Before an Independent Hearing Commissioner appointed by Dunedin City Council

In the matter of	a notice of requirement by Dunedin City Council to designate the Mosgiel Community and Recreation Area

Evidence of Allen Moray Ingles

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Qualifications and experience

1 My name is Allen Moray Ingles.

2 I am employed by GHD Ltd as a Technical Director for the water sector.

3 I have over 35 years' experience in flood protection, land drainage, wastewater and water supply engineering in both the public and private sectors in New Zealand and the United Kingdom. I hold a New Zealand Certificate in Engineering (civil), am an Incorporated Engineer with the Institution of Civil Engineers (**ICE**), United Kingdom and an Associate Member of the ICE (**AMICE**).

Scope of evidence

4 I have been asked by Angus Robertson of Dunedin City Council to prepare evidence in relation to infrastructure for the Mosgiel Recreation Area Designation. My evidence reviews the utilities in the area to assess the level of service, capacity and the impact that proposed development/upgrades may have on the various services. These include:

(a) Water supply;

(b) Wastewater;

(c) Stormwater;

(d) Power; and

(e) Flooding.

5 I also respond to a number of submissions in my evidence.

6 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence has been prepared in accordance with it and I agree to comply with it. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Executive summary

7 ***Water supply*** – The new pool facility and development covered by the designation will result in increased water demand. The current network has sufficient capacity to accommodate the increased flows associated with the pool without the need for upgrades. The Mosgiel water supply is stressed during periods of very high demand associated with domestic irrigation. Additional demands may increase stress to the supply although the pool demand is predominantly outside the peak demand periods of the day. A new pool facility can be supplied from the current network without the need for upgrades.

8 ***Wastewater volume*** – The wastewater network has capacity to accommodate the increased flows associated with the pool during normal operation. However, the network is aging and does have capacity issues associated with groundwater and surface water ingress during periods of high rainfall resulting in surcharging of the downstream section of network and overflows to Silver Stream. The frequency of overflows to Silver Stream and the risk of surcharge in the lower sections will increase slightly with the additional flows from the new development. The expected trade waste consent can manage the timing and volume of larger pool discharges on the network such as backwashing filters and any major maintenance requiring emptying the pool.

9 ***Wastewater quality*** – The nature of the wastewater discharges will have no significant effect on the downstream wastewater treatment system.

10 ***Stormwate***r – While the existing stormwater system is under capacity, there are upgrades scheduled for the Reid Avenue and Carlyle Road pump station, with the Reid Avenue station programmed for construction in 2019. The upgrade design is understood to include an allowance for some increase in impervious surfacing within the designation area. If this is not the case, or a greater allowance is required, the provision of pumped stormwater system discharging directly to Silver Stream would mitigate any adverse effects.

11 ***Power*** – There are 11kV cables running alongside and through designation area. Therefore there will be no significant issues associated with servicing the site, however relocation of a section of the cable may be required depending on the selected location of the pool development.

12 ***Flooding*** – Any development at the site covered by the proposed designation will have a less than minor effect on volumes and flood levels in Silver Stream and flood risk to the adjacent farmland and properties downstream.

Water supply

Current demands

13 The major water demands within the designation area are generated by the Mosgiel Pool, the sports club rooms, and the Mosgiel Caravan Park.

14 Discussions with Dunedin City Council (**DCC**) parks management contractors confirmed that there is currently no irrigation of the playing fields during the summer, but consideration is being given to the establishment of new cricket pitches that would include irrigation of the wicket area.

15 Other facilities within the designation area include the Memorial Park grandstand and associated halls, and the club rooms on Reid Avenue. Water demands for

these are associated with catering and ablution facilities. While there is regular usage of these facilities, demands for the day to day usage are expected to be relatively low (approximately 4 m^3/day assuming usage by 100 people).

16 Peak demands will be associated with large sporting events and functions and will be more intermittent. These events are predominantly outside the morning and evening peak demand periods and no issues with supply have been identified.

17 The Mosgiel Caravan Park is located adjacent to the existing pool. The caravan park will have a similar demand to typical residential areas, however, demand is more consistent throughout the year with no irrigation during the peak summer period.

Future demands

18 There has not been a detailed assessment of the water demands for the proposed Mosgiel Pool, however, network modelling undertaken by DCC using demand figures, based on 75% of the maximum monthly water usage for Moana pool over the last 15 years, showed that there were no issues with headloss or low pressure within the network.

19 This is considered a very conservative assessment equating to an increase of 850% over the existing pool facility. While the new facility is expected to result in an increase in patronage, an increase in peak water demand in the order of 300% is considered more realistic.

20 There are no other proposed major upgrades or increase in club room or function facilities at the site that will generate a significant increase in use from current demands.

21 There are no plans to increase the size of the Caravan Park, however it is possible that the location could change.

22 The development of new irrigated cricket pitches at Memorial Park would increase water demand during the summer period. This would coincide with the peak demand period and could further stress the supply system depending on the watering regime.

23 While it is difficult to assess the potential increase in demand, options to mitigate additional stress on the supply system would be:

(a) Automating irrigation so that it occurs during the lower demand periods of the day or night; and/or

(b) To utilise the existing groundwater bore on Gordon Road (adjacent the existing pool) as an irrigation supply source.

24 Use of the existing bores for irrigation would require new pipework from the bore to the irrigation area as this would be an unsecure supply. However, as there is currently no irrigation network within the playing fields, supply lines would need to be installed even if the potable supply system was used.

25 The proposed upgrades and redevelopment covered by the designation will be generally consistent with the current use at the site.

26 The new pool facility will result in increased water demand and flow within the network, however this can be met by the current network without the need for upgrades.

27 The increased demand may cause additional stress to the supply system when irrigation demand is high, however demand increases associated with increased patronage of the pool facility can be partially offset by the use of modern water efficient facilities. Demand associated with pool usage is also outside the typical peak demand periods.

Water supply system

28 The Wingatui Reservoir that supplies the water supply network for Mosgiel was, until recently, supplied by a number of wells in the area.

29 Recent concerns over the security of water supplies in New Zealand resulted in a review of the water source and the reservoir is now supplied by Mount Grand Water Treatment Plant.

30 DCC has indicated that the water supply system for the Mosgiel area is periodically stressed during the drier summer periods with domestic irrigation causing a significant increase over typical daily demands.

Supply layout

31 As there are supply mains of 100-150 mm dia running around the perimeter and through the site, servicing will not restrict where the pool could be located.

32 However, the water line running through Memorial Park, between Murray Street and Tyne Street, is in a service corridor that also includes a 375 mm wastewater gravity line and the 500 mm dia wastewater rising main.

33 It is recommended that the proposed location of the new pool avoids close proximity or a conflict with this corridor as relocation of the services would involve significant expense.

Wastewater

Current demands

34 Discussions with DCC have confirmed that the Mosgiel gravity network is aging and has capacity issues in the downstream section of the network, near the pump station, where surcharging of manholes can occur.

35 The capacity issues are associated with ground and surface water ingress rather than residential wastewater volumes, with surcharging of the system and overflows to Silver Stream occurring following periods of prolonged or heavy rainfall.

36 Mosgiel does not currently meet the expected level of service for a 1 in 10 year rainfall event.

37 Council has an ongoing maintenance programme for the upgrade of the network to reduce ingress of groundwater and surface water and increase capacity.

38 The 375 mm dia wastewater line which passes through the designation area from Murray Street to Tyne Street was lined as part of this maintenance programme in 2013.

Wastewater volumes

39 Increased wastewater volumes generated from future development at the site will be predominantly related to the increased patronage of the new pool facility and the operation of the pool all year round, rather than just the summer period as currently occurs.

40 Assuming patronage based on 300% of current pool facility peak demand, increased wastewater volumes during the winter period could be in the order of 75 m^3/day (1.4 l/sec assuming a 15 hr day).

41 While the wastewater network has capacity during normal operation, additional inflows to the system during periods of high rainfall would increase the volume and frequency of overflows to Silver Stream and the risk of surcharge of the network.

42 It is noted that the recreation area is currently zoned Residential 1. Typical discharges from a Residential 1 zone of similar area to the proposed designation would be significantly greater than those indicated for the proposed development.

43 Part of the general pool operation regime is the periodic backwashing of the pool filter system with waste discharged to the wastewater system. The backwashing from municipal pools generates relatively high flows, albeit for a short period, during the procedure and it is common practice to capture/store these backwash flows and control discharge rates to avoid overloading of the local wastewater network.

44 It would be expected that the design for the pool development would include for storage of the total backwash volume which would then be discharged to the wastewater system over a prolonged period at a reduced rate that the system can accommodate. This discharge rate and timing would be agreed with Council.

45 Full drain down of pools can be required but is not part of a normal operations and maintenance regime and is typically only required during major maintenance.

46 Any drain down requirement would need to discharge to the wastewater system, however this would be notified well in advance and the details of the process including flow rates and period of discharge agreed with Council. This will not differ significantly from the procedures expected to be in place for the current pool operation.

Wastewater quality

47 The wastewater discharges from pool facilities are predominantly associated with showers and toilets for patrons, staff facilities and food preparation, if a cafeteria is included.

48 While there will be some discharge of chlorinated water, this will generally be associated with the backwash process and the free available chlorine (**FAC**) in the wastewater will be low.

49 It is expected that DCC will require a tradewaste discharge consent of the pool complex. This trade waste consent can manage details such as backwash discharge rates and timing. The low FAC combined with the low rate of discharge and the dilution with wastewater from the pool complex and within the networks dilution will ensure that there is no adverse effect on the wastewater treatment system.

Wastewater infrastructure layout

50 The Mosgiel wastewater system consists of a gravity network discharging to a pump station at Carlyle Road at the western end of the town. Wastewater is then pumped from this site to Green Island Treatment Plant via a 500 mm dia rising main.

51 The network layout will provide little restriction on the location of the proposed swimming pool. The exception to this is the wastewater lines running through Memorial Park between Murray Street and Tyne Street.

52 As indicated above, it is recommended that the proposed location of the new pool avoids close proximity or conflict with the service corridor, which contains water and wastewater lines, as relocation would involve significant disruption and expense.

Stormwater

53 Stormwater management in Mosgiel is provided by a reticulated network discharging to Silver Stream. Discharge to Silver Stream is achieved by pumping when water levels in the stream are high, preventing a gravity discharge.

54 Stormwater from the area to the south and east of the Hartstonge and Reid Avenues flows via a large grassed swale and a 750 mm dia stormwater main running along Reid Avenue to Reid Avenue Pump Station.

55 The carpark and grandstand areas in Memorial park are drained via a piped network that flows in a westerly direction through to Gordon Road and down to the discharge point at Carlyle Road pump station.

56 At present the stormwater system is under capacity and modelling of the 10 year ARI (average return interval) indicates flooding impacting residential floor levels in a number of properties in the Nairn and Oban Street area, flooding across Reid Avenue and overland flows in a westerly direction threatening low lying properties on Gordon Street.

57 An upgrade to increase pump capacity at the Reid Avenue pump station from 2.2 m^3/s to 6.5 m^3/s is scheduled by DCC for 2019 along with a proposal to increase the capacity of the swale flowing to the pump station.

58 An upgrade for Carlyle Road stormwater pump station is also programmed following on for construction of the Reid Avenue work along with some associated network improvements.

59 These stormwater upgrades are targeted at achieving the design 10% Annual Exceedence Probability (**AEP**) level of service. It will significantly reduce flood risk in the area although some flooding during extreme events will still occur.

60 At present, the majority of the designation area consists of relatively level grassed playing fields and significant proportion of the rainfall on this area will infiltrate to ground.

61 Construction of a new pool, along with parking facilities, will result in an increase in impervious surfacing (amounting to 4500 m^2) increasing run off and the associated risk of drainage issues and flooding in the area.

62 Communications with DCC have confirmed that the modelling assessment for design of the Reid Avenue pump station upgrade has included for an increase in development/impervious surfacing within the catchment.

63 It is understood that this includes the recreation area and a small percentage increase in impervious surfacing can be accommodated. If this is not the case, pool design and location will need to consider stormwater management.

64 Potential management options available include:

(a) Minimising impervious area by utilising existing parking areas;

(b) Provision of pumped stormwater system discharging directly Silver Stream during larger rainfall events (this may require a discharge consent from ORC);

(c) Offsetting of the increase in impervious surfacing by restoring the existing pool site to pervious surfacing; and

(d) On site attenuation could also be considered however this is problematic given levels at the site and would either require significant expense or an area of land that would be inundated on a regular basis limiting recreational use.

65 To mitigate adverse stormwater effects I recommended that the following consent condition be imposed on designation:

> For any increase in hard stand (excluding buildings) of more than 2.1% of the designated site or 4,500 m^2, a stormwater assessment is required to determine whether a site specific stormwater solution is necessary (with potential for direct flow to Silverstream via pump).

66 This condition was provided to make provision for an increase in impervious surfacing but providing a trigger value for further assessment requirements to prevent possible adverse drainage implications. It was based on communications with DCC indicating that the modelling used for design of the pump station upgrades had allowed for future development. Although the extent and how the development was distributed across the area, it was considered that an overall increase in impervious surfacing was sufficiently conservative. This proposed condition has been amended in light of the section 42A report which I discuss later.

67 It is assumed that the pumps station upgrades and associated network improvements will be completed before the completion of the pool development.

Power

68 The following information is based on communications with and information provided by Aurora Energy in June 2018 and discussions with GHD electrical engineers.

69 Major power infrastructure in the vicinity of the proposed designation includes a distribution substation on Gordon Road on the northern side of the Silver Stream channel and high voltage (11 kV) cables along Gordon Road.

70 Power Infrastructure within the designation area includes an 11 kV cable running along the Silver Stream flood embankment to the Reid Avenue Pump Station and an 11 kV cable running diagonally across the Memorial Park playing fields to a kiosk transformer on the western side of Reid Avenue. Both cables are in-ground cables which are typically buried at a depth of 900 mm.

71 The 11 kV cable servicing the Reid Avenue pump station runs along the stopbank. While the exact alignment of the cable has not been confirmed on site, it is unlikely that any significant upgrades /development covered by the designation would occur in this area due to the potential impact on the stopbank and the need for access for maintenance and potential future upgrades.

72 The 11 kV cable running across Memorial Park, while not impacting on general park operations, would need to be considered as part of any park upgrades involving excavation.

73 Works such as the installation of pipework for irrigation will need to include positive identification of the cable for any works within the immediate vicinity of the cable but are unlikely to require relocation of the cable.

74 Relocation of the pool to a site that conflicts with the existing cable alignment will require relocation of the cable.

Flooding

75 River or stream based flood risk to Mosgiel and the designation area is associated with flood flows in the adjacent Silver Stream.

76 Stopbanks along the southern bank of the stream provide protection for the designation area and majority of the town for events up to the 1 - 2% AEP event.

77 The design of the stopbanking system in the vicinity Mosgiel includes a lower stopbank on the north side of Silver Stream so that during extreme events, overflow to adjacent farmland occurs before flows get to a level that would overtop the stopbank protecting the township.

78 Any development at the site covered by the proposed designation will have a less than minor effect on volumes and flood levels in Silver Stream and flood risk to the adjacent farmland and properties downstream.

Response to Council Officers' Reports

79 The Council Officer Report: R Buxton 22 Jan 2019 and the appended memorandum regarding the 3 Waters is generally consistent with my evidence associated with the water supply and wastewater services.

80 Council has requested amending the proposed conditions to include assessment of the effects of the increased water demand and wastewater services in the outline plan. As the Council holds and runs the water supply model and holds the detailed knowledge of the wastewater system they are best placed to assess the effects of the increased flows, particularly as any effects will be associated with more extreme events associated with domestic irrigation (for water supply) and groundwater ingress (for wastewater).

81 Proposed conditions have been amended to include provision of average and peak daily demand/flow in the Outline Plan.

82 Discussion in the supporting memorandum regarding stormwater refers to issues in the Reid Avenue area and flooding occurring from rainfall events as low as the 50% AEP event (1 in 2 year). This is the current situation and does not include the proposed upgrades commencing in 2019 which are targeted at providing a 10% AEP (1 in 10 year) level of protection.

83 Council had proposed amendment of the proposed conditions requiring a stormwater management plan for any increase in impermeable area.

84 I consider this is excessive and impractical and would require a stormwater management plan for even very minor works such increasing the width of a footpath.

85 Given the proposed upgrades, scheduled to commence this year, and that the modelling for design of the upgrades has included provision for increased development/impervious surfacing I consider that some allowance for increased impervious surfacing should be permitted before triggering the requirement for a stormwater management plan.

86 In accordance with this the proposed conditions have been amended by the Applicant to allow for a more conservative increase in impervious surface area of 2000 m^2. I support this as being appropriate.

Response to submissions

87 One submission was received in relation to flooding. The submission from the owner of 209 Gordon Street included concerns with existing ground levels and future development creating flood zones within the designation.

88 The property adjoins the SE corner of the existing pool carpark and the Memorial Park playing fields. While detailed level information is not available, review of Lidar information and previous flood modelling results shows that there is some potential for ponding of stormwater in this area. This ponding is associated with localised ground levels rather than the catchment wide overland flow. The ponding may be exacerbated by runoff from the carpark discharges to this area.

89 Potential adverse flooding at this property would be limited to development in the immediate vicinity of the property that generated runoff to this area or diverted or blocked overland flows.

90 As part of an outline plan for any development, stormwater design is required to consider drainage patterns and stormwater management to ensure that works do not create or exacerbate flooding. This will include providing capture and management of stormwater discharges and ensuring provision of a secondary flow path for more extreme events.

Conclusion

91 Review of the implications of the proposed designation on the 3 Waters infrastructure and flooding indicates that networks generally have capacity to accommodate improvements covered by the designation.

92 Issues with wastewater and water supply capacity are limited to extreme events rather than general daily operation.

93 The current ongoing maintenance/upgrade programme to the wastewater system to reduce groundwater ingress will reduce the frequency moving forward.

94 Peak water demands associated with domestic irrigation are a wider operational issue which can if necessary be managed by operational controls.

95 Stormwater upgrades scheduled to commence this year will improve the current level of service even with increased impervious coverage and the requirements for development of a stormwater management plan for larger area of surfacing is appropriately protective of overdevelopment creating stormwater related flooding.

96 It is therefore considered that with the proposed conditions, the 3 Waters and infrastructure capacity should not restrict development covered by the designation.

Allen Ingles

30 January 2019