

**BEFORE THE ENVIRONMENT COURT  
I MUA I TE KOOTI TAIAO O AOTEAROA**

**Decision No. [2018] NZEnvC 227**

IN THE MATTER of the Resource Management Act 1991  
AND of an appeal under clause 14 of the First  
Schedule to the Act  
BETWEEN TARANAKI ENERGY WATCH  
INCORPORATED  
(ENV-2016-WLG-080)  
Appellant  
AND SOUTH TARANAKI DISTRICT COUNCIL  
Respondent

Court: Environment Judge J E Borthwick  
Environment Commissioner J A Hodges  
Environment Commissioner J T Baines

Hearing: at New Plymouth on 19-23 March 2018, 31 May 2018, 1 June 2018  
and 27-30 August 2018  
Site visit undertaken on 20 March 2018

Appearances: R B Enright and R G Haazen for Taranaki Energy Watch  
Incorporated and for Royal Forest and Bird Protection Society of  
New Zealand Incorporated  
M G Conway and C G Coyle for South Taranaki District Council,  
New Plymouth District Council, Stratford District Council and  
Powerco Limited  
D Allen and V Brunton for Petroleum Exploration and Production  
Association of New Zealand  
R Gardner for Federated Farmers of New Zealand (Inc)

Date of Decision: 23 November 2018

Date of Issue: 23 November 2018

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**INTERIM DECISION OF THE ENVIRONMENT COURT**

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## REASONS

### Introduction

[1] This proceeding concerns an appeal against decisions made by South Taranaki District Council on submissions to the proposed District Plan.

[2] By necessity, and with the agreement of the parties, this is an interim decision. The decision sets out the Environment Court's key findings of fact and opinion on risks arising in relation to the operation of petroleum exploration and production activities.

### Topics

[3] For ease of reference, we will address the grounds of appeal grouped into four broad topics. The topics are:

- (a) the risk of human fatality attendant upon either a fire or an explosion occurring at a petroleum exploration and production facility;
- (b) the risk of injury to human health from, and reverse sensitivity towards, contaminants emitted by petroleum exploration and production facilities;
- (c) the risk of injury to human health and harm to the environment from, and reverse sensitivity towards, seismic testing activities; and
- (d) the risk of injury to human health from, and reverse sensitivity towards, contaminants emitted by petroleum landfarming activities.



### Outline of decision

[4] On topics (c) and (d), the parties have resolved their interests in the TEW appeal by proposing amendments to certain rules and methods.<sup>1</sup> The amendments are set out in the Joint Memorandum of Counsel dated 28 September 2018. The amendments will be considered once the related objectives and policies are determined.

[5] For reasons that we will give, where there is a risk of individual fatality arising from fire or explosion at a petroleum exploration and production facility (topic (a)) it is appropriate this risk be avoided. It is not appropriate for the District Plan to address this risk in terms of it being mitigated.

[6] The contaminants discharged to air from a petroleum exploration and production facility (topic (b)) may cause chronic or acute health effects. Contaminants cannot be discharged to air without the prior authorisation of a discharge permit (s 15(2) RMA). For reasons that we will give, the court is not in a position to make any findings of fact or opinion on this topic, until it receives confirmation from the Regional Council that the Regional Air Quality Plan ("Air Plan") is administered to require internalisation of all contaminants discharged to air which may cause an acute or chronic effect on human health.

### Effects of hazardous substances

[7] Before turning to topics (a) and (b), we briefly address the effects of hazardous substances and, in particular, those from petroleum exploration and petroleum production.

[8] This appeal is concerned with petroleum exploration and petroleum production activities ("petroleum activities"). Under the proposed South Taranaki District Plan ("pDP") petroleum activities<sup>2</sup> are also defined as "significant hazardous facilities". Facilities that do not involve petroleum exploration and petroleum production activities are outside the scope of this appeal and any reference we make to "significant hazardous

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<sup>1</sup> Minute dated 4 September 2018 and Joint Memorandum of Counsel dated 28 September 2018.

<sup>2</sup> "Petroleum exploration" and "petroleum production" are defined in the pDP. In this decision the terms "petroleum exploration" and "petroleum production" and "significant hazardous facilities" may be used interchangeably, together with the abbreviation "petroleum activities".





facilities” is limited to petroleum activities.

[9] As defined by the pDP “hazardous substance” means, unless expressly provided otherwise by regulations in force under the Hazardous Substances and New Organisms Act 1996, any substance:

- (a) with one or more of the following intrinsic properties: explosiveness, flammability, a capacity to oxidise, corrosiveness, toxicity (including chronic toxicity), ecotoxicity (with or without bioaccumulation); or
- (b) which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified in (a) of this definition.<sup>3</sup>

[10] “Contaminants” are not defined in the pDP. In this decision we use the definition in the RMA, noting that the Air Plan does the same.<sup>4</sup>

[11] Contaminants emitted from petroleum activities include those listed in Schedule 1 to the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 and other hazardous air pollutants including aldehydes; BTEX compounds;<sup>5</sup> volatile organic compounds; oxides of sulphur; polycyclic aromatic hydrocarbons; heavy metals and dioxins.<sup>6</sup>

### ***Benzene***

[12] At this hearing the air quality experts have agreed to use the compound benzene as an indicator contaminant for all other contaminants. Benzene is a carcinogen and a key contaminant of discharges to air from petroleum activities, including both fugitive and flare emissions.<sup>7</sup>

<sup>3</sup> Proposed District Plan, clause 1.11, Definitions.

<sup>4</sup> “Contaminants” are defined in s 2 RMA as including any substance (including gases, odorous compounds, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat—

- (a) when discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or
- (b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.

<sup>5</sup> ‘BTEX’ meaning benzene, toluene, ethylbenzene and xylene compounds.

<sup>6</sup> Wickham, EiC dated 18 December 2018 at Attachment B.

<sup>7</sup> Air Quality JWS, 1 May 2018 at 5.





### **Silica**

[13] The use of silica in the fracking of wells was raised as a potential contaminant. The evidence as regards to silica does not reach a standard which we can make findings on the likelihood of silica being emitted from the facility sites.

### **Overview of the petroleum industry in South Taranaki**

[14] Taranaki Basin is New Zealand's only commercially hydrocarbon producing basin. Of the five existing production facilities located in the district, three are zoned Rural Industrial and two are zoned Rural.<sup>8</sup> Well-sites are clustered around the production stations and found throughout rural areas.

[15] We doubt that we have an accurate understanding of the number of consented well-sites with well-heads currently under production. Of those well-sites that are consented, the District Council does not hold information as to which individual well-heads are in production.<sup>9</sup> At each well-site, one or more well-heads may be consented. Ms Roberts says that each well-head may be drilled an unlimited number of times.<sup>10</sup>

[16] A 2013 report<sup>11</sup> recorded that between 1950 and 2012, there were 557 wells drilled offshore and onshore in Taranaki. The report also stated "[t]here are over 70 producing wells in Taranaki extracting hydrocarbons from underground rock formations for processing above ground". Approximately 80 producing well-heads in South Taranaki are shown on maps produced on behalf of the District Council.<sup>12</sup> Other evidence includes the estimate of 30 operational well-sites in the Taranaki region totaling about 90 onshore production wells.<sup>13</sup>

[17] In addition, we were told there are:

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<sup>8</sup> The petroleum production facilities being Rimu, Kupe, Maui, Kapuni Production Stations and Kapuni Gas Treatment Plant.

<sup>9</sup> Sutherland, affidavit affirmed 21 September 2018.

<sup>10</sup> Roberts, supplementary evidence 28 May 2018 at [2(a)(ii)].

<sup>11</sup> Appended to Wesley, supplementary evidence dated 16 March 2018 entitled Taranaki Regional Council (2013), 'Future directions for the management of oil and gas operations in the Taranaki region Review of the Regional Freshwater Plan for Taranaki, Document: 1238455', at 1.

<sup>12</sup> Wesley, supplementary evidence dated 16 March 2018, Map Attachments.

<sup>13</sup> Cudmore, EIC at [138].



- (a) four well-sites with a total of 18 wellheads consented but not yet established;
- (b) fourteen well-sites with a total of 70 non-producing, but consented, well-heads; and
- (c) four well-sites under production with consent to drill an additional 15 well-heads.<sup>14</sup>

[18] The District Council informed the court that it is not in a position to advise the court on the “number, scale, or nature of future petroleum exploration or production stations”.<sup>15</sup> We were referred to its s 32 Evaluation Report which states that recent trends show a “steady amount of new energy activity” in the District. This statement is perhaps in contrast with that of PEPANZ Chief Executive, Mr C Madgwick, while stating that the existing production facilities and well-sites are unlikely to be significantly expanded for the term of the District Plan, he also said that he anticipated that operators will “seek to maintain or increase production levels to meet their supply commitments. This optimisation work could include plant upgrades, work on existing wells and/or new wells being drilled within existing permit areas or from new wellsites”.<sup>16</sup>

**Activities with incompatible effects and activities with the potential to generate reverse sensitivity effects**

[19] As we are concerned with land uses with potentially incompatible effects, we set out next our understanding of the concept of reverse sensitivity starting with the following definition:

Reverse sensitivity is sensitivity not to environmental impact, but to complaint about environmental impact. Reverse sensitivity exists where an established use produces adverse effects and a new use is proposed for nearby land. It is the legal vulnerability of the established activity to the objection from the new use. Under the Resource Management Act 1991 (“RMA”), new uses may be prohibited or limited on the ground of reverse sensitivity in order to protect established uses from having to modify their operations.<sup>17</sup>

[20] The distinction being drawn under this definition is between sensitivity to

<sup>14</sup> Sutherland, affidavit affirmed 21 September 2018.

<sup>15</sup> Wesley, supplementary evidence dated 16 March 2018 at [7.1].

<sup>16</sup> Madgwick, supplementary evidence dated 16 March 2018 at [21]-[22].

<sup>17</sup> Bruce Pardy and Janine Kerr, *Reverse Sensitivity – the Common Law Giveth and the RMA Taketh Away*, 1999 3 NZJEL at 93.





complaint about environmental impact on the one hand, and the sensitivity to an environmental impact on the other. In other words, each land use activity has a different capacity to affect the other.

[21] Finding the above definition very helpful, the Environment Court in *Winstone Aggregates & Ors v Matamata-Piako District Council*<sup>18</sup> draws on the definition when differentiating between the effects of the emitting activity (which the court refers to as the “primary effects”) and the complaining response (the “secondary reverse sensitivity effect”).<sup>19</sup>

[22] Reverse sensitivity typically occurs when a benign activity seeks to locate within the effects radius of an established activity: per *Independent News Auckland Ltd v Manukau City Council*.<sup>20</sup> One potential effect of the new benign activity is to restrain an existing activity that is lawfully carrying on its business: per *Auckland Regional Council v Auckland City Council*.<sup>21</sup> Even though both land uses – existing and new – are legally established, the potential for the reverse sensitivity effect arises because the uses are or may be incompatible: per *J M & D M Sugrue and T R & J A Sadler v Selwyn District Council*.<sup>22</sup>

[23] The primary effects of the existing activity will generally be permitted under the rules of the District Plan or subject to compliance with the conditions of a resource consent. We say “generally” because for some activities the effects may be uncontrolled in the sense that they are unintended or accidental. Yet other effects may have been unforeseen at the time the application for consent was lodged or are an emerging new effect on the environment and therefore one that is not addressed under the consent or by the planning instruments. That aside, a District Plan prepared having regard to Part 2 of the Act, should contain a coherent set of objectives and provisions that achieve “clear environmental outcomes” (to adopt the Court of Appeal’s phrasing in *R J Davidson Family Trust v Marlborough District Council*<sup>23</sup> at [74]).

[24] Whether the primary effect is to be avoided or remedied or mitigated, is fact

<sup>18</sup> *Winstone Aggregates & Ors v Matamata-Piako District Council* Decision No: W55/2004 (EnvC) 18 June 2004.

<sup>19</sup> *Winstone Aggregates & Ors v Matamata-Piako District Council* at [4].

<sup>20</sup> *Independent News Auckland Ltd v Manukau City Council* Decision No: A103/2003 (EnvC).

<sup>21</sup> *Auckland Regional Council v Auckland City Council* [1997] NZRMA 205 at 206.

<sup>22</sup> *J M & D M Sugrue and T R & J A Sadler v Selwyn District Council* Decision No: C43/2004 (EnvC) at [12].

<sup>23</sup> *R J Davidson Family Trust v Marlborough District Council* [2018] NZCA 316 at [74].





sensitive. In some cases mitigation measures may be applied to an incoming sensitive activity to sufficiently reduce the level of adverse effect.<sup>24</sup> In other cases, the adverse effects will be required to be avoided: *per Winstone Aggregates Ltd v Auckland Regional Council & Ors* at [25]-[27] and [34].<sup>25</sup> Where avoidance of adverse effects is determined to be the appropriate measure, the cost of avoidance is normally borne by the activity that is generating the effects and not the neighbouring landowner.

[25] Reverse sensitivity effects may arise where avoidance of adverse effects is not possible and a new activity seeks to establish within the existing activity's effects radius. This potential was considered in the 2002 decision of *Winstone Aggregates Ltd v Auckland Regional Council & Anor*.<sup>26</sup> *Winstone Aggregates Ltd* concerned amendments to the Papakura District Plan to provide buffer zones around areas containing mineral resources. The purpose of the amendments was to provide greater protection from potentially incompatible land uses. Where those buffer areas extended across privately owned land – not being land owned by certain quarry operators – the neighbouring landowners would indirectly bear the cost of the effects. The Environment Court was prepared to consider buffer zones, subject to a two-staged step approach. First, policy required that quarry operators take all reasonable steps to avoid adverse effects beyond the quarry boundary. Second, in relation to those effects which could not reasonably be internalised, policy constrained nearby land-use activities.<sup>27</sup> Noise and vibration standards at the quarry boundary were approved by the court as the reasonable level of restraint that should be imposed on the quarry operator.<sup>28</sup> On a proper construction of the policies under consideration, the court affirmed "internalisation" was not to be interpreted in that case, as "internalisation at all costs".<sup>29</sup>

[26] Compliance with conditions of consent or with the rules in a plan does not preclude complaints about the effects generated by lawfully established activities. This potential is discussed in *J M & D M Sugrue and T R and J A Sadler v Selwyn District Council*, an appeal against a decision declining resource consent. The central issue concerned whether the establishment of a proposed restaurant and café would put

<sup>24</sup> *J M & D M Sugrue and T R & J A Sadler v Selwyn District Council* is an example of mitigation being applied.

<sup>25</sup> *Winstone Aggregates Ltd v Auckland Regional Council & Anor* 26 February 2002, Decision No: A49/2002 (EnvC).

<sup>26</sup> *Winstone Aggregates Ltd v Auckland Regional Council & Anor*.

<sup>27</sup> *Winstone Aggregates Ltd v Auckland Regional Council & Anor* at [46].

<sup>28</sup> *Winstone Aggregates Ltd v Auckland Regional Council & Anor* at [42].

<sup>29</sup> *Winstone Aggregates Ltd v Auckland Regional Council & Anor* at [46].



pressure on a neighbouring piggery to curtail or cease its operations. The court found there was potential for restaurant patrons to perceive the piggery odour to be offensive, even though the odour was reasonable within its rural context and indeed permitted under the District Plan. The patrons' reverse sensitivity towards the piggery could result in complaints and with it costs associated with investigating and responding to those complaints together with uncertainty around the future operation of the farm.<sup>30</sup> The court determined that the effects of odour could be mitigated through conditions on the restaurant's operations.

[27] Returning to the Environment Court's decision of *Winstone Aggregates & Ors v Matamata-Piako District Council*, addressing the primary effects of activities that emit adverse effects, the court identified the following principles:

- (a) in every case emitting activities should internalise their effects unless it is shown, on a case by case basis, that they cannot reasonably do so;
- (b) there is a greater expectation of internalisation of effects of newly established emitting activities than of older activities;
- (c) having done all that is reasonably achievable, total internalisation of effects within the site boundary will not be feasible in all cases. There is, however, no requirement in the RMA that this must be achieved;
- (d) to justify imposing any restrictions on the use of land adjoining an effect emitting site, the industry must be of some considerable economic or social significance locally, regionally or nationally. If that point is reached, then the only feasible means of protecting the industry from reverse sensitivity (the secondary effect) is to impose restriction on surrounding land; and
- (e) where the effect beyond the boundary is one of low probability and low impact, it is usually better to incur occasional relatively minor adverse effects than to impose controls on the adjoining site.<sup>31</sup>

[28] We keep in mind the above caselaw when considering whether and to what extent the planning instruments require internalisation of adverse effects.

[29] We address next our findings of fact and opinion on the topic of the risk of human

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<sup>30</sup> In *J M & D M Sugrue* the court confirmed the grant of consent subject to conditions that would limit the exposure of restaurant patrons to exposure to odour that was otherwise reasonable within this rural setting.

<sup>31</sup> *Winstone Aggregates & Ors v Matamata-Piako District Council* at [7]-[12].





fatality attendant upon either a fire or an explosion occurring at a petroleum exploration and production facility.

## **Topic A: Risk of human fatality attendant upon a fire or explosion**

### **Introduction**

[30] The District Council's position at the commencement of the proceedings, and the position of the neighbouring District Councils,<sup>32</sup> was that the effects, including the potential for reverse sensitivity, are managed under the WorkSafe legislation and regulations and by the Regional Plans.<sup>33</sup>

[31] That was also the position of PEPANZ who,<sup>34</sup> as will be seen, wrongly asserted that the risk of fatality or injury is below the level of risk generally considered acceptable by members of the public.<sup>35</sup>

[32] At the end of the hearing the District Council and PEPANZ had shifted their positions in response to expert evidence that sensitive activities would be exposed to an unacceptable level of risk were they to locate within an individual fatality risk contour that exceeds  $1 \times 10^{-6}$ .<sup>36</sup> In this regard, we record that we have focused on fatality risk (excluding injury risk) as that was the evidence before us.

[33] This is a substantial change in position by the District Council and PEPANZ, both of whom supported the decision to remove separation distances (also known as setbacks) from the pDP.<sup>37</sup>

[34] The decision under appeal records that separation distances were opposed by rural landowners and businesses situated in proximity to significant hazardous facilities. Understandably, landowners and businesses did not want the ability to use their land restricted. It was their view that operators of significant hazardous facilities should internalise their adverse effects and, if required, "remediate any externalities on

<sup>32</sup> Section 274 parties to the proceedings.

<sup>33</sup> Conway, opening submissions dated 19 March 2018 at [6.10].

<sup>34</sup> Allen, opening submissions at [60].

<sup>35</sup> Allen, opening submissions at [52]-[55].

<sup>36</sup> Risk JWS, dated 28 August 2018.

<sup>37</sup> Decision under appeal; Decision Report of the Hearing Panel – Rural Zone; rule 3.2.2 at [143]-[146].





neighbouring properties” such that there are no off-site effects.<sup>38</sup> This remains the preferred position of Federated Farmers.

[35] The decision under appeal also records the advice of the operators that reverse sensitivity can be effectively and efficiently managed without any separation distance. Further, in carrying out their responsibilities under WorkSafe legislation and regulations<sup>39</sup> the operators “ensure that their operations are managed to contain environmental and health and safety risks on-site”.<sup>40</sup>

[36] The Hearing Panel, being satisfied that compliance with WorkSafe legislation and regulations internalised risk to within the operator’s site, removed the separation distances from the rules.<sup>41</sup>

[37] The salience of other evidence received by the Hearing Panel that contradicted the finding that risks are internalised, while noted in the decision, is not discussed. This includes the evidence that a distance of 200m from flammable and explosive substances would be unlikely to “minimise the risk and conflicts” that arise from those substances<sup>42</sup> and that “most” risk [i.e. not all risk] is addressed under WorkSafe legislation and regulations.<sup>43</sup> Notably, the decision records the operators’ preference to work with residents to resolve “any adverse effects experienced” indicating that the risk of an adverse effect is not contained within the operator’s site<sup>44</sup> and related to this, the operators’ advice to the Hearing Panel that risk was being *minimised* – put another way, the operators were not asserting risk was eliminated.<sup>45</sup>

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<sup>38</sup> Decision under appeal; Decision Report of the Hearing Panel – Rural Zone at [32].

<sup>39</sup> When “WorkSafe legislation and regulations” is referred to in this decision, this means Health and Safety at Work Act 2015 (HSWA) and its regulations and Hazardous Substances and New Organisms Act 1996 (HSNO). Although not relevant to the decision, we record that from 1 December 2017 the rules around managing hazardous substances that affect human health and safety in the workplace have been transferred from HSNO to the Hazardous Substances Regulations under HSWA.

<sup>40</sup> Decision under appeal; Decision Report of the Hearing Panel – Rural Zones; at [57], [68] and [79].

<sup>41</sup> Decision under appeal; Decision Report of the Hearing Panel – Hazardous Substances and Contaminated Land at [37] and [40].

<sup>42</sup> Decision under appeal; Decision Report of the Hearing Panel – Rural Zone; at [42].

<sup>43</sup> Decision under appeal; Decision Report of the Hearing Panel – Hazardous Substances and Contaminated Land at [37].

<sup>44</sup> Decision under appeal; Decision Report of the Hearing Panel – Rural Zone; at [57].

<sup>45</sup> Polich, EIC at [16].



### **The witnesses**

[38] The District Council did not call evidence from a risk expert in support of its stance that there is no requirement for regulatory controls under the pDP. PEPANZ and TEW called risk management experts Mr D J Phillis and Ms J Polich respectively. We also heard from Ms R Johnson, a Safety and Risk Engineering Manager employed by Todd Energy, called on behalf of PEPANZ.

[39] Finally, we heard from Mr K Comben, who is employed by WorkSafe New Zealand as an Acting Team Leader and Principal Specialist: Hazardous Substances and Ms K Hanson-White, who is also employed by WorkSafe as the Manager of the Regulatory Frameworks Team.<sup>46</sup>

### ***Preliminary comment on evidence***

[40] We set out next our key findings on the topic of risk of human fatality attendant upon the occurrence of a fire or explosion. Given the compromise in the position of the parties by the conclusion of evidence (Federated Farmers excepted), these findings draw from what emerged to be an agreed view on risk held by the experts. We record our appreciation for the manner in which Mr Phillis and Ms Polich, having identified the relevant issues, worked through their differences in a series of joint witness conferences (both facilitated and unfacilitated).<sup>47</sup>

[41] Before we turn to their evidence, we make some introductory remarks about the interface between the Resource Management Act and WorkSafe legislation and regulations. In doing so, we will not essay the legislation and regulations, about which we heard considerable evidence and submissions. There is no longer any need to do so given that PEPANZ does not pursue an argument that the management of these risks under the RMA gives rise to an unnecessary duplication of the WorkSafe legislation and regulations<sup>48</sup> and given also the District Council's acceptance that risk does extend beyond the boundary of existing petroleum activities.<sup>49</sup>

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<sup>46</sup> Both Mr Cobden and Ms Hanson-White were called under summons by TEW.

<sup>47</sup> See Risk JWS dated 23 February, 23 March, 23 July and 28 August 2018.

<sup>48</sup> Allen, closing submissions dated 30 August 2018 at [15].

<sup>49</sup> Conway, closing submissions dated 30 August 2018 at [2.8].





[42] With that said, we accept Ms Hanson-White's characterisation of the Health and Safety at Work Act 2015 ("HSWA") as being "performance based legislation" insofar as the legislation does not generally prescribe how compliance must be achieved. In principle, "workers and other persons should be given the highest level of protection against harm to their health, safety, and welfare from hazards and risks arising from work or from specified types of plant as is reasonably practicable" (s 3(2)). Section 36 of HSWA establishes the primary duty of care on all persons conducting a business or undertaking<sup>50</sup> which is to ensure, so far as reasonably practicable, the health and safety of workers and other persons who may be exposed to risks that arise from work activity (ss 36(1) and (2)). "Other persons" include persons who are not in the workplace; their identity is determined, inter alia, by the nature of the risks.<sup>51</sup>

[43] Section 30 of the HSWA imposes a duty:

- (a) to eliminate risks to health and safety, so far as is reasonably practicable; and
- (b) if it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks so far as is reasonably practicable.

[44] The key point being, where a risk is minimised, because it cannot be eliminated, there is "no absolute guarantee that incidents or accidents will be prevented or that harm will be prevented".<sup>52</sup> Instead, measures are to be implemented to minimise those risks so far as is reasonably practicable.<sup>53</sup> Thus it cannot be imputed that compliance with WorkSafe legislation and regulations means risk is eliminated.

[45] The second key point is this: WorkSafe legislation and regulations do not control decisions made on the use of land near a workplace.

[46] The final key point is that WorkSafe legislation and regulations do not require an assessment of risk carried out at the time of site selection.<sup>54</sup> Mr Cobden and Ms Hanson-White's view, together with the planning and risk experts, is that decisions on the use of

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<sup>50</sup> It is noteworthy, that Ms Hanson-White EIC at [52] contends a territorial authority has a primary duty of care under HSWA.

<sup>51</sup> Hanson-White, EIC at [14].

<sup>52</sup> Cobden, EIC at [21]; Hanson-White, EIC at [20].

<sup>53</sup> Phillis, EIC at [34].

<sup>54</sup> Risk JWS, dated 23 February 2018 at 7.





land – in particular, the location of petroleum exploration and petroleum production activities and the location of sensitive receptors – are to be addressed under the District Plan.<sup>55</sup>

### The issues

[47] The issues raised under this topic concern:

- (a) does risk extend beyond the boundary of the significant hazardous facilities?
- (b) who is exposed to the risk?
- (c) what is the likelihood of an event that could result in human fatality?
- (d) what are the consequences of that event should it materialise?
- (e) is the level of risk acceptable?

We address the issues collectively.

[48] For significant hazardous facilities associated with petroleum activities, the primary risk to persons located outside of the workplace are from the effects of heat radiation and blast in the event of a fire or explosion occurring on-site.<sup>56</sup> Heat radiation and blast are potential effects of low probability which have a high potential impact.

### Terminology

[49] For clarity, we explain our use of terminology in this part of our decision, as we received evidence based on both the HSWA and associated regulations, and the RMA, which use different terms. The key definitions are reproduced from Chapter 1.11 of the pDP:

PETROLEUM PRODUCTION: any activity undertaken for the purpose of extracting and processing petroleum substances into a usable product, and

SIGNIFICANT HAZARDOUS FACILITY: which means any facility which involves one or more of the following activities:



<sup>55</sup> Cobden, EIC at [36]; Hanson-White, EIC at [51]-[52] and Exhibit TEW 5.

<sup>56</sup> Risk JWS, dated 23 August 2018 at 5. Phillis, EIC at [35]; Polich, EIC at [15] Johnson, EIC at [24].

...

- (b) Petroleum exploration and petroleum production<sup>57</sup>.

[50] We have considered two aspects of petroleum production separately – the first being wells and well-sites, and the second being petroleum production stations. We received evidence in relation to three production stations in South Taranaki – Maui, Kupe and Kapuni. The evidence is that all of these are Lower Tier Facilities; *per* Health and Safety at Work (Petroleum Exploration and Extraction) Regulations 2016 (“PEE Regulations”). Lower tier facilities have limits on the average quantities of oil and gas produced and on the amount of liquified flammable gases that is likely to be at the installation at any time.<sup>58</sup>

[51] We received no evidence in relation to the Rimu production station and very limited evidence related to the Vector Kapuni Gas Treatment Plant, but these will be subject to the overall findings of our decision.

[52] For PEPANZ, Ms Brunton submitted that there are no facilities in South Taranaki that are subject to the Health and Safety at Work (Major Hazard Facilities) Regulations 2016 (“MHF Regulations”). However, the Vector facility appears to be an Upper Tier Facility under the MHF Regulations.<sup>59</sup>

### The evidence

[53] For Upper Tier facilities, we accept WorkSafe’s characterisation of the effects, were they to materialise, as being potentially “catastrophic” having the capability to cause harm to people, the environment and the wider economy. Presently, there is no requirement to obtain resource consent for an existing Lower Tier production facility to upgrade to an Upper Tier production facility.<sup>60</sup> That is so notwithstanding any change to the facility’s risk profile. This is also the case where the risk profile of a Lower Tier facility changes but without that facility becoming an Upper Tier facility.

[54] We accept also the risk experts’ advice that the District Plan should protect against the exposure of sensitive receptors to unacceptable risk. They say that sensitive

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<sup>57</sup> For the reasons set out at paragraph [4] petroleum exploration is not addressed in this part of the decision.

<sup>58</sup> PEE Regulations, Section 3.

<sup>59</sup> TEW Tab 83.

<sup>60</sup> Transcript at 1028.





activities would be exposed to an unacceptable level of risk were they to locate within an individual fatality risk contour that exceeds  $1 \times 10^{-6}$ . This risk level is based on fatality consequences for heat radiation exposure of  $12.6\text{kW/m}^2$ , explosion overpressure of  $14\text{kPa}$  and flash fire exposure (being the extent of Lower Flammability Level for flammable gas release).<sup>61</sup> Within this risk contour they advised residential activities (at least) should not be allowed.<sup>62</sup>

[55] Where the individual fatality risk contour is not known, the risk experts recommended separation distances be based either on the consequence distance or the maximum credible fatality consequence distance. The consequence distance is a generic measurement that does not take into account the site characteristics (including inventory) or the likelihood of the event occurring. The maximum credible fatality distance is established having carried out an assessment of activities occurring on or at a particular site.

***For well-sites***

[56] We received only limited evidence<sup>63</sup> on the extent to which individual risk contours have been prepared for any well-sites in Taranaki. In the absence of this information, it would be possible to adopt a generic separation distance based on published consequence contours for well-sites that indicates a limit of serious injury that is extremely unlikely to be exceeded. Ms Polich considered this distance would be 250m from the nearest well on a well-site with any well composition, pressure, size of wells and production lines<sup>64</sup> and Mr Phillis agreed.<sup>65</sup> While the methodologies to be employed is a matter to be informed by the planners, subject to jurisdiction, she suggested if this "consequence distance" was considered overly conservative by a well operator, the operator would have the choice to produce a site-specific assessment to demonstrate this. This could be based either on the individual fatality risk contour or the maximum credible fatality distance taking into account the particular features of the site and environs.

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<sup>61</sup> Risk JWS, dated 28 August 2018 citing as their source for fatality consequence, HIPAP 4: Risk Criteria for Land Use Safety Planning published by State of New South Wales through the Department of Planning and supplemented with information from OGP 43-14 Vulnerability of Humans.

<sup>62</sup> Transcript at 1116-1117.

<sup>63</sup> Transcript at 1031.

<sup>64</sup> Transcript at 530.

<sup>65</sup> Transcript at 1031.





***For production stations***

[57] Individual risk contours have been produced for each of the three production stations at Maui, Kupe and Kapuni, but the experts consider some need updating. We received limited evidence on risk contours arising from the Rimu Production Station or Kapuni Gas Treatment Plant facilities.

[58] Based on the individual fatality risk contours provided to the court, we conclude that risk of individual fatality at these sites extends beyond their cadastral boundaries.<sup>66</sup> Subject to confirmation, it appears there may be one house and an educational facility located within the individual  $1 \times 10^{-6}$  fatality risk contour for Maui Production Station and a further house within the  $1 \times 10^{-5}$  risk contour for Kapuni.<sup>67</sup> While an individual fatality contour based on a quantified risk assessment was not available for Vector Kapuni Gas Treatment Plant, it is possible that the individual fatality risk contour may extend beyond the site boundaries.<sup>68</sup> The number of properties and aerial extent overlain by the individual fatality risk contour have yet to be assessed.

[59] The experts caution against the use of separation distances based on consequence alone for production stations, as the circumstances of each facility (including inventory present) vary considerably.<sup>69</sup> Rather, the better method is to require the consent holders to produce either the individual fatality risk contour or the maximum credible fatality consequence contour for each of the existing facilities in South Taranaki. In the event that any new production facilities are proposed in the future, either at well-sites or stand-alone sites, a quantitative risk assessment will be required as part of resource consent applications.

[60] In contrast to the individual fatality risk contour, sensitive activities seeking to locate within the consequence distance or the maximum credible fatality consequence distance may not be exposed to an unacceptable level of risk for the whole of that distance. This would need to be determined on a site by site basis.<sup>70</sup>

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<sup>66</sup> Risk JWS, dated 28 August 2018. Planners JWS, dated 23 August 2018 at Appendix 1 and other evidence.

<sup>67</sup> Planners JWS, dated 23 August 2018 at [2.8.1] and Table 1 and Appendix 1.

<sup>68</sup> "Workplace" as defined in the Health and Safety at Work Act 2015. See Exhibit Consent 4.

<sup>69</sup> Transcript at 1034–1035.

<sup>70</sup> See Transcript at 1031. All measurements are taken from the source of the release and if there is more than one well-head at a site, then distances need to be measured from each well-head.



[61] There are six existing dwellings within the consequence distance from wellheads. The consequence distance extends over 70 properties encompassing 1,453 ha of land.<sup>71</sup>

**Preliminary findings of fact in relation to risk of human fatality attendant upon a fire or explosion**

[62] By the end of the hearing, the risk experts had reached agreement on many of the key risk issues before the court and we have relied on those agreements in making the following preliminary findings:

- (a) for both well-sites and production stations use of land by a new sensitive activity seeking to locate within the  $1 \times 10^{-6}$  individual fatality risk is to be avoided;
- (b) for new well-sites and production facilities (including facilities whose risk profile expands), pDP Section 12 objective and policies are to be reviewed in light of whether the provisions should discourage new petroleum activities from externalising risk onto neighbouring land. Consideration is also to be given as to whether, and the extent to which, the objective and policies drive the internalisation of risk within the cadastral boundary of the petroleum activity as their primary outcome and second, whether activity status and other methods may incentivise the internalisation of the individual fatality risk within the cadastral boundary;
- (c) for existing well-sites and production facilities where the individual fatality risk contour has not been produced, land use controls are required to ensure separation of incompatible activities avoid the risk of fatality from fire and explosion. Following on from an assessment of all objectives and policies pursuant to s 32, an assessment of the methods recommended by the risk experts of the consequence distance or maximum credible fatality distance is required;
- (d) In the Rural Industrial Zone, alterations or additions to an existing or new significant hazardous facility that expands an existing individual fatality risk contour into or within a neighboring zone are not permitted; and
- (e) due to their risk profile, the location of some petroleum activities within the township and residential zones are not appropriate. The provisions and methods are to be reviewed to prohibit those petroleum activities within

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<sup>71</sup> Planners JWS, dated 23 August 2018 at Table 1.





these zones.

## Topic B: Air contaminants

### Introduction

[63] The second topic concerns the risk of injury to human health and reverse sensitivity towards, contaminants emitted by petroleum activities.

[64] To orientate the parties into the discussion which follows, based on the evidence, we set out two basic propositions:

- (a) the location of sensitive activities is incompatible with petroleum activities if the sensitive activity is exposed to levels of contaminants which can cause chronic health effects (including death); and
- (b) the location of sensitive activities may be incompatible with petroleum activities if the sensitive activity is exposed to levels of contaminants which have the potential to cause acute health effects (including nausea and headaches) and where the actual experience of those effects have the potential for reverse sensitivity towards activities acting in accordance with the conditions of their consent.

[65] Within the Rural Zone a number of sensitive activities, including residential activities, are permitted.<sup>72</sup> TEW proposes rules which require sensitive activities to obtain resource consent where it is proposed to locate those activities within the emissions radius of petroleum activities.<sup>73</sup>

[66] For reasons that we will come to, we find that it is not an appropriate response to permit sensitive activities to locate within the effects radius of an activity that emits levels of contaminants which may cause chronic health effects.

### Witnesses

[67] Mr R Cudmore and Ms L Wickham were called to give evidence on the topic of

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<sup>72</sup> Rule 3.1.1.

<sup>73</sup> TEW "Schedule of TEW relief sought as at 16 March 2018 – v2" handed up 31 May 2018, rules 12.1.1 (b) and (c).



air quality on behalf of PEPANZ and TEW (respectively). The District Council did not call expert evidence.

***Preliminary comment on evidence***

[68] We are satisfied that under particular circumstances, benzene emissions from well-sites and production stations have the potential to result in adverse effects on human health. The very limited Taranaki-specific benzene monitoring data (emissions and ambient air quality), presents serious difficulties for both the experts and the court in terms of reaching firm conclusions.

[69] The District Council and PEPANZ positions were that the Regional Council adequately controls air discharges so that further controls on land use under the pDP are not required. We received no evidence from the Regional Council to enable us to test this position.

[70] While Ms Wickham sought to assist the court by providing extensive international references, being of limited relevance to South Taranaki petroleum, we could place little weight on the material and indeed Ms Wickham later acknowledged it was not her intention that we should.<sup>74</sup> She also set out a series of hypotheses to support her recommendations on appropriate separation distances from emitters, and once again we found after consideration that we could place little weight on them for the reasons set out later in our decision.

[71] This left us with Mr Cudmore's evidence, which, in view of the importance of the issue raised by TEW – the protection of human health – was subject to extensive cross-examination by Mr Enright and was also tested by the court in some detail. Mr Cudmore changed his position from his evidence-in-chief, where in a qualified statement he concludes that the "Proposed Plan has adequate provisions for controlling the effects of land use and development by the PEP industry in South Taranaki"<sup>75</sup> to one of agreeing by the end of the hearing that land use controls on sensitivity activities seeking to locate close to petroleum activities were appropriate. This is a material change, and in writing our decision relating to air quality we reviewed different aspects of his evidence carefully, as set out below.

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<sup>74</sup> Transcript at 980-981.

<sup>75</sup> EIC at [199] and [203].





### **Terminology**

[72] Counsel and the experts did not consistently use the same terms to describe events and processes. While we have considered the evidence in its broader context as a check on meaning of the words used, it is possible that in some cases we have not correctly understood the witnesses.

[73] In this decision we distinguish between emissions from a flare stack operating under normal conditions and emissions from a flare stack resulting from a process upset (also referred to in evidence as “abnormal” emissions). Finally, there is a third group of emissions which we will refer to as “fugitive emissions”. These include:

- (a) leaks from pressurised plant and equipment;
- (b) intentional cold venting of gas to air for maintenance purposes; and
- (c) accidental or unintentional release, or loss of control of hazardous substances.

### **Guideline health values for exposure to benzene**

[74] Both short-term and long-term effects of the discharge to air of contaminants from significant hazardous facilities are relevant and need to be assessed.<sup>76</sup>

[75] While there are other products of combustion emitted from flare stacks, benzene is the key contaminant for fugitive and flare emissions from petroleum activities and was used by the experts as a proxy for all contaminants in this hearing.

[76] The primary health effect from the discharge to air of benzene arises from long-term exposure to the contaminant,<sup>77</sup> the chronic health effects of which include cancer. Acute effects arising from short-term exposure to benzene include nausea and headaches. These effects may be short-lived and resolve once exposure ceases.<sup>78</sup>

[77] In New Zealand the guideline value at or below which chronic health effects are

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<sup>76</sup> Air Quality JWS, dated 1 May 2018 at [10(a)].

<sup>77</sup> Air Quality JWS, dated 1 May 2018 at [10].

<sup>78</sup> Wickham EIC at [58].



unlikely to occur upon a lifetime exposure to benzene is  $3.6 \mu\text{g}/\text{m}^3$  (applied as an annual average).<sup>79</sup> There is no national guideline value for acute health effects, and in such case the Ministry for the Environment (MfE)<sup>80</sup> recommends use of the California Office of Environmental Health Hazard Assessment (1-hour) Reference Exposure Level (“OEHHA (1-hour)”) guideline for benzene of  $27 \mu\text{g}/\text{m}^3$ .<sup>81</sup> Exposure on an intermittent basis to concentrations of contaminants at OEHHA (1-hour) are unlikely to cause adverse effects in a human population, including sensitive subgroups.<sup>82</sup>

[78] While Mr Cudmore considered the OEHHA (1-hour) guideline conservative when applied in relation to a one-off exposure event, he nevertheless agreed in expert conferencing with its application.<sup>83</sup> In supplementary evidence filed after the hearing commenced, he presented the views of toxicologists he had subsequently consulted who informed him that for a one-off exposure event the US Environmental Protection Agency Tier 1 Acute Exposure Level Guidelines (“AEGL-1”) for 1-hour benzene of  $180,000 \mu\text{g}/\text{m}^3$  was more appropriate.<sup>84</sup>

[79] The views of the toxicologists consulted were, of course, unable to be tested. Recalling that fugitive emissions include both continuous low volume and low velocity leaks together with intentional releases of control of hazardous substances, this immediately begs the question whether Mr Cudmore is correct to characterise all emissions as one-off events and apply AEGL-1. Certainly, it was Ms Wickham’s opinion that the guideline was not appropriate.<sup>85</sup> The OEHHA (1-hour) guideline, on the other hand, does apply to infrequent 1-hour exposures.<sup>86</sup>

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<sup>79</sup> Common bundle at [91] *Ambient Air Quality Guidelines* (Ministry for the Environment, 2002); Air Quality JWS, dated 1 May 2018 at [8].

<sup>80</sup> MfE Good practice guide for assessing discharges to air from industry.

<sup>81</sup> See Air Quality JWS, dated 1 May 2018 at [7].

<sup>82</sup> At 4.5.1.

<sup>83</sup> Air Quality JWS, dated 1 May 2018 at [10(a)] and [12].

<sup>84</sup> Cudmore, supplementary evidence dated 25 July 2018 at [32]-[33].

<sup>85</sup> Transcript at 912.

<sup>86</sup> Air Quality JWS, dated 1 May 2018 at [10(a)].





### **Findings on guideline values**

[80] Both experts address the application of the OEHHA (1-hour) guideline, with Ms Wickham giving cogent reasons for its application and for the inapplicability of the Reference Exposure Level in circumstances where, depending on the cause, fugitive emissions may be either continuous or infrequent.<sup>87</sup> Subject to what the Regional Council may have to say, unless the parties wish to take the matter further and seek leave to call a toxicologist we will be guided by the MfE recommendation on the acute level in the absence of a specific New Zealand guideline.

[81] We accept the guideline values for health effects recommended by the MfE i.e 3.6 µg/m<sup>3</sup> (applied as an annual average) and provisionally accept the OEHHA (1-hour) as the guideline for acute health effects. For the record, in a memorandum filed after the hearing was adjourned, counsel for TEW amended the relief to refer to the guideline values for chronic health effects.<sup>88</sup>

### **Background level of benzene in South Taranaki**

[82] The experts agree that the background level of benzene in rural South Taranaki is likely to be below 0.5 µg/m<sup>3</sup> (as an annual average).<sup>89</sup>

### **Fugitive emissions from production facilities**

[83] The experts agree that the sources of fugitive emissions from production and processing facilities are as follows:

- (a) continuous, low level (<10 m above ground level), low velocity leaks of gas from process equipment, liquid storage tanks and pipework;
- (b) uncontrolled loss of gas due to equipment failure or process upset; and
- (c) uncontrolled, "large", high velocity releases.<sup>90</sup>

<sup>87</sup> Transcript at 912-914.

<sup>88</sup> Enright memorandum dated 20 September 2018. When recommending separation distances for incompatible activities, Ms Wickham did not apply the guideline values but determined instead the distance by which incremental change in the level of benzene from a flare stack would approach the pre-existing background level (Air Quality JWS 1 May 2018 at [10(a)]. While the guideline values are not mandatory in their application, like PEPANZ, TEW did not produce evidence – including toxicological evidence – to substantiate this departure.

<sup>89</sup> Air Quality JWS, dated 1 May 2018 at [5] and [11].

<sup>90</sup> Air Quality JWS, dated 1 May 2018 at [3]-[4].



[84] They further agree that, while impractical to measure fugitive emissions of benzene directly, the effect of benzene on air quality can be measured as an ambient concentration.<sup>91</sup>

***Continuous low level, low volume leaks***

[85] The main sources of fugitive emissions at production facilities are known, however the rates of emissions are not well quantified. Alarm systems at production facilities alert operators to detectable levels of gas leaks. While there is continuous monitoring of gas levels, monitoring does not quantify emissions. Mr Cudmore says that fugitive emissions that escape the site control systems are those that may result from a process valve or piping that starts to leak (i.e. prior to identification and being fixed) and any emission from tanks and equipment that the extraction system does not capture.<sup>92</sup>

[86] That said, the level of fugitive emissions is likely to be, to an extent, proportional to the scale of the production station, but with the concentration of contaminants discharged off-site largely determined by the on-site facilities and control systems. An increase in production capacity does not necessarily translate to an increase in fugitive emissions, as capacity increases are usually accompanied by an upgrade in technology systems.<sup>93</sup> Generally speaking, the level of technology employed on site to monitor, contain and mitigate fugitive emissions differs from site to site and a small site with limited controls may have a similar level of emission as a large site with good controls.<sup>94</sup>

[87] Monitoring at the boundary will not detect short-term discharges from process upset. Moreover, it is cost-prohibitive to perform continuous, ambient air quality monitoring downwind of a production facility for this purpose. Instead, process excursions are best assessed through predictive dispersal modelling.<sup>95</sup>

[88] The experts are agreed that long-term monitoring at the boundaries of production facilities is representative of ambient levels of contaminants near or at the boundaries of

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<sup>91</sup> Air Quality JWS, dated 1 May 2018 at [5(a)].

<sup>92</sup> Air Quality JWS, dated 1 May 2018 at [36(a)].

<sup>93</sup> Air Quality JWS, dated 1 May 2018 at [36(e)].

<sup>94</sup> Air Quality JWS, dated 1 May 2018 at [34] and [36(d)].

<sup>95</sup> Air Quality JWS, dated 1 May 2018 at [35].





those facilities.<sup>96</sup> Workers at some production facilities (at least) are required to wear passive monitoring badges.<sup>97</sup> Both experts also agreed that badges are a low-cost and reliable, but not highly accurate, method of analysis.<sup>98</sup> For production facilities, the data from passive badges is inconclusive. Indeed, Mr Cudmore acknowledged there is not a good body of data upon which to reach a firm conclusion either way whether there is an “issue” with benzene at the boundary of production facilities.<sup>99</sup>

[89] Monitoring data for Kapuni and Pohokura confirms emissions from these facilities can cause elevation of benzene levels at or near the site boundary.<sup>100</sup> Although this does not necessarily mean that emissions will exceed the acute or chronic guidelines,<sup>101</sup> Mr Cudmore considers “fugitive emissions ... from the gas processing are starting to become as significant as the flare emissions”.<sup>102</sup>

[90] At the direction of the court, the air quality scientists reviewed monitoring reports for the last five years produced by the Regional Council for Kapuni Production Station, Kapuni Gas Treatment Plant and Maui Production Station. During this period, the Regional Council did not report on benzene emissions. In saying that, the Regional Council may have had good reason to reduce the frequency of its monitoring.

[91] The Regional Council did monitor methane at the boundary of the above production facilities to determine whether there was an exceedance of the lower explosion limit. We do not know whether the Regional Council relies on that test as an indicator of benzene emissions, as suggested by Mr Cudmore. We record Mr Cudmore’s opinion that the use of the test as a measure of benzene was not “ideal”.<sup>103</sup> Ms Wickham goes further, we think for good reason, and rejects the application of the lower explosion limit as a test for the presence of benzene.<sup>104</sup>

[92] By way of a section summary, the evidence in relation to fugitive emissions from production stations did not provide a clear basis for determining if they are likely to be

<sup>96</sup> Air Quality JWS, 1 May 2018 at [12(d)].

<sup>97</sup> Air Quality JWS, dated 1 May 2018 at Table 1.

<sup>98</sup> Air Quality JWS, dated 1 May 2018 at [10(c)]. At [36(c)] the level of accuracy for a badge is given as being  $\pm 30\%$ .

<sup>99</sup> Transcript at 888.

<sup>100</sup> Cudmore, EIC at [98].

<sup>101</sup> Air Quality JWS, dated 1 May 2018 at [5].

<sup>102</sup> Transcript at 317-318.

<sup>103</sup> Transcript at 888.

<sup>104</sup> Transcript at 950-951.



sufficient to present a risk to human health or not, and if they are, at what facilities and at what distance from the emission source would they cease to be of concern. We note Mr Cudmore's evidence that elevated levels of benzene measured directly opposite the Pohokura Production Station and near the Kapuni Gas Production station are well within worker guideline exposure levels.<sup>105</sup> We are aware that with the exception of McKee, the available ambient air quality monitoring data at the boundary of production stations does not indicate exceedance of chronic guideline values, although the limited data base means it is not possible to be confident on this point. Finally, the available monitoring data provides no indication of whether or not acute guideline values are exceeded on occasions, over what distance, for how long and at which sites.

***Uncontrolled loss of gas due to equipment failure or process upset***

[93] While noted as a source of fugitive emissions, we have no evidence on the frequency and duration of these events. We note that Regulation 12 of the PEE Regulations requires the operator to safely dispose of any waste gases,<sup>106</sup> but we received no evidence on whether or not compliance has been an issue.

***Uncontrolled, "large", high velocity releases***

[94] While noted as a source of fugitive emissions, we have no evidence that such events have occurred in South Taranaki or, if they have, on the frequency and duration of these events. Mr Phillis discusses the off-site consequences that can occur from the use of hazardous substances at petroleum facilities in terms of injuries and fatalities. His understanding is that there has never been an event of this type in the Taranaki petroleum industry that has resulted in significant off-site consequences.<sup>107</sup>

**Fugitive emissions from well-sites**

[95] The air quality scientists agreed that fugitive emissions from well-sites during drilling, testing and production are:

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<sup>105</sup> Cudmore, EIC at 187.

<sup>106</sup> Transcript at 635 and Regulations.

<sup>107</sup> Phillis, EIC at [23]-[26].





- (a) continuous, ground level, low velocity leaks of raw gas;
- (b) high velocity cold venting of raw gas; and
- (c) uncontrolled, "large" high velocity releases.<sup>108</sup>

***Continuous, ground level, low velocity leaks***

[96] Mr Cudmore says that during exploratory drilling and the installation of production wells some fugitive emissions can occur where the operation includes the temporary storage of produced water and condensates on site but in his opinion such fugitive emissions are likely to be at low levels that do not significantly impact on air quality off-site.<sup>109</sup> He also sets out a comprehensive summary of the evidential basis for his concluding that fugitive emissions from well-sites are not significant in terms of potential exposures to people living or working off-site.<sup>110</sup> Ms Wickham said she does not have Mr Cudmore's direct experience of visiting sites<sup>111</sup> and did not materially challenge his evidence on this matter.

[97] Workers at well-sites are required to wear BTEX monitoring badges. The air quality experts understood that the Regional Council's monitoring regime for the industry generally included reviewing data from, *inter alia*, those badges.<sup>112</sup>

[98] Mr Cudmore had not sighted the monitoring data from workers, but was given to understand by the "industry" that it does not have a concern with health effects of workers exposed to emissions.<sup>113</sup>

***Cold venting***

[99] Venting of un-combusted gas<sup>114</sup> to air routinely occurs for maintenance purposes and, based on industry advice, Mr Cudmore understands venting lasts typically for 10 to 15 minutes and discharges only a small quantity of gas in the order of 1 kg or less.<sup>115</sup>

<sup>108</sup> Air Quality JWS, dated 1 May 2018 at [3]-[4].

<sup>109</sup> Cudmore, EIC at [92].

<sup>110</sup> Air Quality JWS, dated 1 May 2018 at [32].

<sup>111</sup> Air Quality JWS, dated 1 May 2018 at [32].

<sup>112</sup> Air Quality JWS, dated 1 May 2018 at [6(b)].

<sup>113</sup> Air Quality JWS, dated 1 May 2018 at [32(a)].

<sup>114</sup> Also known as 'cold venting'.

<sup>115</sup> Air Quality JWS, dated 1 May 2018 at [39].



Operators are required to report to WorkSafe any volume of gas vented in excess of 1 kg. [Note: the experts did not discuss cold venting at production facilities].

[100] Mr Cudmore also described a more significant cold venting event that occurred in South Taranaki within the last 10 years, which was a planned event. He modelled the event, which showed that the downwind ambient impact pattern is similar to that resulting from a hot flare within 150m of the source. The risk of acute health effects are obvious under such an event and we are not told whether that event was authorised by the resource consent (assuming this necessary). That said, we note Mr Cudmore's advice "The industry can easily plan such rare events, so that no nearby residential dwellings are downwind of the discharge stack and there are wind conditions prevailing".<sup>116</sup>

[101] Mr Cudmore's evidence also was that in the past, depressurizing of gas fields was accompanied by venting un-combusted gas to air but he understands this no longer occurs. His recollection was that this was a rare event occurring possibly once every five to 10 years.<sup>117</sup> He suggested that cold venting of large volumes of un-combusted gas may require a discharge permit.<sup>118</sup> We do not know whether that is also the case for cold venting of gas for maintenance purposes.

[102] Ms Wickham raised cold venting as something that could have adverse effects on human health, but provided no evidence to show it was an issue in Taranaki.

***Uncontrolled, "large", high velocity releases.***

[103] The only incident in New Zealand of this type of event occurred in approximately 1995 at the McKee 13 well.<sup>119</sup> We were advised that controls on well operations have improved significantly in the intervening period.

**Emissions from a flare stack**

[104] Both production facilities and well-sites operate flare stacks, the difference between them being that stacks at production facilities are intermittently used to enable facilities to be depressurised for the purpose of maintenance and inspection or in the

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<sup>116</sup> Air Quality JWS, dated 1 May 2018 at [39].

<sup>117</sup> Transcript at 836.

<sup>118</sup> Transcript at 882 and 896.

<sup>119</sup> Johnson, EIC at [24(b)].





event of an emergency. This contrasts with flaring at a well-site which is typically done during start-up and testing to stabilise gas pressure, before it is sent to a production facility. In the case of Cheal, gas was also flared when the production facility was unable to receive gas.<sup>120</sup>

[105] All flare stacks emit contaminants that:

- (a) are typically intermittent, high temperature, high velocity products of gas combustion; and
- (b) can include elevated levels of products of incomplete combustion due to reduced combustion efficiency.<sup>121</sup>

***For well-sites***

[106] There has been a single emission test of a flare stack where benzene was monitored, conducted in 2012 by the Regional Council. We discuss this in the next section. Aside from this emission test and the monitoring of flaring undertaken at the Mangahewa-C well-site to our knowledge there has been no emissions testing of flare operations for compliance monitoring purposes.

[107] As noted above, emissions from a flare can include elevated levels of the products of incomplete combustion due to reduced combustion efficiency. One example given being the emission of black smoke emissions from a flare stack<sup>122</sup> due to a process upset.<sup>123</sup>

[108] Monitoring of the Mangahewa-C well-site during well clean-up and flaring was undertaken by the Taranaki Regional Council at the request of the well operator following complaints about a smoking flare. Monitoring was undertaken at five sites from 24 September 2013 to 4 October 2013. Flaring was intermittent on site during the monitoring period. All site samples returned results below detectable limits (< 6 µg/m<sup>3</sup> and well below the OEHHA acute guideline) and the report concluded that flaring activities were unlikely to have had any significant or on-going adverse effect on the

<sup>120</sup> Bridge, EIC at [17]-[18].

<sup>121</sup> Air Quality JWS, dated 1 May 2018 at [3]-[4].

<sup>122</sup> Also known as a 'smoking flare'.

<sup>123</sup> Cudmore, EIC at [111]-[114] describes a number of process upsets which may cause a black smoke emissions.



environment.<sup>124</sup>

[109] There have been ten complaints made to the Regional Council over the last five years over smoking flares.<sup>125</sup> It is Mr Cudmore's evidence that smoking flares are an infrequent event.<sup>126</sup> He says that there have been no reports to Worksafe of releases of 1 kg of gases or more since 2016 and that uncontrolled backflow of gas events from a well are very rare and in the order of a 1 in 10-year event.<sup>127</sup> During such events, he considers the emissions are likely to contain a higher concentration of contaminants (excluding NO<sub>2</sub>), with Mr Cudmore estimating up to ten times higher than the levels predicted by the dispersal model for normal flare operations but even at this higher concentration, it would still not create concern concerning short-term exposures. He predicts that with levels 100 times higher, the probability of this impacting at a surrounding house would be very low, if it did occur.<sup>128</sup>

[110] Finally, we record that Ms Wickham fairly acknowledged that she has little direct experience of flare operation, noting she had witnessed the Cheal-A flare smoking during a visit to a nearby house.<sup>129</sup> We reviewed Ms Wickham's qualitative assessment of emissions from abnormal flaring set out in her Attachment 1 in but this did not assist in reaching any conclusion on the level of contaminants emitted from this source.

***Findings: emissions from a flare stack***

[111] We find that process upset can occur a few times each year, with each event lasting for a period of a few hours or less.<sup>130</sup> Given the infrequency of these events, we accept that emissions are unlikely to have a chronic health effect. The issue that arises is whether there is a potential for sensitive activities to be exposed to levels of benzene which may cause an acute health effect.<sup>131</sup>

[112] We have noted Mr Cudmore's advice that the assessment of process related discharges "enters into the process hazard-risk assessment arena" which requires

<sup>124</sup> From reference in Air Quality JWS, dated 1 May 2018 at Table 1.

<sup>125</sup> Cudmore, EIC at [135].

<sup>126</sup> Cudmore, EIC at [138].

<sup>127</sup> Air Quality JWS, dated 1 May 2018 at [29].

<sup>128</sup> Air Quality JWS, dated 1 May 2018 at [19].

<sup>129</sup> Air Quality JWS, dated 1 May 2018 at [29].

<sup>130</sup> Air Quality JWS, dated 1 May 2018 at [33].

<sup>131</sup> Air Quality JWS, dated 1 May 2018 at [19] and [33].





process risk knowledge and expertise.<sup>132</sup> This qualification of his expertise is quite appropriate although it creates doubt whether and to what extent he is able to give evidence on the topic and the weight the court should give to his opinion that the probability of these events and their consequences are “minor”.<sup>133</sup>

### **Emissions test from a flare and the dispersal model**

[113] Returning to the emissions test from a flare, the Regional Council has undertaken a single emissions test of a flare pit at Tauriki.<sup>134</sup> This is the only study conducted in New Zealand on emissions testing from a flare where benzene was monitored.<sup>135</sup> The conditions of the test were not ideal as the pit flare contained fracking fluids that had evaporated into the combustion zone and, as a consequence, would have hindered clean combustion.<sup>136</sup> However, the fracking fluids that were used were more concentrated than occurs under normal operation, providing a possible degree of conservatism to be balanced against this.

[114] The data obtained has been used to confirm the physical inputs to a dispersal model ran by Mr Cudmore to predict benzene emissions from a stack. Ms Wickham considered the test provided good physical emissions data on which to base the model<sup>137</sup> and, subject to concerns that she expressed in relation to the terrain assumptions and rate of gas modelled, considered also that the dispersal model used appropriate input data.<sup>138</sup>

[115] The test results record benzene measured at 4.5 µg/m<sup>3</sup> (8 and 9-hour average) at a distance of 90m roughly south of the stack (upwind) and again at 4.15 µg/m<sup>3</sup> of 400m north (downwind) of the stack.

[116] The measurement of 4.5 µg/m<sup>3</sup> at a site south of the stack is higher than what Mr Cudmore would have expected and he concluded the study method resulted in

<sup>132</sup> Cudmore, supplementary evidence dated 25 July 2018 at [24].

<sup>133</sup> Air Quality JWS, dated 1 May 2018 at [19].

<sup>134</sup> Common bundle 34. Taranaki Regional Council (2012): Investigation of air quality arising from flaring of fracturing fluids – emissions and ambient air quality. Technical Report 2012- 03. ISSN: 0114-8184.

<sup>135</sup> Air Quality JWS, dated 1 May 2018 at [17].

<sup>136</sup> Air Quality JWS, dated 1 May 2018 at [17(d)].

<sup>137</sup> Air Quality JWS, dated 1 May 2018 at [17(b)].

<sup>138</sup> Air Quality JWS, dated 1 May 2018 at [17((h))].



systematic bias in the data.<sup>139</sup> Even so, he thought the data is valuable in that it may be analysed for the relative change in the level of benzene emitted by the stack over and above the background level of benzene.<sup>140</sup> Ms Wickham agreed that there was a good basis to conclude that the test included systematic bias.<sup>141</sup> In their Joint Witness Statement,<sup>142</sup> Mr Cudmore said that no weight and Ms Wickham only limited weight, should be placed on that measurement in absolute terms.<sup>143</sup>

[117] We would have thought that the matter would end there, with no or limited weight being given to the data in absolute terms, but with the data being useful to confirm the parameters of the dispersal model that was developed to inquire into the emissions from a stack. However, Ms Wickham, who was critical of the fact that fugitive emissions were not modelled, then looked at the data to see what if anything, it had to say about fugitive emissions generally, and about the elevated concentrations of benzene following combustion of gas and fracking fluids beyond 400m.<sup>144</sup> If Mr Cudmore is correct in his understanding that there is systematic bias towards a higher background level of benzene, then, in Ms Wickham's opinion, the entire data set should be disregarded and not used as inputs into the dispersal model.<sup>145</sup>

[118] Recalling Mr Cudmore's advice that the depositing of fracking fluids in a flare pit is not routine, but instead fracking fluids are separated, stored and deep well reinjected into old well-sites<sup>146</sup> and secondly, that the data set has no value in absolute terms, the appropriateness of the data set does not seem to be a matter in issue.

[119] Given TEW's notification that it is no longer pursuing a separation distance for fracked wells, we conclude it is not a matter we need to decide.<sup>147</sup>

<sup>139</sup> We note his supplementary evidence dated 25 July 2018 at [11], where a similar error is noted in Cheyne B. (2013): Memorandum to the Environmental Monitoring Manager and Scientific Officer – State of the Environment, Taranaki. Regional Council File No. 1262809-SEM 4/11. 25 October 2013.

<sup>140</sup> Transcript at 862.

<sup>141</sup> Transcript at 971.

<sup>142</sup> Dated 1 May 2018.

<sup>143</sup> Air Quality JWS, dated 1 May 2018 at [11].

<sup>144</sup> Wickham, supplementary evidence dated 6 July 2018 at [11]-[15]. We record that we also heard evidence as to whether the 4.5 µg/m<sup>3</sup> (8 and 9-hour average) measured at a distance of 90m was or was not a "fugitive emission". At Transcript 971 and 973 Ms Wickham appears to say that she may have misspoke when talking about "fugitive emissions". Ms Wickham's concern may be best expressed as a concern whether the levels of contaminants from combusted fracking fluids will be distances greater than those predicted in the dispersal model.

<sup>145</sup> Transcript at 973-974.

<sup>146</sup> Air Quality JWS, dated 1 May 2018 at 6.

<sup>147</sup> Enright, memorandum dated 20 September 2018.





***Discussion and Findings: Is the data set appropriate to confirm the parameters for the dispersal model?***

[120] Ms Wickham raised specific concerns around the rate of gas modelled and the parameters used to model terrain.<sup>148</sup>

[121] The sensitivity of the model to the rate of gas inputted was not developed in evidence. We have no basis to assess the salience of the inputs used to any matter that is in issue and make no findings on this point, other than to note that Mr Cudmore's modelling assumed the flare operated continuously throughout the year, which is clearly an unlikely scenario that provides a significant contingency allowance. While, for consenting purposes, the use of inappropriate terrain parameters could invalidate the model's results – we were told the modelling illustrated emissions based on meteorological data developed for two named production facilities using widely differing terrain parameters appropriate to those facilities.

***Discussion and Findings: What weight does the court give to the predictions from the dispersal model?***

[122] Given that both experts had agreed the dispersal model is appropriately set up for a flare stack operating under normal conditions, we were confused by the criticism that the fugitive emissions had not been modelled. We were not told how this would inform a decision about separation distances. Given their inherent variability we doubt that this could be done in any meaningful way.

[123] The dispersal model predicts that, at a distance of 70m from the flare stack operating under normal conditions, the level of benzene will be at or below the guideline level for chronic health effects of 3.6  $\mu\text{g}/\text{m}^3$  (as an annual average).<sup>149</sup> For now, we accept and give this prediction weight.

[124] That said, responding to the court's questions Mr Cudmore made the noteworthy statement that emissions from the stack are variable, with isolated hours exceeding 27

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<sup>148</sup> Transcript at 922.

<sup>149</sup> Transcript at 898.



$\mu\text{g}/\text{m}^3$  by several factors being typical for a well-site.<sup>150</sup> If Mr Cudmore means that from time to time emissions are likely to exceed the acute guideline level for benzene of  $27 \mu\text{g}/\text{m}^3$  (OEHHA (1-hour)), then we want to know the frequency, duration and likely distance of these levels from a flare stack.

**How could potentially incompatible land uses be managed under the District Plan?**

[125] Both experts recommend separation distances as a method to manage the effects of potentially incompatible land use activities.

[126] TEW amended the relief sought for separation distances after the hearing adjourned. Its latest relief is set out in Table 1.

**Table 1: TEW's Amended Separation Distances**

Table 1				
Activity	Pollutants of Concern	Ms Wickham JWS Minimum separation distance	Ms Wickham Transcript Minimum separation distance	TEW Transcript and closing submissions Minimum separation distance
Flaring	BTEX	500m	400m	300m
Flaring with hydraulic fracturing	Dioxins PAHs PM10, NO2	750m	650m	—
Production station	VOCs	500m	400m	500m

Footnotes omitted.

[127] TEW submits if the court were to focus on long term exposure to benzene as the most relevant guideline, there is common ground in that there should be a 300m and 500m separation distance between well-sites and production facilities respectively. We note TEW is no longer pursuing its relief in relation to fracked wells.

<sup>150</sup> Transcript at 898.





[128] The court received a considerable amount of evidence from TEW in support of separation distances responding to the chronic and acute health effects of contaminants, including emissions from flare stacks and a wide range of fugitive emissions. Distances originally recommended for fugitive emissions, and repeated elsewhere in the Joint Witness Statement,<sup>151</sup> do not appear in Table 1 above.

[129] While counsel for TEW asserts there is common ground on the separation distances, and from the footnotes embedded in Table 1 (not reproduced), the distances appear to be those proposed by Mr Cudmore in his evidence-in-chief. If correct, counsel does not address Mr Cudmore's subsequent downward revisions of his recommended distances to 70m and 300m for well-sites and production facilities respectively.<sup>152</sup>

[130] For reasons that we will come to, neither PEPANZ nor the District Council have adopted the separation distances although PEPANZ, at the adjournment of the hearing, advocated for separation distances proposed by Mr Cudmore if the court was of the view the method should be applied.<sup>153</sup>

[131] If there is no common ground between the experts on the method to derive those distances, this begs the question: whose evidence is TEW asking the court to prefer and why?

*Mr Cudmore's recommendations on separation distances*

[132] Mr Cudmore gave a number of reasons in support of separation distances including that the distances define an effects management area within which there needed to be a formal assessment of air quality effects;<sup>154</sup> the distance protects against health effects<sup>155</sup> and importantly – as a method triggering the requirement for sensitive activities to obtain consent, it also provides opportunity for operators to verify their compliance with the conditions of the discharge permit.<sup>156</sup> We return to the last reason given shortly.

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<sup>151</sup> Air Quality JWS, dated 1 May 2018 at Tables 1-4.

<sup>152</sup> Cudmore, supplementary evidence dated 25 July 2018 at [40] and [45]. Transcript at 852-860.

<sup>153</sup> Allen, closing submissions at [36].

<sup>154</sup> Air Quality JWS, dated 1 May 2018 at [41].

<sup>155</sup> Cudmore, supplementary evidence dated 25 July 2018 at [42].

<sup>156</sup> Transcript at 848.



[133] Mr Cudmore advises that his initial 500m separation distance for production stations was an “educated guess” but was not well-established through modelling.<sup>157</sup> Later, having considered the outputs from the dispersal model, Mr Cudmore revised his recommended separation distance for production facilities to 300m.<sup>158</sup> We understand him to say that this separation distance is sufficient for emissions discharged from a stack, possibly including fugitive emissions vented through the stack.<sup>159</sup>

[134] The dispersal modelling does not, however, consider other sources of abnormal/fugitive emissions. And, in light of his evidence that fugitive emissions may be approaching those of a flare stack at some production stations, it is unclear whether his revised recommendation takes into account the cumulative effect of continuous emissions from leakage and intermittent emissions from other sources.<sup>160</sup>

[135] Based on dispersal modelling and the standard conditions imposed by the Regional Council on a discharge permit beyond which there are noxious effects, for well-sites he suggested a distance of 70-100m. In saying that, he was equally comfortable with a separation distance of 300m in line with the standards imposed on a controlled activity in the Air Plan.<sup>161</sup>

*Ms Wickham's recommendations on separation distances*

[136] As noted, both experts agree abnormal emissions are likely to create the potential for increased acute exposures with the potential to result in adverse effects on human health.<sup>162</sup>

[137] If we work on the basis that significant hazardous facilities cannot internalise all emissions, we understand the purpose of Ms Wickham's recommended separation distances is to ensure that the facilities continue to operate without giving rise to adverse effects on human health resulting from the release of unintended discharges.<sup>163</sup> Specifically, she addressed a range of emission scenarios where people living within an

<sup>157</sup> Air Quality JWS, dated 1 May 2018 at [41].

<sup>158</sup> Cudmore, supplementary evidence dated 25 July 2018 at [40]-[43].

<sup>159</sup> Cudmore, supplementary evidence dated 25 July 2018 at [42]. Transcript at 875.

<sup>160</sup> Transcript at 875-876.

<sup>161</sup> Transcript at 887.

<sup>162</sup> Air Quality JWS, dated 1 May 2018 at [19]. See also Transcript (Bridge) at 279.

<sup>163</sup> Transcript at 955.





associated effects radius may be exposed to levels of benzene that can cause adverse health effects.

[138] Ms Wickham's approach, not unlike Mr Cudmore, is also to make a judgement about separation distances. She recommends there be separation distances because air discharge permits do not control for, and operators cannot prevent, fugitive emissions.<sup>164</sup>

[139] At paragraph [64] of her evidence-in-chief, she says:

[m]y review of the literature suggests there is no scientific consensus on the existence, or lack, of human health effects from discharges to air associated with petroleum exploration and development.

[140] And at paragraph [74] Ms Wickham clarifies:

I should be clear that my recommendations are not, and cannot be, based on an exact or rigorous science ... the distances in Table 1 [to her EIC] represent a reasonable balance between the need to protect public health and the efficient exploitation of natural resources.

[141] Even so, Ms Wickham goes on to give extensive reference to facts and data from overseas studies and to guidelines adopted in other countries, without expressly stating that she does not attach weight to the same and that it was not her purpose that the court do so.<sup>165</sup> Unfortunately, the court initially misapprehended the purpose of this evidence as we struggled to understand its relevance to the matters for determination. As counsel for TEW will be aware, the court has a discretion to accept evidence as it sees fit under s 276 RMA, however the evidence received must be relevant (s 7 Evidence Act 2006).

[142] Certainly, Ms Wickham appreciated that the data and facts cited in support of the recommended separation distances, by themselves, are not meaningful or useful. Until the facts and data are assessed, organised and interpreted they are not informative of anything other than their own existence.<sup>166</sup>

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<sup>164</sup> Wickham, EIC at [71]. Transcript at 936.

<sup>165</sup> Transcript at 980-981.

<sup>166</sup> Transcript at 954.



[143] Ms Wickham arrives at her recommended distances by modifying a separation distance for houses and service stations.<sup>167</sup> She has assumed the benzene concentrations for a single well-head are similar to the level of emissions for a service station. Setting aside for one moment the contestability of this assumption, we were unable to find direct support for her methodology from the papers cited to us and are unable to give the recommendations any weight. For his part, Mr Cudmore thought that the fugitive emissions of a large petrol station are more likely to be consistent with a gas production facility than a well-site; emissions from a well-site would be low in comparison.<sup>168</sup>

### Submissions

[144] The District Council opposed the inclusion of any separation distances, submitting TEW's rules seek to manage the effects of discharges of contaminants to air. The control of discharges of contaminants to air is the function of the Regional Council (s 30(1)) and not the function of the District Council. The District Council's functions are those prescribed by s 31 of the Act and are limited to the "control of any actual or potential effects of the use, development, or protection of land..." (s 31(1)(b)).

[145] The District Council's primary thesis is that the Air Plan "deals with" all issues arising in relation to emissions, including – we interpolate – fugitive emissions.<sup>169</sup> More particularly, the Air Plan addresses both land use incompatibility and reverse sensitivity<sup>170</sup> and does so through the conditions of discharge permits which require the internalisation of "effects".<sup>171</sup> This interpretation sets the context for the District Council's central argument that the court must assume that consent holders will comply with the conditions of their discharge permit. If it transpires that they do not or that the Regional Council is not monitoring and enforcing compliance with the conditions, this is not a matter that should be addressed under the District Plan.<sup>172</sup>

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<sup>167</sup> The recommendation for a separation distance for houses and services stations is made in 2008 by a panel of experts for the Auckland Health Board. The methodology is set out in Ms Wickham's EiC at [72] and Table 1 and JWS Air Quality, dated 1 May 2018 Tables 1-4.

<sup>168</sup> Cudmore, EiC at [197].

<sup>169</sup> Transcript at 1375.

<sup>170</sup> Transcript at 1375.

<sup>171</sup> Conway, Closing at [5.18].

<sup>172</sup> Conway, Closing at [5.16].





[146] Stepping back a little, the methods identified in the Regional Policy Statement for implementing policy in relation to air quality, include both the Regional Council and the District Council maintaining plans which address reverse sensitivity effects of discharges of contaminants to air. In the case of the District Plan, it includes controls on the siting and establishment of sensitive or incompatible land uses within the vicinity of an emitter. Other methods include applying regional rules to regulate or prohibit the discharge of contaminants to air and by requiring permit holders to adopt the best practicable options to minimise the adverse effects of discharges.<sup>173</sup>

[147] The above methods give effect to a policy in the Regional Policy Statement that the adverse effects of emissions are to be avoided, remedied or mitigated so that they do not cause, or are unlikely to cause, a toxic or noxious effect on human health.<sup>174</sup> This policy is essentially replicated in the Air Plan.

[148] While, in principle, we could accept a submission the Air Plan may be administered to exclude reverse sensitivity through conditions requiring the internalisation of contaminants, we were not directed to any policies requiring that outcome.

[149] In light of Mr Cudmore's evidence as to the treatment by the Regional Council of unoccupied rural land as mitigation for effects,<sup>175</sup> we wondered what if the District Council is wrong and the Air Plan and discharge permits, properly interpreted and administered, do not require internalisation of effects?

#### **Can contaminants be internalised?**

[150] Ms Wickham's evidence was that contaminants discharged to air cannot be "internalised" within a site; rather their effects are minimised.<sup>176</sup> Indeed, the dispersal modelling of the discharge from two flare stacks does not demonstrate internalisation of effects.

[151] With the exception of Cheal Petroleum, we have no data on the incidence of flaring at production facilities (i.e. typically due to an emergency, mechanical breakdown

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<sup>173</sup> RPS, Methods AQU Meth 1, 2, 3, 8.

<sup>174</sup> RPS, AQU Objective 1 and AQU Policy 1.

<sup>175</sup> Transcript at 848-850.

<sup>176</sup> Transcript at 335.



or – in Cheal’s case, due to an inability to export gas to Waihapa).<sup>177</sup> We note the estimate that flaring occurs at production facilities for up to 5% of the time<sup>178</sup> but we do not know on what records this estimate is based.

[152] We note also the standard condition for well-sites that contaminants not cause a noxious effect at a distance greater than 100m (to that extent, at least, contaminants are not internalised). Production facilities are not subject to the same condition; instead the requirement is to comply at or beyond the boundary. We have noted Mr Cudmore’s evidence that fugitive emissions from production facilities have the potential to be as significant as those from a flare.<sup>179</sup> While flaring is infrequent at a production station, might it not cause acute health effects for sensitive receptors located within its effects radius?

[153] For the court, it remains a live question whether the conditions on discharge permits for production facilities, properly interpreted, internalise acute and chronic health effects at or beyond the boundary of a production station. Given Mr Cudmore’s evidence that emissions from the stack are variable, with isolated hours exceeding 27 µg/m<sup>3</sup> by several factors being typical for a well-site,<sup>180</sup> the same uncertainties arise in relation to well-sites within 100m of the flare.

**Do the conditions of the discharge permit require on-going compliance by consent-holders in circumstances where the sensitivity of the receiving environment increases?**

[154] We took note of the line of cross-examination pursued by the District Council that the conditions of the discharge permits require ongoing compliance by consent holders even in circumstances where the sensitivity of the receiving environment increases because of new sensitive activities locating within the effects radius of an emitter. The District Council’s interpretation is that conditions may be of some moment to the oil industry where, in the Rural Zone, alterations to a significant hazardous facility must be authorised by a resource consent.<sup>181</sup>

<sup>177</sup> Air Quality JWS, dated 1 May 2018 at [21]. Wickham, supplementary evidence dated 17 September 2018.

<sup>178</sup> Air Quality JWS, dated 1 May 2018 at [28]; Transcript (Cudmore) at 927.

<sup>179</sup> Transcript at 317-318.

<sup>180</sup> Transcript at 898.

<sup>181</sup> Rule 12.1.4.





[155] Mr Cudmore was asked by the District Council why he recommends a separation distance of 300m from a production facility, if compliance with the conditions of the discharge permit means there is an ongoing obligation that there are no effects at or beyond the boundary of that facility. His response was that in his experience the Regional Council did not apply a literal interpretation of conditions.<sup>182</sup>

[156] While the District Council's interpretation of the discharge permit is available, the above evidence suggests that there may be an alternative interpretation. Likewise, if as Mr Cudmore says, when processing an application for a discharge permit, the Regional Council treats unoccupied rural land effectively as a buffer (his "mitigation") for adverse effects<sup>183</sup> this too begs the question whether the District Council has the correct understanding of how the Regional Council administers the Air Plan.

**Does the proposed District Plan have anything to say about fugitive emissions?**

[157] The submission by the District Council, that it is not its function to manage the effects of contaminants, essentially repeats what was said by the Hearing Panel when, rejecting TEW's submission, it decided to remove the separation distances from the pDP:

... while the District Council can regulate the use of land to manage the effects of storage, use, disposal or transportation of hazardous substances, controlling land use for the purpose of managing the effects of any discharges of contaminants from hazardous substances into the environment is a responsibility of the Taranaki Regional Council. It would therefore not be appropriate for the District Council to consider imposing any objectives, policies and rules on hazardous substances for the purpose of controlling any discharges of contaminants into the environment.<sup>184</sup>

[158] Counsel for the District Council did not address policy 2.8.6 of the pDP which states:

Ensure appropriate facilities and systems are provided to avoid accidental or unintended release, or loss of control (such as spills and gas escapes) of hazardous substances.

[Court's emphasis: directive words underlined; other key words in bold]

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<sup>182</sup> Transcript at 848-850.

<sup>183</sup> Transcript at 848-850.

<sup>184</sup> Decision Report of the Hearing Panel – Hazardous Substances and Contaminated Land at [32].



[159] Policy 2.8.6 addresses contaminants from accidental or unintended releases, or from loss of control. While the District Plan does not define these terms, emissions from these events are fugitive emissions.

[160] The Hearing Panel decided it was appropriate to have policy 2.8.6, even if the policy was to be given effect through methods outside the pDP. Indeed, the evidence was that the policy is implemented by controls in WorkSafe legislation and regulations, the Regional Plans and lastly, by the requirement that significant hazardous facilities, subject to compliance with certain performance standards, obtain authorisation as a discretionary activity.<sup>185</sup>

[161] Rejecting the submission by the oil companies that the policy be amended to record that risks are to be “managed” rather than “avoided”, the Hearing Panel found this would provide no direction as to the purpose of the management. Recognising that the risks “may be **inherent** with these types and scale of activities” [our emphasis], the Panel held that the consequence of those risks, including the effect on human health, should be avoided.<sup>186</sup>

[162] Thus, contrary to the District Council’s understanding, the District Plan has, at some level, policy that appears to address the emissions of contaminants.

[163] Having not received evidence or submissions on policy 2.8.6 and its relationship with the other hazardous substances policies, including in particular policies 2.8.5 and 2.8.9, it is not appropriate for the court to express any concluded view without giving the parties the opportunity to respond. In the following section, we offer commentary on policy 2.8.6 and will direct the parties to respond by way of submission and planning evidence.

#### ***Commentary on policy 2.8.6***

[164] Policy 2.8.6 is expressed in strong directive language. The consent authority is to “ensure” that appropriate facilities and systems are provided to “avoid” accidental or unintended release or loss of control of hazardous substances. By giving examples, the

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<sup>185</sup> Wesley, supplementary statement dated 28 May 2018 and rules 12.1.4(a) and 12.1.5(a).

<sup>186</sup> Decision of the Hearing Panel – Hazardous Substances and Contaminated Land at [113].





policy illustrates the type of release that it is concerned with, including the escape of gas.

[165] The evidence does not support a finding that petroleum facilities and systems can avoid the occurrence of these events. Presently, operators strive to minimise the risk of the events occurring, and the adverse consequences to human health as far as reasonably practicable.

[166] The policy gives effect to objective 2.8.3 which, inter alia, is to ensure risks to human health are minimised to acceptable levels. One interpretation of the objective and policy, is that risk to human health is minimised to an acceptable level (objective 2.8.3) when the consent authority ensures appropriate facilities and systems are provided. Facilities and systems are appropriate, if the consent authority is satisfied that the facilities and systems will avoid the occurrence of these events (policy 2.8.6).

[167] Is this objective and policy 2.8.6 satisfied by a discharge permit granted under the Air Plan that authorises discharges to air? We would have thought such an interpretation problematic given that the policy focus is on the use of land by facilities and associated systems. The policy does not talk about the adverse effects of hazardous substances.<sup>187</sup> In contrast, policy 2.8.5 addresses directly the risk to human health through facility location, design, construction and management. By not referring to the risk to human health or to effects generally, policy 2.8.6 appears to have a deliberate focus on the events that cause release of hazardous substances and not the consequence to human health of those events occurring.

[168] If "avoid" means "prevent from happening",<sup>188</sup> then we doubt policy 2.8.6 is satisfied by future compliance under the WorkSafe legislation and regulations, as this legislation does not require all risks to be eliminated. In any event at the time resource consent is sought it is unlikely that design of the facility will be known, let alone approved under that legislation.<sup>189</sup>

[169] The elephant in the room, so to speak, is the potential for emissions from accidental or unintended release or loss of control of hazardous substances to have a deleterious effect on human health. Addressing this potential was an important concern

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<sup>187</sup> Objective 3.3 of the Air Plan.

<sup>188</sup> Oxford Online Dictionary and Cambridge Dictionary.

<sup>189</sup> Transcript at 460-461 and 467.



for Ms Wickham. Indeed, the Hearing Panel discusses this potential saying it would be appropriate for the Plan to avoid these effects.

[170] We were left wondering how the policy will be implemented and whether there are linkages between this policy and the relief TEW is seeking.

### **What does the Regional Air Quality Plan say about fugitive emissions?**

[171] Finally, we considered what the Air Plan had to say about the discharge of contaminants. Rules 9-12 address contaminants discharged to air from well-sites, gas treatment and production plants, subject to compliance with the standards, this is a controlled activity. A separate rule defines any discharge of contaminants to air that is not captured in the rules, as a discretionary activity.<sup>190</sup> "Discharge" includes "emit, deposit, and allow to escape" and has the same meaning as under the RMA.

[172] These rules give effect to an objective to maintain the existing high standard of ambient air quality and second, to avoid, remedy or mitigate the adverse effects of activities discharging contaminants (3.3). Implementing policies include policy 1.1:

Discharges to air of contaminants should avoid, remedy or mitigate adverse effects of potentially hazardous, noxious, dangerous or toxic contaminants by ensuring that any such discharge does not occur at a volume, concentration or rate or in such a manner that causes or is likely to cause a hazardous, noxious, dangerous or toxic effect on human or animal health, significant ecosystems or structures.

[173] Policy 2.2 requires the Regional Council to exercise its functions and powers to control the adverse effects of the discharge of contaminants to air through regional rules.

[174] The Air Plan also recognises the District Council's role in planning for land use and subdivision and that these activities "should be managed to avoid, remedy or mitigate adverse effects on people and the environment from reverse sensitivity effects arising from the inappropriate location of sensitive activities in proximity to legitimate activities discharging contaminants to air" (policy 2.5).



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<sup>190</sup> Air Plan, Rule 55.



[175] The Air Plan policies control noxious and toxic contaminants. These terms have broad over-lapping definitions<sup>191</sup> and we would accept they apply to contaminants, the exposure to which, may cause an acute or chronic health effect.

[176] Consent holders are not required to monitor discharges to air to demonstrate compliance with conditions.<sup>192</sup> Instead, the Regional Council has an annual monitoring programme to assess compliance with the discharge permits. As noted, it is unclear to us whether the Regional Council applies health based guideline values for both acute and chronic health effects when undertaking compliance monitoring.

[177] Contrary to the District Council's submission, TEW's planning witness, Mr G Carlyon, did not give an unqualified acceptance of the propositions put to him in cross-examination by the Council that controls on discharges to air "guard against reverse sensitivity effects".<sup>193</sup> Even if he did, this evidence would need to be considered alongside the evidence of the air quality experts.

#### **Discussion on separation distances**

[178] In the following section we discuss the separation distances recommended by the air quality experts in light of the Air Plan and counsels' submissions. We commence by saying that the evidence of the air quality experts has created considerable uncertainty in our minds whether the Regional Council does administer the Air Plan by requiring all applicants for discharge permits to internalise the effects of their emissions as contended by the District Council.

[179] For well-sites this is plainly not the case as most discharge permits we sighted controlled the level of effect at a distance of 100m from the flare. Both experts agree that there is the potential for off-site short-term concentrations of benzene to be elevated following a process upset.<sup>194</sup> Mr Cudmore said there could be benzene emissions that exceed 27 µg/m<sup>3</sup> by "several factors" during isolated hours, which would probably be seen at a typical well-site,<sup>195</sup> although we do not know the predicted radius of any acute health effect.

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<sup>191</sup> Air Plan, section 4.2.3.

<sup>192</sup> Planners JWS, dated 23 August 2018 at [4.3.5].

<sup>193</sup> Conway, closing submissions at [5.3] and memorandum dated 18 September 2018.

<sup>194</sup> The example given being poor flare combustion from separation equipment failure.

<sup>195</sup> Transcript at 898.



[180] We were not materially assisted by statements from Mr Cudmore that the volume of fugitive emissions are “low” with “minimal effect” or no “significant impact”.<sup>196</sup> Quite apart from the sufficiency of evidence to inform this opinion, with reference to the chronic and acute health guidelines, what do these opinions mean?

[181] We anticipate the discharge permit may authorise some types of fugitive emissions subject to compliance with the conditions of the consent.<sup>197</sup> This could potentially include continuous leakage and emissions through the stack that are the consequence of process excursion; all emissions from a flare stack (including any fugitive emissions vented through the stack) and finally cold venting of gas less than 1kg.<sup>198</sup>

[182] That said, it is unclear to us if the Regional Council applies the guideline values to determine compliance with conditions that preclude noxious contaminants at or beyond the boundary, and if they do, do they specifically consider both chronic and acute guideline values? For all petroleum activities, considerable uncertainty arises from the evidence that the Regional Council may consider undeveloped land as mitigation for adverse effects of contaminants. The point being that under the pDP sensitive activities are permitted within the effects radii of these activities.

### **Preliminary findings in relation to the effects of contaminants emitted from petroleum**

[183] The findings are preliminary only, and may be modified by the court if the parties and the Regional Council accept our invitation that the latter address the court. Our preliminary findings are as follows:

- (a) the control of discharges to air from existing and new petroleum activities is the responsibility of the Taranaki Regional Council and should not be duplicated in the pDP;
- (b) land use controls are the responsibilities of territorial authorities.<sup>199</sup>

<sup>196</sup> Cudmore, EiC at [92] and [97].

<sup>197</sup> The planners thought that standard conditions of consent could apply to all emissions, including “abnormal” discharges (Planners JWS, dated 23 August 2018 at [4.3.8]).

<sup>198</sup> The planners can confirm whether Mr Cudmore’s understanding that a discharge permit is required for larger releases of gas.

<sup>199</sup> Email correspondence dated 1 August 2018 from Gary Bedford of the Regional Council to Mr Wesley, included as Appendix 4 of the Joint Statement of Planning Experts dated 23 August 2018.





*For well-sites*

- (c) we accept the effects of emissions are likely to be below the level for chronic health effects on occupants of a dwelling house greater than 300m from the point of discharge. The position in relation to acute health effects is unknown.

*For production stations*

- (d) the evidence does not establish to the level required that emissions from production stations are not exceeding the guideline chronic health values. The position in relation to acute health effects is unknown;
- (e) for the avoidance of doubt, our findings relate only to residential and other sensitive activities defined in the pDP, not to outside activities undertaken as part of day to day work.

[184] We confirm the correctness of the propositions set out at paragraph [64]:

- (a) the location of sensitive activities is incompatible with petroleum activities if the sensitive activity is exposed to levels of contaminants which can cause chronic health effects (including death); and
- (b) the location of sensitive activities may be incompatible with petroleum activities if the sensitive activity is exposed to levels of contaminants which have the potential to cause acute health effects (including nausea and headaches) and where the actual experience of those effects have the potential for reverse sensitivity towards activities acting in accordance with the conditions of their consent.

[185] The Regional Council is not a party to this proceeding and so the court has not had the benefit of evidence from its air quality experts. The District Council is encouraged to approach the Regional Council to see whether it is willing to prepare a brief of evidence from a suitably qualified expert. Otherwise the parties may wish to consider seeking a witness summons from the court. The court would also be assisted if the Regional Council were to address the following questions, together with any other related questions arising from this interim decision and identified by counsel, which are important to the determination whether there is a need for separation distances between



incompatible land use activities:

- (a) when assessing an application for a discharge permit, does the Regional Council require evidence on compliance with any health guidelines? Specifically, does the Regional Council consider both the acute and chronic health effects of benzene?
- (b) when assessing an application for a discharge permit, does the Regional Council consider the absence of sensitive activities on land situated in proximity to a proposed petroleum activity as mitigation for the effects of contaminants discharged beyond the boundary of the site? If correct how are those distances established?
- (c) when undertaking compliance monitoring does the Regional Council specifically evaluate benzene emissions against the health guideline levels and if so, which guidelines are applied?
- (d) can the Regional Council confirm that the Air Plan contains objectives and policies that direct an outcome wherein all discharge permit holders internalise contaminants which may cause an acute or chronic health effect, either to within the cadastral boundaries of a production station or within 100m of a well-site? Second, is this how the provisions are administered?
- (e) does 'boundary' mean "cadastral boundary" when in a discharge permit?
- (f) do discharge permits authorise all discharges to air from petroleum activities, including all fugitive emissions?

### Directions

[186] We direct:

- (a) the District Council is to advise by **Friday 14 December 2018** whether it will approach the Regional Council and ascertain if the Regional Council would be prepared to file evidence responding to the court's questions and if so, for the parties to confer and prepare a list of questions respecting the observations made in this decision; and





- (b) if the District Council declines to approach the Regional Council, then by **Friday 21 December 2018** the parties will file a joint memorandum setting out the options to progress the appeal, including summoning an expert from the Regional Council.

For the court:

  
\_\_\_\_\_  
**J E Borthwick**  
**Environment Judge**

