

**BEFORE THE MANAWATU-WANGANUI REGIONAL COUNCIL**

**UNDER** the Resource Management Act 1991

**IN THE MATTER OF** a review of conditions under section 128(1)(a)(iii) and a change of conditions under section 127 of the Act of the Horowhenua District Council's resource consents for discharges at the Levin Landfill

---

**SECTION 42A REPORT OF DEBORAH RYAN**

**ASSOCIATE AIR QUALITY CONSULTANT**

**25 August 2016**

---

## **A QUALIFICATIONS AND EXPERTISE**

- 1 My full name is Deborah Anne Ryan.
- 2 I have a Bachelor's Degree in Biotechnology and Bioprocess Engineering from Massey University, Palmerston North (1991) and I am a member of the Clean Air Society of Australia and New Zealand.
- 3 I have 24 years' of experience in the air quality and resource management fields. I spent eight years as an Air Quality Specialist with the Manawatu-Whanganui and the Waikato Regional Councils. I have been employed as a Senior Air Quality Consultant with Jacobs New Zealand Limited (formerly Sinclair Knight Merz) for the last 15 years. I have extensive experience in air quality studies, in particular, preparing and reviewing a wide range of air quality effects assessments, and in managing and reporting on air quality monitoring programmes. As an air quality specialist, I have been responsible for reporting and presenting specialist advice to council resource consent hearings on multiple projects.
- 4 My experience with assessing the effects on air quality from landfill developments include involvement in consents and/or monitoring of numerous landfills across New Zealand including: AB Lime Southern Regional Landfill, Buttlers Landfill (West Coast), Burwood Landfill (Christchurch), Awapuni Landfill (Palmerston North), Tirohia and Hampton Downs Landfills (Waikato) and Eketahuna and Bonny Glen Landfills in the Manawatu-Wanganui Region. I have also evaluated the reverse sensitivity effects from a residential development in the vicinity of the Silverstream Landfill in Upper Hutt and a prison development adjacent to Hampton Downs Landfill in North Waikato, and I provided peer review input on the Greenmount Landfill.
- 5 I have assessed multiple activities that give rise to dust and odour effects, and the control and mitigation measures used to reduce the level of effect, including those related to industrial facilities (grain drying, feedmills, sawmills, fertiliser storage and handling, cement plants and wood pellet manufacture), quarries and mines (Glencoal, AB Lime, Winstone's Pokeno, Waihi Gold, Spring Creek, New Vale, Milburn Bombay Hill, Solid Energy Rotowaro), sewage treatment plants at Hamilton, Wanaka, Levin and Shannon, waste disposal to land at Tarras and Synlait Milk (Canterbury), meat or fish meal facilities at Te Aroha, Tuakau, Horotiu, Dannevirke, Oringi, Whanganui, Nelson, Mosgiel, Dunedin and Levin, and fellmongeries at Whanganui, Shannon, and Green Island (Dunedin).

6 I have been contracted to provide specialist advice on air discharge consent matters to regional councils and District Health Boards (DHB) including the Manawatu-Wanganui Regional Council, the Waikato Regional Council, the Otago Regional Council, Waikato DHB and Health Southland. I was the principal author of the Ministry for the Environment's *Good Practice Guide for Assessing and Managing Odour in New Zealand* (2003) and I was contracted as the peer reviewer for the Ministry for the Environment's *Good Practice Guide to Assessing Discharges to Air from Industry* (2008).

7 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court's Practice Note (2014), and I agree to comply with it as if this hearing were before the Environment Court. My qualifications are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

## **B MY ROLE**

8 I am engaged by the Manawatu-Wanganui Regional Council (Horizons) to provide technical advice on the air quality aspects for the Section 128 review of discharge permit 6011 (the Review) held by Horowhenua District Council (HDC) for the Levin Landfill.

9 I undertook a site visit with Horizons consent team and HDC representatives on the 11<sup>th</sup> of March 2016. I have reviewed the documentation for the Review and related background information, principally two MWH reports that were commissioned by HDC to investigate odour issues at the landfill, and I have reviewed the submissions received on the notification of the Review. I attended the prehearing meeting, which took place on 6<sup>th</sup> of April 2016 and I participated in caucusing with the HDC and Neighbourhood Liaison Group (NLG) air specialists, which took place on the 10<sup>th</sup> and 11<sup>th</sup> of August 2016<sup>1</sup>.

10 The principal documents I have reviewed include:

- Notice of Review, Greg Bevin, Horizons Regulatory Manager, 30 October 2015<sup>2</sup>
- Levin Landfill – Response to Notice of Review, Prepared for the Horowhenua District Council, November 2015<sup>3</sup>

---

<sup>1</sup> Tab 2, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

<sup>2</sup> Tab 3, Volume 1, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

<sup>3</sup> Tab 4, Volume 1, Resource Consent Hearing, Response to review of conditions – Levin Landfill.

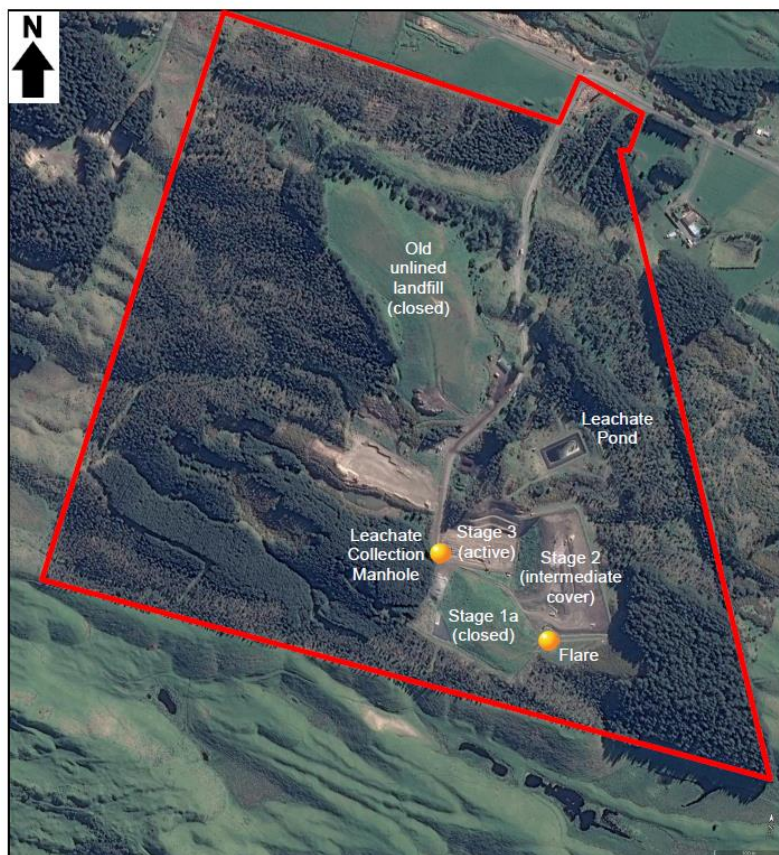
- MWH Report, Levin Landfill Odour Assessment, February 2015 (Odour Assessment) including Appendix E Levin Landfill Odour Management Plan (the MWH Report)<sup>4</sup>
  - MWH Letter, Continuous Ambient Air Quality Monitoring for Hydrogen Sulphide, Levin Landfill, 10 July 2015<sup>5</sup>
  - MWH letter, From D Boddy to D Ryan, Levin Landfill Discharge Permit 6011 – Proposed Conditions, 4 August 2016 (Attachment B to this report).
- 11 The landfill is situated at 665 Hokio Beach Road, four kilometres (km) west of Levin at the western edge of the Levin urban area and 1.5 km east of the Hokio Beach community. Key characteristics are that:
- 11.1 The site is located in dune country which is relatively low lying. The site comprises a central gully system aligned east to west and is enclosed by two broad rounded ridges; and
- 11.2 The area around the landfill is rural in nature with farming including pastoral and cropping activities. Within a one kilometre radius, there are twelve residential dwellings and the Ngatokowaru Marae to the northeast and four residential properties to the northwest. The site is surrounded by forestry consisting of *Pinus Radiata*.
- 12 The MWH Report presents multiple wind roses in Appendix D. A wind rose of data collected at Levin Automatic Weather Station (AWS) is shown as Figure D-1 for 2008 – 2012. The wind rose is provided as Attachment A to this report for ease of reference and shows that prevailing winds (and the strongest winds) are from the west through to the north-northwest. Winds from the east and east-northeast are also relatively common. Calm winds below 0.5 (metres per second) occur around 4.2%. Winds from the south and west-southwest tend to be infrequent.
- 13 Figure 1 below, taken from the MWH Report (Figure 1-4) is an aerial photo that shows the nearest residence to the landfill site, which is at 645 Hokio Beach Road (The Grange's property). The residence is approximately 300 metres northeast of the landfill's leachate pond and 500 metres northeast of stage 3 and 400 metres north-northeast of stage 2.

---

<sup>4</sup> Tab 4, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

<sup>5</sup> Tab 5, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

**Figure 1 Landfill location, stages and odour sources (MWH, 2015)**



- 14 I note that during the site visit on the 11<sup>th</sup> of March 2016 the active fill area was actually taking place over Stage 2, with active filling occurring at the southern end, which is shown in the photograph below (Figure 2). The Stage 2 active area was covered in sand, which is in use as a daily cover. Figure 3 is a photograph taken at the base of Stage 3 with the void area shown for future filling. This area was covered in sand and covered over with mulch, which I understand is currently used for intermediate cover. I also observed an area, which I understand was part of Stage 3, where only sand had been applied although filling would not as I understand it occur over stage 3 for an extended period.

**Figure 2 Active Tipping Face on Stage 2 (11 March, 2016)**



**Figure 3 Stage 3 landfill area with sand and mulch intermediate cover (11 March, 2016)**



- 15 The existing air quality in the area around the landfill is characteristic of a rural area with odours and dust from farming activities such as from silage, animal manure, fertiliser spreading and unsealed roads.

## **C METHODOLOGY OF MY REVIEW**

- 16 My approach to the Levin Landfill consent review has been to review the proposed changes by Horizons and the response by HC. I have reviewed background information including odour studies prepared by MWH on behalf of HDC, undertaken a site visit and used my experience to formulate recommendations on the proposed changes to Consent 6011.

- 17 The scope of my report pertains to air discharges from the operative landfill (shown as stages 1, 2 and 3 in Figure 1) and associated leachate and landfill gas (LFG) management activities. I understand there is a separate consent number 106798, which was changed under application APP-2013016220.01 that authorises the discharge of combustion gases from flaring of landfill gas<sup>6</sup>. I understand that the original consent allowed for landfill gas discharges via seepage through the cap. The changed consent required that a flare (replacing a current flare that is not operational) be installed by 1 July 2016. There is no requirement within the consent to operate the flare (see the advice note to Condition 7). The consent relating to air discharges from the flare is outside the scope of this review as notified by Horizons, although in my view addressing LFG is the critical issue for addressing the effects of odour beyond the boundary of the site.
- 18 I have prepared my advice with reference to national guidance and national environmental standards as follows:
- *Good Practice Guide for Assessing and Managing Odour in New Zealand* (MfE, 2003)
  - *Good Practice Guide to Assessing Discharges to Air from Industry* (MfE, May 2008)
  - Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (NESAQ)
  - WasteMINZ Technical guidelines for disposal to land (April, 2016).
- 19 My report considers:
- The matters raised by Horizons in relation to proposed additional conditions of consent 6011 for air discharges;
  - Matters relating to air and odour raised in submissions; and
  - Issues in relation to the above that were discussed in the air specialist caucusing of the questions from the Whakawatea Forum (10<sup>th</sup> and 11<sup>th</sup> of August)<sup>7</sup>.
- 20 My views as to the extent of the effects and causes of odour from the site: are based on information that I have been provided, the MWH reports, Horizons monitoring staff assessments

---

<sup>6</sup> Tab 7, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

<sup>7</sup> Tab 2, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

(compliance reports) and my experience of landfill odour from other sites. The focus of this evidence is to assess the effects of the proposed changes to Consent 6011.

## **D SECTION 128 REVIEW PROPOSED CHANGES TO DISCHARGE PERMIT 6011**

- 21 The Notice of Review<sup>8</sup> (Horizons, October 2015) sets out proposed changes to Discharge Permit 6011. Horizons' proposed changes (shown as underlined text) are by way of additional conditions to address management and operational aspects at the landfill in order to reduce odour. The aspects covered in the Review include requiring daily and intermediate cover of areas used for landfilling, surface monitoring of methane gas, a proposed biofilter to treat odour (landfill gas) extracted at the leachate sump; and further investigation, remediation and monitoring of odour from the site.
- 22 The rationale for the Review, stated by Horizons, is that there has been an ongoing odour issue with no apparent solution proposed by HDC. Horizons further states that the purpose of the Review is to *“examine current best practice as in terms of capping of the landfill, surface emission testing and standards and what further investigation can be carried out and mitigation measures implemented to avoid noxious, dangerous, offensive or objectionable odours beyond the boundary of the site.”* I discuss the proposed changes to consent conditions and HDC's response to the proposal in turn below. I then provide my recommendations in relation to the subject conditions in conjunction with areas of agreement from the air specialist caucusing (10<sup>th</sup> and 11<sup>th</sup> August 2016).
- 23 I have, in the main, limited my recommendations to matters that have been raised within the scope of the Review, and I have noted any instances where my recommendations fall outside the scope of matters raised in the review. I note that the scope of the air specialist caucusing of the Whakawatea Forum questions was wider than the scope of the conditions covered in Horizons notified review of consent 6011. I have referenced these matters where I consider them important to achieving a reduction in adverse effects from odour arising from the landfill discharges.

---

<sup>8</sup> Tab 2, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.



## E DAILY COVER

24 Horizons proposed new condition 3(c) is to address the need for daily cover over the operational fill area or working face at the end of each day. Horizons notified review proposes that daily cover is to consist of 150 mm of soil or clay, or an alternative where it can be demonstrated to provide comparable control. Horizons proposed wording specifically excludes raw sand as a daily cover.

25 In the response to the Review, HDC states that rather than being specific about the depth and nature of the cover, the consent condition reflects the outcome to be achieved. An update to the HDC position was provided in an MWH letter addressed to me dated 4<sup>th</sup> August 2016 (Attachment B). MWH proposed a minimum thickness for daily cover of 150 mm at the end of each working day, and incorporated the wording

*“that daily cover material may comprise of sand, soil or mulched woody material and should be applied to ensure effective odour control.”*

26 In considering what form of daily cover is likely to be effective for odour control, I refer to the WasteMinz Guidelines. The Guidelines state<sup>9</sup> for landfill site selection an assessment of geology and site soils should consider:

*the availability of on-site materials for lining, cover and capping. Soils with a high percentage of clay are generally the preferred soil type;*

27 The WasteMinz Guidelines state that sand is not recommended as a location to site landfills, due to the risk of off-site movement of leachate and landfill gas. Daily cover options are listed in the WasteMinz Guidelines. Options for daily cover materials include natural soils such as:

- *soils or clays stockpiled from cut operations during landfill construction;*
- *soils or clays imported and stockpiled for use as cover; and*
- *Incoming inert waste materials suitable for stockpiling and use as daily*

28 The WasteMinz Guidelines<sup>10</sup> also provide for alternative daily cover options, with selection being dependent on local circumstances:

---

<sup>9</sup> Page 49

<sup>10</sup> Page 114 - 115

- *Low quality compost, mulch or shredded green waste imported for use as cover;*
- *Manufactured cover materials, including: spray-on pulp or foam; geosynthetic blankets; small weave netting; and heavy duty reusable plastic sheets or tarpaulins; and*
- *Materials accepted for disposal that may also be suitable for use as cover in some circumstances, including: sawdust; - contaminated soil (which complies with waste acceptance criteria); - ash (which complies with waste acceptance criteria); stabilised sludge; and paper pulp.*

29 The WasteMinz guidelines provide reasonable flexibility in selecting a daily cover material and include small weave netting, which would clearly be permeable to odour. In the air specialists' caucusing, we discussed the issue of sand as a daily cover and noted that the working face itself had not been identified as a dominant source of odour, and that sand at the specified minimum depth may be appropriate as a daily cover given its availability on site. This is provided that mulched woody material would be blended as needed to provide "effective odour control". Hence, we all agreed with the updated MWH/HDC proposed wording for condition 3c as per the MWH letter. This was partially on the basis that an improvement in intermediate cover material was seen as the higher priority as I discuss below.

## **F INTERMEDIATE COVER**

30 Horizons' proposed new condition 3(d) is to address the need for intermediate cover to be placed over daily cover on areas that will not receive fill or final cover for more than three months. The combined depth of the cover is to be 300 mm. Condition 3(d) specifically excludes raw sand for use as intermediate cover.

31 HDC seeks that the exclusion of raw sand as an intermediate cover be deleted from Horizons' proposed condition ie that sand should be able to be used. In the MWH letter (and the air expert caucusing notes), Doug Boddy proposes the following on behalf of HDC:

*"From the commencement date of the decision of the 2015 review of conditions, the Consent Holder must ensure that intermediate cover is placed over daily cover to close-off a fill area that will not receive additional lifts of waste or final cover for more than three months. The combined depth of cover, including daily cover, over the waste shall be a minimum of 300 millimetres. Intermediate cover material should be applied to ensure effective odour control and should comprise of uncontaminated soil and mulched woody material, and include a clay layer on top*

*of the intermediate cover. It is noted that this is likely to result in both partially-capped (temporary cap) and permanently-capped (final cap) areas. Intermediate cover shall be stabilised within 20 working days of completion.”*

32 The WasteMinz guidelines state that the objective of intermediate cover is: to minimise water ingress and odour in areas subject to significant delay in further waste placement. Intermediate cover is used to close off a cell that will not receive additional lifts of waste or final cover for some time and the depth of soil used as intermediate cover will be depend on:

- the length of time until cells will be re-opened;
- types of waste material;
- requirements to minimise leachate production; and
- requirements for landfill gas capture and odour minimisation.

33 As agreed by all air specialists in caucusing, intermediate cover is more critical than daily cover for controlling landfill gas and odour. A key limitation at the Levin Landfill is that the landfill is located in sand country and therefore there is an absence of suitable cover materials with a high percentage of clay. In my view, sand as an intermediate cover is not consistent with modern landfill practices. Modern landfills are generally located at sites where the preferred lower permeability soil types are available.

34 Given the above, I agree with Horizons’ proposed condition that raw sand be excluded because it is not a suitable material for intermediate cover due to its porosity and inability to contain both landfill gas and accordingly odour. A further consideration is that in the event that a landfill gas collection and flaring system is commissioned (as per the flare consent permit number 106798)<sup>11</sup>, then the system may result in air ingress if the landfill is not appropriately covered. Air ingress can be a concern for deep seated fires (as referred to in condition 8 of the flare consent). While HDC’s proposed wording for the intermediate cover condition includes a clay layer on top, the depth is unspecified.

35 In my view, the terminology in the HDC proposed condition relating to intermediate cover and temporary capping is confusing and better definition of these terms would be helpful in developing an agreed set of conditions. I recommend further clarification of this condition.

---

<sup>11</sup> Tab 7, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

- 36 I note that under Condition 14 of consent 6009 a Landfill Management Plan is required to include operational, intermediate and final capping requirements<sup>12</sup>. In my view, these terms are poorly defined in the current version of the LMP<sup>13</sup>.

## **G SURFACE EMISSION MONITORING**

- 37 Horizons' new condition 3(e) is to address the need for monthly surface emissions monitoring for all areas of landfill with final and intermediate cover and over the biofilter surface. Horizons' condition excludes monitoring where there has been any rain in the previous 72 hours.
- 38 HDC has suggested minor wording changes, which I agree provide clarity to the condition and seeks to allow monitoring so long as there has been no more than 75 mm rain in the 72 hours prior to the monitoring.
- 39 I have reviewed available guidance on surface emissions monitoring from the Environment Agency (EA) of Wales<sup>14</sup> and Environmental Protection Agency (EPA) of Ireland<sup>15</sup>. The EA states that no measurements should be taken immediately after a prolonged period of heavy rainfall or where there are areas of standing surface water. Likewise the EPA states that preferable meteorological conditions are those that avoid periods of particularly heavy rainfall and locations where standing water is present.
- 40 The WasteMINZ Guideline Appendix J4 states that site conditions should be dry and wind velocities less than 15 km/hr on average. The National Environmental Standards for Air Quality Users Guide<sup>16</sup> refers to monitoring in accordance with procedures available from the Ministry for the Environment (MfE). I obtained a copy of the Instantaneous Surface Monitoring (ISM) monitoring procedures from MfE<sup>17</sup>, which states on the day of monitoring, the site should be dry, less than 0.5 mm of rain having fallen for at least two days and wind speed should be less than 25 km per hour ideally 5 – 10 km/hour.

---

<sup>12</sup> A final cap is defined in permit 6010 as a minimum thickness of 700 mm of a material with a permeability of no greater than  $1 \times 10^{-7}$ .

<sup>13</sup> Tab 6, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

<sup>14</sup> Guidance on monitoring landfill gas surface emissions, Environment Agency Wales, LFTGN07 v2 2010

<sup>15</sup> Air Guidance Note 6 (AG6) Surface VOC Emissions Monitoring on Landfill Facilities, Environmental Protection Agency, Ireland

<sup>16</sup> Ministry for the Environment, 2011 Users' Guide to the Revised National Environmental Standards for Air Quality, 2011, pg. 110.

<sup>17</sup> E-mail correspondence from Nigel Clarke, MfE, 13 April 2016, [ISM monitoring protocol RevA](#).

41 In MWH's letter addressed to me dated 4<sup>th</sup> August 2016 (Attachment B) Doug Boddy proposed on behalf of HDC a revised condition 3e as follows:

*3(e) The Consent Holder must carry out monthly surface emission testing for all areas of the landfill with final or intermediate cover, and the bio-filter bed. The monitoring of surface emissions shall be undertaken utilizing emission testing methods that have been given prior written certification as to their appropriateness by the Manawatu-Wanganui Regional Council's Regulatory Manager. The monitoring of surface emissions shall not be undertaken during or immediately after heavy rainfall or during strong wind speed conditions, and the meteorological conditions at the time of the monitoring shall be provided in the monitoring report ~~following 72 hours with no rain and on any day where the average wind speed is less than 15 kilometres per hour.~~*

42 I agree with HDC that because there is a requirement to monitor on a monthly basis, then it may not always be practical to achieve the ideal weather conditions. I would therefore recommend an advice note for the condition to incorporate the general good practice principles provided in the guidance ie ideally weather and ground conditions should be dry with less than 0.5 mm of rain having fallen for at least two days, and wind speed should be less than 25 km per hour ideally 5 – 10 km/hour.

43 In the air caucusing, the specialists attached a surface monitoring method for methane based on NSW and Vic EPA guidance. We recommended that the monitoring methodology for ISM be incorporated in the site's Landfill Management Plan (LMP)<sup>18</sup>.

44 New condition 3(f) is to address the need for a threshold level for monitoring of methane, which is proposed by Horizons as 5000 ppm as the level where remedial action is to be taken for an exceedance. New condition 3(g) is to include surface emission monitoring results in the annual report. New condition 3(h) is to require ventilation of the leachate collection chamber to a biofilter within six months of the decision on the review. HDC agrees with the proposed conditions 3(f) to 3(h).

45 In my view, a lower methane threshold or "trigger for action" is appropriate to provide a margin of safety for action to be taken prior to assist in managing odour emissions. This is based on Jacob's experience with surface monitoring of methane over landfills. We have found such landfills typically have measured methane levels considerably lower than 5000 ppm. The 5000

---

<sup>18</sup> Condition 14 of Permit 6009 requires a Landfill Management Plan, although there is no provision specific to methane surface monitoring.

ppm level is a health and safety limit based on the Lower Explosion Level or LEL for methane at 25°C rather than an environmental or odour based limit.

46 In the air caucusing, all specialists agreed that it was appropriate to adopt a lower trigger for surface methane as a basis to require remedial action of the cap and/or intermediate cover areas. Based on the Victorian EPA guidelines the following levels were considered appropriate by the air specialists to provide a more proactive system for identifying and managing fugitive odour sources resulting from landfill gas emissions via the landfill surface:

- 100 ppm for 'final cap' areas; and
- 200 ppm for 'intermediate cover' areas.

## **H BIOFILTER MONITORING AND PERFORMANCE**

47 New condition 3(i) is to require an annual audit of the biofilter performance. HDC requested that the consent requirement be for a two yearly audit.

48 New condition 3(j) is to address the need for ongoing monitoring of the biofilter including: continuous display of differential pressure; weekly recording of pressure across the bio-filter bed; weekly general observations of the bio-filter condition including: weed growth, compaction and short circuiting; quarterly media moisture content of the upper two thirds layer for the first two years of operation and then six-monthly thereafter; quarterly monitoring of the pH of the bio-filter media in the upper two thirds layer for the first two years and then six monthly thereafter.

49 In MWH's letter addressed to me (Attachment B), D Boddy proposed on behalf of HDC, that the HDC agreed to an annual audit and also proposed revisions that maintained or strengthened performance and/or monitoring requirements in condition 3j and 3k: Conditions 3(h)(i)(j) and (k) were agreed with some minor modifications by the air specialists in caucusing (refer to response 14 of the air permit caucusing summary).

50 I understand that the biofilter has been designed to achieve an air flow rate of at least 50 cubic metres per hour per square metre of bed and that construction has already commenced. The suite of performance monitoring and monitoring conditions will ensure the performance of the biofilter going forward.

## **I ODOUR INVESTIGATION**

- 51 New condition 3(l) is to investigate and identify an odour source, which was implicated in the MWH letter summarising the 2015 hydrogen sulphide (H<sub>2</sub>S) monitoring. New condition 3(m) is to require the consent holder to remediate odour identified under condition 3(l) in the event that it originates from the landfill property. And new condition 3(n) is to require the consent holder to report to Horizons and the NLG on the outcome of the above within 20 days of completion.
- 52 HDC's response to the review is that they do not agree to conditions 3(l), 3(m) and 3(n) being included in the consent. In my view, issues around existing possibly unknown odour sources, and remediation, and communication of those matters are more compliance related than technical matters. As such, in the role of technical advisor, I have not provided recommendations in relation to these conditions.
- 53 I do, however, support the need for further investigation and control of odours beyond the measures already specified in the Review. Based on the information I have been provided and my site visit, I consider it likely that further measures (beyond the scope of those included in this review) will be necessary to reduce odour from the landfill to an acceptable level. Measures relate in particular to landfill gas collection and flaring as discussed in the air caucusing summary<sup>19</sup>.

## **J COMPLAINT MANAGEMENT AND RESPONSE**

- 54 New condition 6(A) is to require the Consent Holder to nominate a person to manage complaints received and ensure the person is available at all times to respond to complaints. HDC agrees with this condition.
- 55 New condition 6(B) is to require that any complaint received is responded to as soon as practicable and within 24 hours of the complaint. New condition 6(C) is to require the Consent Holder to notify Horizons as soon as practicable in the event of a complaint. HDC has suggested wording changes to both these conditions for clarity. I agree that the HDC changes assist with interpretation of the conditions.

---

<sup>19</sup> Tab 2, Volume 2, Resource Consent Hearing, Review of conditions and change of consent conditions – Levin Landfill.

## K ODOUR MONITORING

- 56 New condition 6(D) is to require the Consent Holder to undertake monthly odour surveys using a method consistent with the German VDI standard 3940. HDC agrees with the condition but considers that monitoring should only be needed along boundaries that have residential dwellings. In my experience, monitoring at a number of locations along the boundary can provide useful information about odour sources and their management, and therefore I do not support monitoring only on the boundary with residential dwellings.
- 57 I consider that HDC should develop a methodology based on the VDI<sup>20</sup> to be provided to and agreed with the Horizons' Regulatory Manager, including suitable locations for observations to be undertaken. The selection of locations should take into account factors such as topography, tree cover, prevailing wind direction, likely odour sources and sensitive receptors. For example the VDI states: *assessors can stand out in the open and are not in the immediate vicinity of houses, high walls, hedges, the edges of forests. In the event that the location is upwind of the landfill and no odour is identified, the observation time could be shortened.* In the air caucusing summary response to the Whakawatea question 6, the air specialists agreed with boundary monitoring for odour upwind and downwind of the landfill using a modified VDI, preferably with one or two independent trained assessors. The air specialists recommended that the modified VDI approach be documented in the LMP.
- 58 New condition 6(E) is to require the Consent Holder to undertake a weekly walk over survey to check for odour, and surface cracks etc. HDC initially disagreed with the new condition but in a revised position as per the letter from Doug Boddy (Attachment A), condition 6(E) is agreed with minor a modification in wording.
- 59 New condition 6(F) is to require the Consent Holder to keep a log of inspections, investigations and actions relating to the monitoring and odour inspections, with a summary presented in the annual report. HDC is in agreement with the proposed condition.

## L SUBMISSIONS

- 60 One-hundred and sixty-eight submissions were received relating to the review of the consent conditions for Levin Landfill. Many were pro forma submissions that stated in relation to the air discharges that they support Horizons focus on what further investigations can be carried out to

---

<sup>20</sup> VDI 3940 Blatt 2 / Part 2



avoid objectionable odours beyond the boundary of the site. As noted above, I also support the need for further investigations relating to odour based on the information I have reviewed.

61 There were a number of submissions that made additional comments specific to consent 6011, and I discuss these below.

62 E and D Grange who live at 645 Hokio Beach Road commented that they have “endured the stench from the Levin Landfill for two years”. The submitter notes that HDC has stated that they are responding to the odour issue and that HDC has undertaken the following actions:

- Pumped out leachate pond
- Monitored the air for three months
- Installed a weather station.

63 The submitters note, however, that these measures have not fixed the odour problem, which they state can get inside their house. The submitters have kept an odour diary, which has been provided to Horizons.

64 The submitters seek measures to remedy the stench problem. In my view, Horizons proposed changes to the conditions of consent will help to reduce odour emissions from the landfill operation, particularly the installation of the proposed biofilter to treat gas extracted at the leachate sump. As noted above, however, in my view further investigation and control of odour beyond the matters specifically addressed in this Review will be required. And I therefore, support the intent of proposed conditions 3(l) to 3(n). Specifically, in my view, the efficient collection and flaring of landfill gas needs to occur for there to be a sufficient reduction in odour beyond site boundaries.

65 Mid Central District Health Board’s Public Health Service (MCPHS) supports the review of the consent conditions and has one further recommendation in relation for discharge consent 6011 as new condition 6C:

*The consent holder shall notify a Manawatu-Whanganui Regional Consents Monitoring Officer as soon as practicable after becoming aware of any offensive or objectionable odour or any complaint from a member of the public regarding odour.*

66 The submitter supports this condition but recommends that the Medical Officer of Health be informed at the same time as the consent monitoring officer so that the Public Health Unit is aware of any issues, and is better informed to communicate with the public if required.

- 67 This request from MCPHS is not a technical matter and therefore outside the scope of my report. I understand this submission will be addressed by Andrew Bashford.
- 68 Rachel Selby of Otaki and the Ngātokowaru Marae Committee both support the conditions put forward by Horizons to eliminate offensive odours, although the submitters seek that the landfill be closed immediately. The relief sought is outside the scope of the Review as addressed by Andrew Bashford in his report.
- 69 The Hokio Neighbourhood Liaison Group (NLG) and the Hokio Environmental and Kaitiaki Alliance (HEKA) support Horizons proposals to stop objectionable odour emissions, which the submitters state has a major adverse effect on the lives of Hokio residents. The submitters seek conditions to avoid or prevent offensive odours beyond the landfill boundary. My comments in paragraph 65 above are also applicable to these submissions.
- 70 Pataka Moore of Otaki is opposed to the discharge of odour or contaminants in to the air and seeks tighter conditions on odour to reduce the smell. In my view, Horizons proposed changes to the conditions of consent will help to reduce odour emissions from the landfill. As discussed in the air caucusing summary, however, collection and flaring of the landfill gas (including improved capping and intermediate cover) are considered the priority to reduce offsite odour impacts.
- 71 The Water and Environmental Care Association Inc (WECA) notes that the odour issue has been ongoing with no apparent solution proposed. WECA supports the changes and additions proposed by Horizons.

## M CONCLUSIONS

- 72 In general, I support the new conditions proposed by Horizons with the modifications recommended and consider that they will assist in reducing odour emissions (and effects) beyond the boundary of the site. I consider that the larger issue relating to odour is the current lack of control of landfill gas, and it will be necessary to address landfill gas capture and flaring to ensure that odour effects beyond the boundary are acceptable and compliant with the existing condition 3 of consent 6011 relating to no objectionable or offensive odour.



---

Deborah Ryan  
25 August 2016

## ATTACHMENT A LEVIN WINDROSE

### Levin AWS – Annual and Seasonal Wind Roses

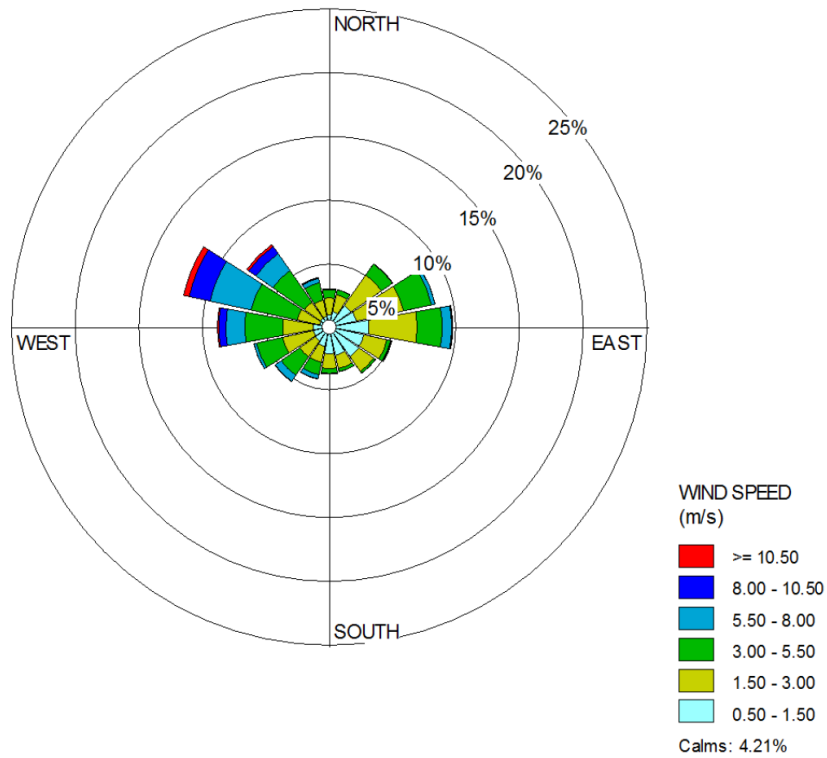


Figure D-1: Wind Rose for Levin AWS for 2008 to 2012

**ATTACHMENT B**

**LETTER FROM MWH TO D RYAN 4 AUGUST 2016**

Client Ref: L005

4 August 2016

Jacobs New Zealand Limited  
PO Box 10283  
The Terrace  
Wellington 6143

**Attention: Deborah Ryan**

Dear Deborah

### **Levin Landfill Discharge Permit 6011—Proposed Conditions**

MWH New Zealand Limited (MWH) was engaged by the Horowhenua District Council (HDC) to provide technical comments on Horizon Regional Council's (HRC) document entitled 'Review of Conditions of Discharge Permits 6009, 6010, 6011, 7289 and 102259 for the Levin Landfill—Schedule of Proposed Conditions' (referred to hereafter as the 'Schedule of Proposed Conditions') dated 30 October 2015.

In the document entitled 'Levin Landfill – Response to 2015 Notice of Review' (referred to hereafter as the 'Response to the Notice of Review') dated November 2015, HDC provided its response to HRC's Schedule of Proposed Conditions and set out a number of amendments to the proposed conditions.

Following our telephone conversation on 23 May 2016 we consider that it is necessary to make further amendments to the proposed consent conditions with regards to the discharge to air consent (number 6011) for Levin Landfill. These amendments to the conditions take into account some of your views and opinions and also line up with best practice.

The proposed changes to the conditions are set out in this letter in numerical order. I would be grateful if you could provide your comments or agreement to these conditions.

## **1 Condition 3C**

HRC's Schedule of Proposed Conditions proposes Condition 3C, which states:

*"From the commencement date of the decision of the 2015 review of conditions, the Consent Holder must place daily cover over the entire operational fill area by the end of each operating day. Daily cover may be 150mm of soil or clay generated on site or imported, but may also be one of a number of non-soil alternative daily cover options of an appropriate thickness where it can be demonstrated that they achieve a comparable level of control with respect to odour discharges, vermin, birds and litter. Raw sand cannot be used as daily cover."*

In its Response to the Notice of Review, HDC proposed the following amendments to the wording of Condition 3C, where deleted text is shown in blue with double strike-through (e.g. ~~deleted text~~) and new text is underlined in red (e.g. new text):

*"From the commencement date of the decision of the 2015 review of conditions, the Consent Holder must place daily cover over the entire operational fill area by the end of each operating day. ~~Daily cover may be 150mm of soil or clay generated on site or imported, but may also be~~*

~~one of a number of non-soil alternative daily cover options~~ Daily cover shall be of an appropriate thickness ~~where it can be demonstrated that they achieve a comparable level of control with respect to~~ such that odour discharges, vermin, birds and litter are kept to a practicable minimum. ~~Raw sand cannot be used as daily cover.~~”

During our telephone conversation on 23 May 2016 you made a comment that controlling “odour, vermin, birds and litter ... to a practicable minimum” may be difficult for HRC to enforce and that a mix of green waste could also be used as daily cover material.

Bearing in mind that the first sentence in Condition 3 states that: “There shall be no discharge of odour or dust from the landfill that in the opinion of a Regional Council Enforcement Officer is noxious, dangerous, offensive, or objectionable beyond the property boundary”, the purpose of the sub-conditions (3A to 3N) should be to provide further clarification on this matter.

Daily cover is applied progressively over the course of the working day and is completed prior to the closure of the site for the day, and given that there is already a requirement in the condition to ensure that there shall be no odour that is, in the opinion of an HRC enforcement officer, offensive or objectionable beyond the boundary of the site, MWH suggests the following amendments to the wording of Condition 3C:

*“From the commencement date of the decision of the 2015 review of conditions, the Consent Holder must place daily cover over the entire operational fill area to a depth of at least 150 millimetres by the end of each operating day. Daily cover material may comprise of sand, soil or mulched woody material and should be applied to ensure effective odour control. ~~Daily cover may be 150mm of soil or clay generated on site or imported, but may also be one of a number of non-soil alternative daily cover options of an appropriate thickness where it can be demonstrated that they achieve a comparable level of control with respect to odour discharges, vermin, birds and litter. Raw sand cannot be used as daily cover.~~”*

In selecting daily cover material, HDC (and HRC as the regulator) should consider:

- Availability;
- Permeability;
- Combustibility;
- Dust;
- Chemical contamination;
- Ease of application; and,
- Traction needs of vehicles.

The use of sand as daily cover material should not be prohibited given that there is a plentiful supply of sand at the site (it is a cost-effective solution), but occasionally it may be necessary to blend it with other non-putrescible material, such as soil or mulched woody material (MWM), such as wood chips or bark, to ensure effective odour control. HDC should avoid a build-up of layers of impermeable material (e.g. clay) which may impede the movement of landfill gas and leachate within the waste body. This is to prevent perched leachate within the landfill. Perched leachate and the build-up of layers of impermeable material have the potential to cause a number of issues within a landfill, such as, but not limited to, the following:

- Settlement, which is not only a health and safety concern, but may also cause damage to any buried gas collection pipework (see Section 2), where applicable;
- Interference with gas collection, making effective gas management difficult;
- Formation of differential lateral pathways for landfill gas, increasing the risk of migration and/or break-out of gas at the surface (i.e. fugitive landfill gas and odour emissions); and,
- Impeded removal of leachate.

HDC must exercise caution if using a blend of sand, soil and MWM as daily cover material, ensuring that at all times that it meets the environmental objectives of daily cover (and thus Condition 3C) and that it does not hinder effective and safe operation of the site. For example, if too much MWM is applied, or greenwaste is not shredded sufficiently fine, or if other materials are used, it may not provide adequate traction for the vehicles using the site. Additionally, blending the sand with other material such as soil and MWM, will reduce the potential for the onsite propagation of sand by wind, thus reducing the potential for dust nuisance effects beyond the boundary. However, it may also be necessary to dampen-down the daily cover material during dry and windy meteorological conditions, to control fugitive dust emissions.

The actual type and thickness of daily cover will depend on the nature and age of the putrescible waste it will cover at the working face, the meteorological conditions (including surface temperature, atmospheric pressure, wind speed and direction, solar radiation and rainfall), the proximity of sensitive receptors, and the rate of site filling.

HDC should keep an adequate supply of daily cover material onsite (sand, soil and MWM) in order to ensure that the depth (at least 150 mm) and type of cover material is effective in controlling odour and other matters which could cause nuisance, such as litter.

It is noted, however, that HDC or the landfill operator has no legal jurisdiction beyond the boundary of the landfill and therefore it is difficult to prepare consent conditions with respect to the control of litter nuisance offsite. HDC has installed litter fences around the site to take all practicable steps to reduce the potential for litter to be blown beyond the site boundary. In addition, HDC is currently operating a bird-scaring device and is controlling vermin. MWH considers, therefore, that the non-odour nuisance issues such as vermin, birds and litter should be deleted from the air discharge consent.

## 2 Condition 3D

HRC's Schedule of Proposed Conditions proposes Condition 3D, which states:

*"From the commencement date of the decision of the 2015 review of conditions, the Consent Holder must ensure that intermediate cover is placed over daily cover to close-off a fill area that will not receive additional lifts of waste or final cover for more than three months. The combined depth of cover, including daily cover, over the waste shall be a minimum of 300 millimetres. Raw sand can not [sic] be used as intermediate cover. Intermediate cover shall be stabilised within 20 working days of completion."*

For the reasons outlined above and to ensure consistency with Condition 3C, MWH suggests the following amendments to the wording of Condition 3D:

*"From the commencement date of the decision of the 2015 review of conditions, the Consent Holder must ensure that intermediate cover is placed over daily cover to close-off a fill area that will not receive additional lifts of waste or final cover for more than three months. The combined depth of cover, including daily cover, over the waste shall be a minimum of 300 millimetres. Intermediate cover material should be applied to ensure effective odour control and may comprise of sand, soil or mulched woody material, but may also include clay at the partially-capped and permanently-capped areas. ~~Raw sand cannot be used as intermediate cover.~~ Intermediate cover shall be stabilised within 20 working days of completion."*

The intermediate cover, as per industry best practice, is effectively a thicker layer of daily cover (as the wording in the condition itself infers) where tipping will not occur for approximately seven days or more, and is distinct from the partially final-capped area on Stage 2 (to control emissions from the landfill gas and odour emission 'hotspot' locations which were identified in MWH's odour assessment dated February 2015) and the permanently (final) capped areas (such as the old unlined landfill and Stage 1a). The use of capping on Stage 2 will not only reduce the release of odour and landfill gas (particularly at the emission



hotspots) but should also increase the efficiency of the landfill gas collection system. However, in order to prevent problems of perched leachate (and subsequent settlement, which may cause damage to buried gas collection system pipework), it may not be possible or appropriate to cap the entire area of Stage 2.

### 3 Condition 3E

HRC's Schedule of Proposed Conditions proposes Condition 3E, which states:

*"The Consent Holder must carry out monthly surface emission testing for all areas of the landfill with final or intermediate cover, and the bio-filter bed. The monitoring of surface emissions shall be undertaken utilising emission testing methods that have been given prior written certification as to their appropriateness by the Manawatu-Wanganui Regional Council's Regulatory Manager. The monitoring of surface emissions shall be undertaken following 72 hours with no rain and on any day where the average wind speed is less than 15 kilometres per hour."*

HDC has recently installed an automatic weather station (AWS) onsite to measure wind speed, wind direction, temperature, relative humidity, atmospheric pressure and rainfall.

MWH suggests the following amendments to the wording of Condition 3E:

*"... The monitoring of surface emissions shall not be undertaken during or immediately after heavy rainfall or during strong wind speed conditions, and the meteorological conditions at the time of the monitoring shall be provided in the monitoring report following 72 hours with no rain and on any day where the average wind speed is less than 15 kilometres per hour.*

The logic is to be more pragmatic and flexible with regards to what is considered to be the ideal meteorological conditions for the landfill gas surface emissions monitoring, without compromising the monitoring itself. As the monitoring will be undertaken on a monthly basis, as required by this condition, there may be a number of occasions during the winter (or other times of the year when rainfall amounts are high) when it is difficult for HDC to meet a strict 'no rainfall' criterion, thus rendering them effectively non-compliant through no fault of their own.

In the original wording of the consent condition, the constraints around the meteorological conditions for the monitoring is a reference to international best practice guidance on surface emissions monitoring of landfill gas (e.g. UK Environment Agency and the US EPA), which state that emissions are typically higher during dry and non-windy conditions and lower after significant rainfall events. Measurements should not, therefore, be undertaken during or immediately after a prolonged period of heavy rainfall or during moderate to high wind speed conditions. It is also noted that at the time that monitoring occurs barometric pressure should not be significantly higher or lower than the average for region and, ideally, should be fairly stable. Changeable barometric pressure conditions often give rise to higher fugitive odour and landfill gas emissions, compared with stable conditions.

75 mm of rainfall over 72 hours relates to a 'light' rainfall intensity event of a little over 1 mm/hour (on average), based on the MetService's definitions for rainfall intensity, as opposed to a period with strictly 'no rainfall'. A wind speed of 15 km/hr has been defined by the MetService as 'moderate' and is an instantaneous measurement rather than an average.

MWH recommends that the constraints around the meteorological conditions for the landfill gas surface emissions monitoring should be agreed with HRC and detailed in the Landfill Management Plan, as should the use of the onsite AWS data to verify that the monitoring was undertaken during and shortly after appropriate meteorological conditions (i.e. low or no rainfall, low or light wind speed conditions and stable barometric pressure). The AWS monitoring data should be reported along with the monthly surface emissions monitoring results.

#### 4 Condition 3F

HRC's Schedule of Proposed Conditions proposes Condition 3F, which states:

*"Surface emissions of methane, as determined by testing carried out by condition 3(e) shall not exceed 5,000 parts per million (ppm) in any single location. An exceedance of the 5,000 ppm requires remedial action to be undertaken within 24 hours and retesting within 24 hours of remediation being completed. If the second testing results in a continued exceedance at the same location then an action plan shall be developed and implemented to reduce methane concentrations below 5,000 ppm and details provided to the Manawatu-Wanganui Regional Council advised within 48 hours of the retest."*

The requirements of this condition are deemed to be appropriate.

With regards to your comment that it would be useful to add in a requirement for HDC to implement remedial action in the event that the surface emissions monitoring identifies any emission sources at the landfill which have the potential to exceed any New Zealand Workplace Exposure Standard (WES), I note that it is not typical for air discharge consents to address the Health and Safety at Work Act 2015 (HSWA).

Methane (CH<sub>4</sub>) is a simple asphyxiant (i.e. it has no other known health effects) and whilst it is potentially explosive, the lower explosive limit (LEL) is 50,000 ppm (5% by volume), which is well above the concentration limit specified in the consent condition of 5,000 ppm (0.5% by volume). Therefore, any exceedances of 5,000 ppm will be reported to HRC (including potential exceedances of the LEL for methane).

Any ad-hoc measurements of other compounds, such as hydrogen sulphide (H<sub>2</sub>S), if undertaken by HDC, should be reported against the 8-hour time-weighted average (WES-TWA) and 15-minute short-term exposure limit (WES-STEL) for H<sub>2</sub>S, which are 10 ppm and 15 ppm, respectively.<sup>1</sup> If any monitoring is undertaken for H<sub>2</sub>S, or other compounds, in addition to methane, the results should be forwarded to HRC, as required by Condition 3G (see below).

It is noted that the leachate collection manhole has been cordoned off by HDC and no site staff are permitted to enter the cordon without an appropriate landfill gas or methane monitor, personal protective equipment (PPE) and a health and safety plan/permit to work. In addition, MWH understands that site staff currently wear air quality monitors which sound an alarm in the event that ambient concentrations of a target pollutant exceed a pre-set trigger level.

#### 5 Condition 3G

HRC's Schedule of Proposed Conditions proposes Condition 3G, which states:

*"Records of surface emission testing must be included in the Annual Report and provided to Manawatu-Wanganui Regional Council on request."*

The requirements of this condition are deemed to be appropriate.

#### 6 Condition 3H

HRC's Schedule of Proposed Conditions proposes Condition 3H, which states:

*"Within six months of the commencement date of the decision of the 2015 review of conditions, the leachate collection chamber must be vented to a bio-filter. The bio-filter must be designed by a suitably qualified and experienced person."*

<sup>1</sup> Workplace Exposure Standards and Biological Exposure Indices, 7<sup>th</sup> Edition, Ministry of Business, Innovation and Employment, February 2013.

The requirements of this condition are deemed to be appropriate. However, as the design has now been finalised and the biofilter will be constructed and commissioned shortly, MWH recommends that the design drawings and technical details are provided to HRC at the earliest possible opportunity in order to satisfy the requirements of this condition, namely that the biofilter has been designed by a “*suitably qualified and experienced person*.” Refer to MWH’s letter dated 19 July 2016<sup>2</sup>, which contains a technical review of the proposed biofilter. Providing that the biofilter is designed and operated in accordance with best practice, MWH considers that there will be no objectionable or offensive odour to the extent that it causes an adverse effect at or beyond the boundary of the landfill site.

## 7 Condition 3I

HRC’s Schedule of Proposed Conditions proposes Condition 3I, which states:

*“The Consent Holder must employ an appropriately qualified person to undertake a comprehensive assessment of the bio-filter performance on an annual basis. The assessment shall include, but not be limited to, an evaluation of the media size distribution and composition and effectiveness in removing contaminants.”*

In its Response to the Notice of Review, HDC proposed the following amendments to the wording of Condition 3I:

*“The Consent Holder must employ an appropriately qualified person to undertake a comprehensive assessment of the bio-filter performance on ~~an annual~~ a two-yearly basis. The assessment shall include, but not be limited to, an evaluation of the media size distribution and composition and effectiveness in removing contaminants.”*

MWH recommends retaining the original wording for this condition, as proposed by HRC (thus requiring an annual assessment of the biofilter performance).

As pressure drop is expected to increase over time as the filter media decomposes and settles, causing the holes in the pipes to become blocked, or after heavy rainfall, HDC may wish to assess the performance of the biofilter on an annual basis, as per HRC’s original wording for the condition. Not only is it best-practice to undertake a performance test at the earliest possible opportunity following the establishment of the microorganisms within the media (e.g. within 6 to 12 months of commissioning the biofilter), but also because the media in the biofilter may need to be replaced (every 5 to 7 years) and so a more frequent performance test would avoid potential odour issues should, for example, the pressure drop become too great. Note that the media should also be raked and loosened on a minimum 3 monthly basis.

If the original wording of Condition 3I is retained, HDC will be required to undertake a “comprehensive assessment” of the performance of the biofilter on an annual basis. However, the performance criteria should actually be determined by HDC on a more regular basis, to ensure that it is effective in controlling odour and landfill gas emissions. MWH suggests that the annual report should summarise the following monitoring and inspection data:

- Daily visual inspection and recording of the state of the biofilter bed, particularly for signs of any short-circuiting, clogging of the bed, compaction and weed growth. This should also coincide with a weekly “check for odour” at the biofilter (and at other locations across the landfill site), which would involve undertaking a sniff test and scoring the odour intensity in accordance with MfE (2003),<sup>3</sup> as required by Condition 6E. The inlet gas fan and ductwork should be inspected daily and any maintenance undertaken should be recorded;

<sup>2</sup> Levin Landfill Biofilter Technical Review, letter reference ‘L004’, prepared for Horowhenua District Council by MWH New Zealand Limited, 19 July 2016.

<sup>3</sup> MfE, 2003. Good Practice Guide for Assessing and Managing Odour in New Zealand, Ministry for the Environment, June 2003.

- Weekly monitoring and recording of the pressure drop across the biofilter media to ensure that it is less than 100 mm water gauge;
- Weekly monitoring and recording of the biofilter media moisture content to ensure that it is between 40-60% moisture content. It is noted that Condition 3J specifies checking the media moisture content of the filter bed on a quarterly basis for the first two years of operation and then six-monthly thereafter, however, MWH does not agree with this and suggests that weekly monitoring and recording of the media moisture content is required to ensure that optimal conditions for the microorganisms are maintained;
- Monthly monitoring and recording of the pH of the media to ensure that it is between 6 pH and 8 pH. It is noted that Condition 3J specifies checking the pH of the filter bed on a quarterly basis for the first two years of operation and then six-monthly thereafter, however, MWH does not agree with this and suggests that monthly monitoring and recording of the media pH is required to ensure that optimal conditions for the microorganisms are maintained; and,
- Quarterly raking and loosening of the biofilter media, or as otherwise required, to reduce the potential for short-circuiting, clogging of the bed, compaction and weed growth.

In accordance with proposed Condition 6F (see Section 16), HDC is required to “maintain a log of all inspections, investigations and actions taken in accordance with all monitoring and odour inspection conditions” of consent number 6011. The condition also requires HDC to make the log available to the HRC on request, and a summary of all results and assessments should be presented in the annual report (as specified in Condition 3I).

## 8 Condition 3J

HRC’s Schedule of Proposed Conditions proposes Condition 3J, which states:

*“The Consent Holder shall measure and record the following parameters:*

- *Continuous display of differential pressure for the bio-filter;*
- *Weekly recording of pressure across the bio-filter bed;*
- *Weekly general observations of the bio-filter condition, including weed growth, compaction and short circuiting;*
- *Quarterly media moisture content of the upper two thirds layer for the first two years of operation and then six-monthly thereafter;*
- *Quarterly monitoring of the pH of the bio-filter bed media in the upper two thirds layer for the first two years then six monthly thereafter.”*

MWH recommends retaining the original wording for this condition, as proposed by HRC, rather than it simply being referenced in the Landfill Management Plan. For clarity and enforcement purposes, it is appropriate for the performance criteria to be retained in the consent conditions and it is standard practice in other resource consents. The Landfill Management Plan could still contain a reference to this condition and other relevant conditions of the consent.

As noted above, MWH recommends that weekly monitoring and recording of the media moisture content and monthly monitoring and recording of the media pH are required to ensure that optimal conditions for the microorganisms and the biofilter’s odour removal efficiency are maintained.

## 9 Condition 3K

HRC’s Schedule of Proposed Conditions proposes Condition 3K, which states:

*“The Consent Holder must ensure that the bio-filter and bed complies with the following limits at all times:*

- *The air flow rate shall not exceed 100 cubic metres per hour per metre of bed;*

- *The pH of the filter material shall be between 6 and 8 pH units;*
- *An even distribution of gas flow through the filter bed; and*
- *There shall be no short circuits of untreated air through and filter bed.”*

As discussed above, MWH recommends retaining the original wording for this condition (except for the minor correction noted below), as proposed by HRC, rather than referencing it in the Landfill Management Plan. Whilst the condition requires that the airflow rate should not exceed 100 cubic metres per hour per square metre of bed ( $\text{m}^3/\text{hr}/\text{m}^2$ ), best practice for a bark biofilter with a 1 m media depth generally requires an airflow rate of  $50 \text{ m}^3/\text{hr}/\text{m}^2$ . MWH understands that the biofilter has been designed on the basis of an airflow rate of  $50 \text{ m}^3/\text{hr}/\text{m}^2$  and should therefore meet the requirements of this condition.

MWH suggests the following amendment to the wording of Condition 3E:

*“The Consent Holder must ensure that the bio-filter and bed complies with the following limits at all times:*

- *The air flow rate shall not exceed 100 cubic metres per hour per **square** metre of bed;*
- *The pH of the filter material shall be between 6 and 8 pH units;*
- *An even distribution of gas flow through the filter bed; and*
- *There shall be no short circuits of untreated air through and filter bed.”*

## 10 Conditions 3L to 3N

HRC’s proposed Conditions 3L, 3M and 3N state:

- L. *“Within one month of the commencement date of the decision of the 2015 review of conditions, the Consent Holder shall investigate and identify the odour source identified in the MWH report titled Continuous Ambient Air Quality Monitoring for Hydrogen Sulphide – Levin Landfill and dated 10 July 2015.*
- M. *The Consent Holder shall remediate the odour source identified in condition 3(l) should the source be located on the Levin Landfill property.*
- N. *The Consent Holder shall provide a report to Manawatu-Wanganui Regional Council and the Neighbourhood Liaison Group within 20 working days of condition 3(m) being completed.”*

MWH recommends that these conditions are deleted as they are of a technical matter which can be dealt with relatively easily by HDC. HDC proposes to investigate the odour source to the west or north-west of the landfill, as identified in MWH’s letter dated 10 July 2015 (reference ‘L001’). MWH does not consider it appropriate to include these conditions, primarily because the odour emission source may not be located on HDC’s property (with the Levin Landfill site boundary) and is therefore beyond its control.

## 11 Condition 6A

HRC’s proposed Condition 6A states:

*“The Consent Holder shall nominate a liaison person to manage any air quality complaint received. The name and contact details of the liaison person shall be provided to the Manawatu-Wanganui Regional Council’s Regulatory Manager. The Consent Holder shall ensure a liaison person is available at all times to respond to odour or dust complaints.”*

As it is not realistic to expect HDC staff to be available at all times to respond to odour or dust complaints, should they arise, MWH recommends that this condition is amended as follows:

*“The Consent Holder shall nominate a liaison person to manage any air quality complaint received. The name and contact details of the liaison person shall be provided to the*

Manawatu-Wanganui Regional Council's Regulatory Manager. The Consent Holder shall ensure a liaison person is available ~~at all times~~ to respond to odour or dust complaints."

## 12 Condition 6B

HRC's proposed Condition 6B states:

*"The Consent Holder shall ensure any complaint received from a member of the general public regarding odour or dust is responded as soon as practicable and within 24 hours of the complaint being received, or at a time mutually agreeable with the party making a complaint."*

MWH recommends that this condition is amended as follows:

*"The Consent Holder shall ensure any complaint received from a member of the general public regarding odour or dust originating from the landfill is ~~responded~~ investigated as soon as practicable and within 24 hours of the complaint being received, or at a time mutually agreeable with the party making a complaint."*

The proposed changes are as per HDC's Response to the Notice of Review apart from the use of the word 'originating' rather than 'emanating'.

## 13 Condition 6C

HRC's proposed Condition 6C states:

*"The Consent Holder shall notify a Manawatu-Wanganui Regional Council Consents Monitoring Officer as soon as practicable after becoming aware of any offensive or objectionable odour, or any complaint from a member of the public regarding odour."*

MWH recommends that this condition is amended as follows:

*"The Consent Holder shall notify a Manawatu-Wanganui Regional Council Consents Monitoring Officer as soon as practicable after becoming aware of any offensive or objectionable odour originating from the landfill, ~~or any complaint from a member of the public regarding odour~~. An explanation as to the cause of the incident and details of any remedial and follow-up actions taken shall also be provided to the Regional Council Consents Monitoring Officer."*

The amendments suggested above are as per HDC's Response to the Notice of Review (except for the use of the word 'originating' rather than 'emanating') and would add extra clarity regarding the potential source of odour and the actions that are required to be undertaken by HDC, in the event of an offensive or objectionable odour occurring at the landfill.

## 14 Condition 6D

HRC's proposed Condition 6D states:

*"The Consent Holder must undertake monthly odour surveys around the boundary of the site, particularly those sections of the boundary that are between the landfill and residential houses, until such time as discharges of refuse to the landfill ceases. Thereafter, the frequency on inspection shall be determined in consultation with the Manawatu-Wanganui Regional Council. The monitoring shall be undertaken using a method that is consistent with the German VDI standard 3940 or subsequent method."*

In HDC's Response to the Notice of Review, Condition 6D was proposed to be amended as follows:

*"The Consent Holder must undertake monthly odour surveys around ~~the boundary of the site,~~ particularly those sections of the boundary that are between the landfill and residential houses,*

*until such time as discharges of refuse to the landfill ceases. Thereafter, the frequency on inspection shall be determined in consultation with the Manawatu-Wanganui Regional Council. The monitoring shall be undertaken using a method that is consistent with the German VDI standard 3940 or subsequent method.”*

It is not practicable to expect HDC staff to undertake monthly field odour surveys in accordance with modified VDI 3940 (Part 2:2006:02) Standard<sup>4</sup> at “sniff test” (field odour monitoring) locations situated downwind and beyond the boundary of the landfill. This may not prove to be a problem in areas with public access, such as along Hōkio Beach Road, but it may not be possible or practicable, without prior approval from the landowners, to access private properties situated to the east and north-west of the boundary of the landfill (i.e. towards the nearest residential properties).

The VDI 3940 Standard requires the field odour assessor (or field odour scout) to assess odour intensity on a 6 point scale where 0 (zero) is ‘very weak’ and 6 is ‘extremely strong’. However, what is inconsistent about proposed Condition 6D is the fact that the “sniff test” (field odour monitoring) locations should be undertaken: (1) on a monthly basis (with no regard to the meteorological conditions at the time of monitoring) and (2) at and beyond the landfill boundary in the direction of the nearest residential properties. Given that the prevailing wind direction at the landfill, as measured at the Levin Automatic Weather Station (AWS) between 2008 and 2012 (refer to MWH’s odour assessment report dated February 2015), was from the west-north-west (WNW) and east (E), there is the potential that HDC’s monthly walkovers/field odour investigations will not coincide with winds that are blowing from the principal odour emission sources located at the landfill and towards the nearest residential properties, bearing in mind that there is more than one property beyond the boundary and that they are in different directions.

The field odour investigation method to be followed by HDC should be agreed by HRC, but it is MWH’s recommendation that it should be based on VDI 3940 and the Ministry for the Environment’s ‘*Good Practice Guide for Assessing and Managing Odour in New Zealand*’ (MfE, 2003)<sup>5</sup>. It should be undertaken by an experienced field odour assessor at both upwind and downwind locations (with respect to the principal odour emission sources located at the landfill) within the boundary of the landfill and, when possible and practicable, at or beyond the landfill boundary. It is important to ensure that the odour assessor avoids olfactory fatigue<sup>6</sup> by selecting monitoring locations which are situated upwind of the odour emission source(s). It goes without saying that these monitoring locations will vary each time, depending on the wind speed and direction at the time of the assessment, and potentially by the location of the odour source(s). The assessment should also avoid certain meteorological conditions, such as strong winds and heavy rainfall, as this has the potential to reduce ambient odour concentrations. The landfill AWS monitoring data should be used to select an appropriate time to undertake the monitoring.

MWH recommends that Condition 6D is amended as per HDC’s Response to the Notice of Review, as outlined above, providing that the method to be followed will be agreed by HRC and stated in the Landfill Management Plan.

## **15 Condition 6E**

HRC’s proposed Condition 6E states:

*“The Consent Holder must carry out a weekly walk-over survey of all the landfill surfaces, including the area around the bio-filter and leachate pond. The purpose of the walk-over survey*

<sup>4</sup> VDI 3940, Part 2: 2006, Measurement of Odour Impact by Field Inspection – Measurement of the impact frequency of recognisable odours – Plume Measurement. Verein Deutscher Ingenieure (VDI), Dusseldorf.

<sup>5</sup> MfE, 2003. Good Practice Guide for Assessing and Managing Odour in New Zealand, Ministry for the Environment, June 2003.

<sup>6</sup> Olfactory fatigue results from a normal but temporary inability to detect (sense) a particular smell after being exposed to it for a long time. Once an odour assessor is no longer exposed to the smell, the ability to detect that particular smell returns.

*is to check for odour, cracks in the landfill cap surface and integrity of any gas collection or leachate pipework.”*

In HDC’s Response to the Notice of Review, Condition 6D was proposed to be deleted, primarily because it was interpreted to be duplicated by other consent conditions, however, this is not the case and MWH recommends that it is retained as per HRC’s Schedule of Proposed Conditions, except for the following amendments:

*“The Consent Holder must carry out a weekly walk-over ~~site inspection survey~~ of all the landfill surfaces, including the area around the bio-filter and leachate pond. The purpose of the walk-over ~~site inspection survey~~ is to check for odour, cracks in the landfill cap surface and integrity of ~~any~~ gas collection or leachate pipework.”*

The condition refers primarily to a visual check (or walkover site inspection) as opposed to the use of landfill gas monitoring equipment, hence the suggestion to replace the word ‘survey’ with ‘inspection’. However, landfill gas monitoring equipment could be used (as required in Condition 3E), if possible and practicable, as it certainly would assist in the identification of any emission hotspot locations, where there may be evidence of landfill gas leaks, odour, cracks in the landfill surface where capping has been applied, gas bubbles, leaks in the gas extraction system or vegetation damage. It is reasonable to assume that the “check for odour” would involve undertaking a sniff test and an assessment of odour intensity, rather than a detailed field-odour investigation (modified VDI 3940) or odour emissions monitoring using sampling equipment (e.g. flux hood) and analysis by dilution olfactometry (using an odour panel).

The integrity of the daily cover should also be determined by the landfill operator on a daily basis at the end of each working day and before leaving the site (in accordance with Condition 3C), whilst the integrity of the intermediate cover should be determined by the landfill operator no less frequently than weekly.

Where necessary, remedial action should be undertaken as soon as practicable by HDC to minimise fugitive discharges of landfill gas and odour. HDC should record the results of the walkover inspection and any remedial action undertaken to control landfill gas or odour.

## **16 Condition 6F**

HRC’s proposed Condition 6F states:

*“The Consent Holder shall maintain a log of all inspections, investigations and actions taken in accordance with all monitoring and odour inspection conditions of this consent. The log shall be made available to the Manawatu-Wanganui Regional Council on request and submit a summary of all results and assessments presented in the Annual Report.”*

This consent condition is acceptable without changes.



## 17 Conclusion

I would be grateful if you could provide your comments or agreement to these conditions. Should you require any additional information or clarification, please do not hesitate to contact me on (09) 580 4575 or 021 766 576.

Yours sincerely



Dr Doug Boddy  
**Senior Air Quality Consultant**  
**MWH New Zealand Limited**

Copy to: Warwick Meyer, Paul Gaydon and Gallo Saidy (HDC)  
Phil Landmark (MWH)

This document has been prepared for the benefit of Horowhenua District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person. This disclaimer shall apply notwithstanding that the document may be made available to Horizons Regional Council and other persons for an application for permission or approval to fulfil a legal requirement.