Before the Independent Commissioner Hearing Panel

Under	the Resource Management Act 1991 (**RMA**)
In the matter of	an application by **Dunedin City Council** to develop a landfill at Smooth Hill, Dunedin.

Statement of evidence of Paul de Mar

29 April 2022

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Qualifications and experience

1 My name is Paul de Mar.

2 I am a Principal Consultant in the Natural Resources and Agriculture Service Group for GHD Pty Ltd.

3 I have tertiary qualifications from the University of NSW (Bachelor of Arts) and Macquarie University (Masters of Environmental Planning), as well as a range of fire technical qualifications pertaining to incident control, fire suppression operations and prescribed burning.

4 For the past 14 years I have been providing consulting services, principally in the fields of land, vegetation and bushfire risk management, to clients around Australia. I have extensive experience providing vegetation management and bushfire mitigation strategy, audit, review and improvement services to land and utility managers in New South Wales (NSW), Victoria (VIC), South Australia (SA), Tasmania (TAS) and West Australia (WA) and in New Zealand. I have led or participated in project teams, for projects including:

(a) Bushfire risk assessment specialist report preparation for Breen Resource Recovery Centre Environmental Impact Statement (Sydney, NSW, 2019);

(b) Bushfire specialist to GHD's Waste Services team examining a landfill fire incident for a confidential client operating a landfill on the North Island of New Zealand (2020);

(c) Bushfire specialist to GHD's Waste Services team re landfill fire incident early detection advisory services relating to a landfill fire incident in Sydney (2019);

(d) Bushfire and vegetation specialist input to GHD Waste Services team for landfill capping advisory services (2 sites);

(e) Bushfire specialist to GHD Waste Services team for a nwaste to energy project at Lucas Heights (2017);

(f) Expert witness reports on fire causation and vegetation clearance compliance for counsel assisting the NSW Coroner in the Coronial Inquest into the 2018 Reedy Swamp Fire (Tathra);

(g) Confidential bushfire cause and origin investigation for a fire in SA, for which overhead powerlines were identified as a possible fire cause (2019);

(h) Confidential bushfire cause and origin investigations for 7 fires in VIC, for which overhead powerlines were identified as a possible fire cause (2017 – 2019);

(i) Lead auditor (bushfire mitigation and vegetation management) for independent audit of Electricity Network Safety Management System (ENSMS) compliance for Sydney Trains overhead electricity distribution network (2019);

(j) Developed a Handbook on Vegetation Risk Management for electricity network service providers, prepared for Energy Networks Australia (completed in August 2017);

(k) Expert witness (electricity supply industry vegetation management) in class action proceedings in the NSW Supreme Court (*Eades v Endeavour Energy*), involving a fire alleged to have been caused by vegetation contact with power lines (settled 2019); and

(l) Audit and review of power line vegetation management procedures and improvement of bushfire mitigation strategy and systems for Powercor/CitiPower in VIC (2016).

5 I have also provided consulting services to many Australian state agencies responsible for land and fire management, fire and emergency service organisations and their national peak body (the Australasian Fire and Emergency Service Authorities Council) and other organisations requiring bushfire prevention, preparedness, technical, and management program/systems advice. Relevant services provided include operational reviews of major, high-consequence bushfire events, analysis and reconstructions of fire spread and behaviour for fire incidents, scientific content review of the national Fire Behaviour Analyst training course, development of bushfire behaviour prediction guides for Radiata Pine and Blue Gum plantations (in collaboration with the Commonwealth Scientific and Industrial Research Organisation's bushfire behaviour and risks group), reviews of state planning provisions/regulatory instruments relating to development in bushfire prone areas, and leading GHD's teams which prepare bushfire management plans for many high bushfire risk sites around Australia. I have also provided expert witness reports and services in relation to a number of matters in VIC (including a number of the 2009 Black Saturday fire matters), NSW, ACT and WA.

6 Prior to consulting with GHD, I gained extensive forest and bushfire management experience (for more than 12 years up to 2007, I managed the Fire Management Branch for State Forests of NSW (SFNSW)), including state-level leadership and coordination of multi-agency fire

planning and fire response operations, and program management for bushfire protection. From 2003 to 2007 I was SFNSW representative on the NSW Bush Fire Coordinating Committee. I led programs for bushfire risk management across a pine plantation estate exceeding 210,000 hectares, and a native forest estate exceeding 2 million hectares. I led and coordinated SFNSW bushfire preparedness and response operations through severe fire seasons in 1997/98, 2000/01, 2002/03, and 2006/07, and was the SFNSW representative in state level multi-agency operations planning activated by the NSW Rural Fire Service Commissioner during major fire events and firefighting campaigns.

7 I also led two international firefighting assistance deployments to the USA in 2000 (northern Rocky Mountains fires in Montana and Idaho) and 2002 (Pacific North-West fires in Oregon and northern California).

8 Early in my career I served 13 years as a commissioned officer in the Royal Australian Navy, where after an initial period of service bridge watchkeeping in a range of warships, I became a command and control specialist, instructor and assessor in firefighting and damage control, before a career change to forestry and bushfire control.

9 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.

Scope of evidence

10 I have been asked to prepare evidence in relation to landfill fire risks. This includes:

(a) Comments on ORC peer review;

(b) Comments on the section 42A report;

(c) Responses to matters raised in submissions as they relate to landfill fire risk.

Introduction

11 I have identified the key themes of the submissions relating to landfill fire concerns. In response to the submissions, I have analysed the controls already proposed for the project and put forward some additional measures. My evidence should be read in conjunction with Anthony Dixon's evidence to provide a complete picture of the response to submissions on fire concerns.

Response to matters raised in submissions

12 Key themes for fire risk concerns were identified in the submissions. These are identified as follows and grouped by theme. Some of these issues have been addressed by Anthony Dixon in his evidence and I refer you to his documentation for the associated details.

Key concerns	Respondent	Where addressed
Batteries ignition risk	Saddle Hill Community Board (via Chairperson Scott Weatherall) South Coast Neighbourhood Society Inc (SCNS) (incorporated society registered by Sarah Ramsay on 14 May 2021) M Sydor (2 Bennett Road, Dunedin)	Refer evidence of Anthony Dixon
Inadequate monitoring measures for fires on site	A & M Granger – 731 Big Stone Road (opposite application site) Saddle Hill Community Board (via Chairperson Scott Weatherall)	Refer evidence of Anthony Dixon
Insufficient fire water supply	EJ Munro GJ Bennett Saddle Hill Community Board (via Chairperson Scott Weatherall) Scott, Justine, Thomas and George Weatherall SW Bennett	Refer evidence of Anthony Dixon
Fire risk due to overhead power lines through forestry	A & M Granger – 731 Big Stone Road (opposite application site)	Refer evidence of Anthony Dixon
Fire spreading off the site and evacuation routes for neighbours	A and K Lucking – 60 Big Stone Road Big Stone Forest Ltd, S & A Ramsey – 689 Big Stone Road (opposite application site) A & M Granger – 731 Big Stone Road (opposite application site) EJ Munro GJ Bennett GL & EG McLeod Family Trust JAR McLeod, PA McLeod – 68 Big Stobe Road RJ King S & B Judd – 389 Big Stone Road (1.5 km east of application site) South Coast Neighbourhood Society Inc (SCNS) (incorporated society registered by Sarah Ramsay on 14 May 2021) Scott, Justine, Thomas and George Weatherall SW Bennett	Refer Paragraph 13 for information on access and fire breaks Refer evidence of Anthony Dixon for operational mitigation measures

Key concerns	Respondent	Where addressed
Fire service response time	Big Stone Forest Ltd, S & A Ramsey – 689 Big Stone Road (opposite application site) E Velenski – 261 Big Stone Road S & B Judd – 389 Big Stone Road (1.5 km east of application site) South Coast Neighbourhood Society Inc (SCNS) (incorporated society registered by Sarah Ramsay on 14 May 2021)	Refer evidence of Anthony Dixon for limitation of risk through exposed areas Refer Paragraph 14 for information on first response and training
Requirement for a fire management plan	JW Hancock S & B Judd – 389 Big Stone Road (1.5 km east of application site) Saddle Hill Community Board (via Chairperson Scott Weatherall) South Coast Neighbourhood Society Inc (SCNS) (incorporated society registered by Sarah Ramsay on 14 May 2021) Vianney Santagati	Refer Paragraph 15
Screening vegetation and ignition risk	Big Stone Forest Ltd, S & A Ramsey – 689 Big Stone Road (opposite application site)	Refer Paragraph 16
Fire risk due to landfill gas	AH McMillan – 291 Big Stone Road Big Stone Forest Ltd, S & A Ramsey – 689 Big Stone Road (opposite application site) P Early W Early Saddle Hill Community Board (via Chairperson Scott Weatherall) SC Hart – 291 Big Stone Road M Sydor (2 Bennett Road, Dunedin)	Refer evidence of Matthew Welsh

Fire spreading off the site and evacuation routes for neighbours

13 In relation to the statements made concerning the potential for a landfill fire to spread off-site into surrounding pine plantations and potentially beyond, the following comments are made specific to site access and fire breaks:

(a) The north-eastern edge of the landfill area is proposed to be occupied by the site's main entrance road (readily accessible by fire appliances) and built facilities, the proposed position of which will provide good mitigation of the risk of any landfill fire to spread beyond the landfill area to the north-east;

(b) The north-west and west of the landfill site area contains the main access road to the landfill areas (readily accessible by fire appliances) and is positioned along the lower edge of the landfill. Further, wetlands are situated adjacent to parts of the access road. This access road provides good mitigation of the risk of any landfill fire to spread beyond the landfill area to the north and north-west;

(c) The proposed western earth stockpile and attenuation basin lie immediately west of the landfill area, thus providing adequate risk mitigation of the risk of any landfill fire to spread beyond the landfill area to the west;

(d) The highest risk of fire escape from the landfill area is to the south-east or south. Pine plantations on neighbouring properties are located south and south-east of the site (south of Big Stone Road) – a vigorous landfill fire spreading toward the southern or south-eastern landfill boundary would have the potential to cause fire ignition in these plantations by means of airborne embers being lofted by fire convection and blown across Big Stone Road;

(e) Further, the slope of the land on which combustible materials are situated affects the rate of spread and intensity of any surface fire burning thereon. Fire runs much more quickly uphill than on flat ground, and much more slowly downhill. As a general rule, for every 10 degrees of uphill slope, a fire's rate of spread will double (relative to rate of spread across flat ground);

(f) From the landfill area, land slope rises toward the south-eastern perimeter adjacent to Big Stone Road. During the operational life of the landfilling operations, land elevation will rise approximately 30 metres from the lowest edge of the landfill area (north-western edge) to the high edge adjacent to Big Stone Road (south-eastern edge). Similarly, the landform rises up from the south-western edge of the landfill area toward the southern boundary, noting that slopes below Big Stone Road in the southern part of the site are proposed to retain a cover of pine forest, which can support a vigorous fire. For these reasons, mitigation of the risk of fire to spread from the landfill in a south or south-east direction is of particular importance;

(g) The original landfill design proposed a 10 metre wide perimeter strip (cleared) along the south and south-eastern boundaries of the landfill site to provide a fire break. The proposed perimeter strip is comprised of a 5 metre wide perimeter track to be constructed with each stage of the landfill around the landfilling boundary. The track will be

trafficable by tracked plant and landfill maintenance vehicles. In addition a 5-6m wide swale drain adjacent to the track will provide the minimum 10m wide fire break between the landfill and screening vegetation. The swale vegetation will be maintained to control fire risk as outlined in the Landfill Management Plan; and

(h) Following consideration of matters raised in submissions, and further consideration of risk mitigation strengthening along the southern and south-eastern site boundary, the following amendments to the design are proposed to strengthen fire risk mitigation along the south and south-eastern boundary:

(i) Prior to construction of the access track, a cleared area will be provided alongside the swale drain that can be accessed by the track mounted water cart (see Anthony Dixon's evidence). A minimum 10 metre wide fire break will be maintained;

(ii) Two emergency access points, accessible by Fire and Emergency New Zealand (FENZ) firefighting appliances are proposed – one near the site entrance near the north-eastern corner of the landfill area, and the second accessed through a proposed emergency access gate (from Big Stone Road) at the south-eastern corner of the landfill area. These design enhancements along the south-eastern boundary will provide improved access for fire appliances to the south-eastern boundary for response to any fire in the landfill near the south-eastern boundary. Adequate vehicle turning space will be allowed for fire service vehicles to enter and exit the site in a forward motion;

(iii) The landfilling footprint will be cleared of woody vegetation including regenerating pine trees during the first stage of works, and remnant grasses or vegetation will be mowed/maintained up until excavation for construction of the landfill cell. This will further assist in containing any landfill fires within the site – providing a clear zone between the active landfill during stage 1 and the southern perimeter; and

(iv) The proposed landfill design enhancements to further mitigate the risk of a landfill fire breaching the southern/south-eastern boundary are considered prudent and appropriate risk controls.

Fire service response time

14 In relation to the statements made concerning fire service response time and first response by trained on-site landfill operations staff, the following comments are made:

(a) It is not proposed that FENZ will provide 'first response' to any fires initiating in the landfill area;

(b) First response will be by on-site landfill operations personnel, undertaken in accordance with the proposed Landfill Fire Management Plan (see paragraph 18 below for recommended plan inclusions);

(c) Surface fires in landfill can be ignited by a variety of means, most commonly from batteries or chemicals or hot/smouldering materials in waste loads (Anthony Dixon's evidence explains these issues in more detail). It is standard and good industry practice for waste loads to be monitored visually as they are deposited onto the landfill and spread, with any incipient fires or smouldering heat sources to be extinguished at or close to source during first response by smothering with inert (non-combustible) material and/or extinguishing with water;

(d) Typically, a high proportion of landfill fires are extinguished at source by landfill operations personnel using landfill machinery and water carts during first response, without the need for attendance or assistance from fire and emergency services;

(e) It is relatively rare, but possible, that some landfill fires may develop beyond the capability of on-site first response resources to control, such that FENZ assistance is required to manage and effect control of a fire incident. Commonly, this is where the fire involves a sub-surface fire component. Sub-surface fires are typically very slow moving (under 1 metre per hour), but can require response resourcing levels beyond a 'first response' level to control;

(f) A fire and emergency service response time of 30 minutes is considered adequate for landfill fire assistance provision, noting that the landfill site is approximately 25 km driving distance from the Dunedin CBD, with the first 20 km being on high quality sealed road, most of which is dual carriageway (NZ State Highway 1);

(g) It is also relevant to consider the fire and emergency response time in the context of other risk controls including mitigation measures such as provision of site access, firebreaks, and inert cover on non-

active landfill areas; all of which serve to assist containment of any landfill fire. Further, on-site first response action serves to retard early fire development and spread while the fire and emergency services response is mobilised;

(h) In the above context, and noting that first response is effected by on-site resources, the FENZ response time from Dunedin is considered adequate; and

(i) Onsite landfill operations staff will be trained to provide first response phase actions in the event of a fire. Equipment and resources will be readily available as outlined in the evidence of Anthony Dixon.

Requirement for a fire management plan

15 In relation to the statements made concerning the requirement for a fire management plan, the following comments are made:

(a) The project documentation identifies that a fire management plan would be prepared for the site. A Fire Preparedness and Response Plan included in the Landfill Management Plan with the following inclusions is considered to be satisfactory:

(i) Introductory section describing the key site features (and providing a location map), the scale and type of landfilling operations undertaken at the site, outlining the business/operating hours and normal on-site workforce presence operating the site (and after hours arrangements), the potential fire ignition risks associated with the site that are sought to be managed, and identifying the purpose and objectives of the plan, accountabilities for preparing and approving the plan, and its future review/update requirements;

(ii) A fire prevention section outlining the measures undertaken to prevent fires from igniting in the landfill and any other areas of the site with the potential for on-site activities to start a fire;

(iii) A fire detection and reporting section, outlining both the business hours and afterhours arrangements for fire detection, and procedures for reporting and notification (e.g. to emergency services, neighbours, regulators and internal management). The section should cover detection methods for both surface, and sub-surface fires;

(iv) A fire risk mitigation and readiness section, outlining (and depicting key site features on a map) key fire risk mitigation features and activities, including:

(A) Site access road network;

(B) Main and emergency entrance gate locations;

(C) Water source locations and details of water access for fire response;

(D) Normal landfill cover procedures and how they serve to mitigate fire risk (and any variations to these in particular circumstances);

(E) Soil cover supply locations for available for fire response;

(F) Perimeter and other fire break locations and specifications;

(G) On-site command point for control and coordination of any fire response operations;

(H) On-site equipment types, capabilities, and availability for fire response; and

(I) Readiness requirements for after hours response;

(v) A fire response section, outlining how response to fires on site is to be organised and controlled, including:

(A) Fire response organisation (persons responsible for manging the response; and operating on-site equipment to be used during response, and arrangements for control transfer and support when emergency services arrive at the site);

(B) Operating procedure for fire response;

(C) Operating procedures for making the personnel, equipment and the site safe in the event of a spreading fire;

(D) Any triggers and arrangements/procedures for clearing the site of personnel not needed for response;

(E) Arrangements/procedures for monitoring and reporting smoke and fumes from fires; and

(F) Arrangements/procedures for residual fire risk monitoring after the fire is reported as contained or extinguished;

(vi) Incident reporting and cause investigation protocol;

(vii) Protocol for review and evaluation of fire causes, effectiveness of fire prevention, detection mitigation and response measures, and process for continuous improvement, including conducting regular simulated fire drills,

(viii) External notification protocols; and

(ix) Response and notifications contact details directory.

Screening vegetation ignition risk

16 Following due consideration of submissions made concerning the screening vegetation ignition risk, the following changes and enhancements of vegetation screen planting are proposed which adequately address the fire concerns raised:

(a) Along the south-eastern boundary along Big Stone Road, a 10 metre wide landscape strip planting comprising two rows of fast-growing exotic pine (*Pinus radiata*) with native Kanuka (*Kunzea ericoides*) and Totara *(Podocarpus totara*) was originally proposed. The further intention was to remove the pine trees once the native trees are fully established in approximately 30 years.

(b) Noting that Kanuka is one of the NZ native plant species with the highest flammability, amendments to the screening design and implementation are proposed to satisfactorily address the screen planting flammability concerns raised, with the following changes to the screen planting design to be made:

(i) An alternative species with flammability risk that is lower than Kanuka will be proposed along this boundary – the selected species is discussed in the evidence of Rhys Girvan and has been informed by FENZ's "Flammability of plant species guide' as per https://fireandemergency.nz/home-and-community-fire-safety/flammability-of-plant-species/#low ; and

(ii) Once the two rows of pine trees which form part of the screen planting are approximately 15 years old (and the native plant

component of the screen has reached maturity, all lower branches of the pine trees up to 6 metres from ground level will be pruned. This will maintain the integrity of the screen planting while reducing the risk of any fire climbing into the crowns of the pines.

Conclusion

17 Key concerns raised in submissions relating to the risk of fires leaving the site and impacting nearby residents have been considered, and recommendations for appropriate design improvements made in response to those submissions. The key boundary of concern was identified as the south-eastern boundary of the site.

18 As outlined in the response to submissions, a number of management measures acting in aggregate are required to ensure that the risk of fire escaping beyond the proposed landfill site is adequately managed.

19 The additional mitigation measures that have been proposed to provide improved and appropriate mitigation of the risks of the potential for a landfill to spread from the landfill site include:

(a) Fire services emergency access points at each end of the south east boundary of the landfill – these provide access for fire response equipment and FENZ appliances to gain access for fire control operations along the south-eastern boundary;

(b) A 10 metre wide firebreak surrounding the landfilling areas that can be accessed by a tracked water cart, and tracked earthmoving machinery at all times;

(c) Amended screening vegetation design to reduce the fire risks along the south-eastern boundary;

(d) Clearing all woody vegetation from the landfill footprint from the commencement date of the project; and

(e) Further clarification on the contents of the Fire Preparedness and Response Plan.

20 These measures would be coupled with appropriately designed monitoring and maintenance programs and operational procedures as outlined in the evidence of Anthony Dixon.

21 The suggested landfill fire management measures outlined in the response to submissions are consistent with current and prudent industry practice in relation to landfill fire management.

Paul de Mar

29 April 2022