAR meet the requirements of s107 of the RMA. Based on the Applicant's evidence, the advice from Dr Meredith, for the Regional Council and the recommended conditions, we are satisfied that the discharge of construction phase stormwater and developed phase stormwater will not result in the production of any conspicuous oil or grease films, scums, foams floatable or suspended materials, any conspicuous change in visual clarity beyond that permitted by the relevant plan, render freshwater unsuitable for consumption by farm animals or any significant adverse effects on aquatic life.

Relevant Planning Objectives and Policies

[83] Ms Dawson and Mr Bacon set out the relevant objectives and policies in the National Policy Statement for Fresh Water Management 2014, the Canterbury Regional Policy Statement, the Mahaanui Iwi Management Plan, relevant Regional Plans and District Plan. We do not repeat these here, but adopt their assessments.²¹ On the basis of our conclusions that the effects on the environment will not be significant we are satisfied that the approval of the Applications, subject to conditions, accords with the objectives and policies of the relevant planning documents.

Land Use Recovery Plan and Recovery Strategy

[84] The application is consistent with the requirements of the Land Use Recovery Plan and Recovery Strategy.

National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011

[85] The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 focus is on protecting human health. We are satisfied that the proposed Rehabilitation Action Plan (RAP) prepared by Tasman Environmental Consultants Limited dated May 2014 is an appropriate response.

²¹ s 42A Reports prepared by Adele Dawson at 194 -244 and Matthew Bacon at 4 and 8 and Appendix II. Waimakariri District Council Northern Arterial Road 29-09-2016

[86] Compliance with the conditions of consent will address the relevant matters to ensure compliance with the regulations.

Part 2

[87] The assessment of an application under Section 104 is also subject to the provisions of Part 2 of the Act.

[88] Section 6 requires that decision-makers recognise and provide for the matters of national importance contained therein. No matters of potential relevance under this section arose with respect to this application.

[89] Section 7 contains three sub clauses which are relevant to this application. These are:

(b) the efficient use and development of natural and physical resources:

(c) the maintenance and enhancement of amenity values:

(f) the maintenance and enhancement of the quality of the environment.

[90] We are satisfied on the evidence that the construction of the NAR will not compromise the above principles and the overall quality of the environment will be maintained. We are further satisfied that the grant of resource consents for the NAR will achieve the overriding purpose of the RMA of sustainable management of natural and physical resources.

DECISION

[91] Pursuant to Sections 104, 104B, 107 and 108 of the Resource Management Act 1991 we grant the applications for resource consent subject to the conditions set out in Schedule 1

29 September 2016

Cindy Robinson (Chair)



Bob Nixon



John Lumsden



SCHEDULE 1 - CONDITIONS

RC155004

THAT pursuant to Section 104C of the Resource Management Act 1991, consent be granted to undertake earthworks exceeding 1000m² per site and within 20 metres of the Kaiapoi Rivers to establish and operate an arterial Road at 261, 274, 280, 336 Giles Road, 7 Footbridge Terrace and the Giles and Butchers Road Reserves, being Lot 1 DP 1575, Lot 2 DP 44080, Pt Lot 1 DP 14099, Lots 1 - 3 DP 471740, Lot 3 DP 67537, Pt RS 14549, Pt Lot 10 DP 10388, RS 42260 and Pt Lot 1 DP 33099, Section 1 SO 470087, as a restricted discretionary activity subject to the following conditions which are imposed under Section 108 of the Act:

1. The activity shall be carried out in accordance with the attached approved application plans.

2. **Standards**

- 2.1 All stages of design and construction shall be in accordance with the Waimakariri District Council Engineering Code of Practice (and the latest amendments) where applicable.

In addition the following standards shall apply.

- R06/23 - Erosion and Sediment Control Guideline 2007
- NZS4431:1989 – Code of Practice for Earthfill in Residential Development
- NZS4402 - Methods of testing soils for civil engineering purposes
- NZS4404: 2010 Land Development and Subdivision Infrastructure.
- National Code of Practice for Utility Operators Access to Transport Corridors (November 2011)

3. **Environmental Management**

- 3.1 Prior to any excavation or filling works commencing on site, the consent holder shall provide an Environmental Management Plan (EMP) to the Council District Plan Implementation Manager for written approval. The EMP shall detail the methodology of works and the environmental controls in place to limit effects from issues involving flooding, dust, noise, pollution, wildlife, etc. and shall include plans showing the proposed mitigation measures.
- 3.2 The consent holder shall be responsible for installing and maintaining any sediment control devices, protection of the existing land drainage and waterways, and making regular inspections, repairs and changes to the proposed measures as required.
- 3.3 Site works shall cease when winds are of such magnitude as to cause sediments (soils) to become airborne and create a dust nuisance.
- 3.4 Any amendment required to the EMP shall be submitted to the Council Plan Implementation Manager prior to the commencement of works subject to the amendment.

- 3.5 All earthworks shall accord with the EMP, including subsequent amendments, and no earthworks shall be undertaken on site until the EMP has been, submitted, and approved, in writing, by the Waimakariri District Council Plan Implementation Manager.

4. Earthworks

- 4.1 The earthworks shall be carried out in terms of the designs and plans approved by the Council.
- 4.2 Stockpiles shall be located a minimum 25 metres away from all neighbouring properties, Stockpiles remaining for a period of more than 3 months shall be no greater than 2.0 metres high, shaped and grassed or otherwise protected from erosion.
- 4.3 All existing natural stormwater channels shall be retained or replaced with an approved drainage system.
- 4.4 All rubbish, organic or other unsuitable material shall be removed off site to an approved site where this material can be legally disposed of.
- 4.5 All vibration levels (measured by peak particle velocity) generated by the construction work shall comply with the German DIN4150 Standard, Part 3 (1999) – *Effects of vibration on structures*.
- 4.6 Except where necessary to comply with Condition 8 below, construction work shall only be undertaken on-site between the following hours:
- a. Monday to Friday: 7am to 6pm.
 - b. Saturday: 7.00am to 6pm.

No construction work shall take place on Sundays or any Public Holiday.

- 4.7 All construction earthworks shall be completed within 12 months of the issue of this consent.
- 4.8 The consent holder shall submit a plan showing the location of all proposed construction accesses, to the Waimakariri District Council Plan Implementation Manager, for approval, in writing, prior to works commencing.
- 4.9 The consent holder shall form the construction accesses approved under Condition 4.8 to accord with the Waimakariri District Council Engineering Code of Practice Standard Drawing 600-217 Issue D. The access shall incorporate a 20 metre metalled approach from the site and a shaker ramp, prior to further works occurring.

5. Conditions Auditing

- 5.1 The Council will audit compliance with the conditions of consent by both site inspections and checking of associated documentation to ensure the work is completed in accordance with the approved plans and specifications. The Council

will undertake inspections and checking at the consent holders cost. The consent holder, or their authorised agent, shall notify Council at least one working day prior to commencing various stages of the works. This is to enable audit inspections required by the consent to be performed.

The minimum level of inspection shall be as follows:

Environmental Management

- Following set up of erosion and sediment control measures as per approved EMP.
- During progress of the works.
- Upon completion.

Earthworks

- Following stripping of topsoil.
- During progress of the earthworks.
- On completion to final levels.

- 5.2 Where repeat inspections are required because of faulty workmanship or work not being ready contrary to the receipt of a notification, such inspections will be carried out at cost for staff time and vehicle running costs for kilometres travelled.

6. Land Contamination Mitigation

- 6.1 The consent holder shall prepare a Remedial Action Plan (RAP) for remediation or mitigation of topsoil in the locations identified in the Tasman Environmental Management detailed site investigation dated February 2014. The Remedial Action Plan shall be prepared by a suitably qualified and experienced professional and submitted in writing, for written approval by the Waimakariri District Council Plan Implementation Manager, prior to the earthworks occurring.
- 6.2 The consent holder shall carry out the operation of the earthworks, including health and safety measures, vehicle plant and staff decontamination, erosion and sediment control and dust control in the known areas containing contamination to accord with the requirements of RAP.
- 6.3 The consent holder shall ensure that any stockpiles of contaminated material are located a minimum of 25 metres away from any dwelling located on any adjacent site. The height of the stockpiles shall be limited to 1.8 metres above surrounding ground.
- 6.4 The consent holder shall ensure that any stockpiles of contaminated material not reused or disposed of within 5 working days are securely covered to prevent sediment migration or dust generation.
- 6.5 In the event that contaminated materials are disposed of offsite, the consent holder shall provide evidence in the form of weight dockets confirming the volume of any contaminated fill taken off site for disposal. Off-site disposal shall be to an authorised facility.
- 6.6 The consent holder shall prepare and submit a post-earthworks report to be prepared and approved by suitably qualified professional confirming that all earthworks in and around the contaminated material have been carried out in accordance with the RAP and that the contaminated material reused is suitable.

- 6.7 The consent holder shall prepare and submit as-built plans of the site detailing the extent and depth of material that has been reused and spread in its final location.

7. Traffic Management

- 7.1 The consent holder shall submit for approval a Traffic Management Plan detailing traffic control works (including sketch layout and control signs). This plan shall be submitted prior to work commencing on or in Butchers Road or Giles Road. Traffic Management shall be to Level 1, as described in the NZ Transport Agency Code of Practice for Temporary Traffic Management.

8. Machinery operation

- 8.1 Heavy equipment shall not operate within 50 metres of any existing dwelling before 7.30am. Motor scrapers shall not operate within 400 metres of an existing dwelling before 7.30am.
- 6.2 Residents within 50 metres of the site boundary shall be notified by the consent holder when motor scrapers will operate within 50 metres of the boundary, or when other heavy machinery will operate within 20 metres of the boundary, a minimum of one day prior to the works commencing.

9. Inspection

- 8.1 Compliance with the above conditions shall be verified by inspection by a Council Officer pursuant to Section 35(2)(d) of the Resource Management Act 1991. Should an inspection be necessary, the consent holder shall pay to the Council charges pursuant to Section 36(1)(c) of the Resource Management Act 1991 to enable the Council to recover its actual and reasonable costs in carrying out the inspections.

ADVICE NOTES

- a) The Traffic Management Plan forms can be sourced from the WDC Service Centres or on-line at:
http://www.waimakariri.govt.nz/services/roads_transport/traffic-management.aspx
- b) For inspections and approval of consent conditions please contact Bruce Cathro, Subdivisions Engineer, on (03) 311 8900 Extn. 8825 or 021 480 817.

CRC147665-, CRC147666, CRC147667 and CRC151940

CRC147665- to discharge sediment-laden stormwater and post-construction stormwater to water

LIMITS

- 1) The discharge shall be only:
 - a. Sediment-laden stormwater during the construction phase; and
 - b. Residual chemicals from the treatment of sediment-laden water; and
 - c. Post-construction phase stormwater from the new arterial road;

located at Part Lot 1 DP 1575; Lot 2 DP 44080; Lot 1 DP 471740; Lot 2 DP 471740; Lot 3 DP 471740; Part RS 14549; Part Lot 10 DP 10388; Section 1 SO 470087; Part Lot 1 DP 33099 and Part RS 338D, Ohoka Road, Giles Road and Butchers Road as shown on Plan CRC147665A and Plan CRC147665B, which forms part of this consent.
- 2) Stormwater during the construction phase shall be discharged either:
 - a. Into Parnham Drain via existing road side drain along Island Road at or about map reference Topo50 BW24:7073-9639; or
 - b. Into the Kaiapoi River between map references Topo50 BW24:7005-9660 and Topo50 BW24:7010-9664; or
 - c. Into Ohoka Stream between map references Topo50 BW24:7019-9742 and Topo50 BW24:7022-9745;

as shown on Plan CRC147665C, which forms part of this consent.
- 3) Stormwater post-construction shall be discharged via swales either:
 - a. Into Parnham Drain via the existing road side drain on Island Road at or about map reference Topo50 BW24:7074-9633; or
 - b. Into the Kaiapoi River between map references Topo50 BW24:7005-9660 and Topo50 BW24:7010-9664; or
 - c. Into the Ohoka Stream at or about map reference Topo50 BW24:7018-9742.; or
 - d. Into the Kaiapoi River at or about map reference Topo50 BW24:7030-9741;

as shown on Plan CRC147665D, which forms part of this consent.
- 4) When the capacity of the post-construction stormwater system is exceeded, stormwater shall be directed to a surface water body.
- 5) The discharge shall not at any time result in:
 - a. The production of oil or grease films;
 - b. The production of floatable or suspended materials;
 - c. A change in visual clarity of more than 20 percent at the edge of the mixing zone;
 - d. A dissolved copper concentration of 0.0018 milligrams per litre; or
 - e. A dissolved zinc concentration of 0.015 milligrams per litre;

in the Kaiapoi River and Ohoka Stream shown on Plan CRC147665C, which forms part of this consent.

- 6) At any discharge point from the site the concentration of Total Suspended Solids in the discharge shall not exceed 50mg/L.
- 7) The discharge shall not cause scour, erosion and/or instability to the bed or banks of Island Road Drain, the Kaiapoi River or Ohoka Stream.
- 8) Prior to discharging post-construction stormwater via swales, the consent holder shall remediate the land identified as being contaminated in the reports titled *Environmental Site Assessment-Silverstream Estate, Kaiapoi* dated June 2012 and *Detailed Site Investigation 336 Giles Road Kaiapoi* dated March 2014 located within the proposed road corridor at 274 Giles Road and 336 Giles Road in accordance with the Remedial Action Plan as required by Condition (18).

PRIOR TO COMMENCEMENT OF WORKS

- 9) Prior to the commencement of works described in Condition (1), the consent holder shall ensure that all personnel working on the site are made aware of and have access to the contents of this consent document and all associated erosion and sediment control plans and methodology, the Remedial Action Plan and the Chemical Treatment Plan, if required.
- 10) Prior to the commencement of works, the consent holder or their agent shall arrange and conduct a pre-construction site meeting between the Canterbury Regional Council and all relevant parties, including the primary contractor. At a minimum, the following shall be covered at the meeting:
 - a. Scheduling and staging of the works;
 - b. Measures such as a Chemical Treatment Plan should the use of flocculants be required;
 - c. Responsibilities of all relevant parties;
 - d. Contact details for all relevant parties;
 - e. Expectations regarding communication between all relevant parties;
 - f. Procedures for implementing any amendments;
 - g. Procedures for managing contaminated soil;
 - h. Site inspection; and
 - i. Confirmation that all relevant parties have copies of the contents of this consent document and all associated erosion and sediment control plans and methodology.

CONSTRUCTION MANAGEMENT PLAN

- 11) The discharge of construction phase stormwater shall occur in accordance with the Construction Management Plan (CMP).
 - a. The CMP shall detail the erosion and sediment control measures that will be taken to ensure compliance with this consent.
 - b. The CMP shall be prepared in accordance with Environment Canterbury's "Erosion and Sediment Control Guidelines for the Canterbury Region" Report No. CRC R06/23, February 2007 (ESGC).

- 12) The CMP shall include, but not be limited to:
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- a. A map showing the location of all works;
- b. Detailed plans showing the location of erosion or sediment control measures and treatment devices, on-site catchment boundaries, sources of runoff and discharge points;
- c. Drawings and specifications of designated erosion or sediment control and treatment measures, which include sediment fences and sediment retention ponds;
- d. Procedures and measures for managing contaminated soil;
- e. A programme of works, which includes but is not limited to, a proposed timeframe for the works;
- f. Inspection and maintenance of the erosion or sediment control measures and treatment devices;
- g. Sampling procedures and protocols;
- h. Defined discharge points where stormwater and dewatering water leaves the site; and
- i. The description of the best practicable options to be applied to minimize contaminants being discharged beyond the boundary of the site.

13) The CMP shall be submitted to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager, at least ten working days prior to construction of the road commencing, for certification that it complies with Environment Canterbury's Erosion and Sediment Control Guidelines for the Canterbury Region and the conditions of this consent.

- a. The discharge shall not commence until the consent holder has received the certification from the Canterbury Regional Council that it is consistent with the ESCG and the conditions of this consent.
- b. Notwithstanding Condition (12)(a). if the consent holder has not received the certification within ten working days of the RMA Monitoring and Compliance Manager receiving the ESCP, the discharge may commence.

14) The CMP may be amended at any time. Any amendments shall be:

- a. Only for the purpose of improving the efficacy of the erosion and sediment control measures and shall not result in reduced discharge quality; and
- b. Consistent with the conditions of this resource consent; and
- c. Submitted in writing to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager, prior to any amendment being implemented.
- d. The Applicant shall apply best practice and all practicable measures to avoid sediment transport off-site.

DURING CONSTRUCTION

15) Prior to the use of any water treatment chemical (flocculants or coagulants), a Chemical Treatment Plan (CTP) shall be provided to Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager. The CTP shall include but not be limited to:

- a. Bench testing results to determine the optimal dosing rates of treatment chemicals;
- b. Specific details of the flocculant(s) or coagulant(s) to be used;
- c. The methodology of how dosing will occur;

- d. A monitoring, maintenance (including post-storm) and contingency programme (including a Record sheet);
- e. A spill contingency plan;
- f. Details of the person or bodies who will be responsible for dosing of flocculants/coagulants; and
- g. The procedure for the storage of chemicals on-site and transportation of chemicals.

Any amendments to the CTP shall be provided to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager in writing prior to implementation.

- 16) The use of flocculants/coagulants shall be in accordance with product specifications and methods described in the Auckland Regional Council, Technical Publication #227 Flocculation Guideline.
- 17) During construction, all practicable measures shall be undertaken to minimise sediment being transported beyond the site boundaries.

CONTAMINATED LAND

- 18) Prior to the commencement of works to remediate the contaminated land, the consent holder shall submit a Remedial Action Plan to the Manager to obtain approval from the Canterbury Regional Council Contaminated Sites Team Leader.
- 19) The Remedial Action Plan required under Condition (18) shall:
 - a. Detail a procedure for managing any accidental discovery of contaminated soil;
 - b. Describe the methodology for soil removal and how soil will be prevented from being discharged to air and entrained in surface water run-off;
 - c. Outline where the contaminated soil will be disposed of; and
 - d. Describe the validation sampling that will be undertaken to ensure all contaminated soil is removed.
- 20) Stockpiling of contaminated material shall be avoided where possible. In the event that temporary stockpiling of contaminated material is required, then the stockpiles shall be managed as below:
 - a. Stockpiled material shall be placed on polythene sheeting or similar impervious material to prevent contamination of underlying material; and
 - b. Stockpiles shall be sited at least 20 metres from surface water bodies; and
 - c. Stockpiles shall include a perimeter bund or berm installed to prevent runoff leaving the area and stormwater from other areas entering the stockpile area; and
 - d. Stockpiled material shall be covered or dampened during dry and windy conditions; and
 - e. If significant rainfall is forecast, the stockpiled material shall be covered by a suitable material to prevent stormwater discharge or wind-blown dust generation;
 - f. All practicable measures shall be undertaken to ensure stockpiles are carted off the site on the same day or the day following excavation;
 - g. Stockpiles shall be fenced to prevent public or unauthorised access;
 - h. If any stockpiled material is deemed odorous, it shall be covered with an impermeable material or other form of odour suppression.

POST-CONSTRUCTION DESIGN

- 21) Stormwater from intersections shall be collected and discharged into swales via sumps.
- 22) Stormwater from bridges shall not discharge directly to any waterbody and shall be directed to a road side swale.
- 23) All sumps shall have submerged outlets and the capacity to trap at least 200 litres of hydrocarbons
- 24) The swales shall:
 - a. Be designed and constructed in accordance with the New Zealand Transport Agency Stormwater Treatment Standard for State Highway Infrastructure;
 - b. Be uniformly vegetated with grass 100-250 millimetres in height;
 - c. Have a hydraulic residence time of at least 9 minutes for a water quality design flow resulting from the contributing catchment from a rainfall intensity of 13.4 millimetres per hour;
 - d. Be capable of conveying stormwater from the contributing catchment from rainfall events up to and including the 10 percent annual exceedance probability event of 24 hours duration.

POST-CONSTRUCTION DESIGN PLANS AND CERTIFICATION

- 25) At least one month prior to the construction of the post-construction stormwater system, the consent holder shall submit to the Canterbury Regional Council Attention: RMA Monitoring and Compliance Manager, design plans of the stormwater system to be installed.
- 26) Within one month of the completion of the post-construction stormwater system, a certificate signed by a Chartered Professional Engineer (CPEng) with stormwater system construction experience shall be submitted to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager, to certify that the stormwater system complies with Conditions (21) to (24) of this consent. This CPEng shall also sign a statement confirming that they are competent to certify the engineering work.

INSPECTIONS AND MAINTENANCE

- 27) The post-construction stormwater system, including the swales and sumps shall be inspected at least once every six months.
 - a. Any litter, debris or visible hydrocarbons shall be removed immediately;
 - b. Any accumulated sediment in swales shall be removed within five days of the inspection; and
 - c. Any accumulated sediment in the sumps shall be removed when the sediment occupies more than one quarter of the depth below the invert of the outlet pipe.
- 28) The swales shall be:
 - a. Maintained so that vegetation is in a healthy and uniform state with the exception of seasonal browning off;
 - b. Replanted where erosion or die-off has resulted in bare or patchy soil cover; and
 - c. Mowed regularly or maintained so that vegetation is at a minimum length of 100 millimetres. Mown grass shall be removed from swales.

WATER QUALITY SAMPLING

Construction phase

- 29) During construction and when a discharge is occurring, the discharge point(s) into the receiving waterbodies shall be visually assessed and observations recorded at least twice a day for any sheen, oil or grease or water clarity change.
- 30) If observations undertaken in accordance with condition (29) indicate a sheen, oil or grease or a decrease in visual clarity, the consent holder shall immediately identify and remediate the source of the sheen, oil or grease or reduction in clarity.
- 31) Following the completion of any remediation required by condition (30), the consent holder shall undertake sampling in accordance with Conditions (32) and (37) to ensure compliance with Conditions (5) and (6).
- 32) Sampling required under Condition (25) shall be conducted in accordance with Condition (31) and using the following protocol:
 - a. The change in visual clarity shall be sampled 10 metres upstream and:
 - i. 30 metres below the downstream discharge point in the Ohoka Stream; and
 - ii. 40 metres below the downstream discharge points in the Kaiapoi River;
 - b. The samples shall be compared and the absolute percentage change in clarity between the two samples recorded for each waterbody;
 - c. If the reduction in water clarity is greater than 20 percent, a water sample shall be taken at all points of discharge into the Ohoka Stream, Kaiapoi River and Island Road Drain and analysed for Total Suspended Solids in accordance with Condition (37) and assessed against Condition (6); and
 - b. A record shall be kept that includes the following information:
 - i. The time the samples were taken;
 - ii. The water clarity samples and percentage change between the upstream and downstream sampling sites; and
 - iii. Any laboratory test results obtained.

Post-construction

- 33) Water quality samples shall be taken during a storm event or within 48 hours of the cessation of a storm event when a discharge is occurring from the site at the frequency specified by Condition (34) and as follows:
 - a. Grab samples of water from Ohoka Stream and the Kaiapoi River shall be taken 10 metres upstream of the discharge points and:
 - i. 30 metres below the downstream discharge point in the Ohoka Stream; and
 - ii. 40 metres below the downstream discharge point in the Kaiapoi River;
 - b. The samples collected in accordance with condition (28)(a) shall be analysed for the following parameters:
 - i. Total Copper;
 - ii. Dissolved Copper;
 - iii. Total Zinc; and
 - iv. Dissolved Zinc;

- c. A grab sample shall be taken of the discharge from the discharge points as and analysed for Total Suspended Solids.
- d. Water clarity measurements of the water samples taken 10 metres upstream of the discharge points and:
 - i. 30 metres below the downstream discharge point in the Ohoka Stream; and
 - ii. 40 metres below the downstream discharge points in the Kaiapoi River
 - iii. The upstream and downstream samples shall be compared and the absolute percentage change in clarity between the two samples shall be recorded for each discharge point;
- e. Samples shall be collected as soon as practicable from the discharge for each rainfall event to obtain a representative sample of first flush contaminant concentrations.

34) Water quality samples shall be collected in accordance with Condition (33) and as follows:

- a. At least twice per year for the first two years from the commissioning of the stormwater system; and
- b. At five yearly intervals thereafter.

35) The samples collected in accordance with Conditions (33) and (34) shall be assessed as follows:

- c. The samples collected from above and below each discharge point in accordance with Condition (34)(a) shall be compared against the limits stated in Condition (5)(c)-(5)(e);
- d. An exceedance of the limits described in (5)(d)-(5)(e) shall only occur if the sample taken above the discharge point complies with the relevant trigger value but the sample from below the discharge point does not meet the limit; and
- e. The samples collected of the discharge in accordance with Condition (33)(c) shall be compared against the following limits in Condition (6).

36) If the results of any sampling undertaken in accordance with Conditions (33) and (34) exceed any of the limits in Condition (5) or Condition (6) then the consent holder shall:

- a. Investigate the possible cause of the exceedance;
- b. Identify the risk to the environment from the exceedance; and
- c. Provide a report within two months of receiving sampling results to the Canterbury Regional Council, Attention RMA Monitoring and Compliance Manager outlining the following:
 - i. The findings of the investigation;
 - ii. Any proposed mitigation measures;
 - iii. A timeframe for implementing any proposed mitigation measures; and
 - iv. Further sampling to show that the mitigation measures implemented have resulted in the limits specified in Condition (5) being met.

Water quality monitoring general

37) Water quality samples shall be collected and analysed as follows:

- a. Grab samples shall be taken and analysed by a laboratory for Total Suspended Solids;
- b. Water clarity shall be tested using a clarity tube, black disc or using a suitable electronic optical measuring device;

- c. All water quality sampling shall be undertaken by a suitably qualified person with water quality sampling experience;
- d. Samples provided for laboratory testing shall be analysed using the most appropriate method and by a laboratory that is accredited for that method of analysis by International Accreditation New Zealand (IANZ); and
- e. All results and observations shall be retained by the consent holder and forwarded to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager on request.

SPILLS

38) All practicable measures shall be taken to avoid spills of fuel or any other hazardous substances within the site.

- a. In the event of a spill of fuel or any other hazardous substance, the spill shall be cleaned up as soon as practicable, the stormwater system shall be inspected and cleaned and measures taken to prevent a recurrence;
- b. The Canterbury Regional Council, Attention: RMA Monitoring and Compliance, shall be informed within 24 hours of a spill event and the following information provided:
 - i. The date, time, location and estimated volume of the spill;
 - ii. The cause of the spill;
 - iii. The type of hazardous substance(s) spilled;
 - iv. Clean up procedures undertaken;
 - v. Details of the steps taken to control and remediate the effects of the spill on the receiving environment;
 - vi. An assessment of any potential effects of the spill; and
 - vii. Measures to be undertaken to prevent a recurrence.

REPORTING

39) The results of the analyses undertaken in accordance with Conditions (29) to (36) shall be provided to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager, within ten working days of receipt of the results by the consent holder.

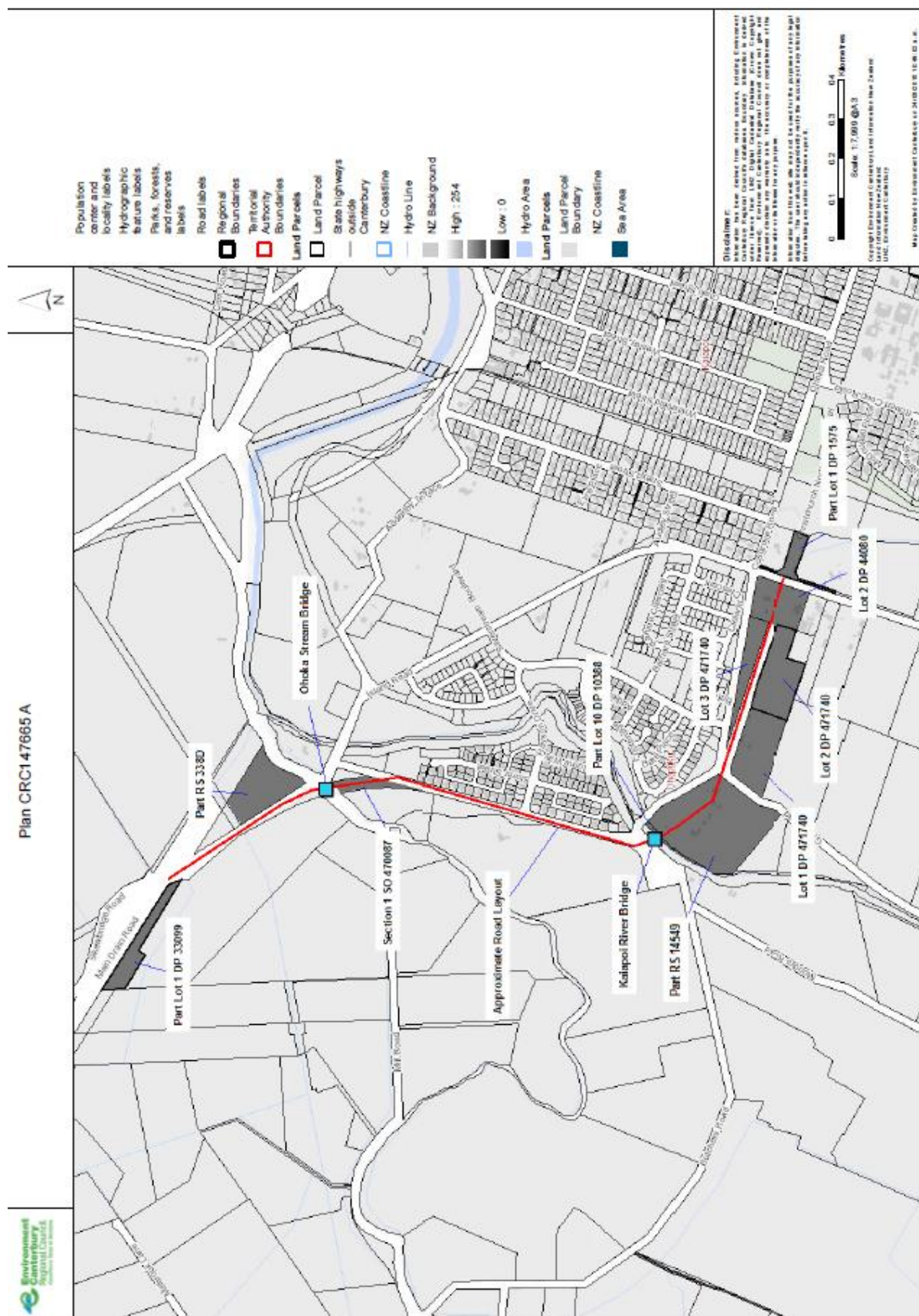
40) Records of the inspection and maintenance of the stormwater system shall be kept. The records shall include, but not be limited to, information that demonstrates compliance with Conditions (27) to (28) of this consent. Copies of these records shall be provided to the Canterbury Regional Council on request

ADMINISTRATION

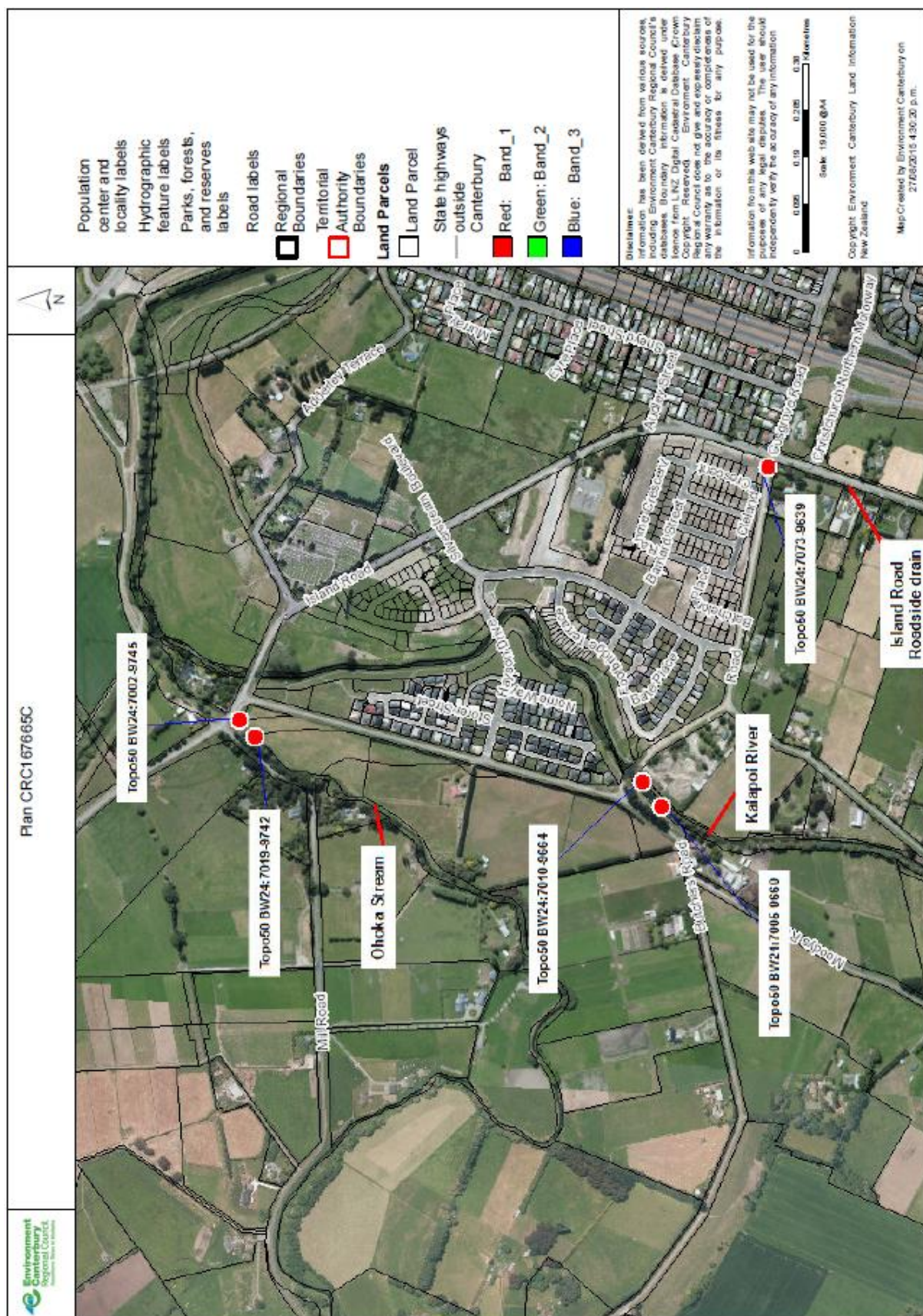
41) The Canterbury Regional Council may, once per year, on any of the last five working days of May or November, serve notice of its intention to review the conditions of this consent for the purposes of:

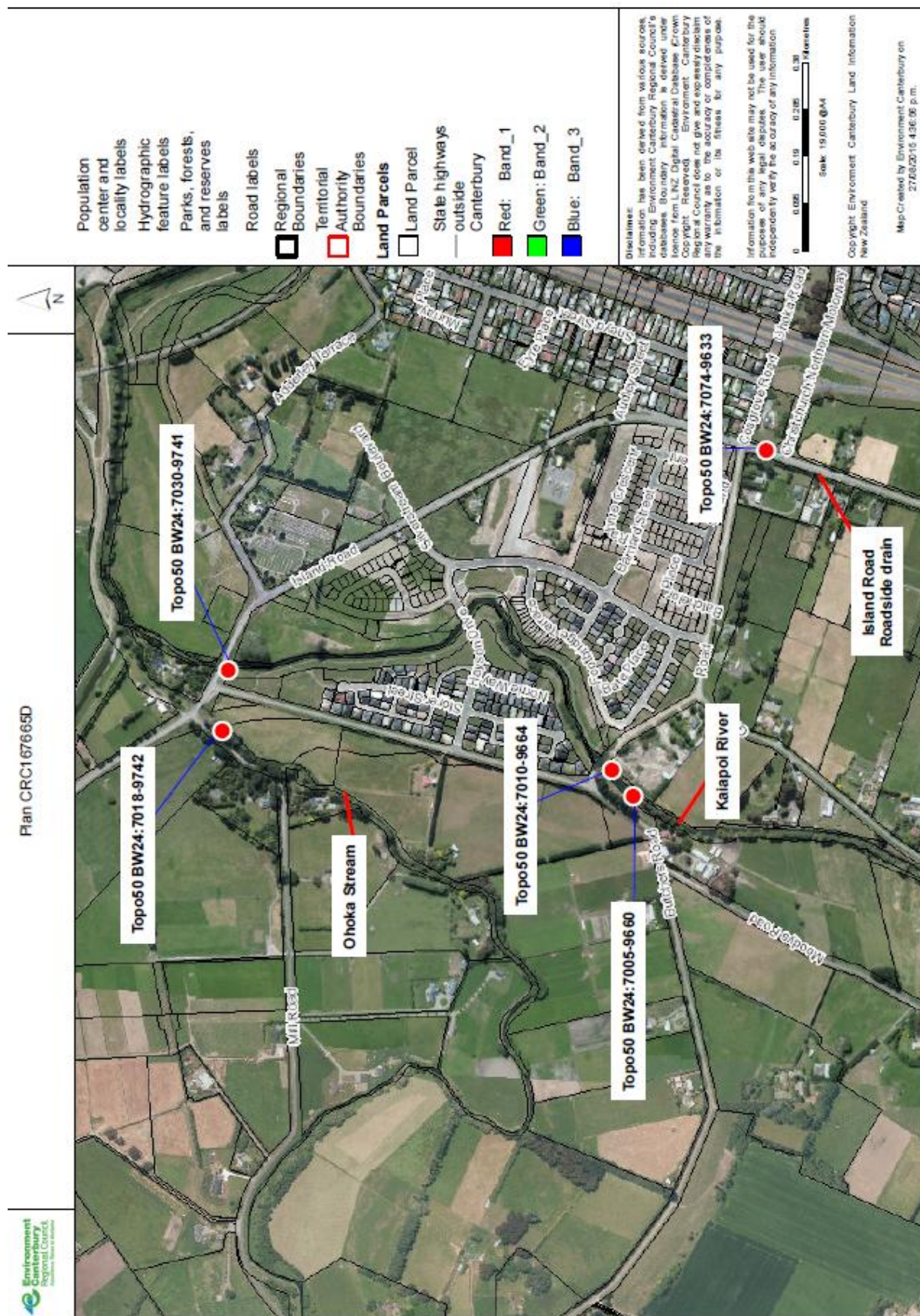
- a. Dealing with any adverse effect on the environment which may arise from the exercise of this consent; or
- b. Requiring the consent holder to carry out monitoring and reporting instead of, or in addition to, that required by the consent; or
- c. Reviewing the required grass length for swales provided for in condition 24b.

42) The lapsing date for the purposes of Section 125 of the Resource Management Act 1991 shall be 31 December 2020.









CRC147666- to use land for excavation

LIMITS

1. The works shall be limited to the excavation of land for the construction of the new arterial road as shown on Plan CRC147666A which forms part of this consent.
2. The works carried out in accordance within Condition (1) shall be located at Part Lot 1 DP 1575; Lot 2 DP 44080; Lot 1 DP 471740; Lot 2 DP 471740; Lot 3 DP 471740; Part RS 14549; Part Lot 10 DP 10388; Section 1 SO 470087; Part Lot 1 DP 33099 and Part RS 338D, Ohoka Road, Giles Road and Butchers Road as shown on Plan CRC147666A and Plan CRC147666B, which forms part of this consent.
3. Excavations shall not be deeper than 2.64m above mean sea level.

PRIOR TO CONSTRUCTION

4. Prior to commencing works, a copy of this resource consent shall be given to all persons undertaking activities authorised by this consent, the Construction Management Plan, the Remedial Action Plan and Chemical Treatment Plan, if required in accordance with CRC147665.
5. The Canterbury Regional Council; Attention: RMA Monitoring and Compliance Manager, shall be notified not less than 48 hours prior to the commencement of works.
6. At least 10 working days prior to construction commencing, a copy of the Construction Management Plan prepared in accordance with Condition (6) shall be submitted to the Canterbury Regional Council; Attention: RMA Monitoring and Compliance Manager.

DURING CONSTRUCTION

7. Works shall be undertaken in accordance with a Construction Management Plan which outlines the following:
 - a. A map showing the location of all works;
 - b. Detailed plans showing the location of sediment control measures, on-site catchment boundaries and sources of run-off;
 - c. Detailed plans and procedures for managing contaminated soil and groundwater;
 - d. Procedures for managing contaminants used on site;
 - e. An erosion and sediment control plan including drawings and specifications of designated sediment control measures;
 - f. A programme of works including an indicative timeframe; and
 - g. Inspection and maintenance for sediment control measures.
8. The Construction Management Plan prepared in accordance with Condition (7) may be amended at any time. Any amendments shall be:
 - a. Only for the purpose of improving the efficacy of the proposed works including erosion and sediment control measures;
 - b. Consistent with the conditions of this resource consent; and
 - c. Submitted in writing to the RMA Monitoring and Compliance Manager prior to any amendment being implemented.

9. All erosion and sediment control measures shall be designed, installed, maintained and decommissioned in accordance with the Environment Canterbury Erosion and Sediment Control Guidelines 2007.

SPILLS

10. All practicable measures shall be taken to avoid spills of fuel or any other hazardous substances within the site. In the event of a spill of fuel or any other hazardous substance:
 - a. The spill shall be cleaned up as soon as practicable, the stormwater system shall be inspected and cleaned, and measures shall be taken to prevent a recurrence; and
 - b. The Canterbury Regional Council shall be informed within 24 hours and the following information provided:
 - i. The date, time, location and estimated volume of the spill;
 - ii. The cause of the spill;
 - iii. The type of hazardous substance(s) spilled;
 - iv. Clean up procedures undertaken;
 - v. Details of the steps taken to control and remediate the effects of the spill on the receiving environment;
 - vi. An assessment of any potential effects of the spill; and
 - vii. Measures to be undertaken to prevent a recurrence.

TANGATA WHENUA

11. In the event of any discovery of archaeological material:
 - a. the consent holder shall immediately:
 - i. Cease earthmoving operations in the affected area and mark off the affected area; and
 - ii. Advise the Canterbury Regional Council of the disturbance; and
 - iii. Advise the New Zealand Heritage New Zealand Pouhere Taonga of the disturbance.
 - b. If the archaeological material is determined to be Kōiwi Tangata (human bones) or taonga (treasured artefacts) by Heritage New Zealand Pouhere Taonga, the consent holder shall immediately advise the office of the appropriate rūnanga (office contact information can be obtained from the Canterbury Regional Council) of the discovery.
 - c. If the archaeological material is determined to be Kōiwi Tangata (human bones) by the New Zealand Historic Places Trust, the consent holder shall immediately advise the New Zealand Police of the disturbance.
 - d. Work may recommence if Heritage New Zealand Pouhere Taonga (following consultation with rūnanga if the site is of Māori origin) provides a statement in writing to the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager that appropriate action has been undertaken in relation to the archaeological material discovered. The Canterbury Regional Council shall advise the consent holder on written receipt from Heritage New Zealand Pouhere Taonga that work can recommence.

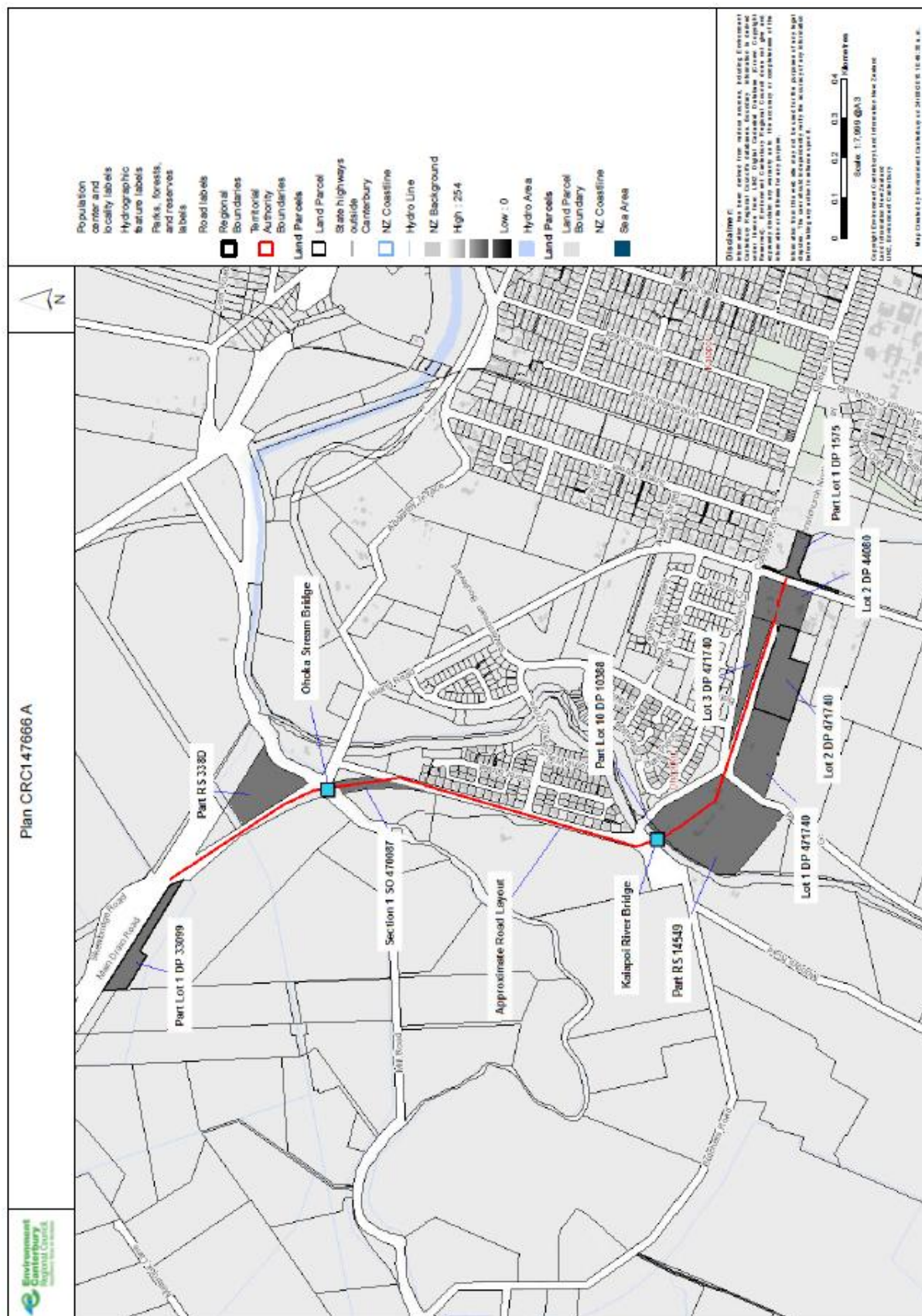
Advice Note: This may be in addition to any agreements that are in place between the consent holder and the Papatipu Rūnanga. (Cultural Site Accidental Discovery Protocol).

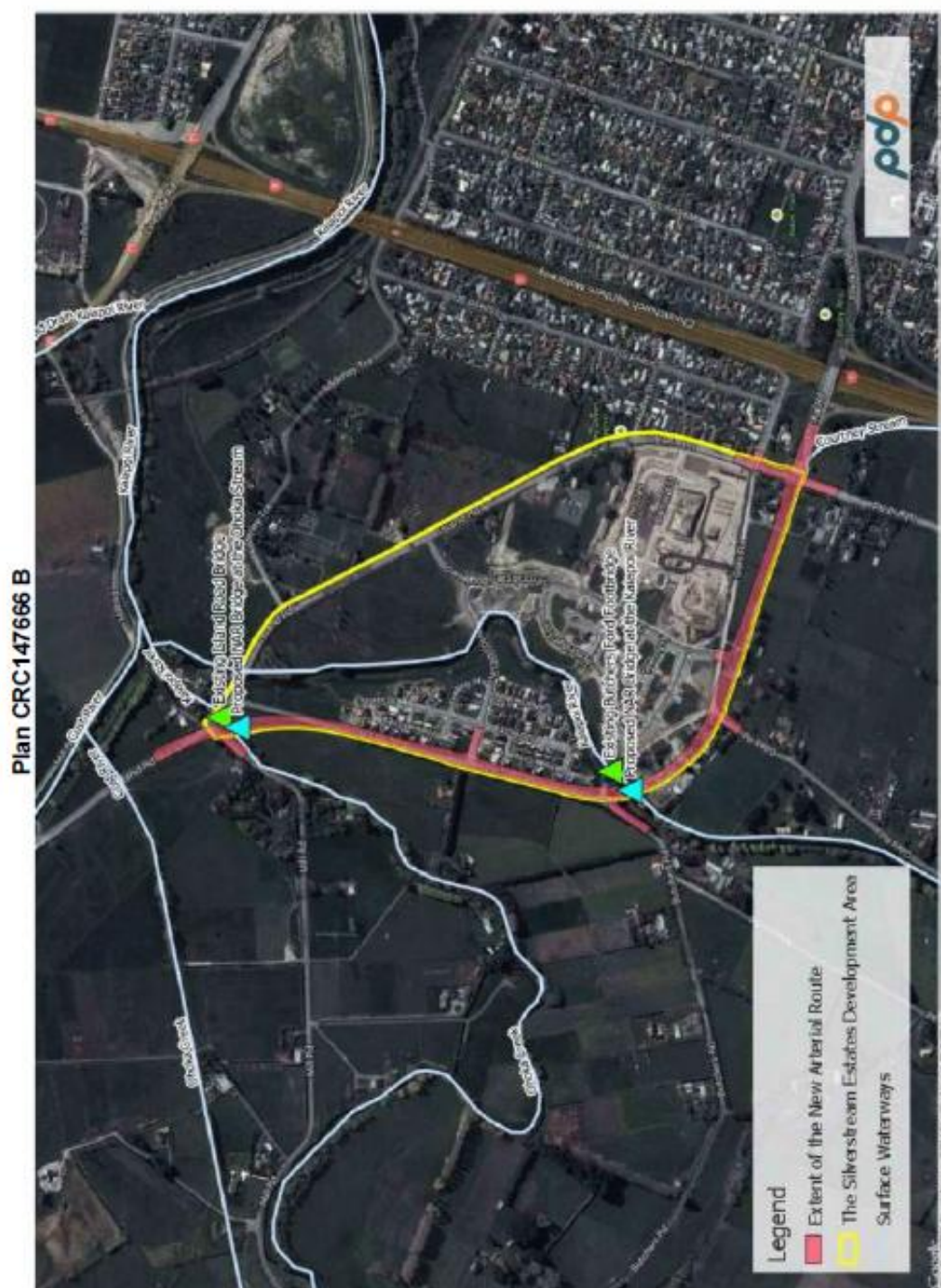
Advice Note: Under the Heritage New Zealand Pouhere Taonga Act 2014 an archaeological site is defined as any place associated with pre-1900 human activity, where there is material evidence relating to the history of New Zealand. For sites solely of Māori origin, this

evidence may be in the form of accumulations of shell, bone, charcoal, burnt stones, etc. In later sites, artefacts such as bottles or broken glass, ceramics, metals, etc, may be found or evidence of old foundations, wells, drains, tailings, races or other structures. Human remains/koiwi may date to any historic period. It is unlawful for any person to destroy, damage, or modify the whole or any part of an archaeological site without the prior authority of Heritage New Zealand Pouhere Taonga. This is the case regardless of the legal status of the land on which the site is located, whether the activity is permitted under the District or Regional Plan or whether a resource or building consent has been granted. The Heritage New Zealand Pouhere Taonga Act 2014 provides for substantial penalties for unauthorised damage or destruction.

ADMINISTRATION

12. The Canterbury Regional Council may, once per year, on any of the last five working days of May or October, serve notice of its intention to review the conditions of this consent for the purposes of:
 - a. Dealing with any adverse effect on the environment which may arise from the exercise of the consent; or
 - b. Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment.





CRC147667- to place structure over the bed of a river, excavate and disturb the bed of a river.

LIMITS

1. The activities authorised by this consent shall be limited to:
 - a. The installation of bridge abutments;
 - b. Placement of rip rap;
 - c. Placement of bridges; and
 - d. The excavation and disturbance of the bed associated with the works authorised by 1(a) and 1(b) of this consent.

2. The works carried out in accordance with Condition (1) shall be located in the bed and on the banks of the:
 - a. The Kaiapoi River at map reference Topo50 BW24:7008-9663; and
 - b. The Ohoka stream at map reference Topo50 BW24:7019-9745

located at Part Lot 1 DP 1575; Lot 2 DP 44080; Lot 1 DP 471740; Lot 2 DP 471740; Lot 3 DP 471740; Part RS 14549; Part Lot 10 DP 10388; Section 1 SO 470087; Part Lot 1 DP 33099 and Part RS 338D, Ohoka Road, Giles Road and Butchers Road as shown on Plan CRC147667A and Plan CRC147667B, which forms part of this consent.

3. The duration of the works to undertake the activities authorised by Condition 1 shall not exceed 12 months.

4. Structures and works authorised by condition (1)(a) shall not result in the:
 - a. Deflection of flows into the banks of the Kaiapoi River or Ohoka Stream; and
 - b. Erosion of the bed and banks of the Kaiapoi River and Ohoka Stream; or
 - c. Reduction in the flood carrying capacity of the Kaiapoi River and Ohoka Stream.

PRIOR TO CONSTRUCTION

5. The Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager and Attention: Regional Engineer shall be notified not less than five working days prior to the commencement of works.

6. Prior to commencing works, a copy of this resource consent shall be given to all persons undertaking activities authorised by this consent.

7. At least one month prior to the construction of the bridges, the consent holder shall submit to the Canterbury Regional Council Attention: RMA Monitoring and Compliance Manager, the final design plans of the bridges to be installed. The design plans shall show how compliance with Condition (4) will be achieved.

8. The consent holder shall prepare a Construction Management Plan (CMP) which clearly sets out the control measures to be undertaken to comply with Condition (17) of the consent. The plan shall be submitted to the Canterbury Regional Council: Attention: RMA Monitoring and Compliance Manager, at least ten working days prior to construction works commencing and shall be adhered to by the consent holder. The CMP shall include but not be limited to:
 - a. A locality map;

- b. Detailed drawings showing the type and location of sediment control measures;
- c. On-site catchment boundaries and off-site sources of run-off;
- d. Drawings, specifications and localities of designated sediment control practices with supporting calculations;
- e. A programme of works, which includes but is not limited to, a proposed timeframe for the works;
- f. The maintenance of sediment control measures; and
- g. Duration of operation and maintenance of sediment control measures.

DURING CONSTRUCTION

9. The works shall occur with the design plans submitted in accordance with Condition (7). Any variation to the plans submitted in accordance with Condition (7) must be approved by the Regional Engineer, or his nominee.
10. All practicable measures shall be undertaken to minimise the discharge of sediment and cement material, including waste wash water from tools and machinery, entering the Kaiapoi River or Ohoka Stream. Measures shall include but not be limited to:
 - a. Taking all practicable measures to minimise work in flowing water;
 - b. Ensuring vehicles and machinery only enter flowing water when no other alternative is practicable;
 - c. Undertaking works at a time of low flow;
 - d. Using erosion and sediment measures to prevent sediment from flowing into surface water or limiting sediment loss from beyond the construction site if works are within water;
 - e. Avoiding placing cut or cleared vegetation, debris or excavated material in a position such that it may enter surface water; and
 - f. Ensuring that cement is stored securely or removed from the site overnight.

Advice Note: All measures undertaken to minimise the discharge of sediment to water shall be undertaken in accordance with the Environment Canterbury Erosion and Sediment Control Guidelines 2007.

11. The works authorised by Condition (1) shall not prevent the passage of fish, or cause the stranding of fish in pools or channels.
12. No works shall occur in flowing water during the īnanga spawning season of May to September except for the installation of bridge abutments unless the area of works has been surveyed by a suitably qualified ecologist and the survey results show that there is unsuitable habitat for īnanga spawning. The survey should include an assessment of riparian vegetation and water chemistry.
13. Machinery shall be free of plants and plant seeds prior to use in the riverbed.
14. To prevent the spread of Didymo or any other aquatic pest, the consent holder shall ensure that activities authorised by this consent are undertaken in accordance with the Biosecurity New Zealand's hygiene procedures.

Advice Note: You can access the most current version of these procedures from the Biosecurity New Zealand website <http://www.biosecurity.govt.nz> or Environment Canterbury Customer Services.

15. The consent holder shall ensure that:

- a. All practicable measures are undertaken to prevent oil and fuel leaks from vehicles and machinery;
- b. There is no storage of fuel or refuelling of vehicles and machinery within 20 metres of the bed of a surface water body;
- c. Fuel is stored securely or removed from the site overnight;
- d. A spill kit that is capable of absorbing the quantity of oil and petroleum products that may be spilt on site at any one time is kept on site at all times.

SPILLS

16. In the event of a spill of fuel or any other hazardous substance with the potential to enter a waterway:

- a. The consent holder shall inform the Canterbury Regional Council, Attention: RMA Monitoring and Compliance Manager within 24 hours of a spill event and shall provide the following information:
 - i. The date, time, location and estimated volume of the spill;
 - ii. The cause of the spill;
 - iii. The type of hazardous substance(s) spilled;
 - iv. The clean-up procedures undertaken;
 - v. The details of the steps undertaken to control and remediate the effects of the spill on the receiving environment;
 - vi. An assessment of any potential effects of the spill; and
 - vii. Measures to be undertaken to prevent a recurrence.

17. The consent holder shall ensure that as soon as practicable or within two months, whichever is sooner:

- a. All disturbed areas shall be stabilised following the completion of works; and
- b. All spoil and other waste material from the works is removed from the site upon completion of the works.

ADMINISTRATION

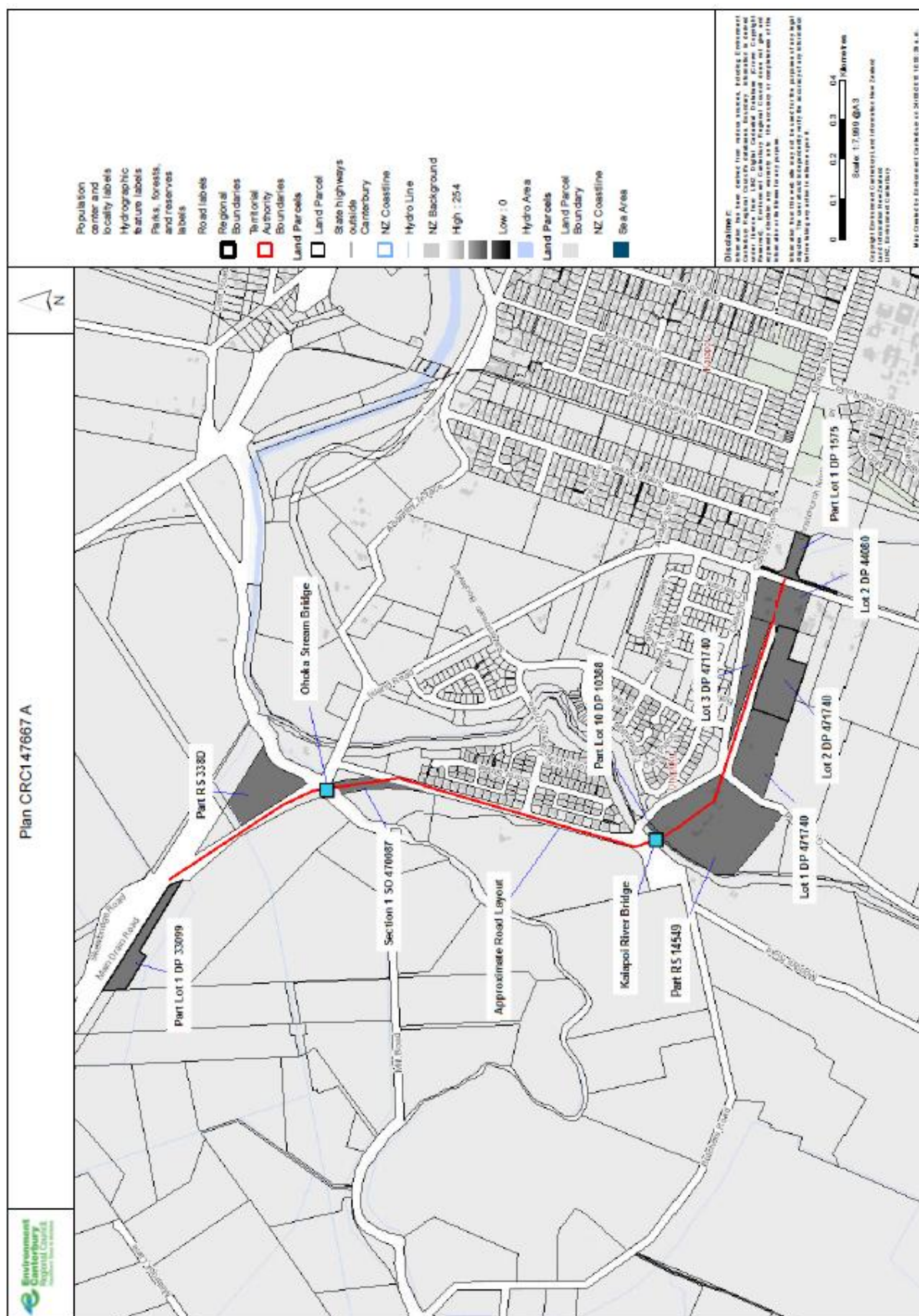
13. The Canterbury Regional Council may, once per year, on any of the last five working days of May or October, serve notice of its intention to review the conditions of this consent for the purposes of:

- c. Dealing with any adverse effect on the environment which may arise from the exercise of the consent; or
- d. Requiring the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

Flood Protection and Drainage Bylaw

This Resource Consent is also a Deemed Authority under the Canterbury Regional Council Flood Protection and Drainage Bylaw 2013 as the consent authorises the construction or placement of a structure between the bank of any watercourse and any associated defence against water and the damage and removal of flood protection vegetation.

For reference, we have assigned Bylaw Authority number FPB125093. This Bylaw Authority has the same duration as this consent. If you have any questions in regards to the Flood Protection and Drainage Bylaw 2013 please contact Canterbury Regional Council, our Engineering Section is available to answer any questions

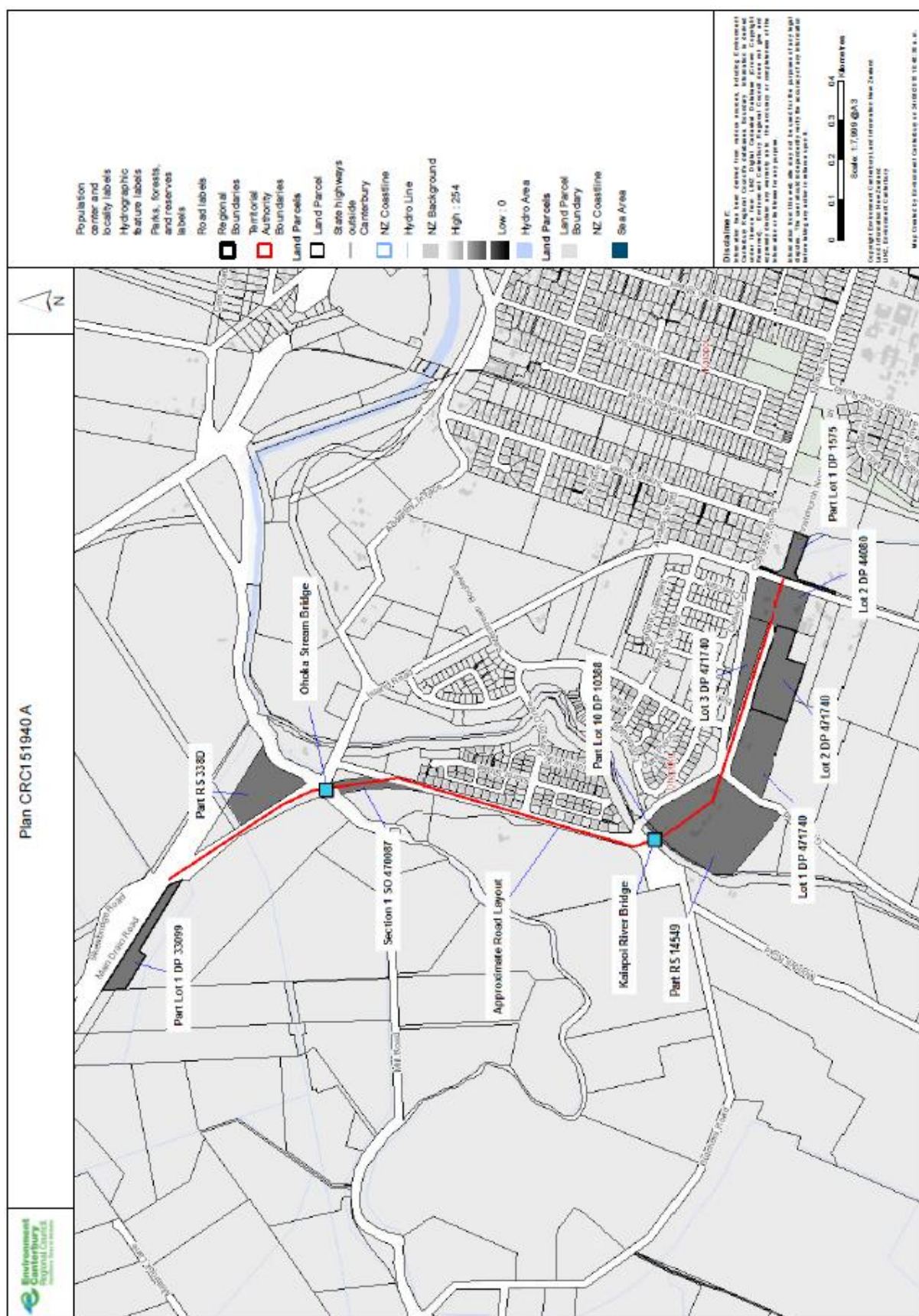


Plan CRC147667 B



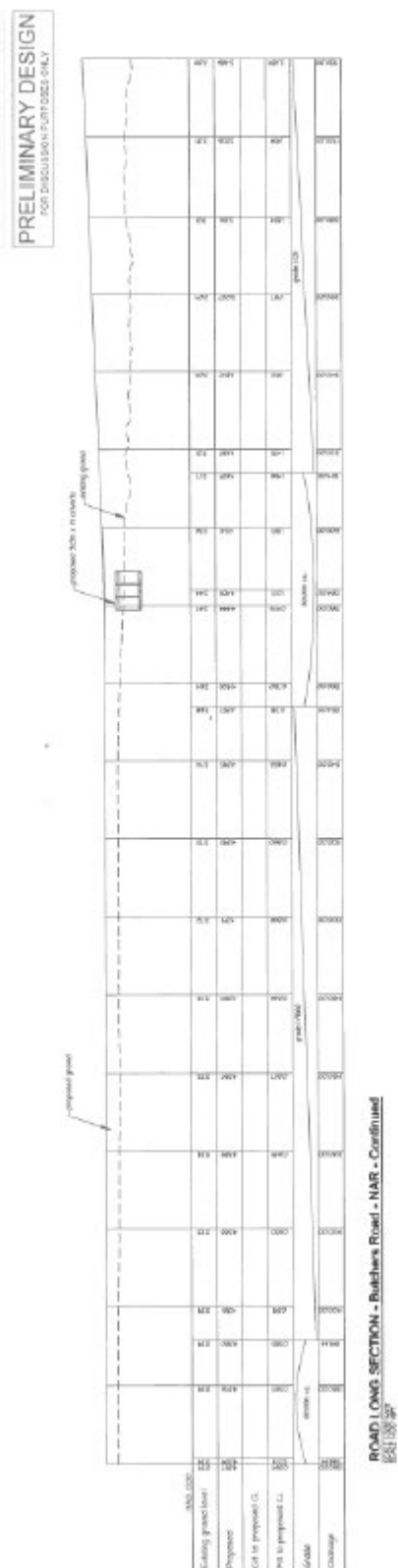
CRC151940-to divert surface run-off water

- 1) The works carried out in accordance with Condition (2) shall be located at Part Lot 1 DP 1575; Lot 2 DP 44080; Lot 1 DP 471740; Lot 2 DP 471740; Lot 3 DP 471740; Part RS 14549; Part Lot 10 DP 10388; Section 1 SO 470087; Part Lot 1 DP 33099 and Part RS 338D, Ohoka Road, Giles Road and Butchers Road as shown on Plan CRC151940A and Plan CRC151940B, which form part of this consent.
- 2) The works shall be limited to the diversion of surface run-off water as a result of the filling of land for the a new arterial road as shown on Plan CRC151940B, which is attached to, and forms part of this consent.
- 3) The consent holder shall ensure that:
 - a. Filling does not exceed 25,000 cubic metres of material over the 24,000m² road area; and
 - b. Three one by three metre culverts are installed in general accordance with Plan CRC151940C, which is attached to, and forms part of this consent.
- 4) The Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, shall be notified not less than 48 hours prior to the commencement of works.
- 5) The Canterbury Regional Council may, once per year, on any of the last five working days of May or November, serve notice of its intention to review the conditions of this consent for the purposes of dealing with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage.
- 6) The lapsing date for the purposes of section 125 shall be 31 December 2020.





Plan CRC151940C



SCHEDULE 2 – APPLICANT’S CORRESPONDENCE



5 September 2016

Joanne McBride
Civil Projects Team Leader
Waimakariri District Council
Private Bag 1005
Rangiora 7440

APPLICATION FOR RESOURCE CONSENTS FOR THE PROPOSED NEW ARTERIAL ROAD – RESPONSE TO MINUTE 5 TO PARTIES

1.0 Introduction

Waimakariri District Council (WDC) has applied for resource consents associated with construction of the proposed New Arterial Road (NAR) near Kaiapoi. Pattle Delamore Partners Limited (PDP) has been engaged by WDC to carry out flood modelling and analysis aspects associated with the proposal.

A resource consent hearing for the proposed NAR commenced on 13 May 2016. The hearing is currently adjourned.

The proposed NAR alignment is shown in Figure 1 attached to this letter. As can be seen in Figure 1, the NAR is located at the perimeter of the Silverstream Estates development. The NAR is included in the ODP (map 164A) for West Kaiapoi and needs to be given effect to.

WDC has recently become aware of an issue with the existing survey benchmark (or benchmarks) at Silverstream Estates. PDP understands that the site benchmarks that have been used for construction aspects, and as such existing constructed levels (including building floor levels), within Silverstream Estates may differ from design levels.

The hearing commissioners have issued Minute No 5 to Parties dated 8 August 2016. Minute 5 requests that the Applicant review the Silverstream Estates survey work and assess whether the survey benchmark issue impacts on the accuracy or sufficiency of evidence presented with respect to the proposed NAR (specifically with respect to flooding hazard).

The purpose of this letter is to;

- ✧ Outline the issue of construction level variation from design at Silverstream Estates; and,
- ✧ Discuss whether this issue impacts on the accuracy or sufficiency of evidence with respect to the proposed NAR.

2.0 Silverstream Estates Survey Benchmarks

Following the resource consent hearing, WDC has become aware that the existing survey benchmark levels at Silverstream Estates are incorrect.



Based on discussions with WDC, and further information provided by Davis Ogilvie and Partners Limited (DO) in the attached letter dated 1 September 2016, PDP understands that the Silverstream Estates development has been constructed at an average of 90 mm lower than designed. This includes ground levels, roads and other infrastructure. Published Silverstream benchmark heights have been recently amended. Independent verification of the revised benchmark heights has been completed by Opus International Consultants Limited.

It should be noted that the survey benchmark issue only affected topographical surveying undertaken with the Silverstream Estates published benchmarks used as a reference.

3.0 PDP Flood Model

In 2011/2012 PDP was engaged by Maxim Projects Limited to carry out flood modelling to assess the flood hazard for the Silverstream Estates development. This included advice on minimum ground levels and providing recommended minimum finished floor levels for individual lots within the subdivision.

In 2013 PDP was engaged by Waimakariri District Council to carry out flood modelling to assess the impact of the proposed NAR on flooding. The existing flood model constructed by PDP for Silverstream Estates was retrofitted to include the proposed NAR.

The flood model developed by PDP is a coupled 1D/2D numerical flood model using TUFLOW hydrodynamic modelling software. The model calculates floodwater depths and flows relative to a digital representation of the earth's surface, known as a Digital Elevation Model (DEM).

The model has been peer reviewed by TUFLOW developers BMT WBM in 2011/2012 and by Opus International Consultants Limited (Opus) in 2015.

3.1 Flood Model Ground Level Data

Modelled peak flood levels are calculated from the depth of flood water over the model DEM at a given location, and are therefore related to the elevation data used in the model.

The DEM used in the flood model is primarily based on LiDAR ground elevation data. LiDAR is a form of aerial survey carried out from a fixed wing aircraft using a laser scanner. The vertical accuracy of the LiDAR data is expected to be in the range of ± 100 to 150 mm in open areas.

The LiDAR survey used in the NAR flood model was carried out by Aerial Surveys Limited on behalf of Waimakariri District Council and Environment Canterbury. This LiDAR survey covered a large area of the Waimakariri District, and was taken on multiple days between March and June 2014.

The LiDAR data is completely independent of local topographical survey, and is not affected by the survey benchmark issue at Silverstream Estates.

The proposed NAR itself has been modelled as an 'inactive' area in the flood model. This means that water cannot flow over or through the NAR alignment, other than via the culverts included in the model. Therefore, in the model any height of floodwater will not overtop the road. This is a conservative approach, however it ensures that if design changes are made to the vertical alignment of the road the flood modelling remains valid.

Additional to the LiDAR data the elevations of some key features, such as the Kaiapoi River channel, key road crowns and some stop bank crests have been added to the DEM to provide improved detail.

Because the engineering work (roads, finished ground levels etc.) for Silverstream Estates was not fully complete at the time the flood modelling was carried out, design ground levels for Stages 2, 3 and 4 of the development (provided by DO on 12/10/2012) were also included in the model. This area, where design levels were used in the modelling, is shown in Figure 1 attached to this letter. Design ground levels for private sections within Stage 1 of Silverstream Estates were also included in the model (shown in Figure 1), as these were considered to be more representative of finished levels than the LiDAR data.

As the flood model is primarily based on LiDAR ground elevation data, the overall integrity of the model is not compromised by the construction variation or survey benchmark issue at Silverstream Estates. This issue does however affect the modelled ground levels used over the Silverstream development site and this would have some effect on the predicted flood levels.

3.2 Impacts of the Level Issue on the Floodplain

As can be seen in Figure 1, Silverstream Estates is most vulnerable to flooding from the Kaiapoi River (Silverstream). The affected party's properties are most vulnerable to flooding from the Ohoka Stream, which is a tributary of the Kaiapoi River. The confluence of the Ohoka Stream and Kaiapoi River is located shortly north of the NAR as shown in Figure 1.

The key potential impact on design flood levels affecting the proposed NAR is that more flood storage could exist than has been accounted for, and additional overland flow may occur around Silverstream Estates. Overall this would act to reduce design flood levels in and around the Kaiapoi River at Silverstream, and possibly also in the Ohoka Stream near the affected parties properties, due to reduced tail water effects from the Kaiapoi River.

3.3 Additional Flood Modelling

A design surface for Silverstream Estates which represents the finished ground levels and also takes into account as-built levels and the survey benchmark error is not available at this time.

The 2014 LiDAR provides an approximate as-built topography for Silverstream Estates as at early/mid-2014. Although the Silverstream Estates development was not complete at the time the 2014 LiDAR survey was carried out, much of the site had been filled and roads formed. This LiDAR topography does include stockpiles, undeveloped sections and other features which are not fully representative of the current or future site. For this reason, the design levels at Silverstream Estates have been used in flood modelling carried out to date. Aerial photographs of Silverstream Estates in early 2014 and early 2016 are included in Figure 2, attached to this letter.

By inspection, ground levels in the 2014 LiDAR dataset appear to be overall slightly lower than the design levels by an order of approximately 0.1 m. This is consistent with construction variation data provided by DO. However, the discrepancy between the 2014 LiDAR ground levels and the Silverstream Estates design level is significantly greater in the north east of the development, around Hayson Drive and further north. As can be seen in Figure 2, this area was still undergoing earthworks in 2014, and remains incomplete as of early 2016. The 2014 LiDAR is therefore not expected to be representative of finished ground levels in this area of Silverstream Estates.

The PDP flood model was re-run applying two scenarios to account for the construction variation and survey benchmark issue;

1. Using the 2014 LiDAR elevations at Silverstream Estates, instead of the design topography provided by Davis Ogilvie and Partners Limited (DO). The exception to this was Stage 4 of the Silverstream Estates development around Hayson Drive and further north (shown in Figure 1) where design ground levels were used. This scenario was modelled prior to receiving advice from DO on the appropriate ground levels to use at Silverstream Estates.

2. Using the finished design surface but lowering this by 0.1 m in all locations within Silverstream Estates (including Stage 4). This scenario was developed based on the advice of DO following their initial assessment of the survey benchmark issue (Russell Benge, pers. comm. 24 August 2016).

A 50 year Average Recurrence Interval (ARI) event with a +16% allowance for climate change and 0.50 m increase in sea level was modelled, which is the same design event previously used for assessing the effect of the NAR on flood levels.

Overall this modelling, using either ground elevation scenario at Silverstream Estates, indicated a very similar flood pattern to previous modelling.

These modelling results indicated:

1. Pre-Construction of the NAR;
 - a. A lower flood level in the Kaiapoi River at Silverstream Estates by approximately 50 mm relative to the existing flood model scenario (a range of -30 mm to -70 mm was observed).
 - b. A lower flood level in the Ohoka Stream, near Butchers Road and the affected party's properties, by approximately 50 mm relative to the existing flood model scenario (a range of -30 mm to -70 mm was observed).
2. Post-Construction of the NAR;
 - a. A lower flood level in the Kaiapoi River at Silverstream Estates by approximately 50 mm relative to the existing flood model scenario (a range of -30 mm to -70 mm was observed).
 - b. A lower flood level in the Ohoka Stream, near Butchers Road and the affected party's properties, by approximately 20 mm relative to the existing flood model scenario (a range of -10 mm to -30 mm was observed).

Therefore this modelling indicates slightly lower flood levels in the Ohoka Stream near the affected party's properties both pre and post construction of the NAR. These changes are relatively small.

The original modelling suggested that the relative effect of the NAR was to increase the flood levels upstream by up to approximately 60 mm. This modelling, which incorporates a lower surface at Silverstream Estates, indicated a similar relative change of up to approximately 90 mm; however the overall flood levels are slightly lower.

It should be noted that in the Ohoka Basin area (near Mill Road) the effect of lower ground levels in the model at Silverstream Estates is to slightly increase flood levels (by up to 80 mm). The same effect was observed both pre and post construction of the NAR. The relative impact of the NAR on flood levels in the Ohoka Basin area was observed to be up to +20 mm only, consistent with previous modelling.

Given the significant depth of flooding, and the high sensitivity of flood levels in the Ohoka Basin, the modelled 80 mm increase in flood depth associated with the lower ground levels at Silverstream Estates is not considered a significant change relative to the existing flood modelling. The effect of the NAR on flood levels in the Ohoka Basin is small, and is consistent with previously modelling.

Overall this result indicates that the level issue at Silverstream Estates will generally result in slightly lower flood levels than reported to date, both pre and post construction of the NAR. This reduction in flood levels is likely to be relatively small. As such, the flood modelling information presented to date is not considered to be invalidated by the level issue at Silverstream Estates.

Relevant flood levels and freeboard values are included in Table 1 to Table 3 attached to this letter.

4.0 Affected Parties Building Floor Levels

LiDAR is not able to be used for measuring building floor levels. Ground survey is required to measure building floor levels and therefore the associated freeboard above flood levels (from flood modelling or otherwise).

Building floor levels at the relevant affected parties' properties have recently been re-surveyed by DO and independently by WDC. These recent surveys are reported to have been carried out using an appropriate LINZ benchmark (not the Silverstream Estates local benchmarks), and the results were both consistent with another independent survey carried out by Woods and Partners Limited at 43 Mill Road.

This aspect was reported in PDP's letter dated 6 July 2016 provided to the commissioners in response to Minute 3.

5.0 Conclusion

An issue has been identified with the survey benchmark(s) and the completed level of development construction at Silverstream Estates. Section levels, roads and infrastructure have been constructed 90 mm lower than designed.

PDP have reviewed how this information may affect the accuracy or sufficiency of evidence presented with respect to the proposed NAR.

The integrity of the flood model used to predict the effects of the NAR on flood levels is not compromised by the Silverstream Estates construction variation and survey benchmark issue. However, there may be additional flood storage within Silverstream Estates than was originally included in the flood model, due to levels at Silverstream Estates being lower than designed. This would likely have the effect of causing a small reduction in design flood levels.

PDP has tested the possible impacts on flood levels by lowering the model DEM at Silverstream Estates, and also by using ground levels from LiDAR flown in early/mid-2014 for the extent of the development which had been built at that time. This assessment indicated the construction variation and survey benchmark issue would cause a small reduction in flood level both pre and post construction of the NAR. This assessment also indicated that the relative effect of the NAR on flood levels is similar to the current modelling scenario.

Based on the assessment described above, it is expected that the impact of the construction variation and the survey benchmark issue on the evidence before the commissioners is relatively minor. Therefore the existing evidence presented with respect to flooding remains applicable and appropriate in assessing the application when considered in conjunction with the additional information contained in this letter.

6.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Davis Ogilvie and Partners Limited, Waimakariri District Council and others not directly contracted by PDP for the work. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Waimakariri District Council for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

WAIMAKARIRI DISTRICT COUNCIL - APPLICATION FOR RESOURCE CONSENTS FOR THE PROPOSED NEW
ARTERIAL ROAD - RESPONSE TO MINUTE 5 TO PARTIES

The results presented in this letter are based on numerical models which approximate the response of a catchment system to natural storm events. They cannot be guaranteed to precisely represent the actual runoff response to any particular storm event.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



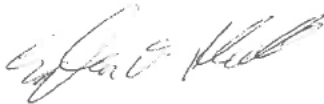
Andrew Dean
Environmental Engineer

Reviewed by



Andrew Brough
Senior Environmental Engineer

Approved by



Eoghan O'Neill
Technical Director



NOTES :

Legend

- Notified Properties
- Silverstream Estates
- Waterways**
 - Cust Main Drain
 - Kalapoi River
 - Dhaka Creek
- NAR Alignment
- Construction Incomplete When LIDAR Flown (Mid 2014)
- Design Levels Used in Flood Modelling to Support Resource Consent Applications

CANTERBURYMAPS (ENVIRONMENT CANTEBURY)
SOURCE: LINZ DATA SERVICE
DAVIS DIGITALE AND PARTNERS

A. ISSUE 1			
NO.	REVISION	DATE	APP.
DESIGNED	AD	24/08/16	
DRAWN	AD	24/08/16	
APPROVED FOR CONSTRUCTION:			
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			
COPYRIGHT ON THIS DRAWING IS RESERVED			

CLIENT :

WAIMAKARIRI DISTRICT COUNCIL

PROJECT :

NEW ARTERIAL ROAD

TITLE :

FIGURE 1: OVERVIEW SITE PLAN



PATTLE DELAMORE PARTNERS LTD
Auckland Teaneira Wellington Christchurch

SCALE : 1:10,000 (A3)

PROJECT NO : C02554800 FIGURE NO : 1 REVISION :

File: PDP AR_Engineering

PATTLE DELAMORE PARTNERS



Figure 2a: Silverstream Estates 17/02/2014



Figure 2b: Silverstream Estates 13/01/2016

Table 1: Modelled Peak Flood Levels and Freeboard (2% AEP Event) Pre-development of the NAR

Property	Location	Floor Level (m RL)	Silverstream Estates Finished Levels As-Designed (Reported previously)		Silverstream Estates Finished Levels As-Designed – 0.1 m		Silverstream Estates Levels As-Built Based on 2014 LiDAR Data (excludes Stage 4 where design levels were used)	
			Flood Level (m RL)	Freeboard (mm)	Flood Level (m RL)	Freeboard (mm)	Flood Level (m RL)	Freeboard (mm)
27 Mill Road (Lot 1 DP 11835)	House	4.27	3.99	280	3.93	340	3.95	320
	Garage	4.17	3.99	180	3.93	240	3.96	210
	Shed	4.12	3.99	130	3.93	190	3.96	160
43 Mill Road (Lot 1 DP 391202)	Barn 1	3.66	3.68	0	3.76	0	3.76	0
	Barn 2	3.74	3.68	60	3.76	0	3.76	0
	Pump Shed	3.69	3.68	10	3.76	0	3.76	0
55 Mill Road (Lot 2 DP 391202)	House	4.72	4.20 - 4.35	520 - 370	4.20 - 4.35	520 - 370	4.20 - 4.35	520 - 370
	Garage	4.61	4.20 - 4.35	410 - 260	4.20 - 4.35	410 - 260	4.20 - 4.35	410 - 260
	Barn	4.69	4.20 - 4.35	490 - 340	4.20 - 4.35	490 - 340	4.20 - 4.35	490 - 340
46 Butchers Road (RS 41470, Pt RS 1083)	House	4.21	4.00 - 4.11	210 - 100	3.95 - 4.09	260 - 120	3.97 - 4.10	240-110
	Shed	3.99	4.00 - 4.11	0	3.95 - 4.09	40 - 0	3.97 - 4.10	20-0

Notes:

1. All levels are relative to mean sea level (Lyttelton Vertical datum, 1937).
2. All flood levels are for flooding near the buildings at each property.
3. All flood levels are the most critical (highest) flood level identified near the buildings at each property.
4. A range of values is provided for 55 Mill Road and 46 Butchers Road due to the Hydraulic Grade on floodwater in this area.

Table 2: Modelled Peak Flood Levels and Freeboard (2%-AEP Event) Post-development of the NAR

Property	Location	Floor Level (m RL)	Silverstream Estates Finished Levels As-Designed (Reported previously)		Silverstream Estates Finished Levels As-Designed – 0.1 m		Silverstream Estates Levels As-Built Based on 2014 LIDAR Data (excludes Stage 4 where design levels were used)	
			Flood Level (m RL)	Freeboard (mm)	Flood Level (m RL)	Freeboard (mm)	Flood Level (m RL)	Freeboard (mm)
27 Mill Road (Lot 1 DP 11835)	House	4.27	4.05	220	4.02	250	4.04	230
	Garage	4.17	4.05	120	4.02	150	4.04	130
	Shed	4.12	4.05	70	4.02	100	4.04	80
43 Mill Road (Lot 1 DP 391202)	Barn 1	3.66	3.71	0	3.77	0	3.78	0
	Barn 2	3.74	3.71	30	3.77	0	3.78	0
	Pump Shed	3.69	3.71	0	3.77	0	3.78	0
55 Mill Road (Lot 2 DP 391202)	House	4.72	4.20 - 4.35	520 - 370	4.20 - 4.35	520 - 370	4.20 - 4.35	520 - 370
	Garage	4.61	4.20 - 4.35	410 - 260	4.20 - 4.35	410 - 260	4.20 - 4.35	410 - 260
	Barn	4.69	4.20 - 4.35	490 - 340	4.20 - 4.35	490 - 340	4.20 - 4.35	490 - 340
46 Butchers Road (RS 41470, Pt RS 1083)	House	4.21	4.07 - 4.15	140 - 60	4.04 – 4.14	170 - 70	4.05 – 4.14	160 - 70
	Shed	3.99	4.07 - 4.15	0	4.04 – 4.14	0	4.05 – 4.14	0

Notes:

1. All levels are relative to mean sea level (Lyttelton Vertical datum, 1937).
2. All flood levels are for flooding near the buildings at each property.
3. All flood levels are the most critical (highest) flood level identified near the buildings at each property.
4. A range of values is provided for 55 Mill Road and 46 Butchers Road due to the Hydraulic Grade on floodwater in this area.

Table 3: Impact of the NAR on Modelled Peak Flood Levels (2% AEP Event) for Different Ground Level Scenarios at Silverstream Estates

Address	Silverstream Estates Finished Levels As-Designed (Reported previously)			Silverstream Estates Finished Levels As-Designed – 0.1 m			Silverstream Estates Levels As-Built Based on 2014 LiDAR Data (excludes Stage 4 where design levels were used)		
	Pre-development	Post-development	Impact on Flood Levels	Pre-development	Post-development	Impact on Flood Levels	Pre-development	Post-development	Impact on Flood Levels
27 Mill Road (Lot 1 DP 11835)	3.99	4.05	60 mm (increase)	3.93	4.02	90 mm (Increase)	3.96	4.04	80 mm (Increase)
43 Mill Road (Lot 1 DP 391202)	3.68	3.71	30 mm (increase)	3.76	3.77	10 mm (increase)	3.76	3.78	20 mm (increase)
55 Mill Road (Lot 2 DP 391202)	4.20 – 4.35	4.20 – 4.35	No change	4.20 – 4.35	4.20 – 4.35	No change	4.20 – 4.35	4.20 – 4.35	No change
46 Butchers Road (RS 41470, Pt RS 1083)	4.00 – 4.11	4.07 – 4.15	65 mm (increase)	3.95 – 4.09	4.04 – 4.14	90 mm (Increase)	3.97 – 4.10	4.05 – 4.14	80 mm (Increase)

Notes:

1. All levels are relative to mean sea level (Lyttelton Vertical datum, 1937).
2. All flood levels are for flooding near the buildings at each property.
3. All flood levels are the most critical (highest) flood level identified near the buildings at each property.
4. A range of values is provided for 55 Mill Road and 46 Butchers Road due to the Hydraulic Grade on floodwater in this area.

File No. 35773

1 September 2016

Waimakariri District Council
Private Bag 1005
RANGIORA 7440

Attention: Joanne McBride

Dear Joanne

WAIMAKARIRI DISTRICT COUNCIL APPLICATION FOR CONSTRUCTION OF NAR - CRC147665-67, CRC151940 AND RC155004

Regarding the survey discrepancy which has been discovered during the hearing process we provide the following comments around how the discrepancy relates to the design of the NAR, and in particular the design levels.

The surface design for the NAR is based on the flood levels from Pattle Delamore and Partners Ltd (PDP) flood modelling analysis. The design level of the soffit of the bridge is set by the PDP flood model plus the design freeboard. The current NAR surface level provides a level of service based on no flood water over the centreline during the 2% AEP design storm event.

From the recent survey work confirming the Silverstream Estate bench marks we conclude the development has been constructed approximately 90mm lower than the design surface. This has been determined by comparing the design surface of the kerb for the Silverstream Estates development with the results of the recent benchmark survey where benchmarks have been placed in the constructed kerb. The results are identified in table 1 below:

Table 1: level comparison between benchmarks and design surface.

Stage 1			
Bench Mark Name	Confirmed Bench Mark Level (m RL in terms of Lyttleton 1937 Datum)	DO Design Level (m RL in terms of Lyttleton 1937 Datum)	Difference in Elevation (m)
MN 1 DP 453541	3.580	3.690	0.11
MN 2 DP 453541	3.670	3.770	0.10
MN 3 DP 453541	3.780	3.890	0.11
MN 4 DP 453541	3.850	3.990	0.14
MN 7 DP 453541	3.660	3.750	0.09
MN 8 DP 453541	3.740	3.830	0.09
MN 9 DP 453541	3.890	3.970	0.08
MN 10 DP 453441	3.790	3.870	0.08
MN 11 DP 453541	3.670	3.770	0.10
<i>Average difference Bench Mark vs Design</i>			<i>0.10</i>
Stage 2			
Bench Mark Name	Confirmed Bench Mark Level (m RL in terms of Lyttleton 1937 Datum)	DO Design Level (m RL in terms of Lyttleton 1937 Datum)	Difference in Elevation (m)
MN 1 DP 461956	3.890	3.950	0.06
MN 2 DP 461956	3.970	4.110	0.14
MN 3 DP 461956	3.760	3.820	0.06
MN 4 DP 461956	3.790	3.840	0.05
MN 5 DP 461956	3.790	3.850	0.06
MN 6 DP 461956	4.000	4.080	0.08
MN 7 DP 461956	3.660	3.720	0.06
MN 9 DP 461956	3.910	3.980	0.07
MN 10 DP 461956	3.700	3.770	0.07
MN 11 DP 461956	3.670	3.750	0.08
MN 12 DP 461956	3.920	3.990	0.07
<i>Average difference Bench Mark vs Design</i>			<i>0.07</i>
Stage 3			
Bench Mark Name	Confirmed Bench Mark Level (m RL in terms of Lyttleton 1937 Datum)	DO Design Level (m RL in terms of Lyttleton 1937 Datum)	Difference in Elevation (m)
MN 1 DP 466640	3.940	4.020	0.08
MN 2 DP 466640	3.990	4.080	0.09
MN 3 DP 466640	3.950	4.040	0.09
MN 4 DP 466640	4.010	4.100	0.09
MN 5 DP 466640	4.070	4.160	0.09
MN 6 DP 466640	4.030	4.100	0.07

MN 8 DP 466640	4.010	4.080	0.07
MN 9 DP 466640	3.950	4.050	0.10
MN 10 DP 466640	4.050	4.130	0.08
MN 11 DP 466640	3.960	4.050	0.09
MN 12 DP 466640	3.880	3.980	0.10
MN 13 DP 466640	3.810	3.910	0.10
MN 14 DP 466640	3.780	3.890	0.11
MN 15 DP 466640	3.830	3.920	0.09
MN 16 DP 466640	3.900	4.010	0.11
<i>Average difference Bench Mark vs Design</i>			<i>0.09</i>
Stage 4			
Bench Mark Name	Confirmed Bench Mark Level (m RL in terms of Lyttleton 1937 Datum)	DO Design Level (m RL in terms of Lyttleton 1937 Datum)	Difference in Elevation (m)
MN 1 DP 476973	4.010	4.080	0.07
MN 2 DP 476973	3.520	3.600	0.08
MN 3 DP 476973	3.430	3.510	0.08
MN 4 DP 476973	3.600	3.690	0.09
MN 6 DP 476973	3.730	3.790	0.06
MN 7 DP 476973	3.650	3.730	0.08
MN 14 DP 476973	3.560	3.650	0.09
<i>Average difference Bench Mark vs Design</i>			<i>0.08</i>
Overall Average difference Bench Mark vs Design			0.09

The DO design levels for the NAR are correct, however where the design intersects existing Island Road, Hayson Drive, Butchers Road and Mill Road there will need to be some amendments to the design as the actual ground levels will be approximately 90mm lower than the ground levels used in the design. We see this as a minor design adjustment which will be carried out as part of the engineering design approval process.

Yours faithfully

DAVIS OGILVIE & PARTNERS LTD



RUSSELL BENGE

DIRECTOR

BSurv, MNZIS, RPSurv, Assoc.NZPI

Licensed Cadastral Surveyor

Email: [REDACTED]

7th September 2016

Joanne McBride
Civil Projects Team Leader
Waimakariri District Council
Private Bag 1005
Rangiora 7440

**APPLICATION FOR RESOURCE CONSENTS FOR THE PROPOSED NEW
ARTERIAL ROAD - PEER REVIEW OF PDP RESPONSE**

I have been asked by Waimakariri District Council (WDC) to undertake a peer review of Pattle Delamore Partners Ltd (PDP) letter response to Minute 5 (dated 5th September 2016). This letter documents the result of my review.

Firstly I must clarify that the review was of the letter only and not the hydraulic model. I have, however, previously reviewed the model and am familiar with it and the prior work PDP have undertaken. I have also reviewed the appended letter from Davis Olgilvie (DO) for background information.

Based on my understanding of the prior modelling and the details of the benchmark error highlighted I would expect the available flood plain to increase slightly, reducing flood levels both pre and post the NAR by a similar amount. The results stated in the PDP letter appear to be consistent with this.

Based on the evidence presented in the letter and my experience I agree with their assessment in terms of how their prior analysis is affected by the benchmark error. As PDP correctly stated, only the Silverstream design levels burnt into the DEM would be affected. The majority of the model outside of that location is based on LiDAR and would not be affected by the benchmark error. It is stated that the floor levels of the affected parties are based on a LINZ datum and can therefore be considered to be un-affected by the benchmark error within the Silverstream development.

To summarise, I agree with PDP's conclusions and see no errors in their analysis as presented in the letter. The hydraulic model PDP developed for the area still remains the best tool available for assessing the proposed effects of the NAR earthworks.

Regards



Mark Groves
Senior Environmental Engineer

Enc. PDP letter dated 5th September 2016

