BOARD OF INQUIRY INTO THE McCRAE LANDSLIDE

Submissions of the Mornington Peninsula Shire Council on the causes of the McCrae Landslide

Prepared for the purpose of a Board of Inquiry

13 August 2025

A Background

1. The Mornington Peninsula Shire Council (**Shire**) makes these submissions in response to topic 2 of the invitation to make submissions issued by the Board of Inquiry into the McCrae Landslide (**Board**) on 15 July 2025. These submissions concern the causes of the McCrae Landslide.

B The trigger[1] of the McCrae Landslide was water from South East Water's burst water main

2. On the evidence before the Board, the Board should find that the trigger of the McCrae Landslide was water from South East Water's (**SEW**) burst water main.

3. Expert geotechnical engineers Darren Paul for the Board and Dane Pope for the Shire gave evidence that, with a high degree of confidence, the burst main (i.e., the **Bayview Leak**) was a significant (for Mr Paul) or major (for Mr Pope) trigger of the McCrae Landslide.[2] Their opinions were supported by expert hydrogeologists Stephen Makin for the Board and Philip Hitchcock for the Shire, and geochemists Dr Hong Phuc Vu for the Board and Chris Jewell for SEW. Mr Jewell gave evidence during the hearing that the water exiting the scarp after the 5 January 2025 Landslide was *"a mixture of mains water and natural groundwater"*.[3] Mr Jewell confirmed that this was his concluded view with a *"high degree of confidence"*.[4] By comparison, the opinions of SMEC (for SEW) should not be accepted: (a) their velocity theory was discredited (and conceded as uncertain); (b) their salinity theory was undone by inconsistency (and gravity); and (c) their "alternative theory" of irrigation as a trigger was conceded to be mere speculation. SMEC's "alternative theory" of irrigation as a trigger is addressed in Section C below.

4. ***Bayview Leak:*** It is uncontroversial that in the second half of 2024 a longitudinal split occurred in a 150mm nominal diameter uPVC Class 12 pipe installed in 1963 at a depth of 1.7m (**the main**) between Bayview Rd and the Mornington Peninsula Freeway (**the burst main site**).[5] The split started with a length of 17mm, and continued to grow to reach a length of 153mm on 30 December 2024.[6] The main was the asset of, and the responsibility of, SEW.[7]

5. Expert evidence from Dr Van Zyl and Dr Brown (for SEW) is that from approximately 3 August 2024 until 31 December 2024, the burst main lost ~40.3 ML of water (i.e., 40.3 million litres of water).[8] The amount of water lost per day increased with the size of the split, peaking at 1.4ML p/d in late December 2024 immediately before SEW *discovered* and (then) *repaired* the burst main.[9]

6. From 28 November 2024, reports of water egress and road degradation downslope of the burst main site (including at Charlesworth St, Waller Pl and Coburn Ave) were made to the Shire and SEW[10]. The Shire's officers in January 2025 observed saturation of road pavement and nature strips that correlated

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[1] Mr Paul and Mr Pope appeared to agree that "triggering factor" means "what actually causes the landslide on the day" (See discussion at T1084:18–1085:47).
[2] See: Exhibit CA74, Joint Report Arising From Conclave, 31 July 2025 (***Conclave Report***), Table 2: items 21, 33.
[3] T1333:34–45.
[4] T1333:47–1334:17.
[5] Exhibit CA76, Dr E Van Zyl and Dr Brown *Flow Rate from a Longitudinal Split in PVC Pipe* , 17 July 2025 (***Van Zyl Report***), pp 11, 16.
[6] Ibid, p 16.
[7] Exhibit CA25, Witness Statement of Lara Olsen, 30 April 2025 (***Olsen Statement***) [10], [41].
[8] Van Zyl Report, p 12; cf. SEW's original estimates, which were: (a) 60-day period with 34–39ML lost; (b) 85-day period with 34–41ML lost (see: Witness Statement of Jonathan Crook, 4 June 2025, [22], Exhibit 2 McCrae Burst Volume – V4 250513 at p 5).
[9] Van Zyl Report, Figure 1 p 12, Figure 5, p 13. See also: T1228:31–41. The burst main was discovered by SEW on 30/12/24 and repaired between 31/12/24 and 1/1/25 (Olsen Statement, [40], [46]).
[10] See: Third Witness Statement of David Smith, 30 April 2025, [15]; Exhibit Q4.1A ; T594:18–22 (Lara Olsen); Exhibit CA26, Task Summary dated 28 November 2024; See also Exhibit CA18, Statement of Kevin Hutchings, undated, [46].

with the locations of sewer lines[11]. Separately, SEW recorded numerous water leaks "downslope"[12] of the burst water main at Charlesworth St, Coburn Ave, and Waller Pl in November and December 2024.[13]

7. ***Flow paths and water volume:*** While the experts said that there is some uncertainty concerning the precise flow path of the Bayview Leak, all experts agreed that a portion of water from the Bayview Leak infiltrated the surrounding soil and flowed downslope:

   (a) through the shallow aquifer (i.e. through natural soil);[14]

   (b) through the shallow aquifer, then into the service trenches with embedment material;[15] and

   (c) through the stormwater drains.[16]

8. Mr Paul opined water was *"pushed up"* to the surface, as it travelled along these pathways, when *"the resistance to subsurface flow was too high for more water to be absorbed"*[17] (explaining observations of surfacing water or "upwelling" by the community). Mr Paul noted *"only a very small proportion, about 0.1% of the water that leaked from the pipe burst would have been required to trigger the January 2025 landslides"*, and that while the exact flow path is uncertain: *"I have high confidence that water did migrate between these two locations [the burst main and the McCrae Landslide site] via subsurface pathways."*[18]

9. In his report of 21 July 2025 (**Pope Report**), Mr Pope included at Figure 3 a plan of SEW Services, being the Water Main Pipe and the Sewer Main Pipe[19]. At Figure 5[20], he included a map of surfaced water and groundwater observations, overlayed with the Water Main Pipe and Sewer Main Pipe (and which reflects the Shire's observations of saturated areas in January 2025 referred to above[21]). Ultimately, Mr Pope opined: (a) *"that the trigger and a physical cause of the 2025 Landslides [was] elevated groundwater levels"*; (b) that *"the major contributing factor to the elevated groundwater was anthropogenic"*; and (c) that *"[i]n the absence of any credible source of water to recharge the Leaky Surficial Aquifer […] the dominant source of recharge was the Outlook Road Water Main Failure."*[22]

10. Mr Pope explained: *"based on the proportion of volumes of water inferred to be available to recharge this aquifer [i.e., the leaky surficial aquifer] in November 2024 and December 2024 and around June 2025, Table 15 it is my opinion that the major credible source of the volumes of water measured on 6 January 2025 is from the Outlook Drive [sic] Water Main Failure due to its capacity to recharge the Leaky Surficial Aquifer."*[23] Mr Pope opined that *"the volume of soil that is required to be saturated is 14% of the entire drainage path highlighted at Inset 41. It follows that approximately 5.4ML would be required to recharge a channel of this nature. In my opinion even where 70% of the SEW estimate of loss went to*

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[11] Third Witness Statement of David Smith, 30 April 2025, [36]; see also Exhibits Q4.3(iii)A and B (22/1/25 map depicting observations).
[12] Exhibit CA67, Daren Paul, *Causation Report,* 21 July 2025 (***Paul Report***), [162].
[13] For a detailed summary, see: Paul Report, Table 8.1 p p 70–72; see also T1216:11–41.
[14] Ibid, [163(a)] and Figure 8.25. See also T1211:34–1212:23.
[15] Ibid, [136(c)] and Figure 8.27. See also T1212:34–41.
[16] Ibid, [163(b)] and Figure 8.26. See also T12 12:25–32.
[17] Ibid, [186].
[18] Ibid, [187].
[19] Exhibit CA71, PSM, *McCrae Landslide Causation,* 21 July 2025 (***Pope Report***).
[20] Pope Report, Figure 5, p 90. The orange area is *"MPSC Observations 22/01/2025"* and shows *"Recent/Current saturation"*. The darker green areas are *"PSM Observations 30/01/2025"* and shows *"Surface Water issues"*. Notably, this includes the house immediately next door to 10-12 View Point Road (i.e., 4 View Point Road), and 2 View Point Road, listed as *"past issues with surface water"*
[21] For discussion, see T1218:30–34.
[22] Pope Report, [188]. (NB: Mr Pope's reference to the *"Outlook Road Water Main Failure"* is a reference to the Bayview Leak).
[23] Pope Report, [174]. Note, at Pope Report, [103] Mr Pope states: *"I measured flow rates of the seepage from the 2025 Landslide: (a) on 6 January 2025 – no less than 0.15 to 0.2 litres per second measured with a 600 mL bottle. This approximates to 13,000 to 17,000 litres per day. (b) 16 June 2025 – no less than 50 litres per day. I note that I had to use a 12 mL syringe to measure this rate."*

stormwater, Table 14, this still leaves 11.4 ML that could contribute to recharge of localised paleochannels. I consider that it is almost certain that these channels exist (…[178])."[24] In the Pope Report at Table 15, Mr Pope identified the Bayview Leak as a contributing factor to recharging the leaky superficial aquifer, noting: *"[d]aily burst volumes estimated to be between 0.6 ML and 1.6ML/day…A proportion of burst volumes likely to have infiltrated into the COLLUVIUM…I note that the measured seepage out of the Landslide on 6 January 2025 is about 1% to 2% of the estimated daily burst volume."*[25]

11. In Table 16 of his report, Mr Pope identified the Bayview Leak as being the only "major" contribution to the leaky superficial aquifer[26]; he stated: *"[i]n my opinion it is almost certain that water from the [burst main] flowed at least in part to the 2025 Landslides. My opinion is supported by:- The drainage pathways of the plateau slopes, Inset 41, including those buried in the MPF [Mornington Peninsula Freeway]. – The interconnectivity of the deep sewer trenches and stormwater trenches, Figure 3. – Observation of groundwater in the sewer trenches and backfill conductive to intercepting sub-surface groundwater flows. – The short flow path between the View Point Road sewer trench and a proven flow path from NDT01 to the 2025 Landslide head, Figure 11."*[27]

12. Notably, after the expert conclave, Mr Paul opined in the conclave report that the Bayview Leak *"is the only water source impacting the ground in the vicinity of the landslide at the time that could have had sufficient volume to cause the landslide and to provide the flow rates that were observed to be issuing from the landslide. There are feasible flow paths from the leak site to the landslide through sewer trenches, stormwater pipes and leakage from pipes and through natural soils."*[28] Further, Mr Hitchcock opined: *"[a]n increase in water flow has triggered the landslide and the Bayview Road mains leak […] there are credible pathways that in my opinion could have led to water from this source flowing to the landslide area. These include flow along stormwater and sewer trenches and bedding material, flow in the surrounding permeable soils and recharge of the shallow aquifer and subsequent groundwater flow."*[29] Further, Mr Pope recorded that he *"agrees with Mr Paul" and that he "considers that water from the Bayview Road leak triggered the 2025 Landslides."*[30] The conclave report concluded: *"Mr Paul, Mr Makin, Mr Hitchcock and Mr Pope opine that the <u>only credible</u> source of water that could have provided*

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[24] As to paleochannels, see Pope Report, [97]–[98], and [178]–[179].
[25] Pope Report, Table 15, p 71.
[26] Ibid, Table 16, p 74. As to the *"leaky surficial aquifer"*, see Pope Report, [99]: *"I refer to shallow groundwater that is observed in upper surficial soils (such as FILL, COLLUVIUM, ALLUVIAL/MARINE deposits, Table 3 of the PSM LRA) about the Residual Soil and XW Granite as the **'Leaky Surficial Aquifer'**."*
[27] Pope Report, Table 16, p. 74. For Insert 41, see Pope Report, p 48 (it depicts two drainage paths; see also Pope Report, [175]–[176], [179]–[180]). For Figure 3 see Pope Report, p 86; for groundwater in sewer trenches see Pope Report, [167]; for backfill discussion see: Pope Report, [168]–[171]; for Figure 11, see Pope Report, p 96 (note: "NDT01" is a Borehole on 6 View Point Road (see Pope Report, Table 7, p 40) where Mr Pope conducted dye testing. He records at Pope Report, [75]: *"Only dye from borehole NDT01 was observed at the headscarp of the 2025 Landslides"*. See also Pope Report, Figure 7, p 92, which shows the location of NDT01 and depicts *"Green Dye Added on 12/02/2025"* and then shows at the site of the landslide *"Green dye observed on 12/02/2025"*. Mr Pope gave evidence that when putting dye into NDT01 he did so *into the colluvium below the trench* (T1222:20–22). The Pope Report then shows photos of green dye exiting the landslide site taken on 17/02/2025 (see: Pope Report, Appendix D11, p 252). Mr Pope records: *"High confidence flow path from NDT01 to 2025 landslide"* (see Pope Report, Table 7, p 40). Then see Pope Report, [171] – i.e., *"The SEW trunk sewer on View Point Road is: (a) approximately 6 m upstream of the proven flow path from NDT01 to the 2025 Landslide. (b) Had grave ls at the invert of the trench, refer to NDT04 borehole log. (c) Had evidence of tree root systems at the inve rt of the trench…which is direct evidence of a source of water. (d) Sits within the inferred COLLUVIUM later, Figure 11."* For trench backfill discussion, see also Pope Report, Table 16, p 73, especially where Mr Pope concludes: *"it is my opinion that: Infiltration and flow through trench backfill is unlikely to be meaningfully [sic] to groundwater recharge of the Leaky Surficial Aquifer under below average rainfall conditions and i n the absence of significant anthropogenic water sources. – Service trenches may contribute significantly to groundwater recharge of the Leaky Surficial Aquifer when surcharged by significant anthropogenic water sources. […]"*
[28] Conclave Report, Table 3, items 21, 33.
[29] Ibid.
[30] Ibid.

sufficient volume to trigger the January 2025 landslides originated from the burst main at Bayview Avenue [sic] and its influence was significant to major" and that *"there are credible flow paths including through sewer trenches and permeable shallow aquifers"*.[31] (On this point, the Shire notes the evidence of mains water in the sewer trenches at Prospect Hill Rd[32] further supports the view that mains water was able to leave the service trenches and permeate the surrounding soil because the sewer line between Coburn Ave and Prospect Hill Rd is not contiguous[33], meaning the only way for water to enter that sewer trench was for water to travel through the natural soils). While Mr Bolton and Mr Hartley did not join with the majority on this point, it was essentially conceded by Mr Hartley in the concurrent evidence session. Mr Hartley accepted: (a) that there are credible flow paths from the burst main site to the landslide[34]; (b) that it was possible for water in the service trenches to seep into natural surrounding material[35]; and (c) that water could exit trenches at points where flow is restricted, such as a tight turn[36].

13. Mr Hitchcock opined in his expert report: *"[g]iven the location of the leaks (refer Figure 2) it is possible for this to flow to the main landslide area via a combination of the trench bedding and underlying soils given the topography of the area."*[37] During the concurrent evidence session, Mr Hitchcock further opined, having had the benefit of the causation reports, that water at the landslide was arriving there by: *"flowing along embedment material, that being saturated, going down into natural soils, going…down into the aquifer and then down to the escarpment"*[38]. The evidence set out above of Mr Paul, Mr Pope, Mr Makin and Mr Hitchcock should be accepted. Each is a suitably qualified and experienced professional in the relevant field of expertise. Each gave compelling evidence which was, on relevant points, consistent. Their opinions withstood the scrutiny of cross-examination.

14. ***Velocity:*** SMEC's evidence[39] was that: (a) *"it is theoretically possible for a volume of 0.4-0.5 ML/day to infiltrate natural ground between the leak location and the stormwater pit"*[40]; and (b) that *"it is very likely that water from whatever source, can be intercepted by and travel through service trenches."*[41] However, SMEC opined that as *"the velocity of water through the natural material [only]… is 2 m per day"*, such velocity was *"too slow" "to impact on the landslide (which is 460 m from the leak site)"*.[42]

15. The experts agreed that water from the Bayview Leak was capable of reaching near the McCrae Landslide site before 5 January 2025, and this is supported by anecdotal evidence of upwelling and water in sewer trenches, which SMEC says was water from the Bayview Leak[43].

16. Importantly, SMEC's expert report did not identify the basis for the 2m per day calculation (despite the importance of this issue for SMEC's conclusions). As a result, the "2m per day" statement in the SMEC

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[31] Conclave Report, p 17.
[32] Paul Report, [163]; Exhibit CA69, SMEC, *Multidisciplinary Expert Supplementary Report*, 30 July 2025 (***SMEC Supplementary Report***), Appendix E, [9.3].
[33] *SMEC Supplementary Report*, Figure 17.
[34] T1272:32–33.
[35] T1272:35–39. See also: T1272:35–1274:25.
[36] T1273:42–46.
[37] Exhibit CA73, Phillip Hitchcock, *Expert Hydrogeological Report,* 21 July 2025 (***Hitchcock Report***), [95]. NB: Figure 2 is at Hitchcock Report, p 6 (it is South East Water's leak detection survey).
[38] See T1224:44–1225:17. Note especially that Mr Hitchcock opined: *"I would think it's unlikely just to follow a trench the whole way down."*
[39] SMEC Supplementary Report, prepared by David Hartley, Hugo Bolton, Dan Gorman and Trung Tran (see SMEC Report, p ii).
[40] SMEC Supplementary Report, p 48. Cf SMEC Supplementary Report at p 54 where this is not cast as a "theoretical possibility" but instead what the water from the Bayview Leak *"would have"* done *"in order of likelihood"*.
[41] Ibid, p 49.
[42] Ibid, pp 48–49.
[43] T1274:27–1275:35; cf. Exhibit CA27, SMEC, *McCrae Landslip Project,* 5 May 2025 (***SMEC 5 May Report***), p 74 [8.2.4].

report could not be tested prior to or during the concurrent evidence hearing. Notably, however, under cross examination Mr Bolton conceded the 2m per day calculation is within a range, that extends out to 5m per day[44]. Further, the 157 day analysis is, by Mr Hartley's own evidence, not certain.[45]

17. Several days after the concurrent evidence hearing and without notice, on 8 August 2025, SEW provided to the Board documents from SMEC purporting to be testing and calculations in support of SMEC's velocity of 2m per day. However, these documents do not displace a finding that water from the Bayview Leak was capable of reaching the escarpment in the time between the burst and the 5 January 2025 Landslide. In Mr Pope's opinion, SMEC's testing did not sufficiently account for or test the permeability of colluvium, which exists in the area and is more permeable than residual soils.[46] Mr Hitchcock's opinion is that the input parameters of the calculation cannot be verified or supported,[47] and ground conditions in the landslide area change rapidly over small distances and permeability can vary significantly.[48] Mr Paul questioned the reliability of the testing and observed that testing at BH03 exhibited a velocity within the range WSP had adopted.[49] Mr Pope, Mr Hitchcock and Mr Paul each confirmed that the additional documentation provided by SMEC did not affect or change their opinions.[50]

18. In light of SMEC's concession, and having regard to the weight of the evidence from Mr Hitchcock, Mr Pope, Mr Paul and Mr Makin, the Board should prefer the analysis of Mr Makin that water from the burst main could have travelled to the landslide site within 60 days[51]. Further, Mr Hitchcock's evidence was that: (a) in a velocity test one ought report a range (contrary to Mr Bolton's approach)[52]; (b) even if the 2m per day number is correct *"I still don't think it negates the flow path…it's in the same ballpark…It's not 10 times or 100 times out."*[53]; (c) that in fact, 157 days cf 230 days is *"more supportive than against it [i.e., mains water reaching the landslide site] because it [the mains water] didn't quite make it but it's in the range"*.[54] Mr Hitchcock also opined: *"it's an imprecise science of lots of variables. That's why you have [to] give a range."*[55] Mr Hartley accepted that the testing underpinning velocity is not *"representative of the entire colluvium band or the transported soils"*, such that the test itself disregards the accepted fact of multiple flow paths (i.e., in trenches, out of trenches, between them).[56] Looked at in this way,

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[44] T1261:11–1261:40. On questioning by the Chair, Mr Bolton stated that none of the other experts engaged in preparing the SMEC Report drew the lack of the 2m per day calculations from the SMEC report to their attention, nor did any of them ask for the calcula tion (see: T1264:2–9). On examination by SEW's Counsel, Mr Bolton conceded that his calculation of 2m per day was *"based on permeability testing that we did at bore sites and the permeability testing we did in the upper range of that permeability re sults that we got was in the order of 5 meters per day"* (emphasis added) (T1287:25–31).

[45] On cross examination, Mr Hartley of SMEC agreed that it was *"possible"* that water from the burst main reached the landslide site by 5 January 2025 (see: T1262:31–39). On examination by Counsel for SEW, Mr Hartley also acknowledged: *"[i]f you're going through an entire man made trenched pathway you're going to get there earlier. And if you're going through what is our…preferred line of going through the trenches, getting to Cob urn Avenue, sitting there because the velocity goes to zip and going through the natural material underneath houses, including 5 Prospect Hill Road, and then going down there, you're looking in the region of 30 days. And so yes, it could get there on the 5th, but if its going to get there on the 5 th its going to get there beforehand."* (emphasis added) (T1288:19–34).

[46] Dane Pope, *Response to SMEC Submissions PSM5665-091L,* 12 August 2025 (***Pope Supplementary Report***), [15.1].

[47] Phillip Hitchcock, *Expert Hydrogeological Report Addendum,* 11 August 2025 (***Hitchcock Supplementary Report***), [13]-[14].

[48] Ibid, [15].

[49] Daren Paul, *Memorandum in response to additional information from South East Water* dated 8 August 2025 (***Paul Supplementary Report***), [3.6].

[50] Pope Supplementary Report, [6]; Hitchcock Supplementary Report, [16]; and Paul Supplementary Report, [3.6].

[51] Paul Report, [165]–[170] (note at [169]: *"It is physically possible for water to travel over 450 m via subsurface pathways within the observed timeframe of less than 60 days."*)

[52] T1254:30–31.

[53] T1254:31–35.

[54] T1254:40–42. See also, Hitchcock Supplementary Report, [15].

[55] T1263:30–31.

[56] T1262:4–5. As the concession of multiple flow paths, and varying velocity, see: T1272:12–1275:38.

even if SMEC's calculations are assumed to be correct, they were sufficiently *consistent* with a finding that SEW's water was the trigger factoring the variability of the subsurface environment

19. ***Geochemistry:*** It is uncontroversial that only two water samples were taken of the seepage at the escarpment in the days after the 5 and 14 January 2025 Landslides and they exhibited electrical conductivity (**EC**) measurements and chloride level different to mains water. The experts for the Board (Dr Vu), the Shire (Mr Hitchcock) and SEW (Mr Jewell) agreed that mains water could increase in salinity as it travelled through natural soils and trench embedment material.[57] The central issue between the experts was whether mains water could reach the EC and chloride level observed in the escarpment seepage samples having regard to the travel time and the material it passed through.

20. SMEC opined that the salinity (EC) in the samples of water taken between 6 January and late January 2025 at various locations (including at the pothole at the junction between Waller Pl and Charlesworth St) were too high to be mains water.[58] Mr Bolton's theory was that mains water entered the *"very permeable"* embedment material, and then moved to the Charlesworth St /Waller Pl pothole site (before the leak was repaired). There, late December/early January testing showed that water initially had a lower EC level more consistent with mains water[59]. Then, after the burst main was repaired, *"the [EC] level jumps back up again", which (purportedly) indicated that the mains water had stopped flowing and that "natural groundwater has come back again"*[60] (cf similar evidence for the Coburn Ave/Charlesworth St pothole[61]).

21. There are three reasons why Mr Bolton's theory should not be accepted. First, by reason of gravitational inconsistency: while on 22 January 2025 water at the Coburn Ave/Waller Pl pothole was measured with an EC of 1000µS/cm, uphill at the *"verge opposite 5 Waller Place"* on the same day, EC was 600µS/cm[62] (i.e., the EC reading uphill was lower, when, by Mr Bolton's theory, the EC reading should have been higher the closer one got to the repaired water main). Mr Bolton could not explain this matter[63]. Second, by reason of Dr Vu's evidence. Dr Vu contended that the higher EC readings were either reflective of water having a longer time to travel and dissolve more salts, or later readings being of water that simply took a different (less permeable) pathway on which it picked up more ions.[64] Third, because under cross examination Mr Bolton accepted that the EC of 1600µS/cm and chloride concentration of 330mg/L for landslide seepage (taken on 6 January 2025 from the landslide face)[65] was *"similar"* to the EC of 1200µS/cm and chloride concentration of 250mg/L taken from upwelling in the pothole at the junction of Waller Pl and Charlesworth St (sampled 16 January 2025)[66] which SMEC accepted was connected to

[57] For Mr Jewell see: T1305:13–18; for Dr Vu see: T1206:29–43, Paul Report, [182(c)], [184]; for Mr Hitchcock see: Exhibit CA75 Supplementary Expert Conclave on Geochemistry Report, 1 August 2025 (***Geochem Conclave Report***), pp 4 [29], and Hitchcock Report, [98(a)]. Mr Bolton appeared to at least partially accept this proposition on cross examination (see T1341:25–41).
[58] See SMEC 5 May 2025 Report, p 67 at "A" and "C"; SMEC Supplementary Report, p 48 [9.4.1]; SMEC Supplementary Report, Appendix E (prepared by Mr Bolton), pp 24–25. Notably, though, Mr Bolton accepted that *"SEW mains water from the Bayview Road Leak is considered to have made its way from Bayview Road to Waller Place, along Charlesworth Street to the intersection of Charlesworth Street and Coburn Avenue. Further migration of a portion of the water is conside red to have occurred towards 7 Prospect Hill Road."* (SMEC Supplementary Report, Appendix E, p 25).
[59] T1323:29–41 (i.e., SMEC 5 May 2025 Report, where "A" had an EC reading of between 670 and 570 between 24/12/24 and 6/1/25 – SEMC 5 May Report, p 67).
[60] T1323:42–1324:2. (i.e., SMEC 5 May 2025 Report "A" had an EC of 1200 on 16/1/25).
[61] T1330:4–45 (i.e., SMEC 5 May 2025 Report, "D" EC reads 750 on 6/1/25, then 1000 on 22/1/25).
[62] SMEC 5 May 2025 Report, p 67, cf. "D" and "F"; T1332:15–1333:14.
[63] T1333:4–14.
[64] T1324:16–26.
[65] T1339:33–34 (see: SMEC Supplementary Report, Appendix E, p 295).
[66] T1340:6–14.

the burst water main[67] and that the similar level of salinity could be because the water had picked up salts along the pathway[68].

22. Dr Vu identified that laboratory results of testing water seepage that issued from the headscarp of the landslide showed the water to be enriched with major cations and anions (compared to sampled rainwater and stormwater pits), suggesting a *"mixing of mains water, stormwater or rainwater with other water…or an accumulation of these ions, for instance via minerals/salt dissolution downstream"*[69]. Dr Vu concluded: *"testing indicates that a plausible model is that water issuing from the pipe burst travelled along a pathway that included seepage through soil, service trenches or both, mixed with shallow subsurface flow or stormwater and accumulated ions along the pathway"*[70]. On examination, Dr Vu gave evidence that when the geochemical and hydrogeological assessmentwas added together, his degree of confidence in this conclusion that water can go from the burst main to the landslide site was *"high"*.[71] (Mr Hitchcock agreed[72]).

23. Mr Hitchcock said *"the contribution of mains water is the most likely source"* of that perched water[73] and that the higher salinity of the collected seepage samples[74] *"may be due to the collection of salt as the water flows through the soil"*[75].

24. Mr Jewell gave evidence during the hearing that *"the water arriving at the scarp, right, has to be a mixture of mains…and other water. […] [T]he water which triggered the slide…is a mixture of mains water and natural groundwater"* (the mixing explaining the increase in salinity).[76] This was expressed by Mr Jewell, with a *"high degree of confidence"*, as his concluded view of the water exiting the scarp after the 5 January 2025 landslide. [77] Contrary to SEW's submission,[78] it is plain that Mr Jewell's reference to *"mains water"* was a reference to the Bayview Leak when considered in the context of the questions from Counsel Assisting. It was also apparent Mr Bolton held this same understanding, stating *"he's [Mr Jewell] a geochemist and knows more than me, I guess"*[79] and *"if [Mr Jewell's] conclusion is otherwise… I have to go with that…"*.[80]

25. Further, Mr Hartley, on cross examination, accepted that SMEC's salinity theory was no longer a viable position to take[81] (or, in his words, *"the likelihood is low"*[82]).

26. After the concurrent evidence session, SEW filed an expert report from Mr Jewell (**Jewell Report**),[83] in which Mr Jewell expressed an opinion that it was *"unlikely that [the flow from the escarpment] originated from the Bayview Road mains leak"* having regard to (among other things) the geochemical nature of

[67] T1341:1–11.
[68] T1341:25–41.
[69] Paul Report, [182(c)].
[70] Paul Report, [182(c)]; see also T1316:4–1317:3.
[71] T1316:45–1317:12.
[72] T1318:30–37.
[73] Hitchcock Report, [101].
[74] See Hitchcock Report, Table 5, p 33 *"6/01/2025 Seepage within [6 January 2025] landslide material"* with *"EC"* at *"1,600"*.
[75] Hitchcock Report, [98]. At the hearing, Mr Hitch cock reiterated this point: T1319:7–8.
[76] T1333:34–37.
[77] T1333:47–1334:17.
[78] SEW's *Submissions on the Cause(s) of the McCrae Landslid* e, received 8 August 2025 (***SEW's Submissions***), [23].
[79] T1335:12–23. Mr Bolton however maintained that the contribution of mains water was minor.
[80] T1338:9-13.
[81] T1350:24–30.
[82] T1350:31.
[83] Chris Jewell, McCrae Landslide Geochemistry Report, 8 August 2025 (***Jewell Report***).

the water.[84] This opinion is at odds with Mr Jewell's oral evidence, and Mr Jewell did not explain how his report can be reconciled with his oral evidence. There are a number of shortcomings with Mr Jewell's written opinion, which means the Board should give the evidence little weight. Notably, the analysis (a) does not consider the ability of the water to gain salts along the flow path from aeolian sand, (b) does not identify three out of four flow rates used to calculate the flux of chloride, (c) is inconsistent with the hydrogeological models prepared by SMEC and WSP, and (d) used a chloride concentration for deep groundwater (480mg/L), which is not representative of the interface groundwater.[85] Both Mr Hitchcock and Mr Paul opined that a more appropriate chloride concentration of groundwater for the water balance analysis is between 100 mg/L and 170 mg/L as observed in SMEC BH03 and BH04,[86] being representative of interface groundwater. If this concentration is adopted (even assuming other aspects of Mr Jewell's approach are sound), it has a material impact on the contribution of mains water at the escarpment, with most water being derived from the Bayview Leak (77% or more).[87]

27. Independent experts Mr Hitchock, Mr Pope and Mr Paul confirmed that the Jewell Report did not cause them to change their opinions.[88]

28. The Board should accept the evidence of Dr Vu and Mr Hitchcock that mains water could reach the EC and chloride level observed in the escarpment seepage samples having regard to the travel time and the material it passed through. Each has relevant expertise, and gave clear and consistent expert evidence.

C Domestic irrigation did not trigger the McCrae Landslide

29. The only other "theory" for the trigger of the McCrae Landslide was put forward by SMEC. SMEC advanced an opinion that water from domestic irrigation infiltrated the soil at 10-12 View Point Road causing the 5 January 2025 Landslide, which in turn destabilised the gully leading to the 14 January 2025 Landslide.[89] However, SMEC did not do any testing or analysis to show that infiltration could have occurred in the way required to cause the 5 January 2025 Landslide.[90] It was conceded by both Mr Hartley and Mr Bolton under cross-examination that SMEC's *"alternative irrigation theory*" was speculation.[91] Mr Paul and Mr Pope were of the opinion that, the contribution of domestic irrigation as a trigger was *"minor"* with a *"high"* degree of confidence.[92]

30. While domestic water usage at 10-12 View Point Road was higher than the area average for permanent occupancy,[93] on the evidence before the Board, a finding that domestic irrigation triggered the McCrae Landslide cannot be supported.

[84] Ibid, [8].
[85] Hitchcock Supplementary Report, [6]-[12]; Paul Supplementary Report, [3.5].
[86] Hitchcock Supplementary Report, [10]-[11]; Paul Supplementary Report, [3.5].
[87] Ibid.
[88] Hitchcock Supplementary Report, [16]; Pope Supplementary Report, [6]; and Paul Supplementary Report, [3.5] (page 6).
[89] SMEC Supplementary Report, [9.8]. Conclave Report, Table 2: items 22, 34.
[90] T1346:46–1347:29.
[91] T1335:29–1338:13; T1347:47–1348:5.
[92] Conclave Report, Table 2: items 22, 34.
[93] SMEC Supplementary Report, [5.4.4].

D Preparatory factors that contributed to the cause of the McCrae Landslide to varying degrees

31. ***Erosion of slope after 5 January 2025*:** Evidence was given before the Board about the erosion and steepening of the slope at the site of the McCrae Landslide following the 5 January 2025 Landslide.[94] Mr Pope opined, with a *"high"* degree of certainty, that this erosion made a *"significant"* contribution to triggering the McCrae Landslide,[95] by destabilising the slope at a point where there was significant fill and no effective resisting forces.[96] Mr Hartley expressed a similar view.[97] Mr Paul opined that the contribution of the 5 January 2025 Landslide was *"minor"* relative to that of water.[98] The Shire submits, on balance, that this erosion was at least a contributing factor to the McCrae Landslide.

32. ***Old fill*:** The Board heard evidence that old fill, being soil of various sources placed by humans on the escarpment at some time in the past[99], contributed to the McCrae Landslide. Mr Pope expressed the opinion that layers of fill, at least 2m deep, were placed over the steep terrain of the escarpment no later than the 1970s, by being end-dumped over it with without any preparation of the gully slope.[100] Mr Pope opined that this was a major contributor to the McCrae Landslide as a preparatory factor, because the heterogeneous nature and uncontrolled placement of the fill made it (and the slope on which it was placed) fundamentally unstable.[101] Mr Pope's evidence was that had the old fill not been placed over the slope, the McCrae Landslide would not have occurred.[102]

33. While Mr Paul accepted that the soils evacuated by the McCrae Landslide did comprise some fill[103], he disagreed as to the quantity[104]. Further, in his opinion the McCrae Landslide occurred because of the moisture content of the slope and would have occurred irrespective of whether the soils that became wet were natural or fill, and so fill was a *"minor"* contributor.[105] Mr Hartley opined that the presence of fill made a nominal difference in slope stability analysis and was a *"minor"* contributor.[106]

34. In the Shire's submission, the Board should find that the presence of old fill contributed to the McCrae Landslide as a preparatory factor.

35. ***Removal of vegetation*:** There is evidence before the Board of the removal or loss of vegetation in the vicinity of the McCrae Landslide site before 2025.[107] Mr Pope opined that, in particular, the trees would have exerted suction forces over the soils in their immediate vicinity and influenced groundwater levels, which would have ceased with their removal.[108] He considered the removal of vegetation a *"medium"* contributor to the McCrae Landslide as a preparatory factor.[109]

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[94] T502:9–505:10, T522:47–523: 32, T527:13–14 (Gerrard Borghesi); Exhibit CA22, Statement of Gerrard Borghesi dated 5 May 2025, [27].
[95] Pope Report, [112(c), (f)].
[96] Pope Report, [112(c)]; Conclave Report, Table 2: item 27, Table 3: items 14, 27 (Dane Pope).
[97] SMEC Supplementary Report, pp 6, 47; Conclave Report, Table 2: item 27, Table 3: items 14, 27 (David Hartley).
[98] Paul Report, [134]; Conclave Report, Table 2: item 27, Table 3: items 14, 27 (Darren Paul).
[99] T1158:5–31 (Darren Paul).
[100] T1159:21–25, T1162:18–22, T1163:31–1164:36, T1171:4–17, T1174:25–38, T1179:30–1180:4 (Dane Pope); Pope Report, [89(c)]; Conclave Report, Table 2: item 29, Table 3: items 17, 29, p 15 (Dane Pope).
[101] T1171:25–1172:4 (Dane Pope).
[102] T1170:47–1171:2 (Dane Pope).
[103] T1161:46–1162:12, T1173:23–28, 42–47 (Darren Paul).
[104] T1172:2–1174:15, T1179:13–23 (Darren Paul).
[105] T1172:22–29 (Darren Paul); Conclave Report, Table 2: item 29, Table 3: items 17, 29, p 15 (Darren Paul).
[106] Conclave Report, Table 2: item 29, Table 3: items 17, 29 (David Hartley). See T1174:45–1175:12, T1178:47–11795 (David Hartley).
[107] T488:45–494:25 (Gerrard Borghesi); Exhibit CA22, Statement of Gerrard Borghesi dated 5 May 2025, [29(b)]; T130:45–131:6, T135:21–140:34 (Dane Pope); Pope Report, [84(c)]; Paul Report, [107]; SMEC Supplementary Report, pp 16–22.
[108] Pope Report, [139(d)]; Conclave Report, Table 2: item 37, Table 3: items 25, 37 (Dane Pope).
[109] Pope Report, Table 17; Conclave Report, Table 2: item 37, Table 3: items 25, 37 (Dane Pope).

36. Mr Paul's evidence was that removal of vegetation was a *"minor"* contributor to the McCrae Landslide, because the flow path of the water that infiltrated the slope was below the depth of the roots of vegetation, and that the suction forces would have been lost because the soil was softened to the extent that it flowed.[110] Mr Hartley also opined it was a *"low"* contributor.[111] However, Mr Pope explained during cross-examination that a tree's *"capability to pull water is directly linked to the canopy size"* and, on that basis, reduction of the canopy size (not just removal of the whole tree) was relevant.[112]

37. The Shire submits that, on balance, the evidence supports that removal of vegetation was at least a contributing cause of the McCrae Landslide.

38. ***Retaining walls*:** Two retaining walls existed in the immediate vicinity of the McCrae Landslide site: the first was constructed around September or October 2022, comprised a number of timber sleepers (**First RW**); and the second was constructed around January 2024, comprised of steel posts with concrete piers and concrete sleepers, and was approximately 2m in height (**Second RW**)[113].

39. Mr Pope considered the construction of these retaining walls was a *"major"* preparatory factor for the McCrae Landslide because: the Second RW increased the angle of the slope from 32° to 37°; the fill behind the retaining walls and the elevated vegetable garden beds added a significant (40kPa) surcharge load to the slope; and neither retaining wall was constructed with appropriate piers or to applicable engineering standards.[114] Mr Pope opined that, as a result, the retaining walls fundamentally increased the driving forces on the slope without providing sufficient resisting forces.[115] Mr Hartley's opinion aligned with this.[116] In comparison, Mr Paul took the view that the construction of the retaining walls made a "minor" contribution to the McCrae Landslide.[117]

40. The Shire submits that the weight of the expert evidence supports a finding that the retaining walls were a major preparatory factor.

41. ***Delay of South East Water in detecting the burst water main*:** If the Board accepts, as the Shire submits, that the Bayview Leak was the cause or trigger of the McCrae Landslide, it follows that SEW's failure to detect the burst for (according to expert evidence[118]) over 150 days, despite numerous reports made to SEW of upwelling from at least late November 2024[119], contributed to the McCrae Landslide. Had SEW adequately responded to the concerns of residents and detected the Bayview Leak earlier, less water would have been lost from it, and less water would have travelled to the landslide site.

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[110] Pope Report, [108]; Conclave Report, Table 2: item 37, Table 3: items 25, 37 (Darren Paul).
[111] SMEC Supplementary Report, pp.21, 53–54; Conclave Report, Table 2: item 37, Table 3: items 25, 37 (David Hartley).
[112] T1095:21–28 (Dane Pope).
[113] T497:1–500:1, T536:14–17, T538:2–4 (Gerrard Borghesi). There was some disputed evidence as to the height of, and whether a building permit was required for, the construction of, in particular, the Second RW. See: T499:41–45, T538:6–539:47 (Gerrard Borghesi) (*"Just under two metres"*); Pope Report, [107(a)] ("Up to 2m"); Paul Report, Figure 7.11 p 44 ("2.4m"). That issue does not impact the expert evidence concerning the cause of the McCrae Landslide.
[114] T1181:10–1182:20, T1183:4–24 (Dane Pope); Pope Report, [112(d), (f)], [135], [136]–[140], Table 17, [190(c)]; Conclave Report, Table 2: item 28, Table 3: items 16, 28, p.16 (Dane Pope).
[115] T1188:30–1189:21 (Dane Pope); Pope Report, [112(d), (f)], [135], [136]–[140], Table 17, [190(c)]; Conclave Report, Table 2: item 28, Table 3: items 16, 28, p 16 (Dane Pope).
[116] T1193:7–21, T1194:34–1195:23 (David Hartley); SMEC Supplementary Report, p 55; Conclave Report, Table 2: item 28, Table 3: items 16, 28, p 16 (David Hartley).
[117] T1189:33–1192:12 (Darren Paul); Conclave Report, Table 2: item 28, Table 3: items 16, 28, p 16 (Darren Paul); Paul Report, [113], [137].
[118] T616:41–618:37 (Lara Olsen); Van Zyl Report, pp 11–12; SMEC Supplementary Report, pp 3, 34.
[119] T594:18–22 (Lara Olsen); Exhibit CA26, Task Summary dated 28 November 2024; See also Exhibit CA18, Statement of Kevin Hutchings, undated, [46].

42. ***Domestic water usage:*** Mr Paul, Mr Pope, Mr Hitchcock and Mr Hartley agreed that domestic water leakages in the area could have contributed to background water.[120] Mr Paul, Mr Pope and Mr Hitchcock each considered its contribution to be *"minor"* and Mr Hartley considered its contribution to be *"medium"*.[121] The Shire submits that domestic water leakages may have contributed as a preparatory factor, but no more than a minor one.

E Factors that did not cause the McCrae Landslide

43. ***Rainfall and groundwater from a shallow aquifer:***[122] These factors were at best minor.[123]

44. ***Leakage from stormwater assets:*** Losses and leakage from stormwater assets generally, creating background moisture, was no more than a *"medium"* preparatory factor to the McCrae Landslide.[124] Leakage from stormwater assets (including at 25 Coburn Ave) was also one of three *potential* subsurface flow paths identified by Mr Paul between the burst water main and the landslide site.[125] However, there is no evidence before the Board as to how much water from the burst water main entered the stormwater network,[126] whether any breaches in relevant parts of the network existed prior to the McCrae Landslide,[127] or the path of the water from any leak to the landslide site.[128] The Shire submits that the Board cannot be satisfied that stormwater leakage contributed to the McCrae Landslide.

45. ***Lack of an Erosion Management Overlay*****:** At the time of the McCrae Landslide, the McCrae escarpment was not the subject of an Erosion Management Overlay (**EMO**). Mr Paul expressed an opinion in his report concerning the effect of an absence of an EMO on landslide susceptibility and landslide risk—including that some anthropogenic changes (such as the placement of fill, retaining walls and the removal of vegetation) were not restricted in its absence.[129] However, under cross-examination, Mr Paul clarified that he was making a *"general statement"* that the absence of planning controls can lead to an increase in landslip susceptibility and landslide risk, not an assertion this in fact occurred in the context of the McCrae Landslide.[130] Mr Paul accepted that he had not considered the Shire's practice of imposing additional planning requirements in respect of the McCrae escarpment similar to an EMO,[131] or whether planning and building permits were required for works performed under existing planning and building regulations.[132] No other expert identified the absence of an EMO as a trigger of, or a

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[120] Conclave Report, Table 3: items 23 and 35.

[121] Conclave Report, Table 2: items 23 and 35.

[122] See: T1206:1–1207:20, 1207:45, T1208:46–1209:10 (Phillip Hitchcock); T1207:30 (Dane Pope); T1207:34–40 (Stephen Makin); T1208:2–3 (Darren Paul); T1208:11–42 (Hugo Bolton).

[123] Conclave Report, Table 2: items 30, 32, Table 3: items 18, 20, 30, 32.

[124] Conclave Report, Table 2: item 36, Table 3: items 24, 36.

[125] Paul Report, [163(b)]; T1212:25–32 (Darren Paul).

[126] T1240:10–1242:24, T1242:33–1244:13, T1245:47–1247:9 (David Hartley); T1242:26–31 (Hugo Bolton); T1244:15–1245:11(Darren Paul); T1245:13–27 (Stephen Makin); T1245:37–40 (Phillip Hitchcock).

[127] T1268:27–44, T1269:22–27 (Mr Paul); Paul Report, [163(b)]; T1268:46–1269:16, T1269:29–1270:1 (Mr Pope).

[128] T1269:18–27, T1276:14–41 (Mr Paul); T1271:1–31 (Mr Pope).

[129] Paul Report, [125], [127], [222].

[130] T1197:42–1201:24 (Darren Paul).

[131] T1200:16–31. See: Exhibit CA11, Statement of Bulent Oz dated 11 April 2025 [40] –[46]; Exhibit CA13, Second Statement of David Simon dated 17 April 2025 [63] –[69]; T241:45–T247:29 (David Simon).

[132] T1199:20–1200:14 (Darren Paul); T224:33–226:15 (David Simon). For example, both the Environmental Significance Overlay (**ESO**) and the Design and Development Overlay (**DDO**) required a planning permit to "[c]onstruct a building or construct or carry out works", which encompasses the removal of vegetation, construction of a retaining wall and the placement of fill: Mornington Peninsula Planning Scheme (**MPPS**) cll 42.01-2 pp 409, 593–595, 43.02-2, pp 593, 605-609; *Planning and Environment Act 1987* (Vic) s 3(1) (definition of "works"). While some exemptions from the permit requirement are provided for in ESO sch 25 and DDO sch 3, which applied to th e area, many kinds of development would have required a permit, including the Second RW: See MPPS, ESO sch 25, pp 460-461; Map No 27 ESO24–27; DDO sch 3, pp 606–607; Map No 27 DDO. A building permit was also required for retaining walls over 1m in height not associated with other building work or protection of adjoining property, including the Second RW: *Building Act 1993* (Vic) s 16; *Building Regulations 2018* (Vic) reg 23, sch 3, item 15.

preparatory factor to, the McCrae Landslide. Contrary to Mr Paul's report, there are formal development controls in place in the form of the Environmental Significance Overlay and the Design and Development Overlay, which both contain provisions relating to erosion. As such, there is no evidentiary foundation for a finding that the absence of an EMO was a cause of the McCrae Landslide.

46. ***Responses to the November 2022 Landslide and 5 January 2025 Landslide*:** The experts did not identify the response to the November 2022 Landslide or to the 5 January 2025 Landslide as either a trigger of, or a preparatory factor to, the McCrae Landslide. It follows that there is no evidentiary foundation for a finding that the Shire's responses to these landslides caused or contributed to the McCrae Landslide.

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