Stantec Consulting Services Inc.
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June 13, 2023
File: 193708803.100.002

Attention: **Mr. Hylton Jackson**
Iowa Department of Natural Resources
Solid Waste and Contaminated Sites Section
Wallace Building
502 East 9th Street
Des Moines, Iowa 50319-0034

Reference: **Voluntary Corrective Action Activities Work Plan**
Rockwell Collins
Main Plant
855 35th Street NE
Cedar Rapids, Iowa

Dear Mr. Jackson:

Stantec Consulting Services Inc. (Stantec), on behalf of Rockwell Collins, Inc. (Collins), has prepared this *Voluntary Corrective Action Activities Work Plan* (Work Plan) for the Main Plant site (Land Recycling Program Site [LRP] #2683), located at 855 35th Street NE., in Cedar Rapids, Iowa (Site) (Figure 1). The purpose of the Work Plan is to outline proposed voluntary corrective action activities, in the form of groundwater remediation activities, to be conducted at the Site ahead of completing a risk evaluation, pursuant to LRP requirements.

Collins proposes to conduct amendment injections in and around identified impacted areas and down-gradient of these areas. The goal of the injections is to achieve bioaugmentation and stimulation of chemical reduction and anerobic biodegradation of chlorinated volatile organic compounds (CVOCs) through vinyl chloride to ethene gas in identified source areas and prevent down-gradient migration of CVOCs. Secondarily, liquid activated carbon application is proposed to form a downgradient barrier with a high sorption capacity to reduce concentrations while destructive remediation occurs. This Work Plan outlines the scope of work for the implementation of direct push injection points for *in situ* treatment, baseline sampling, and remediation progress monitoring at the Site.

Concurrent to these groundwater remediation activities in the LRP, a pilot study is planned in the vicinity of monitoring well MW-07, using liquid activated carbon, to evaluate its effectiveness in reducing concentrations of pre- and polyfluoroalkyl substances (PFAS) detected in groundwater at this location.

BACKGROUND

The Site (Parcel #14104-27007-00000), owned by Rockwell Collins (d/b/a Collins Aerospace), consists of approximately 23.8 acres of land developed with 14 light-manufacturing buildings totaling approximately 342,000 square feet (approximately 7.8 acres). The remainder of the Site

Reference: Voluntary Corrective Action Activities Work Plan, Rockwell Collins, 35th Street Main Campus Site

(approximately 16 acres) consists of paved parking/driveways and landscaped areas. BAE Systems, who also co-occupied a portion of the facility beginning on July 31, 2020, vacated their portion of the facility in October 2022. Surrounding properties are mainly residential developments, including single family houses. Kenwood city park is north of the Site across 35th Street NE, and Elmcrest Golf and Country Club is located 500 feet northwest of the Site across 35th Street NE.

Phase II Environmental Site Assessment (ESA) activities were conducted at the Site in 2019 and documented in the Phase II ESA Report completed by Stantec, dated August 19, 2019 (Stantec, 2019). Additional assessment activities were performed in 2020 prior to the Site's enrollment in the Iowa Department of Natural Resources (IDNR) LRP. The investigation work in 2020 was summarized in three letter reports dated March 2, 2020, May 26, 2020, and October 2, 2020, all submitted to the IDNR with the LRP Application. During this effort, eleven direct-push soil borings, eleven groundwater monitoring wells, and 18 sub-slab soil vapor points were installed and sampled.

Additional assessment activities were completed at the Site in 2021 and 2022 to further assess the extent of impacts in soil and groundwater in accordance with the LRP Site Investigation Work Plan (2021 Work Plan). This work included:

- Additional soil borings
- Temporary monitoring well installation
- Permanent monitoring well installation
- Surveying and water level measurements
- Groundwater sampling
- Hydraulic conductivity testing

The locations of sampling activities, summarized in the Site Assessment Report (SA Report), submitted to the IDNR in January 2023, are shown on Figure 2.

The first groundwater saturated zone across the Site represents the water table, and generally occurs at approximately 6 to 8 feet below ground surface (bgs) within sand, silty sand, or sandy clay lithology. The shallow water table unit at the Site is a protected groundwater source, as defined by Rule 567 – 137.2 (455H), IAC. Groundwater flow in the shallow unconsolidated sediments at the Site appears to behave as a single unconfined aquifer. The shallow groundwater flow direction overall appears to be toward the west and southwest. Based on a log of a former on-site water well, limestone bedrock is preset at approximately 30 feet bgs. Hydrogeologic Cross-sections (and Cross-section locations) are depicted on Figures 3 through 5, as well as in the SA Report.

Results of sampling at the Site, described in detail in the SA Report, indicated the following groundwater VOC concentrations above IDNR Statewide Standards (SWSs):

- Cis-1,2-dichloroethene (cis-1,2-DCE) at MW-07, MW-08, MW-11, MW-12, MW-17, and TW-17
- Trichloroethene (TCE) at MW-07, MW-11, MW-17, TW-17, and TW-26
- Vinyl chloride (VC) at MW-11, MW-17, and TW-17.

Reference: Voluntary Corrective Action Activities Work Plan, Rockwell Collins, 35th Street Main Campus Site

Monitoring wells MW-07, MW-08, and MW-11 are located west of the Site buildings in the hydraulically downgradient direction. MW-12 is located in the City of Cedar Rapids (City) right-of-way (ROW) west of the Site south of the intersection of Eastern Avenue NE and Center Street. MW-17 is located south of building 165 adjacent to TW-17. Groundwater analytical data is summarized in Table 1.

Shallow groundwater is not actively used near the Site. The former on-site water well is cased in bedrock and is inactive. One public water supply well; associated with the Elmcrest Country Club, is located approximately 1,000 feet north-northwest of the Site. According to IDNR records, the well is cased 120 feet into bedrock and does not access the same water bearing unit as that being assessed at the Site.

Vapor Intrusion (VI) evaluation activities have been completed at the Site under separate cover including a VI Workplan (August 2021), VI Report (February 2022), and follow-up sampling events with data submittal letters (February 2022, May 2022, and November 2022). Based on the results of these efforts, Collins proposed discontinuing VI sampling unless and until site conditions changed, summarized in the most recent Monitoring Event Summary dated March 20, 2023.

VOLUNTARY CORRECTIVE ACTION ACTIVITIES

Data collected during historic site investigation and groundwater sampling events were used to determine the extent and scope of proposed groundwater remediation activities. The goals of groundwater remediation activities are to 1) reduce CVOC concentrations onsite west of facility building footprints to concentrations below Iowa SWSs for protected groundwater, and 2) prevent the migration of CVOCs at concentrations above Iowa SWSs for protected groundwater.

Groundwater parameters indicate that groundwater ranges from anerobic (0.01-1.00 milligrams per liter [mg/L] near MW-11, MW-12, MW-13, MW-14, MW-15, and MW-16) to mildly aerobic (up to 4.00 mg/L near MW-7, MW-8, and MW-17) as well as mildly reductive to mildly oxidizing (ORP generally varies between ~-75 to ~+200 mV, lowest near MW-11 and MW-12). Amendments were selected to create a highly reductive condition in site groundwater (using zero valent iron [as S-MicroZVI® [{S-MZVI}]), provide an electron donor (using emulsified vegetable oil [as 3-D Microelusion® {3DME}]), and provide bioaugmentation (using Bio-Dechlor INOCULUM Plus® [BDI Plus]). The goal of these amendments are to dechlorinate CVOCs in groundwater, including residual vinyl chloride. Further, a liquid activated carbon (using PlumeStop®) barrier will be injectioned will demobilize and further reduce CVOCs. A PlumeStop® barrier is also being using to pilot test its effectiveness to reduce PFAS concentrations.

The direct push injection approach will consist of amendment injections in 194 locations in the area west of Buildings 139 and 165, in an area primarily used for parking and facility deliveries, and along the western side of Eastern Avenue NE, controlled by the City (See Figure 6). Injection of S-MicroZVI®, 3-D Microemulsion® , and BDI Plus is to be conducted in a grid in the vicinity of monitoring well MW-17, where the highest CVOC concentrations have been detected (25 injection points, total), and as a 535-foot-long treatment wall extending from monitoring wells MW-06 to MW-09 (67 injection points). Injection of a 450-foot wall of granular carbon (as PlumeStop®) is also planned to capture and treat any remaining CVOCs offsite in Eastern Avenue NE (90 injection

points). A separate capture and treatment barrier, consisting of 12 injection points, is planned immediately east of monitoring well MW-07 to evaluate its effectiveness in treating PFAS on MW-07.

An Iowa One Call ticket will be submitted, a private ground penetrating radar survey (GPRS) will be completed, and boring locations will be cleared by hand-auger to the top of the first injection zone (5-7 feet) or at least to the depth of deepest utility (8 feet bgs in Eastern Avenue NE). Public utilities exist in the vicinity of planned down-gradient injections west of the facility, as depicted on Figure 6. Injection activities will be performed a minimum of 6 feet away from identified or suspected utilities.

In addition to injection activities, baseline sampling and effectiveness monitoring will be completed in select groundwater monitoring wells as described below. Safety Data Sheets (SDSs) and manufacturer cutsheets are available for injection amendment products in Attachment 2.

Pre-Field Activities

Prior to field work, Stantec will update the Site-specific Health and Safety Plan (HASP) which will address safety considerations during the work, including drilling, utilities, spill abatement and containment, and pressurized injection safety. Stantec will also request a waiver for an Underground Injection Control Permit from the United State Environmental Protection Agency (USEPA) to complete the injection work and confirm the IDNR Water Supply Section does not require a water allocation permit for the project. Site activities will also be coordinated with Collins personnel. Based on the scope of work, well permits are not required from the Linn County Health Department.

A ROW permit will be obtained from the City to include:

- Possible address obstruction
- Pavement cutting
- Excavation/boring fee
- Traffic control

A Traffic Control Plan (TCP) will be prepared to cover the duration of work occurring in the City ROW. Traffic control (signage and flaggers) will be subcontracted to a company from the approved list of City vendors. It is expected that a single lane closure will be required while completing injections in Eastern Avenue NE.

FluxTracer Passive Flux Meters

Prior to injection activities (approximately 4 weeks prior), one passive flux meter, provided by Regenesis, will be installed in monitoring well MW-12 to help identify preferential transport zones in shallow groundwater. The passive flux meter will be deployed for approximately two weeks to collect groundwater velocity and contaminant information at one-foot intervals within the saturated screened interval of MW-12. Following its deployment for approximately two weeks, the flux meter will be removed and returned to Regenesis for evaluation. The data collected by the passive flux meter will be used to confirm final injection amendment blends, locations, and intervals, with the goal of improving the effectiveness of the groundwater remediation activities. Additional Information on the passive flux meter is included as Attachment 3.

Reference: Voluntary Corrective Action Activities Work Plan, Rockwell Collins, 35th Street Main Campus Site

Baseline Sampling

Approximately one week prior to injection activities, baseline groundwater monitoring and sampling will be completed from a subset of monitoring wells (MW-2, MW-6 through MW-9 and MW-11 through MW-17). The seventeen Site monitoring wells will be opened and gauged to obtain static groundwater elevations prior to groundwater sampling activities.

As part of the baseline groundwater sampling activities, monitoring wells will be purged and sampled for parameters using low-flow well sampling procedures. Wells will be purged with a submersible pump or peristaltic pump until readings of pH, conductivity, ORP, DO, turbidity, and temperature have stabilized. Groundwater elevations in each well will be monitored before and during purging.

With the exception of monitoring wells MW-07, groundwater purging and sampling will be conducted using the same methodologies outlined in the approved Site Investigation Work Plan. Groundwater samples will be collected and analyzed for VOCs using EPA Method 8260C. Analysis will be subcontracted to Eurofins Environment Testing (Eurofins) with groundwater samples to be analyzed by their Cedar Falls, Iowa laboratory.

The groundwater samples collected from monitoring wells MW-07, MW-12, and MW-17 will also be analyzed by Eurofins for the presence of select performance monitoring parameters [Dissolved Iron (EPA Method 6000), Dissolved Manganese (EPA Method 6000), Sulfate (EPA Method 9056), Sulfide (Standard Method (SM) 4500), Nitrate (EPA Method 9056), Total Organic Carbon (TOC, EPA Method 9060), Chloride (EPA Method 9056), and Methane/Ethane/Ethene/CO2 (R.S. Kerr (RSK) 175)]. A groundwater sample from monitoring well MW-2 will also be analyzed for these parameters as an up-gradient background baseline.

The groundwater gauging, purging, and sampling procedures for monitoring well MW-07 will be modified so to also follow the IDNR's *Collection of Public Drinking Water Samples for Pre- and Poly FluoroAlkyl Substances (PFAS) Standard Operating Procedures* (February 23, 2021). Following collection, the sample from MW-7 will be analyzed for the presence of PFAS using EPA Method 533. The groundwater samples will be collected to establish baseline conditions to evaluate the effectiveness of the liquid activated carbon barrier to be installed as a pilot test near monitoring well MW-07.

Direct-Push Injections

Stantec will supervise the completion of the amendment injections in the areas depicted on Figure 6. The mixing and application of the amendments will be conducted by REGENESIS® Remediation Services (RSS). Advancement of injection tooling to allow for the amendment applications will be completed by Below Ground Surface, Inc. (BGS), a licensed well contractor in the state of Iowa. Each injection point will first be pre-cleared using a hand-auger to a depth of at least five-feet bgs to confirm no unmarked utilities or other obstructions are present to these depths that would conflict with probe advancement. The injections will be completed via a direct-push drill rig using 1.5-inch diameter injection tooling target the shallow groundwater bearing zone. The injection activities are

proposed to be completed from the water table, as gauged from nearby monitoring wells to a depth of up to 15 feet bgs, the depth in which a stiff clayey silt and/or weather rock is encountered. Injection pressures will be adjusted based on the lithology of the current target interval, and based on the CVOC transmissive zones are determined from the passive flux meter results. Injections are anticipated to be completed in a top-down fashion, as feasible, to reduce the risk of injection fluid being directed into a prior, more permeable injection interval rather than the intended treatment interval. If utility clearance via hand-auguring extends into the water table, a bottom-up injection method may be employed at those locations.

The proposed injections will be completed from approximately 5 feet bgs to 15 feet bgs and intervals will vary based on depth to groundwater and subsurface conditions. The injections will target four locations as shown in Regenesis' Treatment Specs table (Attachment 1). Based on location, a mix of PlumeStop®, 3DME, S-MZVI, and/or BDI+ will be used to achieve treatment dosage (Figure 6).

Details of the injection activities provided by RSS are presented in Attachment 1. Amendment mixing will be conducted in a trainer owned and staffed by RSS to combine and deliver dry and wet amendments. The trailer(s) will be placed within secondary containment. The exact quantities may be modified in the field based on observed conditions. Monitoring will also be conducted for surfacing of product. Should excessive surfacing be observed, injection activities will cease until the surfaced material has been removed. Surfaced materials will be vacuumed off the ground and containerized for disposal or potential reinjection at another location.

During injections, Stantec will monitor depth-to-water (DTW) level in permanent monitoring wells near injection points to aid in determining radius of influence (ROI). This will be completed by manually measuring DTW with a water level probe at nearby monitoring wells and mounting pressure transducers in certain target well for the duration of injection activities. A calibrated down-well water quality meter will be onsite to collect live readings during injection activities. In areas where PlumeStop® is being installed, grab samples of groundwater from existing monitoring wells may be collected to evaluate color changes. Similarly, soil borings may be advanced to look for PlumeStop® distribution in soil core samples. Stantec and RSS will use this information to confirm ROI and application effectiveness in real time.

Following completion of the injection activities, each borehole will be sealed with bentonite to within 6-inches of the ground surface. Un-paved areas will be backfilled with potting soil and compacted to the ground surface. Paved areas will either be patched by the contractor pursuant to City requirements, or repaired by Collins, depending on location. Hand-augered soils and any liquid wastes will be drummed for off-site disposal by Heritage.

Post-Treatment Groundwater Monitoring

Upon completion of the amendment injections, Stantec will implement a post-injection monitoring program to evaluate treatment effectiveness. The field and laboratory parameters and sampling methodology used will be the same as those summarized in the baseline sampling section. The subject wells will be sampled using low-flow methodology quarterly for four calendar quarters.

Purge water collected during monitoring events will be placed in labeled drums by Stantec and removed and disposed by Heritage. Post-injection groundwater monitoring data will be evaluated and used to select future remedial actions, as necessary.

Data Analysis and Reporting

Following completion of the injection activities and receipt of analytical laboratory results, a voluntary corrective action implementation report will be prepared for submittal to IDNR to document the site activities and discuss any deviations from the Work Plan. The report will include a copy of the UIC waiver request response from EPA, the water allocation permit inquiry response from IDNR, private utility locate report, an updated site plan, groundwater data tables and figures, analytical laboratory reports and chain of custody forms, field sampling forms and daily field reports, RSS injection logs, and a photographic log.

Following each post-treatment monitoring event, Stantec will evaluate the data quality to determine usability. Following completion of quarterly post-injection monitoring, Stantec will provide a summary of the results and recommendation to Collins and IDNR whether to modify or continue post-treatment monitoring, conduct a risk assessment, or whether additional voluntary corrective action activities are proposed. Stantec, on behalf of Collins, will submit a summary report to the IDNR describing the sampling activities, CVOC degradation trends and PFAS sampling results, results of geochemical observations analyses, as well as conclusions and recommendations. The summary report will include updated summary tables and figures, field sampling forms, laboratory analytical reports, and chain-of-custody forms for groundwater samples.

SCHEDULE

Pending IDNR approval, Stantec has provided an estimated duration for planned groundwater remediation sampling activities, pending IDNR approval. The following is a tentative duration and schedule for injection and monitoring activities:

- Permitting and preparation – one month;
- Baseline groundwater sampling and flux monitoring – two weeks (concurrent with permitting);
- Direct push injections – five weeks;
- Monitoring – quarterly for 4 calendar quarters.

Pending regulatory approval, permitting, preparation, and baseline sampling are expected to be completed by July 2023. Injection activities are planned to begin in late August 2023. The exact timing of the injection activities is also contingent of facility access the areas to be remediated, approval of City permitting, subcontractor and material availability, and weather.

Reference: Voluntary Corrective Action Activities Work Plan, Rockwell Collins, 35th Street Main Campus Site

Please feel free to contact me should you have any questions or comments regarding this Work Plan.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Stephen Varsa, P.G., R.G.
Principal Hydrogeologist
Phone: 515-251-1020
steve.varsa@stantec.com

cc: John Wolski, RTX

List of Enclosures:

Table 1 – Historic VOC Concentrations
Table 2 – Historic GW Elevation Data

Figure – 1 Site Location Map
Figure – 2 Site Plan and Sampling Locations
Figure – 3 Cross Section Trace Map
Figure – 4 Cross Section A-A'
Figure – 5 Cross Section B-B'
Figure – 6 Proposed Injection Locations

Attachment 1 – Regenesis Technical Approach and Dosing Calculations
Attachment 2 – Safety Data Sheets
Attachment 3 – Passive Flux Meter Information

TABLES

TABLE 1
GROUNDWATER ANALYTICAL RESULTS - VOCs
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Parameters	Iowa Statewide Standards Protected Source	Iowa Statewide Standards Non-Protected Source	Sample ID:	MW-01	MW-02	MW-03	MW-03	MW-03	MW-04	MW-05	MW-06	MW-07	DP-01 (MW-07)	MW-07	MW-07	DUP-01 (MW-07)	MW-07	MW-07	MW-07
			Sample Date:	6/26/19	6/26/19	6/26/19	2/7/2020	9/9/2020	6/26/2019	6/25/2019	6/27/2019	6/27/2019	6/27/2019	2/7/2020	9/9/2020	9/9/2020	1/13/2022	4/11/2022	7/12/2022
Volatile Organic Compounds (µg/L)																			
Acetone	6300	32000		**13.6**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	5	64		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	80	400		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	80	440		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromomethane	10	50		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
2-Butanone (MEK)	400	21000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	5	50		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	100	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	80	400		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	2800	14000		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Chloroform	80	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloromethane	NA	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	75	650		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	140	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	5	38		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	7	180		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	**70**	**350**		<1	<1	<1	<1	<1	<1	<1	<1	**74**	**64.1**	**24.2**	**53.0**	**50.3**	**61.5**	**15.7**	**98.7**
trans-1,2-Dichloroethene	100	700		<1	<1	<1	<1	<1	<1	<1	<1	**4.37**	**3.79**	**9.69**	**9.46**	**9.89**	**6.53**	**5.52**	**6.18**
1,2-Dichloropropane	5	60		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Hexanone	NA	NA		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(MIBK)	560	2800		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	1800		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methyl tert-butyl ether	210	1000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	100	700		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	0.3	18		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	1700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1000	5000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	200	70000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	5	61		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	**5**	**76**		<1	<1	<1	<1	<1	<1	<1	<1	**16.5**	**13.7**	**15.4**	**16.3**	**15.8**	**12.6**	**9.61**	**20.6**
Vinyl chloride	**2**	10		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes, Total	10000	50000		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3

Notes:

Results and comparison criteria are in micrograms per liter (µg/L).

Iowa Statewide Standards reference: https://programs.iowadnr.gov/riskcalc/Home/statewidestandards.

VOCs = Volatile Organic Compounds.

< = The analyte did not exceed the reporting limit.

NA = No established criteria for the selected analyte/category.

Detected results are **bold**.

Shaded results exceed Iowa Statewide Standards for Protected Source.

Shaded results with underline exceed Iowa Statewide Standards for Non-Protected Source.

TABLE 1
GROUNDWATER ANALYTICAL RESULTS - VOCs
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Parameters	Iowa Statewide Standards Protected Source	Iowa Statewide Standards Non-Protected Source	Sample ID:	MW-07	MW-08	MW-08	MW-08	DUP-01 (MW-08)	MW-08	MW-08	MW-08	MW-08	MW-09	MW-10	MW-11	MW-11	MW-11	MW-11	DUP01 (MW-11)
			Sample Date:	9/7/2022	6/25/2019	2/7/2020	9/9/2020	2/7/2020	1/13/2022	4/11/2022	7/12/2022	9/7/2022	6/25/2019	6/25/2019	5/7/2020	9/9/2020	1/13/22	4/12/2022	4/12/2022
Volatile Organic Compounds (µg/L)																			
Acetone	6300	32000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	5	64		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	80	400		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	80	440		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromomethane	10	50		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
2-Butanone (MEK)	400	21000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	5	50		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	100	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	80	400		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	2800	14000		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Chloroform	80	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloromethane	NA	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	75	650		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	140	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	5	38		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	7	180		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	**70**	**350**		**115**	**85.9**	**11.8**	**22.0**	**11.7**	**13.3**	**9.78**	**21.8**	**38.8**	<1	<1	**109**	**125**	**109**	**107**	**110**
trans-1,2-Dichloroethene	100	700		**7.37**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**2.36**	**3.44**	**3.91**	**4.47**	**4.22**
1,2-Dichloropropane	5	60		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Hexanone	NA	NA		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(MIBK)	560	2800		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	1800		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methyl tert-butyl ether	210	1000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	100	700		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			<5	<5
1,1,2,2-Tetrachloroethane	0.3	18		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	1700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1000	5000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	200	70000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	5	61		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	**5**	**76**		**20.6**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**5.03**	**15.4**	**6.85**	**9.87**	**10.6**
Vinyl chloride	**2**	10		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**2.5**	**1.61**	**1.13**	**3.00**	**2.92**
Xylenes, Total	10000	50000		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3

Notes:

Results and comparison criteria are in micrograms per liter (µg/L).
Iowa Statewide Standards reference: https://programs.iowadnr.gov/riskcalc/Home/
VOCs = Volatile Organic Compounds.
< = The analyte did not exceed the reporting limit.
NA = No established criteria for the selected analyte/category.
Detected results are **bold**.
Shaded results exceed Iowa Statewide Standards for Protected Source.
Shaded results with underline exceed Iowa Statewide Standards for Non-Protected S

TABLE 1
GROUNDWATER ANALYTICAL RESULTS - VOCs
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Parameters	Iowa Statewide Standards Protected Source	Iowa Statewide Standards Non-Protected Source	Sample ID:	MW-11	MW-11	DUP01 (MW-11)	MW-12	MW-12	MW-12	MW-12	MW-13	DUP01 (MW-13)	MW-13	MW-13	MW-13	MW-14	MW-15	MW-16	MW-17
			Sample Date	7/12/2022	9/7/2022	9/7/2022	1/13/22	4/12/2022	7/12/2022	9/7/2022	1/13/22	1/13/22	4/12/2022	7/12/2022	9/7/2022	9/7/2022	9/7/2022	9/7/2022	9/7/2022
Volatile Organic Compounds (µg/L)																			
Acetone	6300	32000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	5	64		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	80	400		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	80	440		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromomethane	10	50		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
2-Butanone (MEK)	400	21000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	5	50		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	100	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	80	400		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	2800	14000		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Chloroform	80	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloromethane	NA	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	75	650		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	140	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	5	38		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	7	180		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	**70**	**350**		**101**	**108**	**106**	**5.20**	**55.2**	**109**	**24.6**	**10.7**	**9.24**	**6.76**	**11.8**	**8.28**	<1	**4.87**	**19.5**	**1310**
trans-1,2-Dichloroethene	100	700		**5.59**	**5.06**	**4.98**	<1	**5.11**	**10.5**	**2.08**	<1	<1	<1	<1	<1	<1	<1	<1	**8.02**
1,2-Dichloropropane	5	60		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Hexanone	NA	NA		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(MIBK)	560	2800		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	1800		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methyl tert-butyl ether	210	1000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	100	700		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	0.3	18		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	1700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1000	5000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	200	70000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	5	61		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	**5**	**76**		**14.1**	**9.25**	**8.54**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**60.2**
Vinyl chloride	**2**	10		<1	**1.71**	**1.87**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**6.62**
Xylenes, Total	10000	50000		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3

Notes:

Results and comparison criteria are in micrograms per liter (µg/L).
Iowa Statewide Standards reference: https://programs.iowadnr.gov/riskcalc/Home/
VOCs = Volatile Organic Compounds.
< = The analyte did not exceed the reporting limit.
NA = No established criteria for the selected analyte/category.
Detected results are **bold**.
Shaded results exceed Iowa Statewide Standards for Protected Source.
Shaded results with underline exceed Iowa Statewide Standards for Non-Protected S

TABLE 1
GROUNDWATER ANALYTICAL RESULTS - VOCs
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Parameters	Iowa Statewide Standards Protected Source	Iowa Statewide Standards Non-Protected Source	Sample ID:	SB-17/TW-17	SB-19/TW-19	SB-20/TW-20	SB-21/TW-21	SB-22/TW-22	SB-23/TW-23	SB-24/TW-24	SB-25/TW-25	SB-26/TW-26	SB-27/TW-27	SB-28/TW-28
			Sample Date:	4/13/2022	4/13/2022	4/13/2022	4/13/2022	4/14/2022	4/13/2022	4/13/2022	4/13/2022	4/13/2022	4/14/2022	4/13/2022
Volatile Organic Compounds (µg/L)														
Acetone	6300	32000		<10	<10	**14.7**	<10	<10	**21.6**	<10	<10	<10	<10	<10
Benzene	5	64		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	80	400		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	80	440		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromomethane	10	50		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
2-Butanone (MEK)	400	21000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	5	50		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	100	700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	80	400		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	2800	14000		<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Chloroform	80	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloromethane	NA	NA		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	600	3200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	75	650		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	140	700		**1.02**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	5	38		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	7	180		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
cis-1,2-Dichloroethene	**70**	**350**		**481**	<1	**1.17**	<1	<1	<1	<1	**1.57**	**47.0**	<1	<1
trans-1,2-Dichloroethene	100	700		**6.47**	<1	<1	<1	<1	<1	<1	<1	**2.94**	<1	<1
1,2-Dichloropropane	5	60		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	NA	NA		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	700	3500		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Hexanone	NA	NA		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(MIBK)	560	2800		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	1800		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methyl tert-butyl ether	210	1000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	100	700		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	0.3	18		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	5	1700		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1000	5000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	200	70000		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	5	61		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	**5**	**76**		**106**	<1	<1	**2.31**	<1	<1	<1	<1	**9.59**	**1.02**	<1
Vinyl chloride	**2**	10		**5.37**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes, Total	10000	50000		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3

Notes:

Results and comparison criteria are in micrograms per liter (µg/L).
Iowa Statewide Standards reference: https://programs.iowadnr.gov/riskcalc/Home/
VOCs = Volatile Organic Compounds.
< = The analyte did not exceed the reporting limit.
NA = No established criteria for the selected analyte/category.
Detected results are **bold**.
Shaded results exceed Iowa Statewide Standards for Protected Source.
Shaded results with underline exceed Iowa Statewide Standards for Non-Protected S

TABLE 2
GROUNDWATER ELEVATION DATA
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Well Identification	Date	Depth to Water (feet)	Groundwater Elevation (feet amsl)
MW-01	6/24/2019	4.10	785.76
	2/7/2020	NM	NM
	5/7/2020	6.18	783.68
	9/9/2020	2.88	786.98
	1/4/2022	7.85	782.01
	4/11/2022	4.85	785.01
	7/11/2022	3.80	786.06
	9/6/2022	6.45	783.41
MW-02	6/24/2019	7.43	772.27
	2/7/2020	10.70	769.00
	5/7/2020	10.40	769.30
	9/9/2020	11.32	768.38
	1/4/2022	12.44	767.26
	4/11/2022	12.87	766.83
	5/10/2022	11.96	767.74
	7/11/2022	10.95	768.75
	9/6/2022	11.72	767.98
MW-03	6/24/2019	7.20	772.70
	2/7/2020	10.67	769.23
	5/7/2020	NM	NM
	9/9/2020	11.15	768.75
	1/4/2022	12.39	767.51
	4/11/2022	13.08	766.82
	5/10/2022	12.12	767.78
	7/11/2022	10.84	769.06
	9/6/2022	11.69	768.21
MW-04	6/24/2019	3.77	775.84
	2/7/2020	4.30	775.31
	5/7/2020	NM	NM
	9/9/2020	4.31	775.30
	1/4/2022	4.83	774.78
	4/11/2022	4.26	775.35
	5/10/2022	3.92	775.69
	7/11/2022	4.05	775.56
	9/6/2022	4.73	774.88

TABLE 2
GROUNDWATER ELEVATION DATA
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Well Identification	Date	Depth to Water (feet)	Groundwater Elevation (feet amsl)
MW-05	6/24/2019	6.17	771.32
	2/7/2020	7.67	769.82
	5/7/2020	7.41	770.08
	9/9/2020	8.43	769.06
	1/4/2022	9.24	768.25
	4/11/2022	8.15	769.34
	5/10/2022	7.32	770.17
	7/11/2022	7.56	769.93
	9/6/2022	8.75	768.74
MW-06	6/24/2019	6.44	768.00
	2/7/2020	6.57	767.87
	5/7/2020	6.42	768.02
	9/9/2020	6.39	768.05
	1/4/2022	6.93	767.51
	4/11/2022	6.36	768.08
	5/10/2022	6.19	768.25
	7/11/2022	6.25	768.19
	9/6/2022	6.86	767.58
MW-07	6/24/2019	6.72	769.14
	2/7/2020	7.17	768.69
	5/4/2020	7.51	768.35
	5/7/2020	NM	NM
	9/9/2020	7.61	768.25
	1/4/2022	8.08	767.78
	4/11/2022	7.44	768.42
	5/10/2022	7.21	768.65
	7/11/2022	7.38	768.48
	9/6/2022	7.88	767.98
MW-08	6/24/2019	5.61	770.10
	2/7/2020	6.26	769.45
	5/7/2020	6.55	769.16
	9/9/2020	6.60	769.11
	1/4/2022	7.17	768.54
	4/11/2022	6.51	769.20
	5/10/2022	6.21	769.50
	7/11/2022	6.12	769.59
	9/6/2022	6.81	768.90

TABLE 2
GROUNDWATER ELEVATION DATA
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Well Identification	Date	Depth to Water (feet)	Groundwater Elevation (feet amsl)
MW-09	6/24/2019	7.95	769.48
	2/7/2020	8.87	768.56
	5/7/2020	8.87	768.56
	9/9/2020	8.98	768.45
	1/4/2022	9.69	767.74
	4/11/2022	9.12	768.31
	5/10/2022	8.61	768.82
	7/11/2022	8.51	768.92
	9/6/2022	9.32	768.11
MW-10	6/24/2019	5.81	770.64
	2/7/2020	7.04	769.41
	5/7/2020	7.01	769.44
	9/9/2020	6.90	769.55
	1/4/2022	7.99	768.46
	4/11/2022	7.38	769.07
	5/10/2022	6.84	769.61
	7/11/2022	6.51	769.94
	9/6/2022	7.50	768.95
MW-11	5/7/2020	7.46	767.74
	9/9/2020	7.52	767.68
	1/4/2022	7.87	767.33
	4/11/2022	7.48	767.72
	7/11/2022	7.38	767.82
	9/6/2022	7.86	767.34
MW-12	1/4/2022	7.25	767.15
	4/11/2022	6.84	767.56
	7/11/2022	6.79	767.61
	9/6/2022	7.25	767.15
MW-13	1/4/2022	7.17	767.23
	4/11/2022	6.68	767.72
	7/11/2022	6.62	767.78
	9/6/2022	7.13	767.27
MW-14	9/6/2022	7.62	767.25
MW-15	9/6/2022	6.73	767.18
MW-16	9/6/2022	7.74	767.10
MW-17	9/6/2022	7.74	769.89

TABLE 2
GROUNDWATER ELEVATION DATA
ROCKWELL COLLINS
855 35TH STREET - CEDAR RAPIDS, IOWA

Well Identification	Date	Depth to Water (feet)	Groundwater Elevation (feet amsl)
TW-17	4/13/2022	9.16	768.71
TW-19	4/13/2022	3.57	776.53
TW-20	4/13/2022	5.42	774.79
TW-21	4/13/2022	14.12	766.86
TW-22	4/13/2022	12.63	766.95
TW-23	4/13/2022	12.51	766.90
TW-24	4/13/2022	7.08	767.84
TW-25	4/13/2022	6.76	768.54
TW-26	4/13/2022	8.14	767.85
TW-27	4/14/2022	7.57	768.16
TW-28	4/13/2022	9.23	768.31

Notes:

Depth measured from top of well casing (TOC).

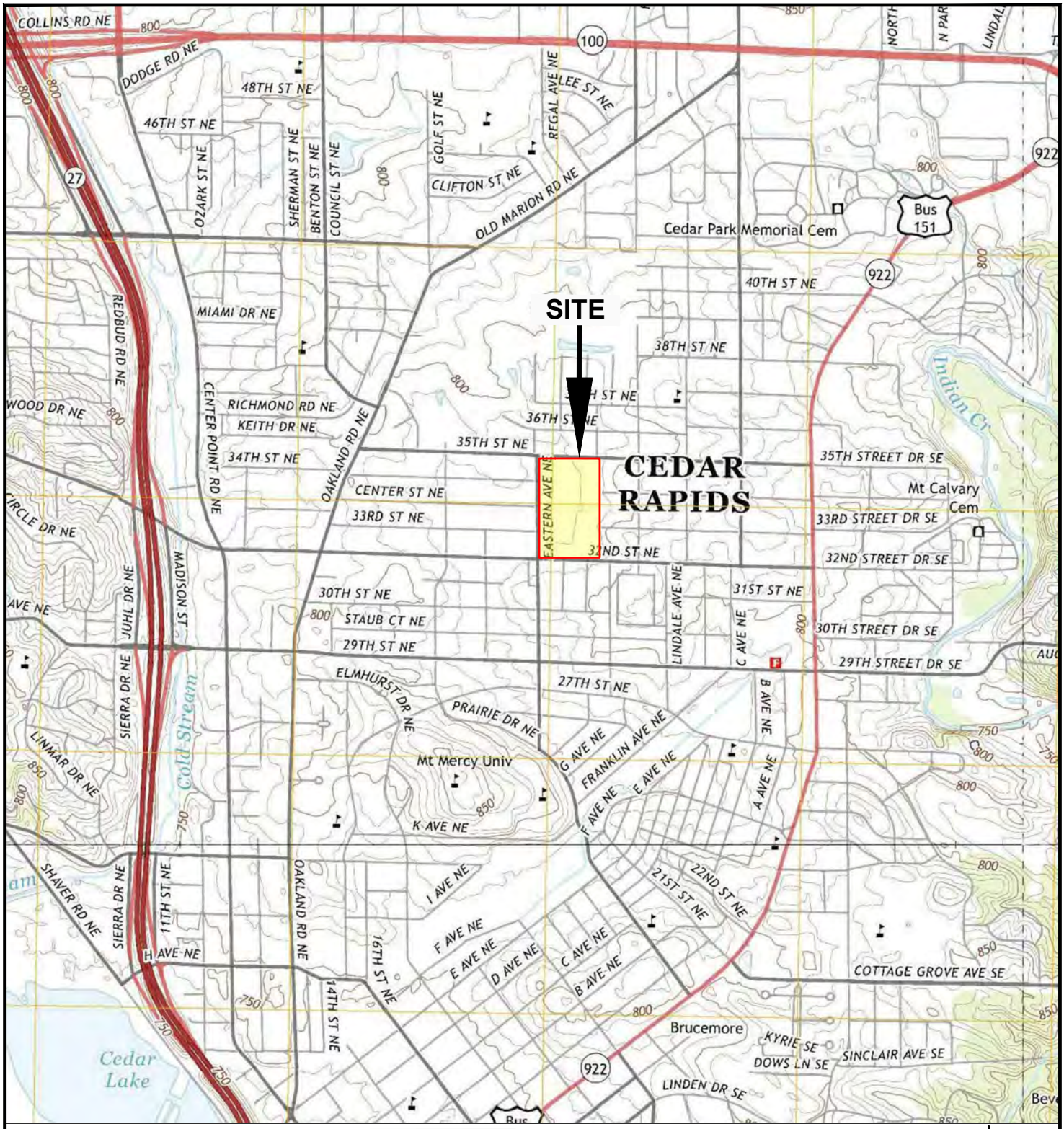
Elevation is measured in feet above mean sea level (amsl).

Temporary wells TW-17 and TW-19 to TW-28 were gauged once and then plugged.

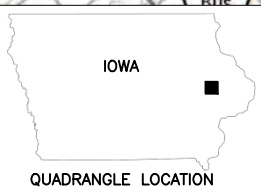
TW-18 is missing in the sequence of temporary wells because the planned location hit auger refusal and TW-18 was not installed.

NM = Not measured because well was not accessible.

FIGURES



SOURCE MAP–
USGS 7.5 MINUTE
TOPOGRAPHIC MAP
CEDAR RAPIDS NORTH, IOWA 2013



QUADRANGLE LOCATION

0 1800 3600

APPROXIMATE SCALE (FEET)

N

Stantec

11311 AURORA AVENUE
DES MOINES, IA 50322
PHONE:(515) 253-0830 FAX:(515) 253-9592

FOR:

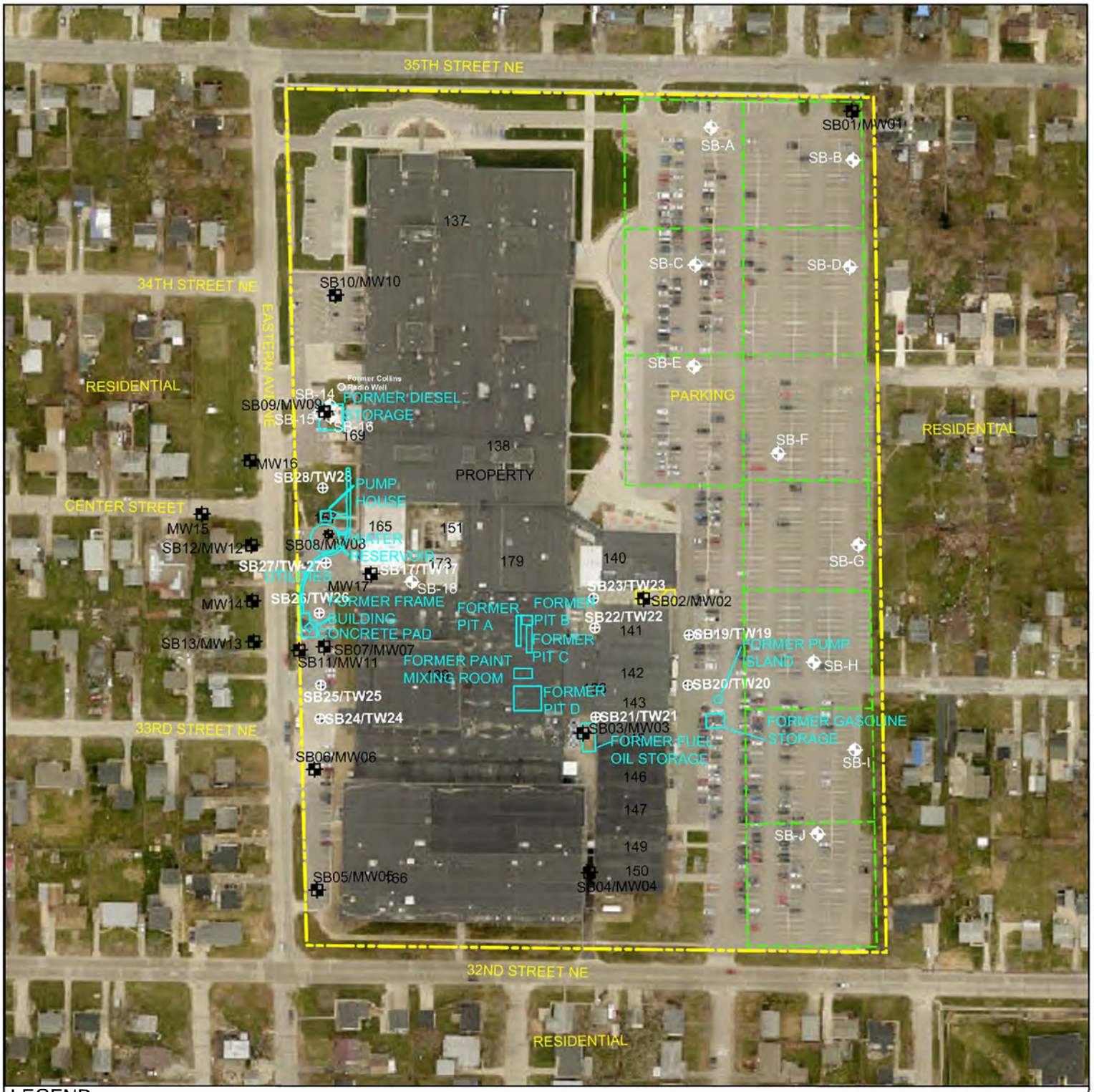
ROCKWELL COLLINS FACILITY
855 35TH STREET
CEDAR RAPIDS, IOWA 52498

SITE LOCATION MAP

FIGURE: 1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
193706862	JLF			08/08/19

FILEPATH:C:\pwworkdir\dms41070\Fig 1 Main Plant.dwg|shansen|Feb 01, 2021 at 21:35|Layout: FIGURE 1



LEGEND:

- MONITORING WELL LOCATIONS
- SOIL BORING LOCATION
- TEMPORARY MONITORING WELL LOCATIONS
- HISTORICAL SITE FEATURES
- PROPERTY BOUNDARY
- SOIL BACKGROUND ARSENIC SAMPLING AREA
- 2017 SOIL EXCAVATION AREA

0 200 400

APPROXIMATE SCALE (FEET)

N

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FOR:
ROCKWELL COLLINS FACILITY
855 35TH STREET
CEDAR RAPIDS, IOWA 52498

SITE PLAN AND SAMPLING LOCATIONS

FIGURE: 2

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
193708679	SAH	SRV	SRV	11/04/2022

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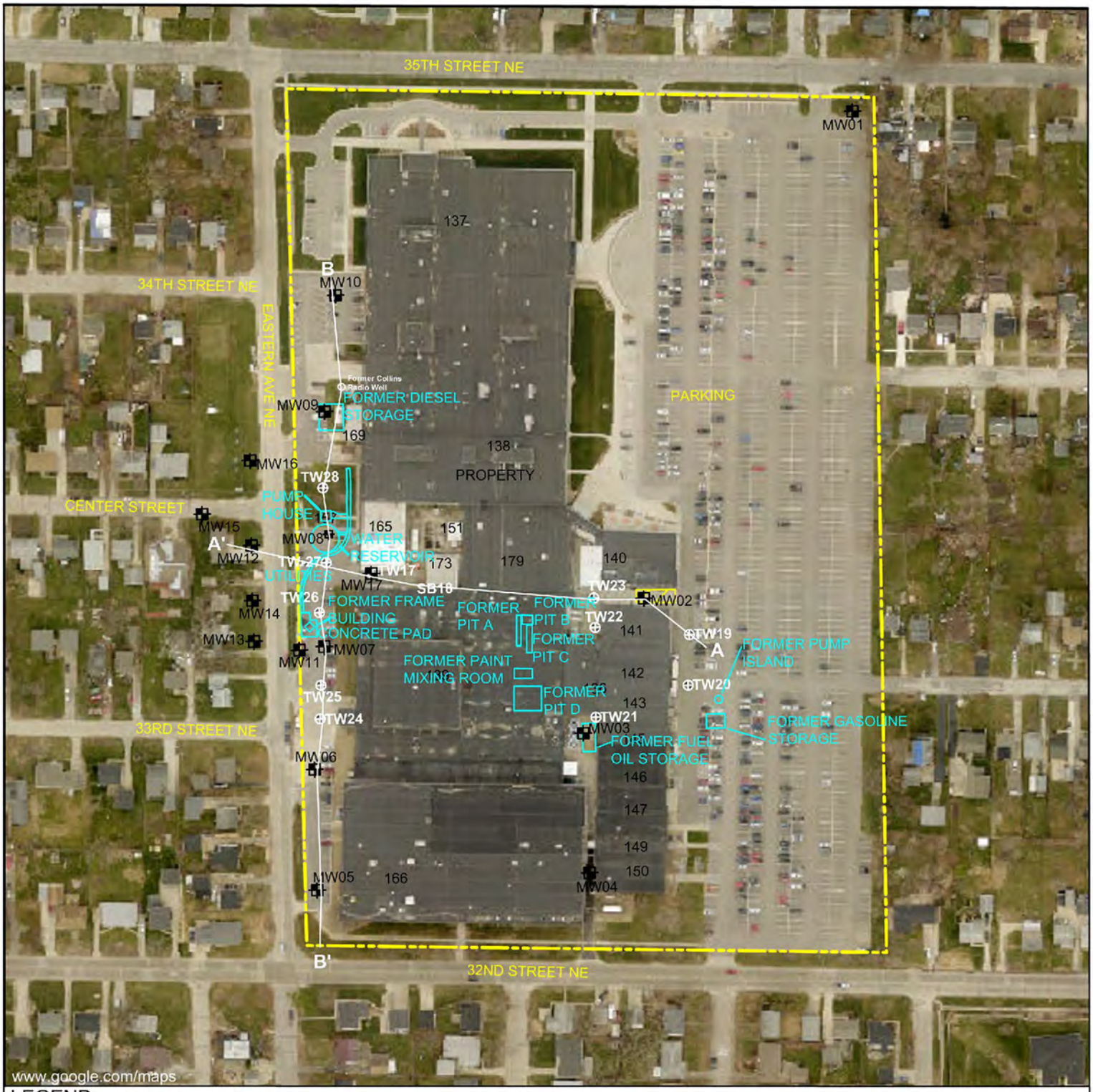

LEGEND:

- MONITORING WELL LOCATIONS
- TEMPORARY MONITORING WELL LOCATIONS
- PROPERTY BOUNDARY
- CROSS SECTION TRACE
- HISTORICAL SITE FEATURES
- 2017 SOIL EXCAVATION AREA

0 200 400

APPROXIMATE SCALE (FEET)

N

Stantec

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DES MOINES, IA 50322
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FOR:
ROCKWELL COLLINS FACILITY
855 35TH STREET
CEDAR RAPIDS, IOWA 52498

CROSS-SECTION TRACE MAP

FIGURE: 3

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
193708679	SAH	RSM	SRV	11/14/2022

FILEPATH:C:\pwworkdir\d0102571\Main Plant 35th St x-section trace 2022-06.dwg|shansen|Nov 14, 2022 at 17:14|Layout: PH2 F3

A

A'

Elevation (ft)

Distance Along Baseline (ft)

SB-19
MW-02
SB-23
SB-18
SB-17
SB-27
MW-12

Asphalt and Fill
Concrete
Concrete
Silty Clay Fill
Sandy Clay
Clay and Silty Clay
Silty Sand
Clay and Silty Clay
Sandy Clay
Silty Clay
Till
Clay
Gravel
Gravel
Gravel
Apparent Weathered Bedrock?
Plant Building
Concrete and assumed Fill
Sandy Clay and Sand
Sandy Clay
Loading Dock
Asphalt
Concrete Slab
Sand
Silty Clay Fill
Sandy Clay
Clay
Clay
Sandy Clay and Sand
Gravel
Sandy Clay
Clay and Silty Clay
Eastern Avenue
Roadbase Fill
Fill (Silty Clay and Sand)
Sandy Clay and Silty Sand
Clay
Sand and Sandy Clay
Sandy Clay and Silty Sand

LITHOLOGY GRAPHICS

- Water Level
- Screened Interval
- PID (ppm-v)
- USCS Poorly-graded Sand with Clay
- USCS Low Plasticity Silty Clay
- USCS Low Plasticity Clay
- USCS Well-graded Gravelly Sand
- Fill (made ground)
- USCS Low Plasticity Sandy Clay
- USCS Silt
- USCS Low to High Plasticity Clay
- Concrete
- USCS Silty Sand
- Asphalt
- USCS High Plasticity Clay
- Gravel With Silt
- USCS Clayey Sand
- USCS Poorly-graded Sand
- Glacial Till

Stantec

Rockwell Collins Facility
855 35th Street – Cedar Rapids, Iowa

Hydrogeologic Cross-Section A-A'
FIGURE 4

Project Number: 193708679

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B

B'

Collins Radio Well

Facility

Pump House

MW-10

MW-08

MW-07

MW-06

MW-05

SB-28

SB-27

SB-26

SB-25

SB-24

Asphalt/Fill

Silt

Silty Clay

Sand and Sandy Clay

Sandy Clay

Clay

Utility Sand

Asphalt Fill

Silty Clay and Clay

Sandy Clay and Sand

Sand

Silty Clay and Clay

Silty Clay and Clay

Silty Sand

Sand

Sand and Gravel

Apparent Weathered Bedrock

Concrete

Clay

Sand

Clay

Sand

Sand and Gravel

Asphalt

Fill

Sand

Sandy Silt

Clay and Silty Clay

Sand and Sandy Clay

Clay

Sand and Gravel

Plugged Collins Radio Well is cased to elevation of 670 ft.) (108 ft. deep) and bottom of well is at elevation of 318 ft, (460 ft. deep)

Elevation (ft)

778 776 774 772 770 768 766 764 762 760 758 756 754 752 750 748 746

0 100 200 300 400 500 600 700 800 900 1,000

Distance Along Baseline (ft)

Stantec

LITHOLOGY GRAPHICS

- Water Level
- Screened Interval
- PID (ppm-v) 0.0 0.2 0.4 0.0
- USCS Poorly-graded Sand
- USCS Low Plasticity Clay
- USCS Silt
- Concrete
- USCS Poorly-graded Sandy Gravel
- Limestone
- USCS Low Plasticity Silty Clay
- USCS Low Plasticity Sandy Clay
- USCS Sandy Silt
- Asphalt
- USCS Poorly-graded Sand with Silt
- USCS Well-graded Sand
- USCS High Plasticity Clay
- USCS Poorly-graded Gravel
- USCS Silty Sand
- USCS Well-graded Sand with Clay

Rockwell Collins Facility
B55 35th Street – Cedar Rapids, Iowa

Hydrogeologic Cross-Section B-B'
FIGURE 5

Project Number: 193708679

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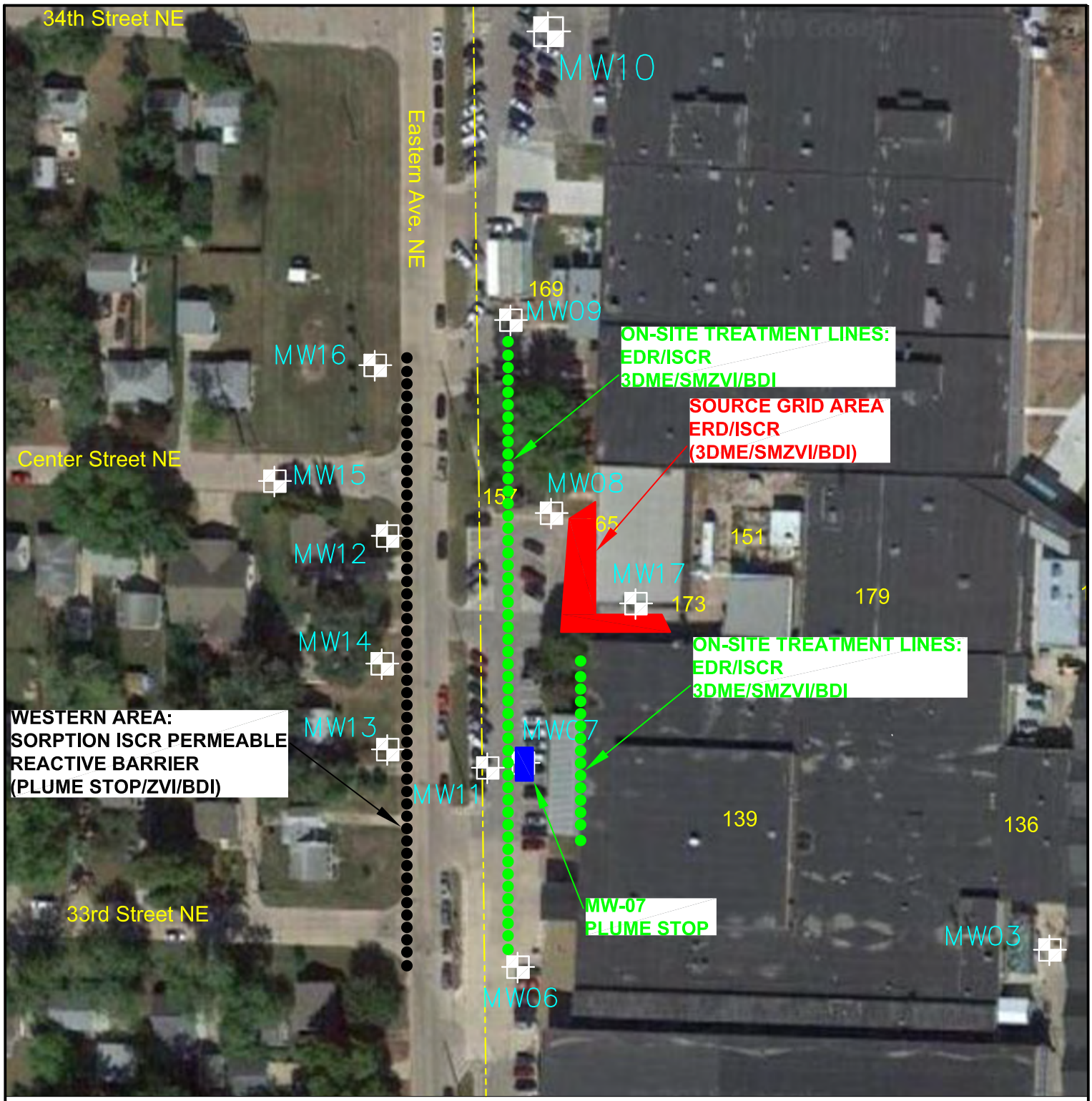

LEGEND:

- PROPERTY BOUNDARY
- MONITORING WELL LOCATION
- 139 BUILDING NUMBERS

0 100 200

APPROXIMATE SCALE (FEET)

N

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FOR:
ROCKWELL COLLINS FACILITY
855 35TH STREET
CEDAR RAPIDS, IOWA 52498

PROPOSED INJECTION LOCATIONS

FIGURE: 6

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
193708679	SAH	SRV	SRV	6/2/2023

FILEPATH:C:\pwworkdir\d0107722\Main Plant 35th St_InjectionLayout_2023-06.dwg|shansen|Jun 02, 2023 at 11:22|Layout: Layout1

ATTACHMENT 1

REGENESIS TECHNICAL APPROACH & DOSING CALCULATIONS

REGENESIS

Technology-Based Solutions for the Environment

PROJECT NAME

Rockwell Collins Main Plant

Revision 4

PREPARED FOR

Stantec
Steve Varsa
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PREPARED BY

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June 07, 2023

Project Summary

REGENESIS appreciates the opportunity to provide Stantec our remedial design and cost estimate for the Rockwell Collins Main Plant project. This proposal includes an overview of our proposed solution, the project goals, technologies proposed, application design summary table and a treatment area map.

Proposed Solution

We are proposing a remedial strategy that is centered around a comprehensive treatment of the chlorinated volatile organic compounds (i.e., cVOC) contamination at the Rockwell Well Building #139 site. To facilitate treatment, we are proposing the use of treatment reagents to promote and facilitate biological Enhanced Reductive Dechlorination (ERD) and In-Situ Chemical Reduction (ISCR). The combination of ERD/ISCR will provide a robust degradation mechanisms to fully dechlorination and degrade the cVOCs in groundwater. In addition, we are also proposing the use of PlumeStop as a platform to enhance ERD/ISCR degradation mechanism and to prevent further cVOC migration, as well as in localized area for treatment of PFAS in the on-site property.

Project Goals

- Reduce source area mass subsequent plume strength for the on-site property by utilizing ERD/ISCR degradation mechanisms.
- Capture and degrade cVOCs migrating both off-site and near residential property.
- Demonstrate proof of concept of PFAS treatment using PlumeStop .

Technologies Proposed

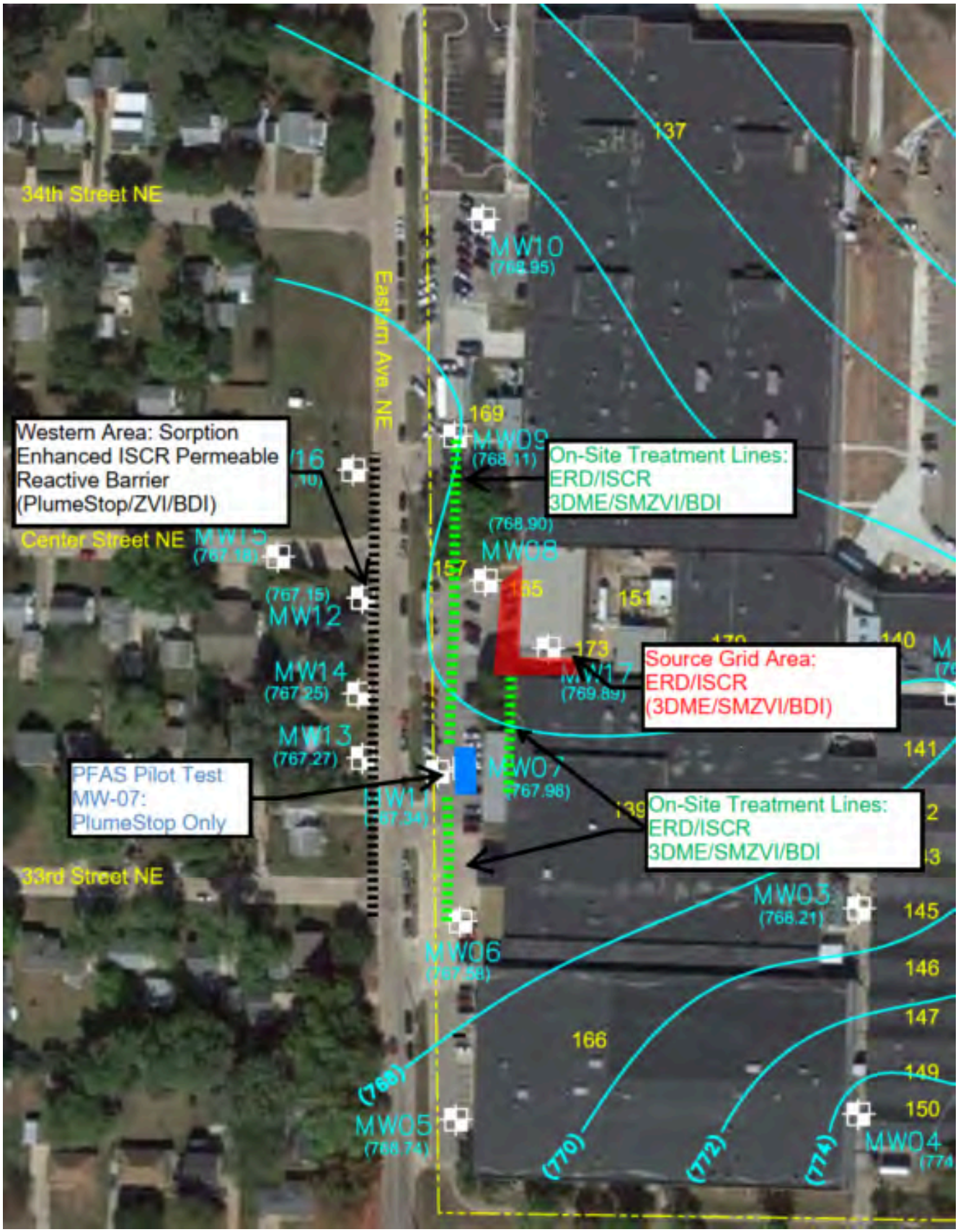
- PlumeStop®
- S-MicroZVI®
- 3-D Microemulsion®
- Bio-Dechlor INOCULUM® Plus (BDI Plus)
- FluxTracer® Flux Mapping Tool

Technical Resources

- Combined Remedy Case Study: Advanced Remedial Technologies Restore Michigan Neighborhood
- Plumestop® Case Study: Successful Remediation of PFAS at Fairbanks Alaska Airport
- PlumeStop® Technical Bulletin 4.1: Regeneration of Sorptive Capacity
- 3-D Microemulsion Technical Bulletin: Micelluar Distribution

Stantec - Rockwell Collins: Design Summary

Treatment Zone	PRB length (ft)	Grid Size (sq. ft)	Top (ft. bgs)	Bottom (ft. bgs)	PlumeStop (lbs)	3DME (lbs)	S-MZVI (lbs)	BDI+ (L)	Application Points	Total Vol (gal)
Western PRB	450	-	5	15	14,000	-	3,400	21	90	33,778
On-Site Treatment Lines	535		5	15	-	4,000	1,600	31	67	12,407
On-Site: Source Grid	-	2,500	5	15	-	2,000	1,500	18	25	5,077
On-Site: PFAS Treatment	30	-	5	15	4,000	-			12	4,358



Rockwell Collins Main Plant

Stantec

June 07, 2023

Figure 1-Treatment Area Map

REGENESIS

Technology-Based Solutions for the Environment

Technical Approach

On-Site Treatment

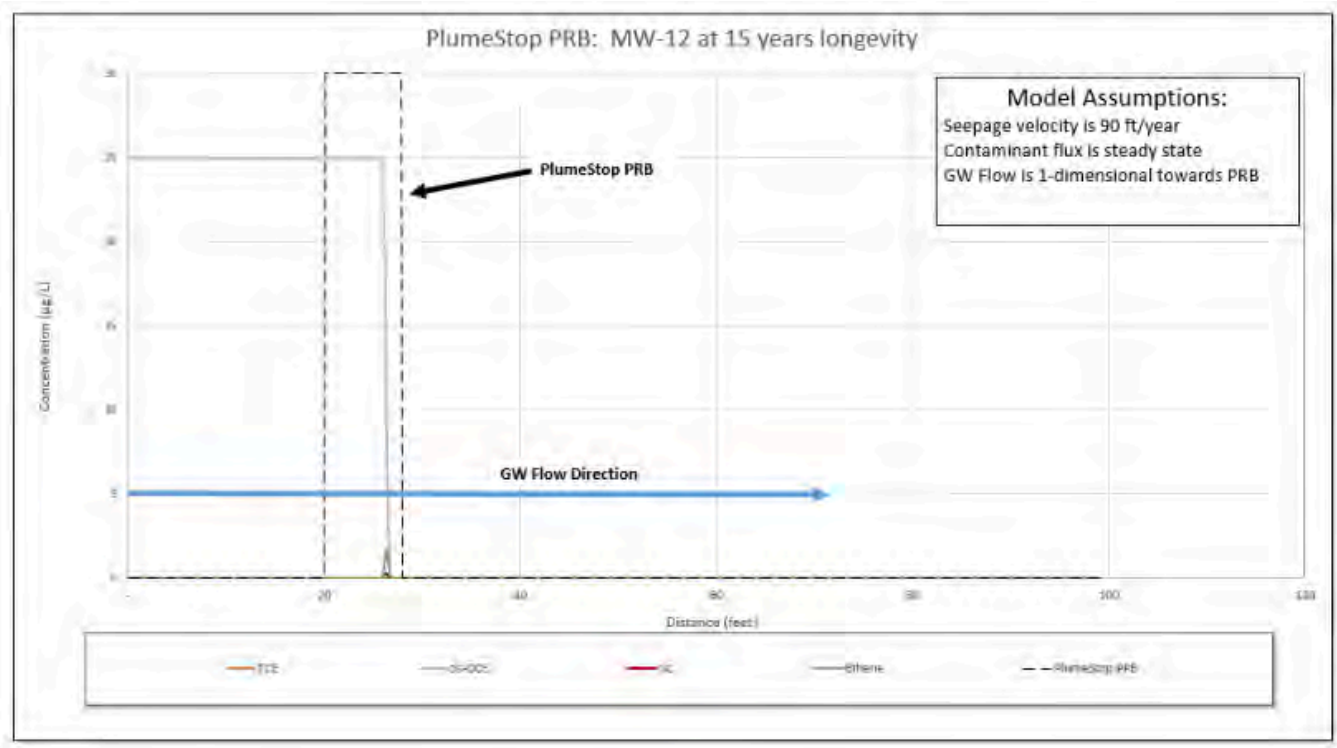
This approach combines both biological enhanced reductive dechlorination (ERD) and abiotic in situ chemical reduction (ISCR) degradation pathways for rapid reduction of chlorinated solvents. The self-distributing features of 3-D Microemulsion® combined with its longevity (several years) allow for sufficient coverage with minimal pore volume displacement thereby minimizing application costs. Our colloidal zero-valent iron (ZVI) product, Sulfidated-MicroZVI (S-MZVI®), will provide a strong reductant for cVOC degradation while also creating conditions for abiotic reduction via the formation of iron sulfides, oxides and hydroxides and maintaining strongly reducing conditions in the treatment area for an extended timeframe. This will foster rapid abiotic reduction of chlorinated solvents while reducing the potential for daughter product formation compared to a standard in situ bioremediation approach. This treatment chemistry will be applied in a series of treatment lines and a grid within the on-site treatment areas.

Off-Site Treatment

We are proposing the application of PlumeStop® Liquid Activated Carbon™ (PlumeStop), Sulfidated-Micro Zero Valent Iron (S-MicroZVI®) and Bio-Dechlor Inoculum Plus (BDI Plus®) to treat residual chlorinated solvents. Together, these technologies will foster rapid concentration reductions and provide long-term treatment of the target compounds through sorption plus abiotic and biological destructive pathways, while minimizing the potential for daughter product formation. PlumeStop is a colloidal form of activated carbon with a surface treatment which reduces its interactions with the soil matrix. This allows it to move through soil pores leaving a coating on the soil matrix as it distributes from the injection point. This provides a very large sorption surface which will result in immediate reduction of these contaminants while concentrating contaminants to allow for more efficient and controlled remediation through destructive technologies like S-MicroZVI. S-MicroZVI is a concentrated suspension of sulfidated, colloidal zero-valent iron, designed for enhanced, long-lasting reactivity and ease of application relative to other forms of ZVI. When applied to the subsurface it imparts an *in-situ* chemical reduction (ISCR) mechanism that allows for the direct destruction of chlorinated ethenes (i.e. TCE) via abiotic degradation pathways, which minimizes the formation of daughter products such as vinyl chloride. Sulfidation of the ZVI surface significantly decreases the reaction that occurs between water and the ZVI particles, allowing the reagent to be more effective for the chemical reduction of chlorinated ethenes. In addition, the inclusion of S-MicroZVI can enhance the biological degradation of contaminants by creating and sustaining a reduced environment for the dechlorinating bacteria. BDI Plus is added to bioaugment the site with a live microbial culture that is known to fully degrade these compounds. As contaminants are degraded to non-toxic and non-sorptive end products, the PlumeStop sorption surface will be regenerated. This allows for further sorption and treatment of contaminants which may diffuse back into the groundwater from the soil matrix over time.

PlumeStop Modeling for Off-Site Treatment PRB

This treatment combination will be applied in the off-site Western PRB to prevent migration of the plume. Under the current assumptions, we have modeled the estimated longevity of the Western PRB to be at least 15 years. An output of our 15 year model run is shown below.



PFAS Pilot Test

Per Stantec's request, we are also using PlumeStop to address PFOA/PFOS in MW-7 to demonstrate proof of concept for potential future PFAS treatment. This treatment assumes PFOA/PFOS concentrations are 13 part per trillion (ppt), respectively. Performance for this pilot test will be measured in monitoring well MW-07.

Performance Monitoring

To measure performance at your site, we recommend the following analytical parameters be collected at key wells within the treatment zone of influence and submitting the samples for analysis of the following parameters.

In-Situ Anaerobic Bioremediation Performance Monitoring Parameters	
Analytical Parameter	**Method**
Contaminants of Concern (COC's)	Varies
pH	Meter reading taken in flow-through cell (DO can also be measured with a Hach kit)
Dissolved Oxygen (DO)	
Oxidation Reduction Potential (ORP)	
Total Fe	Colorimetric Hach Method or EPA 6000 series with filtered and unfiltered samples
Total Mn	
Dissolved Fe	
Dissolved Mn	
Sulfate	EPA 375.3 or EPA 9056
Sulfide	EPA 376.1
Nitrate	EPA 353.1 or EPA 9056
Total Organic Carbon (TOC)	EPA 415.1 or EPA 9060
Alkalinity	EPA 310.2
Chloride	EPA 300
Methane, Ethane, Ethene, CO2	ASTM D1945

Design Verification Test Item	Description	To be Completed by:
Passive Flux Meters	Devices inserted into wells to sample contaminant concentrations over time to determine rate of flux. When multiple are used per well they can identify transport zones.	supplied by REGENESIS, but installed by Stantec.

Placement Validation

Placement Validation (PV) seeks to evaluate that the designed injection point spacing and volumes are adequate to achieve proper distribution within the target treatment zone. Evaluation will be based on the reagent fluid monitoring at nearby monitoring locations during the injection process and modifications may be made to the design if initial field tests are not satisfactory. PV is also used to document visual PlumeStop sorption onto aquifer materials after its initial colloidal fluid state.

As such, RRS will conduct various field tests to evaluate the distribution and influence of the remedial reagents (particularly PlumeStop) in the subsurface throughout the injection application. These site--specific PV field tests will typically be conducted in strategically-located quality control segments within the injection area footprint. These segments are commonly referred to as as "clusters". The field tests may include pre-injection soil cores to view the lithology and confirm vertical treatment as designed; installation of temporary piezometers to monitor water level, groundwater parameters, and groundwater color; and lastly, collection of post-injection soil cores to observe PlumeStop adhered to the aquifer matrix. In general, RRS may utilize several field test procedures in combination or individually to evaluate the distribution and influence of the remedial reagents being applied. Materials for PV will need to be coordinated with the subcontracted drilling firm.

Technical Resources

Included below is a list of technical resources for the project.

- Plumestop Technical Bulletin 1.1: Distribution Through a Permeable Medium
- PlumeStop® Technical Bulletin 2.1: Sorption of Contaminants from Solution
- PlumeStop® Technical Bulletin 2.2: Sorption of Contaminants from Solution-Column Study

Technical Resources

Included below is a list of technical resources for the project.

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- PlumeStop® Technical Bulletin 2.1: Sorption of Contaminants from Solution
- PlumeStop® Technical Bulletin 2.2: Sorption of Contaminants from Solution-Column Study

Performance Objectives

Purpose/Goals

The purpose of this remedial approach is to address cVOC impacts and off site migration concerns at the property boundary. The goal will be to achieve reductions of TCE, DCE and VC below regulatory standards (IA SWS Protected Source) at the defined compliance wells downgradient of the PlumeStop permeable reactive barrier. In addition, we are also treating MW-7 with a PlumeStop pilot test for PFAS. The objective here is to demonstrate proof of concept for PFAS/PFOA treatment.

Monitoring

To evaluate and measure off-site migration and PRB performance at this site, monitoring wells MW-12, MW-13, MW-14, MW-15 and MW-16 will be utilized. The on-site treatment performance will be meaured using monitoring wells: MW-7, MW-8, MW-11 and MW-17. Within this proposal it is suggested that groundwater monitoring parameters will be collected monthly for the 1st 3 months, and quarterly thereafter. To help support performance evaluations, REGENESIS requests the data collected be provided to us in a timely manner.

Qualifiers (Design Considerations)

- Seepage velocity/mass flux is a primary driver of dose for PlumeStop projects. This is the basis for our recommendation of Passive Flux Meters at your site.
- As indicated above MW-12, MW-12, MW-14, MW-15 and MW-16 are the key wells which should be used to evaluate performance of the PlumeStop barrier. MW-15 is approximately 100' downgradient of the treatment and as such we do not expect to see immediate reductions in this area. Overtime, we do anticipate downgradient plume reduction will occur but based upon our groundwater modeling, these effects will likely not be observed for 2 years.

Statement of Qualifications

REGENESIS Remediation Services (RRS) provides turn-key remediation planning, design, and application services. RRS field scientists are college degreed professionals that understand the details of each remediation design, the site conceptual site model, the remediation chemistry being applied, the significance of the designed reagent dosing and achieving subsurface distribution, and how a breakdown of any one of these and other factors can result in poor remediation performance. They have the unique background and experience to understand the significance of modifications made in the field.

RRS' direct management of the injection program optimizes the design and ultimately, the overall remedy performance. No one has more professional experience handling and applying in situ remediation products than RRS personnel.

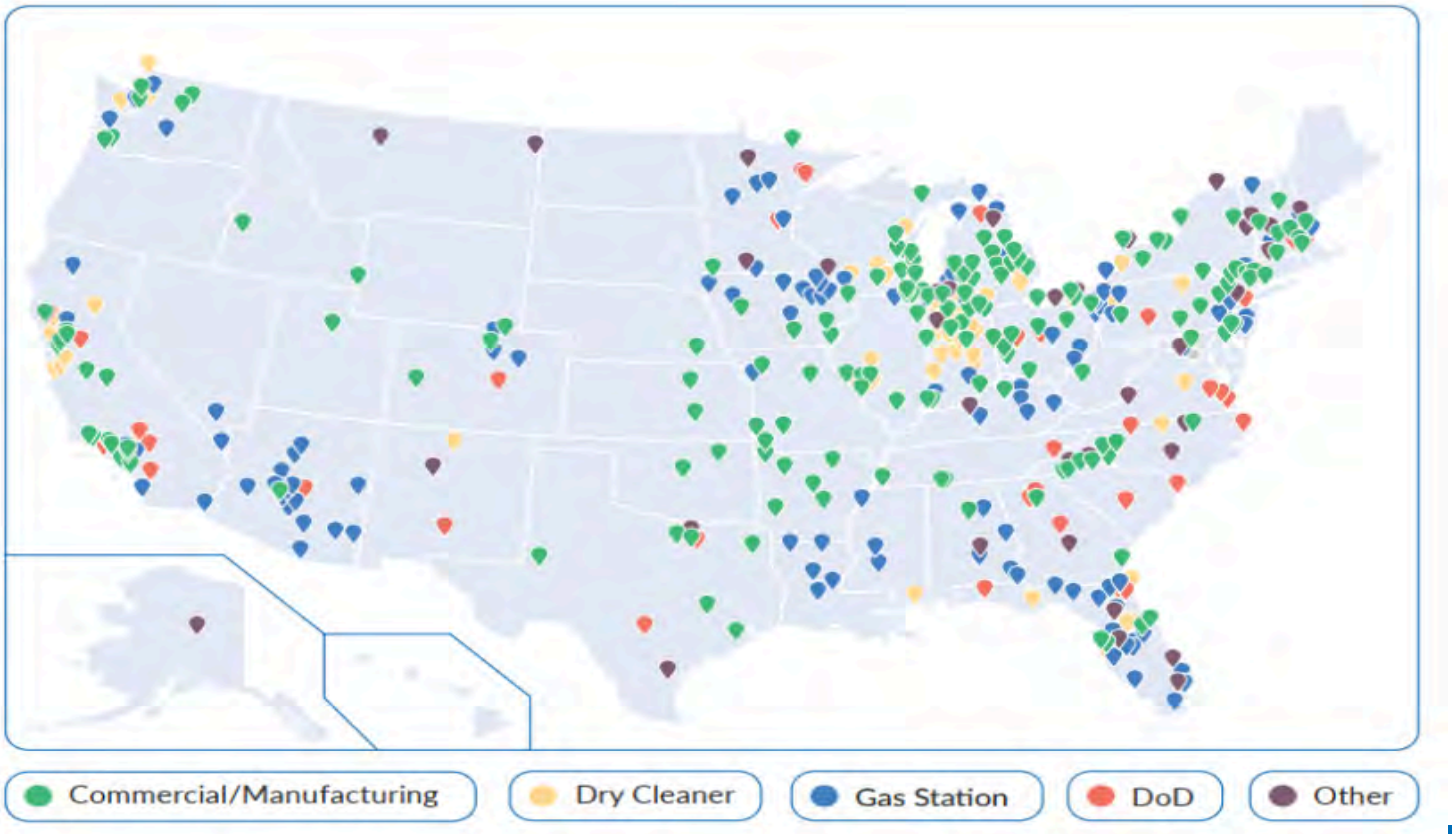
RRS has been offering industry-leading application services combined with excellence in field activity management for over a decade. We achieve success by meeting the cleanup objectives established by the environmental engineering firms who contract our services. To produce this outcome, we field experienced, disciplined, and dedicated project teams who work with our clients to address the unique requirements of each project site. Astute technical insight and timely, direct, and honest communication are hallmarks of RRS. Our reputation for meeting or exceeding clients' objectives has been proven in project successes throughout North America.

Further information on what sets RRS apart is provided in the following technical resources:

- RRS: Performance Driven, Results Based
- The RRS Difference

With decades of application experience, RRS is strategically located across the country to mobilize and assist on a wide range of sites throughout the US.

Over 100 Projects Completed Annually Across the US



RRS Scope of Services

RRS will work under the direction of Stantec to implement the remedy in the field, applying the selected remediation technologies. RRS and Stantec will share the responsibilities for implementing this scope of work. The delegation of responsibilities is outlined in this section and under the Assumptions/Qualification section. At the beginning of each day, RRS will conduct a safety tailgate meeting and review the day's goals, procedures, and responsibilities.

RRS will be equipped with multiple injection tool options to use with 1.5-inch diameter DPT rods. The injection tool string will be advanced to the top or bottom of the target treatment zone and injections will be performed in a bottom-up or top-down method depending on the site lithology.

The remediation technologies will be mixed in an injection trailer (Figure 2) with water in batches at the designated solution percentage and kept in constant suspension throughout the injection application. Pressures, flow rates, and total volume will be monitored and digitally documented for each injection interval. Simultaneous injection at multiple locations may be conducted to increase efficiencies on-site. RRS will monitor the injection points and surrounding areas for any signs of surfacing, and a spill response kit will be on standby.

During the application, real-time information will be collected and analyzed to help verify design assumptions and subsurface reagent distribution. Depending on the primary product applied, data collected and analyzed may consist of groundwater quality parameters (i.e., pH, conductivity, DO, ORP, etc.), depth-to-water measurements, visual indicators through groundwater or soil samples, and in-field injection concentration test kits. This information is typically collected during the application when operating within 10 feet of an appropriately screened monitoring well. Based on the information collected, the project team may modify the remediation design to optimize the injection application further. Typical modifications may include injection concentrations, volume per vertical foot, injection intervals, and point spacing.

Once the injection event is completed, RRS will demobilize all equipment and personnel off-site. A detailed injection summary report which includes injection point data (interval depths, injection pressure/flow rates, reagent volume, time elapsed and if surfacing occurred), field observations and any other noteworthy information, will be prepared and submitted to Stantec.

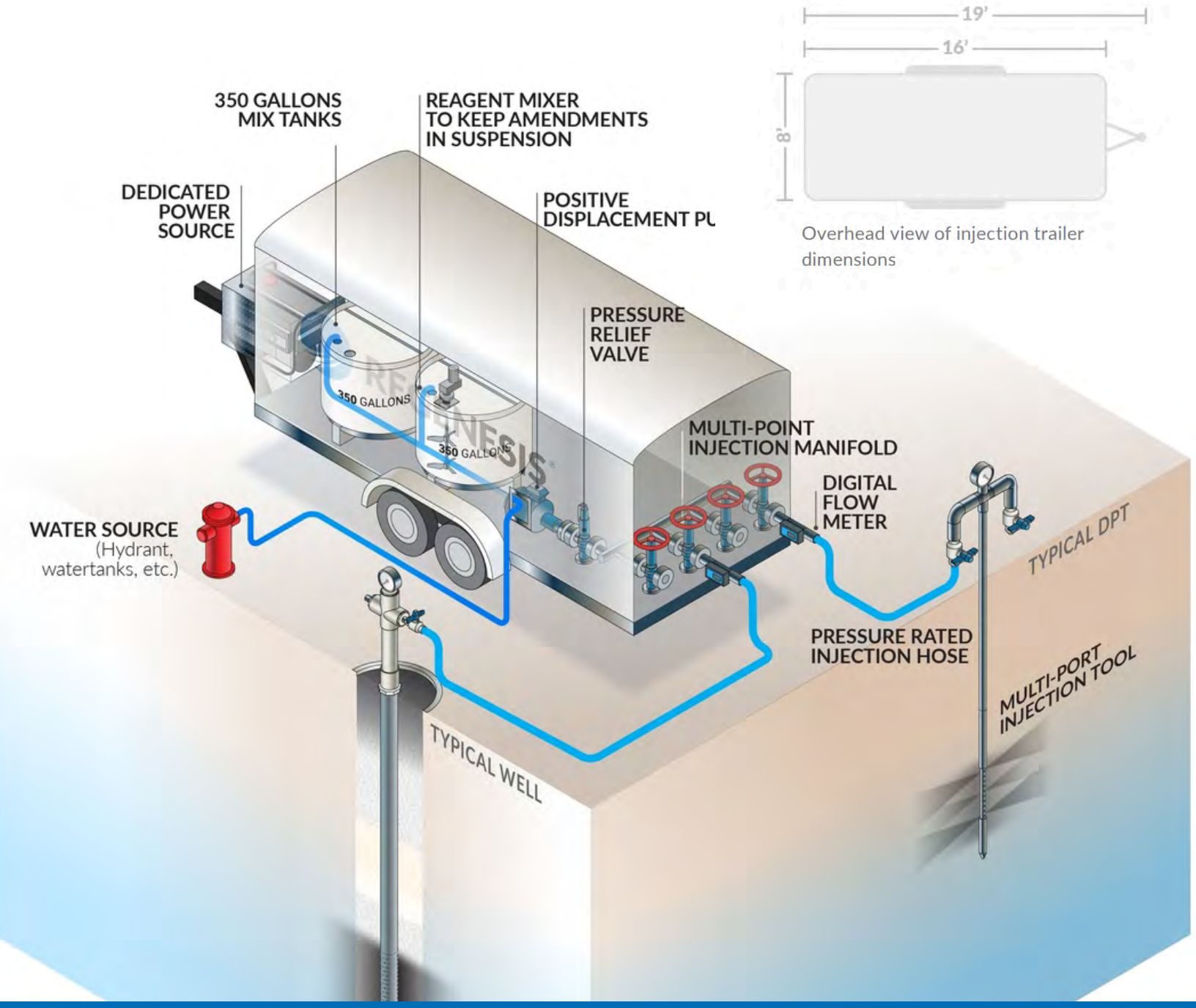
Scope of Services Summary	
Application Type	**Direct-Push Injection**
Volume	**55,620 gallons**
# of Injection Points	**194**
RRS Days On-Site **21 on-site injection days, 1 day product acceptance**	**22**
Direct-Push Services Provided by	**Stantec**

Custom-Built Application Equipment

RRS maintains a dedicated fleet of ready-to-deploy application systems strategically located throughout the US that provide comprehensive injection services, reliability, and accountability.

RRS has numerous purpose-built reagent application systems and can modify systems and appurtenances to accommodate any scenario.

Figure 2: RRS Application Trailer



Project Responsibilities

RRS will:

- Provide and ship the specified quantities of the remediation reagents to the site address provided by Stantec. RRS shipping estimates assume all products will be shipped to the site simultaneously.
- Coordinate with Stantec prior to any shipment of product. Alternative shipping locations or phases could lead to an increase in freight costs.
- Keep updated credentials in **ISNetworld. (ISN# 400-258322)**
- Mobilize a 40-hour HAZWOPER certified crew experienced in correctly applying REGENESIS remediation technologies.
- Provide a forklift for the project's duration to maneuver the product containers.
- **Provide secure storage for product containers (Conex Box).**
- **Provide spill containment for remediation chemistries storage and injection trailers.**

Stantec will:

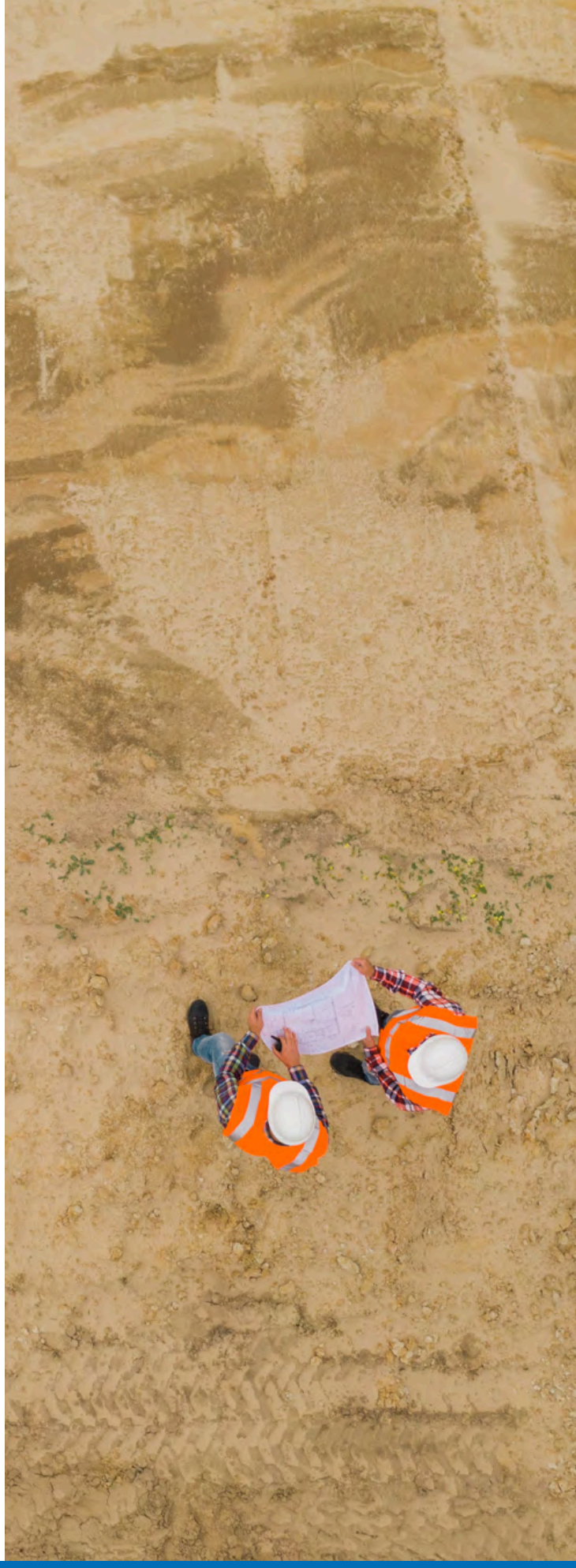
- Coordinate project schedule and reagent order with RRS to ensure adequate shipping and mobilization time.
- Coordinate site access with the property owner to coincide with the project schedule and identify a secure product staging area.
- Should private underground utilities be within the treatment area, Stantec will contract with a private utility locating service to mark utilities prior to RRS mobilization.
- Provide a water source (e.g. hydrant) capable of producing at least 30 GPM for the project duration within 300 ft. of the project staging area, at no cost to RRS.
- Contract a qualified, licensed DPT drilling operator equipped with the necessary tooling and materials to safely complete the application scope of work outlined within this proposal.
- Be responsible for disposal or recycling of totes, drums, pails and pallets. All nonhazardous refuse will be collected and placed in a Stantec-provided on-site refuse container for disposal. RRS will collect project related refuse and empty treatment chemistry containers daily to keep the site clean.
- Be responsible for transportation and disposal of any contaminated waste generated on-site during injection activities, though we do not anticipate generating any such waste.
- Stantec will provide field water quality meter similar to a YSI 556 with a down-hole sensor, a water level meter, bailers and a technician while on-site for injection activities to assist RRS in assessing groundwater from monitoring wells.

Services Assumptions and Qualifications

In generating this proposal, RRS relied upon professional judgment and site-specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to estimate product quantities and subsurface placement required to achieve the remedial goals. The attached design summary tables specify the assumptions used to complete the remedial design. We request that these modeling input assumptions be verified by your firm before injection. Other assumptions and qualifications related to this proposal are as follows:

- The product and services cost outlined will be valid for 60 days the proposal date. If beyond 60 days, RRS reserves the right to update the cost.
- The freight charges included for product delivery above are estimated at the time of proposal generation. Actual freight charges are neither set nor guaranteed by RRS and are calculated when the product order is placed. This price may vary from what is estimated above. Actual freight charges for product delivery will be invoiced.
- Freight delivery time frames cannot be guaranteed and RRS will not be responsible for any delays or increased costs associated with those delays.
- If applicable, sales tax charges for product, freight, and services are considered estimated at the time of proposal submittal. The appropriate sales tax category (i.e., product, freight, and services) and actual sales tax rate are finalized at the time of invoice and may change from date of proposal submittal.
- RRS will have access to the site for equipment operation and secure storage of materials and equipment throughout the project duration. Access to each work area location will be clear and free of obstructions. RRS also assumes the injection trailer can be staged within 80 feet of the furthest injection point location.
- Stantec is responsible for securing any permits prior to mobilizing to the site.
- Stantec is responsible for all soil, air, and groundwater sampling and analysis.
- For safety reasons, access to the treatment area will be limited to RRS and Stantec personnel.
- The remediation design and injection procedures contain the necessary precautions to minimize the likelihood of surfacing of the treatment chemistry. RRS will monitor the injection flow rates and pressures and observe for signs of reagent surfacing around active injection areas. If surfacing is detected, RRS will stop or slow down injection activities at that location to stop additional surfacing and remove/vacuum up recoverable surfaced fluid. RRS is not responsible for treatment chemistry infiltration into undesired locations beyond our visible control.
- RRS personnel will have access to the site for work up to 12 hours per day Monday through Friday (daylight hours). However, the standard workday does not exceed 10 hours with travel time Monday through Friday. A 10-hour workday does not mean 10 hours on-site and/or injection pumping. Additional charges may apply for work completed on Saturday and Sunday.
- RRS is not responsible for damage to unmarked utilities and subsurface structures. Stantec will review as-built drawings with RRS to confirm clearance prior to advancing DPT injection tooling and marking injection point locations.
- Pricing and work schedule assume union labor and prevailing wages (Davis-Bacon) are not required.

- This proposal assumes probing and drilling will begin at the ground surface. If hand auger, concrete/asphalt coring, or air knife services are required, additional charges, including for surface restoration could apply.
- RRS assumes that direct-push style drill rig can access all injection point locations and drive 1.5" diameter injection tooling to the required depth. If site conditions limit the use of the provided direct-push rig or tooling for any injection point and other drilling methods are required to complete the task, additional charges will apply.
- All traffic control requirements, if necessary, will be provided by Stantec.
- Site conditions can change over time and should be monitored post injection. RRS is not responsible for changing site conditions after completing the scope of work and demobilizing. Such changes include but are not limited to changes related to borehole abandonment (i.e., swelling of backfill material), surface restoration, well conditions, and on-site utilities.



Health and Safety Plan

RRS is committed to providing a safe and healthy working environment for all on-site employees, including Stantecs and contractors on-site. Before mobilization, RRS will develop a site-specific Health and Safety Plan (HASP) and designate an on-site safety officer. All personnel on-site are required to participate in daily safety tailgate meetings to proactively identify potential hazards and mitigate risks to the full extent possible.

In addition to the hours of rigorous safety training courses all personnel are required to complete, RRS also incorporates a behavior-based safety program by utilizing our DoneSafe mobile application (app) interface on every site. This app encourages our personnel to actively search for potential on-site risks and document mitigation actions. The effectiveness of our safety program can be seen in our industry leading Experience Modification Rating (EMR) listed in Table 3.

Year	Total Hours	EMR
2022	189,458	0.73
2021	125,592	0.71
2020	162,037	0.64
2019	169,964	0.66
2018	144,600	0.70

RRS safety tailgate meetings and HASP will include the following:

- Site map with entrance and exit points and best possible muster points depending on conditions.
- List of personnel and contact information for employees on-site and supporting the project.
- Route to the nearest occupational treatment facility and hospital along with contact information.
- Job Hazard Analysis (JHA) detailing each job task on-site with its potential hazards and best practices to avoid those hazards.
- Description and hazards of the contaminants of concern (COC) with appropriate Personal Protection Equipment (PPE) requirements.
- COVID-19 precautions will be discussed, and personnel will be equipped with face coverings.
- List and description of REGENESIS chemicals on-site including a Safety Data Sheet (SDS) for each chemical.
- Checklist of site safety equipment including fire extinguishers, eyewash station, first aid kit, spill prevention kit and any site-specific equipment needed.
- Daily tailgate safety meeting sheet with identified hazards and risks associated with the site and job tasks for that day, along with shared learning observations from the previous day.

Pricing

Below is the cost estimate for to provide the remediation technologies and execute the application design provided in this proposal. Please also see the assumptions and qualifications section.

Description			Subtotal
CVOC Flux tracers 10' unit Includes t 2-day shipping to the site and overnight back to the lab (should be installed/sent 4-6 weeks prior to application)			$3,500
☑ **Product Acceptance** 15 totes, 1 pallet, 1 day			$2,654.53
☑ **Forklift** 5,000 lb. Variable Reach			$5,195.55
Remediation Products PlumeStop, 3-DME, S-MicroZVI, BDI (includes freight and applicable sales tax)			$271,928.43
Remediation Services (RRS has ISNETWORLD Cert.) 21 Injection Field Trailer Days			$98,654.64
☐ **Of-Site water transport (per day)**	$50	1	$50
☐ **Second Crew Mob/Demob** Price per event	$5,500	1	$5,500
Total			**$381,933.15**

The cost provided above is inclusive of all product, estimated product freight, product mixing, injection services as outlined within this proposal, tax and materials to complete the work. We will submit invoice(s) when product ships and upon project completion or end of calendar month for remediation services. **Payment terms are Net 30 days upon invoice submittal. Should payment terms be extended beyond 30 days, finance charges may be applied.**

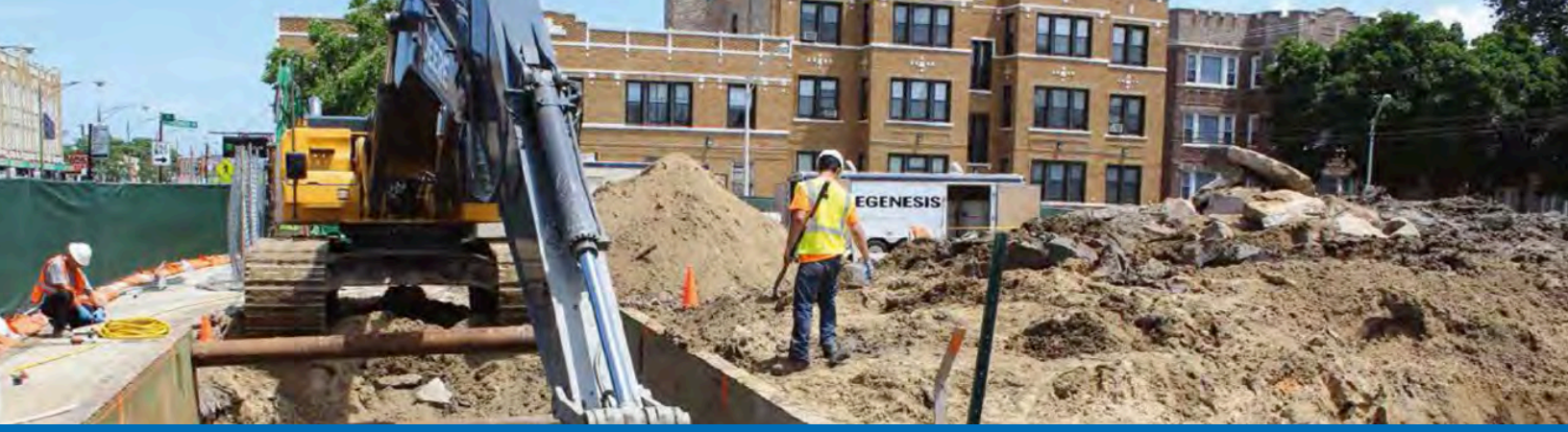
Please note that this pricing is contingent upon completion of this scope of work without delays or work stoppages once mobilization occurs. RRS has allotted twenty-one (21) on-site working days (10-hr days, Monday through Friday) to apply the remediation technologies and one (1) day to accept product. RRS believes the scope of work provided above can be completed in this timeframe proposed, however, if the project is delayed due to circumstances beyond our control, RRS will utilize a daily rate of $4,500 plus applicable tax to the invoice price. Should the project be completed ahead of schedule, a portion of the daily rate may be credited to the final invoice after review. It is our understanding that Stantec may want a second application crew on-site to reduce the total number of calendar days onsite. If a second application crew is mobilized to the site, a mobilization fee of $5,500 will be applied. Additionally, when two application crews are on-site, it counts as two field days per calendar day. The $8,000 per day rate will be used for each trailer onsite past the allocated 21 field days.

RRS reserves the right to modify the design and associated cost if additional information gathered warrants modification.

COST ESTIMATE DISCLAIMER: The cost listed assumes conditions set forth within the proposed scope of work and assumptions and qualifications. Changes to either could impact the final cost of the project. This may include final shipping arrangements, sales tax or application related tasks such as product storage and handling, access to water, etc. If items listed need to be modified, please contact RRS for further evaluation.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgements provided by those whom completed the earlier environmental site assessment(s), and in reliance upon REGENESIS' prior experience on similar project sites. The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limit on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the government.

PROFESSIONAL JUDGEMENT: In generating this estimate, REGENESIS relied upon professional judgement and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.



Acknowledgement

Signature below confirms signee has reviewed the proposal and agrees with all outlined responsibilities and assumptions/qualifications. Please also review our terms and conditions.

Here is a list of next steps toward implementation of this project. Please note these steps may take 4-6 weeks to complete depending upon the complexity of the project and previous experience with your company. RRS will contact you soon to begin the implementation process.

Steps to Project Implementation

1. Sign acceptance of proposal
2. Finalize contract documents incorporating this proposal or formal REGENESIS Subcontract Agreement
3. Confirm account credit status
4. Complete remediation services logistics evaluation
5. Confirm delivery address and date
6. Schedule application

Please sign below to acknowledge acceptance of proposal RRS proposal-Rockwell Collins Main Plant_Rev4 for the Rockwell Collins Main Plant Site and authorize REGENESIS to proceed with a final contract and work authorization:

SIGNATURE
Steve Varsa

Not yet accepted

Stantec | Steve Varsa, Senior Hydrogeologist

Terms & Conditions

1. **PAYMENT TERMS.** Net 30 Days. Accounts outstanding after 30 days will be assessed 1.5% monthly interest. Volume discount pricing will be rescinded on all accounts outstanding over 90 days. An early payment discount of 1.5% Net 10 is available for cash or check payments only. We accept Master Card, Visa and American Express.
2. **RETURN POLICY.** A 15% re-stocking fee will be charged for all returned goods. All requests to return product must be pre-approved by seller. Returned product must be in original condition and no product will be accepted for return after a period of 90 days.
3. **FORCE MAJEURE.** Seller shall not be liable for delays in delivery or services or failure to manufacture or deliver due to causes beyond its reasonable control, including but not limited to acts of God, acts of buyer, acts of military or civil authorities, fires, strikes, flood, epidemic, war, riot, delays in transportation or car shortages, or inability to obtain necessary labor, materials, components or services through seller's usual and regular sources at usual and regular prices. In any such event Seller may, without notice to buyer, at any time and from time to time, postpone the delivery or service dates under this contract or make partial delivery or performance or cancel all or any portion of this and any other contract with buyer without further liability to buyer. Cancellation of any part of this order shall not affect Seller's right to payment for any product delivered or service performed hereunder.
4. **LIMITED WARRANTY.** Seller warrants the product(s) sold and services provided as specified on face of invoice, solely to buyer. Seller makes no other warranty of any kind respecting the product and services, and expressly DISCLAIMS ALL OTHER WARRANTIES OF WHATEVER KIND RESPECTING THE PRODUCT AND SERVICES, INCLUDING ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE AND NON-INFRINGEMENT.
5. **DISCLAIMER.** Where warranties to a person other than buyer may not be disclaimed under law, seller extends to such a person the same warranty seller makes to buyer as set forth herein, subject to all disclaimers, exclusions and limitations of warranties, all limitations of liability and all other provisions set forth in the Terms and Conditions herein. Buyer agrees to transmit a copy of the Terms and Conditions set forth herein to any and all persons to whom buyer sells, or otherwise furnishes the products and/or services provided buyer by seller and buyer agrees to indemnify seller for any liability, loss, costs and attorneys' fees which seller may incur by reason, in whole or in part, of failure by buyer to transmit the Terms and Conditions as provided herein.
6. **LIMITATION OF SELLER'S LIABILITY AND LIMITATION OF BUYER'S REMEDY.** Seller's liability on any claim of any kind, including negligence, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair or use of any goods or performance of any services covered by or furnished hereunder, shall in no case exceed the lesser of (1) the cost of repairing or replacing goods and repeating the services failing to conform to the foregoing warranty or the price of the goods and/or services or part thereof which gives rise to the claim. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, OR FOR DAMAGES IN THE NATURE OF PENALTIES.
7. **INDEMNIFICATION.** Buyer agrees to defend and indemnify seller of and from any and all claims or liabilities asserted against seller in connection with the manufacture, sale, delivery, resale or repair or use of any goods, and performance of any services, covered by or furnished hereunder arising in whole or in part out of or by reason of the failure of buyer, its agents, servants, employees or customers to follow instructions, warnings or recommendations furnished by seller in connection with such goods and services, by reason of the failure of buyer, its agents, servants, employees or customers to comply with all federal, state and local laws applicable to such goods and services, or the use thereof, including the Occupational Safety and Health Act of 1970, or by reason of the negligence or misconduct of buyer, its agents, servants, employees or customers.

8. **EXPENSES OF ENFORCEMENT.** In the event seller undertakes any action to collect amounts due from buyer, or otherwise enforce its rights hereunder, Buyer agrees to pay and reimburse Seller for all such expenses, including, without limitation, all attorneys and collection fees.
9. **TAXES.** Liability for all taxes and import or export duties, imposed by any city, state, federal or other governmental authority, shall be assumed and paid by buyer. Buyer further agrees to defend and indemnify seller against any and all liabilities for such taxes or duties and legal fees or costs incurred by seller in connection therewith.
10. **ASSISTANCE AND ADVICE.** Upon request, seller in its discretion will furnish as an accommodation to buyer such technical advice or assistance as is available in reference to the goods and services. Seller assumes no obligation or liability for the advice or assistance given or results obtained, all such advice or assistance being given and accepted at buyer's risk.
11. **SITE SAFETY.** Buyer shall provide a safe working environment at the site of services and shall comply with all applicable provisions of federal, state, provincial and municipal safety laws, building codes, and safety regulations to prevent accidents or injuries to persons on, about or adjacent to the site.
12. **INDEPENDENT CONTRACTOR.** Seller and Buyer are independent contractors and nothing shall be construed to place them in the relationship of partners, principal and agent, employer/employee or joint ventures. Neither party will have the power or right to bind or obligate the other party except as may be expressly agreed and delegated by other party, nor will it hold itself out as having such authority.
13. **REIMBURSEMENT.** Seller shall provide the products and services in reliance upon the data and professional judgments provided by or on behalf of buyer. The fees and charges associated with the products and services thus may not conform to billing guidelines, constraints or other limits on fees. Seller does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where seller may serve as a supplier or subcontractor to an entity that seeks reimbursement from the Government for all or part of the services performed or products provided by seller, it is the sole responsibility of the buyer or other entity seeking reimbursement to ensure the products and services and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity that seeks reimbursement from the Government, seller does not knowingly present or cause to be presented any claim for payment to the Government.
14. **APPLICABLE LAW/JURISDICTION AND VENUE.** The rights and duties of the parties shall be governed by, construed, and enforced in accordance with the laws of the State of California (excluding its conflict of laws rules which would refer to and apply the substantive laws of another jurisdiction). Any suit or proceeding hereunder shall be brought exclusively in state or federal courts located in Orange County, California. Each party consents to the personal jurisdiction of said state and federal courts and waives any objection that such courts are an inconvenient forum.
15. **ENTIRE AGREEMENT.** This agreement constitutes the entire contract between buyer and seller relating to the goods or services identified herein. No modifications hereof shall be binding upon the seller unless in writing and signed by seller's duly authorized representative, and no modification shall be effected by seller's acknowledgment or acceptance of buyer's purchase order forms containing different provisions. Trade usage shall neither be applicable nor relevant to this agreement, nor be used in any manner whatsoever to explain, qualify or supplement any of the provisions hereof. No waiver by either party of default shall be deemed a waiver of any subsequent default.

Detailed Design Table

Project Info		
Rockwell Collins Bld #139		
Cedar Rapids, IA		
Dissolved Plume: Western PRB		
Prepared For:		
Stantec		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Barrier Length	ft	450
Top Treat Depth	ft	5.0
Bot Treat Depth	ft	15.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	36,000
Treatment Zone Volume	cy	1,333
Soil Type	—	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	107,719
Treatment Zone Effective Pore Volume	gals	53,860
Treatment Zone Pore Volume	liters	407,761
Treatment Zone Effective Pore Volume	liters	203,881
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	3.6E+06
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91
Application Dosing	**Unit**	**Value**
PlumeStop to be Applied	**lbs**	**14,000**
S-MZVI to be Applied	**lbs**	**3,400**
BDI Plus to be Applied	**Liters**	**21**

PlumeStop® Application Design Summary		
Dissolved Plume: Western PRB		
PlumeStop + S-MZVI		**Technical Notes**
Treatment Type	**Barrier**	
Distance Perpendicular to Flow (ft)	450	
Spacing Within Rows (ft)	5	
Number of Rows	1	
DPT Injection Points	**90**	
Top Application Depth (ft bgs)	5	
Bottom Application Depth (ft bgs)	15	
PlumeStop to be Applied (lbs)	**14,000**	
PlumeStop to be Applied (gals)	1,554	
In Situ Chemical Reduction - S-MZVI		
S-MZVI to be added to PlumeStop (lbs)	**3,400**	
S-MZVI to be added to PlumeStop (gals)	225	
PlumeStop + S-MZVI Volume Totals		
Mixing Water (gal)	31,999	
Total Application Volume (gals)	**33,778**	
Injection Volume per Point (gals)	375	
Bioaugmentation - BDI Plus		
BDI Plus Application Points	**90**	
BDI Plus to be Applied (Liters)	**21**	
BDI Plus per point (Liters)	0.2	
Technical Notes/Discussion		

Prepared by: Owen Miller - Sr. Design Specialist
Date: 4/13/2023

Project Information		
Rockwell Collins Bld #139		
Cedar Rapids, IA		
Dissolved Plume: On-Site Treatment Lines		
Prepared For:		
Stantec		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Barrier Length	ft	535
Top Treat Depth	ft	5.0
Bot Treat Depth	ft	15.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	53,500
Treatment Zone Volume	cy	1,981
Soil Type	—	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	160,083
Treatment Zone Effective Pore Volume	gals	80,042
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	5.3E+06
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91
Application Dosing		
3-D Microemulsion to be Applied	**lbs**	**4,000**
S-MZVI to be Applied	**lbs**	**1,600**
BDI Plus to be Applied	**liters**	**31**

3-D Microemulsion®, S-MZVI®, BDI® Plus Application Design Summary		
Dissolved Plume: On-Site Treatment Lines		
Treatment Type	**Barrier**	
Distance Perpendicular to Flow (ft)	535	
Spacing Within Rows (ft)	8	
Number of Rows	1	
DPT Injection Points	67	
Top Application Depth (ft bgs)	5	**Field Mixing Ratios**
Bottom Application Depth (ft bgs)	15	3DME Concentrate per Pt (gals)
3DME to be Applied (lbs)	**4,000**	7
3DME to be Applied (gals)	479	Mix Water per Pt (gals)
3DME Mix %	4%	172
Volume Water (gals)	**11,504**	3DME Mix Volume per Pt (gals)
3DME Mix Volume (gals)	11,983	179
S-MZVI to be Applied (lbs)	**1,600**	S-MZVI Volume per Pt (gals)
S-MZVI Volume (gals)	106	2
BDI Plus to be Applied (L)	**31**	BDI Volume per Pt (L)
BDI Plus Mix Water Volume (gals)	310	0.5
	0	
	0	
Total Application Volume (gals)	**12,407**	Volume per pt (gals)
Estimated Radius of Injection (ft)	3.9	185
Prepared by: Owen Miller - Sr. Design Specialist		Volume per vertical ft (gals)
Date: 4/13/2023		19
Technical Notes/Discussion		

Project Information		
Rockwell Collins Bld #139		
Cedar Rapids, IA		
Dissolved Plume: On-Site Source		
Prepared For:		
Stantec		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Areal Extent	sq ft	2,500
Top Treat Depth	ft	5.0
Bot Treat Depth	ft	15.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	25,000
Treatment Zone Volume	cy	926
Soil Type	—	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	74,805
Treatment Zone Effective Pore Volume	gals	37,403
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	2.5E+06
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91
Application Dosing		
3-D Microemulsion to be Applied	**lbs**	**2,000**
S-MZVI to be Applied	**lbs**	**1,500**
BDI Plus to be Applied	**liters**	**18**

3-D Microemulsion®, S-MZVI®, BDI® Plus Application Design Summary		
Dissolved Plume: On-Site Source		
Treatment Type	**Grid**	
Treatment Areal Extent (sq ft)	2,500	
Spacing Within Rows (ft)	10	
Spacing Between Rows (ft)	10	
DPT Injection Points	25	
Top Application Depth (ft bgs)	5	**Field Mixing Ratios**
Bottom Application Depth (ft bgs)	15	3DME Concentrate per Pt (gals)
3DME to be Applied (lbs)	**2,000**	10
3DME to be Applied (gals)	240	Mix Water per Pt (gals)
3DME Mix %	5%	182
Volume Water (gals)	**4,554**	3DME Mix Volume per Pt (gals)
3DME Mix Volume (gals)	4,793	192
S-MZVI to be Applied (lbs)	**1,500**	S-MZVI Volume per Pt (gals)
S-MZVI Volume (gals)	99	4
BDI Plus to be Applied (L)	**18**	BDI Volume per Pt (L)
BDI Plus Mix Water Volume (gals)	180	0.7
	0	
	0	
Total Application Volume (gals)	**5,077**	Volume per pt (gals)
Estimated Radius of Injection (ft)	5.2	203
Prepared by: Owen Miller - Sr. Design Specialist		Volume per vertical ft (gals)
Date: 4/13/2023		20
Technical Notes/Discussion		

Project Info

Rockwell Collins Bld #139
Cedar Rapids, IA
Dissolved Plume: PFAS Pilot Test
Prepared For:
Stantec

Target Treatment Zone (TTZ) Info	Unit	Value
Barrier Length	ft	30
Top Treat Depth	ft	5.0
Bot Treat Depth	ft	15.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	3,900
Treatment Zone Volume	cy	144
Soil Type	---	sand
Porosity	cm^3/cm^3	0.33
Effective Porosity	cm^3/cm^3	0.23
Treatment Zone Pore Volume	gals	9,627
Treatment Zone Effective Pore Volume	gals	6,710
Treatment Zone Pore Volume	liters	36,444
Treatment Zone Effective Pore Volume	liters	25,400
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	3.9E+05
Hydraulic Conductivity	ft/day	25.0
Hydraulic Conductivity	cm/sec	8.82E-03
Hydraulic Gradient	ft/ft	0.003
GW Velocity	ft/day	0.33
GW Velocity	ft/yr	119

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**4,000**

PlumeStop® Application Design Summary

Dissolved Plume: PFAS Pilot Test

PlumeStop	
Treatment Type	**Barrier**
Distance Perpendicular to Flow (ft)	30
Spacing Within Rows (ft)	5
Number of Rows	2
DPT Injection Points	**12**
Top Application Depth (ft bgs)	5
Bottom Application Depth (ft bgs)	15
PlumeStop to be Applied (lbs)	**4,000**
PlumeStop to be Applied (gals)	444
PlumeStop Volume Totals	
Mixing Water (gal)	3,914
Total Application Volume (gals)	**4,358**
Injection Volume per Point (gals)	363

Technical Notes

Technical Notes/Discussion

Prepared by: Owen Miller - Sr. Design Specialist
Date: 4/13/2023

ATTACHMENT 2

SAFETY DATA SHEETS

REGENESIS

SAFETY DATA SHEET

1. Identification

Product identifier **3-D Microemulsion® Factory Emulsified**

Other means of identification 3DME

Recommended use Remediation of soils and groundwater.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name REGENESIS

Address 1011 Calle Sombra
San Clemente, CA 92673 USA

General information 949-366-8000

E-mail CustomerService@regenesis.com

Emergency phone number For Dangerous Goods Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC 24/7 at:

USA, Canada 1-800-424-9300

International +1 703-741-5970

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Hazard symbol None.

Signal word None.

Hazard statement The mixture does not meet the criteria for classification.

Precautionary statement

Prevention Observe good industrial hygiene practices.

Response Wash hands after handling.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Fatty acid esters	-	40 - 60
Water	7732-18-5	35 - 45
Lactate oligomers	-	2 - 10
Sodium lactate	867-56-1	2 - 10
Surfactant	-	< 1

Composition comments All concentrations are in percent by weight unless otherwise indicated.
Contains no hazardous ingredients according to OSHA 29 CFR 1910.1200.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation. Prolonged skin contact may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed. Combustion products may include: carbon oxides, phosphorus oxides, metal oxides.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk. Water spray should be used to cool containers.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	The product is an aqueous solution. After the water component evaporates, the remaining material will burn.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	This product is miscible in water. Spilled product may create a slipping hazard. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in tightly closed container. Store away from incompatible materials (see Section 10 of the SDS). Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, reinforced fiberglass.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier.

Skin protection	
Other	Wear suitable protective clothing.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Color	White.
Odor	Odorless.
Odor threshold	Not available.
pH	6 - 8
Melting point/freezing point	Property has not been measured.
Initial boiling point and boiling range	212 °F (100 °C)
Flash point	> 199.94 °F (> 93.3 °C) Closed Cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Explosive limit - lower (%)	Property has not been measured.
Explosive limit - upper (%)	Property has not been measured.
Vapor pressure	Property has not been measured.
Vapor density	Property has not been measured.
Relative density	1 - 1.2
Solubility(ies)	
Solubility (water)	Miscible.
Partition coefficient (n-octanol/water)	Property has not been measured. Property has not been measured.
Auto-ignition temperature	Property has not been measured.
Decomposition temperature	Not applicable as the product is not unstable.
Viscosity	Not available.
Other information	
Density	Property has not been measured.
Explosive properties	Not explosive.
Kinematic viscosity	Property has not been measured.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Undergoes hydrolysis in water to form lactic acid and soybean oil.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Bases. Acids.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Spray mists may cause respiratory tract irritation.
Skin contact	May cause mild or temporary skin irritation upon prolonged and excessive contact.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	May cause discomfort if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation. Prolonged skin contact may cause temporary irritation.

Information on toxicological effects

Acute toxicity	Not expected to be acutely toxic.
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Fatty acid esters (CAS -)			
Aquatic			
Acute			
Algae	EL50	Selenastrum capricornutum	> 854.9 mg/l, 72 hours
Fish	LL50	Pimephales promelas	> 1000 mg/l, 96 hours
Other	EL50	Daphnia sp.	> 1000 mg/l, 48 hours

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	No data available.
Mobility in soil	The product is completely soluble in water. Expected to be mobile in soil.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.

Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not established.

15. Regulatory information

US federal regulations

This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Toxic Substances Control Act (TSCA)	All components of the mixture on the TSCA 8(b) inventory are designated "active".

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Industrial Chemicals (AICIS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 09-April-2015

Revision date 06-May-2022

Version # 04

HMIS® ratings

Health: 1
Flammability: 1
Physical hazard: 0
Personal protection: B

NFPA ratings

Disclaimer

Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

REGENESIS

Technology-Based Solutions for the Environment

SAFETY DATA SHEET

1. Identification

Product identifier	**Bio-Dechlor INOCULUM® Plus**
Other means of identification	None.
Recommended use	Soil and Groundwater Remediation.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name	Regenesis
Address	1011 Calle Sombra San Clemente, CA 92673
Telephone	949-366-8000
E-mail	CustomerService@regenesis.com
Emergency phone number	CHEMTREC® at 1-800-424-9300 (International)

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

Chemical name	CAS number	%
Soil Bacteria	Not Applicable	100

Composition comments All concentrations are in percent by weight unless otherwise indicated.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.

General information	If you feel unwell, seek medical advice (show the label where possible). Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Carbon dioxide (CO2). Water. Foam.
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials. Use water spray to keep fire-exposed containers cool.
General fire hazards	No unusual fire or explosion hazards noted. The product itself does not burn.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Avoid contact with spilled material. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	This product is miscible in water. Disinfect the spill area with 5% bleach solution after clean-up. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid prolonged exposure. Observe good industrial hygiene practices. Wear appropriate personal protective equipment (See Section 8).
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass. Store away from incompatible materials (see Section 10 of the SDS). Store in a cool, dry area at 4 - 5°C (39 - 41°F).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate. Provide eyewash station.

Individual protection measures, such as personal protective equipment

Eye/face protection	Tightly fitting safety goggles.
Skin protection	
Hand protection	The following glove materials are recommended: vinyl or rubber.
Other	Wear suitable protective clothing.
Respiratory protection	Not normally needed. In case of insufficient ventilation, wear suitable respiratory equipment. If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Color	Murky yellow.
Odor	Musty.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	212 °F (100 °C)
Flash point	Not flammable.
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	0.9 - 1.1
Solubility(ies)	
Solubility (water)	Soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials. Keep from freezing.
Incompatible materials	Strong oxidizing agents. Bases. Acids.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
Skin contact	Prolonged or repeated skin contact may result in minor irritation.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Ingestion may cause irritation and stomach discomfort.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	Not expected to be acutely toxic.
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.
Further information	May be harmful by inhalation, ingestion, or skin absorption via bacterial action.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	This material will degrade in the environment. Material is readily degradable and undergoes hydrolysis in several hours.
Bioaccumulative potential	No data available.
Mobility in soil	Expected to be highly mobile in soil.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical: No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA): Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

Not Listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-February-2015

Revision date -

Version # 01

Further information HMIS® is a registered trade and service mark of the American Coatings Association (ACA).

HMIS® ratings
Health: 0
Flammability: 0
Physical hazard: 0

NFPA ratings

Disclaimer Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

SAFETY DATA SHEET

1. Identification

Product identifier	**PlumeStop® Liquid Activated Carbon™**
Other means of identification	None.
Recommended use	Soil and Groundwater Remediation.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name	REGENESIS
Address	1011 Calle Sombra San Clemente, CA 92673 USA
General information	949-366-8000
E-mail	CustomerService@regenesis.com

Emergency phone number	For Hazardous Materials Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC 24/7 at:
USA, Canada	1-800-424-9300
International	1-703-527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Water	7732-18-5	>75
Colloidal activated carbon ≤2.5 µm	7440-44-0	<25
Proprietary additives		≤3

Composition comments All concentrations are in percent by weight unless otherwise indicated.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	If you feel unwell, seek medical advice (show the label where possible). Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Carbon dioxide, alcohol-resistant foam, dry chemical, water spray, or water fog.
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed. Combustion products may include: carbon monoxide, carbon dioxide, sodium oxides, metal oxides.
Special protective equipment and precautions for firefighters	Use protective equipment appropriate for surrounding materials.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials. Use water spray to keep fire-exposed containers cool.
General fire hazards	This material will not burn until the water has evaporated. Residue can burn. When dry may form combustible dust concentrations in air.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Avoid contact with spilled material. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	This product is miscible in water. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid contact with skin and eyes. Avoid prolonged exposure. Observe good industrial hygiene practices. Wash thoroughly after handling. Wear appropriate personal protective equipment (See Section 8).
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS). Protect from freezing.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-3 (29 CFR 1910.1000)

Components	Type	Value	Form
Colloidal activated carbon ≤2.5 µm (CAS 7440-44-0)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Colloidal activated carbon ≤2.5 µm (CAS 7440-44-0)	TWA	2 mg/m3	Respirable fraction.

Biological limit values	No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls	Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear approved chemical safety goggles.
Skin protection	
Hand protection	Rubber, neoprene or PVC gloves are recommended. Wash hands after handling.
Other	Avoid contact with the skin. Wear suitable protective clothing.
Respiratory protection	Not normally needed. In case of insufficient ventilation, wear suitable respiratory equipment. If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Aqueous suspension.
Color	Black.
Odor	Odorless.
Odor threshold	Not available.
pH	8 - 11
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not flammable.
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1 - 1.2 (Water = 1)
Solubility(ies)	
Solubility (water)	Miscible.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials. Keep from freezing.
Incompatible materials	Strong oxidizing agents. Water reactive materials.

Hazardous decomposition products Combustion may produce: carbon monoxide, carbon dioxide, sodium oxides, metal oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation Prolonged inhalation may be harmful.

Skin contact Prolonged or repeated skin contact may result in minor irritation.

Eye contact Direct contact with eyes may cause temporary irritation.

Ingestion Expected to be a low ingestion hazard.

Symptoms related to the physical, chemical and toxicological characteristics Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity Not expected to be acutely toxic.

Components	Species	Test Results
Colloidal activated carbon ≤2.5 µm (CAS 7440-44-0)		
Acute		
Oral		
LD50	Rat	> 10000 mg/kg

Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not an aspiration hazard.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
PlumeStop® (CAS Mixture)			
Aquatic			
Chronic			
Fish	LC50	Fathead minnow	> 100 mg/l, 96 hr, static renewal

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil Expected to be temporarily highly mobile in soil.

Other adverse effects None known.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Toxic Substances Control Act (TSCA) All components of the mixture on the TSCA 8(b) inventory are designated "active".

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Colloidal activated carbon ≤2.5 µm (CAS 7440-44-0)

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 2016 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Industrial Chemicals (AICIS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 26-February-2015

Revision date 24-October-2021

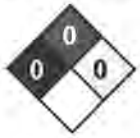
Version # 04

Further information HMIS® is a registered trade and service mark of the American Coatings Association (ACA).

HMIS® ratings

Health: 0
Flammability: 0
Physical hazard: 0

NFPA ratings



Disclaimer Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

REGENESIS

SAFETY DATA SHEET

1. Identification

Product identifier	**S-MicroZVI or S-MZVI**
Other means of identification	None.
Recommended use	Remediation of contaminants in soil and groundwater.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name	REGENESIS
Address	1011 Calle Sombra San Clemente, CA 92673 USA
General information	949-366-8000
E-mail	CustomerService@regenesis.com

Emergency phone number	For Dangerous Goods Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC 24/7 at:
USA, Canada	1-800-424-9300
International	+1 703-741-5970

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	Contact with acids liberates very toxic gas.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Glycerol	56-81-5	40 - 50
Zero valent iron	7439-89-6	30 - 50
Iron(II) sulfide	1317-37-9	1 - 4

Composition comments All concentrations are in percent by weight unless otherwise indicated.
Components not listed are either non-hazardous or are below reportable limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.

Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed. Combustion products may include: carbon oxides, iron oxides.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	This material will not burn until the water has evaporated. Residue can burn.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid prolonged exposure. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Glycerol (CAS 56-81-5)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.

US. OSHA Table Z-3 (29 CFR 1910.1000)

Components	Type	Value	Form
Glycerol (CAS 56-81-5)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls	Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier.
Skin protection	
Other	Wear suitable protective clothing.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Viscous metallic suspension.
Color	Dark gray
Odor	Slight.
Odor threshold	Property has not been measured.
pH	10 (As shipped) 7 - 8 (When mixed with water)
Melting point/freezing point	Property has not been measured.
Initial boiling point and boiling range	Property has not been measured.
Flash point	Property has not been measured.
Evaporation rate	Property has not been measured.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Explosive limit - lower (%)	Property has not been measured.
Explosive limit - upper (%)	Property has not been measured.
Vapor pressure	Property has not been measured.
Vapor density	Property has not been measured.
Relative density	Property has not been measured.
Solubility(ies)	
Solubility (water)	Property has not been measured.
Partition coefficient (n-octanol/water)	Property has not been measured.
Auto-ignition temperature	Property has not been measured.
Decomposition temperature	Property has not been measured.
Viscosity	3000 cP (77 °F (25 °C))
Other information	
Density	Property has not been measured.
Explosive properties	Not explosive.
Kinematic viscosity	Property has not been measured.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Contact with acids will release highly flammable and highly toxic hydrogen sulfide gas. Can react with some acids with the evolution of hydrogen.
Conditions to avoid	Contact with incompatible materials. Avoid drying out product.
Incompatible materials	Strong oxidizing agents. Acids.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Spray mist may irritate the respiratory system. For dry material: Dust may irritate respiratory system.
Skin contact	Prolonged or repeated exposure may cause minor irritation.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	May cause discomfort if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity Not expected to be acutely toxic.

Components	Species	Test Results
Glycerol (CAS 56-81-5)		
Acute		
Dermal		
LD50	Rabbit	> 18700 mg/kg
Oral		
LD50	Rat	27200 mg/kg

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Further information	Contains an ingredient known to produce adverse effects in a small percentage of hypersensitive individuals exhibited as respiratory distress and allergic skin reactions.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components	Species	Test Results
Glycerol (CAS 56-81-5)		
Aquatic		
Acute		
Crustacea	EC50 Daphnia magna	> 10000 mg/l, 24 Hours

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Partition coefficient n-octanol / water (log Kow)

Glycerol (CAS 56-81-5)	-1.76

Mobility in soil No data available.

Other adverse effects None known.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Toxic Substances Control Act (TSCA) All components of the mixture on the TSCA 8(b) inventory are designated "active".

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

FEMA Priority Substances Respiratory Health and Safety in the Flavor Manufacturing Workplace

Glycerol (CAS 56-81-5) Other Flavoring Substances with OSHA PEL's

US state regulations

US. Massachusetts RTK - Substance List

Glycerol (CAS 56-81-5)

US. New Jersey Worker and Community Right-to-Know Act

Glycerol (CAS 56-81-5)

US. Pennsylvania Worker and Community Right-to-Know Law

Glycerol (CAS 56-81-5)

US. Rhode Island RTK

Glycerol (CAS 56-81-5)

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Zero valent iron (CAS 7439-89-6)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Industrial Chemicals (AICIS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	27-December-2018
Revision date	25-May-2022
Version #	02
HMIS® ratings	Health: 1 Flammability: 1 Physical hazard: 0 Personal protection: B

NFPA ratings

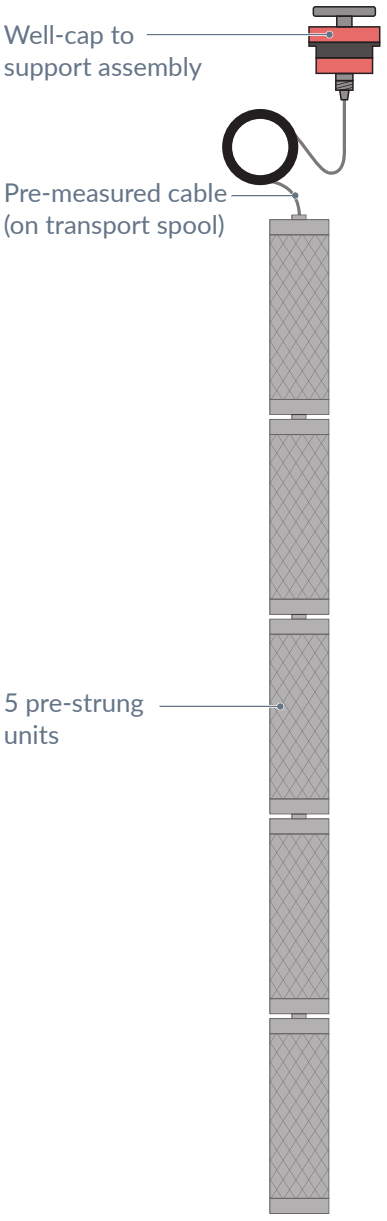
Disclaimer

Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

ATTACHMENT 3

PASSIVE FLUX METER INFORMATION

FluxTracer®
Flux Mapping Tool



Specification Sheet

FluxTracer® Flux Mapping Tools are easy-to-use devices that vertically delineate contaminant mass flux and groundwater velocity within an existing monitoring well to aid in site characterization and remedial designs. The FluxTracers consist of five separate two-foot-long stainless-steel screen canisters that are secured in series on a pre-measured central wire line equipped with a modified J-Plug well cap. FluxTracers are always pre-assembled, arriving at your site ready to deploy with no on-site construction required. The unique design provides joint-like flexibility between the closely stacked canisters to easily install and remove from a well.

Each FluxTracer canister is filled with granular activated carbon pre-loaded with biodegradable tracers. The tracers are composed of five different alcohols each having well-known partitioning characteristics with the activated carbon. As groundwater passively flows through a FluxTracer canister over the deployment period, the alcohol tracers are depleted from the activated carbon, with the net loss of the tracers directly correlating to the groundwater speed. At the same time, any contaminants present in the groundwater adsorb to the activated carbon during the deployment period. The total mass of contaminants accumulated on the activated carbon is then quantified and the contaminant mass flux is calculated.

A study consists of a FluxTracer installation into a well across a predetermined vertical interval of the saturated zone. The FluxTracer unit is typically in the well for two weeks and then retrieved. Once removed from the well, the FluxTracer devices are simply repackaged into the provided sleeves with zip ties and returned to the REGENESIS Lab for analysis. No on-site disassembly or sampling is required.

Upon receipt in the REGENESIS lab, each FluxTracer canister's contents will be sampled and analyzed at one-foot intervals. From those analyses, an accurate vertical profile of contaminant mass flux ($mg/m^2/day$) and groundwater Darcy flux (speed) (cm/day) is generated, and the results are provided in a report. The generated data provides remedial designers with important information on the flux zones within the aquifer, which ultimately aids to improve the results of remediation efforts.

FluxTracer®
Flux Mapping Tool

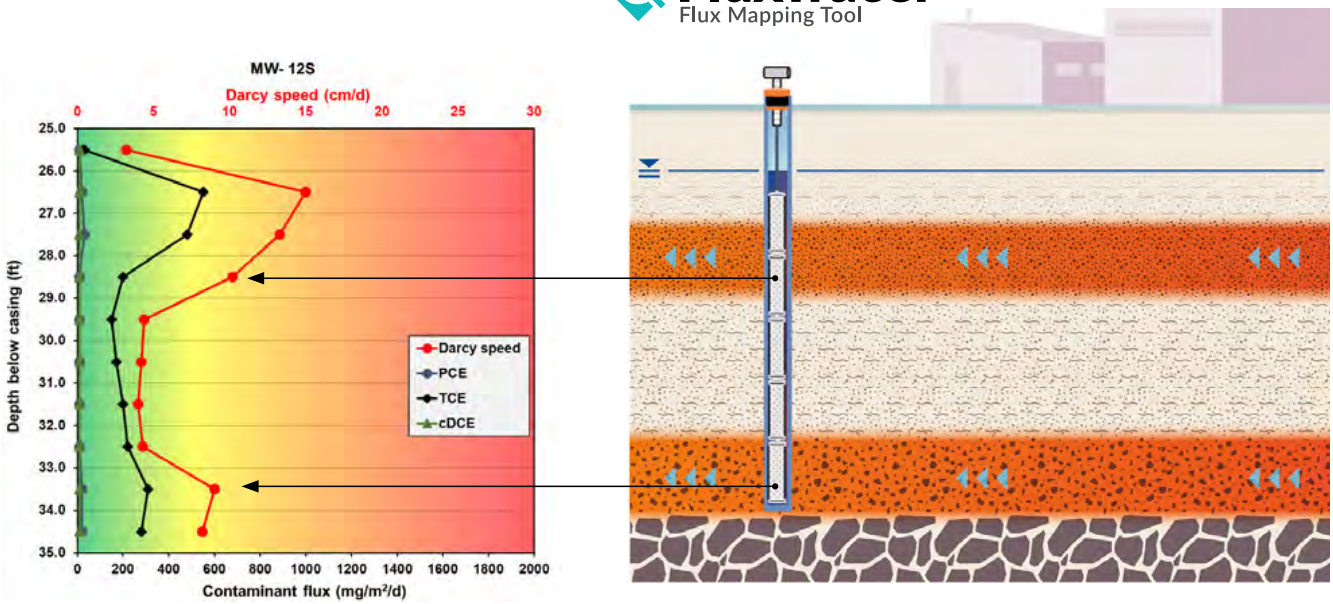


Illustration of a FluxTracer installed in a heterogeneous aquifer, and the ability to identify higher water and contaminant flux zones in an example data set.

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Storage and Handling Guidelines

- Follow all installation and retrieval directions.
- Store the FluxTracers in the original shipping cooler until deployment. The cooler should be stored in a cool, dark location until deployment.
- Do not remove the FluxTracers from the packaging until the time of deployment.
- FluxTracers should be deployed within five days of receipt.
- Wear appropriate personal protective equipment when handling.

Applications

- REGENESIS currently only offers FluxTracer units for 2-inch diameter schedule 40 PVC wells.
- FluxTracers are currently only appropriate for determining contaminant flux of chlorinated VOCs: PCE, TCE, and cDCE.

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