BEFORE A HEARINGS PANEL OF THE GREATER WELLINGTON REGIONAL COUNCIL

UNDER	**the Resource Management Act 1991 ("the Act")**
IN THE MATTER OF	**Resource Consent Applications to Greater Wellington Regional Council pursuant to section 88 of the Act to discharge contaminants to land, air and water**
BY	**South Wairarapa District Council**
FOR	**the proposed staged upgrade and operation of the Featherston Wastewater Treatment Plant**

BRIEF OF EVIDENCE OF STEVEN JOHN COUPER ON BEHALF OF SOUTH WAIRARAPA DISTRICT COUNCIL

WASTEWATER TREATMENT PROCESS ENGINEERING AND ALTERNATIVES AND OPTIONS ASSESSMENT

DATED 29 MARCH 2019

EVIDENCE OF STEVEN JOHN COUPER ON BEHALF OF

SOUTH WAIRARAPA DISTRICT COUNCIL

Counsel: **Philip Milne**
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1. My name is Steven John Couper. I hold the degree of Bachelor of Biotechnology and Bioprocess Engineering from Massey University, Palmerston North. I have completed postgraduate studies in Business, Finance, Management and Environmental Law through the University of Auckland.

2. I am a chartered engineer CEng (UK), a chartered scientist CSci (UK), a member of the Chartered Institute of Water and Environmental Management CIWEM (UK), a member of the Society of Chemical Engineers of New Zealand SCENZ. I am a fellow of Engineering New Zealand (formally IPENZ) and a former board member and past president of Water New Zealand. Currently I am the Water Sector leader for Mott MacDonald across New Zealand, Australia and the Asia Pacific region.

RELEVANT EXPERIENCE

3. I have worked in the field of environmental engineering, wastewater treatment, disposal and reuse for the last 25 years and during this time I have been directly involved in numerous wastewater engineering projects in New Zealand, Australia, the UK and in several other countries across the Asia Pacific region.

4. I have been involved in scientific and engineering investigations and design of several wastewater treatment and disposal/reuse projects. During these investigations my role has been to identify suitable consent conditions as well as providing recommendations on the design and management of treatment plants to meet such conditions.

5. I have also overseen reviews for Regional Councils where consent conditions have been set. I have provided expert evidence and technical advice to several NZ Councils and Water utilities along with industrial clients associated with the water sector. And I have appeared at several council hearings with regards to wastewater treatment and disposal.

CODE OF CONDUCT

6. I have read the Code of Conduct for Expert Witnesses in section 7 of the Environment Court's Practice Note (2014). I agree to comply with that Code of Conduct. Except where I state that I am relying upon the specified evidence of another person, my evidence in this statement 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 which I express.

MY ROLE IN THE PROJECT

7. I provided technical review for the treatment process aspects of the report entitled Featherston Wastewater Treatment Plant, Resource consent and assessment of effects on the environment (AEE). My involvement centred around technical advice for the alternatives assessment and the performance of the existing oxidation ponds.
8. I have visited the FWWTP site for the purposes of this consent project. I have walked the FWWTP site, including the oxidation ponds and ultra violet (UV) disinfection unit. I have also viewed the discharge point, the Donald Creek environment, and have visited the surrounding area, including the proposed land discharge sites and adjoining areas. From my visit I also gained an understanding of the proximity of submitters' properties and houses to the proposed land application scheme.

SCOPE OF EVIDENCE

9. My evidence will address the following:
   (a) An overview description of the existing Featherston wastewater treatment plant, including the oxidation ponds
   (b) Wastewater influent i.e. process / plant inputs from the wastewater network – flows, characteristics and pollutant loads
   (c) Existing pond performance

(d) Summary of the alternative treatment options considered, including a combine scheme assessment
(e) Proposed upgrade works to the site
(f) Ability of the treatment process to meet the proposed conditions
(g) Disinfection system performance
(h) Potential for odour generation
(i) Response to submissions
(j) Response to the relevant GWRC technical reports / s42 officer's report
(k) Conclusion

OVERVIEW DESCRIPTION OF THE EXISTING FEATHERSTON WASTEWATER TREATMENT PLANT INCLUDING THE OXIDATION PONDS AND THEIR CAPACITY

10. The Featherston Wastewater Treatment Plant (FWWTP) is located approximately 2 km south of Featherston township between Abbot Creek and Donald Creek. The site covers an area of 7.3ha and is owned by the South Wairarapa District Council (SWDC). The site is designated in the Wairarapa Combined District Plan for sewage disposal purposes.

11. The current treatment system on the site consists of:

- Inlet flow reception chamber and flow measuring device (flow meter installed in 2014, which was last calibrated in November 2018).
- Inlet works – unscreened.
- Two oxidation ponds configured in series with a total surface area of approximately 3.9ha. Originally constructed in 1975 and consisting of a larger primary oxidation pond with a concrete wave band and imported clay base and a smaller maturation pond with a butanol rubber wave band and a lime cement base.
- Pond outlet chamber and piping system with 3mm screen on outlet of the pond.
- Ultra Violet (UV) disinfection treatment system after the ponds.

- An open discharge channel conveying the final effluent from the UV system to the discharge point in Donald Creek.
- There is a manually operated emergency discharge bypass down stream of pond 2 but prior to the UV plant. This is only used if there is a failure with the UV plant or if the ponds are about to overflow due to their hydraulic capacity being exceeded. Note that the only time the bypass has been operated was 1-3 December 2018 during a major storm in Featherston when a suspected flow surge broke 4 of the quartz sleeves. The units were bypassed for repairs.

12. Featherston WWTP consists of two facultative ponds in series. The primary pond has a surface area of 2.5 ha and the secondary pond has an area of 1.34 ha. The maximum surface organic loading rate for facultative ponds under winter conditions is taken as 100 kg BOD_5/ha/day[1]. In summer this may increase to 220 kg BOD_5/ha/day based on the average summer temperature of 18^oC. From Table 2 it is seen that the current average BOD_5 load is estimated to be 167 kg BOD_5/d, hence the primary pond is being loaded at 167 kg BOD_5/d divided by 2.5ha = 67 kg BOD_5/ha/day, and (assuming 70% BOD_5 removal in the primary pond) the secondary pond is being loaded at (1-0.7) x 167 kg BOD_5/d divided by 1.34ha = 37 kg BOD_5/ha/day. Hence, the ponds are being loaded well within their capacity. Based on the worst-case winter operation, the maximum facultative treatment capacity of the primary pond is 100 kg BOD_5/ha/day x 2.5ha = 250 kg BOD_5/day.

13. I note that the original design for this system was to target the removal of the organic load (measured as BOD_5) and Suspended Solids (TSS). The pond system was not designed for nutrient reduction / removal.

14. The UV plant was installed in 2011 to provide disinfection to improve the microbiological quality of the final effluent.

[1] von Sperling, M. Waste Stabilisation Ponds. London: IWA Publishing, 2007.

WASTEWATER INFLUENT CHARACTERISTICS – PROCESS INPUT FLOW AND LOAD - DEMAND.

15. The FWWTP receives wastewater from the Featherston urban area only, which, based on the 2013 census, has a connected population of 2,253 people, occupying 996 dwellings.

16. The wastewater contributions are predominantly domestic with a small commercial contribution from local industry estimated by SWDC to be approximately 5% of the volume. Known local industry inputs are from restaurants, doctors surgery, vegetable washing facility and Davis sawmill.

17. Routine monitoring of the influent characteristics and quantity entering the ponds is not a condition of the current consent. There is no recent influent wastewater characterisation data available, but there is influent flow data available.

18. As outlined in the Alternatives Assessment (2017), the typical average dry weather flow (ADWF) of wastewater generated by a community with a population of the size of Featherston is approximately 560m^3/day or in the order of 500m^3/day to 600m^3/day. However, the average daily flow (ADF) at the FWWTP is 2,566m^3/day, with a measured peak daily (95th percentile flow) flow (PDF) of 5,480m^3/day.

19. The FWWTP flow (measured) inputs from the wastewater network are presented in Table 1 below, alongside estimated flows following the inflow and infiltration reduction program. The data highlights a significant contribution to the network from inflow and infiltration.

Table 1: Plant inputs - Flow Criteria for all options including Targeted I/I Reduction

	Measured Inflows* (m3/day)	High Rate Treatment Sizing **(m3/day)	Water Disposal Options** (m3/day)	Land Disposal Options** (m3/day)
Inflow Average Daily Flow	2,566	1,765		
90th%ile	4,468	3,083		
Outflow Average Daily Flow	2,235		1,542	1,453
90th%ile	4,136		2,854	2,688
95th%ile	5,480			

Source: AEE, Appendix 2, Alternatives Assessment, Mott MacDonald 2017. *No I/I Reduction / Pre-rehabilitation. **Assumes I/I Reduction.

20. Table 2 gives typical wastewater flow, load and concentrations, based on the population of Featherston. This has been derived using typical per capita loading rates[2].

Table 2: Estimated Influent Loads to FWWTP

Population	2,253	Persons	
Typical ADWF	250	L/p/d	
ADWF	563	m^3/d	
	Per Capita g/p.d	Mass Load kg/d	Concentration mg/L
BOD_5	74	167	296
TSS	86	194	344
Total Nitrogen	11.5	26	46
Ammonia (as N)	7.2	16	29
Total Phosphorus	3	7	12

[2] *L.J. Whitehouse, H. Wang and M.D.Tomer (Editors) New Zealand Guidelines for Utilisation of Sewage Effluent on Land (2000).*

21. The issues and proposed solutions around lowering the inflow and infiltration into the network are covered in the evidence from our flow monitoring expert, Mr Chris Park.

22. In summary, the data shows a substantial difference in the wet and dry weather flows and of particular note is the fact that the average daily flow to the plant is high when compared to population numbers as a result of the high degree of infiltration. The measured summer dry weather flow is of a similar magnitude to what is estimated to be "typical" based on standard per capita wastewater volumes, however, when viewed over the course of the year, the ADWF is significantly higher than expected (refer to Mr Park's evidence).

23. There are some limitations on the influent flow meter data as discussed in Mr Park's evidence.

EXISTING POND PERFORMANCE

24. As noted above, the estimated design capacity for the pond is 250-550kg/d BOD_5, which, based on the input loads set out in Table 2, shows that the current input demand is at 30 - 67% of the capacity over summer and winter respectively.

25. Total suspended solids are also an important component of input load as these accumulate in the pond overtime.

26. Mr Lawrence Stevenson will describe in his evidence work that has been undertaken to assess the extent of solids build up in the ponds, and the fact that the ponds have been recently desludged and surveyed in 2013. Thus, the impact from the TSS load will be no different than normal and will be managed through on-going measurement / assessment and periodic desludging as and when required.

27. The annual FWWTP effluent quality statistics are summarised from data collected from 2006 to 2016[3] in Table 3.

[3] *E.coli* based on data collected following UV disinfection installation in 2011.

Table 3: Current Effluent Quality from FWWTP

Parameter	# of Samples	25th percentile	Mean	Median	90th percentile	95th percentile
BOD_5 (g O_2/m^3)	76	11	17.6	16.7	30.1	32
TSS (g/m^3)	76	18	44.1	35	95.4	125.4
TN (g/m^3)	73	7.4	13	8.7	13	15.3
NH_4-N (g/m^3)	75	2.7	5.1	4.4	8.7	11.5
DIN (g/m^3)	75	3.8	5.9	5.4	9.3	12
NO_3-N (g/m^3)	75	0.18	0.66	0.49	1.58	2.05
DRP (g/m^3)	75	0.8	1.66	1.49	3.32	3.91
TP (g/m^3)	72	1.18	2.18	1.81	4.21	4.52
E.coli	21	-	-	24	-	820
pH	71	7.2	7.4	7.4	7.9	8.1
DO (mg/L)	68	6.4	7.8	8.2	11	11.3
Conductivity	70	186	231	228	312	393
Temperature	39	10	13.9	13.3	20	21.9

Note: Based on effluent quality data collected between February 2006 and May 2016.

28. I have checked the most recent data (i.e. since 2016) pond outputs for pollutant concentrations and can confirm that the data is similar to the above data set.

29. In summary, the above data shows that the ponds are working effectively and providing good removal of the organic load, represented by the reduction in the BOD_5

30. While there is a reduction of TSS, the final effluent at times has elevated levels of TSS and this has the potential to decrease the UV transmissivity and associated disinfection system performance.

31. Of note is the limitation around the reduction of the nutrients nitrogen and phosphorus which is typically variable in pond systems and often a result of seasonal conditions.

32. Pond systems were not designed to provide effective nutrient removal and where this is, or becomes, a requirement then alternative treatment systems, such as a modern high rate plant or land treatment, are typically deployed to meet environmental nutrient removal or reuse requirements.

33. Pond systems that are working within their design capacity do not typically cause nuisance odour related problems or complaints. Mr

Lawrence Stephenson will present details around logged complaints in his evidence. I understand that there are some complaints that are due to a local piggery and not the WWTP pond and the officer's report has not raised any odour concerns.

SUMMARY OF THE ALTERNATIVE TREATMENT AND DISPOSAL OPTIONS CONSIDERED INCLUDING A COMBINED SCHEME ASSESSMENT

34. The RMA[4] requires an applicant to provide a description of alternative methods, including a description of alternative available receiving environments, where the activity involves the discharge of any contaminant. The availability (or not) of alternatives is also a matter which must be taken into account when considering the application.

35. Mr Allingham has provided an assessment of SWDC's asset management approach and response with regard to the preferred method of treatment and disposal and the staged approach. The proposal is to transition from the pond-based treatment with UV disinfection and disposal to surface water to continued pond/UV treatment followed by land application for additional treatment and nutrient recovery.

36. As part of the process for developing long term options Mott MacDonald considered the planning work completed for both the Greytown and Martinborough consents and completed a two-stage process to identify the Best Practicable option (BPO) using a Multi Criteria Analysis (MCA) approach. This approach was also driven by the intent of the planning documents (note PNRP Objectives O49 and O50) and the kaitiaki preference for the discharge to (so far as is practicable) be to land (refer to Mr Allingham's evidence).

37. Initial work completed as part of a district wide assessment include the following district wide schemes:

    - A district wide integrated land disposal scheme with and without the inclusion of Carterton District Council's WWTP effluent. This

[4] Schedule 4 Section (6)(1)(d)(ii).

option combines the wastewater discharges from Martinborough, Greytown and Featherston at a centralised location.

- Separate land disposal schemes at each individual WWTP site.
- Integrated high rate treatment plant with discharge to water. This option combines the wastewater discharges from Martinborough, Featherston and Greytown at a centralised location and then discharges to the Ruamahanga River.
- Separate high rate treatment plants at each location with continued discharge to water. Which, for the Featherston case, would be a continued year-round discharge to Donald Creek.

38. A preliminary assessment to determine the feasibility of an alternative facility to combine wastewater from Martinborough, with Greytown and Featherston, and a second combined scheme including Carterton District, were deemed cost prohibitive primarily due to the cost of pumping and piping to a central facility (AWT, 2013; refer to Appendix 3 of AEE).

39. Early on in our BPO study, Featherston was also identified as having a significant Inflow and Infiltration into the wastewater network. The analysis completed and presented by Mr Chris Park shows a two to five times greater flow than expected for a "typical" community of this scale. The work completed strongly suggested the additional flow to be ground water infiltration (GWI) as opposed to storm water inflow.

40. As presented in Mr Park's evidence, SWDC investigated the cost to rehabilitate the leakiest parts of the wastewater catchment so that SWDC could better understand the extent of the network that is economic to rehabilitate.

41. This has been an important aspect in selecting a BPO as the costs and associated impacts for both a high rate treatment plant and a land application scheme are driven by the input flow and its associated variation in time.

42. The overall cost benefit from rehabilitating the reticulation network and reducing the flow through targeted GWI reduction needs to be balanced

against the cost savings and other environmental benefits that can be achieved through a smaller downstream treatment and disposal / reuse scheme.

43. Work completed by SWDC during 2013 (refer to Appendix 4A of the AEE, AWT 2013b) identified that for a high rate treatment system with direct discharge to water a 31% reduction in ADF through network rehabilitation and associated GWI reduction resulted in the lowest overall cost. Comparatively, the most economical land disposal scenario was identified to be a 35% reduction in ADF.

44. As identified in the evidence from Mr Chris Park, a 35% reduction is understood to be achievable given the extent of the GWI and its concentration to specific parts across the network. Except for the status quo option, all alternatives were therefore considered alongside targeted GWI reduction through network rehabilitation.

45. SWDC also considered a full new reticulated low-pressure sewer network that would in theory eliminate all GWI from the public network. However, this was deemed to be cost prohibitive at around $15-$18M when compared against the planned rehabilitation program and will still be exposed to some GWI and direct inflow from the gravity pipework on individual properties, including the lateral connections.

46. Following the district wide options assessment where centralised schemes were deemed to be uneconomic, SWDC assessed twenty-one (21) options for upgrade to the Featherston WWTP on the basis that targeted GWI removal through network rehabilitation would be implemented by SWDC.

47. The alternatives, from which the individual options are derived, can be broadly categorised as follows; Option A, Status quo / do nothing; Option B, Full time discharge to Tauherenikau River; Option C, Full time discharge to Ruamahanga River; Option D, full time land treatment with deferred storage; Option E, Land treatment with deferred storage for 90th percentile flows and contingency winter overflows; Option F, Partial land treatment with wet weather overflow options.

48. The twenty-one options referred to above relate to sub options derived from the above six alternative options that relate to different treatment, network rehabilitation and disposal aspects (refer to Figure 1 of the alternatives assessment, Appendix 2 of the AEE).

49. Four options were shortlisted for final MCA scoring with criteria including environmental, community / cultural values, human health and safety, economic and financial implications, likelihood of success and risk.

50. Early assessments had identified a high rate treatment plant such as an MBR with ongoing discharge to the stream as being a suitable alternative because there was no land for land treatment available.

51. In 2014 SWDC was able to purchase sufficient land for a viable land treatment scheme, which was in line with both SWDC and GWRC policy of preferential application of wastewater to land as opposed to water discharges.

52. As Ms Beecroft explains in her evidence, before this land was purchased a high-level soil assessment study was undertaken for the district which showed that the Project scheme land was suitable from a soil perspective.

53. As the high rate treatment plant consent application for the full-time discharge to Donald Creek was put on hold it was discounted from the alternatives assessment (2017). The high rate treatment plant was considered appropriate for a discharge to water but is generally not considered an efficient use of capital resource for a land treatment scheme as it is expensive and will require the same I/I reduction (refer to Mr Park's evidence). Also the point of it a high rate treatment plant is to remove nutrients so the treated wastewater could be discharged to water. A high rate treatment plant discharge to water is not considered appropriate in the context of BPO assessment here as the underlying GWRC policy is to move to a land-based discharge. Land treatment is also likely to provide a better overall nutrient capture and reductions as a whole once the final arrangement and Staging is complete.

54. The detailed BPO evaluation (within the alternatives assessment, 2017) identified 'Option 3E3' *"pond upgrade with screening and land treatment*

with contingency winter discharge to Donald Creek" as the best practicable option for SWDC for the ongoing treatment and disposal of Featherston's wastewater.

55. This option provided the best balance of environmental outcomes, cultural aspirations and affordability, and is aligned with the desire by SWDC, GWRC and kaitiaki to move to discharge to land so far as is reasonably practicable.

56. As Mr Mark Allingham will explain in his evidence, SWDC is committed to diverting treated effluent flows from water onto land. Land application or land treatment is where wastewater is applied at a rate that allows the soil and plant system to utilise most of the applied water and nutrients, and pathogen attenuation occurs in the soil or on the surface of the land due to natural processes such as disinfection from sunlight.

57. For the Featherston WWTP, land irrigation will, over time, provide significant benefits to Donald Creek and Lake Wairarapa downstream including a reduction in contaminants discharged to surface waters during low flow conditions. The significant benefits of the reductions in pollutant loads on Donald Creek is discussed in Ms Hammond and Dr Hamill's evidence.

58. The officer's report has recommended that consent for the upgrade be declined and has suggested that there be a further process of consideration of alternatives in consultation with the community. There is, however, no indication by the officers as to what alternatives they consider might be reasonably practicable.

59. In my opinion, the current proposal is the "best practicable option" and there is no reasonably practicable alternative to ongoing discharge to Donald's Creek in the short to medium term until land disposal and further storage are fully implemented. In my opinion, there is a need for the residual discharge to Donald Creek at Stage 2B because, as discussed in the alternatives assessment (section 5.4.2), the only way to not have a discharge to Donald Creek is to either re-reticulate the entire wastewater network as a pressure sewer or to have a significantly bigger deferred

storage pond. Both options were considered to be cost prohibitive by SWDC.

60. I am also satisfied that there is no reasonably practicable alternative to discharge to land at this site. I am aware that the Council has purchased the former golf course land, however, that land area and type does not provide sufficient capacity for the land treatment that is required.

61. I cannot comment on the potential availability of other sites but note that the issues of potential groundwater mounding and pathogen risks is likely to apply at most sites near the FWWTP (refer to Mr Simpson's evidence).

62. I do observe that if consent was declined, the need to reconsider options, prepare another consent application and AEE, and go through the consenting, design and commissioning processes would inevitably delay the staged reduction of discharge to surface water and the attendant environmental benefits from that.

FURTHER CONSIDERATION OF ALTERNATIVES SINCE THE APPLICATION WAS LODGED

63. As described by Mr Allingham since the application was lodged, SWDC considered whether there are other reasonably practicable options which could be incorporated into the current proposal.

64. As a result of that consideration, SWDC amended its application to bring forward stages 1B, 2A and 2B from what was originally proposed. I have read the evidence of Mr Mark Allingham and Mr Lawrence Stephenson and agree with Mr Stephenson's opinions as to why it would be inefficient to bring forward this timing any further.

65. Other enhancement options which have been considered are:

- Shifting the discharge to land to the golf course land, which was purchased in 2018. I understand from Ms Beecroft that this land has some capacity but requires further assessment.
- Shifting the discharge point from Donald Creek to Abbott Creek/Otauira Creek. As per the alternatives assessment, there is

insufficient environmental benefit from doing this and it would require a further application with attendant delays and risks.

- Supplementing flows in Donald Creek to increase dilution rates at times of low flow is likely to be impracticable and expensive, and largely redundant after Stage 2A is implemented (refer to Mr Stephenson's evidence).

ENHANCED TREATMENT PLANT PROCESSES

66. I understand that until Stage 2A of the scheme is implemented the discharge to Donald Creek will continue to have some adverse effects on aquatic ecology (albeit less than currently from Stage 1B). I understand from the Joint Witness Statement (Aquatic Ecology) that in large part these effects derive from the solids content (TSS) in the treated wastewater.

67. As part of the assessment of alternatives, we did consider the option of an add-on of a dissolved aeration flotation (DAF) plant under a number of scenarios, which would reduce the level of TSS levels in the treated wastewater stream, providing a more consistent TSS and UVT input to the UV plant. That option was, however, was not considered necessary because the assessment at the time (2017) showed that S107 (RMA) could be met by the BPO by Stage 2B. It was also considered cost prohibitive by SWDC and did not get short listed.

68. I note that from Stage 2A onwards there is a significant reduction in discharge to the stream. As discussed by Emma Hammond the occasions of high clarity changes (which are indicative of high TSS) are significantly reduced from Stage 2A. Mr Hamill discusses the effects of TSS on aquatic ecology in his evidence and conclude that the effects will be minimal as the stages progress. My understanding is that the ecologists do not consider that high TSS levels in the discharge will cause any significant adverse effects on aquatic life. Within that context, it would be inefficient to require a DAF plant or similar which would only achieve significant benefits for the first part of the proposal.

69. Some submitters have suggested that the best possible treatment plant be installed, such as a high rate biological treatment plant (SBR or MBR etc), or even a step further, reverse osmosis (not assessed). As discussed above, and in the alternatives assessment, two high rate plant options (Option 5B and Option 5F1) did get shortlisted in the final four options and involved either a full-time discharge to the Tauherenikau River (ranked 4th overall) or part time discharge to Donald Creek and partial discharge to land (ranked 2nd overall).

70. The high rate plant effluent quality would contain less nutrients in the discharge so would be of little benefit to a cut and carry type land treatment scheme that seeks to utilise nutrients to grow grass / crops and then sell this as a feed product to dry stock animals.

71. A high rate plant would be an option if the discharge to land component does not proceed. However, I understand that option is unacceptable to SWDC and tangata whenua because of the GWRC policy preference for avoiding or minimising discharges to water.

PROPOSED UPGRADE WORKS TO THE SITE

72. An inlet works screen will be installed at Pond 1. The screen will be in the order of 3mm to 5mm gap to capture large solids at the inlet.

73. Harvest weather station has been installed adjacent to the inlet and operating since June 2018. Ms Beecroft has used this site data to compare it to the Tauherenikau race course to sense check some of the assumptions made around land discharge and wind speeds.

74. The inlet flow meter was installed in 2014 and calibrated by Mott MacDonald in November 2018.

ABILITY OF THE TREATMENT PROCESS TO MEET THE PROPOSED CONDITIONS

75. Table 4 summarises the proposed consent conditions for discharge to Donald Creek.

Table 4: Proposed Consent Conditions for Effluent Quality Standards

	First year	1 year +		
BOD_5	35	35	mg/L	3 out of 12 samples
TSS	100	100	mg/L	3 out of 12 samples
NH_4-N	12	12	mg/L	3 out of 12 samples
TN	15	25	mg/L	3 out of 12 samples
DRP	4	6	mg/L	3 out of 12 samples
E Coli	100	100	cfu/100 mL	5 out of 10 samples
E Coli	1,400	1,400	cfu/100 mL	2 out of 10 samples

76. Table 5 compares these with historical performance. This shows that the plant has been operating within these proposed limits. As we are reducing I/I overtime, which will increase the pond retention time for treatment, the concentration of some parameters are likely to improve.

Table 5: Analysis of Historical WWTP Performance against Proposed Conditions

Parameter	# of Samples	25th percentile	Mean	Limit 5 out of 12 samples	Median	90th percentile	Limit 3 out of 12 samples	95th percentile
BOD_5 (g O_2/m^3)	76	11	17.6		16.7	30.1	35	32
TSS (g/m^3)	76	18	44.1		35	95.4	100	125.4
TN (g/m^3)	73	7.4	13		8.7	13	15	15.3
NH_4-N (g/m^3)	75	2.7	5.1		4.4	8.7	12	11.5
DIN (g/m^3)	75	3.8	5.9		5.4	9.3		12
NO_3-N (g/m^3)	75	0.18	0.66		0.49	1.58		2.05
DRP (g/m^3)	75	0.8	1.66		1.49	3.32	4	3.91
TP (g/m^3)	72	1.18	2.18		1.81	4.21		4.52
E.coli	21	-	-	100	24	-	1400	820
pH	71	7.2	7.4		7.4	7.9		8.1
DO (mg/L)	68	6.4	7.8		8.2	11		11.3
Conductivity	70	186	231		228	312		393
Temperature	39	10	13.9		13.3	20		21.9

Note: Based on effluent quality data collected between February 2006 and May 2016.

77. Having analysed the latest effluent results (2016-2018) for the FWWTP, it is likely that the proposed consent conditions for effluent standards will be met.

78. As noted above, the current pond system is meeting typical pollutant removal for BOD_5. The periodic elevated TSS is most likely related to algae

solids. Given that the same capacity will continue to be available post the network rehabilitation (and associated GWI reduction) the performance of the pond system should be the same or better.

79. The reduction in the influent flow that comes to the treatment plant over time is projected to improve the pond system performance as this will provide an increased hydraulic retention time that should improve disinfection performance across the pond and will likely improve the reductions in organic and solids load (ref to Section 2.4.1.5, and Table 2 and Table 3 of the Alternatives Assessment Report, Appendix 2 of the AEE).

80. There will be a reduction of nutrient's release into the catchment through the increased application to land and the subsequent uptake and reuse via the cultivar to be grown, as presented in the evidence by Ms Katie Beecroft.

DISINFECTION SYSTEM PERFORMANCE

81. It is understood from SWDC that the UV system can cater for disinfection for wastewater flows of up to 140l/sec, suspended solids of 120mg/l, *E.coli* influent quality of 20,000cfu/100ml and UV transmissivity of 60%. The UV system is performing well in terms of disinfection, designed with a target effluent quality of less than *E.coli* 100cfu/100ml. The unit has been operating with a median of *E.coli* 24cfu/100ml (refer to Table 3 above). Therefore, at the time of preparing the AEE and alternatives assessment, other forms of disinfection, such a chlorination or ozone, were not considered any further.

82. Given the lower flows projected as a result of the targeted network rehabilitation program, the UV plant as installed will see a lower hydraulic demand than the current situation. These lower flows will allow for additional spare capacity in the disinfection system.

83. The biggest risk with the disinfection performance is likely to be low UVT at times of increased TSS discharge from the pond and, in particular,

during periods where algae proliferates in the pond system. This can result in a discharge containing excessive algae solids and a subsequent reduction in UVT.

84. This potential risk is partially mitigated under the proposed scheme because algal proliferation is much more likely during the lower flow summer months and at this time the discharge will be to land. So, during an occasion where algal solids could be elevated, and the UV system may not be as effective due to a lower UVT, the wastewater will be irrigated with the land treatment system, providing additional natural disinfection.

85. Subsequently, through the conferencing between the groundwater and public health experts in late 2018 and early 2019 and further assessment (refer to Mr Chris Simpson's evidence and Mr Graham McBride's evidence), it became apparent that approximately seven shallow bores that take groundwater for potable use could potentially be at risk from microbiological contamination given the proposed land treatment scheme. I understand that an alternative potable water supply is being considered as a condition to safeguard those bore owners who are potentially affected, therefore I have not considered this matter any further.

POTENTIAL FOR ODOUR GENERATION

86. As outlined above, there is enough capacity in the existing pond treatment system to provide effective treatment without the system being overloaded.

87. There is always potential for odour generation at wastewater treatment sites typically due to one or a combination of the below:

- Varying input pollutant loads
- Biological activity
- Weather and climatic conditions
- Operation and Management
- Anaerobic conditions in the ponds or soil.

88. The primary potential effect on air quality is in respect of odour emanating from the plant, or from the discharge. Poorly managed or stressed WWTPs do have the potential to create odour by being allowed to become anaerobic.

89. The operation of the site will continue to be managed in accordance with the existing resource consent. In her evidence, Ms Katie Beecroft will discuss odour issues relating to the proposed land treatment system.

90. An Odour Management Plan will be developed which will include procedures for managing odour from both the ponds and irrigation infrastructure, within six months of the commencement of the new consent.

RESPONSE TO S42A OFFICER'S REPORT AND OTHER SUBMISSIONS

91. The officer's report (page 28) states; *"If I and I targets are not met then it may be that effects differ from those in the AEE and assessed above as increased volumes with potentially lesser treatment levels will be going in to the waterway and increased volumes will need to go to land".* In regard to *"potentially lesser treatment levels",* I assume this relates to the effectiveness of the treatment ponds and hydraulic retention time. The evidence set out above identifies that under the current input flows the treatment levels already meet the proposed consent concentrations for discharge into Donald Creek with any reduction in influent flow providing a benefit. I understand that if the I/I reduction target of 35% is not met that SWDC have sufficient options to consider (refer to Ms Beecroft's and Mr Stevenson's evidence).

92. The officer's report (page 43) goes on to say; *"And when the discharge to water occurs, the quality and quantity of the discharge will remain the same as it is currently and in fact, with I and I work it could be that the contaminant levels increase".* This statement is somewhat misleading because although the influent concentrations to the plant will increase, the effluent loads to the stream will significantly reduce. Effluent

concentrations for N and P may slightly increase but importantly the load will not as the flow will be lower. As GWI is removed the resulting impact on Donald Creek, when coupled with the land treatment scheme, will in fact improve Donald Creek water quality (refer to Ms Hammond's evidence). The key point is that, regardless of the I/I reduction, the same load of pollutants will come into the FWWTP and over time, as more land is developed for treatment, the effects on Donald Creek are reduced. If the 35% reduction in I/I is not met other options are available to SWDC as discussed by Mr Stephenson and Ms Beecroft in their evidence.

93. I note that some submitters have questioned the MCA scoring process and suggested that the alternatives assessment was not robust. I acknowledge that the top four options scored fairly closely and the top two ranked options score very closely. However, the preferred option is considered the best practicable option and the officer's report appears satisfied with the alternatives assessment.

94. I understand that the Panel is required to take into account the availability of alternatives. I have discussed the potential alternatives above. It is clear that there is no short-term alternative to discharging to Donald Creek. The proposal involves significant reduction of discharge by the end of Stage 1 and further reductions from Stage 2.

95. Total removal of the discharge at Stage 2B would require very significant storage volume or much higher I/I reduction than is likely to be achievable and a greater land disposal area. In my view the environmental benefits of that option are insufficient to justify the significant costs involved.

96. The only alternative to land disposal is continued high volume disposal to the surface water at the same location or another location. That option was found to be unacceptable to the community and in my opinion makes no sense given that the land is available and suitable.

97. I note that some submissions have questioned whether odour will be an issue and this is addressed in my evidence above, and in Mr Stevenson's and Ms Beecroft's evidence. In my opinion, odour is unlikely to be an issue and can be addressed by way of the Odour Management Plan.

CONCLUSION

98. The existing wastewater scheme (sewer network, treatment plant and disposal to Donald Creek) provides an essential public health and environmental service to the community of Featherston.

99. The existing scheme has had some minor improvements over the past 20 years but now requires a significant upgrade to maintain public health protection, meet modern environmental compliance requirements, and to make the scheme sustainable in the longer term.

100. Twenty-one combinations of treatment and disposal options for the upgrade to the Featherston WWTP have been considered and evaluated. Based on a two stage multi-criteria assessment it was determined that a land treatment scheme with deferred storage and provision for contingency winter discharges of treated wastewater to Donald Creek is considered the best practicable option.

101. As part of this improvement SWDC has committed to a targeted GWI reduction program through the targeted rehabilitation of the wastewater reticulation network to reduce the peaks and ADF to the plant.

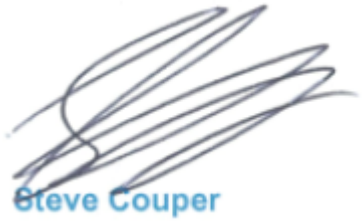
102. The above option aligns with the objectives of the Regional planning documents, and the SWDC long term wastewater strategy, which promotes the staged implementation of land treatment and the staged reduction of direct discharges of treated wastewater into the district's waterways.

103. Having been involved in the consideration of alternatives, I am of the opinion that the current proposal represents the best practicable option for the treatment and disposal of Featherston's wastewater. I am

unaware of any efficient alternatives or enhancements to the current proposal.

104. In my opinion, the option of declining consents for the discharges (as recommended by officers) is not a sensible or sustainable option. There is no alternative to the ongoing discharge to Donald Creek until the proposed land treatment and storage is fully operational or some other alternative is implemented. I am unaware of any alternatives to the land treatment option, other than a high rate treatment plant. I do not believe that such a plant is a sensible alternative to discharge to land because it will not achieve the objectives of both Councils to minimise discharge to surface water.

Signed:



29 March 2019