

Review Comment Table

Board:	MVLWB
Review Item:	Hay River Groundwater Monitoring Program Proposal (MV2009L3-0005 and MV2019L3-0010)
File(s):	MV2009L3-0005 MV2019L3-0010
Proponent:	Town of Hay River
Document(s):	MV2019L3-0010 - Hay River - Groundwater Monitoring Program Proposal - Jan30-20 (20.78 MB)
Item For Review Distributed On:	Feb 25 at 11:36 Distribution List
Reviewer Comments Due By:	Mar 17, 2020
Proponent Responses Due By:	Apr 15, 2020
Item Description:	<p>June 12, 2020 Update: As noted below, Board staff had intended to use the outcomes of this review in both the ongoing proceeding for the Town’s application for Licence MV2019L3-0010, as well as to revise the SNP for the Town’s existing Licence MV2009L3-0005. However, Board staff were unable to utilize this review to make changes to the SNP for MV2009L3-0005, and are now focusing efforts on integrating the outcomes of this review into the renewal proceeding for MV2019L3-0010. Please refer to the Work Plan Version 4 for the MV2019L3-0010 proceeding.</p> <p>March 19, 2020 Update: The Town of Hay River has requested and been granted an extension to respond to reviewer comments. The new response deadline is April 15, 2020. At at this point, revisions to the timeline for the MV2019L3-0010 renewal proceeding are being considered, and will be distributed at a later date.</p> <p>The Town of Hay River (Town) has submitted a Groundwater Monitoring Program Proposal (GMPP), as part of their Application for Water Licence MV2019L3-0010. The GMPP includes proposed changes to groundwater monitoring currently being conducted under the Town’s current Licence</p>

	<p>MV2009L3-0005, including proposed changes to monitoring parameters for the upcoming spring sampling event. As such, the Town has requested that the approval and recommendations arising from the GMPP also be considered in the ongoing proceedings for their renewal Application for MV2019L3-0010.</p> <p>Board staff are distributing the GMPP for public review under the current Licence MV2009L3-0005 because of the immediate relevance to upcoming sampling, and the possibility of associated changes to the Surveillance Network Program (SNP) annexed to MV2009L3-0005. Reviewers are requested to take note that Board staff intend to use the comments and recommendations posted by reviewers on the GMPP, along with responses from the Town, in the ongoing proceedings for the Town's Application for Licence MV2019L3-0010, as any changes to monitoring under the current Licence MV2009L3-0005 can inform draft Licence conditions and/or the SNP annexed to the renewal Licence MV2019L3-0010.</p> <p>If you have any questions or comments about the ORS or this review, please contact Board staff identified below.</p>
<p>General Reviewer Information:</p>	<p>This information was also faxed to the following:</p> <ul style="list-style-type: none"> • Fort Simpson Métis Local #52 - Marie Lafferty President (867)695-2040; and • Northwest Territory Métis Nation - Garry Bailey c/o Tim Heron NWTMN IMA Coordinator (867)872-3586.
<p>Contact Information:</p>	<p>Erica Janes 867-766-7466 Heather Scott 867-766-7463 Jen Potten 867-766-7468 Katherine Harris</p>

Comment Summary

Town of Hay River (Proponent)				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Response

1	General File	Comment (doc) Town of Hay River Response Letter Recommendation		
Environment and Climate Change Canada: Russell Wykes				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Response
1	<p>TOPIC: surface water sampling program</p> <p>REFERENCE(S): 1. Landfill Fire - Environmental Monitoring Report, Hay River Municipal Solid Waste Facility (Beckingham Environmental; February 7, 2020). Section 5.1 Surface Water Results & Recommendations; Section 5.1.1 At Landfill Fire Site: Samples SW13, S</p>	<p>Comment The landfill fire monitoring report provides the following recommendation regarding surface water sampling: "In order to find out whether the landfill is still a source of contaminants in surface water, it is recommended to conduct a one-time surface water sampling program on the landfill during the upcoming spring snowmelt runoff event. Parameters to include in the analysis are dioxins and furans, total metals, PAHs, VOCs, and routine parameters. If these parameters exceed guidelines, the landfill is continuing to release contaminants to the river and groundwater and an environmental management plan may need to be developed to contain these parameters. However, if these parameters do not exceed guidelines, there is no need for further sampling". The report also provides the following recommendation regarding soil sampling: "It is recommended to conduct a one-time soil sampling</p>	<p>Apr 15: The Town would like to note that this comment would be more relevant as part of the review of the Landfill Fire Sampling Report. If the soil sampling program associated with the above report recommendations, determines that there are high levels of parameters in soil (i.e. above guidelines), the Town would develop a Remediation Response Plan (RAP) to contain these parameters. The Town proposes that a study be developed for the monitoring of the fire related parameters under the new water licence rather than as part of the Surveillance Network Program (SNP). This would allow the study to be responsive to the monitoring changes that occur as the monitoring results are collected and interpreted.</p>	

		<p>program at locations SW13, SW1, and SW7, at 0-15 cm depth, to assess potential residual soil contamination resulting from the landfill fire. The sooner this program is conducted the better. Recommended analyses include dioxins and furans, total metals, PAHs, VOCs, and routine parameters. If these parameters do not exceed guidelines, there is no need for further sampling". ECCC notes that if there are high concentrations of these soil parameters, then there could be potential migration of contaminants into the Hay River. In the event of high concentrations of these soil parameters, the mobility of contaminants in surface water should be evaluated. The proposed monitoring programs do not address this scenario.</p> <p>Recommendation If the soil sampling program determines there are high levels of parameters in the soil (i.e., above guidelines), then ECCC recommends expanding the surface water sampling program to include post-rain event sampling, in order to evaluate the mobility of contaminants.</p>		
2	<p>TOPIC: Hay River sampling REFERENCE(S): 1. Landfill Fire -</p>	<p>Comment River samples (River-1, River-2, and River-3) that had been collected in September 2019 at three</p>	<p>Apr 15: The Town proposes that a study be developed for the monitoring of the fire related parameters under the new water</p>	

<p>Environmental Monitoring Report, Hay River Municipal Solid Waste Facility (Beckingham Environmental; February 7, 2020). Section 5.2 River Water Results & Recommendations 2. Groundwater Monitoring Program Proposal (KBL Environmental Ltd.;</p>	<p>locations (upstream, at level, and downstream from landfill) were analyzed for PAH, VOC, and petroleum hydrocarbons. Concentrations of these parameters were below detection limits. As noted in the report, although the September 2019 river sampling program was not complete - since it did not include dioxins and furans, total metals, and routine parameters - a definite decrease of fire related contaminants in the river water could still be identified. The report provides the following recommendation for Hay River sampling: "In order to confirm this decrease of fire related contaminants in the river water, it is recommended to conduct a one-time river sampling program at these three river locations in the upcoming summer or fall (or as soon as funding allows), after snowmelt runoff and any precipitation events, and to include dioxins and furans, total metals, and routine parameters in the water analyses. If these parameters exceed guidelines for samples River-2 and River-3, the landfill is continuing to release contaminants to the river and groundwater and an environmental</p>	<p>licence rather than as part of the Surveillance Network Program (SNP).&nbsp; This would allow the study to be responsive to the monitoring changes that occur as the monitoring results are collected and interpreted.&nbsp; The sampling of the Hay River would be included in the study and include monitoring of the parameters as recommended in the Beckingham Report: Hay River Landfill Fire &ndash; Environmental Monitoring Report.&nbsp; This includes a one-time river sampling program at the three river locations in 2020.&nbsp; The parameters would include PAHs, VOCs, petroleum hydrocarbons, dioxins and furans, total metals, and routine parameters.&nbsp; As part of the study, the collected data would be reviewed, and recommendations provided based on the data and groundwater flow rate would be taken into consideration.&nbsp; The Town would like to note that this comment would be more relevant as part of the review of the Landfill Fire Sampling Report.&nbsp;</p>	
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	<p>management plan may need to be developed to contain these parameters on the landfill site. However, if these parameters do not exceed guidelines, there is no need for further sampling". ECCC notes that this recommendation does not explicitly include the previously analyzed parameters (e.g., PAH, VOC, and petroleum hydrocarbons) in the one-time river sampling program. In addition, ECCC advises that although the proposed one-time river sampling program could monitor for fire-related parameters from landfill surface runoff, it would not necessarily be expected to detect groundwater contaminants from the 2019 landfill fire. In order to monitor the Hay River for fire-related contaminants originating from landfill groundwater, the groundwater flow rate should be considered, as well as groundwater quality at relevant monitoring wells. The Beckingham Environmental report 'Groundwater Monitoring Program Review' (January 23, 2020) discusses site groundwater movement, and estimates that it will take between 4 to 17 years for fire-generated contaminants to reach</p>		
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	<p>monitoring well SNP0053-5e. This report, in conjunction with groundwater monitoring results, will help to inform the timing of additional river monitoring.</p> <p>Recommendation ECCC recommends including PAH, VOC, petroleum hydrocarbons, dioxins and furans, total metals, and routine parameters in the water analyses for the river sampling program. ECCC also recommends conducting additional river monitoring at a later date, in order to monitor the Hay River for groundwater contaminants from the 2019 landfill fire. Timing of such follow-up monitoring should consider the groundwater flow rate, and when groundwater inputs could be expected to reach the Hay River. Given that fire-generated contaminants are estimated to reach monitoring well SNP0053-5e between 4 to 17 years after the fire (Beckingham Environmental; January 23, 2020), ECCC recommends that groundwater be monitored periodically for fire-related contaminants over the life of the water licence. ECCC also recommends that groundwater flow rate and water quality monitoring results be used to inform the timing of river monitoring</p>		
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		for fire-related contaminants originating from groundwater.		
General Public: Matthew Miller				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Response
1	Development of site-specific criteria	<p>Comment The report recommends that the setting criteria and action levels for the Site should be achieved through setting risk based, site-specific criteria that are sensible, practical and appropriate for the Site with action levels chosen achieve the goals of protecting human health and the environment. When developing these guidelines analysis and context should be provided to town residents on what background levels are for various parameters and what parameters could potentially be sourced from the waste facility. Relating the action levels to potential impacts the river, residents watering gardens and lawns and the sport, commercial and aboriginal fisheries of the Hay River will provide clarity to stakeholders and help to streamline the process.</p> <p>Recommendation Relating action levels to potential impacts the river, residents watering gardens and lawns and the sport, commercial and aboriginal fisheries of</p>	<p>Apr 15: The Town will relate the action levels to the potential impacts to the river, residents watering gardens and lawns, and the sport, commercial and aboriginal fisheries of the Hay River.&nbsp;</p>	

		the Hay River will provide clarity to stakeholders and help to streamline the process.		
GNWT - ENR - EAM (Environmental Assessment and Monitoring): Central Email GNWT				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Response
31	General File	Comment (doc) ENR Letter with Comments, Recommendations and Various Attachments in Support of ENR Comments and Recommendations Recommendation		
32	General File	Comment (doc) GNWT-ENR reference tables 1, 2 & 3 Recommendation		
35	General File	Comment (doc) GNWT-ENR reference tables 9, 10 & 11 Recommendation		
36	General File	Comment (doc) GNWT-ENR Figure 1 - Aluminum graphs Recommendation		
37	General File	Comment (doc) GNWT-ENR groundwater data compilation - Tables 4 5 6 7 8 Recommendation		
1	Topic 1: General Comment	Comment Important details and rationales relevant to various aspects of groundwater monitoring and management were submitted by the Town as per requirements of MV2009L3-0005, in the May 2019 Interim Closure and Reclamation Plan (by	Apr 15: <p style="margin-left:36.0pt">The Town hired an independent third party (Beckingham Environmental) conduct a review of all historical reports (including the reports mentioned above). This review (Beckingham – Groundwater Monitoring Program Review Town of Hay	

	<p>Stantec), as well as the 2013 Landfill Drainage Study (LDS) (by Dillon Consulting). Section 2.1 of the 2013 LDS also provided a list of all past various Reports that have been prepared for the Town in the past. As such, various consultants selected by the Town have endeavored since 1991 to collect samples for this landfill long standing Groundwater Monitoring Program, and prepare Reports providing observations and recommendations that still apply today, such as: . Leachate emanating from the landfill was found to be higher in metals, salts and suspended solids (Dillon 1991, Section 6.0). . The background monitoring well BH-1 [Current 0053-5b] appears to have been impacted by anthropogenic sources (EBA, 2001). It is not likely that the groundwater is truly representative of background regional groundwater quality. The groundwater at this location contained ammonia, phenols, and total extractable hydrocarbons. . Leachate from the former trench disposal is impacting groundwater at BH-4 [Current 0053-5e]. Based on the limited groundwater program [data], the impacts at BH-4 appear to be</p>	<p>River) and the recommendations coming out of that review take into consideration all the recommendations from the previous reports as well as the current data.&nbsp; The Town's proposed groundwater monitoring plan is based on the recommendations coming out of the Beckingham report.</p>	
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	<p>reduced compared to that of the active cell, in comparing the analytical results from BH-4 to BH-3 [Current 0053-5d] (EBA 2001). . It should be assumed that contaminants are reaching the river, albeit highly diluted. It is likely that the contaminants are below CCME Criteria for Protection of Freshwater Aquatic Like once the groundwater reaches the river. A more detailed investigation would be required to determine this conclusively (Section 6.0, EBA 2001). . Monitoring well MW010-C [Current 0053-7C] contained concentrations of TDS, chloride, ethylbenzene, and PHC fraction F2 greater than the [2010 Alberta Tier 1 Soil and Groundwater Remediation] Tier 1 Guidelines.(Section 5.9, EBA 2011) . Maintain the current annual groundwater monitoring and sampling program at the site for 2011, with the exception of substituting total metals for dissolved metals analysis (Section 5.0, EBA 2011). These excerpts can be found as recommendations, discussion and/or conclusion of each respective Report. As past Reports and associated data may be hard to locate on the public registry, they were attached to facilitate consultation as part of the current Water Licence</p>		
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		<p>renewal (see TOHR 2 - Past SWDF GW Monitoring REPORTS). While ENR recommendations provided here may be directed specifically to information presented in the Beckingham Report, it is assumed that they also apply to all related topics and sections of the KBL Groundwater Monitoring Program Proposal (GMPP), for which the Beckingham Report was prepared for.</p> <p>Recommendation 1) ENR recommends that the Town consider, and respond to, the listed recommendations above. ENR believes that valuable resources invested in past groundwater monitoring work and Reports, data, conclusions and recommendations are still relevant today for the current decision making process.</p>		
2	None	<p>Comment None</p> <p>Recommendation 2) ENR recommends that the Town and the Board review the attached Excel spreadsheet compiling data monitored at each of the 0053-5 and 0053-7 well series (ENR Table 6 to 11) to facilitate the analysis of current and past data.</p>	<p>Apr 15: <p style="margin-left:36.0pt">The Beckingham review (Groundwater Monitoring Program Review Town of Hay River) included a review of compiled data monitored at each of the 0053-5 and 0053-7 well series to inform the recommendations that were provided in the above-mentioned report.</p> </p>	
3	Topic 2: 1991 Background Well=Background	<p>Comment Section 2.2.4 of the Town 2013 LDS (Phase 2, by Dillon Consulting) specifies that "The first</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town engaged experts (see Beckingham Environmental -</p> </p>	

<p>Groundwater Quality of the Area</p>	<p>borehole (BH1) [1991 Dillon] was located upgradient of the solid waste facility to provide background information on groundwater quality." ENR further notes that results monitored at BH2, also established in 1991 and located within the landfill limits (see Fig. 2, 2013 LDS), presented quality results similar to background groundwater monitored at BH1. These wells (along with former wells BH3, BH4 and BH5) no longer exist today. Section 3.2 of the Beckingham Report specifies that "[GNWT] does not maintain a database of water well drilling Reports so no drillers' Reports from nearby water wells could be reviewed to get a better understanding of the surficial geology and groundwater chemistry of the surrounding area." Section 4 of the Report also specifies that "Beckingham had not identified any reason to suspect that monitoring well [0053-5b] had been compromised or impacted in any way, and that it should continue to be used as upgradient background well." The Report further suggested the addition of a second background well, which proposed locations are shown in Figure 5 of the</p>	<p>Groundwater Monitoring Program Review Town of Hay River) to review the location and suitability of 0053-5b as a background well.&nbsp; Included was a review of all the recommendations from historical reports, groundwater flow information, and historical and current data.&nbsp; Beckingham also considered the groundwater chemistry and how landfill leachate and road salt impact would be expected to show in the groundwater chemistry of the well.&nbsp; The Town supports the Beckingham Report recommendation.&nbsp;</p>	
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		<p>Report. ENR isn't clear why data from the 1991 background MW, collected as part of the Town's Groundwater Monitoring Program, has not been considered in the Beckingham Report. Instead, the Beckingham Report suggested that elevated levels at the landfill monitored at the current background well 0053-5b were representative of the local background geology and associated groundwater quality (section 2.4). ENR does not support the Beckingham Report recommendation that the current background well is representative of natural background geology of the area.</p> <p>Recommendation 1) ENR recommends that the 1991 Background Well (or upstream groundwater well with similar groundwater quality signature as of 1991 BH1, or perhaps BH2), be re-established by the Town.</p>		
4	None	<p>Comment None</p> <p>Recommendation 2) ENR does not recommend, nor oppose, of the drilling of a second background well, but would rather stress the main priority is in re-establishing a valid background well that is representative of background quality of the site, to facilitate a valid</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town supports the Beckingham Report recommendation of the second background well given the variability of the groundwater across the site.</p></p>	

		<p>representation/comparison of past/future monitoring data collected at the site. Any subsequent background well should also be reflective of the natural background groundwater quality.</p>		
5	<p>Topic 3: Groundwater Quality Variations Flowing through Landfill Site from Background MW</p>	<p>Comment ENR is of the opinion that if the 1991 background MW was still in operation today, the quality monitored at this location, combined with KBL August 2017 data presented in Fig 6 of the Beckingham Report, would present the following quality variation as groundwater flows through the site. An increase for several parameters occurring as the groundwater enters the northern portion of the landfill at/near 0053-5b, elevated concentrations maintained in mid-site at 0053-7D, followed by concentration attenuations near the end of the site at 0053-5c and 0053-5d before reaching the Hay River. The impact in the southern portion of the landfill is reduced when compared to the most concentrated portion of the plume (northern portion) [with the exception of TDS and Sulphate at 0053-5e], which is consistent with EBA observations Reported in 2001 (see ENR's first comment). The historical range of results collected</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town engaged experts (see Beckingham Environmental - Groundwater Monitoring Program Review Town of Hay River) to review the location and suitability of 0053-5b as a background well. The report is current and considered the historical reports to provide the recommendations. The report concluded that the existing background well was a valid background monitoring well for the landfill. The Town is planning on drilling the second background well as recommended in 2021.</p></p>	

		<p>between 1991 and 2018 for each parameter is presented in ENR Table 1, suggesting that the KBL 2017 monitoring results from KBL (2017, Fig. 6) are well within historical range of data collected at the site to date. ENR notes that the Town landfill has been operating since 1973. During that time, the landfill has relied on natural attenuation in the absence of liner that would prevent landfill leachate from reaching the groundwater (SWDF O&M plan). ENR is concerned that further delays in re-establishing a valid background MW for the landfill is impeding an informed decision process when assessing monitoring results of current operations, as well as future closure activities of the site.</p> <p>Recommendation 1) ENR recommends the Town indicate when reestablishing a background monitoring well can be considered for the site.</p>		
6	<p>Topic 4: Monitoring Parameters at the 0053-7 Series - TDS, Sulphate and Fluoride</p>	<p>Comment Results for Sulphate, Calcium, Magnesium, Sodium and TDS from the Beckingham Report Fig. 6 (and attached ENR Table 1), generally follow a similar increase-attenuation trend as described above. Monitoring requirements for these parameters only exist</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town agrees with this recommendation.</p></p>	

	<p>for the 0053-5 wells series in the current Water Licence, and results for these parameters at these locations have been available since 1991. Although not a requirement of the Water Licence, results for these parameters at the mid-site 0053-7 wells series were submitted in 2010, 2011 and 2013 (see 0053-7 Reports and/or ENR Table 9), as part of the Town's GMP. Added to ENR Table 1 were results for fluoride, also monitored by KBL during the June 2017 sampling campaign (see KBL 2017 results). Even though fluoride has never been monitored at the 0053-7 wells series in past (other than during the 2019 fire), fluoride has been consistently monitored since 2009 at the 0053-5 wells series located at the landfill's entrance and adjacent to the river. The following standards exist for these parameters, under the Federal Interim Groundwater Quality Guidelines (FIGWQG) and the Alberta Tier 1 Guidelines for Soil and Groundwater Remediation: Sulphate: 100 mg/L (FIGWQG and Alberta Tier 1) TDS: 3,000 mg/L (FIGWQG), 500 mg/L (Alberta Tier 1) Fluoride: 0.12 mg/L (FIGWQG), 1.5</p>		
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		<p>mg/L (Alberta Tier 1)</p> <p>Recommendation 1) ENR agrees with the Town recommendation to add Chloride to the monitoring parameters at the 0053-7 wells series.</p>		
7	None	<p>Comment None</p> <p>Recommendation 2) Upon review of current and historical analytical results, other ions parameters were monitored in exceedance of FIGWQG and Alberta Tier 1 (ENR Table 1). As such, ENR recommends that sulphate, calcium, magnesium and sodium, fluoride and TDS also be added to inorganic parameters monitored (see below comment) at the 0053-7 wells series, in order to confirm mid-site concentrations and display the variability of these parameters throughout the site.</p>	<p>Apr 15: <p style="margin-left:1.0cm">The purpose of the 7 series wells are to monitor the potential impacts from the biotreatment pad. The wells are located upgradient of the landfill and were not intended to confirm mid-site concentrations.</p></p>	
8	Topic 5: Results for Total Major Ions Results for Dissolved Major Ions	<p>Comment Section 4.3 of the FIGWQG specifies that the standards limits in a dissolved form apply to inorganics, which include both metals and major ions. Following a consultation with ECCC contaminated sites experts, it was specified that major ions mostly already exist in groundwater in a dissolved form, and that results for major ions in a total form are typically very similar to major ions in a dissolved form, the great</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town agrees with this recommendation.</p></p>	

		<p>majority of the time. This similarity between 'total' and 'dissolved' major ions results can also be observed in Hay River's landfill, at times when both major ions forms were monitored simultaneously at the 0053-5 wells series for Mg, Na, K (EBA, July 2011), as well as the 0053-7 series in 2011, 2013, 2016 and 2017. This information helps to provide rationales to recommend that past monitoring results, collected for major ions, would still be comparable and useable for trends analyses.</p> <p>Recommendation 1) Considering similarity between major ions results in their total and dissolved forms, ENR recommends that all past results for major ions be kept in future trends analyses representations by the Town.</p>		
9	None	<p>Comment None</p> <p>Recommendation 2) ENR wishes to clarify that majors ions analyses results provided by Taiga Lab are already represented in a dissolved form, which already aligns with section 4.3 of the FIGWQG. Therefore no changes to monitoring requirements, such as currently done with metals, will be necessary for major ions.</p>	<p>Apr 15: The Town agrees with this recommendation.</p>	

10	Topic 6: Metals Results: Past Total Metals & Future Dissolved Metals	<p>Comment The Beckingham Report recommended (p. 21 of 88) that "all groundwater sampling be done for dissolved metals and the requirement for total metals sampling of groundwater be dropped." ENR agrees that Water Licence requirements be changed to require future monitoring of inorganics in a dissolved form, in order to better align with applicable groundwater guidelines such as FIGWQG,. It would appear that a 'transition period' however (two years, or as deemed most appropriate by the Board), during which both 'Total' and 'Dissolved' parameters are monitored simultaneously, would inform on potentially linkages between of the long-time total metals results with measurements. Parameters ratio/relationships between metals in their total and dissolved forms was compiled in attached ENR Table 4 and 5, from the 2019 landfill fire monitoring by ENR, to inform the current review.</p> <p>Recommendation 1) ENR recommends that analyses for both $\tilde{\text{Total}}^{\text{TM}}$ and $\tilde{\text{Dissolved}}^{\text{TM}}$ metals samples be conducted by the Town during a transition period of</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town does not see the benefit in continuing the sampling of total metals.&nbsp;As Beckingham noted in their report (Groundwater Monitoring Program Review Town of Hay River), the value of the results of total metals sampling is questionable.&nbsp;After careful analysis of the total groundwater metals collected and compiled to date, Beckingham determined that the total metals results reflected the amount of sediments entrain in the samples and types of metals adsorbed onto the surface of the suspended particulate or present in the mineral composition of the particulate matter.&nbsp;</p></p>	
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		two years, or as else deemed most appropriate by the Board.		
11	None	<p>Comment None</p> <p>Recommendation 2) ENR recommends that boron, cobalt, molybdenum, selenium, thallium, titanium and uranium also be monitored during this transition period by the Town, in addition parameters listed in section 2.5 of KBL. ENR notes that elevated levels for uranium were outlined in the preliminary data compilation provided in the attached ENR Table 5.</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town would recommend the Board follow the recommendations that were presented by the third-party consultant (Beckingham Environmental). Having said that, the Town will test any parameters that the Board requires when the new Water Licence is issued.</p> </p>	
12	Topic 7: Trends Representations vs. Other Parameters (Figure 8)	<p>Comment During the February 2020 technical session, the Town specified that if the GMP was to change to dissolved metals moving forward that it wasn't clear if a trend analysis would be needed for the 2019 AR. On behalf of the Town, KBL also clarified that trends submitted in past Annual Reports did not represent all parameters, but only those monitored in exceedance. As specified above, major ions parameters monitored in exceedance should also be presented in trends to facilitate results interpretation. ENR notes that other non-metals parameters were also monitored in exceedance in</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town agrees that it is important to have consistent future groundwater methodology directives. However, the Town would propose that it not be in the Water Licence as sampling methodology best practices can change multiple times over the lifetime of the permit.</p> </p>	

		<p>the past, such as BTEX, phenols, etc. in past groundwater monitoring Reports. The attached ENR Tables 6 to 11 of historical data for both the 0053-5 and 0053-7 were made available, to help the Town with future data trends analyses presentation requirements. Note: Results in this Excel sheet should be verified prior to use, in order to confirm accuracy. ENR does not take responsibility for any inaccuracy or missing data. A lack of consistent sampling methodologies was suggested/outlined in Fig 8 of the Beckingham Report. During the 2018 AR review process, the Town agreed to correct trends presentations - to prevent that 'no values' be presented as a "0", and to ensure that dates presented in the graphs align with lab Report dates. As an example, Figure 8 for Aluminum may also be presented as followed (Figure 1).</p> <p>Recommendation 1) ENR recommends, as a provision of the new Water Licence, to include specific groundwater methodology directives (filtering, preservation, etc.) as deemed necessary, in order to foster consistent future methodologies for potential future consultants.</p>		
13	None	<p>Comment None</p> <p>Recommendation 2) ENR</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town would like</p>	

		recommends that trends analyses be submitted yearly for all parameters monitored in exceedance (not only for metals), in the Town's Annual Reports.	clarity on this recommendation as it is unclear at what point the trend analysis would no longer be required if the parameters were no longer exceeding the designated criteria.	
14	None	Comment None Recommendation 3) ENR recommends that previous data trends representation corrections be agreed upon by reviewers, and be integrated in order to facilitate data representation and comprehension.	Apr 15: <p style="margin-left:1.0cm">The Town is not sure what ENR is asking with this recommendation. Data trend representation has been updated for the 2019 Annual Report as required.</p>	
15	Topic 8: FIGWQG, CCME-PAL & Alberta Tier 1 Soil & Groundwater Remediation Guidelines	Comment Different groundwater guidelines were used in the Town's past groundwater monitoring Report to interpret exceedances. Most recently, Reports by Dillon and Nichols Environmental have used FIGWQG and/or Alberta Tier 1. ENR notes that the recently released Petroleum Hydrocarbon Contaminated Soil Treatment Facilities (HCSTF) Guidelines also referred to the FIGWQG. The Beckingham Report specified (section 3) that CCME-PAL may also be used, in times when the limit for a specific parameter is less stringent than the applicable guidelines. The FIGWQG guidelines specify that CCME-PAL should also be used when the monitoring point is located within 10 m	Apr 15: <p style="margin-left:1.0cm">The Beckingham Report (Groundwater Monitoring Program Review Town of Hay River) from January 2020, recommends using the 2016 FIGWQG as a starting point for the Town to develop the criteria and action levels for Site. The FIGWQG is the current federal standard for groundwater remediation.</p>	

		<p>of a water body. The Alberta Tier 1 Soil and Groundwater Remediation Guidelines were recently updated (April 2019), which limits may at times align with the FIGWQG standards, or be different (less or more stringent) for each specific parameter. These standards may also provide other groundwater quality standards alternatives to the Town (if/as required), other than the ones specified here above.</p> <p>Recommendation 1) ENR recommends that the Town consider the most relevant and current standards for groundwater remediation.</p>		
16	Topic 9: FIGWQG - Site-Specific Standards/Criteria and Action Levels	<p>Comment The Beckingham Report recommends the following (Section 4.4, p. 44): "It's important that the criteria and action levels chosen [for the site] achieve the goals of protecting human health and the environment but it's equally important that they also make sense and take into natural background levels of certain parameters and the variability of groundwater chemistry across the Site. For example, background concentrations of some common water ions (e.g. SO4, Cl and others) are higher than typical limits for those parameters, sometimes by hundreds or</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town accepts this recommendation.</p> </p>	

		<p>thousands of mg/L. Setting site-specific criteria and action levels would seem to be more sensible and appropriate in such cases." The Report also recommends that FIGWQG guidelines be used as the starting point for developing the criteria and action levels of the site (Beckingham Report, p. 22 of 88).</p> <p>Recommendation 1) ENR agrees with the Beckingham Report that FIGWQG guidelines limits first be adopted by the GMP groundwater monitoring criteria, from which specific site-specific standards and action levels may be developed if/as required. These criteria should be provided as a starting point in the Town's Table B-3 (see subsequent comments).</p>		
17	None	<p>Comment None</p> <p>Recommendation 2) For each parameter for which a site-specific criteria may be considered (eg. sulphate, chloride and/or other parameters), ENR recommends these adapted standards by the Town be based on relevant background groundwater quality, such as established at the 1991 background MW. ENR does not consider elevated results measured at 0053-5b to representative</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town engaged an independent third-party consultant (Beckingham Environmental) to review all historical reports (including the 1991 report) and provide recommendations regarding the groundwater monitoring. Specifically, the 0053-3b well was reviewed to determine the viability of it being a background well. Based on all the information gathered throughout the past 30 years since the 1991 report and the surficial geology,</p></p>	

		background groundwater quality (see ENR Table 1), which therefore should not serve as a basis from which site-specific objectives should be established.	hydrogeology, and hydrochemistry of the site, the recommendation was that the 0053-5b well was viable as a background well. Beckingham also recommended, based on the hydrochemistry variability across the site that a second background well be established. Both wells would inform the development of site-specific objective for the site. 	
18	None	Comment None Recommendation 3) To be consistent with section 4.3 of the FIGWQG Guidelines stating that standards limits apply to all inorganics in their dissolved form only (such as metals), ENR recommends that major ions also be monitored in their dissolved form by the Town.	Apr 15: As stated in response to ENR Topic 5, the Town will continue to monitor major ions in their dissolved form.	
19	Topic 10: Action Levels Table B-3 not yet Provided	Comment In the past, the Table B-3 "Groundwater Monitoring Action Levels" has been included within the Town's Water Monitoring Plan (WMP). This table typically provided Actions Levels' limits for metals, as well as for other non-metal parameters such as general chemistry, major ions and total petroleum hydrocarbon, which would not be affected by the monitoring change from total to dissolved metals. Section 3.1 of the KBL GMPP specifies that "The Town proposes to set the Action	Apr 15: <p style="margin-left:1.0cm">The Town has no issue in submitting Table B-3 as part of the Annual Report while data is gathered to establish site-specific results with the groundwater monitoring network.	

		<p>Levels after 4 sampling events (2 years) including the new wells once they have been completed." It was specified during the technical session, that the updated Action Levels' table, based on the FIGWQG (section 5) and dissolved metals background levels, would include [data] from the new monitoring wells and background wells. The Town further suggested that Action Levels be inserted along with SNP requirement, as an annex to the new Water Licence. Considering the crucial role of Table B-3 in management of groundwater results (and potential associated required actions), and that the existence of Table B-3 does not solely rely on dissolved metals analysis, ENR isn't clear why this important piece was not provided within the GMPP, as part of the current review. In order to be consistent with the Beckingham Report recommending that FIGWQG standards be used as starting points, from which site-specific criteria and action levels would be developed thereafter (if/as required), Table B-3 dissolved metals should therefore use FIGWQG limits (+25%). These limits may thereafter be updated with site-specific</p>		
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		<p>criteria following availability of two years of SNP monitoring results (for dissolved metals), and/or available results from new proposed wells' additions.</p> <p>Recommendation 1) ENR recommends that the Table B-3 be submitted within the GMP (or GMPP) in the future by the Town, in order to prevent regulatory inconsistencies.</p>		
20	None	<p>Comment None</p> <p>Recommendation 2) ENR recommends for the Table B-3 (or equivalent) on SWDF Groundwater Monitoring Actions Levels, be submitted to the Board by the Town prior to the MV2019L3-0010 Public Hearing proceedings.</p>	<p>Apr 15: <p style="margin-left: 1.0cm;">As noted by ENR, the intended initial levels would be based off of the FIGWQG standards. These standards are publicly available and therefore the Town does not agree with the need to submit this information prior to the Public Hearing proceedings. Additionally, referencing to the standards as opposed to copying the information allows more flexibility in the event that the FIGWQG standards are changed.</p> </p>	
21	None	<p>Comment None</p> <p>Recommendation 3) ENR does not believe that the delays proposed by the Town are necessary nor required, in order to establish groundwater monitoring Action Levels using FIGWQG as starting point(s) (i.e., . delays encountered for collecting two years of dissolved metals results collection, waiting for the completion of</p>	<p>Apr 15: The Town would like to point out that the proposed changes to the groundwater monitoring for site includes not only the switch from totals metals to dissolved metals, but the addition of a second background well, the addition of two more groundwater wells to the network, and the re-completion of the 0053-5x series wells. All of these improvements will inform the site-specific Action Levels for all</p>	

		proposed new wells - and subsequent years necessary to collect enough data). The Town may wish to consult the ENR Table 4 and 5 preliminary data, in order to have a sense of dissolved metals results comparisons with most applicable guidelines.	parameters. In the interim while the site-specific Action Levels are being developed, the Town will use the FIGWQG (+25%) as the criteria to monitoring the results against. 	
22	None	Comment None Recommendation 4) ENR recommends that until such a time as new wells are in place and operable, the Town should be required to continue providing data as part of the already established groundwater monitoring wells (see subsequent comments on new monitoring wells).	Apr 15: <p style="margin-left:1.0cm">The Town agrees with this recommendation.	
23	None	Comment None Recommendation 5) To facilitate any future potential changes relating to site-specific criteria, ENR recommends that the Town keep Table B-3 (or equivalent on Action Levels) within the Town GMP (or GMPP).	Apr 15: <p style="margin-left:1.0cm">Until such time that site-specific Action Levels are developed the Town will provide the equivalent to Table B-3 in the submission of the Annual Report for ease of reference. The Town does not agree that this Table should be included in the GMP but rather that it should be included in the Annual Report where the testing results are presented.	
24	Topic 11: Action Levels & “ Past Inconsistencies	Comment In their response to comments received during the review of their 2018 AR, the Town specified that groundwater exceedances above FIGWQG would be easily identifiable (e.g., highlight/bold) in the	Apr 15: <p style="margin-left:1.0cm">The Town would like to note that the information from the 1991 Dillon report was not missed by the Beckingham Report. This information was included in their review of historical information. As stated	

		<p>upcoming 2019 Annual Report SNP Tabular Summaries. The Town further specified however that once the Water Licence renewal is approved, "site-specific action levels as identified in the approved Water Monitoring Plan will be used." The following important Action Levels differences between Table B-3 submitted in the Town's Water Monitoring Plan, and the November 15, 2018 document on groundwater action levels determination, were submitted in the past for non-metal parameters:</p> <p>Table B-3 - WMP (Feb 2018) November 15, 2018 [Based on max site concentrations] [Based on FIGWQG] TDS 6125 mg/L 3000 mg/L Chloride 645 mg/L 100 mg/L Sulphate 3188 mg/L 100 mg/L Fluoride 0.88 mg/L 0.12 mg/L Nitrite 5 mg/L 0.06 mg/L Phenols 0.0066 mg/L 0.004 mg/L</p> <p>While Actions Levels in Table B-3 were established based on maximum historical concentrations monitored at the site + 25% (using results monitored at 0053-5b, as representative background groundwater quality), the November 15, 2018 document presented Action Levels criteria based on FIGWQG (FCSAP) and/or CCME-PAL values. The 2018</p>	<p>in the Groundwater Monitoring Program Proposal, for the rationale outlined in that proposal, the Town would use the FIGWQG/CCME-PAL as starting points until the site-specific Action Levels are developed.</p>	
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		<p>AR 'Evaluation process' (Table 15-2: "Corrective Action Summary Table") specifies (for several parameters including sulphate and fluoride), that "the upgradient well concentrations [at 0053-5b] exceeded the criteria, indicating the contaminant is introduced to the site from upstream, therefore no corrective action was recommended."</p> <p>Recommendation 1) In the light of the 1991 background well monitoring results that were missed by the Beckingham Report historical data analyses, ENR recommends that the Town clarify which of the above list of Action Levels will be used for the landfill GMP, between Action Levels from Table B-3, Action Levels from the November 15/2018 document using FIGWQG and/or CCME-PAL as starting point(s). For the selected choice, please provide the associated rationales.</p>		
25	<p>Topic 12: Groundwater Wells 5-series "Suggestion for Replacement</p>	<p>Comment The Beckingham Report recommended the replacement of the 19 years old 0053-5 monitoring wells series, suggesting that they were improperly constructed so that it would be currently impossible to identify the groundwater chemistry of either horizon identified at the site. The GMP was</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town agrees with this recommendation.&nbsp;</p></p>	

	<p>established at the landfill in order to monitor the quality (and potential leachate impacts) on groundwater below the facility. As specified in past Reports, part of the geological layers at the sites may in fact be replaced by buried landfill wastes. Furthermore, monitoring the landfill groundwater quality is likely the primary goal of the GMP, considering that geological influences at the site should resemble those monitored at the background well in 1991. Considering the consistency of data monitored at each of these wells even during most recent sampling campaign (see attached ENR Tables 6 to 11), it would appear that the monitoring performance of the 0053-5 would be consider acceptable. As such, the Town may decide to invest in more pressing priorities for the moment (eg. replacement of problematic wells, such as 0053-5d potential blockages, etc.), until more evidence may become available to justify the need to replace the entire 0053-5 wells series.</p> <p>Recommendation 1) Should the Town decide to upgrade/replace the 0053-5 wells series at any point in the future, ENR recommends that the current 0053-5 wells</p>		
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		series remain in operation by the Town and continue to be monitored as per requirements of their Water Licence, until such a time as new groundwater monitoring wells are in place and operable.	
26	None	<p>Comment None</p> <p>Recommendation 2) Should the Town decide to upgrade/replace the 0053-5 wells series in the future, The Town should also plan to facilitate for "data continuity"™, to ensure that the past/current data collected at these wells will not automatically lost or dropped to move on to assumedly better monitoring results.</p>	<p>Apr 15: <p style="margin-left:1.0cm">The Town will plan to keep past/current data collected from the 0053-5 series wells.&nbsp;</p></p>
27	Topic 13: Groundwater wells 5-series " New Wells Additions	<p>Comment Apart from the proposal to replace the 0053-5 wells series, the Beckingham Report recommended other new groundwater wells additions to the 0053-5 series (near the river), as well as upstream background well(s). The Dillon 2013 LDS appears to also be suggesting the addition of a well, in the same general area as the one currently suggested by Beckingham for background wells (see Figure 2 of the 2013 Dillion LDS). ENR notes that groundwater quality monitored in 1991 at BH2, also located in the same general area as the</p>	<p>Apr 15: The Town does not foresee an issue with aligning additional groundwater wells with the current walking path.</p>

	<p>closest point to the road, provided similar results as those monitored also in 1991, at BH1 (background MW). Rather to be located at a central point aligning between 0053-5c and 0053-5e, this proposed well addition may be moved further towards the river, in order to align with the open walking path linking 0053-5d to 0053-5e. Current well 0053-5c may also be very difficult to find, as currently hiding amongst the trees and spread garbage (ENR had to use GPS coordinate while in site, in order to locate the well). Therefore, if 0053-5c was to be re-established in the future, it may also be relocated along that same walking path, such as to align with the current 0053-5d and 0053-5e wells. Past history of landfill fires at the site, paired with the persistent large pile of unsegregated material in the current landfill area, may justify the need to add two wells in-between 0053-5c and 0053-5e rather than just one (see LDS - Fig. 2), in order to best monitor operations at the current landfill area - and best capture potential impacts from unfortunate potential future fires. ENR further notes that Dillon's additional wells suggestions</p>		
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		<p>downstream from the "Auto Hulk Storage Area", are shown in Figure 2 of the 2013 LDS.</p> <p>Recommendation 1) ENR recommends that any additional groundwater wells align with the current walking path currently linking monitoring wells 0053-5d and 0053-5e.</p>		
28	None	<p>Comment None</p> <p>Recommendation 2) ENR recommends that past suggestions for well additions, such as recommended during the Landfill Drainage Study and/or the Interim Closure and Reclamation Plan, be considered by the Town when finalizing the choices for the GMP wells additions.</p>	<p>Apr 15: The Town will review the past additional well location suggestions and compare them to the current Beckingham recommendations prior to finalizing the locations.</p>	
29	Topic 14: Attachments Size and Number	<p>Comment This letter has a large number of attachments in support of ENR comments, the size and number of which cannot be submitted to the ORS, or to the Board by email. Jeanne Arsenault ENR GNWT will be transferring the attachments directly to the regulatory specialist by a secure file transfer protocol. It is anticipated the attachments will be available on the Board ORS or public registry.</p> <p>Recommendation 1) ENR recommends that reviewers access the information on the ORS, after posted by the</p>		

		Board, or by the Public Registry as necessary.		
30	Topic 15: Viewing table listed in Topic 11	<p>Comment The ORS doesn't accept certain formats for tables and graphs.</p> <p>Recommendation 1) To properly view the table in Topic 11, please refer to ENR's submitted formal letter.</p>		

Katlochee First Nation: Patrick Riley

ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Response
1	Groundwater Monitoring Guidelines	<p>Comment N/A</p> <p>Recommendation In lieu of groundwater monitoring guidelines for SWDFs in the NWT, KFN recommends that the TOHR adopts the groundwater monitoring programs and action levels for SWDFs based on the Standards for Landfills in Alberta. KFN notes that these standards have been adopted by the City of Yellowknife for the landfill facility.</p>	<p>Apr 15: The Town would like to note that if the Board chooses to use the Alberta Environment, Standards for Landfills in Alberta as the guidelines for it has no issue.&nbsp; But the Board should be making definitive recommendations on one set of standards instead of a variety of sources for different aspects of the program for consistency throughout the life of the Water Licence.&nbsp; The other alternative would be for the Board to develop their own standards for landfills based on the appropriate aspects of each program that they determine is most suitable. &nbsp;</p>	
2	Groundwater Monitoring Action Levels	<p>Comment On Page 20 of the Standards for Alberta Landfills, it states, "the person responsible for a landfill shall develop the Groundwater Monitoring Program to include, at a minimum, all of the following: (i) background</p>	<p>Apr 15: The Town would like to note that on Page 20 of the Alberta Environment, Standards for Landfills in Alberta in the same section item ii. states the following: "ii. obtaining groundwater samples from monitoring wells</p>	

		<p>groundwater quality for each monitoring well (ii) a. existing landfills or landfill cells may establish background levels after the start of landfill operations by i. using historical data.</p> <p>Recommendation KFN understands from the Beckingham Report that the Series 5 wells (including background monitoring wells) were improperly constructed. KFN recommends that the Dillon 1991 groundwater monitoring data inform the TOHR's groundwater monitoring program.</p>	<p>established in nearby areas not affected by landfill activity" The Beckingham report determined that the existing 0053-5b monitoring well is outside the influence of landfill activity. The report also recommended that a second background well it planned to capture the variation in groundwater chemistry. The Town feels that using the data collected from the existing and future background wells is appropriate for informing the TOHR GWMP.</p>	
3	Groundwater Monitoring	<p>Comment On page 17, of the Groundwater Monitoring Program, the TOHR states "The Town is proposing to sample for the dissolved metals that are in the FIGQG for 4 sampling events (2 spring, 2 fall) in order to set a baseline and to help improve the characterization of the groundwater at the site.</p> <p>Recommendation Prior to establishing baseline and setting Action Levels, how will the TOHR address contaminants at the site if there are signs of high contaminant levels?</p>	<p>Apr 15: The Town will use the FIGWG criteria to determine if there are signs of high contaminant levels during the time period that the site-specific Action Levels are being determined. Corrective actions will be implemented to address contaminants at the site if there are signs of high contaminant levels.</p>	
4	Groundwater Monitoring	<p>Comment For the Groundwater SNP 5 series and and 7 series - KFN compared the proposed dissolved metals to be</p>	<p>Apr 15: The Town has been working within the metals required by the Water Licence. As part of the groundwater monitoring</p>	

		<p>analyzed in groundwater monitoring against the Standards for Alberta Landfills. Notably missing is boron, molybdenum, silicon, thallium and uranium and volatile organic compounds: Methylene Chloride, Vinyl Chloride, Trichloroethylene (TCE), Tetrachlorethylene (PCE).</p> <p>Recommendation Why are these compounds not included in the monitoring suite? KFN recommends that the TOHR adopt the guidelines for Alberta: "Standards for Landfills in Alberta".</p>	<p>program review by Beckingham Environment recommendations for metals to be monitored were made based on parameters commonly found in landfill.&nbsp; Should the Board choose to adopt the Alberta Environment and Park &ldquo;Standards for Landfills in Alberta&rdquo;the Town will comply with the parameters the Board issues in the new Water Licence.&nbsp;</p>	
5	Groundwater Monitoring	<p>Comment The SNP 7 Series was compared the Standards for Landfills in Alberta (2010) - notably missing are major ions - calcium, magnesium, sodium, potassium, sulphate, nitrate and nitrite.</p> <p>Recommendation Why are these major ions not included in the monitoring suite? KFN recommends that the TOHR adopt the guidelines for Alberta: "Standards for landfills in Alberta".</p>	<p>Apr 15: The Town would like to note that the 0053-7x series wells are located upgradient from the landfill and were designed to monitor potential contaminates from the biotreatment pad not the landfill.</p>	
6	Series 5 Groundwater Monitoring Wells	<p>Comment Currently, the Series 5 groundwater monitoring wells are not properly installed and have surface water influencing the groundwater sampling.</p> <p>Recommendation Does the TOHR have funds to repair/re-drill the</p>	<p>Apr 15: Based on the plan the Town has developed; the funding is anticipated to be available in 2021 to upgrade the 5 Series monitoring wells, drill the second background well and install the 2 new wells.&nbsp; This plan is based on current information that that Town has.&nbsp; The</p>	

		<p>groundwater monitoring wells and what is the projected timeline of the repairs/installation? Can the wells be re-drilled? How will the TOHR prioritize the well installation at the site? Since e Series 7 groundwater monitoring wells inform the TOHR's Groundwater Monitoring Proposal? Since the Series 7 wells are operating fine, could extra parameters be added to these wells in the interim prior to the extra wells being drilled?</p>	<p>Town will drill all the wells at the same time as this will provide a cost savings on mobilization fees. The 7 Series wells are located upgradient of the landfill and were placed to monitoring the groundwater from the biotreatment pad. Therefore, they would not provide information on the groundwater potentially influenced by the landfill.</p>	
7	BTEX Monitoring	<p>Comment Currently, the TOHR Series 5 groundwater monitoring wells do not include monitoring for BTEX. Recommendation KFN requests that the TOHR explain why BTEX is not being monitored in wells other than series 7?</p>	<p>Apr 15: The Town proposed in the GMPP to monitor Total Petroleum Hydrocarbons F1 fraction (CCME) which includes BTEX. The Town does not accept hydrocarbon contaminated soil at the landfill but recognized the importance of capturing the potential of light-end petroleum hydrocarbon contaminants. The 7 series wells were put in place to monitor the biotreatment pad, which was designed to accept hydrocarbon contaminated soils, therefore, BTEX is a primary contaminant of concern for those monitoring wells.</p>	
8	Action levels	<p>Comment Action Levels are established to trigger Corrective Actions. Results from groundwater monitoring and sampling will be evaluated against the Action Levels and if a contaminant of concern has</p>	<p>Apr 15: The Town agrees with the recommendation to use dissolved metals to set groundwater monitoring Action Levels.</p>	

		<p>an exceedance, the corrective action plan will be initiated.. the TOHR would like to set new Action Levels as Dissolved Metals data is collected at the Site. Beckingham recommends disregarding the current metals action levels as they were based on historic groundwater metals results, which are not comparable with Dissolved Metal results or criteria.</p> <p>Recommendation KFN agrees with the approach to use dissolved metals data as it is consistent with the Standards for Landfills in Alberta.</p>		
9	Action Levels	<p>Comment From page 10, of the TOHR's Groundwater Monitoring Program, "Corrective Actions shall be evaluated and/or implemented if the following events occur: An unplanned or accidental release of waste material (waste, untreated soil or water) from the SWDF (including the HCSTF) or; Groundwater concentrations of one or more of the monitored parameters exceed the Action Level.</p> <p>Recommendation The groundwater performance standards in "Standards for Landfills in Alberta" include a third performance standard: "any</p>	<p>Apr 15: The Town would like to request the interpretation regarding the third performance standard quoted above to provide clarity.</p>	

		<p>parameters not naturally present in groundwater is not detected in three consecutive sampling events. KFN requests that the TOHR includes the third groundwater performance standard: (iii) any parameters not naturally present in groundwater is not detected in three consecutive sampling events as a corrective action.</p>		
10	None	<p>Comment From the TOHR's Groundwater Monitoring Program (page 11). During Step 1 of Corrective Actions, the action level exceedance will be evaluated against the following:.... If the exceedance occurs from a contaminant that is determined to be due to operations at the facilities (i.e., petroleum hydrocarbons), then the parameters that are exceeded will be monitored for a cycle (2 sampling events) to determine the trend of the exceedance.</p> <p>Recommendation KFN recommends that the wording of this section is changed from "if the exceedance occurs from a contaminant that is determined to be due to operations at the facility" to "Unless a source other than the facility or facility operations is determined to have caused the</p>	<p>Apr 15: The Town identifies in the Groundwater Monitoring Program Proposal (page 11) "As part of Step 1 Corrective Actions, operations and subsequent sampling during Step 1 indicate that concentrations are stable or increasing, then the Town will prepare a Remedial Action Plan (RAP) to further investigate the impacts. The RAP will be submitted to the MVLWB for review, comment and approval. All monitoring results are provided to the MVLWB as part of the Annual Report and posted for review."</p>	

		health of the environment.ÃÃÃÃ		
MVLWB: Erica Janes				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Response
1	Overall Plan	<p>Comment Board staff reviewed the Town of Hay River's Groundwater Monitoring Program Proposal (V1) and are of the opinion that while it is somewhat encouraging in its approach, it is limited in the extent to which it can effectively address the monitoring requirements in the town's current licence and/or potential future licence due to fundamental and inherent challenges surrounding the integrity of existing monitoring stations (i.e., improperly installed wells) and effectiveness of the overall monitoring program design, including suitability of parameters analyzed and consistency in sampling procedures. These issues are foundational to this entire Plan.</p> <p>Recommendation None</p>		
2	Groundwater Monitoring Plan - General Comment	<p>Comment Board staff note that issues have been identified with the integrity of the existing groundwater wells as a direct result of improper installation. Continuing to sample compromised groundwater wells is of limited value.</p>	<p>Apr 15: Based on the plan the Town has developed; the funding is anticipated to be available in 2021 to upgrade the 5 Series monitoring wells, drill the second background well and install all the 2 new wells.&nbsp; This plan is based on current information that that Town has.&nbsp; The</p>	

		<p>Board staff are of the opinion that a plan for resolving this known issue should be included in the Groundwater Monitoring Program Plan, and that this should include a timeline as to when this work will be completed.</p> <p>Recommendation Please provide detailed information, including a timeline, related to the fixing of compromised groundwater wells.</p>	<p>Town will drill all the wells at the same time as this will provide a cost savings on mobilization fees.&nbsp;</p>	
3	<p>Groundwater Monitoring Plan; Section 2.1 Page 6</p>	<p>Comment The conclusion that the elevated salinity concentrations are natural is partially correct. The high sulphate concentrations are from natural dissolution of gypsum in the soil profile. The chloride concentrations are not natural at the values observed in the background monitoring well; they are likely due to road salt placement on the Ft Smith Highway and/or calcium chloride being used as a dust suppressant on the roads near the monitoring well location. The purpose of the groundwater surveillance network is to detect impacts to the groundwater from the landfill activities. Knowing that the groundwater is elevated in chloride before entering the landfill is important in the interpretation of the results observed in the down</p>	<p>Apr 15: The Town of Hay River hired an independent third-party consultant (Beckingham Environmental) to review groundwater monitoring at the site (including historical reports and data) and provide a recommendation regarding the validity of the current background well.&nbsp; The Beckingham Report (Groundwater Monitoring Program Review Town of Hay River) provides an in-depth review and discussion on the importance of the current background well location in determining if the landfill is impacting the groundwater downgradient of the landfill footprint.&nbsp; Please refer to section 4.1 in the Beckingham Report.</p>	

		<p>gradient monitoring wells, making it important to retain the current background well in addition to establishing a background well that is as free from anthropogenic influences as possible.</p> <p>Recommendation Please provide rationale to explain the importance of the current background location in determining whether the landfill is impacting the groundwater downgradient of the landfill footprint.</p>		
4	<p>Groundwater Monitoring Plan; Section 2.2 Page 6</p>	<p>Comment The addition of another background well into the monitoring network is sound. The chemistry results from monitoring well SNP 0053-5e indicate that the road salt/calcium chloride use does not appear to affect the southern portion of the landfill, thus a background well representing groundwater flowing into this part of the landfill is required. The location proposed by Beckingham that is approximately 50 m south of well SNP 0053-7a makes sense, as this location is furthest from the Ft Smith Highway. However, there have been indications that this area could have been previously impacted by historic landfilling activity.</p> <p>Recommendation Please include rationale to justify</p>	<p>Apr 15: The Town’s intent would be to find a location for the second background well between the highway and the landfill that has not been impacted by historical wastes, and would use the aid of an EM survey &nbsp;to identify areas of higher and lower electrical conductivity in the subsurface around the perimeter of the Site.&nbsp; The second background well location may not be upgradient as they are cross gradient but far enough east to be in low salinity/Cl groundwater and far enough south from a source of groundwater contamination.</p>	

		establishment of a second background well between the highway and the landfill, considering the area could be impacted by historical waste, as opposed to establishing a second background well in an area known to not have anthropogenic influence.		
5	Groundwater Monitoring Plan; Section 2.2 Page 6	<p>Comment None</p> <p>Recommendation Would the Town consider test pitting to determine the presence of historical waste in potential locations for a second background well?</p>	<p>Apr 15: The Town would consider test pitting to determine the presence of historical waste in potential locations depending on which well location is chosen but does not necessarily believe this will be required if existing information is used to select the location.&nbsp; The Town intends to choose a location outside the historic landfill area.&nbsp;</p>	
6	Groundwater Monitoring Plan; Section 2.3 Page 6	<p>Comment This section recommends establishing an additional monitoring well between SNP 0053-5c and SNP 0053-5d. The general location is reasonable, but Board staff are of the opinion it is too close to the edge of waste.</p> <p>Recommendation Please consider moving the location for an additional downgradient monitoring well to be closer to the Hay River and more geographically in line with wells SNP 0053-5d and SNP 0053-5e.</p>	<p>Apr 15: The Town has no issue with moving the location for an additional downgradient monitoring well to be closer to the Hay River and more geographically in line with wells SNP 0053-5d and SNP 0053-5e.&nbsp; The ENR recommendation that the well be located on the same walking path as the other wells, should be contemplated when choosing a location for the well.</p>	

7	Groundwater Monitoring Plan; Section 2.5 Page 7	<p>Comment Board staff understand that there is no cost savings gained by eliminating the analysis of select metals from the standard metal suite. Board staff note that the proposed list of metals is based on the types of wastes typically disposed of in a municipal landfill; however, a proper screening approach that also considers guidelines and background concentrations should be applied to enable a site-specific screening once dissolved metals data is available. Given the gaps in the information regarding waste management at this site, a more comprehensive screening approach is likely required to support any proposed changes to analytical and reporting requirements for the Surveillance Network Program.</p> <p>Recommendation Please provide further information related to site-specific screening for parameters of concern in the next version of the proposed Groundwater Monitoring Program Proposal.</p>	<p>Apr 15: The Town will provide further information related to site specific screening for parameters of concern in the next version of the Groundwater Monitoring Program Proposal. The Town would also request that the Board provide specifics on what “further information” they would like to see if there are specific concerns that the Board has. Additionally, the Town would point out that the statement that “there is no cost savings gained by eliminating the analysis of select metals from the standard metal suite” is not entirely correct. While there are no additional costs associated with the testing, there is additional work required for gathering, compiling, and presenting this information which, in turn, does mean additional costs. </p>	
8	Groundwater Monitoring Plan; Section 2.6 Page 7	<p>Comment Board staff note that sulphate and fluoride are included with the routine analysis package provided by the laboratory and no cost savings are gained by eliminating them. Sulphate</p>	<p>Apr 15: As recommended in the Beckingham report, the monitoring of sulphate and fluoride at the 7 series wells (which are for monitoring the biotreatment pad, not the landfill) is not necessary. </p>	

		<p>concentrations are required to produce piper plots, which are a good tool to determine changes to the groundwater over time. Sulphate and fluoride are constituent ions of Total Dissolved Solids, which is a parameter of interest for this site; therefore, having an understanding of the constituent ion concentrations may be useful in interpreting results. In addition, although reference to historical data was mentioned in the Groundwater Monitoring Program Proposal, no empirical data were provided to support the proposal to eliminate this parameter from the SNP 0053-7 series wells. The Beckingham report states that sulphate and fluoride are naturally occurring in the groundwater in this area. Board staff are of the opinion that these background concentrations provide useful information and context for interpreting data from downgradient groundwater wells, and that these parameters should be retained in the Surveillance Network Program.</p> <p>Recommendation Please retain sulphate and fluoride in the list of parameters to be analyzed under the</p>	<p>However, if the Water Licence Surveillance Network Program requires testing for sulphate and fluoride at the 7 series wells then the Town will comply.</p>	
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		any differences between the two plans.		
12	Groundwater Monitoring Plan; Section 3.1, Page 10	<p>Comment The Plan states that a new set of action levels are to be developed due to the change from total metals to dissolved metals. It goes on to describe the procedure (based on the methodology for developing Tier 2 Guidelines documented in the Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites) for establishing the action levels after four sampling events had been conducted. However, the procedure for calculating Tier 2 Guidelines does not take into account background concentrations that are over the guideline (e.g., sulphate). A statistical procedure is required to set action levels in these cases that is based on the observed variability in the concentrations at the background wells. Board staff agree with the recommendation to establish a new set of Action Levels for dissolved metals; however, Board staff are of the opinion that this should be done for all parameters of interest, not just dissolved metals, as the new action levels would take into account specific background concentrations. There is no</p>	<p>Apr 15: The Town will revise the Plan to include a methodology to address situations where the background concentrations are higher than the guideline.</p>	

		<p>reason to delay setting action levels for non-metal parameters. Given the known delay for installing the second background well, it would be prudent to set action levels for non-metal parameters now, add action levels for dissolved metals in two to three years (i.e., when sufficient data is available), and reassess these action levels once the groundwater wells are fixed and revise as appropriate.</p> <p>Recommendation Please revise the Plan to include a methodology to address situations where the background concentrations are higher than the guideline.</p>		
13	None	<p>Comment None</p> <p>Recommendation Please provide action levels, with rationale, for non-metal parameters.</p>	<p>Apr 15: The Town would like to note that the GMPP includes the addition of a second background well, the re-drill/completion of the 0053-5x series wells and the addition of two downgradient monitoring wells.&nbsp; These would all impact the development of action levels for all parameters and the Town is of the opinion that developing the action levels at the same time would be appropriate.</p>	
14	Groundwater Monitoring Plan; Section 3.2, Step 1 third bullet ,Page 11	<p>Comment Board staff note that this corrective action is no different than the existing monitoring events. Exceedance of an action level can be caused by sampling or laboratory errors (false positives). The</p>	<p>Apr 15: Given the cost implications for including a re-sampling event and increased sampling frequency for that trigger an action level the Town would prefer stay with the existing sampling frequency.</p>	

		<p>first step should be to re-sample the well before the next sampling event to rule out false positives; then an increased sampling frequency for the well and parameters in questions would be prudent, to establish a trend with a high statistical confidence.</p> <p>Recommendation Please include a re-sample event and an increased sampling frequency for wells that trigger an action level.</p>		
15	<p>Groundwater Monitoring Plan; Section 5.0, Page 12</p>	<p>Comment This section discusses how two of the three existing monitoring wells down-gradient of the landfill are not down-gradient of the area where the 2019 fire occurred, and that only well SNP0053-5e should have the special (post-2019-fire) sampling and analysis. Board staff disagree with this statement, as those two wells are necessary to capture any potential impacts of any landfill fire, regardless of when it occurred. The two additional down-gradient wells that are recommended will also be down-gradient of the landfill and should be under the same additional sampling regime as the three existing wells.</p> <p>Recommendation Please revise the Plan to specify that the two new additional down-gradient monitoring</p>	<p>Apr 15: The Town would like to manage the landfill fire monitoring as a separate study under the new Water Licence.&nbsp; This would allow for an ease of modifying the landfill fire monitoring program as data is collected regarding groundwater, surface water and soil.&nbsp; The two new additional down-gradient monitoring wells will be subject to the sampling and analysis requirements as per the SNP in the new Water Licence.&nbsp; &nbsp;</p>	

		wells will be subject to the same sampling and analysis requirements as the existing wells 0053-5d, 0053-5c, and 0053-5e.		
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