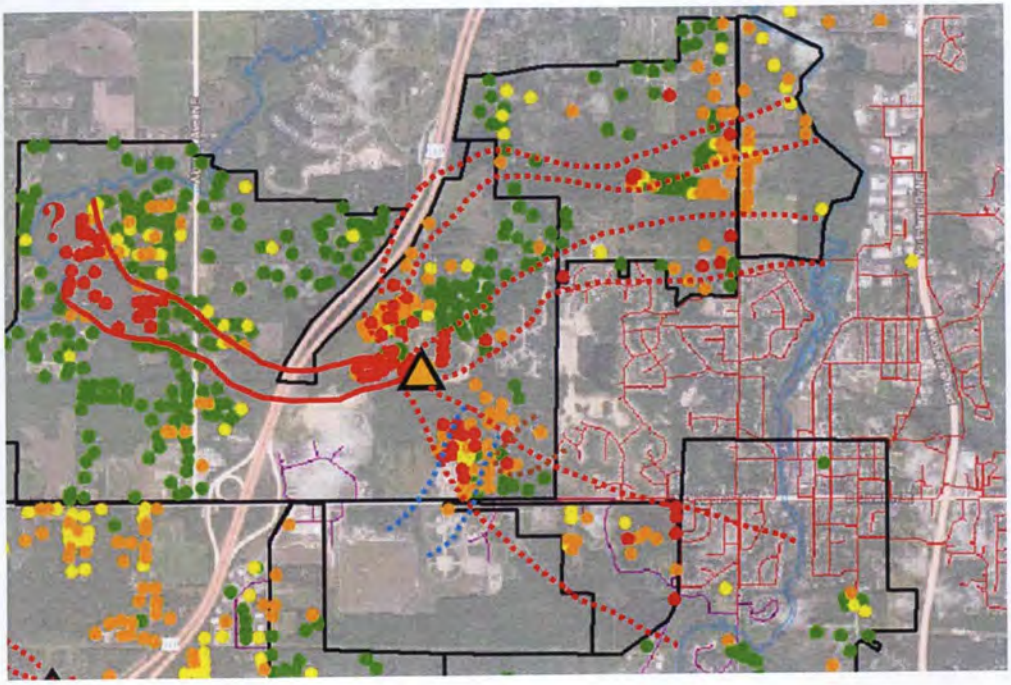
Geologic Review

DEQ-RRD Grand Rapids District

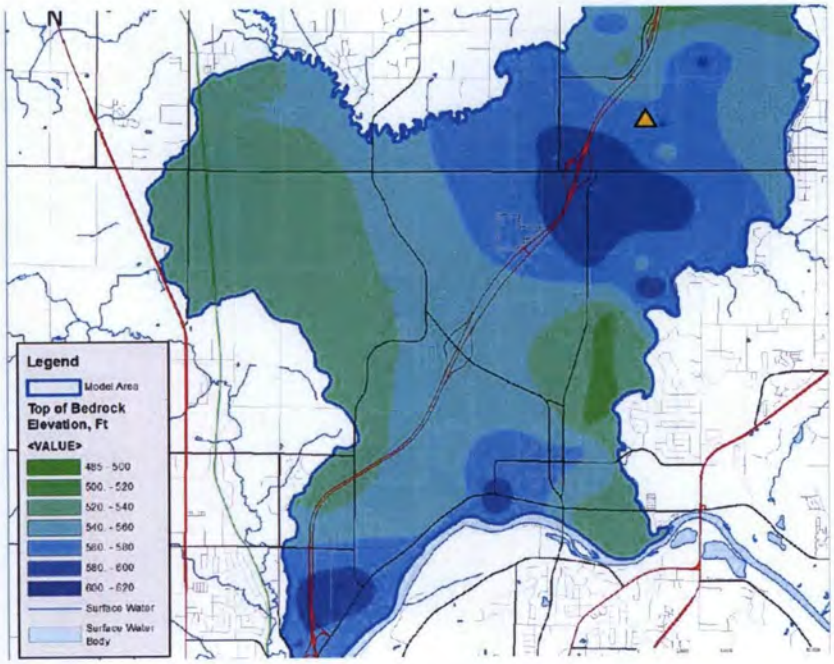
Perfluoroalkyl and Polyfluoroalkyl Substances Plume Evaluation of the Wellington Ridge Neighborhood Plume - 12-2018

This evaluation of perfluoroalkyl and polyfluoroalkyl substances (PFAS) impact encompasses the area surrounding the Wellington Ridge Neighborhood where a disposal area was located. This review uses residential well data collected by Wolverine World Wide (WWW). The PFAS plumes emanating from the disposal area in Wellington Ridge are illustrated below.



PFAS groundwater plumes emanating from the Wolven-Jewell source area in Wellington Ridge. The source area is illustrated by the orange triangle; the principle PFAS groundwater plume is illustrated by the solid red lines and the secondary PFAS groundwater plumes are illustrated by the red dashed lines.

This area is a kettle and kame glacial depositional environment that overlies bedrock of higher elevation with a bedrock high immediately southwest of the modeled area (see GZA figure below).



Bedrock elevations from a GZA document dated 2-8-18. Orange triangle marks the disposal site in the Wellington Ridge Neighborhood.

The Wolven-Jewell source area in the Wellington Ridge neighborhood was a former gravel pit/borrow area where surficial dumping of liquid waste streams containing PFAS was disposed. This location was identified as a disposal area through multiple lines of evidence. DEQ-RRD staff conducted interviews where information was provided that identified liquid disposal in a gravel pit/borrow area which would be within the current Wellington Ridge neighborhood. The location of the gravel pit/borrow area was subsequently supported by historical aerial imagery from the 1950s and 1960s. The use of the gravel pit/borrow area for disposal of liquids was further supported by analysis of the spatial distribution of PFAS concentrations in drinking water well samples which indicated the source area is within the footprint of the former gravel pit/borrow area; additionally, PFAS soil quality information collected by the EPA indicated the former gravel pit/borrow area was used for PFAS disposal. The location of the former gravel pit/borrow area is illustrated on attached Figures 3 and 4 and was located at the highest area of the neighborhood.

The disposal site sits on a groundwater divide leading to groundwater flow in multiple directions and thus, PFAS plumes migrating in several directions. The basic plume directions emanating from the source area are shown on Figure 2, the Total PFAS concentration map.

Plume 1:

The primary PFAS plume moves to the west from the source area to a prominent paleo-drainage feature that is present from the disposal area west to the Rogue River and is shown in the LIDAR (Light Detection and Ranging) image below. This geologic feature controls groundwater flow to the west from the historic disposal area. This plume is present at elevations from at least 725 to 680 feet, however, vertical definition has not been completed at this time.

Plume 2:

Additionally, there is second PFAS plume present at a shallower depth (770-755 feet) to the west of the disposal area along the same flow direction of the primary plume but this plume is very poorly delineated.

Plume 3:

Another PFAS plume is present flowing to the northeast from the source area and impacting drinking water wells on the south end of Elstner Avenue. This PFAS plume is present at elevations from at least 740 feet to 720 feet, however, this plume is poorly delineated as to the vertical and lateral extent. Further information on this plume can be found in the Wolven Northeast geologic review.

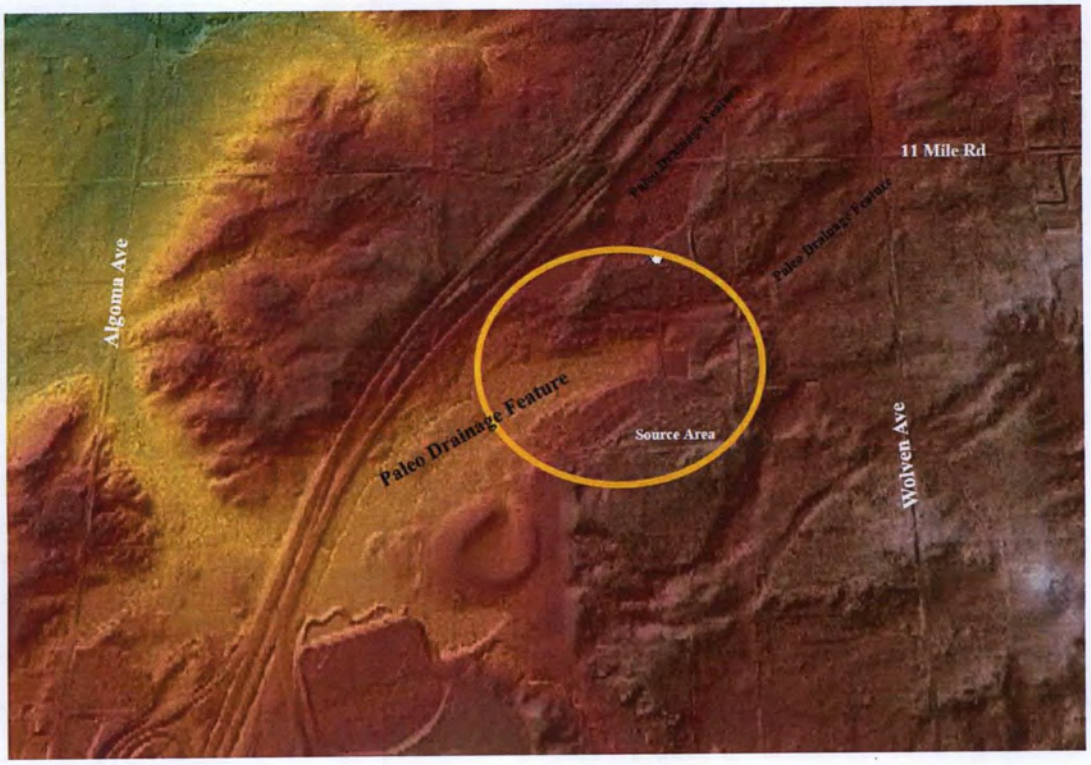
Plume 4 Area:

Based on the current contaminant distribution within the Wellington Ridge neighborhood, multiple PFAS plumes migrate to the north in narrow bands (significant additional delineation is necessary to determine the location of these plumes) at shallower elevation ranging from 800 feet to 730 feet. One or all these plumes ultimately flow into a paleo-drainage feature that flows to the Rogue River to the northeast, see the Wolven Northeast geologic review for additional information.

Plume 5:

PFAS groundwater plumes migrate from the source area to the southeast and additional information on these plumes can be found in the Wolven Southeast/North Childsdale geologic review.

Installation of a number of additional monitor well locations are necessary to fully understand the PFAS plumes emanating from the Wolven Jewell source area.



LIDAR of the Wellington Ridge neighborhood area with the neighborhood circled in orange.

Attachments:

- Figure 1 - PFOS/PFOA – Analysis of Drinking Water Well Results for the Wellington Ridge Neighborhood
- Figure 2 – Total PFAS – Analysis of Drinking Water Well Results for the Wellington Ridge Neighborhood
- Figure 3 – Geospatial/Temporal Analysis of Wellington Ridge Gravel Pit
- Figure 4 - Geospatial/Temporal Analysis of Wellington Ridge Gravel Pit

Geologist Signature: _____ Date: 2/15/2019

Mark Worrall, District Geologist

Disposal Area

663-658 **Elevation of Well Screen**
(Top of Screen-Bottom of Screen)

unk **Well Screen Information Unknown**

709-704 **Below Method Detection**

736-731 **PFOS/PFOA: <20ppt**

703-693 **PFOS/PFOA: 20 to 70ppt**

704-695 **PFOS/PFOA: >70ppt**

704-695 **PFOS/PFOA: >1,000ppt**

Figure 1—PFOS/PFOA

Analysis of Drinking Water Well Results for Wellington Ridge Area

Algoma Township MI

North

Stream or River

Note - Well depths have been placed over where the residences are.

Note - Results are the initial sample results for the drinking water well

Updated by the MDEQ-RRD-GR 12/7/2018

Disposal Area

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unk **Well Screen Information Unknown**

709-704 **Below Method Detection**

736-731 **PFAS: <20ppt**

703-693 **PFAS: 20 to 70ppt**

704-695 **PFAS: >70ppt**

704-695 **PFAS: >1,000ppt**

Figure 2—Total PFAS

Analysis of Drinking Water Well Results for Wellington Ridge Area

Algoma Township MI

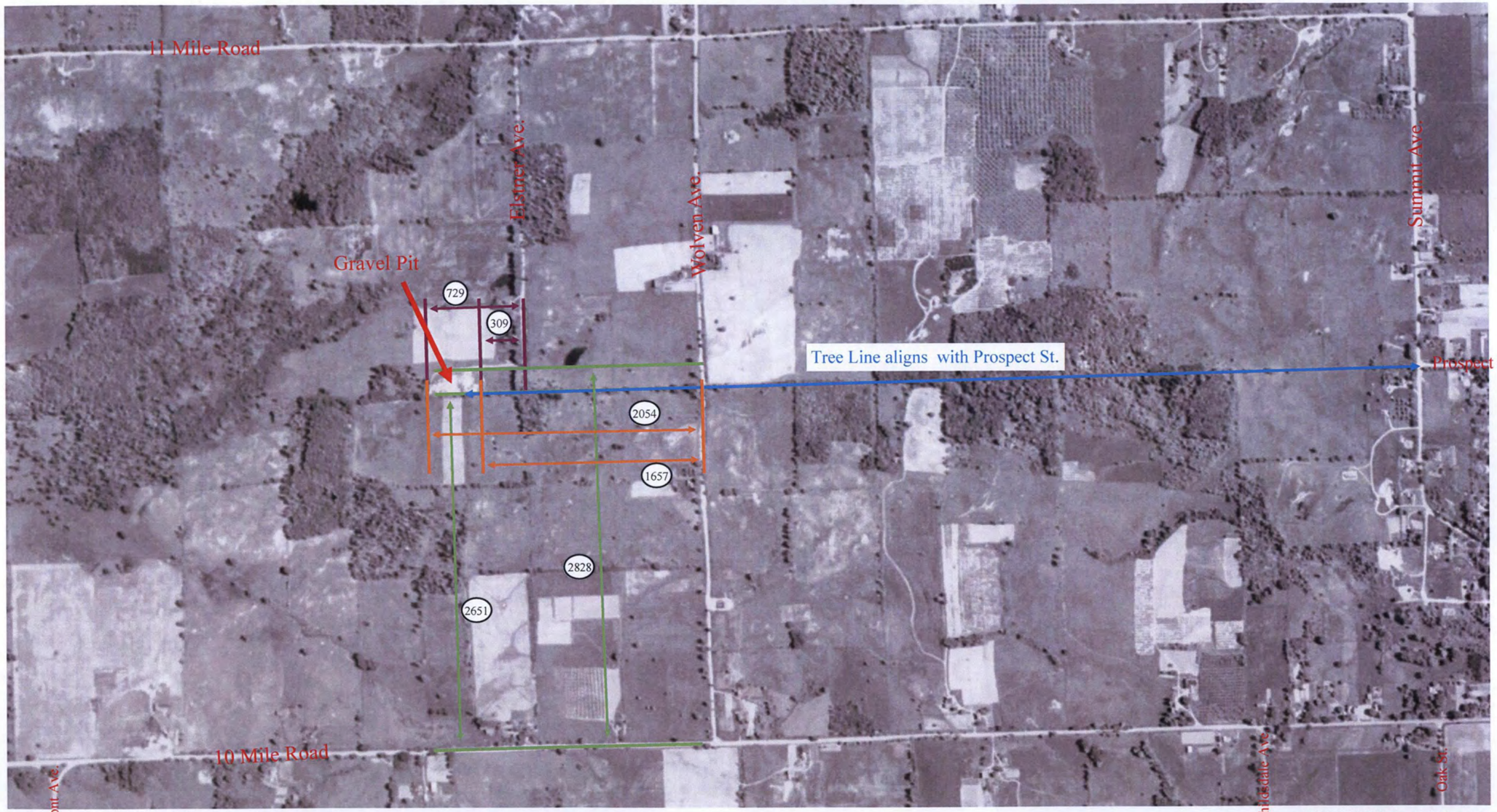
North

Stream or River

Note - Well depths have been placed over where the residences are.

Note - Results are the initial sample results for the drinking water well

Updated by the MDEQ-RRD-GR 12/7/2018



1953 USGS Aerial Image

Figure 3

Geospatial/Temporal Analysis of Wellington Ridge Gravel Pit

Algoma Township MI

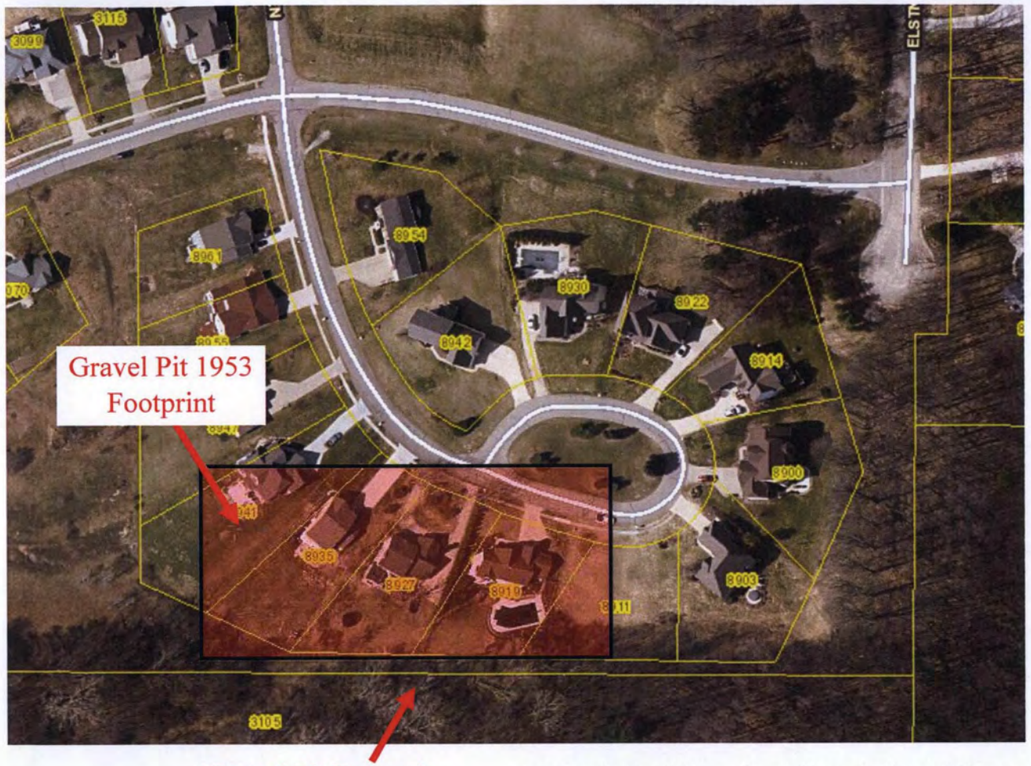
(2673) **Distance in Feet**

Distance from 10 Mile to Gravel Pit

Distance from Wolven to Gravel Pit

Distance from Elstner to Gravel Pit

Updated by the MDEQ-RRD-GR 7/11/2018



Images derived from Kent County Parcel Viewer

Updated by the MDEQ-RRD-GR 7/11/2018

Figure 4

Geospatial/Temporal Analysis of Wellington Ridge Gravel Pit

Algoma Township MI