

Supplemental Remedial Investigation Work Plan

**Cedar Springs Former Wastewater Treatment Lagoons Site
730 West Court Street
Cedar Springs, Michigan**

**Prepared For:
City of Cedar Springs**

**December 30, 2021
Project No. 201460**

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List of Abbreviations/Acronyms

- EGLE Michigan Department of Environment, Great Lakes, and Energy (formerly the MDEQ)
- PFAS per-and polyfluoroalkyl substances
- PFOA perfluorooctanoic acid
- PFOS perfluorooctanesulfonic acid

1.0 Introduction

This Supplemental Remedial Investigation Work Plan (Work Plan) has been prepared by Fishbeck on behalf of the City of Cedar Springs (City) in response to EGLE's demand for additional delineation of Per- and Polyfluoroalkyl Substances (PFAS) impacts in groundwater with respect to the former Cedar Springs wastewater lagoon area (site) (Figure 1).

This Work Plan was with the scope prepared as requested by Michigan Department of Environment, Great Lakes, and Energy (EGLE) during telephone conversations between representatives of Fishbeck and EGLE on November 18, 2021, and December 22, 2021.

1.1 Background

Remedial investigative activities are being performed by the City under the regulatory oversight of EGLE and in response to Violation Notice No. VN-011095 dated October 2, 2020, and Second Violation Notice No. SVN-01124.

The generalized hydrostratigraphy of the site consists of the following:

- A laterally extensive sequence of sand beginning near the ground surface and extending to approximately 30 feet below ground surface (bgs). The water table is located approximately 10 feet bgs. The resulting approximately 20-foot-thick saturated zone exhibits unconfined aquifer properties. Groundwater in this water-bearing zone is towards the west.
- A 40- to 70-foot-thick clay confining layer is present beneath the unconfined aquifer and extends to a depth of approximately 70- to 100- feet bgs.
- A lower confined aquifer is present beneath the clay confining layer beginning at a depth estimated at 70- to 100- feet bgs. The physical characteristics of this water-bearing zone have not been locally documented.

Within the PFAS group of chemicals, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), have been identified in the unconfined aquifer at concentrations greater than applicable Part 201 Cleanup Criteria. Additional background information can be found in the *Draft Revised Remedial Investigation and Feasibility Study Work Plan, Cedar Springs Former Wastewater Treatment Lagoons Site* (Fishbeck, February 2021), and the *Draft Remedial Investigation Report, Cedar Springs Former Wastewater Treatment Lagoons Site* (Fishbeck, September 2021).

1.2 Objectives and Scope

The objectives of this Work Plan are to respond to EGLE's requirement that the City:

1. Delineate PFAS impacts in the unconfined aquifer to the north and south of the former wastewater lagoon area; and
2. Demonstrate that PFAS impacts identified in the unconfined aquifer beneath the site have not migrated through the 40-70 foot thick clay confining layer and impacted the lower confined aquifer.

The scope of the proposed investigation is limited to what is presented herein. The proposed activities are anticipated to be sufficient to achieve the above objectives. Further investigation is not contemplated beyond this current Work Plan. Unless otherwise specified herein, the general investigation methods and procedures associated with the activities described in this report will be consistent with the *Draft Revised Remedial Investigation and Feasibility Study Work Plan* (Fishbeck, 2021) and are incorporated by reference herein.

2.0 Remedial Investigative Activities

The following section describes the remedial investigation activities to be performed. Drilling oversight will be completed under the supervision of a Fishbeck geologist. Refer to Figure 2 for a map depicting site features, existing monitoring wells, and locations of the proposed vertical aquifer profile and monitoring wells. Prior to initiating subsurface investigative activities, MISS Dig will be notified a minimum of 72-hours prior to the start of field activities, and any other necessary permits will be obtained.

2.1 Unconfined Aquifer

Delineation activities will be performed using the sonic method of drilling to install three monitoring wells. A nominal 6-inch diameter borehole will be advanced to the base of the target well screen interval using the dual walled drilling approach via a 4-inch diameter inner core barrel and 6-inch diameter outer drive casing. Continuous soil samples will be obtained at each location for geological logging (standard operating procedure [SOP] 04-30).

The locations of the three monitoring wells have been pre-determined. One of the wells will be positioned along the north side of the central former wastewater lagoon, while the other two wells will be installed within the 16 Mile Road Right-of-Way (ROW) to the south of the former wastewater lagoon area. Unless geological data collected during borehole advancement suggests otherwise, the monitoring wells will be screened from approximately 25 to 30 feet bgs (i.e., immediately above the contact between the unconfined aquifer and the clay confining layer).

Each monitoring well will be constructed with 2-inch-diameter, Schedule 40 polyvinyl chloride (PVC) well casing and factory slotted 0.010-inch well screen. A sand filter pack will be placed in the interval from the base of the well screen to 1 to 2 feet above the top of the well screen. A bentonite seal, approximately 2 feet thick, will be placed above the filter pack. A bentonite grout placed above the bentonite pellet seal will extend to approximately 2 feet bgs. A flush-mounted or aboveground, steel protective well cover will be cemented in place around the well.

2.2 Confined Aquifer

Delineation activities will be performed using the sonic method of drilling to install four monitoring wells and perform one vertical aquifer profile (VAP) location. To further minimize potential hydraulic communication between the unconfined and confined aquifers, at each location a temporary 7 or 8-inch diameter override casing will be advanced approximately five feet into the clay confining layer. Drilling, soil sample collection, and logging will be performed consistent with the methods described above.

2.2.1 Pre-Determined Monitoring Wells

The locations of three of the monitoring wells have been pre-determined and positioned adjacent to the proposed shallow monitoring wells. This will result in three pairs of shallow/deep monitoring wells which will allow for the determination of vertical hydraulic gradients between the unconfined and confined aquifers and the determination of the groundwater flow direction within the confined aquifer.

The three monitoring wells will be screened from approximately 115 to 120 feet bgs.¹ The monitoring wells will be constructed consistent with the approach described above.

¹ During a telephone conversation on December 22, 2021, between representatives of Fishbeck and EGLE, EGLE indicated that the proposed wells were to be installed approximately 10 to 20 feet below the bottom of the clay confining layer. As such, the actual screen intervals will be subject to change based on field conditions.

2.2.2 Groundwater Flow Mapping

Following installation of the three deep monitoring wells, static water level measurements will be collected using an electric tape and recorded to the nearest 0.01 foot (SOP 18-04). The static water level data will be converted to groundwater elevation data and used to generate a groundwater elevation contour map of the confined aquifer. Once the groundwater flow direction has been determined for the confined aquifer, the location of the VAP/fourth monitoring well will be determined. The location of the VAP/monitoring well will be positioned hydraulically downgradient of the former wastewater lagoon area. The proposed location will be provided to EGLE for review and concurrence prior to installation. EGLE will be kept informed of the investigation progress and a reasonable attempt will be made to determine the appropriate location for the VAP during a single drilling mobilization.

2.2.3 Vertical Aquifer Profile and Fourth Monitoring Well

One VAP will be performed in the confined aquifer to evaluate the potential vertical distribution of PFAS impacts to the underlying water-bearing zone. VAP will be performed using either push-ahead or temporary monitoring well sampling methods. Sampling will occur at approximately 10-foot intervals beginning just below the clay confining layer and extending to the bottom of confined aquifer or 200 feet bgs, whichever occurs first.

Groundwater sampling will be conducted in accordance with low-flow sampling procedures (SOPs 10-01 and 10-02) using a peristaltic pump or inertial pump, as appropriate, based on the depth to groundwater. As a deviation to the SOP, if stabilization of the field parameters is not achieved after 30 minutes of purging a groundwater sample will be obtained. Appropriate groundwater quality control samples will be obtained during VAP (SOP 10-11). All materials used for groundwater sampling will be Teflon and PFAS free.

Following VAP, a fourth permanent monitoring well will be installed in the borehole. The well will be screened in the middle of the confined aquifer, from approximately 145 to 150 feet bgs. The final screen interval will be adjusted based on geological observations. The monitoring well will be constructed consistent with the approach described above.

2.3 Development

Each well will be developed until free of suspended sediment.

2.4 Surveying

The wells will be surveyed by a Michigan licensed surveyor following completion to establish the horizontal coordinates and the top-of-casing elevation.

2.5 Monitoring Well Sampling

Groundwater elevation measurements will be collected from onsite monitoring wells prior to sampling activities using a decontaminated, electronic water level indicator meter, and recorded to the nearest 0.01 foot from the marked survey point on the top of the well casing.

Groundwater sampling will be conducted in accordance with low-flow sampling procedures consistent with the methods described above with one exception – the sample duration to allow for stabilization will be increased from 30 to 45 minutes.

2.6 Laboratory Analysis

Groundwater samples will be submitted for laboratory analysis of PFAS (28 compound list) using USEPA Method 537M. One duplicate sample and one field blank will be collected during the groundwater sampling for quality assurance/quality control (QA/QC) purposes.

2.7 Investigation Derived Waste

Investigation derived waste (IDW) generated from this investigation will include soil cuttings generated during drilling, decontamination water, development water, and purge water. The IDW will be sampled and stored onsite. Final disposition of the IDW will be determined following review of the laboratory analytical results.

3.0 Reporting

The remedial investigative activities and findings will be incorporated into the *Draft Remedial Investigation Report* (Fishbeck September 2021) and resubmitted for EGLE review. The updated report will include soil boring/well construction logs, vertical aquifer profile sample results, monitoring well construction details, monitoring well sampling results, an updated map illustrating the VAP and well locations, and a groundwater elevation contour map of the confined aquifer.

4.0 Schedule

Field activities will begin within 60 days following EGLE approval of the Work Plan. If circumstances outside of the City's control develop to prevent achieving this target schedule (i.e., obtaining access for drilling locations, authorization approval, contractor availability, inclement weather, etc.), we will communicate the schedule changes to EGLE.

Figures



Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

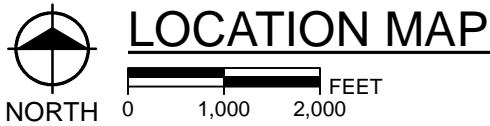
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Kent County, Michigan

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201460









FIGURE NO.
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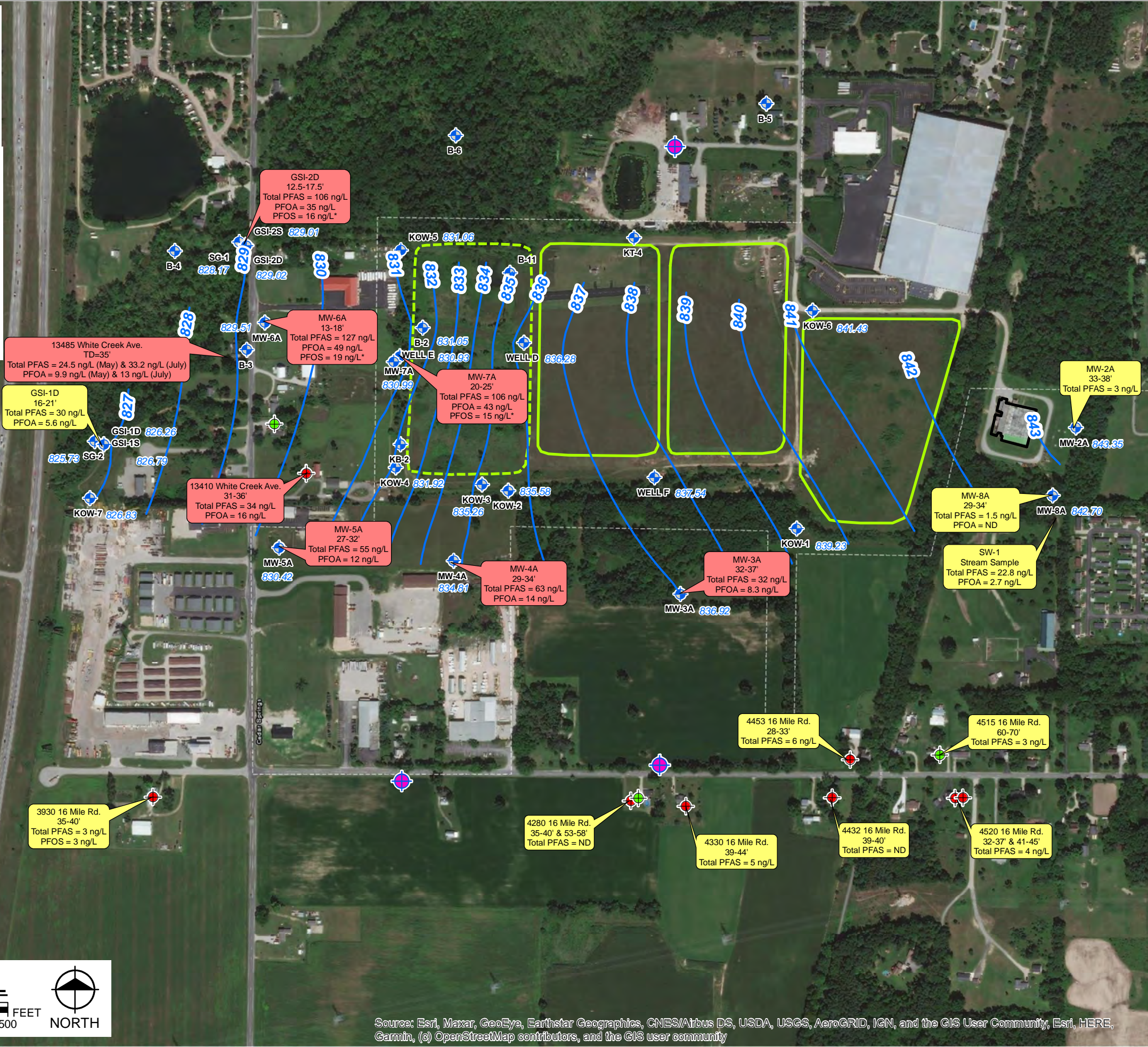
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LEGEND

-  Proposed Monitoring Well Cluster Location
-  Shallow Residential Well - Sampled by EGLE
-  Deep Residential Well - Sampled by EGLE
-  Shallow Groundwater Contour (ft amsl) - March 2021
-  Monitoring Well
-  Lagoon
- ND** No PFAS detected
- *** Exceeds PFOS GSI Criteria
-  Well was sampled and exceeded the Part 201 PFAS criteria.
-  Well was sampled and did NOT exceed the Part 201 PFAS criteria.



PROPOSED MONITORING WELL CLUSTER LOCATIONS

0 250 500 FEET

NORTH

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

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PLOT INFO: Z:\2020\201460\CAD\GIS\mapdoc\FIG01_SuppReport_ProposedWellLocations.mxd Date: 12/29/2021 4:39:43 PM User: bahannah