

Attachment E4 – Assessment of Perched Wetlands

Perched Wetlands North of 9 Mile Road

- 29 (50%) of the 58 mapped wetlands located within or bisected by the 0.5-foot drawdown contour are located north of 9 Mile Road (including a portion of Wetland R).
- The ground surface elevation ranges from 1,180 to 1,220.
- The SSPA regional ground water contours range from 1,120 to 1,140 feet.
- Therefore, 28 wetlands (excluding wetland R) located north of 9 Mile Road and within the 0.5-foot drawdown contour are located from 60 to 80 feet above the regional groundwater table.
- This results in a thick unsaturated zone above the water table and below the wetlands (refer to Figure 3-2 of the July 2016 Section 17 Application Information Package for a stratigraphic cross-section showing this condition).
- There is only one way wetlands can exist under such conditions – depressional morphology and presence of a low-permeability soil layer at or near the ground surface that holds water long enough during the growing season to support hydrophytic vegetation. Wetlands with this characteristic are conventionally referred to as “perched wetlands.”
- The silty-sand and clayey-sand soils near the surface in this area (Figure 3-2 of the Application Information Package) have low enough permeability to perch water on the ground surface long enough to support wetlands.
- This type of geomorphic wetland is described by the U.S. Environmental Protection Agency (EPA) in *Methods for Evaluating Wetland Condition: Wetland Hydrology*¹ as follows: “...perched wetlands form above low-permeability substrates where infiltration is restricted, such as above permafrost, clay, or rock (Novitzki 1989).”

Perched Wetlands South of 9 Mile Road

- An additional 22 wetlands located south of 9 Mile Road are also perched wetlands.
- The ground surface elevation near these wetlands ranges from 1,120 to 1,180 feet.
- The regional groundwater contours range from 1,100 to 1,120 feet.
- The ground surface at all of these wetlands is 20 to 60 feet above the regional groundwater table (Figures 3-2 and 3-3 of the Application Information Package).
- Similar to wetlands north of 9 Mile Road, there is a thick unsaturated zone below these 22 wetlands south of 9 Mile Road.

Perched Wetlands B, C, and D

- Wetlands B, C, and D are located south of 9 Mile Road and within the 0.5-foot drawdown contour.
- Wetlands B, C, and D were determined to be perched on the same geomorphic basis as the other 50 wetlands described above.
- ECT field investigated Wetlands B, C, and D to confirm the presence of a confining layer because the regional groundwater table was potentially located within 10 feet of the ground surface. This estimate of the depth to the water table was based on review of available

¹ U.S. EPA. 2008. *Methods for Evaluating Wetland Condition: Wetland Hydrology*. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA-822-R-08-024.

groundwater data, National Elevation Dataset elevation data, and 2003 wetland mapping by Tilton & Associates.

- ECT observed clay and clayey-sand under these three small wetlands using soil probing.
- Their morphology suggests they are vernal pools located in depressions that fill with snowmelt and rainwater runoff during the spring. They are located on a topographic plateau in hilly terrain and are surrounded by steep slopes to the north, west, and south that generate considerable runoff.
- While the groundwater table may be located within 10 feet of the ground surface under these three wetlands, they are perched on the basis of their morphology, geomorphic setting, and presence of low-permeability soils under them.
- It is unlikely the groundwater table intersects the land surface at Wetlands B, C, and D under normal seasonal fluctuations given it is several feet lower than the land surface.

Perched Wetland Summary

- In summary, 53 of the mapped 58 wetlands located within the 0.5-foot drawdown contour are perched wetlands as defined by the USEPA² because they exist due to perched water on the land surface over a confining layer of low-permeability soil that is separated from the regional groundwater table by a thick unsaturated zone (10 to 80 feet thick).
- The confining layer is comprised of low-permeability clayey-sand, clay, and/or silty-sand. It allows vertical movement of water, but at very low rates. However, water only moves in the downward direction under these wetlands as infiltration and groundwater recharge. The regional groundwater table is located too far below the ground surface for groundwater to move up through the confining layer under normal seasonal fluctuations.
- If the confining layer under such a perched wetland was not continuous, then the wetland could not exist. It would effectively drain.

Connected Wetlands R, A, G, H, and CC

- The remaining five wetlands located within the 0.5-foot drawdown contour are Wetlands R, A, G, H, and CC, which were determined to be hydrologically connected to the groundwater source aquifer from which Nestle is pumping.
- Groundwater associated with the spring aquifer flows through those five wetlands because they are located along groundwater discharge boundaries (the groundwater table intersects the land surface or discharges onto the land surface as springs).
- The geomorphic position in the landscape is different than the 53 perched wetlands.
- Confining soil layers were not observed under them.
- An unsaturated zone likely does not exist under them.
- They all have a thick layer of muck that is 12 inches or thicker, a common trait of groundwater saturated wetlands.

² U.S. EPA. 2008. Methods for Evaluating Wetland Condition: Wetland Hydrology. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA-822-R-08-024.