UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1 – NEW ENGLAND
5 POST OFFICE SQUARE – SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

Via Electronic Mail

March 16, 2022

Mr. Peter Britz, Environmental Planner
City of Portsmouth Planning Department
1 Junkins Avenue
Portsmouth, NH 03801

RE:	Coakley Landfill Superfund Site
	December 22, 2021, Draft *Deep Bedrock Investigation Final Report*

Dear Mr. Britz:

The United States Environmental Protection Agency (EPA) is in receipt of the *Draft Deep Bedrock Investigation Final Report* (the "Draft Report"), dated December 22, 2021, and submitted by Haley Ward, Inc. on behalf of the Coakley Landfill Group (CLG). The Draft Report documents the deep bedrock investigation undertaken by the CLG at the Coakley Landfill Superfund Site (the "Site") between April 2017 and October 2021.

EPA and the New Hampshire Department of Environmental Services (NHDES) have reviewed the Draft Report for completeness, technical accuracy, and responsiveness to the objectives of the investigation and have found it to be lacking in all of those areas. Significant aspects of the interpretations presented are incomplete and lack full consideration of the extensive data generated by the deep bedrock investigation and existing historic data. Several components of the hydrologic characteristics at the Site are not fully addressed or discounted all together, resulting in an incomplete Conceptual Site Model (CSM). The recommendations provided do not fully address the extensive comments that EPA and NHDES have already provided throughout this investigation; they fall short of what will be required to fully document the bedrock flowpaths at the Site; and the recommendations do not establish a long-term plan for monitoring the flowpaths in bedrock and the impact and potential risks to receptors. EPA does concur with several of the findings in the Draft Report. However, the development of the CSM and the conclusions and recommendations presented in the Draft Report did not fully consider or utilize all of the data generated by the investigation. In several cases the Draft Report provides interpretations that are inconsistent, confusing, or inaccurate, presents several conclusions that are based only on single lines of evidence, and does not provide recommendations that are adequate for the continued assessment of contaminant migration in the bedrock aquifer.

The Draft Report is subject to the terms and conditions specified in the Consent Decree that was lodged in District Court on January 14, 1999 (the "Consent Decree"). Pursuant to paragraph 37(d) of the Consent Decree, EPA, following consultation with the NHDES, disapproves the Draft Report. In accordance with paragraph 39 of the Consent Decree, the CLG shall correct the deficiencies in the Draft Report as specified in the general comments below and the detailed comments enclosed, incorporate the recommendations listed below, and resubmit within 45 days of receipt of this letter.

General Comments:

- Since initiation of the deep bedrock investigation, the CLG has submitted numerous progress reports, work plans, and data submittals to EPA and NHDES (the "Agencies") for review, and the Agencies have provided often extensive comments. With respect to this investigation, in many cases the CLG has responded that the Agencies' comments would be addressed in the final report. There are numerous instances in the Draft Report where it is evident that earlier comments from the Agencies were not considered or addressed. Repeated references to prior submittals are made in the Draft Report in lieu of including the associated information and data within the Draft Report. In this regard, the Draft Report is incomplete and difficult to review. It was the Agencies expectation that the Draft Report would be a comprehensive compilation of all work performed as part of this investigation and would address and consider comments from the Agencies that had not been previously addressed or considered.

- In many sections of the Draft Report, conclusions are stated based on 'general' conditions or a singular line of evidence. For example, it is concluded that groundwater discharge conditions exist west of the landfill based on upward vertical gradients in many monitoring wells and that the plume is 'stable' based on a lack of exceedances in most water supply wells. While it is reasonable and expected that these observations would be presented based on the data collected, variations from the 'general' conditions, such as the areas where geologic conditions (marine deposits) limit the extent of groundwater discharge must also be highlighted, explained, and incorporated into the CSM.

- The maps, cross-sections, and figures that represent the interpretations of the geologic and hydrologic conditions at the Site conflict in many areas. For example: 1) Figure 4.2 shows the extent and thickness of the marine deposits, including beneath the landfill, but the cross-sections shown in Figures 4.4 and 4.5 do not show marine deposits beneath the landfill. 2) The legend in Figure 4.1 defines the glacial till thickness contours without units, while the embedded table in the figure and the indication at each well identify depth to till in feet; and depth to till for FPC-9B is shown as 56 feet and within the 40-foot thickness contour, while Figure 4.5 appears to show depth to till at FPC-9B as about 56 feet, but the contoured thickness suggest that it is about 15 feet. 3) Figure 4.4 shows FPC-5B in the Rye Gneiss and Figure 4.5 shows FPC-9B in the Rye Gneiss, but Figure 4.6 shows them both in the Breakfast Hill Granite.

- Interpretations of watershed boundaries should be consistent with New Hampshire's statewide geographic information system clearinghouse (NH GRANIT http://www.granit.unh.edu/) as previously expressed in EPA's November 22, 2019, response to CLG's September 2019, *Stormwater Investigation Report*. The watershed boundaries presented in the *Deep Bedrock Investigation Interim Report* are accurately interpreted and presented, while those presented in the Draft Report are not.

- In some cases, such as with the pumping test and DPT efforts, the intent for performing the specific investigation activity is misrepresented in the Draft Report. For example, the Draft Report states that the pumping test was conducted "to confirm that identified transmissive fractures in bedrock monitoring wells were not hydraulically connected to nearby private supply wells and did not provide potential pathways for off-site migration of Site contaminants to potential receptors" which is over simplistic and incomplete. The actual objective of the pumping test as stated in the approved *Deep Bedrock Investigation Pumping Test Work Plan* dated November 20, 2020, was to assess bedrock fracture connectivity and further evaluate the southern migration pathway in bedrock, and to assist with 1) refining the CSM and further the understanding of deep bedrock hydrogeology; 2) determining (along with other lines of evidence) whether transmissive fractures in bedrock monitoring wells provide likely migration pathways for off-site migration of contaminants to potential receptors; and 3) evaluating inter-fracture groundwater flow and its relationship with overburden and shallow bedrock.

- The Draft Report does not provide adequate detailed discussion of the bedrock geologic features that were found to be secondary to the predominant fracture features in bedrock. Sheeting fractures and cross-fractures are not fully considered as part of the interpretation of groundwater pathways in bedrock and are not adequately represented in the CSM. Data from surface geophysical surveys and LiDAR imagery, along with other historic data sources, do not appear to be incorporated into the interpretation of bedrock topography.

- The current impact or the potential future impact to receptors around the landfill (Stone Meadow Way, Berry Farm Lane, North Road) from contaminant migration in groundwater within bedrock flowpaths is not clearly presented in the Draft Report. Conversely, the Draft Report does conclude that there is not an impact to receptors, but this conclusion is often only supported in the Draft Report by a single line of evidence. One of the goals of the deep bedrock investigation was to characterize the potential for the migration of site-related contaminants to local receptors. This characterization is not adequately articulated in the Draft Report.

A modified report shall incorporate the following recommendations:

- CLG shall install a monitoring well couplet (overburden and deep bedrock) near the centerline of the bedrock trough, south of GZ-105 in order to monitor the extent of contamination migrating along the southern flowpath within the bedrock trough and to bound the contaminant plume with respect to the GMZ boundary. Conducting a surface geophysical survey will likely be required to properly locate this well within the bedrock trough.

- CLG shall sample temporary well TMW-11 and based on the results locate a permanent monitoring well in overburden to confirm and monitor the western GMZ boundary.

- CLG shall submit a work plan for completing open bedrock boreholes at the Site, that includes at least MW-24, GZ-130 and GZ-109.

- CLG shall continue the investigation of interaction between groundwater and surface water at the Site, including the identification and mapping of areas of thin or discontinuous marine layers as locations where groundwater is likely to discharge to wetlands and Berrys Brook. Recommendations shall be made for the long-term monitoring of these locations.

As required by the Consent Decree, the CLG shall correct these deficiencies and resubmit a modified report within 45 days of receipt of this letter.

If you have any questions or comments regarding this letter, or would like to schedule a meeting, you can contact me at (617) 918-1882 or Hull.Richard@epa.gov.

Sincerely,

Richard Hull

Richard W. Hull, Remedial Project Manager
New Hampshire and Rhode Island Superfund Program

cc: Andrew Hoffman, NHDES
Jim Soukup, Weston Solutions, Inc.
Kelsey Dumville, USEPA
RuthAnn Sherman, USEPA
Jacalyn Gorczynski, Haley Ward

Enclosure

Draft Deep Bedrock Investigation Final Report, December 22, 2021
Coakley Landfill, North Hampton, NH
Prepared by Haley Ward, Inc.

EPA and NHDES Comments
March 16, 2022

Executive Summary:

1. The discussion of the remedy for Operable Unit 1 (OU1) documented in the Record of Decision (ROD) should include reference to the groundwater extraction and treatment component of the selected remedy. This component was later dropped from the remedy for OU1 by an Explanation of Significant Differences (ESD) issued on September 29, 1999.

2. The discussion of the initiation of sampling for PFOA and PFOS at the Site indicates that the EPA health advisory (HA) of 70 parts per trillion (ppt) was exceeded "within the landfill boundary." Samples collected in May 2016 showed results that exceeded the EPA HA in both OU1 and OU2 wells, outside of the landfill boundary.

3. Page ii indicates that the fourth Five-Year Review (FYR) determined that the remedy at OU2 "was protective of human health and the environment". The fourth FYR issued in 2016 concluded that a protectiveness determination for OU2 could not be made (deferred) without obtaining further information. Accordingly, the site-wide protectiveness determination was deferred. The subsequent addendum to the fourth FYR issued in 2017 determined, based on information collected since the issuance of the fourth FYR, that the remedy for OU2, and for the Site overall, was protective in the short-term.

4. With respect to the timeline for the submission of the draft and final Work Plan Addendum and EPA's subsequent conditional approval described on page iii, the Coakley Landfill Group (CLG) submitted a draft Work Plan Addendum on April 30, 2020, EPA issued comments on June 17, 2020, CLG submitted a response to comments and final Work Plan Addendum on July 17, 2020, and EPA issued a conditional approval on August 4, 2020.

5. The last paragraph of the *Introduction and Site History* section states that "initial data collected from routine sampling of private water supply wells completed in deep bedrock indicate that little to no significant migration in the deep bedrock has occurred." EPA strongly disagrees with this statement. Routine sampling of water supply wells R3 and 339BHR has shown exceedances of the NHDES Ambient Groundwater Quality Standards (AGQS) for 1,4-dioxane and PFAS compounds demonstrating that the migration of contamination has occurred in the deep bedrock.

6. The *Completed Investigation Activities* section states that "both a variable rate pumping test and a constant rate pumping test [were conducted] at MW-6 to confirm that identified transmissive fractures in bedrock monitoring wells were not hydraulically connected to nearby private supply wells and did not provide potential pathways for off-site migration of Site contaminants to potential receptors." The actual objective of the pumping test as stated in the approved Deep Bedrock Investigation Pumping Test Work Plan dated November 20, 2020, was to assess bedrock fracture connectivity and further evaluate the southern migration pathway in bedrock, and to assist with 1) refining the Conceptual Site Model (CSM) and further the understanding of deep bedrock hydrogeology; 2) determining (along with other lines of evidence) whether transmissive fractures in bedrock monitoring wells provide likely migration pathways contaminants to potential receptors; and 3) evaluating inter-fracture groundwater flow and its relationship with overburden and shallow bedrock. A single pumping test that utilizes a well outside of the landfill footprint and has only very low contaminant concentrations would not be sufficient, on its own (single line of evidence), to support a conclusion about off-site migration to specific receptors.

7. The *Geology and Hydrology* section cites MW-21D as an example of where overburden thickness is less than one foot but does not cite a well as an example of where overburden is 85-feet west-northwest of landfill. Additionally, MW-21D is located west-northwest of the landfill so there is some contradiction here

8. The *Geology and Hydrology* section indicates that the top of bedrock is shallower beneath the landfill because it is a topographic high point. That statement is incorrect and inconsistent with the cross-section shown in Figure 4.5 that shows the bedrock is located beneath nearly 50-feet of fill and overburden. Figure 3.4 provides a contour map of the bedrock surface that shows the high point for the bedrock is in the vicinity of the Bethany Church (120-foot elevation), while the elevation of the bedrock beneath the landfill is shown as 75-feet. Therefore, the bedrock surface near the landfill is neither shallow nor high in elevation compared to other locations in the study area.

9. The *Geology and Hydrology* section lists the various factors that influence groundwater flow patterns in the vicinity of the Site, but the influence of sheeting fractures is not mentioned at all, nor is the highly variable distribution and thickness of the various overburden layers (outwash, marine silt and clay, till). Groundwater flow in crystalline bedrock is determined by the orientation of the various fracture sets (three fractures sets have been identified at this Site) and the local or regional hydraulic head field (distribution of groundwater elevations). This should be more clearly explained. The paragraph concludes that "…shallow and deep groundwater at the Site are discharging to the wetland complex and/or the Little River/Berrys Brook." While it is likely that overburden and shallow bedrock groundwater discharge to surface water in these drainage basins, it

has not been conclusively shown that the deep bedrock groundwater discharges to surface water. Deep bedrock groundwater can follow longer flow paths that transcend smaller drainage basins, discharging to more distant regional or subregional drainages, or the Atlantic Ocean.

10. The *Geology and Hydrology* section summarizes the trend analyses performed for various parameters and monitoring locations at the Site and concludes that "groundwater concentrations demonstrate primarily statistically significant decreasing concentrations of contaminants or no trend." No mention is made of the wells that show increasing trends and many of the interpretations of decreasing trends are incorrect. The lack of exceedances in water supply wells near the landfill is not necessarily an indication of plume stability or reduction. The text notes the exception of 339BHR and R3, but these are notable exceptions and document migration of contaminants from the landfill over large distances along preferential pathways in deep bedrock.

11. Paragraph 1.d. of the *Conceptual Site Model* section concludes that the relatively small head differentials measured in nested wells indicates "relatively good hydraulic communication between fractures" and that this is consistent with short flow paths in a small watershed. However, extensive fracture measurements have shown that the area is characterized by relatively steeply dipping fractures, which would also tend to produce small vertical head variations. It is more likely that the small vertical head variations measured at the Site are indicative of near horizontal flow conditions along strike, as is common in New Hampshire.

12. Paragraph 2.a. of the *Conceptual Site Model* section concludes that contaminant migration and the interconnectedness of fractures in deep bedrock are limited based on the lack of observed drawdown during the pumping test. However, the monitoring well used for the pumping test (MW-6) is not significantly impacted by contaminants from the landfill, suggesting that well is not well connected to the contaminant migration pathways. The well is located south of the landfill and not within the mapped zone of E-W lineaments. Hydraulic reaction to pumping at MW-6 was dominated by the primary fracture set (NE-SW) and the bedrock trough. Water level data from transducers placed in nearby monitoring wells during the drilling of MW-25 recorded measurable drawdown both east and west, confirming the importance of the E-W lineaments and cross-set fractures for contaminant migration from the landfill.

13. Paragraph 2.d. of the *Conceptual Site Model* section states that "Low to non-detect COC concentrations in this highly transmissive zone indicates low or no COC migration to this area." This statement is inaccurate. Concentrations of 1,4-dioxane and PFAS were found in all 12 fracture zones tested at MW-25. The presence of these compounds confirms contaminant migration to this area. The fact that they are found in a highly transmissive

fracture at concentrations exceeding the Site cleanup levels (CLs) is indicative of a large mass of contamination that is contributing to that fracture, such that it is able to maintain these high concentrations.

14. Paragraph 2.h. of the *Conceptual Site Model* section indicates that wells at the west and southwest toe of the landfill slope are influenced by stormwater contribution, but no evidence is presented to prove this conclusion. The correlation between the contaminant loading from stormwater runoff and contaminant level in groundwater should be developed and presented.

15. *Recommendations* section concludes that there is little potential for groundwater to migrate beyond the Little River valley to receptors south of North Road. This conclusion needs to be supported with more detail and data. The bedrock trough pathway to the north and south is well established, and there is no data that would discount this as a significant pathway.

16. *Recommendations* section concludes that samples from private water supply wells located east of 339 BHR (golf course) and north of the landfill do not show Site COCs. This is not the case given that private wells on Stone Meadow Way, Berry Farm Lane, and now 399 BHR, east of 339 BHR and north of the landfill, consistently show detections of PFAS compounds.

17. *Recommendations* section indicates that the southern extent of contaminant migration from the landfill is in the vicinity of FPC-3A/B and FPC-4A/B. These wells are located along the eastern and western boundaries of the bedrock trough, which is the predominant groundwater flowpath to the north and south. GZ-105 and MW-25 are located near the center of the trough and have significantly higher contaminant concentrations. It is likely that the core of the plume is located near the centerline of the bedrock trough and that it extends some distance south of FPC-3A/B and FPC-4A/B. Again, no data currently exists that would discount this as a significant pathway for contaminated groundwater to impact receptors to the south. The northern extent of the plume extends beyond 339BHR which is located more than 3,200 feet north of the landfill. It has yet to be shown that the southern extent of the plume is not of a similar magnitude.

18. *Recommendations* section proposes to install a multilevel monitoring well in existing deep bedrock borehole MW-23 (Chinburg Well) that will serve as a long-term monitoring point for the northern extent of the plume. Results of the packer sampling and transducer monitoring programs for that well have shown that MW-23 is not connected to, or influenced by, the bedrock trough which is the primary pathway for contaminant migration to the north. Therefore, MW-23 is not located in a suitable spot to monitor contaminant migration to the north.

Section 1: Introduction

19. To clarify, the remedial action objectives (RAOs) for OU2, as specified in the 1994 ROD, are to prevent ingestions of contaminated groundwater, to restore the aquifer to drinking water standards, and to facilitate wetland restoration.

20. Section 1.1 states that the objective of the pumping test at MW-6 was to "…confirm that identified transmissive fractures in bedrock monitoring wells were not hydraulically connected to nearby private supply wells and did not provide potential pathways for off-site migration of Site contaminants to potential receptors." The objective of the pumping test is detailed in a previous comment. To reiterate, a single pumping test would not be able to meet the objective stated, and in any event, the detection of 1,4-dioxane and PFAS in off-site private supply wells R3, 178A, and 339BHR conclusively show that off-site migration of contaminants to potential receptors has occurred.

21. Section 1.2, *Investigation* Approach, states that "Initial data collected from routine sampling of private water supply wells completed in deep bedrock indicate that little to no significant migration in the deep bedrock has occurred." This statement is incorrect. The original RI and follow up investigations and monitoring conducted in the 1980s and 1990s identified Site contaminants in residential wells along Lafayette Road and North Road, requiring the installation of a municipal water line to those areas to provide alternative drinking water. Section 1.2 also does not account for the impacts at the Site from 1,4-dioxane which has prompted the further assessment of groundwater quality in deep bedrock.

22. Section 1.2, *Investigation* Approach, mistakenly identifies Direct Push Technology (DPT) as "Deep Push Technology".

Section 2: Site History

23. Section 2 should discuss the water line extensions performed in the area around the Site between 1982-1986, including on Lafayette Road and the eastern end of North Road, and that the water lines were extended due to impacts from the Site. The development of the Seavey Way 10-lot subdivision and the associated water line extension should also be described.

24. Section 2.1, *Site Mining and Landfill* Operations, indicates that sand and gravel operations were conducted between 1965 and 1972, but no mention is made of bedrock mining or blasting that is known to have occurred. Additional detail on the sand and gravel mining should be included, such as the depth to which the mining occurred and whether bedrock or groundwater were encountered (refer to Section 1.2.2 of the 1988 Remedial Investigation), and the bedrock mining and blasting operations should be summarized

here. Bedrock mining plays an important role in the site history because blasting would have exacerbated shallow fractures in the rock what would act as contaminant transport mechanisms once the pit began accepting wastes in 1972. Maps and historical aerial photographs should be included to document the location and types of mining and landfilling activities as well as the timeframes.

25. Section 2.5, *Institutional Controls,* indicates that the Groundwater Management Zone (GMZ) restricts property owners from extracting groundwater for potable use. The GMZ, as established by the Groundwater Management Permit (GMP), has no inherent restrictive element. However, the GMP does have provisions for implementing institutional controls (ICs) above and beyond the recording of deed notices on properties within the GMZ. The CLG currently only records deed notices on properties within the GMZ and thus far has not established any further ICs.

26. Section 2.5, *Institutional Controls*, should describe all supply wells that are within the GMZ, including the private well at 65 North Road. Permission to sample this well has not been granted by the property owner, therefore, the water quality of this well is unknown. At the least, a summary of the history of this well and attempts to access the well or apply institutional controls should be provided.

Section 3: Completed Investigation Activities

27. Section 3 should discuss the extensive surface geophysics that have been performed at the Site, including those that were conducted for locating monitoring wells MW-20, MW-21, MW-22, and MW-25. These geophysics investigations were conducted to identify potential bedrock pathways west and north of the landfill and generated critical data that should be used to inform interpretations of bedrock topography and potential pathways. The surface geophysics reports should be appended to the final report.

28. Section 3.1.1, *Chinburg Well/MW-23 Investigation,* indicates that the conclusions presented are based on packer interval sampling results from MW-23, however interpretations of the migration pathway to receptors north of MW-23 and the bounding of the GMZ are interpreted, seemingly based only on this data. These interpretations are premature here and are not supported by this single line of evidence. This subsection should focus only on the work conducted at MW-23 and conclusions specific to that investigation, including geologic characteristics, fracture patterns and water quality.

29. Section 3.1.2, *MW-20/MW-21/MW-22 Series Wells*, states that the location of MW-21 "…was selected to provide a sentinel monitoring location near the northern boundary of the GMZ and in the interpreted downgradient groundwater flow direction from the Site." This implies that there is only one downgradient flow direction. The groundwater/surface

water divide west of the Site bifurcates the plume to the north and to the south, which should be considered here.

30. Section 3.1.2, *MW-20/MW-21/MW-22 Series Wells,* should describe the data and criteria used for selecting the packer sampling intervals for MW-20, MW-21, and MW-22, as well as the intervals screened for completion.

31. Historic wells that were discovered or suspected to be destroyed (GZ-127, GZ-128), as described in Section 3.1.3, *Reconnaissance Bedrock Wells*, should be represented on figures.

32. Section 3.1.5, *BP-4*, states that "…the lithologic contact at 50 feet is dipping at a shallow angle to the east." It should also be noted here, and cited in the CSM, that this contact is located within one of two transmissive zones within BP-4 and is an important line of evidence supporting a component of eastern groundwater flow in bedrock.

33. Section 3.1.6, *New Well Installation: MW-25*, cites the NH AGQS for arsenic as 10 µg/L. References to the NH AGQS for arsenic should be changed to 5 µg/L, which is the new standard adopted on July 1, 2021.

34. Section 3.1.7.1, *Initial Installation Summary*, indicates that the recorded water level fluctuations were less than 0.25 feet and "reflect residual barometric influences (i.e., tidal) in the data". Note that tidal (or associated earth tides) are not a barometric phenomenon but are cyclical and are caused by the gravitational influence of the moon and to a lesser extent the sun. Barometric responses are related to changes in atmospheric pressure associated with weather patterns.

35. Section 3.1.7.3, *Vertical Hydraulic Gradient Assessment*, discusses the spring 2020 data set, but vertical gradients from other monitoring events are listed in Table 3.2. A value of 0.1 feet in vertical gradient is used in the assessment to determine whether flow was vertical or neutral, but no explanation or reference for this particular value was provided. When evaluating gradients, the ratio of the vertical gradient to the local horizontal gradient should be considered, not just the magnitude of the vertical gradient. This assessment is often done using a gradient of hundredths of a foot, not 0.1 feet. Groundwater flow is a vector quantity and to properly evaluate the direction of groundwater movement in 3 dimensions, the magnitude of the vertical gradient in comparison to the horizontal gradient should be considered. The local horizontal groundwater gradient in the vicinity of each of the wells listed in Table 3.2 should be provided to facilitate this comparison.

36. Section 3.1.7.3, *Vertical Hydraulic Gradient Assessment,* discusses results from the spring 2021 round and notes changes from previous rounds, but it is not clear whether the comparison is with the spring 2020 or fall 2020 data set, or some other data set. Further evaluation is postponed until the 2021 Annual Groundwater Quality Report. The variation of vertical gradients noted on the eastern side of the Site (GZ-109/117 and FPC9A/B) should be evaluated against precipitation records and measured groundwater elevation. Vertical gradients can be sensitive to longer-term climatic variations such as droughts or unusually wet periods. The conclusion that vertical gradients in the wetland complex west of the landfill do not appear to have a discernible pattern does not support the CSM that groundwater from the landfill discharges to surface water in this area. Lastly, while it is true that the small magnitude of vertical gradients between bedrock and overburden may suggest good hydraulic communication, it could also simply mean that flow in both units is near-horizontal, as would be expected in bedrock where the flow is along strike and the predominant fractures are moderate to steeply dipping.

37. Section 3.2, *Bedrock Outcrop Mapping*, should also mention the outcrops located around the Bethany Church parking lot as an area of interest. This section lists the three major types of fractures but should be corrected to include "primary foliation parallel (FPF), cross set, and sheeting fractures. 'Primary' is listed twice, and clarification should be added that the primary fracture set are parallel to regional foliation of the rock. In discussing the results of the outcrop mapping, only the orientation of the primary FPF fractures is mentioned. No discussion is provided about the frequency of the other fractures encountered (cross sets and sheeting fractures), nor is there any discussion about other key aspects of the outcrops such as rock type, fracture length, spacing, appearance (open, closed, staining, etc.). These observations are also not shown in Table 3.3 where the outcrop data are summarized. Along with the primary fracture data collected, other key information obtained from outcrop mapping is the frequency and relationship of the cross-set and sheeting fractures, along with the rock type.

38. Section 3.3.1.1, *Well Redevelopment and Borehole Geophysics*, concludes that "the hydraulic influence in MW-5S/-5D (and minor influence in MW-2) observed during the redevelopment of MW-6 indicates these wells are located along the primary north-south preferential bedrock structure identified in the CSM" and appears to be based on this single line of evidence and is premature to state here without providing further evidence.

39. Section 3.3.1.1, *Well Redevelopment and Borehole Geophysics*, summarizes the analytical testing of redevelopment water but does not provide the actual analytical results. The results should be specified or provided in a table.

40. The interval packer sampling results for MW-6 should be provided in Section 3.3.1.2, *Interval Packer Sampling,* or provided in a table.

41. Section 3.3.2.3, *Results,* states that "…the pumping rate to be used for the constant rate test was determined to be approximately 12.7 gpm. This rate was determined in order to stress the aquifer more than actual residential pumping influences." The pumping rate of 12.7 gpm was selected because it was the estimated yield of MW-6 based on the variable rate test.

42. More explanation for the table and figure inserted in section 3.3.2.3, *Results,* should be provided.

43. Section 3.3.3.3, *Results*, should include a figure that shows the locations of the wells monitored during the pumping test, with the observed drawdown plotted and contoured to show the extent and shape of the cone of depression. The map should be used to estimate the anisotropy to see if it is consistent with the Mack (2012) estimate of 5:1.

44. Section 3.3.3.3, *Results,* indicates that the hydraulic influence observed in wells FPC-2B, MW-2, MW-5S/5D and MW-11 during the constant rate pumping test agrees with the observations made during the redevelopment of MW-6 and the variable rate test. The discussion of the hydraulic influence observed during redevelopment of MW-6 indicates that only MW-5S/-5D and MW-2 showed an influence, and that no drawdown was observed in FPC-2A/-2B or MW-11. Similarly, the discussion of the variable rate test indicates that a drawdown was observed in MW-5S/5D only. The representation that the drawdowns from the constant rate test "agree" with the results from the redevelopment of MW-6 and the variable rate test needs clarification.

45. The conclusions provided in the last two paragraphs of Section 3.3.3.3, *Results,* are not correct. Several statements mention the high or low bias of the results based on whether the wells were located north-south or east-west of the pumping well. These variations represent the anisotropy of the bedrock and the difference between Kx and Ky. Hydraulic conductivity parallel to the predominant fracture set (Kx) will be 5 to 10 times higher than the hydraulic conductivity in the transverse direction (Ky). The discussion should be revised to remove reference to data 'bias' and add a discussion of anisotropy and the variation of Kx and Ky.

46. Section 3.3.3.3, *Results,* concludes that "the pumping test has confirmed that identified transmissive fractures in bedrock monitoring wells are not hydraulically connected to nearby private supply wells and do not provide potential pathways for off-site migration of Site contaminants to potential receptors." As mentioned in the comments for the Executive Summary, a single pumping test cannot 'confirm' this condition, especially at a site this large. Also, the detection of 1,4-dioxane at concentrations exceeding the AGQS

at R3 and 339BHR confirms that transmissive fractures in bedrock are a pathway for contaminant migration.

47. Section 3.3.4, *Groundwater Sampling,* presents the results of groundwater sampling collected during the pumping test and indicates that concentrations of 1,4-dioxane and PFAS in the pumped groundwater steadily increased as pumping progressed, and that this may "suggest an eventual contribution of shallow fracture groundwater with higher concentrations…". Given the maximum observed drawdown in MW-5D, which has much higher PFAS and 1,4-dioxane concentrations than MW-6, it is more reasonable to conclude that pumping at MW-6 drew in groundwater from the vicinity of MW-5D via the deep bedrock fractures. As noted in the Report, the shallow fractures in MW-6 were sealed off with a Jaswell insert to target flow in the deeper fractures.

48. Section 3.4.2, *2021 Surface Water Elevations*, fails to provide the length of the screens used for the drive point piezometers. Both sections 3.4.1 and 3.4.2 conclude that "surface water and shallow groundwater elevations are similar in some areas" but no examples or comparisons are provided. Specific surface water gauging points and comparable monitoring wells should be cited as examples, along with a table showing the comparison.

49. Section 3.5, *Investigation and Impacts West of MW-21S*, references surface geophysics that was conducted to inform the placement of MW-21, and specifically to a shallow zone of low resistivity, but the results are not provided. As mentioned previously, the surface geophysics reports should be appended to the final report.

50. Section 3.5.1, *DPT Investigation and Temporary Well Installation*, indicates that the sediments in the area of the DPT investigation and MW-21S thinned to the west. However, overburden thickness along the northern DPT transect (DPT-1 thru DPT-5) increased to the west, going from a low of 4.5 feet at DPT-2 to 22.5 feet at DPT-5. This section also indicates that DPT-1 had the thinnest overburden at 4.5 feet, but the boring logs in Appendix A indicate refusal at 8.5 feet in DPT-1 and 4.5 feet in DPT-2. The boring logs indicate that the overburden only thins to the west along the southern DPT transect. A table should be added that summarizes and interprets the lithology and depth to refusal for all the DPT points, along with a site-specific cross-section presenting the interpretation of the lithology. And, based on the findings of the DPT investigation, the CLG had recommended the installation of a permanent well in the vicinity of DPT-11 to bound the GMZ, but this recommendation is not included in the Report.

51. Section 3.5.2.1, *Water Levels and Flow Directions*, presents the water elevation data from the DPT well points and discusses groundwater flow patterns. The text states that groundwater flow is "consistent with Site topography, LiDAR data, and monitoring data"

and “generally mimic topography and support the flow and subsequent discharge of groundwater to the wetland complex”. However, groundwater elevation data plotted on Figure 3.5 suggest that a westward component of groundwater flow is present along a portion of the northern DPT transect, suggesting that shallow groundwater flow patterns in this area are complex. The groundwater data should be contoured to illustrate groundwater flow patterns in this important area of the Site.

52. Section 3.5.2.2, *Temporary Monitoring Well Sampling*, should include an explanation for which temporary wells were selected for sampling. Most notably, TMW-11S and -11D were not sampled even though this location is most proximate to the GMZ boundary and would represent groundwater quality near the edge of the GMZ. The CLG shall sample TMW-11S and -11D as soon as possible. The CLG shall also establish one or more permanent monitoring well(s) for monitoring the GMZ boundary in this area. The statement that the “existing westward delineation of the GMZ is appropriate” based on the DPT analytical results is premature, pending results from the sampling of TMW-11S and -11D and establishment and sampling of a permanent monitoring well(s).

53. One of the intended outcomes of the investigation of water supply well records (Section 3.6) was to provide as much private well information as possible, including construction information, well type, well depth, well yield, and any other information that would be available. This section indicates that some well records exist, but no summary is provided, and the well logs that do exist are not appended to the report. Table 3.1 and 3.6 comments are provided separately.

Section 4: Geology and Hydrogeology

54. Section 4.1.1, *Description and Extent of Units,* references Figure 4.1 which shows the extent of the till unit at the Site. Review of Figure 4.1 suggests that it is based largely on data from the original RI and does not include till observations from the recent work including the DPT investigation along the western boundary of the GMZ or from monitoring wells at MW-20, MW-21, MW-22, and MW-25. The interpreted extent of the till in Figure 4.1 does not align with the bedrock surface map presented in Figure 3.4, and the table in the figure indicates depth to till while the legend defines the contours as till thickness. The text states that the till follows the bedrock surface, but this is not evident based on a comparison of Figures 3.4 and 4.1. The large trough in the bedrock located north of the landfill (between the landfill and the Bethany Church) is not reflected on the till map.

55. Section 4.1.1, *Description and Extent of Units,* Similar to the interpretation of glacial till deposits in this section, the map for the marine deposits (Figure 4.2) does not appear to include data from the DPT borings and does not appear to align with the bedrock surface map (Figure 3.4). The table in Figure 4.2 also indicates depth to marine deposit while the

legend defines the contours as marine deposit thickness and shows the marine deposits extending beneath the landfill. Examination of the cross-sections in Figures 4.4 and 4.5 does not show marine deposits present in that area. Figures 4.1 and 4.2 should be redrawn to provide accurate interpretations and to be consistent with the other interpretations and figures.

56. Section 4.1.1, *Description and Extent of Units*, references Figure 4.3 as an interpretation of the extent of the glacial outwash deposits. Again, the figure appears to be based largely on the original RI and does not incorporate the DPT borings or new wells. The text states that glacial outwash was encountered in all 70 borings at the site, so a map outlining the study area is not needed. A more useful figure would be one showing the mapped thickness of the outwash. As drawn, Figure 4.3 suggests that the outwash deposits do not extend beyond the study area and shows the outwash deposits being exposed at the surface within the landfill footprint, which is inaccurate.

57. The cross-sections (Figures 4.4 through 4.6) presented in support of Section 4.1, *Surficial Geology,* appear to be the same as provided in the Interim Bedrock Investigation Report, except that MW-25 was added to B-B'. The Agencies provided comments on the cross-sections presented in the Interim Report (see EPA letter to Peter Britz dated February 6, 2020) which do not appear to have been addressed here. Specifically, bedrock elevations presented on Figure 3.4 (bedrock surface contour map) do not match up with elevations on the cross-sections. Also, Figure 4.4 shows MW-5S/D screened in the Rye Formation, but Figure 4.5 shows them both screened in the Breakfast Hill Granite (BHG). Well BP-4 is similarly shown as screened in different geologic units on different cross-sections. Groundwater elevations should be plotted on the cross-sections and contours and flow arrows added to illustrate the vertical flow patterns.

58. Section 4.2, *Bedrock Geology*, references mapping performed by Mack, Lyons, and Escamilla-Casas. Copies of these geologic maps should be included to allow for direct comparison of geologic interpretations. The interpretated extent of the BHG as shown on Figure 3.4 appears much more limited than previous studies and does not seem to consider LiDAR imagery and topographic relief, which are often indicative of variations in bedrock composition resulting from differential weathering.

59. Section 4.2.1.2, *Local, Breakfast Hill Granite*, provides a list of 1988 RI test borings where the BHG was confirmed, but these locations are not identified on Figure 3.4. The current understanding of the bedrock geology in the area should combine historic data with more recent data, detailing where data from this investigation has confirmed or contradicted the historic interpretations for the existence and extent of the BHG.

60. Section 4.2.3.1, *Regional Structures*, describes two major faults that are mapped in the vicinity of the Site. These faults should be shown on a map and added to existing Figure 3.4.

61. Section 4.2.3.2, *Local Structures*, indicates that there is saddle in the bedrock valley (trough) west of the landfill in the vicinity of GZ-105, and references multiple interpretations from the RI, RI/FS, GMZ Report and this investigation. Because the bedrock valley and saddle are identified by multiple data points and represented in multiple cross-sections, other wells that are within the vicinity of the trough should be identified (GZ-105, FPC-5B, etc.).

62. Section 4.2.3.2, *Local Structures*, mentions the photo-lineament and fracture trace analysis data from the RI, but the presentation is confusing. For example, reference is made to east-west trending photolinears that may reflect a fracture system coincident with the bedrock valley (trough) which trends north-south. Clarification and discussion of other sets of photo-lineaments (north of Breakfast Hill Road, south of the landfill) should be provided.

63. Section 4.2.3.2, *Local Structures*, states that "a discussion of lithologies and fracture patterns interpreted from borehole geophysical data collected from the nine bedrock reconnaissance wells is included in Section 3.1.4." Section 3.1.4 discusses the evaluation of MW-6 for use in the pump test. Section 3.1.3 provides a summary list of the reconnaissance bedrock wells and their individual status and access but does not discuss lithology and fracture patterns interpreted from borehole geophysical data.

64. Section 4.2.4, *Statistical Analysis of Fracture Data,* indicates that outcrop data were excluded from the DAISY analysis of fracture groups by bedrock type. The rationale for why this large dataset was excluded from that evaluation should be provided. The description of the DAISY analysis does not explain the difference between the two Gaussian evaluations presented for each well in Appendix D. A more detailed explanation of the process used is needed.

65. Section 4.2.4.2, *Fracture Families Identified by Individual Boreholes*, references Figure 4.7. Based on review of the downhole geophysics' logs and comparison of Figure 4.7 to the associated figures in the 2019 *Deep Bedrock Investigation Interim Report*, there are several errors in identification of the rock type in specific boreholes. The upper section of MW-20D is schist but is shown as basalt. The upper section of GZ-130 should be phyllite, not quartzite. The upper section of GZ-109 should be schist, not basalt. The upper section of GZ-110 should be phyllite, not quartzite. More explanation should be provided for how the difference between phyllite, schist, and gneiss was determined based on the optical televiewer (OTV) logs.

66. Section 4.2.4.3, *Fracture Families Identified by Rock Type*, presents the results of a statistical analysis of fractures by rock type for five different rock types: phyllite, schist, basalt, quartzite, and gneiss. However, the BHG represents a major bedrock formation at the Site and was observed in several monitoring wells (GZ-110, GZ-119, and GZ-125). The gneiss, schist, phyllite, and quartzite are all components of the Rye Formation and would therefore be expected to have the same fracture orientation since they were all exposed to the same regional forces and stresses during formation. The basalt and BHG are of different ages and may have different fracture patterns. The fracture analysis based on rock type should include the granite. Note that this same recommendation was included in EPA's February 6, 2020, comment letter on the Interim Bedrock Investigation Report.

67. Section 4.2.4.6, *Lineament Identification and Fracture Correlation*, provides bulleted conclusions from the statistical analysis of the various fracture datasets.
    - As expected, the dominant fracture strike is NNE, parallel to the regional foliation. However, 2 to 3 other (less frequent) fracture families were also identified in 14 of 16 locations and also in the outcrop dataset. This confirms the presence of these other fracture families, whose importance should not be discounted because they can represent primary pathways for groundwater migration when the head distribution does not align with the primary fracture orientation.
    - The steep median dip angle strongly favors groundwater migration along strike, rather than down-dip.
    - As mentioned above, the analysis did not assess fracture orientation in the BHG. The large difference in fracture orientation noted in MW-24 relative to the other rock types evaluated may also hold true for the granite, which is of similar age/foliation as the basalt.
    - Numerous statistical evaluations have been conducted in an attempt to correlate well depth with yield in New England. No such correlation has been clearly identified. Hansen and Simcox (USGS WRI Report 93-4115) conclude that "The common assumptions that fractured crystalline rocks generally yield only small quantities of water to wells and that the fractures pinch out or are closed because of lithostatic pressure at depths greater than 300 to 400 feet may be in error."
    - Photo-lineaments are also shown on Figure 3.2. Examination of Figure 3.2 shows two clear groupings of lineaments: those parallel to the regional foliation (the majority) and a smaller number that are roughly perpendicular to the foliation. The distribution of the lineaments mirrors that of the fractures, as would be expected. It is unclear why the statistical analysis did not identify the secondary set of cross-lineaments, as they are clearly visible on Figure 3.2. The bedrock surface contours shown on Figure 4.8 are vastly different than those on Figure 3.4

and show the landfill on the west side of a bedrock high point. References to the lineament figure in this section should be changed to Figure 3.2.

68. Section 4.3, *Groundwater*, concludes that groundwater from the landfill discharges into a wetland on the west side, consistent with the overall principals outlined in the USGS paper (Mack, 2012). However, applying the principals of the USGS paper, the landfill is located at the top of a bedrock high point, so some groundwater is also expected to migrate to the east and discharge to the Bailey Brook and/or North Brook watersheds.

69. Section 4.3.1, *Occurrence and Flow in Overburden*, references the groundwater contour map in Figure 4.9. The groundwater flow patterns depicted on Figure 4.9 are inconsistent with the principals described in Mack 2012. Specifically, there is no eastward component of flow shown away from the topographic high point located along the eastern boundary of the landfill. This suggests that groundwater flow patterns in the vicinity of the Site are more complex than the simplistic, generalized description developed by Mack. There is no discussion of the screened interval or lithology screened by the various monitoring wells used to develop the groundwater contours on Figure 4.9. Lithology information for the overburden wells is not provided on Table 3.1. It is possible that many of the wells are screened in different lithologies and may not be representative of water table conditions. The last paragraph on Page 60 acknowledges that variations in overburden lithology are likely to have a significant effect on localized flow patterns, but no attempt is made to evaluate those affects, incorporate them into the interpretation of groundwater flow, or to elaborate on what they might be.

70. Section 4.3.1, *Occurrence and Flow in Overburden*, concludes that groundwater elevation data at overburden well GZ-117 indicates a slight eastward flow component. However, the groundwater elevation at GZ-117 is 98.48, which represents one of the highest elevations in the study area and does not suggest eastward flow. The discussion neglects to mention the large head variation between MW-4 and the cluster of wells to the east and south, suggesting a much more robust component of groundwater flow to the east and south, which would be consistent with Mack 2012 as previously mentioned.

71. Section 4.3.1.1, *Overburden Groundwater Quality*, indicates that the discussion of overburden groundwater quality will be “focused on the presence and distribution of 1,4-dioxane and PFAS” and references figures showing the distribution of those compounds. However, a discussion of the distribution of arsenic and manganese, which are important contaminants in groundwater, is included later in this section. Figures should be added to illustrate the extent of arsenic and manganese in overburden groundwater, similar to 1,4-dioxane and PFAS.

72. Section 4.3.1.1, *Overburden Groundwater Quality*, states that "…glacial till overlies bedrock in most locations and glacial outwash in all locations", which is inconsistent with the Surficial Geology Section where it is shown that, when present, glacial till directly overlies bedrock. Glacial till does not overly the outwash at any location.

73. Section 4.3.1.1, *Overburden Groundwater Quality*, states that "…overburden groundwater discharges to the wetland complex west of the landfill" and "…moves northward towards the headwaters of Berrys Brook where the marine deposit thins or becomes discontinuous allowing more direct discharge to Berrys Brook." The locations where marine deposits are thin or discontinuous allowing for the impacted groundwater to flow upward into Berrys Brook need to be identified, mapped, and targeted for long-term monitoring because they represent a critical point in the contaminant migration pathway.

74. Section 4.3.1.1, *Overburden Groundwater Quality*, presents the DPT water quality results. As commented previously, temporary wells TMW-11S and TMW-11D shall be sampled and CLG shall install a permanent well (or wells) to bound the GMZ in this area and to confirm that contaminant migration west of the landfill is within the deeper till and outwash deposits below the marine clay. If the CSM is correct, no exceedances of water quality criteria should be found in TMW-11S, but 1,4-dioxane and PFAS may be present in TMW-11D.

75. Section 4.3.2, *Occurrence and Flow in Bedrock*, references Figure 4.15, a groundwater contour map for bedrock that includes data from several deep bedrock boreholes that have multiple well screens that are representative of shallower and deeper groundwater heads. In cases where the variation in head between the two wells impact the groundwater contours, such as at MW-21D1 and -21D2, the data from the shallower well screen should be used because substantially more of the bedrock monitoring wells at the site are screened in shallow bedrock. Accordingly, the 72-foot contour should be moved west of MW-21D to honor the groundwater elevation at MW-21D1 and a note should be added to indicate that the depth from the shallower well screens is used to develop the contours. In addition, the contour should be dashed through this area because there is no control to the west.

76. Section 4.3.2.1, *Analysis of Transducer Water Level Data*, is incomplete. Transducer data from R-3 is cited even though this is a private well. Section 3.1.7 lists numerous data logger monitoring events that have been performed during this investigation, but Section 4.3.2.1 does not describe any of the events or discuss the findings relative to the objective of each specific event. The only conclusion presented was that earth tides were observed in most deep bedrock wells and that some bedrock wells close to MW-6 showed drawdown during the pumping test. This section needs to be expanded to provide a

detailed analysis of the data logging results and present graphs of the data that support the conclusions, taking into consideration the effect of precipitation events, barometric pressure, and residential pumping on the bedrock aquifer.

77. Section 4.3.2.2, *Summary of Conceptual Flow System*, references Burton et al., 2002, but this is not listed in the Reference section.

78. Section 4.3.2.2, *Summary of Conceptual Flow System,* is confusing and does not discuss groundwater migration other than westward flow. Figures 4.16 through 4.18 are not referenced in this section and seem out of order. The previous section references Figure 4.15 and the following section references Figure 4.19. The cross-sections presented in Figures 4.16 through 4.18 include the results of the ambient heat pulse flow meter (HPFM) logging, with many of the logs stating "no flow". The intent appears to be to suggest there is no flow to the east of the landfill. This is misleading and should be corrected. The HPFM logging will identify vertical groundwater flow within a borehole but cannot measure horizontal flow through a borehole. The steeply dipping nature of the fractures at this Site tends to favor horizontal flow along strike and not vertical flow down dip, which would produce measurable vertical gradients within boreholes. The lack of ambient flow detected by the HPFM is indicative of horizontal flow, not a lack of groundwater flow altogether. Also, the Legend and Notes on the three figures reference sections or appendices that are incorrect or are blank (denoted with "XX"). The figures also reference the 'FLASH' analysis that was conducted as part of the Interim Report but is not presented in the Final Report. References to FLASH should be removed, along with the Day-Lewis references in Section 8.

79. Section 4.3.2.2, *Summary of Conceptual Flow System:* As mentioned above, this section does not provide a clear description of groundwater flow in the bedrock aquifer. Based on EPA's analysis of the data, groundwater flow in bedrock is controlled by the bedrock fabric (fracture network and bedrock topography) and the head distribution. Topographic relief, variations in recharge, and the presence of streams (groundwater discharge points) will control the head distribution. The bedrock fabric is characterized by 1) a steeply-dipping predominant fracture set with strike parallel to the regional foliation (NNE-SSW); 2) less frequent steeply-dipping cross-set fractures striking roughly perpendicular to the foliation; and 3) near horizontal sheeting fractures. Unlike groundwater flow in porous media (overburden), bedrock groundwater cannot typically flow in a straight line from the recharge areas to the discharge areas and must move through the available fractures. Groundwater can more easily move along strike of the predominant fracture set (parallel to the regional foliation) because those fractures are more frequent but will move through cross-set or sheeting fractures (east or west) to reach groundwater discharge points (streams), resulting in a tortuous flow pattern from groundwater recharge areas on topographic and bedrock high points to groundwater discharge points.

80. Section 4.3.2.3, *Bedrock Groundwater Quality*, indicates that the majority of the bedrock monitoring wells at the Site are shallow (50-75 ft) but that the private wells in the area are deeper (up to 300 ft). This suggests that the existing monitoring well network at the Site is insufficient to adequately monitor potential impacts to the receptors.

81. Section 4.3.2.3, *Bedrock Groundwater Quality,* indicates that there eight open borehole bedrock wells that supplement the existing bedrock groundwater quality monitoring network, but 10 are listed.

82. Section 4.3.2.3, *Bedrock Groundwater Quality,* references Figure 4.21 which shows the distribution of PFOA in bedrock groundwater. Monitoring well FPC-11B located east of the landfill had a concentration of PFOA of 13.3 ppt, so the 12 ppt contour should extend around this well.

83. Section 4.3.2.3, *Bedrock Groundwater Quality,* finds that "The elongated distribution of 1,4-dioxane and PFAS north and south of the wetland complex is consistent with regional geologic structure, lineament analysis, and fracture orientation observed in most downhole geophysical surveys. However, the decline in concentrations to the north and south are also consistent with interpreted discharge of groundwater to Berrys Brook and Little River, which are also oriented in a north-south direction." This finding suggests that the extent of 1,4-dioxane and PFAS contamination to the south should be similar to that observed to the north of the landfill. Concentrations of these compounds at GZ-105 and MW-25 (south of the landfill) are substantially higher than in similarly placed wells north of the landfill (such as FPC-5B). It is known that contaminant along the northern pathway extend over 3,200 feet to Breakfast Hill Road (R-3 and BHR339). It is reasonable to suggest that the contaminant plume extends to the south a significant distance, beyond the extent of the current monitoring network.

84. Section 4.3.2.3, *Bedrock Groundwater Quality,* references Figures 4.22 and 4.23 which depict the distribution of PFNA and PFHxS in bedrock groundwater, respectively. These figures only contain one contour representing the NHDES AGQS. Additional contours should be added to show variations and distribution of the higher concentrations, similar to the figures for PFOA and PFOS.

85. Section 4.3.2.3, *Bedrock Groundwater Quality,* includes findings related to packer sampling of the GZ-series reconnaissance wells, but the specific data from the packer sampling are not included here or represented in a figure. Because findings related to the packer sampling results are presented, the specific results of the sampling should be presented along with the other bedrock groundwater data.

86. Section 4.3.2.3, *Bedrock Groundwater Quality,* discusses the 1,4-dioxane detection at MW-24 and its relation to nearby wells BP-4 and GZ-109. Examination of the data on Figure 4.19, supplemented with the packer sampling results for the reconnaissance wells, suggests a consistent concentration gradient from BP-4 (6.9 ppb) to FPC-9B (3.9 ppb) to MW-24 (1.2 ppb) to AE-1B (1.1 ppb) to FPC-11B (0.57 ppb) to 178A LR (0.37 ppb). This may suggest a groundwater flow pathway to the south along the eastern contact between the Breakfast Hill Granite and the Rye Formation, or possibly impacts from the Great Common Fault.

87. Section 4.3.2.3, *Bedrock Groundwater Quality,* refers to the "stayed AGQS" for PFAS while discussing the MW-6 interval packer sampling results. Note that the NH AGQS for four PFAS compounds have been adopted.

88. Section 4.3.3, *Water Quality Trend Analysis*, presents the results of the water quality trend analysis performed using a Mann-Kendall test. A summary table of the Mann-Kendall results by well should be included in the Report and the output files should be included in Appendix F along with the time-series plots. A figure that shows the trend (increasing, decreasing, or stable) at each well should also be developed to allow for a visual representation of plume stability across the Site, which is a presented as a key conclusion of the investigation.

89. EPA does not concur with the interpretation of the time-series plots for 1,4-dioxane presented in Section 4.3.3, *Water Quality Trend Analysis*. For example, the Mann-Kendall analysis for FPC-11A indicated a decreasing trend, but evaluation of the time-series plot shows that while concentrations decreased between 2016-2019, they increased in 2020 and returned to previous levels. Taken as a whole, the trend analysis seems to suggest that wells with higher concentrations closer to the landfill are more likely to exhibit a decreasing trend, but wells with lower concentrations that are more distant from the landfill tend to show no trend. The wells with increasing Mann-Kendall trends are clustered near the northwest corner of the landfill (where discharge of stormwater runoff from the landfill is concentrated) and southeast of the landfill along the flow path mentioned in the previous section.

90. EPA does not concur with the interpretation of the time-series plots for PFOA/PFOS presented in Section 4.3.3, *Water Quality Trend Analysis*. For example, MW-10 was listed in the text as having a decreasing trend for both PFOS and PFNA, but examination of the time-series plot shows that concentrations of both compounds increased dramatically in that well from 2016 through 2020 (with PFOS going from less than 100 ppt to over 800 ppt) but decreased (to about 150 ppt) in the fall 2020 round. A single low data point does not constitute a trend or take precedence over a consistent trend measured over a 4-year period consisting of 8 data points. In general, increasing PFAS concentrations are found along the western edge of the landfill and southward in the bedrock trough, as well as on

the eastern side along the same possible flow path mentioned above, where 1,4-dioxane concentrations are increasing.

91. Section 4.3.3, *Water Quality Trend Analysis*, should list the wells that were interpreted to be having increasing trends for PFOS.

92. The radar plots included in Appendix H and referenced in Section 4.3.3.2, *PFAS Compositional Analysis,* should be included on a Site map, similar to the presentation of the fracture orientation rose diagrams in Figure 3.1, to present the spatial relationships in the PFAS composition.

93. The stormwater investigation radar plots in Appendix H seem to have a consistent pattern that matches the pattern for MW-9 and MW-10 from fall 2018. However, plots are also included for MW-9 and MW-10 using data from spring 2020 that shows a much different signature. This suggests that there may be a seasonal variation in PFAS composition at the Site that should be explored. Radar plots should be prepared for select monitoring wells and surface water locations over time to evaluate seasonal or longer-term trends in PFAS composition. Seasonal trend variations may be indicative of impacts from surface water runoff from the landfill.

94. Section 4.3.3.3, *Contaminants of Concern and Emerging Contaminants in Groundwater*, does not address any contaminants other than 1,4-dioxane and PFAS compounds (emerging contaminants). Arsenic and manganese are the contaminants of concern at the Site that remain widespread near and downgradient of the landfill. A discussion of arsenic and manganese should be included, or the title of this section adjusted to more accurately reflect the discussion provided.

95. Section 4.4, *Surface Water*, states that "groundwater….primarily flows towards, and discharges into, a wetland complex west of the landfill" and that "the majority of surface water runoff from Site discharges towards the Little River and Berrys Brook". These conclusions do not consider the portion of groundwater and surface water runoff that discharges east of the Site into the Bailey Brook watershed. While it is reasonable to focus much of the discussion on the west side of the landfill, conditions and impacts on the east side should also be presented and discussed relative to the Berrys Brook, Little River and Baily Brook watersheds depicted in Figure 2.2. Also, the results of surface water sampling conducted in Bailey Brook in 2016 by Conservation Law Foundation for low-level 1,4-dioxane and PFOA/PFOS (all non-detect) should be cited as evidence that this water body has not been impacted by the landfill.

96. Section 4.4.2.1, *Surface Water Quality Monitoring Locations*, should clarify the location of SW-BB3, which is shown on the east side of the railroad easement but was relocated west of the railroad easement in 2020. In addition, the description of the beaver dam removal

should indicate that the removal of the beaver dam lowered the overall water level in the wetland located to the east of the railroad easement and not the west.

97. Section 4.4.2.2, *Surface Water Quality Monitoring Results*, appears to only present sampling results from 2020. A discussion of historical results and trends should be included. Location L-1 (seep) is a critical location and should be added to this discussion. Also, the results for 1,4-dioxane and PFAS should be plotted on a figure with arrows showing surface water drainage pathways which are critical to understanding the movement of surface water away from the landfill. The leachate seeps noted during the site inspection conducted in 2021 should also be discussed as further evidence of the extent of groundwater discharge to surface water. Arsenic and manganese data should also be discussed here as an indicator of the impact of groundwater on surface water.

98. Section 4.4.3.1, *2019 Surface Water Quality Monitoring Results*: The title of this section is incorrect and should be changed to reflect the actual content of this section, which is surface water elevations.

99. Section 4.4.3.1, *2019 Surface Water Quality Monitoring Results*, indicates that the surface water elevation monitoring locations, including locations SB-1 and SB-2, are identified on Figure 2.2, but SB-1 and SB-2 are not shown on the figure. In addition, SB-1 and SB-2 are identified as being located in Stormwater Pond NW. SB-1 is located in the northeast basin and SB-2 is located in the northwest basin.

100. Section 4.4.3.1, *2019 Surface Water Quality Monitoring Results*, states that the surface water elevations listed "indicates that surface water flows from the Stormwater Pond towards the wetland complex, Berrys Brook, and Little River." As mapped in Figure 2.2, both stormwater basins are within the Berry Brook drainage basin, such that water from the basins would flow into Berrys Brook and not Little River, as presented in the bullet that follows. Although the northeast stormwater basin is within the Berrys Brook drainage basin, it is not clear if the discharge from the basin is fully within the watershed. That basin discharges to groundwater, as previously concluded by the investigation of storwmater, or overflows to the wetland area located directly north and is separated from Berrys Brook by the access road from Bethany Church to the landfill. Examination of LiDAR imagery from this area shows a large depression located directly east that could represent a surface water drainage pathway to the east from the northeast stormwater basin. This surface water flow condition should be evaluated further.

101. Section 4.4.3.1, *2019 Surface Water Quality Monitoring Results*, indicates that water elevations in the two stormwater basins are similar to groundwater elevations measured in piezometers and references the data in Table 3.4. Review of the water elevations presented in Table 3.4 suggest that the elevations between PZ-2 and SB-2 differ by several feet, which is substantial given the limited depth of the piezometer screens below the bottom of the basins. The significance of the variation in water level between

PZ-2 and SB-2 should be discussed (basins are perched and water is infiltrating through the bottom into the underlying groundwater).

102. Section 4.4.3.2, *Surface Water Quality Monitoring Results*: The title of this section is incorrect and should be changed to reflect the actual content of this section, which is surface water elevations. The intent of the piezometer investigation described in this section was to assess groundwater and surface water hydraulic interaction. The shallow groundwater elevations should be compared to surface water elevations measured at each location to determine whether groundwater is discharging to surface water or whether surface water is perched and is recharging the groundwater. The depth to water should have been measured both inside (groundwater) and outside (surface water) of each piezometer and the data presented on Table 3.5 to allow a determination of recharge/discharge conditions at each location.

103. Section 4.4.4.3, *Stormwater Infiltration Modeling*, references the Stormwater Investigation Report prepared by Haley Ward in 2019, for which EPA provided extensive written comments in a letter dated November 22, 2019. Many of the comments pertained to how PFAS loading from groundwater was calculated. In the January 22, 2020, Response to Comments letter, CLG indicated that additional details would be provided in future discussions of the stormwater investigation. However, this section does not provide any additional detail as to how the PFAS loading calculations were revised in accordance with EPA's comments. The estimated annual mass discharge of PFAS in stormwater (0.62 lbs) and groundwater (0.24 lbs) exactly match the values presented in the Stormwater Investigation Report, suggesting that EPA's recommendations for modifying those calculations were not implemented. Further discussion is required to justify the loading estimates and to explain how earlier comments were or were not addressed.

Section 5 Conceptual Site Model

104. The comments provided for the Executive Summary also apply to Section 5, *Conceptual Site* Model. Overall, the CSM is not well described, illustrated, or supported, and does not fully consider secondary flow paths to the east and south, focusing only on the western and northern pathways.

105. Section 5.1, *Site History and Contamination Source*, should include a more detailed description of the waste sources and known releases, including the years that the wastes were placed, the source/composition of the wastes, and the mode of placement.

106. Section 5.1, *Site History and Contamination Source*, indicates that the Site was mined previous to placement of waste, but no discussion is provided about the type of mining that was conducted or where it was located. The location and mode of bedrock mining is critical to understanding how the wastes could have entered the bedrock. Also, blasting (if conducted) would have increased the shallow fracturing in the bedrock, providing additional pathways for waste migration. The location and orientation of any

remnant bedrock troughs or pits could influence groundwater migration within the bedrock. Historical aerial photographs, including (but not limited to) the Site Analysis Coakley Landfill dated March 1985, should be consulted to develop a chronology of the quarry and filling activities.

107. Section 5.1, *Site History and Contamination Source*, states that "refuse was placed in areas that were mined to within a few feet of the groundwater table". However, it should be noted that during the mining activities, trenches were dug to drain groundwater westward into the wetland area, artificially lowering the groundwater table to allow the mining to extend deeper. As a result, groundwater elevations are likely higher currently than they were at the time the fill was placed. Further, this statement conflicts with information contained in the ROD and original RI reports. Specifically, the ROD states: "Sand and gravel operations were conducted from 1968 to 1972 during which time rock quarrying and landfill operations were also conducted. Much of the refuse disposed at the landfill was placed in open trenches created by the rock quarrying and sand and gravel operations. Direct leachate discharge to the bedrock may take place beneath parts of the landfill since the refuse is in direct contact with bedrock in areas where rock quarrying had previously occurred. Much of the refuse disposed of at the Coakley Landfill was placed in open (some liquid-filled) trenches created by rock quarrying sand and gravel mining." This is important because whether the waste is situated in groundwater will impact the migration and degradation of the contaminants.

108. Section 5.2, *Potential Receptors,* concludes that properties along Falls Way and September Drive are not receptors of contamination from the Coakley Site based on the fact that site-related compounds have not been detected in those wells over the last 5 years. While the agencies agree with this conclusion, citing the private well data alone is not sufficient. Additional lines of evidence beyond just the sampling results should be cited such as the understanding of the bedrock fabric and hydraulic head distribution, to fully characterize groundwater migration in bedrock.

109. Section 5.2, *Potential Receptors*, discusses the eastern flowpath and seems to suggest that the Rye Landfill is a potential source of the PFAS and 1,4-dioxane at 178A LR. This is inconsistent with the hydrogeologic conceptual model. The Rye Landfill is located well north of the Coakley Landfill and 178A LR is located south of the Coakley Landfill across a topographic high point. All data indicates that the Rye Landfill is a source only for contamination found to the north and east of that site. Well 178A LR is located along a presumed flow path that extends east from the Coakley Landfill through the Breakfast Hill Granite and associated mafic intrusive rocks (MW-24) and then south along the predominant foliation-parallel fractures in the Rye formation.

110. Section 5.3, *Physical Characteristics of the Site*, mentions the predominant fracture set (foliation-parallel fractures striking roughly northeast-southwest) at the Site. EPA concurs with the assessment of the predominant fracture set, but the cross-set

fractures striking roughly perpendicular to the foliation and near horizontal sheeting fractures should also be discussed. While not as frequent as the predominant fractures, these secondary fracture sets provide important connections between the predominant fractures and allow groundwater movement in directions other than along strike of the predominant fractures (northeast-southwest). At the Coakley Site, it is the cross-set and sheeting fractures that facilitate the westward flow from the landfill into the bedrock trough, where flow is then controlled by the predominant foliation-parallel fracture set.

111. Section 5.3, *Physical Characteristics of the Site*, focuses exclusively on the western flow path and does not discuss the eastern or southern flow paths, and concludes that groundwater in deep bedrock is discharging to the wetland complex without any specific discussion of the flow mechanism.

112. Section 5.4, *Fate of Site Contaminants*, concludes that there is generally a “stable” contaminant concentration trend in groundwater. EPA disagrees with this conclusion (see comments Section 4.3).

113. Section 5.5, *Transport of Site Contaminants*, references Figures 5.1 and 5.2. Figure 5.1 incorrectly depicts the landfill waste above the water table. As noted above, the waste was placed directly into standing water within bedrock trenches excavated into the bedrock, and drains had been constructed to lower the water table to facilitate mining. Landfill waste is depicted within the water table in Figure 4.5. The supposition that capping of the landfill has lowered the water table below the bottom of the waste is not supported by data. A plan-view figure paired with Figure 5.1 is needed to illustrate the flow paths described in this section. The figures need to clearly show the interpreted flow paths from the landfill (groundwater from the waste, as well as stormwater runoff from the cap) and follow them through to the eventual discharge point into surface water.

114. Section 5.5, *Transport of Site Contaminants*, indicates that stormwater runoff from the landfill cap contributes a significant amount of PFAS to the wetland complex. This conclusion has not been adequately supported and is subject to the same comments provided for Section 4.4.4.3.

115. Section 5.5, *Transport of Site Contaminants*, references Appendix H as containing the Stormwater Investigation Report (Haley Ward, 2019), however, Appendix H contains PFAS radial plots. The Stormwater Report is not appended to the report.

Section 6 Conclusions

116. Second Bullet: The mafic intrusive rocks (MW-24) are not mentioned, and there is no discussion of the two other fracture sets identified at the Site, which are all critical components of the CSM.

117. Third Bullet: Does not explain how groundwater from the bedrock and till layers is able to discharge into surface water in those areas where a thick sequence of marine clay separates the bedrock/till groundwater from the surface water bodies west of the landfill.

118. Fourth Bullet: No mention is made of sheeting fractures and their role in the bedrock system. The last sentence conflicts with the prior one, which recognizes a component of flow to the east. The fate of groundwater in the eastern flow path is not discussed.

119. Fifth Bullet: The pumping test did not show that the bedrock trough is a hydraulic barrier to westward migration. Rather, the bedrock trough, and associated storage of groundwater in the overburden deposits contained within it, acts as a groundwater reservoir. The lack of drawdown observed to the west during the pumping test is a result of the bedrock anisotropy and the higher bulk hydraulic conductivity of the overburden deposits present in the bedrock trough. The lines of evidence that the landfill has not impacted the neighborhoods to the west are 1) the orientation of the fractures that limit migration in that direction; 2) the hydraulic head field (groundwater elevations and surface water divides); and 3) the data from the sampling of private wells.

120. Sixth Bullet: Again, the presence and importance of sheeting fractures is not discussed. Also, there is not 'limited migration' along the predominant foliation-parallel fracture set. As shown by the pumping test and detection of 1,4-dioxane and PFAS at R3 and 339BHR, no restriction to groundwater flow along this fracture set has been identified.

121. Seventh Bullet: No explanation is provided for how groundwater in till and bedrock is able to discharge to the wetlands complex west of the site when there is a thick sequence of marine clay separating the till/bedrock from the shallower outwash deposits and the associated surface water bodies. The eastern pathway should be broken out into a separate bullet and that pathway should be discussed in greater detail, including the ultimate fate of groundwater flowing to the east.

122. Eighth Bullet: No evidence is provided that the contamination rate and interconnectedness of the fractures is "limited". Site contaminants are found in water supply wells on Breakfast Hill Road, some 3,200 ft north of the site. This is proof that bedrock fractures are interconnected along the predominant strike and the bedrock trough and supports contaminant transport over large distances. Results of the pumping test also confirm that the predominant foliation-parallel fractures are well connected.

123. Ninth Bullet: The conclusion that the pumping of active private drinking water wells does not influence contaminant migration or groundwater gradients within the contaminant plume is not well supported. It has not been proven that contamination

identified in R3 and 339 BHR was not drawn to the north along the bedrock trough by the combined pumping of these wells. Drawdown related to pumping of R3 is observed in monitoring well MW-20D.

124. Final Bullet: While there is likely contribution of PFAS to Berrys Brook as a result of stormwater runoff from the landfill cap, the comparative PFAS loading evaluation presented in the Stormwater Sampling Report was flawed and Agency comments on that document were not addressed.

Section 7 Recommendations

125. EPA agrees that additional work is required to better understand and define how and where bedrock groundwater is discharging to the wetland complex and streams (Berrys Brook and Little River) west of the landfill. The ongoing surface water/groundwater interaction investigation should continue to be implemented. In addition to staff gauge locations, hydraulic monitoring of the piezometers installed in the wetland area should continue to be conducted to evaluate temporal variations in vertical gradients. Measurements should be made on a monthly basis over a period of one year to assess seasonal variations resulting from differential precipitation, evapotranspiration, and temperature.

126. Vertical gradients should be measured at all paired DPT locations. All temporary well locations in this area should be included in the sampling program for water quality, including TMW-11S and -11D.

127. MW-25 is not the ideal location to monitor the southern extent of the plume west of the landfill. As previously mentioned, the hydrogeologic data indicates that the southern extent of the plume would likely be similar to the northern extent. In addition, monitoring wells FPC-3A/B and FPC-4A/B are located on the edge of the bedrock trough, not near the center where the most robust flow would be expected. MW-25/GZ-105 are located near the centerline of the bedrock trough but are both impacted by PFAS and 1,4-dioxane at fairly high concentrations and therefore are not located near the leading edge of the plume. The CLG shall install a new monitoring well to determine the extent of the southern flowpath south of MW-25.

128. Packer sampling and monitoring of groundwater elevations in MW-23 have shown that this well is not located within the plume migrating along the northern pathway. MW-23 is located between the Stone Meadow Way development and R3/339 BHR, so there are no receptors downgradient of this location, providing limited usefulness as a long-term monitoring point. The data from MW-23 and the nature of the fracture network in this area should be discussed further in the context of the potential for impact to the receptors to the north of MW-23.

129. Optimization of the groundwater monitoring program should not be considered until the additional monitoring described above has been completed and confirmed to support the CSM as described.

130. Radio dating can be conducted to evaluate the age of groundwater at various points to assess the length of flow paths. The Report makes the statement in several locations that the bedrock is characterized by short flow paths and that groundwater west of Berrys Brook is expected to be older than groundwater from the landfill.

131. **Figures**

- Figure 2.2, 2.2A, & 2.2B:
    - Insignias and color coding of SW, SED, SG, PZ, & PW are not consistent from legend to figure; some sampling locations appear twice and as different colors (i.e., SG-1, SW-4, and SG-3 on Figure 2.2).
    - GZ-127 and GZ-128 have been confirmed destroyed but do not appear on figures. They should be added to figures and shaded to indicate destroyed.
    - A private well exists at 65 North Road (Fitzgerald property), and though it is not part of the private well monitoring network, it should be shown on Fig 2.2 & 2.2A because it is located in the GMZ and along the inferred southern flowpath.
    - In Figure 2.2A, residential wells 178A LR and 27 BR, and in Figure 2.2B, 339 BHR, R-3 and 340 BHR, are highlighted in yellow as OU2 wells. They should not be represented as OU2 wells, and only as residential wells as they are in Figure 2.2.
- Figure 3.3 should include the bedrock outcrop location name (i.e., 1A, 1B, etc.) as designated in Table 3.3.
- Figure 3.4 indicates that it is based on existing sampling locations, which limits the interpretation of the bedrock type and surface contour. All available bedrock lithological and elevation data should be considered for this figure, or another figure added that considers all available data. Figure 3.1: The fracture orientations on Figure 3.1 and lineaments (shown on Figure 3.2) do not appear to align. It should be confirmed that the rose diagrams have been corrected for magnetic declination and that both the base map and rose diagrams are referenced to the same north (magnetic or geographic).
- Figure 3.4: Note 5 indicates that contours were developed from boring logs, while the legend defines the bedrock surface contour, so that it is not clear if the contours represent depth to bedrock or bedrock elevation. The extent of the Breakfast Hill Granite appears to be limited and based strictly on interpretations of outcrops and boring logs. Similar to the comment for Figure 3.4, all available bedrock lithological and elevation data should be considered.
- Figure 3.4 identifies a "Possible Linear Fracture" which would suggest potential for flow to the E-SE from the NE corner of the landfill towards the Bailey Brook drainage basin. The downhole geophysics log for MW-24 suggests that well encountered the mafic intrusive rocks, yet these are not shown on the bedrock geologic map.

- Figure 3.5: The NWI Wetland delineation appears different from the previous figures. For example, the DPT locations are shown to be outside of the NWI delineated area, while they appear inside the NWI delineated area in Figures 2.2, 2.2A and 2.2B. In addition, the “F” and “J” qualifiers in the table should be defined.
- Figure 4.1: The figure does not appear to include the observations of till from the DPT, MW-20, MW-21 or MW-22 borings and appears to be based only on data from the original RI. All available lithological data should be considered for development of Figures 4.1, 4.2 and 4.3. This figure should be enhanced with the most recent geologic data. The 40 ft contour near GZ-125 is not supported by any data and is likely plotted incorrectly. A smaller contour interval (5 or 10 feet) should be used to show more detail. The interpreted extent of the till does not align with the bedrock surface map presented in Figure 3.4. The depths for GZ-123 and GZ-125 are flipped between the table and the figure.
- The legend in Figure 4.1 defines the glacial till thickness contour, while the table in the figure and the indication at each well identify depth to till. For example, depth to till for FPC-9B is shown as 56 feet in the table but is plotted within the 40-foot thickness contour on the figure. Figure 4.5 also appears to show depth to till at FPC-9B as about 56 feet, but the thickness looks to be about 15 feet. This comment also applies to Figure 4.2 for marine deposits. Contouring the depth to a certain unit provides little meaning because the surface topography is highly variable. Rather, the elevation of the top of the unit should be contoured. This comment applies to Figures 4.1, 4.2 and 4.3.
- The titles of Figures 4.1 and 4.2 do not clearly define what the figures are showing. Consider changing the titles to “Contoured Depth to Glacial Till” and “Contoured Depth to Marine Deposits”.
- Figure 4.4 shows FPC-5B, MW-5D, and MW-5S in the Rye Formation and Figure 4.5 shows FPC-9B in the Rye Formation, but Figure 4.6 shows them both in the BHG. The same comments were made in EPA’s February 6, 2020, letter on the 2019 Interim Report.
- Fig. 4.5 shows GZ-109 and GZ-117 to be 571.7’ and 540.65’ off center of the B-B’ line, respectively, but Figure 4.3 shows them to be very close to, if not on the line.
- Figure 4.6 shows MW-24 as being in the BHG, which is not correct.
- Figure 4.7 does not correlate with the lithological interpretations shown in the cross sections. All available data should be considered for this lithological interpretation.
- Figure 4.8: The bedrock surface contours are not consistent with those shown on Figure 3.4.
- Numerous figures (4.7, 4.8. 4.16. 4.17, 4.18) all of which appear to have been prepared by Sanborn Head, reference Appendix XX, which is not included in the Report. These figures appear to have been only slightly modified from the Interim Report, if at all.
- Figures 4.10 (1,4-dioxane) and 4.12 (PFOA) show the presence of contaminants to the east of the landfill that supports an eastern component of flow that is not adequately discussed in the Report.

- Figures 4.16, 4.17 and 4.18: The data within the blue boxes should be defined in the legend.
- Figure 4.19: Concentration contours south of GZ-105 are unbound and should be dashed. Consider updating figure to reflect exceedances of 1,4-dioxane in 178A.
- Figure 4.21: Concentration contours south of GZ-105 are unbound and should be dashed. Consider updating figure to reflect exceedances of PFOA at 399 BHR (R-5).
- Additional explanation is needed regarding the interactive 3-D Figure 5.2. It is not obvious what that figure is intended to illustrate. The vertical scale on Figure 5.2 is too small to allow inspection of the various overburden layers and their interaction with bedrock and in fact the overburden is not discretized into its components.

132. **Tables**

- Table 3.1 Inventory of Monitoring Locations: If well records exist, they should be appended and summarized in a separate table. 340 BHR is not in the GMZ, as noted.
- Table 3.6 Residential Well Record Review: The private wells that are part of the current monitoring network should be added to this inventory. If well records exist, they should be appended and summarized in a separate table. The existing table has several errors: (1) well R-3 is currently not located in the GMZ, as noted; (2) well R-1 is not located in the GMZ, as noted; and (3) 65 North Road is located in the GMZ.
- All of the Table 4.3 tables are labeled as manganese. USEPA screening levels should be included for PFOA and PFOS.

133. **Appendices**

- The boring logs in Appendix A should be organized chronologically and breaker pages added between groups of logs to aid the reader in finding specific logs. The DPT logs prepared by Haley Ward in 2020 are sandwiched between Aries Engineering logs from 2003 and CDM logs from 1992.
- Appendix D plot for BP-4 is mislabeled as PB-4.
- Note that Appendix B and E each have 180+ pages repeating the geophysical logs, with the difference being that E includes interval sampling data.