Before the Selwyn District Council

under: the Resource Management Act 1991

in the matter of: Proposed Private Plan Change 69 to the Operative District Plan: Lincoln South

and: **Rolleston Industrial Developments Limited**
Applicant

Statement of Evidence of Tim McLeod (Civil engineer)

Dated: 4 November 2021

Reference: JM Appleyard (jo.appleyard@chapmantripp.com)
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STATEMENT OF EVIDENCE OF TIM MCLEOD

INTRODUCTION

1 My full name is Timothy Douglas McLeod. I am a Senior Civil Engineer at Inovo Projects Limited.

2 My qualifications include a Bachelor of Natural Resources Engineering from Canterbury University (BE[NatRes]), and I am a Chartered Member of Engineering New Zealand (CMEngNZ) and Chartered Professional Engineer (CPEng).

3 I have over twenty-five years' experience as a Civil Engineer working on a range of infrastructure and land development projects.

4 I am familiar with the plan change application by Rolleston Industrial Developments Limited (*the Applicant*) to rezone approximately 190 hectares of land on Springs Road, Lincoln to enable approximately 2000 residential sites and a small commercial zone. I prepared the Infrastructure Assessment that was submitted as part of the Plan Change 69 application.

CODE OF CONDUCT

5 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 7 of the Environment Court Practice Note 2014. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

6 My evidence will deal with the following:

6.1 Infrastructure Assessment

6.2 Preventing Interception of Groundwater

6.3 Lincoln Main Drain Diversion

6.4 Response to s42a Officers Report

6.5 Response to other concerns raised by submitters

7 In preparing my evidence, I have reviewed and considered the following:

7.1 Section 42a Report on Private Plan Change Application 69 prepared by Mr. Nick Boyes on behalf of Selwyn District Council (SDC).

7.2 Officer Comments of Mr. Murray England, Asset Manager Water Services (SDC) in respect to Plan Change 69.

7.3 Memo on Technical Issues/Difficulties experienced with subdivision neighbouring proposed Plan Change 69 prepared by Zani van der Westhuizen, Development Engineering Manager on behalf of Selwyn District Council.

7.4 Statement of Evidence (Flooding / stormwater) prepared by Mr. Eoghan O'Neil of Pattle Delamore Partners Ltd.

7.5 Statement of Evidence (Hydrology) prepared by Mr. Bas Veendrick of Pattle Delamore Partners Ltd.

7.6 The updated Outline Development Plan (ODP).

8 I have visited the site and have been involved in planning and observing various stages of site investigation work to date so am familiar with the site characteristics. I am also familiar with the local area having a family interest in a small land holding down Poplar Lane off Collins Road to the south.

PLAN CHANGE AREA SUMMARY

9 The PC69 site is bounded by the existing urban edge of Lincoln to the north, Collins Rd to the south, Ararira/LII River to the east, and a drain identified as the Western Boundary drain to the west. Springs Road bisects the PC69 site and separate drainage networks to the west and east of Springs Road currently drain the site to the Ararira/LII River.

10 The site east of Springs Road generally slopes in a northwest to southeast direction, with the highest land being approximately 11.9m (NZVD2016) sloping to approximately RL2.9m (NZVD2016) elevation at its lowest point in the south east of the Plan Change area. The area to the east of Springs Road drains to the Ararira/LII River via three primary drainage features being the Lincoln Main Drain towards the north of the site, Springs Creek which flows west to east across the centre of the site, and Collins Road drain in the southeast corner of the site. The area west of Springs Road drains westwards to a drain along the western boundary which runs southwest along Collins Road before connecting with Sergeants Drain running southeast alongside Sergeants Road until it enters the Ararira/LII River approximately 2 km downstream.

INFRASTRUCTURE ASSESSMENT

11 Consistent with my assessment accompanying the Plan Change Request:

11.1 the site can be developed with adequate "on-demand" potable water services to provide for the needs of future residential properties. This would be enhanced with the transfer of existing water-take consents to Council.

11.2 Upgrades to the water reticulation network including development of a new supply bore(s) in or near the proposed plan change area, in conjunction with extensions of the water supply network from neighbouring subdivisions, will improve resilience of the water supply in the area.

11.3 New wastewater pump stations serving catchments west and east of Springs Road will be required, with dedicated rising mains to the Allandale Road wastewater pump station (main Lincoln wastewater pump station), from where it is pumped to the Pines Wastewater Treatment Plant (WWTP) for treatment.

11.4 Analysis by WSP confirmed the existing trunk network conveying wastewater to the Pines WWTP does not require upgrades to service the plan change site.

11.5 In his report accompanying the Officer's Report, Mr England confirmed that various options for conveyance of wastewater to the Pines WWTP are feasible and will be subject to the engineering approval process.

11.6 Power and communication network extension requirements would be carried out prior to any subdivision occurring, however there are no obvious reasons preventing such extensions.

Water

12 Capacity upgrades to the existing Lincoln water network can be completed to supply water for the proposed plan change area, including potential development of new water supply bore(s) within or near the plan change site. Lincoln has accessible groundwater aquifers for drinking water abstraction available, and new water supply bore(s) could be developed on-site to augment supply. Existing water take consents CRC042703, CRC001158 and CRC152245 could be transferred to Council (subject to ECan process) to assist in satisfying the water supply demand from the proposed development.

13 Additional connections to other parts of the Lincoln supply network to the northeast such as Te Raki Drive (via the Allendale pump station site) and Liffey Springs Drive to increase network connectivity and resilience will be determined at the subdivision design stage.

Wastewater

14 The majority of the plan change area can be serviced by gravity wastewater network discharging to new pump stations located at the western and eastern boundaries of the site (lowest elevation). Lots that cannot be serviced by gravity sewer could utilise local pressure sewer to discharge into the gravity network or rising main.

15 Direct connection from new pump stations to the Allandale Pump Station (main collection point for Lincoln) would be required for the ultimate development, although the existing wastewater pipe network in Springs Road could be used as discharge point for initial stages of development until dedicated rising mains to the Allandale pump station are completed.

16 I note that Mr England and Mr Boyes in their evidence consider that overall the options identified to convey wastewater to the Pines WWTP are feasible and that PC69 area can be adequately served by the Council's wastewater network subject to the required upgrades.

Stormwater

17 Stormwater conveyance and treatment will be managed within two catchments being those areas east and west of Springs Rd. The east catchment will be further split into north and south of Springs Creek to avoid pipelines crossing under Springs Creek. The low permeability of the soils across most of the site are not conducive to discharge of stormwater to ground, therefore the proposed discharge for each catchment is ultimately to the Ararira/LII River. Stormwater Management Areas (SMA's) are proposed to be constructed at the downstream end of each catchment with stormwater treatment and attenuation proposed to be provided in accordance with the Wetlands and Waterways Design Guide (WWGD) published by Christchurch City Council.

18 Conceptual design of the stormwater management areas has been provided by e2 Environmental Ltd as described in their Stormwater Concept Design Report attached as Appendix A of the Infrastructure Assessment report. This report details the design philosophy for the SMA's and presents conceptual sizing of the first flush basins to retain the first 20mm of rainfall in each catchment, treatment wetlands to treat the first flush for each catchment, and detention basins to retain stormwater up to the 2% Annual Exceedance Probability (AEP) event.

19 Following peer review of the stormwater concept design by Pattle Delamore Partners Ltd (PDP) and further development of the concept subdivision layout, the Living X zone has been removed from the ODP and the area between the RL 3.5 and 4.0m (NZVD2016) has been identified for stormwater treatment and management above the 2% AEP (1 in 50 year) flood level. Further flood modelling will be required as part of the detailed subdivision design to confirm the minimum elevation for locating the parts of the stormwater management area that must be above the 2% AEP flood event level.

20 For further commentary on flood assessment and stormwater refer to the evidence prepared by Mr. O'Neil from PDP.

21 The area identified as Stormwater Wetland / Reserve on the ODP on the eastern portion of the site will be utilised for wetland treatment of stormwater runoff from the subdivision. There is potential for development of this area for a combination of stormwater treatment, reserve space and wetland restoration. This could include wetland planting and naturalisation of the channelised waterways that drain the permanent springs in this area to create a naturalised wetland area.

22 Wetland treatment areas of the SMA can be located in this area between the 20% AEP (5-yr) and 2% AEP (50-yr ARI) flood levels provided that flooding over the wetland base water level is less than 0.5m in depth, is from existing floodwaters (i.e., cannot provide storage from development runoff for attenuation benefits), and is ponded water only (i.e., slow moving). First flush basin and flood attenuation basins cannot be located in this area.

Preventing Interception of Groundwater

23 One of the potential effects of urban development is the potential for construction of service trenches (for stormwater, sewer, telecommunication and electrical networks), granular hardfill for pavement construction, and drainage channels for stormwater conveyance and stormwater management areas to intercept shallow groundwater and re-direct groundwater flow away from existing springs. Service trenches backfilled with engineered granular materials (gravels) and hardfill areas can be much more permeable than the surrounding soils, and if shallow groundwater is intercepted then the engineered granular materials can act as preferential groundwater flow paths lowering the groundwater level and diverting water away from spring heads. This potentially results in reduced spring flows.

24 Deep trenches for services can be backfilled with material with the same permeability as the surrounding ground or low-permeability barriers installed at intervals to prevent short-circuiting of

groundwater along trench lines, particularly in areas of high groundwater or in close proximity to identified springs.

25 Apart from shallow stormwater swales that do not intercept groundwater, and the Lincoln Main Drain (LMD) diversion to Springs Creek, no new drains are proposed within the subdivision. Therefore, there is no risk for drains to redirect groundwater away from springs.

26 Deep excavations crossing under Springs Creek for underground services such as stormwater, wastewater rising mains and water mains will be avoided to minimise the risk of breaking through the confined aquifer layer and intercepting groundwater. Services crossing over Springs Creek will be incorporated into the road bridge or culvert designs at crossing points. This effectively splits the site into individual catchments either side of Springs Creek for managing stormwater and wastewater.

27 Pavement depth for roads is expected to be approximately 0.6m depth and shallower than installed services (typically 1.0 to 1.2m deep). Where subgrade improvement or replacement is required due to presence of peat / organic rich materials, then engineering soils with low permeability can be used instead of granular hardfill to improve the subgrade and prevent short-circuiting of groundwater. Treatment of soils using added lime or bentonite can be used to stabilise soils and reduce permeability. Use of geogrids and geofabrics can also be used to strengthen road pavements without requiring deep excavation and replacement of subgrade materials.

Lincoln Main Drain Diversion

28 The Lincoln Main Drain (LMD) is a spring-fed classified drainage channel that crosses the northeast portion of the PC69 site from northwest to southeast, and serves as the main drain outlet for the Te Whāriki subdivision. The LMD is a man-made drainage channel dating back to early 1900's, and is 1.5 to 2.5m deep with steep banks and discharges into the Ararira/LII River some 185m downstream of the confluence of the LI River and Liffey Stream.

29 The LMD is to be diverted from its current alignment to connect with Springs Creek as shown on the ODP. This presents the opportunity to naturalise and enhance the amenity values of the LMD. This will not affect its primary function as the main spring-fed drain outlet to the Te Whāriki subdivision. As the majority of flow is clean spring-water flow this can be diverted directly to Springs Creek.

30 The main outlet from the Te Whāriki subdivision stormwater management area will be diverted (piped or channelled) along the northern boundary or incorporated into the plan change area drainage system. Final design will be undertaken in consultation with Council during subdivision design.

RESPONSE TO SECTION 42A REPORT

31 In his s42a report Mr Boyes has noted that "*the proposed Moirs Lane connection also presents some difficulties in terms of the ability to locate both the proposed collector road and the existing Rail Trail within the existing legal width, (being as this is only some 13.5m)*".

32 Property boundaries shown on the LINZ database referred to by Council Officers and other submitters suggests that Moirs Lane is narrower, however this misconception is due to inaccuracies arising during the digitisation of old survey plans and the boundaries shown have not being calculated or surveyed. Moirs Lane has a legal road width of 20.12m (or 1 "chain") along its length as shown on deposited survey plan DP17916 and DP445316, attached as Appendix A. The legal road width of 20.12m is sufficient to provide for the proposed collector road and existing Rail Trail.

33 In his s42a report Mr. Boyes noted that proposed connections through to the residential areas north of the PC69 area are precluded due to the already approved allotment layout of those developments. It is acknowledged that road connection options are limited due to the design of the adjacent Verdeco Park and Te Whāriki subdivisions to the north. However, there are a number of reserve areas along the boundary interface which can be utilised for cycle and walkway connections.

34 Feasible road and cycleway/pedestrian connections to recreation reserves or local purpose utility reserves are shown on the updated ODP plan. A road connection to Kaitorete Drive within the Te Whāriki subdivision is feasible as shown on plan of proposed road connection included as Appendix B. The possible connection crosses an existing Local Purpose (Utility) Reserve and would require modification of an existing stormwater pond. An equivalent area within the PC69 area can be provided for reshaping of the stormwater pond to provide the equivalent storage volume.

35 In the Development Engineering Technical Memo attached as Appendix D to the s42a report, the Council Engineer's have raised concerns about the risks associated with varying ground water and ground conditions affecting infrastructure and road construction.

36 In his email attached as Appendix C, Mr. Mason Reed, Director & Geotechnical Engineer at Fraser Thomas Ltd responsible for assessing and reporting on geotechnical aspects of the Te Whāriki Subdivision (Stages 3 and 4) noted that the difficulties experienced during the construction of the roads within Te Whāriki were primarily due to trying to construct the road pavement during a wet winter. Where organic soil was encountered at road subgrade level, localised undercutting to remove organic material and replacement

with granular pavement (sandy gravels) was undertaken which is common practice for road construction. I agree with Mr. Reeds opinion that, provided that appropriate investigation, design and monitoring is undertaken, suitable robust road pavements should be able to be constructed at the Plan Change 69 site which will be able to meet the required performance standards.

37 To address these risks detailed site investigation including borelogs to identify any buried peat or organic layers (if present) and to determine elevation relative to road subgrade level or buried infrastructure will be completed as part of subdivision design process. Installation of piezometers across the site to monitor groundwater fluctuation will be also completed prior to detailed engineering design.

38 Civil construction works can be timed for the summer construction period (November to May) to reduce construction risks associated with wet ground conditions.

RESPONSE TO SUBMITTERS

39 Submitters raised concerns that existing infrastructure did not have sufficient capacity to support the level of development proposed, and will impose additional costs on ratepayers. As noted in the Officer's Report, upgrades will either be undertaken (and funded) by the developer or, for upgrades required beyond the site, there are mechanisms available to the Council to recoup proportional costs from the developer such as through development contributions.

40 Concerns raised by submitters regarding groundwater and flooding is addressed in statement of evidence prepared by Mr. Veendrick and Mr. O'Neil of PDP.

41 Concerns were raised by submitters they would be impacted by the incraese in trraffic, dust and noise genration during construction of the subdivision. I agree with the Officer's Report that the effects resulting from construction can be appropriately managed through subdivision consent conditions relating to the construction phase, and through existing mechanisms, including:

41.1 the control of noise through the NZ Standard for construction noise; and

41.2 management of dust through requirements under the Regional Land and Water Plan.

CONCLUSIONS

42 In summary, already planned infrastructure upgrades or new infrastructure constructed as part of the development of the plan

change site can provide for the infrastructure needs of the Plan Change. Accordingly, I agree with the conclusion in the Officer's Report that there are no physical or capacity constraints to the provision of necessary infrastructure for the Plan Change.

43 The proposed Living X has been removed from the ODP, and development of the proposed Living Z zone and stormwater management areas in the ODP is appropriate subject to further modelling during subdivision design to appropriately locate the SMA's above predicted flood levels and set appropriate minimum floor levels for buildings. Assessment of flood risk will be carried out in more detail at time of subdivision design but is not expected to impede the development of the plan change area.

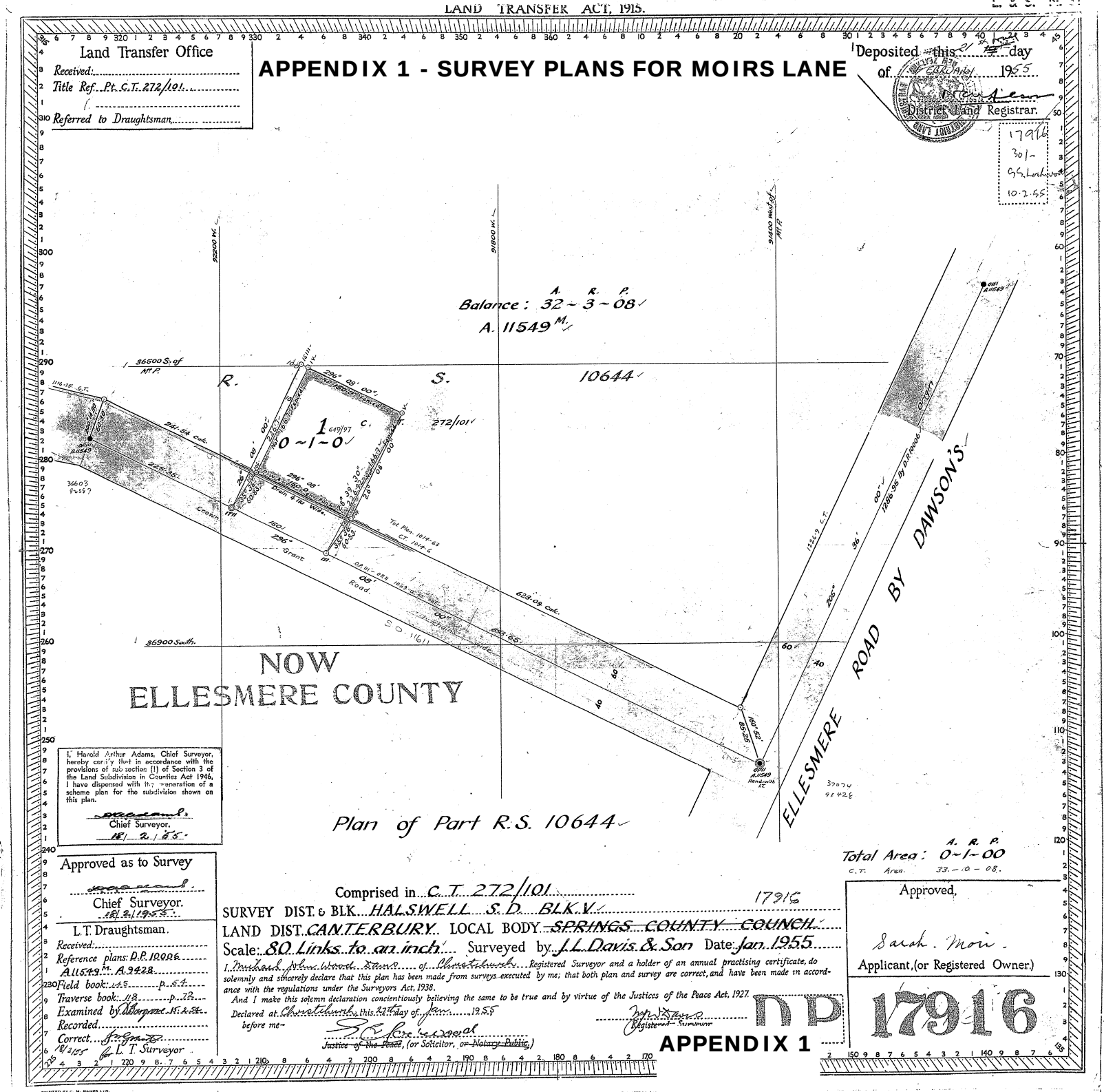
44 The required infrastructure upgrades will be practicable to develop the plan change area in accordance with the proposed zoning. Concerns raised by submitters about capacity of existing infrastructure will be addressed by provision of new infrastructure and upgrades to existing infrastructure to service the proposed plan change area.

45 Overall, I remain of the view that the proposed plan change can be supported from an infrastructure perspective.

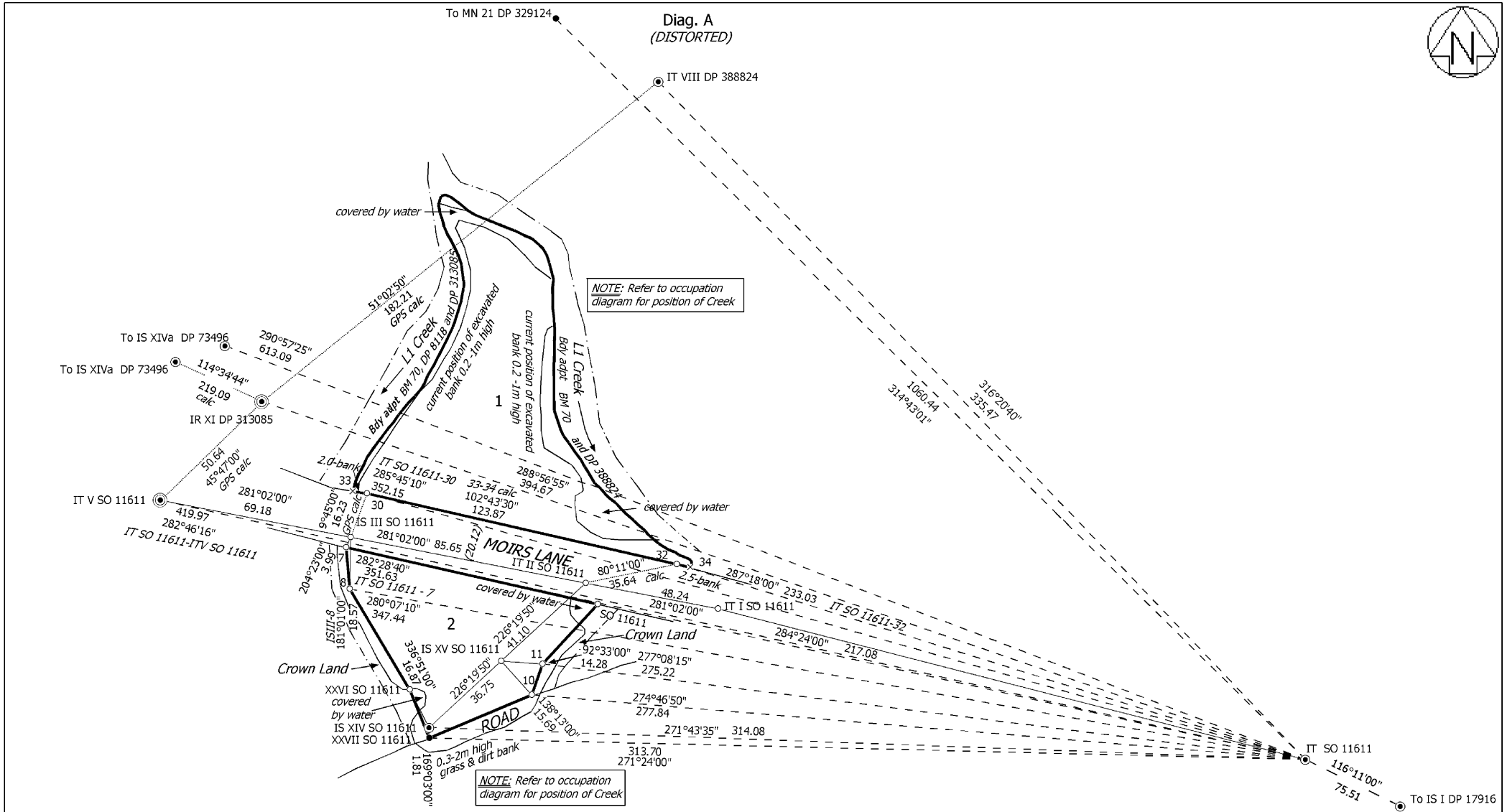
Dated: 4 November 2021

Tim McLeod

APPENDIX 1 - SURVEY PLANS FOR MOIRS LANE



APPENDIX 1



NOTE: 7, 8, 10 and 11 reinstate XXIV, XXV, XXVIII, XXIX SO 11611

Surveyor Ref: 8842

S 2/2

Land District: Canterbury Digitally Generated Plan Generated on: 17/04/2013 12:31am Page 8 of 9	LOTS 1 AND 2, A SUBDIVISION BEING RS 20697 AND RS 40020	Surveyor: Colin Edgar Heald Firm: Survus Contracting Ltd (Christchurch) Survey Date: 15/07/2011	CSD Plan DP 445316 Deposited on: 5/03/2013

APPENDIX 2 - PLAN OF ROAD CONNECTION TO KAITORETE DRIVE

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PC 69 - LINCOLN SOUTH
POTENTIAL ROAD CONNECTION

FOR INFORMATION

drawn	checked	drawing no.
MP		14692-SK-01
date	scale @ A3	revision.
30/10/2021	1:1000	

APPENDIX 3 - EMAIL FROM MR. MASON REED - FRASER THOMAS

Tim McLeod

From: Tim Carter <tim@cartergroup.co.nz>
Sent: Wednesday, 3 November 2021 8:43 am
To: Jeremy Phillips - Novo Group; Tim McLeod; Lucy Forrester
Subject: FW: Comments relating to SDC 'Technical Document'- for proposed Plan Change 69

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From: Mason Reed <mreed@ftl.co.nz>
Sent: Tuesday, 2 November 2021 4:40 pm
To: Tim Carter <tim@cartergroup.co.nz>
Cc: Bruce Van Duyn <bruce@cartergroup.co.nz>
Subject: Comments relating to SDC 'Technical Document'- for proposed Plan Change 69

Hi Tim

I have read the SDC document titled “Technical issues/difficulties experienced with subdivision neighbouring proposed Plan Change 69”, dated 8 October 2021.

I comment as follows:

(1) My name is Mason Vout Reed. I am the Geotechnical Director and Christchurch Branch Manager of Fraser Thomas Limited (Fraser Thomas).

(2) I have some 25 years’ experience working as a geotechnical engineer. I have worked in New Zealand since 1996, with the exception of the period 1997 -1998 when I gained professional experience in Australia and the UK. I hold a Bachelor of Engineering (Civil) from Auckland University, 1996. I am a Chartered Professional Engineer (CPEng), a Member of the Institute of Professional Engineers New Zealand (CMEngNZ) and an International Professional Engineer (IntPE NZ).

(3) For the past 7 years I have been a Practice Area Assessor for EngNZ, which involves assessing the competence of geotechnical engineers applying for CMEngNZ and CPEng status.

(4) I have provided geotechnical advice for a variety of projects, including residential and commercial building developments, roading projects and municipal landfills.

(5) I am currently the geotechnical engineer responsible for assessing and reporting for all geotechnical aspects associated with the Te Whāriki residential subdivision (Stages 3 and 4) in Lincoln, Canterbury. I am actively involved in the construction observation works associated with the road pavement constructions for the Te Whāriki subdivision.

(6) The SDC document refers to a 'peer review' undertaken for the pavement construction works. This work was undertaken by Tonkin and Taylor for the Stage 3 road pavement. I was the Fraser Thomas representative for this peer review process.

(7) The difficulties experienced, during the construction of the road placement, were primarily the result of trying to construct the road pavement during a wet winter. In some areas, the pavement did not achieve the required Benkelman Beam deflection results, which resulted in the requirement, in some areas, to re-design the road pavement (i.e. thickening of the pavement). The primary cause of the 'failed' Beam testing is believed to have been excess pore pressures within the subgrade material, which was believed to have been caused by the 'wetting up' of the exposed subgrade during wet weather (i.e. surface water ponding on the subgrade- not groundwater). Overtime, the beam results were observed to improve, which is consistent with the hypothesises of the cause of the 'failed' beam results (i.e. as the excess pore pressures had time to dissipate, the beam results subsequently improved).

(8) In some places, if organic soil was encountered in the surface of the subgrade, localised undercutting was undertaken. However, the presence of organic layers beneath the Te Whāriki site, was not identified as the cause of the 'failed' beam results. It should be noted that the peer reviewer (engaged by SDC) agreed with this conclusion. It is noted that SDC have indicated that the "re-design" of the pavement was due to the "peat". This is not correct, and is not consistent with the conclusions of their own peer reviewer.

(9) It is noted that the peer reviewer, in their report dated 20 February 2020, states the following:

"T+T do not believe, on the basis of the documentation provided, that the constructed pavements will exhibit a reduced design life, provided the usage of the road is in line with the original design assumptions and the results are representative of the construction throughout."

(10) The peer reviewer, however, did raise some concerns regarding the "raising and equalisation of the water table" and the possible effect of this on the road pavement. This primarily relates to the low lying part of Te Raki Drive (Stage 3D- Te Whāriki). The road surface, at this location, is relatively low and his minimal free-board above the water level in the adjacent stormwater management ponds. This is an isolated part of the road network within Stage 3 of the subdivision. FTL did not share the same concerns as the peer reviewer, regarding the effect of "raising and equalisation of the water table", on the stability of the road pavement. It is the opinion of FTL that the road pavement, in this area, has been appropriately designed and constructed as a robust pavement, and is suitable for the site conditions. The road pavement, in this area (and all parts of the Stage 3 and 4 development), achieved the required beam results, prior to sealing. However, based on the perceived 'water table' issue, the peer reviewer recommended the following:

"that additional testing is carried out in 12-18 months (to coincide with winter conditions) after commissioning of the stormwater basin to identify any deterioration to the subgrade condition and compacted layers as a result of a higher water table."

(11) It should be noted that the Stage 3D road pavement was completed in May 2020 (some 18 months ago). In that time, the adjacent stormwater ponds have been at their operational level, and that the site was also affected by a significant (1:200 return period) storm event, in May 2021 (which likely resulted in an elevated water table in the area). It should also be noted, due to the residential building construction works being undertaken for Stage 3, that the road pavement has been exposed to unusually high volumes of heavy vehicle movements (likely more than will be applied in the future- over the design life of the pavement). Even though the road pavements have been subject to an elevated water table and unusually heavy traffic loadings, to date, no obvious damage has been observed to any parts of the constructed road pavement in Stage 3 (which has been in place now for some 18 months), in particular, the low lying parts of Te Raki Drive have performed well.

(12) Based on the foregoing, it is my opinion, although the ground conditions encountered at Te Whāriki are more 'challenging' than other sites in the Selwyn district, for pavement construction, the issues experienced at Te Whāriki were not primarily related to "peat" or "varying ground water table". Given our experience with the Te Whāriki subdivision, it is my opinion, provided appropriate investigation, design and monitoring is undertaken, that

suitable robust road pavements should be able to be constructed at the site (subject to Plan Change 69), which (based on my experience with the Te Whāriki subdivision), should be able to meet the required performance standards.

Regards

Mason Reed - Director - Geotechnical Engineering

Christchurch Branch Manager

Fraser Thomas

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