



Minnesota Pollution Control Agency

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November 3, 2015

Mr. Larry Deeney
General Mills, Inc.
One General Mills Boulevard
Minneapolis, MN 55426-1347

RE: Minnesota Pollution Control Agency Response to the Vapor Intrusion Pathway Investigation Report for the General Mills/Henkel Corporation Site; Site ID#: SR3

Dear Mr. Deeney:

The Minnesota Pollution Control Agency (MPCA) completed review of the Vapor Intrusion Pathway Investigation Report (Report) prepared by Barr Engineering Company (Barr) for General Mills, Inc. (GMI) dated July 2015 for the General Mills/Henkel Corporation Site (Site).

A main requirement of the Report was to prepare a feasibility study, including a recommendation to MPCA identifying additional response action(s) to address volatile organic compound (VOC) concentrations in soil, soil gas, and groundwater due to GMI's operations at the Site. The required feasibility study was not provided with the Report.

The groundwater plume in the shallow glacial drift is a primary source of trichloroethylene (TCE) vapors identified beneath residential homes and commercial buildings in the area. MPCA acknowledges, and has started investigating, multiple potential release sources of TCE that may be contributing to an area-wide groundwater contaminant plume in the vicinity of the Site. However, Report data indicates that the GMI release is a primary source of TCE contamination in the area. Figure 1 (attached) illustrates TCE concentrations in the shallow glacial drift for the March 2015 groundwater sampling completed by GMI. As shown on Figure 1, elevated (>100 $\mu\text{g/L}$) TCE concentrations in the shallow glacial drift up-gradient (northeast) of the Site do not extend onto the Site or into the central area investigated by GMI. An area of elevated TCE in groundwater is present in the shallow glacial drift directly down-gradient (southwest) of the Site in the central area consistent with a TCE release from the Site.

Installation of sub-slab depressurization (SSD) systems temporarily addressed the vapor intrusion risk to the majority of the homes and commercial buildings in the vicinity of the GMI release. However, the source of these vapors (shallow groundwater contamination in glacial drift) has not been adequately addressed. The GMI feasibility study is required to develop an effective remedial strategy to address the groundwater to vapor contamination pathway.

The Report references the Human Health Risk Assessment (HHRA) Report prepared by GMI (dated July 2015) in conjunction with the vapor intrusion pathway investigation. MPCA along with Minnesota Department of Health (MDH) will provide specific comments on the HHRA Report in a separate response.

Required Report amendment items are summarized below. Specific MPCA review comments on the Report text, figures and tables are provided in Attachment A.

Required Report Amendment Items

MPCA is requiring that GMI submit a Report amendment including the following items no later than February 3, 2016:

1. GMI must submit a feasibility study as required by the Response Action Plan (RAP) Modification #1, dated March 11, 2014.
2. GMI must submit a long-term operation and maintenance plan for the SSD systems installed for the Site.
3. GMI must submit a plan for reimbursement of electrical costs associated with the SSD systems installed for the Site.
4. GMI must submit a sampling plan for the sentinel vapor point network. This sampling plan may also be provided with the upcoming sentinel monitoring report in lieu of the Report amendment.
5. GMI must submit a sampling plan for the monitoring well network. This sampling plan may also be provided with the upcoming sentinel monitoring report in lieu of the Report amendment.
6. Attachment A includes specific MPCA review comments that GMI must also address.

If you have any questions regarding this letter, please contact me at timothy.grape@state.mn.us or 651-757-2893, or Hans Neve at hans.neve@state.mn.us or 651-757-2608. Thank you for your cooperation with this effort.

Sincerely,

A handwritten signature in blue ink that reads "Timothy J. Grape". The signature is fluid and cursive, with the first name "Timothy" and last name "Grape" clearly legible.

Timothy J. Grape, PG
Project Manager
Site Remediation and Redevelopment Section
Remediation Division

TJG:mcb

Attachments:

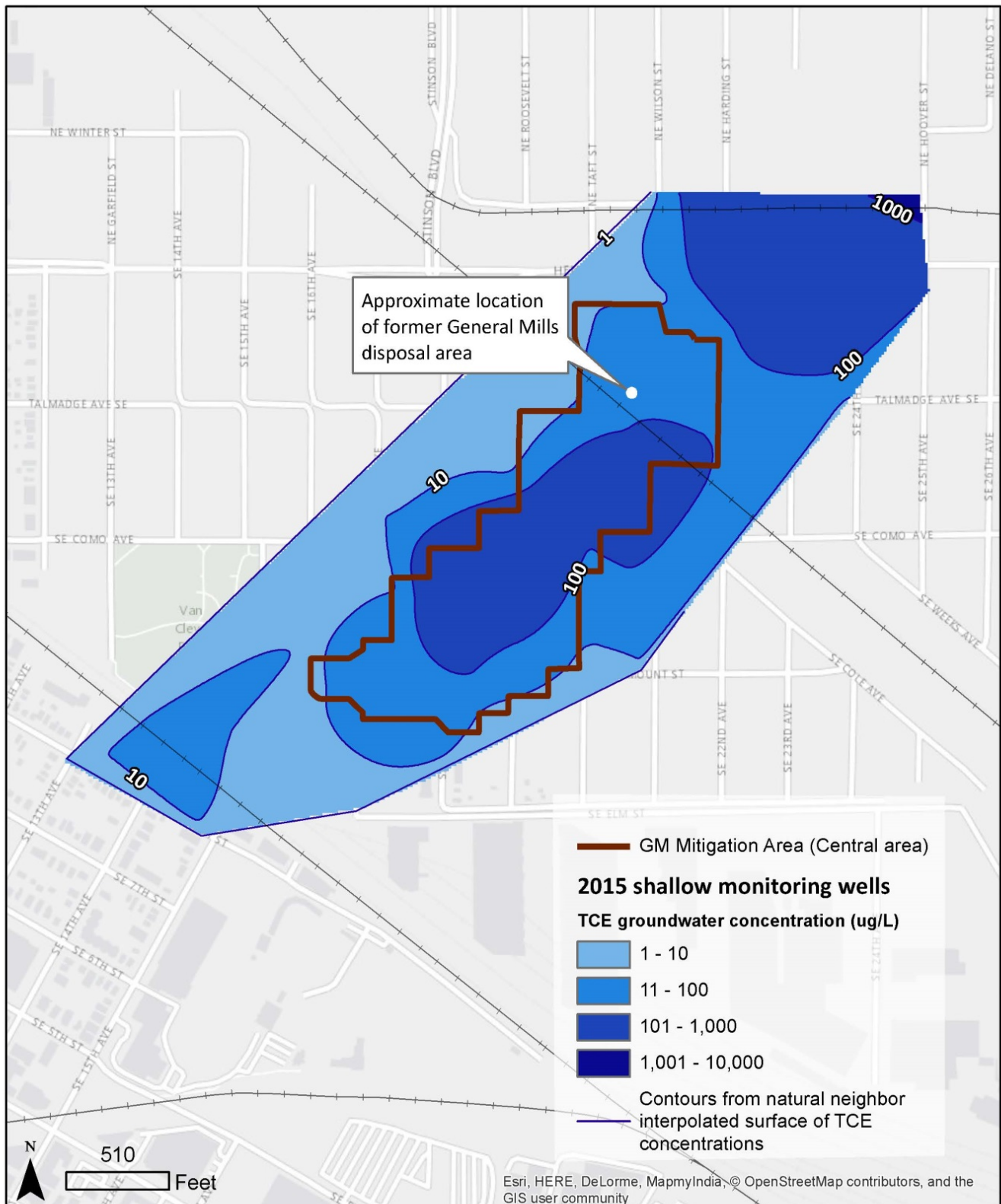
Figure 1 – TCE Groundwater Concentrations in the Shallow Glacial Drift, March 2015 Sampling Event
Attachment A: MPCA Review Comments

cc: Mary Sands, Barr Engineering

**Figure 1 – TCE Groundwater Concentrations in the Shallow Glacial Drift
March 2015 Sampling Event**



Figure 1 shows TCE groundwater contours generated from GMI's sampling of shallow permanent monitoring wells in March 2015.



ATTACHMENT A

Specific MPCA review comments for: Vapor Intrusion Pathway Investigation Report, East Hennepin Avenue Site, Minneapolis, Minnesota. Prepared for General Mills, Inc. By: Barr Engineering Co.

Dated: July 2015.

Comments on Report Text

1. Executive Summary Section, Page V, Paragraph 2 – The Report references the Human Health Risk Assessment (HHRA), and states: *“The HHRA concludes that the only exposure pathway in the Study Area that may be complete and of potential significance is the potential VI pathway from VOCs in the glacial drift groundwater within the Northeast Area.”*

GMI did not conduct a thorough completed vapor intrusion pathway investigation for all properties potentially impacted by the release. SSD systems were installed to interrupt the completed pathway in the majority of the homes/buildings requiring them; however, the potential VI pathway risk is still present throughout the Study Area due to elevated TCE soil gas concentrations beneath the buildings. GMI should amend the HHRA conclusion to acknowledge the continued presence of TCE-contaminated groundwater in the Central and Southwestern Areas that acts as a source of vapors that may pose a potential risk to unmitigated properties in the Central and Southwest Areas.

2. Section 1.0 Introduction, Page 1, Paragraph 2 – *“General Mills investigated soil, groundwater, and soil gas at the Site and at locations northeast, south, and southwest of the Site. These areas are collectively referred to in this report as the Study Area as shown on Figure 2.”*

It is not clear what the boundaries of the Study Area are. Figure 2 labels the Site, Northeast, Central and Southwest areas. However, only the Site and Soil Gas Monitoring Area have definitive boundaries illustrated. GMI completed investigation and sampling north of Hennepin Avenue East; however, it is not clear if this is included in the “Study Area.” GMI should provide clear boundaries for the areas referenced throughout the Report.

3. Section 2.1.1, Site History, Page 4, Paragraph 2 – The Report mentions *“the remedial action objectives set forth in the Consent Order.”*

One of these objectives was to remediate groundwater in the glacial drift capture zone with TCE concentrations greater than 270 µg/L.

The text of the Report also states that *“no significant rebound in TCE concentrations has been observed following the shutdown of the pump-out system.”*

Several glacial drift wells at the Site and down-gradient from the Site (including both temporary and permanent monitoring wells) have recently (2014 - 2015) had TCE groundwater concentrations greater than the Consent Order remedial action objective of 270 ug/L. Figures 9 and 10 in the Report show that these wells include: DP-064, DP-065, DP-067, 110, 313GS, 313GD, 314GS, 314GD, and 315GD. Thus, the Feasibility Study required by the amended Response Action Plan shall include alternatives to address the elevated TCE concentrations in groundwater in the glacial drift aquifer.

4. Section 5.2.1 Buildings 10, 11, 12 and 14, Page 24, Paragraph 1 – *“As described below, a completed VI pathway does not exist at Buildings 10, 11, 12, and 14, based on the indoor air sampling results at these buildings. In addition, the lack of elevated TCE concentrations in soil from the vadose zone and groundwater at the water table support that the risks are sufficiently low and that no additional action with regard to soil, groundwater, or soil gas is necessary in this area.”*

TCE sub-slab soil gas concentrations above 1,000 $\mu\text{g}/\text{m}^3$ were detected at all four Site buildings (10, 11, 12 and 14). The highest sub-slab TCE concentration (3,320 $\mu\text{g}/\text{m}^3$), observed beneath building 12, exceeds 100 times the industrial ISV for TCE (3,000 $\mu\text{g}/\text{m}^3$).

Following the sub-slab sampling, GMI collected indoor air samples at the four Site buildings. The indoor air sampling completed by GMI did not indicate a completed vapor intrusion pathway at the Site buildings sampled and vapor mitigation systems were not installed. For buildings where sub-slab vapor concentrations exceed ten times the ISV, one or two indoor air samples are not sufficient to make a final completed pathway determination and forego active vapor mitigation. A full completed pathway evaluation requires multiple indoor air samples collected over a period of time under different seasonal and building operation conditions. GMI must install active vapor mitigation systems or conduct additional completed pathway evaluation work for the Site buildings referenced above based on the sub-slab vapor sampling results.

5. Section 5.2.3, Former Disposal Area, Page 27, 3rd Bullet – The Report states that *“(t)he highest TCE concentration in groundwater measured during the VI pathway investigation on the Site (temporary well DP-064 at a depth of 52.5 to 54.5 feet bgs at 629 $\mu\text{g}/\text{L}$) is located at the east property boundary, up-gradient of the former disposal area and down-gradient from known releases of TCE in groundwater in the Northeast Area.”*

This Section should include additional discussion regarding potential migration pathways of dense non-aqueous phase liquids (DNAPL) in relation to Site stratigraphy. Clay till was observed on top of the first encountered bedrock in former disposal area boring 311 pilot boring at approximately 817 feet above mean sea level (AMSL). Clay till was not observed directly above the first encountered bedrock at soil boring DP-064 to a depth of approximately 805 feet AMSL. DNAPL can migrate up-gradient due to preferential pathways including on top of clay till layers. GMI should provide additional evaluation and discussion regarding possible contaminant migration pathways of TCE through the glacial drift. GMI should also provide an amended Figure 14 with a cross-section realignment through DP-064, DP-066 and the source area monitoring well nest (311GS/GD) as discussed in comment 16 below.

6. Section 5.4, Central Area, Page 29, Paragraphs 1 and 3 – This section of the Report begins: *“The extent of groundwater impacts, potential presence of current and historical TCE sources, and extensive soil gas sampling data collected in the Central Area suggest that multiple off-Site sources of TCE have impacted groundwater in this area.”*

MPCA acknowledges that there may be multiple off-Site sources of TCE that have impacted groundwater in this area and MPCA is in the process of investigating potential off-Site TCE sources in the vicinity of the Site. However, the discussion of releases of TCE to groundwater in this section does not acknowledge the continuing residual impact of the GMI release on groundwater and soil gas in the Central Area. A Feasibility Study should be submitted to evaluate alternatives to address the potential human health risks posed by TCE-contaminated groundwater that originated at the Site.

7. Section 5.5, Southwest Area, Page 31 – The Report states *“(a)n area of low to no TCE concentrations in soil and groundwater between the Central and Southwest Areas...”* The Report cites soil, groundwater, soil gas and indoor air results from the Southwest Area. The Report also states (last paragraph on p.31): *“The Central and Southwest Areas are separated by an approximately 400 foot-wide area with no detectable TCE in groundwater and TCE sub-slab soil gas concentrations of less than 20 ug/m³. This data shows that several potential releases have caused the groundwater and vapor impacts in the Southwest Area.”*

Other potential causes for this apparent “gap” include an area with glacial till at a higher elevation and correspondingly thinner glacial drift (shown on Figures 14 and 17), and the long-term operation of down-gradient glacial drift pumpout wells 111, 112, and 113. GMI should amend the Report to acknowledge the continuing residual impact of the Site on groundwater and soil gas, and consider other potential causes for the area of low TCE concentrations in groundwater and soil gas between the central and southwest Areas.

8. Section 6.1 Vapor Sources, Page 32, Paragraphs 1-3 – *“As described previously, TCE was a commonly-used industrial and household solvent between the 1930s and the 1990s and is still in use today. Documented releases of TCE to shallow groundwater are present in the Northeast Area and potential users of TCE exist throughout the Study Area.”*

No evidence of DNAPL has been found at the Site and TCE is not detected in the unsaturated soils at the Site. Only low concentrations of TCE (less than 1 mg/kg) are present in the soil below the water table at the Site. These low concentrations are consistent with the dissolved TCE measured in the shallow groundwater and do not indicate the presence of DNAPL or source material. The Site is not an ongoing source of TCE to groundwater that would contribute to the potential vapor intrusion pathway in the Study Area.

The highest TCE concentrations in groundwater in the glacial drift are present in the Northeast Area, which is hydraulically up-gradient from the Site and the Central Area. The magnitude and northeasterly extent of TCE in groundwater in the Northeast Area is undefined.”

The GMI TCE release as a contribution to the dissolved phase plume in the shallow groundwater is a vapor source. The vapor source and pathway are not discussed in Section 6.1. GMI should amend Section 6.1 of the Report to discuss the vapor source and pathway in relation to the GMI release and the associated dissolved phase TCE groundwater plume at and down-gradient of the Site.

9. Section 6.6 Vapor Mitigation, Page 33, Paragraph 1 – *“Mitigation systems, specifically sub-slab depressurization systems, were installed at buildings that had reported TCE concentrations in sub-slab soil gas greater than the conservative MPCA screening value or that were otherwise offered mitigation systems. The SSD systems are operating as designed and prevent completion of a vapor intrusion exposure pathway.”*

There are a small number of properties within the Central, Northeast and Southwest areas requiring follow up related to sub-slab sampling or mitigation. GMI has requested MPCA assistance at some properties where numerous attempts to obtain property access, coordinate vapor investigation work, or where installation of required mitigation systems was unsuccessful. GMI is still required to conduct the necessary sampling, vapor intrusion assessment and mitigation at these properties when property access is obtained.

GMI is required to submit an operation and maintenance plan for all existing and any future SSD systems installed for the Site. GMI is also required to submit a reimbursement plan for electrical costs associated with operating the SSD system fan(s).

10. Section 7.0 VI Pathway Investigation Conclusions, Page 34, Paragraph 5 – *"Additional response actions at the Site are not necessary to adequately protect human health or the environment. Until the extent and magnitude of the impacts associated with the documented and potential off-Site sources are defined, remedial action objectives cannot be established. Additionally, remedial alternatives, to the extent they are needed, cannot be effectively evaluated for such criteria as cost, implementability, technical practicability, or long-term effectiveness, given the potential for re-contamination from up-gradient sources."*

Additional response actions are necessary to adequately protect human health and the environment. TCE groundwater concentrations in the glacial drift directly down-gradient of the Site exceed the Consent Order remedial action objective of 270 µg/L and continue to act as a source of vapors beneath buildings at concentrations exceeding 10 times residential intrusion screening values (ISVs).

As stated in Section 3.3 of the Response Action Plan (RAP) Modification #1 dated March 11, 2014, The Vapor Intrusion Pathway Investigation and Feasibility Study Report are required to include a recommendation to MPCA identifying additional response action(s) to address VOC concentrations in soil, soil gas, and groundwater due to GMI's operations at the Site as necessary to adequately protect human health and the environment. Regardless of the potential for other contaminant sources to be present in the vicinity of the Site, GMI is required to provide MPCA with an evaluation of potential active response actions to address VOC concentrations in soil, soil gas, and groundwater due to GMI's operations at the Site.

The National Contingency Plan (NCP) requires that remedial alternatives be assessed to evaluate whether they could adequately protect human health and the environment in both the short and long-term from unacceptable risks posed by hazardous substances, pollutants, or contaminants.

11. Section 7.0, VI Pathway Investigation Conclusions, Page 34, 5th Bullet – The Report concludes: *"TCE impacts in the Southwest are unrelated to the Site; one or more separate releases are present in the Southwest Area."*

GMI should amend the Report so the first portion of this conclusion ("TCE impacts in the Southwest are unrelated to the Site;...") considers the factors mentioned in the previous comment on Section 5.5 (see above).

12. Section 8.1, Additional Sentinel Network Monitoring, Page 35, Paragraph 3 – *"The sentinel monitoring report will include a proposal for future data collection and analysis, if necessary."*

The Report discusses the current plan and schedule for sampling the sentinel soil vapor monitoring network. Based on the continued presence of TCE-contaminated groundwater in the Study Area due to historical releases at the Site, it is necessary to extend the monitoring period for sampling this network beyond the one year of quarterly sampling specified in the Work Plan (which ended after the September 2015 sampling event). GMI is required to conduct ongoing sentinel vapor monitoring until a long-term remedial action is implemented to address the source of soil vapors.

Comments on Report Tables

13. Table 10, Soil Gas Sampling Analytical Results:

GMI should add the sampled depths for the sentinel vapor monitoring points (SVP-1 through SVP-29).

Comments on Report Figures

14. Figure 4, Potential Study Area TCE Sources:

This figure appears to show sources of TCE. Since potential historical sources are shown, the figure should include the Site as a potential source of TCE with corresponding historical shallow groundwater TCE concentrations (e.g., 7,200 ug/L in well 106). Historical data from the Site, including groundwater data from the original glacial drift aquifer monitoring well network, support the concept that disposal activities at the Site produced an extensive groundwater plume that continues to be a source for TCE-contaminated soil vapors in the area down-gradient/southwest of the Site. GMI should amend Figure 4 to show the Site as a TCE source.

15. Figure 10, Groundwater Sampling TCE Results – Permanent Wells:

This figure displays the combined data for monitoring wells screened in the shallow (water table) and deep (top of bedrock) glacial drift wells. Plotting the shallow monitoring well data separately would more effectively show the potential vapor intrusion risk in the Study area. Similarly, contouring the TCE groundwater concentrations in the shallow monitoring wells would illustrate the plume and areas that may potentially be impacted by vapor intrusion. MPCA staff has utilized these and other pertinent groundwater data to draft a figure (see attached Figure 1) illustrating the shallow TCE plume in the glacial drift aquifer for the March 2015 sampling event completed by GMI. Figure 1 supports the concept that historical disposal activities at the Site produced an extensive groundwater plume that continues to be a potential source for TCE soil vapors in the area. GMI should prepare separate isoconcentration maps for the permanent monitoring wells screened in the shallow (water table) and deeper (top of bedrock) within the glacial drift for both the December 2014 and March 2015 sampling events.

16. Figure 14, Geologic Cross Section A-A':

Cross section alignment for A-A' was not completed through the Site and former disposal area to incorporate recently completed data points including DP-064, DP-066 and source area well nest 311GS/GD. The cross section was aligned south and east of the Site and the former disposal area. A cross section alignment through the disposal area and up-gradient would provide additional information regarding the elevation and configuration of the clay till layer on top of the Decorah Shale. GMI should provide an amended Figure 14 (Cross Section A-A') extending through the Site from the northeast including borings DP-064 and DP-066 and the former disposal area monitoring well nest 311GS/311GD.