

BEFORE THE INDEPENDENT HEARINGS PANEL

UNDER

the Resource Management Act 1991

AND

IN THE MATTER OF

the submissions of B & A Stokes on
the Waimakariri Proposed District
Plan (#214) and Variation 1 (#29)

**PRIMARY EVIDENCE OF
ANDREW HALL
ON BEHALF OF B AND A STOKES
(Infrastructure)**

4 March 2024

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1 EXECUTIVE SUMMARY

- 1.1 The site is located at 81 Gressons and 1375 Main North Road, Woodend/Waikuku (the **Site**) and is approximately 144ha in size. The Stokes' submissions on the PDP seek to rezone the Site from a mixture of Large Lot Residential Zone (**LLRZ**), Rural Lifestyle Zone (**RLZ**) and Large Lot Residential Zone Overlay (**LLRZO**) (as notified) to General Residential / Medium Density Residential Zoning (**the Proposal**). Development of the Site is proposed to occur in accordance with the Outline Development Plan (**ODP**) included as **Appendix A**.
- 1.2 The Proposal will enable approximately 1500 residential sites along with stormwater facilities, reserves, protected waterways and springs, provision for landscape buffering around the wāhi tapu area, a small commercial area and flood relief channels.
- 1.3 This evidence addresses the proposed servicing of the Site, the protection of springs & waterways and the proposed mitigation of flooding. The various components of the Proposal that will address those matters are included in the ODP.
- 1.4 It is proposed that a new domestic potable water supply bore be either installed on the Site or connected to the Waimakariri District Council (**WDC** or **Council**) network to provide potable water and firefighting reserve to meet WDC standards.
- 1.5 It has been agreed with WDC that either a gravity sewer or a Local Pressure Wastewater Network of individual pumps may be applied to the Proposal along with a dedicated pipe connecting the Site to the Woodend Wastewater Treatment Plant (**Treatment Plant**). The Treatment Plant will have sufficient capacity for the Proposal, once planned upgrades are complete.
- 1.6 It is proposed that consents will be obtained from Environment Canterbury (**ECan**) for the treatment and disposal of stormwater. It is expected that the stormwater facility will consist of storage basins and a wetland for the treatment of stormwater on-site prior to it being discharged off-site.

- 1.7 1 in 200-year flood waters entering the Site from upgradient will be channelled through the Site, bypassing the stormwater storage and treatment. All proposed dwellings will be built to a level exceeding the 1 in 200-year flood event plus a Council approved freeboard.
- 1.8 The Site contains a number of springs and farm drains / waterways. A number of those waterways, including Stokes Drain, are considered to be of moderate ecological value. In light of that, the Proposal will naturalise/enhance Stokes Drain in its existing location, including through extensive planting in the riparian buffer. Most of the other drains/waterways will be redirected/realigned into Stokes Drain and/or into a new waterway which will also be subject to extensive enhancement initiatives, including riparian planting. In combination with the other measures proposed in the eastern stormwater basin (**Eastern SMA / Open Space**), the Proposal presents the opportunity to secure a net biodiversity gain, as described in the evidence of Mr Payne.
- 1.9 The Site will be serviced for power and communications in accordance with Industry standards. Street lighting will be installed to WDC standards.

2 QUALIFICATIONS AND EXPERTISE

- 2.1 My full name is Andrew James Emil Hall. I am a Chartered Professional Engineer, Registered Surveyor and a Director of Davie Lovell-Smith Ltd, an engineering firm based in Christchurch.
- 2.2 I hold a Bachelor of Surveying from Otago University and a Bachelor of Engineering (Honours 1st Class) from Coventry University (UK). I am also a member of New Zealand Institute of Surveyors (**MNZIS**) and Engineering New Zealand (**CMEngNZ**).
- 2.3 My area of expertise is consulting in civil engineering related to the development of land. I have 30 years' experience in this field including 20 years' experience in Christchurch.

3 CODE OF CONDUCT

- 3.1 While this is not an Environment Court proceeding, I confirm that I have read the Code of Conduct for Expert Witnesses set out in the

Environment Court Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and will continue to comply with it while giving oral evidence. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

4 SCOPE OF EVIDENCE

4.1 This evidence will address the proposed servicing for rezoning of the Site, including stormwater, flooding, wastewater, water supply, telecommunications, power and street lights.

4.2 In preparing this evidence, I have reviewed:

- (a) Memorandum to Waimakariri District Council by Ms Jennifer McSloy, *Proposed District Plan Stream 12 – Engineering matters for consideration*, dated 12 December 2023 (**WDC Engineering Memorandum**).
- (b) Activity Management Plan - Woodend-Pegasus Water Supply Scheme 2021 (**Water Supply Management Plan**).
- (c) Activity Management Plan 2021 Woodend Wastewater Scheme (**Wastewater Activity Management Plan**).
- (d) Preliminary Environment Site Investigation (**PSI**) – Gressons and Main North Road, Woodend, Waikuku. Engeo Ltd, Proj#19640.000.001, addressed in the evidence of Mr Robotham on behalf of the Stokes.
- (e) Geotechnical Investigation – Gressons and Main North Road, Woodend, Waikuku. Engeo Ltd, Proj#19640.000.001, addressed in the evidence of Mr Charters on behalf of the Stokes.
- (f) 81 Gressons Road and 1375 Main North Road Plan Change Area - Assessment of Potential Loss of Productive Land, Reeftide Ltd, addressed in the evidence of Mr Mthamo on behalf of the Stokes.
- (g) Review of Tsunami Evacuation Zones for Waimakariri and Southern Hurunui Districts - Report No. R21/08, ISBN 978-1-99-002739-0 – ECan.

- (h) Ecological assessment of a proposed rezoning site at 1301 Main North Road, Waikuku, Canterbury – Wildlands Consultants Ltd (**Wildlands Report**) attached to the evidence of Mr Payne on behalf of the Stokes.

5 THE SITE

- 5.1 The Site is currently a working dairy farm. The land comprises several paddocks with farm drains/waterways generally following the fence lines. The average gradient across the Site is approximately 1 in 300 from east to west and there is a wide shallow flood channel running through the centre of the Site from west to east. (Refer to the LIDAR contours of the Site in **Appendix B**.)
- 5.2 The ground conditions are considered to be “heavy” with a high water table. There are springs on, and above, the Site as shown on the plan in **Appendix C**. The springs drain into a series of farm drains/waterways that ultimately lead to Stokes Drain (also shown on the plan in Appendix C). As detailed in the evidence of Mr Payne, Stokes Drain and two of its tributaries (Drain 1 and 5) have moderate ecological values.
- 5.3 As set out further below, the Proposal aims to protect and enhance the ecological values and qualities of these features, including through protecting them from stormwater ingress and through planting and improving shade for those waterways within the riparian buffer.
- 5.4 As also described in the evidence of Mr Payne, the Site contains two wetland areas which have been assessed as having low ecological value. In accordance with Mr Payne’s recommendations, those wetlands will not be retained but will instead be replaced by an extensive wetland complex within the Eastern SMA / Open Space.
- 5.5 There are broadly three water management themes relevant to the Proposal:
 - (a) management of existing springs and spring-fed waterways;
 - (b) collection and treatment of on-site stormwater; and

(c) directing overland flows entering the Site from the west and that are generated by high %AEP flood events.

5.6 The Proposal will encompass different solutions for addressing each of these three themes, as set out below.

6 THE PROPOSAL

6.1 The Proposal is described in detail in the evidence of Mr Clease. In short, if approved, the Stokes' submission would enable the rezoning of the Site for residential development to be undertaken in accordance with an ODP included as **Appendix A** to my evidence.

6.2 The rezoning and the ODP would enable the establishment of approximately 1,500 residential lots as well as an extensive blue and green network.

6.3 The proposed methods for infrastructure servicing of the Proposal are described below.

7 PROTECTION OF SPRINGS AND NATURAL FLOWS

7.1 As detailed in the evidence of Mr Charters and Mr Mthamo, the Site is affected by high groundwater levels. Portions of the Site have positive artesian pressure.

7.2 The Site is also affected by compressible soils and, whilst the modelling of potential settlement is relatively minor, some works will need to be completed on the Site at the time development occurs to mitigate this. While these matters will need to be recognised at the time of subdivision, the evidence of Mr Charters concludes that:

There are no geotechnical issues or hazards with this Site which would preclude it from being rezoned for residential purposes, as sought by the landowners in their submission on the proposed Waimakariri District Plan. While we have identified a number of geotechnical issues/hazards with the Site, I consider that these can be appropriately addressed at the subdivision stage, with the benefit of additional geotechnical assessment works (which can be undertaken once a subdivision design has progressed).¹

¹ Statement of Evidence - Neil Charters, 27 February 2024, at [10.1].

- 7.3 The location of Stokes Drain is shown on the plan at **Appendix C**. Most of the flow within Stokes Drain originates from land to the west of the Site but there are additionally some on-site springs that feed into it via minor constructed farm drainage channels. The locations of the springs and other drains/waterways on the Site are also shown on the Plan at **Appendix C**.
- 7.4 As noted, in response to the Wildlands ecology assessment of the Site (addressed in the evidence of Mr Payne), the Proposal will:
- (a) Naturalise and enhance Stokes Drain in its existing location through the provision of extensive landscape planting within a riparian buffer adjoining the Drain. That would likely be informed by a Stream Naturalisation Plan, as recommended by Mr Payne.
 - (b) Redirect spring water (currently feeding Drains 1, 3 – 5, and 8) into an extensive new waterway along the southern boundary of the Site (**Southern Waterway**) that will also be supported by a landscaped riparian buffer. That Waterway may also receive treated stormwater from Ravenswood.
 - (c) Retire the existing wetland areas (which Mr Payne has assessed as having low ecological value) and replace them with extensive wetland areas/plantings as part of the Eastern SMA / Open Space.
 - (d) Separate the existing wāhi tapu area on the Site from that eastern area through provisions of a 15m wide planting buffer. (that would sit alongside the existing planting).
- 7.5 As discussed further below, the stormwater servicing arrangements will be designed to ensure that no stormwater runoff generated from the Proposal up to 1:50-year event will be able to enter Stokes Drain (until it has been treated in the eastern basin area). For events up to that scenario, stormwater will be isolated away from Stokes Drain by ensuring that gradients fall away from its alignment. Stokes Drain and the treated stormwater flow will eventually merge at the culvert under State Highway 1 (**SH1**). In that regard, Stokes Drain will act as a hydrological barrier within the Site, with the land to the north of

Stokes Drain requiring a separate stormwater treatment facility, discussed further below.

- 7.6 The Southern Waterway will follow along Wards Road then north along the SH1 frontage to the main culvert under the highway. As with Stokes Drain, stormwater run-off from the Site up to 1:200- year event will be kept separate from Southern Waterway.
- 7.7 Through these initiatives (and as described in the evidence of Mr Payne), the Proposal presents an opportunity to secure a net biodiversity gain.

8 FLOODING

- 8.1 The flood model for the Site has been investigated and consultation has been carried out with the WDC modellers at DHI Ltd.² **Appendix D** of my evidence contains the flood plan for the 1: 200-year flooding event and associated graphed flow predictions.
- 8.2 Three distinct flow channels have been identified on the Site (A, B & C – as shown on **Appendix D**). Peak flood flows in those channels for a 1 in 200-year flooding event are as follows:
- (a) A: 2.1m³/s.
 - (b) B: 2.6m³/s.
 - (c) C: 1.5m³/s.
- 8.3 Storm events up to a 1:50-year rating need to be attenuated as part of the Proposal (though, as noted below, dwellings will need to achieve finished floor levels to accommodate a 1:200-year event). In that context, as a general proposition, the Proposal will ensure that the upstream flood flows up to 1:200 year event will be bypassed through or around the Site, including via dedicated channels.
- 8.4 Flow A to the north of the Site has minimal effect on the Proposal. However, if in the future the existing paper road in the northwest corner of the Site was to be utilised as a roading connection between

²

<https://waimakariri.maps.arcgis.com/apps/MapSeries/index.html?appid=16d97d92a45f4b3081ffa3930b534553>

the Site and Gressons Road, a bridge may be required over the Flow A channel.

- 8.5 Flow B is a broad, shallow flood flow that extends across the central area of the Site and will need to be funnelled into a central flood flowpath through the Site. To that end, the Proposal includes a cut-off diversion area along the western boundary of the Site (the **Western Diversion**) which will direct overland flow into a significant central channel that will be funnelled toward the eastern end of the Site (discussed further below) (**Central Flood Bypass Channel**). Our initial calculations indicate that that Central Flood Bypass Channel will likely be 11.5m wide plus margins to account for the significant flood flow.
- 8.6 Flow C will be incorporated into the Southern Waterway and will only receive upland flows.
- 8.7 As discussed further below all untreated on-site stormwater flows up to the 1:50-year critical event will be isolated away from the Central Flood Bypass Channel, the Southern Waterway, the spring feeder drains and Stokes Drain.

Central Flood Bypass Channel

- 8.8 The Central Flood Bypass Channel will work similarly to Stokes Drain in that it will isolate areas of the Site into hydraulically separated stormwater catchments. The catchments will all drain to the same general area within the Eastern SMA / Open space (shown on the ODP as the "Stormwater Conveyance and Treatment Network"). As discussed further below, separate treatment facilities will however be provided within the Eastern SMA / Open Space between the Southern Waterway and the Central Flood Bypass Channel, and again for the area between the Central Flood Bypass Channel and Stokes Drain. A third catchment along the within the Eastern SMA / Open Space is provided between Stokes Drain and Gressons Road.
- 8.9 Flows from the Central Flood Bypass Channel up to 1:200 year event will eventually drain through the stormwater culverts under State Highway 1 (**SH1**) (as shown on the ODP), which may need to be upgraded to accommodate those flows. In a recent storm event, those

existing culverts were unable to accommodate waterflows, which caused flooding on the Site. This issue will be brought to the attention of Waka Kotahi/NZTA along with other consultation matters relating to works on SH1 and its intersection with Gressons Road. WDC will also be engaged to address maintenance issues with waterways downstream of the Site which have exacerbated flooding.

Southern Waterway

- 8.10 As shown on the ODP, the Southern Waterway will pass close to existing homes on SH1.
- 8.11 The LIDAR plan in **Appendix B** shows that those existing homes well elevated above the existing natural drainage channel. The detailed design of the Waterway and the finished contours of that part of the Site will ensure that these homes are protected from 1:200 year event.

Other measures

- 8.12 In addition to these on-site measures, all finished floor levels for dwellings will be elevated to Council standards above the 1:200-year event plus a Council approved freeboard.
- 8.13 Flood events between the 1:50 and 1:200-year will also be managed through standard overland flow measures, including roads, channels and other public spaces. That will be addressed at the subdivision stage.

Tsunami Risk

- 8.14 An investigation into the extent of the Tsunami Evacuation Zones has been reviewed and they do not appear to affect the Site.

9 STORMWATER

- 9.1 In general terms, the stormwater system for the Proposal involves a series of pipes and secondary flow paths that will drain to an integrated stormwater treatment and storage facility at the eastern end of the Site, being the Eastern SMA / Open Space. The Eastern SMA / Open Space is identified on the ODP as the extensive green area along the eastern boundary (the Stormwater Conveyance and Treatment Network).

- 9.2 As noted above, the Eastern SMA / Open Space will effectively comprise three separate systems isolated hydraulically by Stokes Drain, the Central Flood Bypass Channel and the Southern Waterway.
- 9.3 The piped and secondary conveyance systems will be constructed in accordance with the WDC Engineering Code of Practice. The storage and treatment infrastructure will be designed and implemented in accordance with the Christchurch City Council (**CCC**) Waterways Wetland and Drainage Guidelines and will require a stormwater discharge consent from ECan. The discharge is considered to be a restricted discretionary activity under Rule 5.93 of the Canterbury Land and Water Regional Plan.
- 9.4 The Eastern SMA / Open Space and resource consent will be vested in WDC. WDC will be consulted on the ECan consents and the design and construction of the Eastern SMA / Open Space will be in accordance with WDC Engineering approvals. Subject to further consultation with mana whenua in respect of the Proposal, WDC has agreed with that approach.
- 9.5 It is expected that each of the three parts of the Eastern SMA / Open Space will contain a first flush basin, treatment wetland and overflow storage to contain the 1:50-year storm event. For the purposes of our assessment, we have considered a 48hr storm as the critical event, but this will need to be agreed with WDC. The stormwater area shown on the eastern side of the ODP will be designed to contain this scenario, and to achieve stormwater neutrality. As noted above, the existing wāhi tapu area would be separated from the Eastern SMA / Open Space through an extensive planting buffer.
- 9.6 Following treatment and attenuation, the stormwater flows will discharge to existing culverts under SH1. As noted above, those culverts may require upgrades to accommodate those flows. That will be determined in discussion with Waka Kotahi NZTA and WDC in advance of progressing detailed design.
- 9.7 In reference to the PSI addressed in the evidence of Mr Robotham, it is expected that there will be some contamination found in certain areas of the Site, particularly within the vicinity of the Eastern SMA / Open Space. The removal of any contamination and subsequent validation

would be required prior to the construction of the Eastern SMA / Open Space.

10 WATER SUPPLY

10.1 WDC has been consulted in respect of water supply and the potential roll out of the network into the Site to accommodate the Proposal. WDC has confirmed that there is no immediate capacity within the existing network. However, in light of the alternative proposed servicing solution (discussed further below), WDC's engineers have confirmed that water supply serviceability of the Proposal can be adequately addressed and therefore should not preclude rezoning of the Site.

Proposed water supply solution

10.2 Advice received from WDC's Engineers, Jennifer McSloy and Chris Bacon, indicates that as an alternative to connecting to the Pegasus reservoir/well, a new well and supporting system may be required on the Site to provide water supply services to the residential development enabled by the Proposal.

10.3 In light of that advice we have considered the potential requirements of that system (refer to **Appendix F** for Council correspondence).

10.4 It is projected that the Proposal will enable approximately 1500 residential sections. The peak hourly flow per dwelling is estimated to be 0.1l/s, meaning the total domestic demand for the development will equate to a peak hourly flow of 150l/s.

10.5 The developer would therefore need to design the water supply system to satisfy the following WDC criteria:

- (a) Fire flow plus 50% of the peak hourly flow with a minimum residual pressure of 100 kPa during a fire event. For hydrants and for Residential Zone allotment lateral connections, this total flow = 75l/s + 25l/s = 100l/s.
- (b) Peak hourly domestic flow with a minimum residual pressure of 300 kPa and minimum flow of 20 L/min at the point of supply.

- (c) Peak hourly domestic flow with a minimum residual pressure of 250 kPa and minimum flow of 15 L/min at each property.
- (d) Minimum domestic flow case with a maximum static pressure of 850 kPa at the lowest elevation in the supply area.
- (e) Appropriate working, emergency and fire-fighting storage.

10.6 From this we can determine that a new well on the Site would be required to provide 100l/s maximum flow plus some contingency. An appropriate provision would be 20%, equating to 120l/s Peak Flow.

10.7 In terms of the daily demand volumes as opposed to peak flows, the WDC Engineering Code of Practice does not provide any advice but Table 2 of the Water Supply Management Plan provides the following 2019/2020 data about the Pegasus System:

- (a) Average Daily Flow per Connection = 645 l/connection/day.
- (b) Peak Daily Flow per Connection = 1803 l/connection/day.

10.8 If that data is adopted for 1500 lots, this equates to an annual flow of $1500 \times 365 \text{ days} \times 645 \text{ litres} = 353,138\text{m}^3$. Adding a 20% contingency to this makes the estimated Annual Flow = $423,765\text{m}^3$.

10.9 The peak daily flow for 1500 lots would be $1500 \times 1803 \text{ litres} = 2,704\text{m}^3$. Adding a 20% contingency to this makes the Peak Daily Flow $3,245\text{m}^3$.

10.10 The Site has an existing well and corresponding resource consent (CRC143175) permitting the Site owner to take water for irrigation. The particulars of the consent are as follows:

- (a) Maximum rate of take = 45l/s.
- (b) Maximum daily take = 3726m^3 .
- (c) Maximum yearly take = $900,000\text{m}^3$.

10.11 The volume and daily take rate of water authorised by that existing consent would accommodate the predicted water supply requirements for the Proposal although storage would be required to cover peak flows and fires. If a peak flow of 120l/s is sustained for, as

an estimate, two hours (120l/s - 45l/s), then a storage reservoir of 540m³ would be required. This is feasible. Alternatively, a new water supply consent could allow short periods of high pump rates to cover this scenario.

- 10.12 It is recognised that the current well which supplies that consented water take may need to be drilled deeper to achieve better water quality. As noted in Mr Robotham's evidence:

ECan undertook groundwater testing from five wells across the Site from 19 December 2020. Arsenic was detected in four out of five wells at concentrations that exceeded the NZ Drinking Water Standards and was therefore not considered suitable as a drinking water supply (for humans).³

- 10.13 In light of those findings, a full investigation into a suitable aquifer for supply drinking water will be required, along with guidance as to the appropriate drilling depths to avoid arsenic contamination. Specific treatment measures (including well-head protection, filtration and UV treatment) may also be required to ensure compliance with the National Drinking Water Standards.

- 10.14 Although a matter for determination at the consenting stage, if the Proposal were to include the construction of its own well and network for vesting in WDC, that should absolve any requirement for water supply related development contributions.

Future connectivity

- 10.15 While WDC has confirmed that there is no existing capacity within the water supply network to accommodate the Proposal, the Activity Management Plan - Woodend-Pegasus Water Supply Scheme 2021 (**Water Supply Management Plan**) nevertheless identifies a range of planned capital works which could assist in connecting the Site to the existing network should capacity become available in future.

- 10.16 Of particular relevance to the Proposal, Table 19 of the Water Supply Management Plan identifies a two-stage development of the Pegasus Waikuku link, which, if constructed, would connect the Site to

³ Statement of Evidence of David Robotham, 27 February 2024, [7.3].

the Pegasus reservoir/well (URW0104 (Stage 1) - \$338,000.00 plus GST, and URW0248 (Stage 2) - \$610,000.00 plus GST). Those Stages are projected for delivery in 2027 and 2037 respectively, at a combined cost of \$948,000.00 plus GST as described in Table 19 – Summary of Capital Works.

- 10.17 To accelerate delivery of those works and to enable connection to the Site, the developer of the Site would construct and partially pay for that watermain. Financial assistance for this connection would also be provided from WDC.

11 WASTEWATER

- 11.1 The Woodend Wastewater Treatment Plant (**Treatment Plant**) services the Woodend/Pegasus area, and has been designed to accommodate Pegasus and future upgrades to Woodend.

- 11.2 The following statement is included in the Activity Management Plan Woodend Wastewater Scheme 2021 (**Wastewater Management Plan**):⁴

The mainly residential growth anticipated is expected to occur within the existing town boundary, mainly in the Ravenswood development area. Then it is anticipated that growth would be beyond the existing town boundary to the North of Woodend.

Due to capacity constraints Ravenswood has constructed a dedicated rising main to the Wastewater Treatment Plant through Pegasus. It is likely that any further developments to the north of Woodend would do the same.

- 11.3 This, and other comments in the Wastewater Management Plan, suggested that there is capacity in the Treatment Plant to accommodate the Proposal. The Wastewater Management Plan also notes that the connection from the Treatment Plant to Pegasus is a dedicated line and that any new development would require its own piped infrastructure.⁵

⁴ Activity Management Plan Woodend Wastewater Scheme, July 2021 at [5.6].

⁵ Activity Management Plan Woodend Wastewater Scheme, July 2021 at [5.6].

- 11.4 Since reviewing that Management Plan, further consultation has been undertaken with WDC Officer Mr Chris Bacon regarding the existing capacity of the Treatment Plant. He confirmed that while there is no immediate capacity in the existing adjacent infrastructure, additional capacity to accommodate the Proposal will be provided through planned upgrades of the Treatment Plant. Mr Bacon confirmed that these upgrades can be expedited, as necessary, to meet development demand (refer **Appendix F**).
- 11.5 In terms of the specific details for servicing the Proposal, WDC has agreed that either a gravity sewer and pump station arrangement, or a Local Pressure System (**LPS**) could be used for the proposed 1,500 lots. The final decision on the preferred servicing arrangement will be made at the time of subdivision consent in conjunction with WDC.
- 11.6 For current purposes, I note that there are a number of advantages of an LPS over an equivalent gravity network, including:
- (a) The LPS system will provide enough pumping impetus to get wastewater from the Site to the Treatment Plant (discussed further below) without an intermediate pump station.
 - (b) LPS infrastructure is installed at a shallower depth than gravity pipelines, allowing for easier and safer maintenance.
 - (c) The groundwater levels are considered high and the install and eventual replacement of the LPS network is cost effective.
 - (d) There will be no reliance on the Pegasus town infrastructure.
- 11.7 There would be an expected reduction in stormwater and groundwater ingress when compared with a gravity wastewater network, therefore a lesser load on the Treatment Plant.
- 11.8 The Wastewater Management Plan provides the following calculations for wastewater capacity requirements:
- (a) Average daily sewer flow = 626l/day/connection.
 - (b) Peak Daily flow = 5 x 626l/day/connection = 0.0362l/s/connection.

- (c) Peak Wet Weather Flow = 1382l/day/connection (expected to be less than this due to LPS) = 0.016l/s/connection.

11.9 A sewer pipe would need to be constructed by the developer to connect the LPS infrastructure at Site to the Treatment Plant. Three routes for that pipe have been investigated:

- (a) Option 1: Over the Pegasus Golf Course. This option has encountered resistance from owners of the Golf Course.
- (b) Option 2: Along Preeces Road. Following consultation with the Kaiapoi Pa Trust and Te Kōhaka o Tūhaitara Trust, and in recognition of the significant cultural values within that area, this option is not being pursued.
- (c) Option 3: Along SH1, down Pegasus Boulevard, south along Infinity Drive and then east along Gladstone Road to the Treatment Plant. This has been identified as the most viable option. Please refer to **Appendix E** for the expected route.

11.10 The pipe route from the Site to the Treatment Plant would be approximately 3.4km and decreases in elevation approximately 2.5m.

11.11 Maximum flows from 1500 homes would equate to approximately 55l/s. The average pipe flow rate would be 11l/s.

11.12 As there is about 2.5m drop in elevation from the Site to the Treatment Plant, it is expected that the pipe can drain slowly under gravity at times of no pumping, and therefore avoid slugs. The estimated pipe size is a PN12.5 250mmPE100 (212.4ID). Table 1 below illustrates the calculation of an estimated flow and headloss, confirming the feasibility of this pipe sizing.

Table 1

Pipe diameter	212.4	mm
Headloss - 1 in	100	
Pipe Roughness - ks	0.06	mm
Results for Full Bore Conditions:		
Velocities	1.570	m/s
Discharge	55.65	litres/sec

11.13 In summary (and as noted above) the final decision regarding the intended wastewater servicing arrangements for the Proposal will be made at the time of subdivision consent.

11.14 For completeness, it is also noted that WDC is currently at an early stage of planning for the pumping of wastewater flows from Sefton to the Waikuku Treatment Plant, and has advised that flows from the Proposal could potentially be included as part of that initiative. That option is still very much in infancy, so is not relied on for the purposes of this evidence.

12 POWER, TELECOMMUNICATIONS AND STREET LIGHTS

12.1 All roads forming part of the Proposal will be lit to WDC standards.

12.2 All new lots will be serviced with a power and telecommunications connection which will achieve the required standards of the utility provider.

13 SERVICING OF ADJACENT LAND

13.1 As part of the wider urban analysis undertaken in support of the Proposal, consideration has been given to how adjacent parcels of land could be incorporated into the ODP in future. That adjacent land includes the land between the Site, the Ravenswood Development to the south and the land at 1355 and 1369 Main North Road adjacent to SH1.

13.2 For completeness, I note that the flooding and stormwater solutions to be provided as part of the Proposal do not rely on inclusion and/or use of those adjoining parcels of land. If the adjacent land is not included

as part of the Proposal, the Eastern SMA / Open Space will simply be designed to exclude the neighbouring land adjacent to SH1.

- 13.3 If those properties do form part of the Proposal in future, additional capacity in the proposed water supply and wastewater infrastructure can be provided for these properties, subject to standard confirmation from WDC regarding the cost of any necessary upgrades/extensions.
- 13.4 Stormwater treatment and storage can also (and will need to) be provided separately on each of those adjoining properties.
- 13.5 I am not aware of any reason why those properties could not be provided with utility services such as power and communications in the same way as they would for the Proposal.

14 CONCLUSION

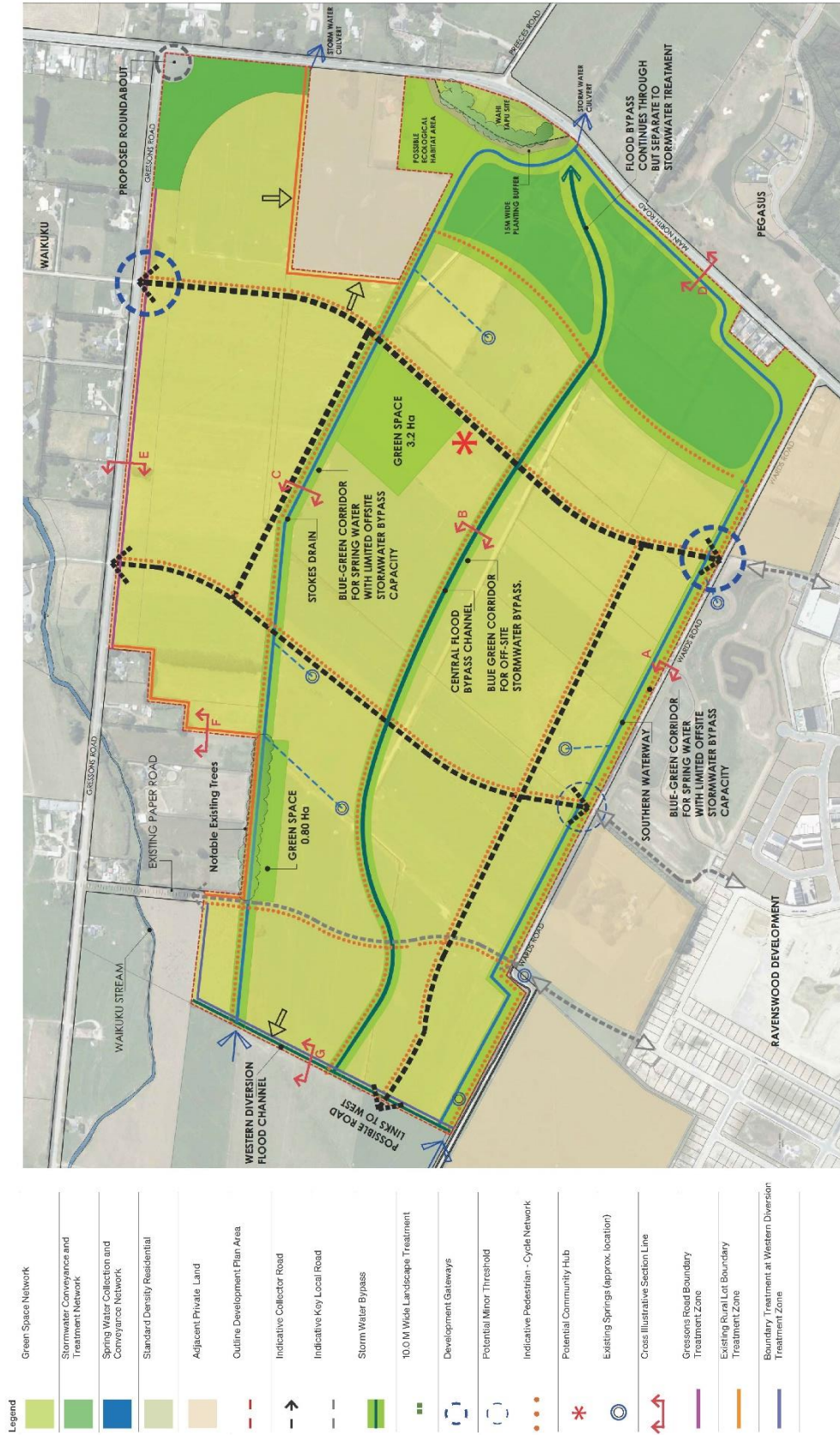
- 14.1 In summary, there are no infrastructure or flooding matters which, in my opinion, should preclude the Panel from granting the relief sought by the Stokes. The Proposal has been carefully designed to respond to hydrological, ecological and (known) cultural features of the Site and its surrounds. The proposed servicing arrangements will ensure those features are accounted for and that any adverse effects can be properly avoided, remedied or mitigated.

Andrew Hall

4 March 2024

Appendix A – Outline Development Plan

Outline Development Plan



Legend	Description
[Light Green Box]	Green Space Network
[Dark Green Box]	Stormwater Conveyances and Treatment Network
[Blue Box]	Spring Water Collection and Conveyance Network
[Light Green Box]	Standard Density Residential
[Light Orange Box]	Adjacent Private Land
[Red Dashed Line]	Outline Development Plan Area
[Black Arrow]	Indicative Collector Road
[Black Dashed Line]	Indicative Key Local Road
[Green Box]	Storm Water Bypass
[Green Box]	10.0 M Wide Landscape Treatment
[Blue Circle]	Development Gateways
[Blue Circle]	Potential Minor Threshold
[Red Dotted Line]	Indicative Pedestrian - Cycle Network
[Red Asterisk]	Potential Community Hub
[Blue Circle]	Existing Springs (approx. location)
[Red Arrow]	Cross Illustrative Section Line
[Purple Line]	Gressons Road Boundary Treatment Zone
[Orange Line]	Existing Rural Lot Boundary Treatment Zone
[Blue Line]	Boundary Treatment at Western Diversion Treatment Zone

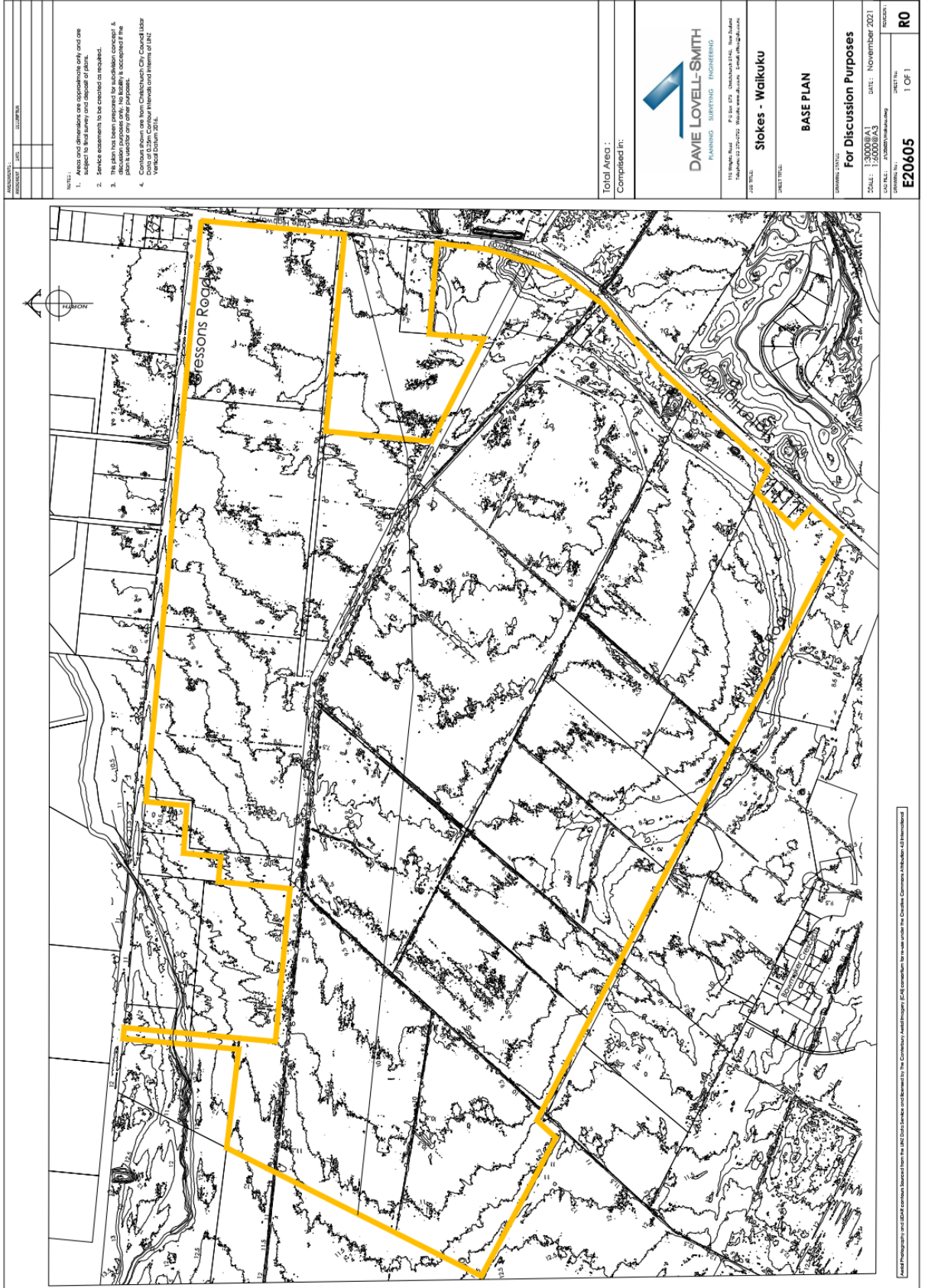
Scale 1 to 6000 @ A3

09

Stokes Waikuku Land, Waimakariri

RMM

Appendix B – LIDAR Topographical Plan



- NOTES:
1. All uses and developments are subject to the Resource Management Act and are subject to final survey and design of plans.
 2. Service easements to be created as required.
 3. The site has been prepared for subdivision concept & discussion purposes only. No liability is accepted if the plan is used for any other purposes.
 4. Contours shown are from Christchurch City Council LIDAR Vertical Datum 2016. Contour interval is 1m.

Total Area :
Completed In:

DAVE LOVELL-SMITH
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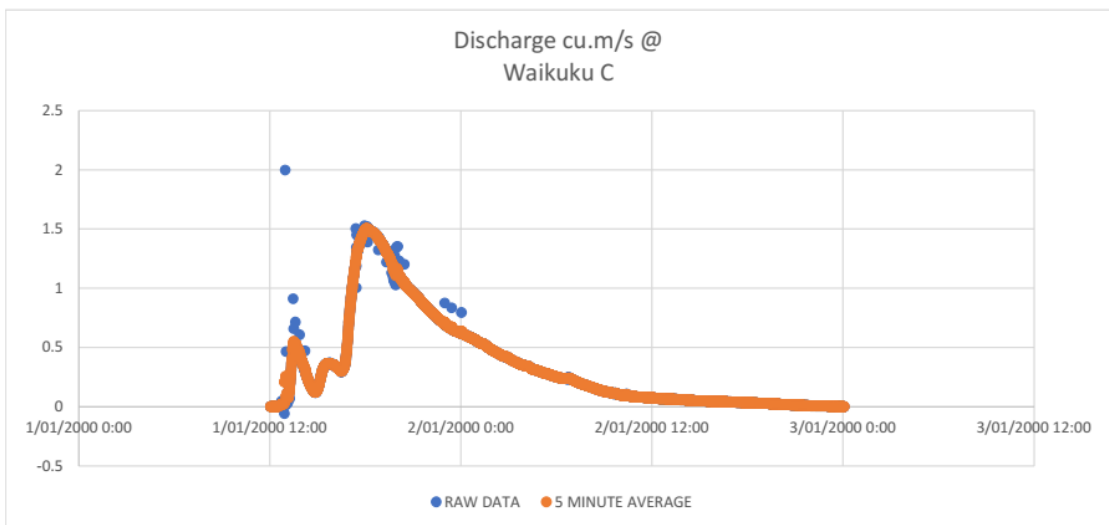
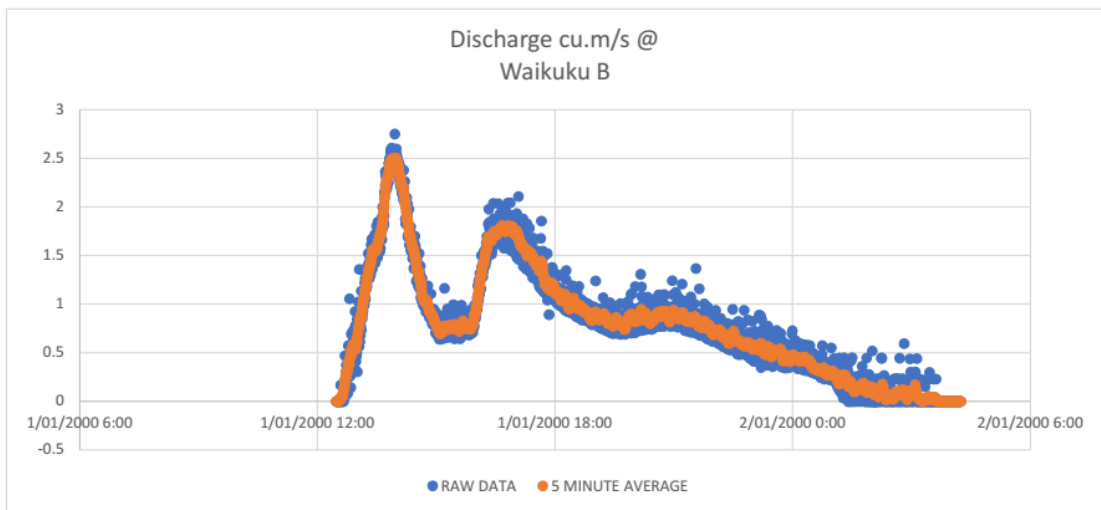
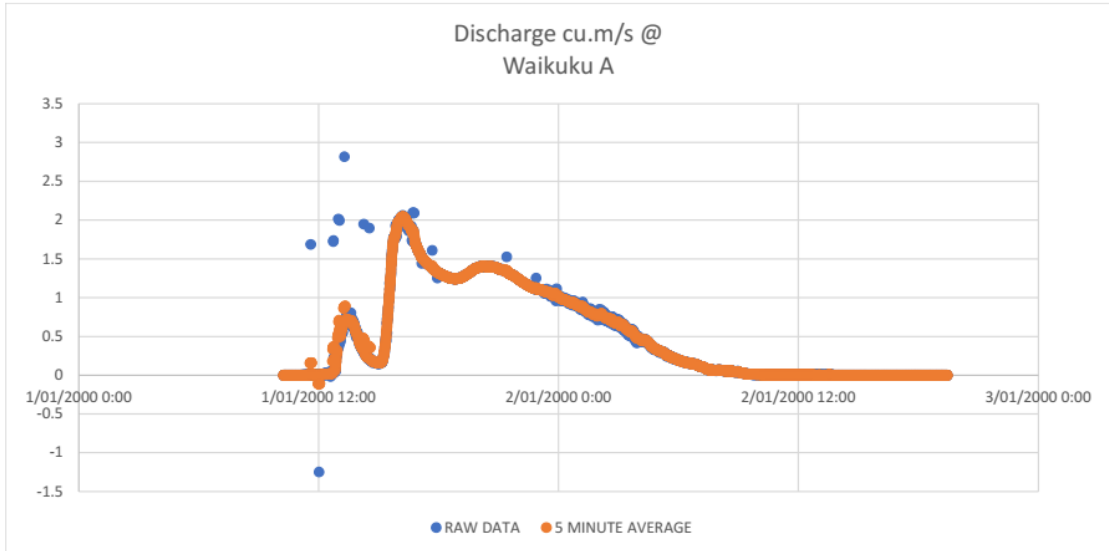
JOB TITLE: Stokes - Waikuku

PROJECT TITLE: BASE PLAN

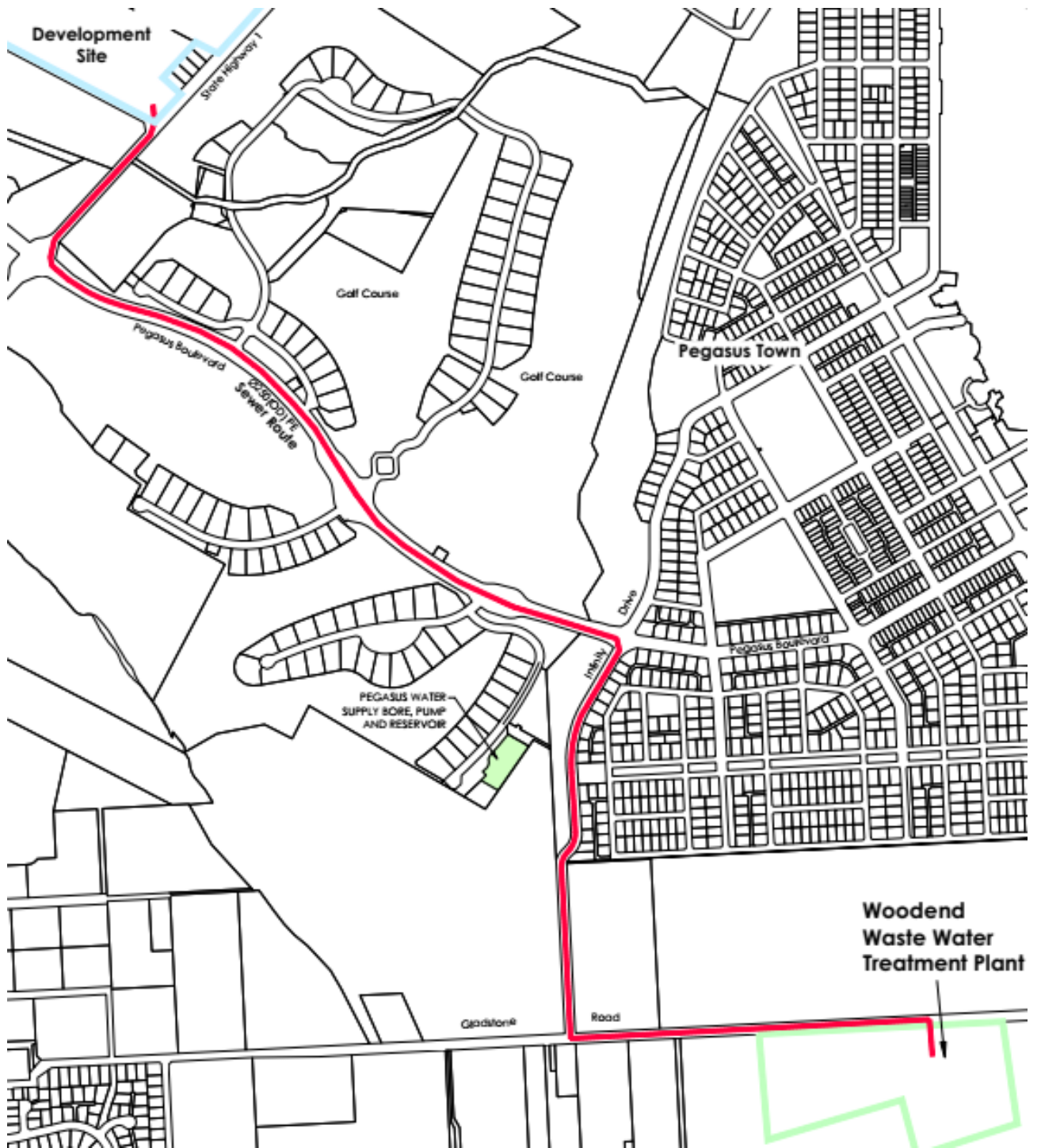
DRAWING STATUS:	For Discussion Purposes
DATE:	13/09/2021
SCALE:	1:2000(A3)
DATE:	November 2021
DRAWING No.:	E20605
SHEET No.:	1 OF 1
REVISION:	RO

Appendix D - Flood Mapping





Appendix E – Sewer Route from Site to Treatment Plant.



Appendix E – Waimakariri Council Correspondence

Andy Hall

From: Chris Bacon <chris.bacon@wmk.govt.nz>
Sent: Friday, 23 February 2024 8:51 am
To: Andy Hall
Cc: Subdivision Eng; Monaghan@suburbanestates.co.nz; Jennifer McSloy
Subject: RE: Stokes Waikuku Plan Change

You don't often get email from chris.bacon@wmk.govt.nz. [Learn why this is important](#)

Hi Andy

I agree that is a fair reflection of what we discussed, just a couple of points of clarification:

- The Council doesn't have a clear preference at this stage regarding a new bore on site or an upgrade to the Pegasus well field, however both would be acceptable solutions.
- The bore on site option would need to be accompanied with a new headworks including reservoir storage, surface pumping and treatment and this would need to be integrated into the existing Woodend-Pegasus water scheme.

Cheers

Chris Bacon | Network Planning Team Leader
 Project Delivery Unit

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waimakariri.govt.nz

From: Subdivision Eng <subdivisioneng@wmk.govt.nz>
Sent: Friday, February 23, 2024 7:58 AM
To: Chris Bacon <chris.bacon@wmk.govt.nz>
Cc: Subdivision Eng <subdivisioneng@wmk.govt.nz>
Subject: FW: Stokes Waikuku Plan Change

Hi Chris

FYI below

Sharon Timms | Land Development Officer
 Project Delivery Unit

Phone: [0800 965 468](tel:0800965468) (0800 WMK GOV)
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waimakariri.govt.nz

From: Andy Hall <>
Sent: Thursday, February 22, 2024 1:58 PM
To: Subdivision Eng <subdivisioneng@wmk.govt.nz>
Cc: Sean Monaghan <>; Jennifer McSloy <jennifer.mcsloy@wmk.govt.nz>
Subject: Stokes Waikuku Plan Change

Caution: [THIS EMAIL IS FROM AN EXTERNAL SOURCE] DO NOT CLICK links or attachments unless you recognise the sender email

Dear Chris

Thanks for meeting with me yesterday to discuss the attached potential plan change. I would like to keep a record of the discussion for the purposes of the hearing and to that end can you please confirm the following points.

1. Water Supply
 - a. There may be no immediate capacity in the existing network.
 - b. There are two options for supply, an upgrade of the Pegasus water supply bores, pumping... With a dedicated pipe to the development site, OR a bore on site. The on site option is probably preferable but can be confirmed as part of the subdivision process.
 - c. The supply of water should not be an inhibitor to the zoning of this site into residential.
2. Wastewater
 - a. There is no capacity in the existing adjacent wastewater infrastructure
 - b. The site may be serviced by Local Pressure Sewers in accordance with the WDC Policies on this system but a full justification of this can only be undertaken at Subdivision consent. For now we can treat it as a possibility.
 - c. If a LPS system were to be used, a pipe would be laid from the site to the WWTP
 - d. If a gravity system were to be used, a new pump or several pumps may need to be installed on site with a new rising sewer to the Woodend WWTP
 - e. The WWTP has upgrades included in the LTP. These upgrades are sufficient to cover the development of this site. The upgrades can be brought forward to meet development demand.
 - f. There may be an option of pumping to the Waikuku WWTP in association with potential flows from Sefton. The potential of this option is in its infancy and may be further developed at the time of subdivision consent.
3. Stormwater
 - a. The development will drain to a new facility designed and consented with ECan to WDC approval.
 - b. The flooding and mitigation was discussed and generally accepted as a feasible proposal subject to Iwi consultation.

I think that a pretty fair reflection of the discussion. Please go over it and correct me where you think necessary.

Really grateful for you time yesterday.

Regards

Andy Hall | Engineering Director



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