FEHR GRAHAM
ENGINEERING & ENVIRONMENTAL

July 27, 2016

Mr. Kevin McKnight
WDNR
625 E. County Road Y, Suite 700
Oshkosh, WI 54901

RE: WPDES Permit for Soil Mixing and Treatment, Remedial Action, Bay Towel Remediation, 501 S. Adams Street, Green Bay, WI BRRTS # 02-05-237064

Dear Kevin:

Attached are the following completed and signed materials:

- Request for Coverage Under WPDES Application Form
- Determination Checklist for Contaminated or Uncontaminated Groundwater Remedial Actions
- Remediation Description from the Approved Remedial Action Plan
- $100 Injection Permit Fee

Planned Remedial Excavation, Chemicals and Processes

The plan includes excavation and landfill disposal of an estimated 1350 tons of soil, primarily beneath the building in the area of prior drycleaning operations (Figure 3). The excavation dimensions are shown in the attached figure, with the primary area measuring roughly 50 feet square by eight feet deep. Monitoring well MW-1, and any existing components from the former molasses injection system, will be removed during the excavation.

Some of the soil cannot be directly excavated and landfilled due to elevated concentrations of tetrachloroethene (PCE). To lower the concentrations to allow for landfill disposal as a solid waste, spray-on addition of Fenton's Reagent will be performed, with mixing of the chemicals and the soil using a conventional backhoe operated by a contractor. The solutions will be mixed on site inside a treatment system trailer, and will be pumped onto the soil using hoses and spray nozzles to achieve the correct consistency of soil and treatment chemicals. Water will be provided by tapping a hydrant located on-site, owned by the City of Green Bay. Permits from the City of Green Bay will be obtained prior to implementation. We have already had a meeting with the City, fire department, and utilities to discuss the planned process, and received information on the necessary permits and procedures.

Included in the mixture will be BAM, a 90% carbon, 10% mineral solid. These substances will be mixed with the contaminated soil in estimated two foot lifts, allowed to react for approximately one day, and then tested for total VOC's, and TCLP VOC's. If the soil passes the testing criteria, the material will be removed and taken to a licensed subtitle D landfill for disposal.

If the soil does not pass, it will be treated with additional chemical and mixed, then retested.

If necessary, drop boxes will be rented to place the treated soil pending laboratory test results, so further mixing and excavation activities can proceed.

Fenton's reagent is a strong oxidizer, and we will have another company, Orin Technologies of Madison, conducting that operation. Chemicals stored at the site to use in this process will include 50% hydrogen peroxide (which will be diluted down to 15% for use in the Fenton's mixture), sodium citrate dihydrate, ferrous sulfate, sulfuric acid (93% but diluted down), phosphoric acid (85% but diluted down) and a proprietary solid mixture called BAM, consisting of 90% carbon and 10% minerals. These chemicals will be secured inside a locked building or trailer.

A total of 12,000 gallons of Fenton's reagent and 50 cubic yards of BAM, a solid, is planned for use. The total quantity may vary depending on the findings from a pre-treatment batch test, which is pending completion.

Post-Excavation Chemical Addition and Backfill

In addition, after completion of the excavation to eight feet below grade, a solution of ABC+ will be added to the base of the excavation and briefly mixed with the remaining soil in the excavation base. Because all contamination will not likely be removed via excavation, this water-based solution consists of soluble lactic acid with a phosphate buffer to maintain reducing conditions and provide micronutrients for bioremediation. The plus part of the ABC+ consists of up to fifty percent zero valent iron, which is added to undergo degradation, providing ferrous iron and hydrogen as reducing agent. These compounds will act as an energy source for anaerobic bacteria. An estimated 1210 gallons of ABC+ is proposed for use.

Backfill will consist of two-inch diameter stone and bank run sand. Monitoring well MW-1 will be replaced with a sump completed to the excavation base at eight feet.

Utilities

Utilities are shown on the attached map, and include private utilities that run through the proposed excavation area, and storm sewer, sanitary sewer, water, and the Green Bay Interceptor Sewer line that runs beneath Adams Street. A private utility locator has already been to the site and painted the location of sub-building storm, sanitary and water lines.

Removal of all private underground utilities is planned within the excavation footprint areas to facilitate the dig and mixing operations. The storm sewer connects roof drains, and if precipitation appears likely during the excavation, temporary drain pipe will be installed to direct storm water to the existing storm drain outfall to prevent the excavation from filling with rainwater.

Upon completion of the excavation, the storm sewer and sanitary sewer laterals will be restored, however, if the building is to be demolished shortly after completion of the remedial action, utility restoration will not be necessary.

Concern was raised by the WDNR over potential migration of chemicals to the main utility lines and the interceptor sewer that runs beneath Chicago / Adams Street. Because there is no pressure injection at this site, and merely spray on chemical addition, no migration of sprayed-on chemicals is expected to take place. However, as requested by the WDNR, bentonite clay plugs will be installed at the terminus of the excavation area surrounding the storm sewer, sanitary sewer, and water lines, at the location closest to the point that they exit the building on the east.

Proposed Monitoring During Injection

Since added chemicals are not being pressure injected and surface sprayed, and since the chemicals are being excavated and removed shortly after addition, only minimal monitoring for potential off-site chemical contaminant migration is planned. Monitoring well MW-1, in the heart of the excavation and treatment area, will be removed during the remediation, and restored upon completion of backfilling. Monitoring well MW-2, located approximately ten feet hydraulically downgradient from the proposed excavation, will remain in place.

There are several monitoring wells located outside the building that will also remain in place that are proposed for monitoring.

Pre-excavation monitoring of water level, dissolved oxygen, pH, conductivity, and oxidation / reduction potential will be recorded from wells MW-1, MW-2, MW-4, MW-5, MW-7, MW-13, and PZ-2 (Figure 1). The headspace of these wells will also be monitored with a four gas meter, for percent oxygen, percent carbon dioxide, hydrogen sulfide, and percent of the lower explosive limit (LEL).

During days when chemical additions occur in the excavation, measurements of these parameters will be performed once per day from all of the above locations except MW-1, which will have been removed.

Upon conclusion of the excavation and backfilling, and after restoration of a sump at location MW-1, a final round of measurements for the sample water and gas parameters will be recorded.

I trust these documents meet your needs, and you have enough information to issue the permit. If you need additional information, please call and let me know. We hope to begin the remedial action in the Fall of 2016, and look forward to hearing from you.

Sincerely,

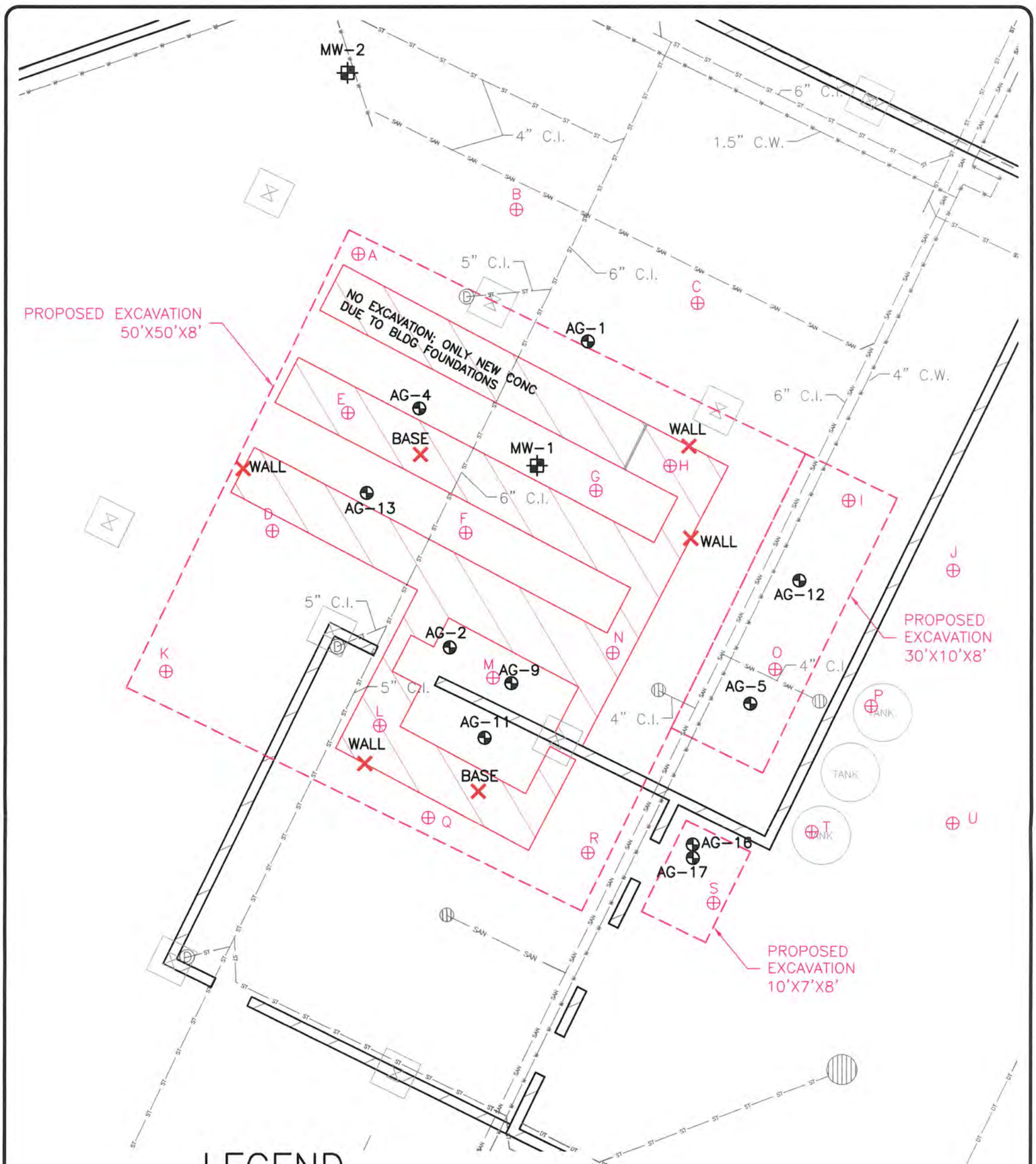
Kevin O. Ellis

Kendrick A. Ebbott, PG., CGWP
Branch Manager

Attachments: Completed WPDES Request for Coverage Form and $100 Permit Fee Check
Completed Checklist for Groundwater Remedial Actions Form
Figure 1: Site Borings and Monitoring Wells
Figure 3: Proposed Remediation Plan

Cc: Ms. Kristin DuFresne, WDNR, 2840 Shawano Avenue, Green Bay, WI 54313-6727 w/ Attachments
Mr. Don Gallo, Husch Blackwell LLP, via email
Ms. Michelle Williams, Husch Blackwell LLP, via email
Mr. John Butz, Bay Towel, via email

o:\bay towel\15-1527\reports\revised work plan and remedial action plan\final revised scope and work plan.docx



LEGEND

MW-1 MONITORING WELL / PIEZOMETER

MW-11 ABANDONED MONITORING WELL

A PROPOSED SOIL BORING DEPTHS:
1-2'
4-5'
7-8'

NOTE: PROPOSED CONC SAMPLES AT BORINGS:
A, F, H, I, K, M

AG-1 SOIL BORING 2000

SOIL EXCAVATION 2003

X EXCAVATION SAMPLE 2003

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GRAPHIC SCALE IN FEET

FEHR GRAHAM ENGINEERING & ENVIRONMENTAL ILLINOIS IOWA WISCONSIN

BAY TOWEL-SOLVENT INVESTIGATION
501 S. ADAMS ST.
GREEN BAY, WI 54301
DRWN: MKH DATE:10/21/15 APPD: XXX

TITLE: PROPOSED REMEDIATION SPLAN

BRRTS: 02-05-237064
JOB NO.:15-1527
PLOT DATE: 2/26/16

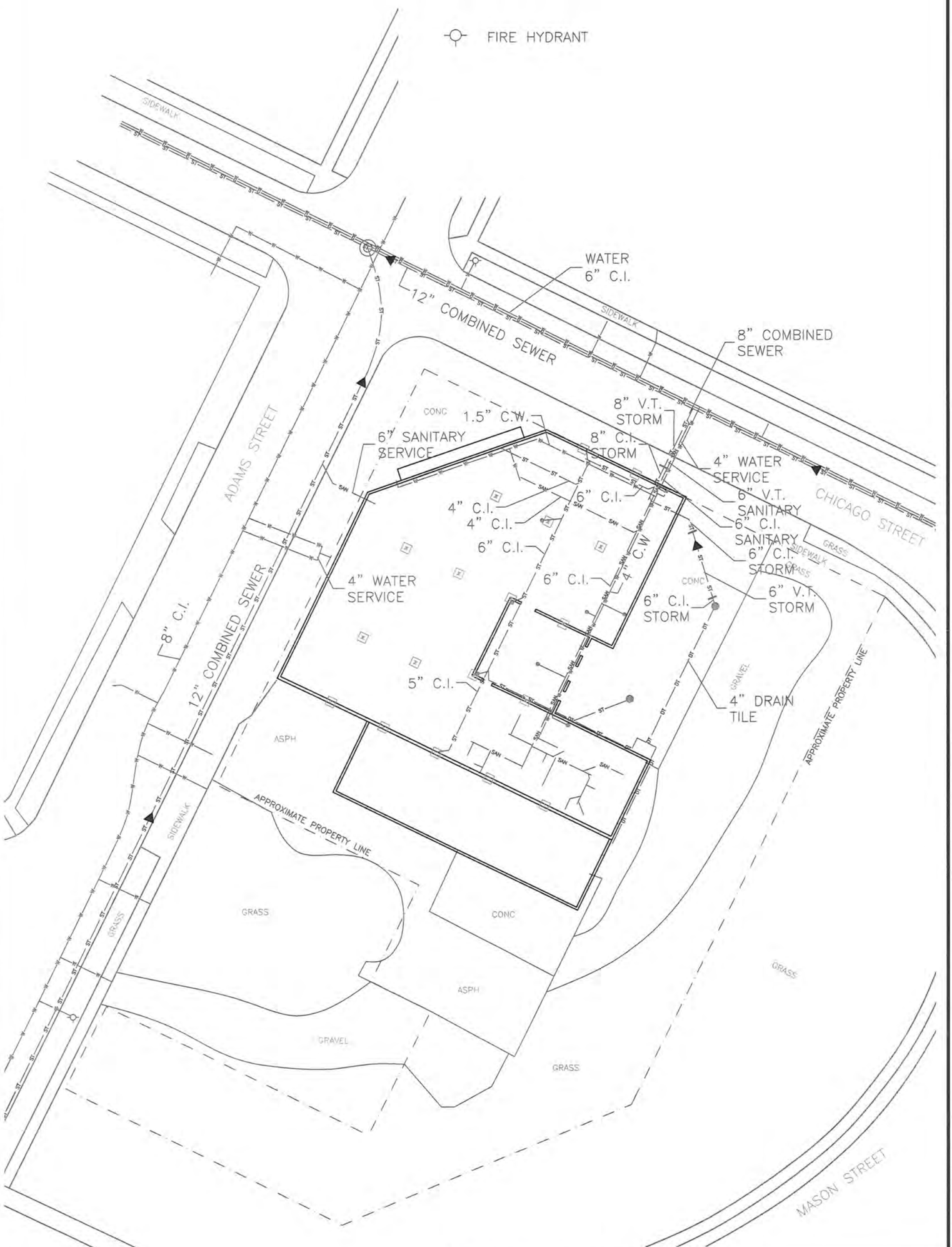
FIGURE: 3

F:\Drawings\C3D\15\15-1527 Bay Towel\Exhibits\15.1527-BaseMap-Bay Towel.dwg, FIG 3-PROP PREREM SMPL

LEGEND

C.I. CAST IRON
V.T. VITREOUS TILE
C.W. COLD WATER BELOW FLOOR

FIRE HYDRANT



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GRAPHIC SCALE IN FEET

FEHR GRAHAM ILLINOIS IOWA WISCONSIN
ENGINEERING & ENVIRONMENTAL

BAY TOWEL–SOLVENT INVESTIGATION
501 S. ADAMS ST.
GREEN BAY, WI 54301
DRWN: MKH DATE: 10/21/15 APPD: XXX

TITLE:
UTILITIES

BRRTS: 02–05–237064
JOB NO.: 15–1527
PLOT DATE: 2/26/16

FIGURE:
1A

F:\Drawings\C3D\15\15–1527 Bay Towel\Exhibits\15.1527–BaseMap–Bay Towel.dwg, FIG 1A – UTILITIES

DETERMINATION CHECKLIST FOR CONTAMINATED OR UNCONTAMINATED GROUNDWATER REMEDIAL ACTIONS (rev 8/97)

DNR WILL COMPLETE SHADED SECTIONS

NAME/ADDRESS OF FACILITY: Former Bay Towel, 501 S. Adams Street, Green Bay, WI

HIGHEST MONTHLY AVERAGE DISCHARGE FLOW RATE: NONE VACANT STRUCTURE GPM, _____ GPD, _____ CFS

A. Applicability criteria - discharge character/pollutants

1. Type of wastewater and possible sources of pollutants:

   No Wastewater - Proposal to add chemicals (Fenton's Reagent and BAM - biomass solid with high carbon content) via spray to soil, mix, then excavate mixture and landfill. Also ac ABC+ - lactic acid and iron) to excavation base after excavation complete.

2. Categories of pollutants tested/scanned:

   None in added materials

3. Priority pollutants identified: *(check all that apply)*

   _____ OK - pollutants are properly regulated by the general permit
   _____ BETX (Benzene, Ethylbenzene, Toluene, Xylene)
   _____ Other Petroleum Products - type: _____
   _____ PAH's (Polynuclear aromatic hydrocarbons incl. Naphthalene)
   _____ Lead (Tetraethyl lead is an octane booster)
   X VOC's (Volatile Organic Chemicals) Existing in soil and groundwater - not to added
   _____ PROBLEM - general permit does not have limits to properly regulate discharges of these pollutants *(have facility change discharge or draft an individual permit when limits are needed)*
      _____ Other NR 105 metals, cyanide or phenols
      _____ Pesticides to surface waters
      _____ GC/MS Acids
      _____ GC/MS Base Neutrals (except Polynuclear Aromatic Hydrocarbons)
      _____ Others (Acrylonitrile, NH_3, Cl^-, etc.)

4. Are any bioaccumulating substances listed on page 2 of GP present?

   _____ YES Facility is not eligible for general permit
   X NO Continue with checklist to determine eligibility

A. Applicability Criteria - Receiving Water:

1. Aquatic Use Classification:

2. Mean Annual Flow: _____cfs *(data or drainage basin estimate)*

3. Any downstream higher quality waters that could be impacted?

_____ YES Use additional worksheet to evaluate downstream impacts
_____ NO Continue with checklist to determine eligibility

4. Does discharge flow to (or impact downstream) Outstanding Resource Waters?

_____ YES Facility is not eligible for general permit *[Issue specific permit or change discharge. For "existing" discharges (previously covered under the general permit), no 207 review is needed; for new or increased discharges, a 207 review is necessary].*
_____ NO Continue with checklist to determine eligibility

5. Does discharge flow to waters classified for Public Water Supply?

_____ YES Facility is not eligible for general permit *[Issue specific permit for discharge. For "existing" discharges (previously covered under the general permit), Water Resource Management review is needed to make sure NR 105/106 limits are included in the specific permit].*
_____ NO Continue with checklist to determine eligibility

6. Does discharge flow to (or impact downstream) Exceptional Resource Waters?

_____ YES *(check appropriate line below)*
_____ Facility is eligible for the permit if the purpose of discharge is to prevent or correct an existing groundwater contamination situation or a public health problem *(see NR 207.04(1)(c)1.*
_____ Existing discharges with no increase in flow are eligible
_____ Otherwise, the facility is not eligible for the permit *(and a site specific permit shall be individually drafted).*
_____ NO Receiving water is not an Exceptional Resource water. *(Continue with checklist to determine eligibility).*

7. Does discharge flow to waters classified as a wetland?

_____ YES Facility may still be eligible for general permit if the Department determines that the facility's discharge meets the wetland protection requirements of ch. NR 103.
_____ NO Continue with checklist to determine eligibility

B. REQUIREMENTS FOR ALL DISCHARGERS

1. Is the contaminated groundwater discharged directly without any treatment for removal of pollutants?

_____ YES Facility is not eligible for general permit, treatment is required
X NO Continue with checklist to determine eligibility

NO DISCHARGE OF CONTAMINATED GROUNDWATER

2. Is there a discharge management plan to approve?

_____ YES Use the discharge management plan approval (paragraph in the cover letter) to exempt the facility from monitoring certain contaminants that data has shown will not be present in the effluent, require additional monitoring for something in NR 105 or 140 that is not listed in the permit, or approve alternate limits for seepage.

_____ NO Specify (in the cover letter) that all parameters in appropriate section of the GP are required to be monitored, but the facility may sumbit a future discharge management plan to delete substances from monitoring.

3. Are any harmful, not approved chemical cleaning or water treatment additives proposed to be discharged under this general permit?

_____ YES Facility is not eligible for general permit because the additives used are not approved under the general permit; *specific permit or change in discharge or additive use is needed.*

X NO Facility is eligible for general permit because:

_____ None are used

_____ Type and amount of additive listed on application are allowable under general permit. *(Contact IWW/Madison for approved additives)*

_____ Treatment cleaning solutions are properly discharged offsite (such as POTW)

_____ Facility uses chlorine, but can meet the "no detect" permit limit for discharge *(monitoring for trihalomethanes may be required).*

Notes on additive use or cleaning system at this facility:

Will mix Fenton's Reagent (hydrogen peroxide and sulfuric acid/ferrous sulfate, plus will add BAM - organic carbon source) with site soil to drop concentrations of PCE below levels that prevent landfill disposal. Will then excavate soil and landfill. Additions done via spray, and soil to be removed following mixing, so chemicals not remaining in subsurface longer than a couple days.

4. pH: Does the discharge pH fall outside of 6.0 - 9.0 s.u.?

NO DISCHARGE

_____ YES Facility is not eligible for general permit. *(Issue specific permit or change discharge)*

X NO Facility is eligible for general permit. *(Continue with checklist to determine eligibility)*

5. Have other programs been informed to check on the need for other permits/approvals?

NA : WDNR Bureau of Remediation and Redevelopment has approved the plan

_____ YES Air management staff are informed; a permit is issued if needed; benzene emissions of greater than 300 lbs/year requires a permit.

_____ YES Water Reg/Zoning is informed of any outfall work below the high water mark. Facility is aware that local storm sewer may be needed.

_____ NO Send a copy of this checklist or the permit application to appropriate program.

C&D. EFFLUENT LIMITS AND MONITORING REQUIREMENTS FOR DISCHARGES TO SURFACE WATERS

1. Suspended Solids: Is it likely that the effluent will exceed 40 mg/L TSS?

NO EFFLUENT

_____ YES Facility is not eligible for general permit. *(Issue specific permit or change discharge)*

X NO Facility is eligible for general permit. *(Continue with checklist to determine eligibility under other parameters)*

2. Petroleum Product Remediations

a. Can the facility comply with the free product separation requirement, the 50 ug/L Benzene limit, 70 ug/L Naphthalene limit, and the total BETX limit of 750 ug/L?

X YES Facility is eligible for general permit.
_____ NO Facility is not eligible for general permit. *(Issue specific permit or change discharge)*

b. Can the facility comply with the total recoverable lead limit set at 1/3 of the remaining assimilative capacity. Calculate the lead limit based on the receiving water hardness, background lead conc, $3Q_{7,10}$ and Q_e. Use the calculation formula on page 7 of the permit, of quatro pro spread sheet located in P:\general\reissue\gw\Pbcalc.wb2. Include the numerical lead limit in the cover letter (don't expect the facility to calculate it). Don't put a weekly ave. lead limit higher than the 50 ug/L daily maximum limit (BAT) in the cover letter.

_____ YES Facility is eligible for general permit.
_____ NO Facility is not eligible for general permit. *(Issue specific permit where full assimilative capacity limit is possible or change treatment to require more aggressive filtering)*

c. Has testing of the treatment system influent revealed detectable quantities of polynuclear aromatic hydrocarbons using EPA method 8310 HPLC?
NA : NO SYSTEM INFLUENT

_____ N/A Not applicable to gasoline (only) remediations
_____ YES Facility will not be able to remove PAH's to less than detectable levels, and will not be able to comply with GP limit *(Issue specific permit or change discharge)*
_____ YES Facility is eligible for general permit, but treatment will be provided to remove PAH's to not detectable levels.
_____ NO Facility is eligible for general permit. *(Monitoring for PAH's may be required during permit life)*

d. Is the discharge expected to exceed the daily maximum oil and grease limit of 10 mg/L?
NA : NO DISCHARGE

_____ N/A Not applicable to gasoline (only) remediations
_____ YES Facility is not eligible for general permit. *(Issue specific permit or change discharge)*
_____ NO Facility is eligible for general permit. *(Monitoring for PAH's may be required during permit life)*

3. Volatile Organic Chemical Remediations

a. Any stream background data for the VOC's in the discharge?

____ YES Subtract the background value from the criteria to find the remaining assimilative capacity
____ NO Assume non-detectable background or request testing

b. Calculate the theoretical instream concentration for each pollutant using the general permit limit: (attach sheet w/calculations for all pollutants)

$$\frac{(\text{GP Limit}) \times (\text{Effluent Flow})}{(\text{3 harmonic mean stream flow} + \text{Effluent Flow})} = \text{instream pollutant concentration}$$

c. Will the calculated instream pollutant concentration exceed 1/3 (NR 207 not significant lowering) of the remaining assimilative capacity (water quality criteria minus background level) for the aquatic use classification listed in the table?

_____ YES Facility is not eligible for general permit. *(Issue specific permit with mass limits or change discharge)*

_____ NO Facility is eligible for general permit. *(Specify in the cover letter which VOC's will be required to be monitored)*

d. note: If there are no limits in the GP for VOC's in the discharge, the need for a permit limit can be checked by substituting [the water quality criteria] for [the instream pollutant concentration] in the formula above to solve for what the potential [permit limit] would be. As long as the discharge level would be less that 20% of the potential permit limit, an numerical limit is not needed and the general permit can be used. If the discharge level is above 20% (or the p99) of the water quality based limitation, an individual permit must be drafted to contain the water quality based limit. Alternatively, the treatment system could be redesigned to reduce the effluent concentration such that the discharge is again eligible for the general permit.

E. EFFLUENT LIMITS AND MONITORING REQUIREMENTS FOR DISCHARGES TO GROUNDWATERS.

Effluent limits and monitoring requirements for groundwater discharges are established in the permit at a level equivalent to the preventive action limit to assure compliance with Ch. NR 140 groundwaterquality standards. The permittee may submit (and the field DNR wastewater staff may approve) a demonstration in discharge managemnt plan that justifies that limits up to the enforcement standard are needed due to technical or economic infeasibility. Approve the alternate limits in your approval of the discharge management plan. The cover letter shall specify the preferred method of documenting compliance with the groundwater standards, such as: (1) meeting PAL or ES in samples from groundwater monitoring wells, (2) meeting PAL or ES in samples of wastewater treatment effluent before discharge, or (3) by meeting end-of-pipe wastewater discharge limits that are back calculated (for effects of pollutant dilution, dispersion of degradation) to comply with ground water standards.

F. EFFLUENT LIMITS AND MONITORING REQUIREMENTS FOR DISCHARGES TO IN SITU REMEDATION OF GROUNDWATERS

Effluent limits and monitoring requirements for groundwater discharges are established in the permit at a level equivalent to the preventive action limits unless a Temporary Exemption under Ch. NR 140.28(5) is granted by the DNR Remediation and Response Program. The ERR NR 140 temporary exemption must set maximum seepage/injection levels to protect surrounding groundwater. Above ground treatment (air stripping) is generally required of these projects to reduce the risk of contaminated groundwater moving outside the plume area. You are encouraged to call Jeff Brauer at (608) 267-7643, Steve Karklins at (608) 266-5240, or your Regional hydrogeologist if you get involved with one of these projects.

G. REQUIREMENTS FOR AG-CHEM SITE DISCHARGES TO FARM FIELDS

In most cases farm Coop sites with pesticides and fertilizers should be encouraged to reuse the remediation wastewater when the are mixing up pesticide batches or when they can irrigate of landspread the waters for beneficial use on farm fields. When these sites are considering surface water discharge, Best Available Treatment generaly requires activated carbon to be used and there are difficult issues with regard to Ammonia-Nitrogen affects on aquatic life. Often there may be no assimilative capacity remaining for ammonia and the stream classification (or lack of any formal classification resulting in a default full fish class) causes difficult permitting problems. For those reasons the general permit should not be used on Ag-chem remediation discharges to surface waters.

Is this facility eligible for the general permit?

_____ YES *(see reasons checked above)*
_____ NO *(see reasons checked above)*

Special considerations at this facility:

Wastewater Reviewer Sign _____ Date: _____

Basin Biologist/WQ limit spec Approval _____ Date: _____

Date Received _____
(Leave blank)

Request for Coverage Under
Wisconsin Pollutant Discharge Elimination System (WPDES)
Wastewater Discharge Permit (WI-0046566-06) for
Contaminated Groundwater from Remedial Action Operations

(Revised 8 / 2012)

Please type or print required information, except for the signature.

I. GENERAL INFORMATION

A: FACILITY LOCATION INFORMATION		
Name of Facility / Project Bay Towel / Drycleaner Site Remediation	Official Representative Onsite Vacant – contact consultant or owner	Title
(Address or Highway / Road with Distance and Direction from nearest City) 501 S. Adams Street	Telephone No.: Vacant - None	Fax #
City, State, Zip Code Green Bay, WI	County Brown	Email Address None

B: Individual, parent company, or organization with direct control over the facility. Enter full official legal name of the owner or parent company, if there is one, the mailing address, and the name and title of the official representative (responsible party) signing this application if he/she is located at address of parent company.		
Parent Company/Owner Bay Towel	Company Contact Mr. John Butz	Title President
Mailing Address - PO Box, Street, or Route 2580 S. Broadway, P.O. Box 12115	Telephone No.: 920 497-2000	Fax #
City, State, Zip Code Green Bay, WI 54307-2115	Email Address Tshipshock@hydro-flo.com	

C: Consulting Firm for Groundwater		
Company Name Fehr Graham	Company Contact Ken Ebbott	Title Branch Manager
Mailing Address - PO Box, Street, or Route 1237 Pilgrim Road	Telephone No.: 920-892-2444	Fax # 920-892-2620
City, State, Zip Code Plymouth, WI 53073	Email Address kebbott@Fehr-graham.com	

D. **Name of Person to Receive Discharge Monitoring Report Forms** from Department:

Ken Ebbott, Fehr Graham

E. **Any Other Necessary Contact Person** (name, phone, email)

F. **DNR Environmental Response & Repair Project Number, and DNR Project Manager name:**

BRRTS # 02-05-237064 Kristin Dufresne

II. SPECIFIC INFORMATION ON PROJECT

A. Pollutants

1. The suspected **sources of the pollutants** (estimate of material release quantity and contributing activities)

Tetrachloroethene and related breakdown products, concentrations up to 406 mg/kg in shallow soil 1 to 2 feet below grade and 7,710 mg/kg at depths of 4 to 5 feet beneath the building. Lower levels have been detected beneath and outside the building over an estimated 50-foot square area. Source from incidental releases from operations as drycleaning facility, cleaning filters, wet transfer, product delivery, former tanks, etc.

2. Check **all fuel and waste types** suspected in the contamination at this site:

☐ Unleaded Gasoline	☐ Jet Fuel	☐ Pesticides
Leaded Gasoline	☐ Waste Oil	☐ Fertilizers
☐ Diesel Fuel	☒ Solvents	
☐ Heating Oil	☐ Other:	

3. Check **all pollutants identified at this site**:

BETX (Benzene, Ethylbenzene, Toluene, Xylene)	☐ Pesticides/Fertilizers
☐ PAHs (Polynuclear aromatic hydrocarbons)	☐ Total Recoverable Lead *
☒ VOCs (Volatile Organic Chemicals)	☐ Other_____

* Include upstream receiving water hardness analysis if lead is detected.

B. Treatment

1. **Describe the existing treatment system**:

Sprayed on to excavation soils and mixed, a solution of Fenton's reagent (mix of hydrogen peroxide and sulfuric acid / ferrous sulfate, then BAM, a high biomass solid with 90% carbon, 10% minerals.

Following mixing and allowing for reaction time, the material will be tested for total VOCs and / or TCLP VOCs. If below acceptable concentrations Material will be taken to a subtitle D landfill for disposal. If not acceptable, additional Fenton's and / or BAM will be added and the material retested until it can be landfilled.

After excavation completed, will add ABC Plus in the exaction base, a mixture of soluble lactic acid and a phosphate buffer, combined with zero valent iron.

Treatment Techniques Used

- ☐ Pump & Treat
  - ☐ Air stripping
  - ☐ GAC (Granular Activated Carbon)
- ☐ Augmented Insitu Bioremediation (with chemicals or nutrient addition)
- ☐ Other (describe)

2. **If any cleaning, softening or descaling of the treatment system**

a. Identify any additives that are proposed or being used for cleaning, softening, or descaling of the treatment system. Provide Safety Data Sheets, and describe dosage.

None for these purposes. Soil mixing will use Fenton's Reagent, BAM, and ABC Plus. A 50% hydrogen peroxide container will be delivered to the site, later diluted to 15% for application. The peroxide will be mixed with iron sulfate heptahydrate and sulfuric acid (93%). An estimated 12,000 gallons of fenton's reagent will be added, along with 50 cubic yards of BAM. Attached are SDS's for these materials. BAM is a proprietary carbon source that will also be added to help bind residual solvents. After the soil excavation has been completed, an estimated 1200 gallons of ABC Plus, an aqueous mixture of soluble lactic acid, phosphorous buffer, and zero valent iron will be mixed into the soil at the excavation base. The mixture chemistry of the ABC Plus will be determined pending the outcome of a batch test.

b. Describe what is done to clean, soften or descale, and how often it is done.

N/A

c. Where is the reject water from cleaning and descaling discharged?

☐ same discharge point as treated effluent ☐ sanitary sewer ☐ other (please describe)

3. **Anticipated operating schedule** during the new permit term (2012 – 2017)

September 2016 mixing to require an estimated two weeks

4. **Anticipated flowrate** (in gpm), and total volume of treated water to be discharged per month:
None

5. **Effluent discharge point location**:

None

6. Is an **air permit** from the DNR air management program required? If not, why not

No – subsurface addition – VOCs are chemically degraded in the subsurface with no emissions to air.

III. DISCHARGE MANAGEMENT PLAN UPDATE

Include the following information:

1. A **summary** of analytical results for contaminants **detected** at the site.

2. Results from the most recent **volatile organic compounds (VOC) scan**, including methods used and detection levels.

3. Results from an analysis of the **poly-nuclear aromatic hydrocarbons (PAHs)** shown on the right, including methods used and detection levels (unless PAH data are already submitted)

   The lab needs to reach the lowest detection level achievable for each parameter because of the low limit for total PAHs. EPA test method SW-846 8310 is recommended.

benzo(a)anthracene	dibenzo(a,h)anthracene
benzo(a)pyrene	fluoranthene
benzo(b)fluoranthene	indeno(1,2,3-cd)pyrene
benzo(g,h,i)perylene	naphthalene
benzo(k)fluoranthene	phenanthrene
chrysene	pyrene

4. **Contaminants proposed for periodic monitoring** and demonstration of why any monitoring required in the permit should be exempted due to low level of contaminants in the wastewater discharge.

5. **Information to support request for any alternate effluent limit** for discharges to groundwater (Part 5 of permit) or request for temporary exemption for in-situ discharges (Part 6 of permit).

6. **Plans and specifications for the proposed treatment system** identifying sampling points. For supplier furnished package treatment units, only a flow diagram, design summary, and unit sizing calculations are required.

7. **General description of operations**, identifying operational tasks, who is responsible to do that task, and how frequently the task is done (particularly needed at pump & treat systems).

8. A **site plan** that identifies general land uses, underground storage tanks and pipelines, groundwater monitoring and recovery wells, contaminant plume definition and zone of influence, other known spills in the area, septic tanks and drain fields, separation distances to potable water supply wells and residences, and other pertinent information.

9. A **detailed map** of the discharge location, showing if discharge is direct or via a storm sewer or other conveyance. Indicate distance from site to discharge location and other impacted water bodies or wetlands.
   - If a city storm sewer is used, approval from the municipality is required.

- If a new outfall structure is proposed, the plans should identify the outfall and incorporate appropriate erosion control methods. A permit for riprap projects (available at most DNR offices) should be obtained.
- Wetland discharges are not allowed unless they meet wetland protection requirements of Ch. NR 103, Wis. Admin. Code.

III. SIGNATURES

A. Signature of person completing the form, attesting to the accuracy and completeness of the statements made.

Name	Title	Date Signed
	Branch Manager	7/26/2016
1237 Pilgrim Rd., Plymouth, WI 53073	KEbbott@fehr-graham.com	920-892-2444
Address	Email	Telephone Number

B. This application must be signed by the official representative of the permitted facility (responsible party) who is: the owner, the sole proprietor for a sole proprietorship, a general partner for a partnership, or by a ranking elected official or other duly authorized representative for a unit of government, or an executive officer of at least the level of vice president for a corporation, having overall responsibility for the operation of the facility. If the application is not signed, or is found to be incomplete, it will be returned.

Mr. John Butz	President
Typed or Printed Name of Official Representative	Title
Signature of Official Representative	7/27/16
	Date Signed

Submit this General Permit Request for Coverage:

Department of Natural Resources,
Water Permits Central Intake - WT/3,
P.O. Box 7185,
Madison, WI 53707-7185.

The decision on whether to cover this discharge under the remediation general permit will be made by regional DNR wastewater staff. Upon receipt in Madison, this application will be forwarded to the appropriate regional staff person.

A copy of the submittal should also be sent to the Department Remediation & Redevelopment Project Manager.
Watershed Central:\General Permits\Reissue Docs\Grw Remediation\Request For Coverage 2012.doc

SAFETY DATA SHEET
Zero Valent Iron (ZVI)

Section 1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ZVI**
GENERAL USE: Chemical reduction of halogenated organics and-or metals

MANUFACTURER:

Redox Tech, LLC
200 Quade Drive
Cary, NC 27513
919-678-0140

EMERGENCY TELEPHONE:

Within USA and Canada: 1-800-424-9300
+1 703-527-3887 (collect calls accepted)

Section 2. HAZARDS IDENTIFICATION

Physical state : Solid (Powder)
Emergency Overview : Potential dust explosion. Avoid contact with oxidizing agents.
USE WITH CARE.
Follow good industrial hygiene practice

Routes of entry : Demal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects
- Eyes : May cause eye irritation.
- Skin : No known significant effects or critical hazards
- Inhalation : May cause respiratory tract irritation.
- Ingestion : No known significant effects or critical hazards.

Potential Chronic Effects: : Carcinogenic effects: Not classified or listed by IARC, NTP, OSHA, EU AND ACGIH.
Mutagenic effects: Not available
: Teratogenic effects: Not Available

Medical conditions : Repeated exposure of the eyes to a low level of dust can produce eye irritation

Section 3. COMPOSITION INFORMATION ON INGREDIENTS

Greater than 98% Iron CAS# 7439-89-6
Contains carbon, sulfur and other metal impurities.

Section 4. FIRST AID MEASURES

Eye contact : Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 20 minutes. Get medical attention if irritation occurs

Skin contact : Wash with soap and water. Get medical attention if irritation occurs.

Inhalation : Move person to fresh air. Get medical attention if breathing difficulty persists

Ingestion	:	Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention if symptoms appear.
Notes to physician:		No specific antidote. Material is used as an iron supplement in food and vitamins. Treatment would be the same as for iron overdose.

Section 5. FIRE FIGHTING MEASURES

Flammability of the product	Generally non-flammable but susceptible to dust explosion.
Fire-fighting media	Use a fog nozzle to spray water.
Special protective Equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment.
Special remarks on fire	As with any finely granulated product, a risk of dust explosion is present should the material be dispersed in air and exposed to a source of ignition. Fine powder can form flammable and explosive mixtures in air.

Section 6. ACCIDENTAL RELEASE MEASURES

In case of a significant release, take immediate efforts to minimize discharge to surface water (storm drains, streams, lakes, rivers, etc). If the release occurs in a closed area, take steps to improve ventilation. If improvement of ventilation is not possible, call the fire department. The material can be swept up and placed into approved storage containers. Do not use a vacuum to gather the material because this may result in dispersion of dust particles and increase the risk for a dust explosion.

Section 7. HANDLING AND STORAGE

The material should be stored in a cool, dry, environment. It is not recommended to store the material in the proximity of oxidants. When handling the product, wear a dusk mask, eye protection and gloves. The product should always be handled in a well ventilated environment.

Section 8. EXPOSURE CONTROLS – PERSONAL PROTECTION

Engineering controls	:	Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fumes or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal protection		
Eyes	:	Safety eyewear complying with an approved standard should be used and selected based on the t ask being performed and the risks involved (avoid exposure to liquid splashed, mists, gases or dusts). Where there is a risk of exposure to high velocity particles safety glasses or face shield complying with an approved standard should be used to protect against impact. Where there is a risk of exposure to dusts, goggles should be used. Recommended: Safety glasses.
Respiratory	:	Dusk mask or respirator is recommended.
Hands	:	Gloves are recommended

Skin/Body	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Risk from dermal contact is minimal.

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	:	Solid (Powder)
Color	:	Gray
Melting/freezing point	:	1535°C (2795°F)
Specific gravity	:	7.88
Bulk density	:	2.4 to 3.2 g/cm^3
Solubility	:	Insoluble in water

Section 10. STABILITY AND REACTIVITY

The product is reactive with oxidizers. Precautions should be taken not to store or contact the product with oxidizers.

Fine particles of this product (not widely found in this grade) have a potential for a dust explosion. The product should be handled in a well ventilated area where dust generation is minimized.

Section 11. TOXICOLOGICAL INFORMATION

Acute Effects

Eyes	May cause eye irritation.
Skin	No known significant effects or critical hazards.
Inhalation	May cause respiratory tract irritation.
Ingestion	No known significant effects or critical hazards.

Chronic Health Effects: Carcinogenic effects: Not classified or listed by IARC, NTP, OSHA, EU and ACGIH

Section 12. ECOLOGICAL INFORMATION

Will reduce dissolved oxygen levels in aquatic ecosystems. Direct discharge to surface water should be avoided.

Section 13. DISPOSAL CONSIDERATIONS

The generation of waste should be avoided or minimized to the extent practical. Disposal of this product, solutions and any by-products should be completed in an environmentally responsible manner that complies with all local, state and federal laws.

Section 14. TRANSPORT INFORMATION

Classification:

AND/ADR/TDG/DOT/IMDG/IATA: Not regulated.

Section 15. REGULATORY INFORMATION

This product is not regulated in the United States and Canada. The user should ensure this product is not regulated where used.

Section 16. OTHER INFORMATION

Health	0
Fire Hazard	2
Reactivity	1
Personal Protection	C

SAFETY DATA SHEET
Anaerobic BioChem (ABC)

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **Anaerobic BioChem**
GENERAL USE: **Bioremediation of halogenated organics and metals**

MANUFACTURER:

Redox Tech, LLC
200 Quade Drive
Cary, NC 27513
919-678-0140

EMERGENCY TELEPHONE:

Within USA and Canada: 1-800-424-9300
+1 703-527-3887 (collect calls accepted)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Product is generally recognized as safe. May cause irritation exposure to eyes. Long term contact to skin may cause some drying and minor irritation.

3. COMPOSITION INFORMATION ON INGREDIENTS

Proprietary mixture of fatty acids, glycerol, lactates and dipotassium phosphate.

4. FIRST AID MEASURES

EYES: Immediately flush with water for up to 15 minutes. If irritation persists, seek medical attention.

SKIN: Rinse with water. Irritation is unlikely, but if irritation occurs or persists, seek medical attention.

INGESTION: Generally safe to ingest but not recommended.

INHALATION: No first aid required.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Deluge with water

FIRE/EXPLOSION HAZARDS: Product is combustible only at temperatures above 600C

FIRE FIGHTING PROCEDURES: Use flooding with plenty of water, carbon dioxide or other inert gasses. Wear full protective clothing and self-contained breathing apparatus. Deluging with water is the best method to control combustion of the product.

FLAMMABILITY LIMITS: non-combustible

SENSITIVITY TO IMPACT: non-sensitive

SENSITIVITY TO STATIC DISCHARGE: non-senstive

6. ACCIDENTAL RELEASE MEASURES

Confine and collect spill. Transfer to an approved DOT container and properly dispose. Do not dispose of or rinse material into sewer, stormwater or surface water. Discharge of product to surface water could result in depressed dissolved oxygen levels and subsequent biological impacts.

7. HANDLING AND STORAGE

HANDLING: Protective gloves and safety glasses are recommended.

STORAGE: Keep dry. Use first in, first out storage system. Keep container tightly closed when not in use. Avoid contamination of opened product. Avoid contact with reducing agents.

8. EXPOSURE CONTROLS – PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
ABC	NA	NA	NA

ENGINEERING CONTROLS: None are required

PERSONAL PROTECTIVE EQUIPMENT

EYES and FACE: Safety glasses recommended
RESPIRATOR: none necessary
PROTECTIVE CLOTHING: None necessary
GLOVES: rubber, latex or neoprene recommended but not required

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor:	none to mild pleasant organic odor
Appearance:	clear to light amber
Auto-ignition Temperature	Non-combustible
Boiling Point	>600 C
Melting Point	NA
Density	1.15 gram/cc
Solubility	infinite
pH	7-9

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Do not contact with strong oxidizers
STABILITY: product is stable
POLYMERIZATION: will not occur
INCOMPATIBLE MATERIALS: strong oxidizers
HAZARDOUS DECOMPOSITION PRODUCTS:

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
A: General Product Information
Acute exposure may cause mild skin and eye irritation.
B: Component Analysis - LD50/LC50

No information available.

B: Component Analysis - TDLo/LDLo
TDLo (Oral-Man) none

Carcinogenicity
A: General Product Information
No information available.
B: Component Carcinogenicity
Product is not listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Epidemiology
No information available.

Neurotoxicity
No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity
Discharge to water may cause depressed dissolved oxygen and subsequent ecological stresses
Environmental Fate
No potential for food chain concentration

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Material is not considered hazardous, but consult with local, state and federal agencies prior to disposal to ensure all applicable laws are met.

14. TRANSPORT INFORMATION

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subjectto change with changes in package size. Consult shipperrequirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

US DOT Information
Shipping Name: Not Regulated
Hazard Class: Not Classified
UN/NA #: Not Classified
Packing Group:None
Required Label(s):None

50th Edition International Air Transport Association (IATA):
Not hazardous and not regulated

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

Material is not regulated under IMDG

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III

SECTION 311 No Hazard for Immediate health Hazard
SECTION 312 No Threshold Quanitity
SECTION 313 Not listed

CERCLA NOT REGULATED UNDER CERCLA

TSCA NOT REGULATED UNDER TSCA

CANADA (WHIMS): NOT REGULATED

16. OTHER INFORMATION

HMIS:

Health	1
Flammability	0
Physical Hazard	0
Personal Protection	E

E: Safety Glasses, gloves

SDS	Safety Data Sheet

Section I Chemical Product and Company Identification

Product Name	BAM
Synonyms	Not Assigned
CAS Number	7440-44-0
Active Ingredients	Pyrolized Cellulosic Material
Recommended Use	No data available
Restrictions on Use	No data available
Formulated by	ORIN Technologies
Address	405 Investment Court
Emergency Phone Number	**8 AM-5PM CST**: 608-838-6699 **5 PM -8 AM CST, Weekends, Holidays**: 262-82107024 **CHEMTREC**: 1-800-424-9300

Section II Hazard(s) Identification

Signal Word	Warning
Hazard Statements	May Cause Skin Irritation May cause Eye Irritation May cause Respiratory Irritation
Precautionary Statements - Prevention	Do not breathe dust, fume, gas Wash thoroughly after handling Use only outdoors or in a well-ventilated area Wear gloves, eye, and face protection and protective clothing
Precautionary Statement – Response	IF ON SKIN – Wash with plenty of soap and water IF INHALED – Remove victim to fresh air and keep at rest position comfortable for breathing. IF IN EYES –Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue Rinsing Call a POISON CENTER or doctor if you feel unwell If skin irritation occurs: Get medical advice or attention. If eye irritation persists: Get medical advice or attention. Take off contaminated clothing and wash before reuse.
Storage	Store in a well ventilated place. Keep container tightly closed. Store in a secure manner.

Exposure Limits	**Synergistic Products**	**Sensitization/Irritancy:**	**Carcinogenicity/Teratogenicity/ Mutagenicity/Reproductive Effects:**
ND	ND	ND	None Known

Section III Composition and Information on Ingredients

Chemical Name	CAS#	w/w%
Carbon (Wood Derived)	7440-44-00	85-95 wt% dry basis
Minerals (Wood Derived)	N/A	5-10 wt% dry basis
Water	7780-20-0	

Hazardous Ingredients: NONE

Section IV First Aid Measures

Skin	Wash with soap and water. Not expected to be harmful under normal conditions of use.

Eyes	Remove Contacts. Flush promptly with plenty of water for at least 15 minutes.
Inhalation	Remove to fresh air.
Ingestion	If suffering gastrointestinal discomfort, treat symptomatically.

Section V Fire-Fighting Measures

Flammability	This product should not come into contact with naked flames.
Means of Extinction	Foam, Water Spray, CO_2

Flashpoint	NA	Auto-Ignition Temperature	ND
UEL	NA	TDG Flammability Class	ND
LEL	NA	Hazardous Combustion Products	NA

Section VI Handling and Storage

Engineering Controls	Ventilate
Leak or Spill Procedure	Sweep up into suitable container. Prevent entry into waterways.
Handling Procedures and Equipment	Avoid direct and prolonged contact with skin
Storage Requirements	Store in a cool, dry place

Section VII Exposure Controls/Personal Protection

Personal Protective Equipment	Respiratory:	No special protection is needed when using this product as directed.
	Eyes:	Dust mask could be worn if prolonged use of this product in confined areas is expected.
	Gloves:	No special protection is needed when using this product as directed.

Section IIX Physical and Chemical Properties

Physical State	Solid
Odor and Appearance	Brown to black blend of natural organic and mineral substances. Slightly earthy odor.

Odor Threshold	NA	Specific Gravity	1.5-2.1 for solid matrix, bulk density varies.	Evaporation Rate	ND
Vapor Pressure	1@3586 C	Vapor Density	ND	Density	ND
Boiling Point	NA	Freezing Point	NA	pH	7-9.5

Section IX Stability and Reactivity

Chemical Stability:	Stable	Incompatibility:	Strong acids, alkalis, and oxidizing agents.
Conditions of Reactivity:	NA	Hazardous Decomposition Products:	Strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc. may result in rapid combustion. Avoid contact with strong acids.

Section X Disposal Considerations

Disposal	Sweep, vacuum or shovel material into labeled container. If at all possible, reuse product. Keep out of any bodies of water.

Section XI Transport Information

Shipping Information	Not regulated

Section XII Other Information

The information and recommendations set forth herein are presented in good faith and believed to be correct as of the date hereof. The information and recommendations are supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ORIN Technologies, LLC. or any of its agents be responsible for damages of any nature whatsoever resulting from the use of or reliance upon the information and recommendations. No representations or warranties, either expressed or implied, of merchantability, fitness, or a particular purpose or of any other nature are made here under with respect to information or the product to which information refers.

Preparation Information	Department	Technical
	Phone Number	608-838-6699
	Date	August 2015

SAFETY DATA SHEET

SULFURIC ACID 66 DEG.
Product ID: AC006600
Revised: 02-14-2014
Replaces: 10-12-2009

1. IDENTIFICATION

Product Name:	SULFURIC ACID 66 DEG.
Synonyms:	Sulfuric acid; Oil of vitriol; Hydrogen sulfate
CAS Number:	MIXTURE
Recommended Use:	No data available.
Restrictions on Use:	No data available.

Hydrite Chemical Co.
300 N. Patrick Blvd.
Brookfield, WI 53008-0948
(262) 792-1450

EMERGENCY RESPONSE NUMBERS:
24 Hour Emergency #: (414) 277-1311
CHEMTREC Emergency #: (800) 424-9300

2. HAZARD(S) IDENTIFICATION

Signal Word:	Danger
GHS Classification:	Substance or mixture corrosive to metals Category 1 Skin Corrosion/Irritation Category 1A Serious Eye Damage/Eye Irritation Category 1 Carcinogenicity Category 1A Acute Toxicity - Inhalation Vapour Category 2 Specific Target Organ Systemic Toxicity (STOT) - Repeated Exposure Category 2 Acute Toxicity - Inhalation Dust / Mist Category 3
Hazard Statements:	May be corrosive to metals. Causes severe skin burns and eye damage. Fatal if inhaled. Toxic if inhaled. May cause cancer. May cause damage to organs (teeth, respiratory system) through prolonged or repeated exposure (by inhalation).

Precautionary Statements:

Prevention:	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep only in original container. Do not breathe dust, fume, gas, mist, vapours or spray. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear gloves, eye and face protection and protective clothing. Wear respiratory protection.
Response:	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.
Specific treatment is urgent (see First Aid on SDS or on this label).
Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.

Storage: Store in a well-ventilated place. Keep container tightly closed.
Store in a secure manner.
Store in corrosive resistant container with a resistant inner liner.

Disposal: Dispose of in accordance with local, regional and international regulations.

Hazards Not Otherwise Classified: None known.

Percentage of Components with Unknown Acute Toxicity:
Dermal: 93.2 %

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	% by Wt.
Sulfuric Acid	7664-93-9	93.19 %

4. FIRST-AID MEASURES

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Tilt head to avoid contaminating unaffected eye. Get immediate medical attention.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Do not reuse clothing and shoes until cleaned. Discard contaminated leather articles such as shoes and belt. Do not apply oils or ointments unless ordered by the physician.

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration, preferably mouth-to-mouth. GET MEDICAL ATTENTION IMMEDIATELY.

Ingestion: If fully conscious, drink a quart of water. DO NOT induce vomiting. CALL A PHYSICIAN IMMEDIATELY. If unconscious or in convulsions, take immediately to a hospital or a physician. NEVER induce vomiting or give anything by mouth to an unconscious victim. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Note to Physicians:
This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artifical resuscitation and appropriate chemotherapy if respiration is depressed. Following exposure the patient should be kept under medical review for at least 48 hours as delayed pneumonitis may occur. DO NOT attempt to neutralize the acid with weak bases since the reaction will produce heat that may extend the corrosive injury.

Most Important Symptoms/Effects:

Eye Contact: CORROSIVE-Causes severe irritation and burns. May cause: blurred vision. redness. pain. conjunctivitis. ulcerations. tissue destruction. permanent eye damage. blindness.

Skin Contact: CORROSIVE-Causes severe irritation and burns. Concentrated solutions may cause: severe burns. severe necrosis. permanent skin damage. Prolonged and repeated exposure to dilute solutions may cause irritation, redness, pain and drying and cracking of the skin.

Skin Absorption: No data available.

Inhalation: CORROSIVE-Causes severe irritation and burns. Vapors or mists may damage: mucous membranes. respiratory tract. Vapors or mists may cause: coughing. sore throat. shortness of breath. labored breathing. choking. bronchospasms. chemical pneumonitis. pulmonary edema. death. Effects may be delayed. Chronic exposure may cause: dental erosions. discoloration of teeth. bronchitis. bronchial emphysema.

Ingestion: CORROSIVE-Causes severe irritation and burns. May cause damage to the: mouth. throat. esophagus. stomach. gastrointestinal tract. May cause: pain. vomiting. diarrhea. bleeding. labored breathing. burns or perforation of the gastrointestinal tract leading to ulceration and secondary infection. death. Effects may be delayed. Aspiration into the lungs may cause chemical pneumonia and lung damage.

5. FIRE-FIGHTING MEASURES

Extinguishing Media: Carbon dioxide. Dry chemical. Foam.

Fire Fighting Methods: Evacuate area of unprotected personnel. Wear protective clothing including NIOSH-approved self-contained breathing apparatus. Remain upwind of fire to avoid hazardous vapors and decomposition products. Use water spray to cool fire-exposed containers. Do not get water inside containers. Product generates heat upon addition of water, with possible spattering. Neutralize run-off with Lime, Soda Ash, etc., to prevent corrosion of metals and formation of Hydrogen gas. Run-off from fire control may cause pollution.

Fire and Explosion Hazards: Product may react with some metals (ex.: Aluminum, Zinc, Tin, etc.) to release flammable hydrogen gas. Will react with organic materials with evolution of heat and sulfur dioxide. Concentrated acid is a strong oxidizing agent. May cause ignition of combustible materials on contact with generation of sulfur dioxide fumes.

Hazardous Combustion Products: Sulfur oxides.

6. ACCIDENTAL RELEASE MEASURES

Spill Clean-Up Procedures: CORROSIVE MATERIAL. Evacuate unprotected personnel from area. Maintain adequate ventilation. Follow personal protective equipment recommendations found in Section 8. Never exceed any occupational exposure limit. Contain spill, place into drums for proper disposal. Flush remaining area with water and neutralize with Soda Ash or Lime and dispose of properly. Avoid direct discharge to sewers and surface waters. Notify authorities if entry occurs.

7. HANDLING AND STORAGE

Handling: Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Do not swallow. Avoid breathing vapors, mists, or dust. Do not eat, drink, or smoke in work area. Wash thoroughly after handling. Empty containers retain product residue (vapor, dust, or liquid) and can be dangerous. DO NOT pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other source of ignition. They may explode and cause injury or death. Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use non-sparking tools.

Storage: CORROSIVE MATERIAL. Store in a cool, well ventilated area, out of direct sunlight. Store in a dry location away from heat. Keep away from incompatible materials. Keep containers tightly closed. Do not store in unlabeled or mislabeled containers. Do not freeze. Highly corrosive to most metals with evolution of hydrogen gas. Explosive/flammable concentrations of hydrogen gas may accumulate inside metal containers. Elevated temperatures will increase the corrosion rate of most metals. See Section 10 for incompatible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA Exposure Guidelines:

Component	Limits
Sulfuric Acid	1 mg/m3 TWA

ACGIH Exposure Guidelines:

Component	Limits

Sulfuric Acid	0.2 mg/m3 TWA (thoracic fraction)

Engineering Controls: Local exhaust ventilation, process enclosures, or other engineering controls are required when handling or using this product to avoid overexposure. Maintain adequate ventilation. Do not use in closed or confined spaces. Avoid creating dust or mist. Keep levels below exposure limits. To determine exposure levels, monitoring should be performed regularly.

Eye/Face Protection: Wear chemical safety goggles and a full face shield while handling this product. Do not wear contact lenses.

Skin Protection: Prevent contact with this product. Wear gloves and protective clothing depending on condition of use. Protective gloves: Acid-proof. Chemical-resistant. Impervious.

Respiratory Protection: Respiratory protection must be worn if ventilation does not eliminate symptoms or keep levels below recommended exposure limits. If exposure limits are exceeded, wear: NIOSH-Approved air-purifying respirator with: Acid gas cartridge and Dust/mist filter. NIOSH-Approved positive pressure supplied air respirator. NIOSH-Approved self-contained breathing apparatus. DO NOT exceed limits established by the respirator manufacturer. All respiratory protection programs must comply with OSHA 29 CFR 1910.134 and ANSI Z88.2 requirements and must be followed whenever workplace conditions require a respirator's use.

Other Protective Equipment: Eye-wash station. Safety shower. Rubber apron. Chemical safety shoes. Rubber boots. Protective clothing. Full-rubber acid suit.

General Hygiene Conditions: Wash with soap and water before meal times and at the end of each work shift. Food, beverages, and tobacco products should not be carried, stored or consumed where this material is in use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Oily liquid.
Color: Clear to cloudy. Colorless to amber.
Odor: Odorless to pungent.
Odor Threshold: N.D.
pH: < 1.00
Freezing Point (deg. F): ~ -21
Melting Point (deg. F): N.A.
Initial Boiling Point or Boiling Range: ~ 529 °F
Flash Point: N.A.
Flash Point Method: N.A.
Evaporation Rate (nBuAc = 1): <1
Flammability (solid, gas): N.D.
Lower Explosion Limit: N.A.
Upper Explosion Limit: N.A.
Vapor Pressure (mm Hg): 0.0016 @102F
Vapor Density (air=1): 3.4 (H_2SO_4)
Specific Gravity or Relative Density: 1.835 @25C
Solubility in Water: Complete
Partition Coefficient (n-octanol/water): N.D.
Autoignition Temperature: No Data
Decomposition Temperature: N.D.
Viscosity: N.D.
% Volatile (wt%): N.D.
VOC (wt%): 0
VOC (lbs/gal): 0
Fire Point: N.D.

10. STABILITY AND REACTIVITY

Reactivity: No data available.

Chemical Stability: Stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur under normal conditions. May react with certain metals to produce flammable hydrogen gas. Hazardous gases are evolved on contact with chemicals such as cyanides, sulfides, carbides, etc.

Conditions to Avoid: Avoid contact with heat, sparks, electric arcs, other hot surfaces, and open flames. Contact with organic materials may cause fire and explosions. Contact with water may cause violent reaction with evolution of heat. To dilute: Add product slowly to lukewarm water; not water to product.

Incompatible Materials: Metals. Water. Alkalies. Strong oxidizing agents. Reducing agents. Carbonates. Cyanides. Sulfides. Carbides. Chlorates. Fulminates. Nitrates. Powdered metals. Organic materials. Combustible materials. Nitrogen compounds. Picrates. Bases. Halogens. Alkali metals. and many other reactive substances.

Hazardous Decomposition Products: Sulfur oxides. Sulfuric acid vapors. Hydrogen gas.

11. TOXICOLOGICAL INFORMATION

Component	Oral LD50	Dermal LD50	Inhalation LC50
Sulfuric Acid	Rat: 2140 mg/kg	No Data	2H Rat: 510.0 mg/m3

Acute Toxicity Estimate (ATE):
Inhalation Vapor: 0.5473 mg/L
Inhalation Dust/Mist: 0.5473 mg/L

Routes of Exposure: Eyes. Ingestion. Inhalation. Skin.

Eye Contact: CORROSIVE-Causes severe irritation and burns. May cause: blurred vision. redness. pain. conjunctivitis. ulcerations. tissue destruction. permanent eye damage. blindness.

Skin Contact: CORROSIVE-Causes severe irritation and burns. Concentrated solutions may cause: severe burns. severe necrosis. permanent skin damage. Prolonged and repeated exposure to dilute solutions may cause irritation, redness, pain and drying and cracking of the skin.

Skin Absorption: No data available.

Inhalation: CORROSIVE-Causes severe irritation and burns. Vapors or mists may damage: mucous membranes. respiratory tract. Vapors or mists may cause: coughing. sore throat. shortness of breath. labored breathing. choking. bronchospasms. chemical pneumonitis. pulmonary edema. death. Effects may be delayed. Chronic exposure may cause: dental erosions. discoloration of teeth. bronchitis. bronchial emphysema.

Ingestion: CORROSIVE-Causes severe irritation and burns. May cause damage to the: mouth. throat. esophagus. stomach. gastrointestinal tract. May cause: pain. vomiting. diarrhea. bleeding. labored breathing. burns or perforation of the gastrointestinal tract leading to ulceration and secondary infection. death. Effects may be delayed. Aspiration into the lungs may cause chemical pneumonia and lung damage.

Medical Conditions Aggravated by Exposure to Product: Eye disorders. Skin disorders. Respiratory system disorders.

Other: Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death. The International Agency for Research on Cancer (IARC) has concluded that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to man, causing cancer of the larynx (the voice box). Although no direct link has been established between exposure to sulfuric acid itself, and cancer in man, exposure to any mist or aerosol during the use of this product should be avoided.

Cancer Information:
This product contains 0.1% or more of the following chemicals listed by NTP, IARC or OSHA as known or possible carcinogens:
Sulfuric acid mist

12. ECOLOGICAL INFORMATION

Ecotoxicological Information: No data available.

Chemical Fate Information: No data available.

13. DISPOSAL CONSIDERATIONS

Hazardous Waste Number: D002
Disposal Method: Dispose of in a permitted hazardous waste management facility following all local, state and federal regulations. Since emptied containers retain product residue, follow label warnings even after container is emptied. DO NOT pressurize, cut, weld, solder, drill, grind or expose empty containers to heat, flame, sparks or other sources of ignition.

14. TRANSPORT INFORMATION

DOT (Department of Transportation):

Identification Number:	UN1830
Proper Shipping Name:	SULFURIC ACID
Hazard Class:	8
Packing Group:	II
Label Required:	CORROSIVE
Reportable Quantity (RQ):	1000# (Sulfuric Acid)

15. REGULATORY INFORMATION

TSCA Inventory Status: All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements.

SARA Title III Section 311/312 Category Hazards:

Immediate (Acute)	Delayed (Chronic)	Fire Hazard	Pressure Release	Reactive
Yes	Yes	No	No	Yes

Regulated Components: Component	CAS Number	CERCLA RQ	SARA EHS	SARA 313	U.S. HAP	WI HAP	Prop 65
Sulfuric Acid	7664-93-9	Yes	Yes	Yes	No	Yes	Yes

Note: * Sulfuric acid appears on the Section 313 List. However, the listing only applies to the aerosol forms of sulfuric acid.

16. OTHER INFORMATION

Hazard Rating System
Health: 3*
Flammability: 0
Reactivity: 2
* = Chronic Health Hazard

NFPA Rating System
Health: 3
Flammability: 0
Reactivity: 2
Special Hazard: W

MSDS Abbreviations
N.A. = Not Applicable
N.D. = Not Determined
HAP = Hazardous Air Pollutant
VOC = Volatile Organic Compound
C = Ceiling Limit
N.E./Not Estab. = Not Established

MSDS Prepared by: CSH

Reason for Revision: New format. Changes made throughout the MSDS.

Revised: 02-14-2014
Replaces: 10-12-2009

The data in this Material Safety Data Sheet relates to the specific material designated and does not relate to its use in combination with any other material or process. The data contained is believed to be correct. However, since conditions of use are outside our control it should not be taken as warranty or representation for which HYDRITE CHEMICAL CO. assumes legal responsibility. This information is provided solely for your consideration, investigation, and verification.

SAFETY DATA SHEET

HYDROGEN PEROXIDE 50% STANDARD GRADE
Product ID: MI081300
Revised: 01-31-2014
Replaces: 01-27-2014

1. IDENTIFICATION

Product Name:	HYDROGEN PEROXIDE 50% STANDARD GRADE
Synonyms:	Peroxide; Hydrogen Dioxide
CAS Number:	MIXTURE
Recommended Use:	No data available.
Restrictions on Use:	No data available.

Hydrite Chemical Co.
300 N. Patrick Blvd.
Brookfield, WI 53008-0948
(262) 792-1450

EMERGENCY RESPONSE NUMBERS:
24 Hour Emergency #: (414) 277-1311
CHEMTREC Emergency #: (800) 424-9300

2. HAZARD(S) IDENTIFICATION

Signal Word: Danger

GHS Classification:
Skin Corrosion/Irritation Category 1B
Serious Eye Damage/Eye Irritation Category 1
Oxidizing Liquid Category 2
Acute Toxicity - Inhalation Vapour Category 3
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3
Acute Toxicity - Inhalation Dust / Mist Category 4
Acute Toxicity - Oral Category 4

Hazard Statements:
May intensify fire; oxidizer.
Harmful if swallowed or if inhaled.
Causes severe skin burns and eye damage.
Toxic if inhaled.
May cause respiratory irritation.
May cause drowsiness or dizziness.

Precautionary Statements:

Prevention:
Keep away from heat, sparks, open flames and hot surfaces. – No smoking.
Keep away from clothing and other combustible materials.
Take any precaution to avoid mixing with combustibles.
Do not breathe dust, fume, gas, mist, vapours or spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear gloves, eye and face protection and protective clothing.

Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.
Specific treatment (see First Aid on SDS or on this label).
Wash contaminated clothing before reuse.
In case of fire: Use appropriate extinguishing media - See Section 5 on SDS.

Storage: Store in a well-ventilated place. Keep container tightly closed.
Store in a secure manner.

Disposal: Dispose of in accordance with local, regional and international regulations.

Hazards Not Otherwise Classified: None known.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	% by Wt.
Hydrogen Peroxide	7722-84-1	~ 50 %

4. FIRST-AID MEASURES

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Tilt head to avoid contaminating unaffected eye. Get immediate medical attention.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Do not reuse clothing and shoes until cleaned. Wash with soap and water. Discard shoes if contaminated.

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration, preferably mouth-to-mouth. GET MEDICAL ATTENTION IMMEDIATELY. Keep warm and quiet.

Ingestion: If swallowed, call a physician immediately. DO NOT induce vomiting unless directed to do so by a physician. Never give anything by mouth to an unconscious person. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Rinse mouth with fresh water. Give 1-2 glasses of water to drink. Keep warm and quiet.

Note to Physicians:
Exposure to material may cause delayed lung injury resulting in pulmonary edema and pneumonitis. Exposed individuals should be monitored for 72 hours after exposure for the onset of delayed respiratory symptoms. Hydrogen peroxide is a strong oxidant. Direct contact with the eye is likely to cause corneal damage, especially if not washed immediately. Careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered. Because of the likelihood of corrosive effects on the gastrointestinal tract after ingestion and the unlikelihood of systemic effects, attempts at evacuating the stomach via emesis induction or gastric lavage should be avoided. There is a remote possibility, however, that a nasogastric or orogastric tube may be required for the reduction of severe distension due to gas formation.

Most Important Symptoms/Effects:

Eye Contact: CORROSIVE-Causes severe irritation and burns. May cause: corneal damage. permanent eye damage. blindness. Effects may be delayed.

Skin Contact: CORROSIVE-Causes severe irritation and burns. Contact with concentrated liquid for a short period of time may cause a temporary whitening or bleaching of the skin.

Skin Absorption: Practically non-toxic if absorbed through the skin.

Inhalation: CORROSIVE-Causes severe irritation and burns. High concentrations of vapor or mist may cause severe irritation of the: nose. throat. respiratory tract. Excessive exposure may cause: pulmonary edema. death. Toxic by inhalation. Effects may be delayed.

Ingestion: CORROSIVE-Causes severe irritation and burns. Moderately toxic by ingestion. May cause: gastrointestinal irritation, nausea, vomiting, diarrhea, ulcerations, burns, edema (fluid in lungs), death. The rapid releasing of oxygen can cause distension and bleeding of the mucosa in the stomach and lead to severe damage of the intestinal organs, especially in the event of greater intake of the product.

5. FIRE-FIGHTING MEASURES

Extinguishing Media: Water only. Water spray. Water fog. Water (flood with water). DO NOT USE: Organic compounds.

Fire Fighting Methods: Evacuate area of unprotected personnel. Wear protective clothing including NIOSH-approved self-contained breathing apparatus. Remain upwind of fire to avoid hazardous vapors and decomposition products. Use water spray to cool fire-exposed containers. Move containers from fire area if possible without hazard. Run-off from fire control may cause pollution.

Fire and Explosion Hazards: STRONG OXIDIZER. Forms explosive mixtures with combustible, organic, or other easily oxidizable materials. These mixtures are easily ignited by friction or heat. Heated material can form flammable vapors with air. Heated material can form explosive vapors with air. Decomposition will release oxygen, which will intensify a fire. The rate of decomposition may exceed the vent capacity of storage containers and cause an explosion. Solutions above 65% are especially hazardous as they do not contain enough water to remove the heat of decomposition by evaporation.

Hazardous Combustion Products: Oxygen.

6. ACCIDENTAL RELEASE MEASURES

Spill Clean-Up Procedures: CORROSIVE MATERIAL. STRONG OXIDIZER. Eliminate all sources of ignition. Evacuate unprotected personnel from area. Maintain adequate ventilation. Follow personal protective equipment recommendations found in Section 8. Never exceed any occupational exposure limit. Shut off source of leak if safe to do so. Never return spilled product into its original container. Never put spilled material into another container for disposal. Avoid contact with organic or combustible material which may cause fire or violent decomposition. Dilute spill with large amounts of water to a concentration of 5% hydrogen peroxide; hold in a pond or diked area until peroxide is completely decomposed or dispose of according to all local, state and federal regulations. Hydrogen peroxide may be decomposed by adding sodium metabisulfite or sodium sulfite after diluting to 5%. Flush remaining area with water to remove trace residue and dispose of properly. Avoid direct discharge to sewers and surface waters. Notify authorities if entry occurs. Combustible materials exposed to hydrogen peroxide should be immediately submerged in or rinsed with large amounts of water to ensure that all hydrogen peroxide is removed. Residual hydrogen peroxide that is allowed to dry (upon evaporation hydrogen peroxide can concentrate) on organic materials such as paper, fabrics, cotton, leather, wood, or other combustibles, can cause the material to ignite and result in a fire.

7. HANDLING AND STORAGE

Handling: Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Do not swallow. Avoid breathing vapors, mists, or dust. Do not eat, drink, or smoke in work area. Wash thoroughly after handling. Empty containers retain product residue (vapor, dust, or liquid) and can be dangerous. DO NOT pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other source of ignition. They may explode and cause injury or death. Avoid contamination. Never return unused product to container. Contamination may cause decomposition and generation of oxygen gas which could result in high pressure and possibly container rupture. Use non-sparking tools and equipment. Utensils used for handling hydrogen peroxide should only be made of glass, stainless steel, aluminum or plastic.

Storage: CORROSIVE MATERIAL. STRONG OXIDIZER. Store in a cool, well ventilated area away from all sources of ignition and out of direct sunlight. Store in a dry location away from heat. Keep away from incompatible materials. Keep containers tightly closed. Do not store in unlabeled or mislabeled containers. Avoid storage on wood floors or near wooden walls, etc.. Do not store on wooden pallets. Store in a vented container. Do not store near combustible materials. DO NOT contaminate water, food or feed by storage or disposal. Refer

to the National Fire Protection Association (NFPA) Code for the Storage of Organic Peroxide Formulations. See Section 10 for incompatible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA Exposure Guidelines:

Component	Limits
Hydrogen Peroxide	1 ppm TWA; 1.4 mg/m3 TWA

ACGIH Exposure Guidelines:

Component	Limits
Hydrogen Peroxide	1 ppm TWA

Engineering Controls: General room ventilation is required. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Maintain adequate ventilation. Do not use in closed or confined spaces. Avoid creating dust or mist. Keep levels below exposure limits. To determine exposure levels, monitoring should be performed regularly.

Eye/Face Protection: Wear chemical safety goggles and a full face shield while handling this product.

Skin Protection: Prevent contact with this product. Wear gloves and protective clothing depending on condition of use. Protective gloves: Butyl rubber. Neoprene. Polyvinyl chloride. Nitrile. Inspect regularly for leaks. Thoroughly rinse the outside of gloves with water prior to removal. Avoid cotton, wool and leather clothing and shoes.

Respiratory Protection: Respiratory protection must be worn if ventilation does not eliminate symptoms or keep levels below recommended exposure limits. If exposure limits are exceeded, wear: NIOSH-Approved respirator. NIOSH-Approved self-contained breathing apparatus. DO NOT use any form of air-purifying respirator (APR) or filtering facepiece (AKA dust mask), especially those containing oxidizable sorbants such as activated carbon. DO NOT exceed limits established by the respirator manufacturer. All respiratory protection programs must comply with OSHA 29 CFR 1910.134 and ANSI Z88.2 requirements and must be followed whenever workplace conditions require a respirator's use.

Other Protective Equipment: Eye-wash station. Safety shower. Rubber apron. Rubber boots. Impervious clothing. Full body suit. NOTE: As the water content of hydrogen peroxide evaporates, cotton, rayon, and wool fibers are particularly subject to spontaneous combustion. Where there is significant risk of sudden splash or spray, it is advised that an apron or rubber suit be worn. Any contaminated clothing, including gloves, shoes, aprons, coveralls, etc., should be removed immediately and throroughly flushed with water to eliminate any traces of hydrogen peroxide before cleaning and reuse. Residual hydrogen peroxide, if allowed to dry on material such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in fire.

General Hygiene Conditions: Wash with soap and water before meal times and at the end of each work shift. Good manufacturing practices require gross amounts of any chemical be removed from skin as soon as practical, especially before eating or smoking. Food, beverages, and tobacco products should not be carried, stored or consumed where this material is in use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid.
Color: Clear. Colorless.
Odor: No odor.
Odor Threshold: N.D.
pH: <= 3.00 (as is)
Freezing Point (deg. F): 1.4 - -68.8
Melting Point (deg. F): N.D.
Initial Boiling Point or Boiling Range: 237 °F
Flash Point: N.A.
Flash Point Method: N.A.
Evaporation Rate (nBuAc = 1): > 1

Flammability (solid, gas): N.D.
Lower Explosion Limit: N.A.
Upper Explosion Limit: N.A.
Vapor Pressure (mm Hg): 18.3 @ 30C
Vapor Density (air=1): N.D.
Specific Gravity or Relative Density: 1.19 @ 20 C
Solubility in Water: Complete
Partition Coefficient (n-octanol/water): N.D.
Autoignition Temperature: N.A.
Decomposition Temperature: N.D.
Viscosity: N.D.
% Volatile (wt%): 100
VOC (wt%): 0
VOC (lbs/gal): 0
Fire Point: N.D.

10. STABILITY AND REACTIVITY

Reactivity: No data available.

Chemical Stability: Stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur under normal conditions. Contact with organic materials may cause fire and explosions. Contact with metals, metallic ions, alkalis, reducing agents and organic matter (such as alcohols or terpenes) may produce self-accelerated thermal decomposition.

Conditions to Avoid: Avoid elevated temperatures. Avoid exposure to light. UV-rays. pH variations. Excessive heat or contamination could cause product to become unstable.

Incompatible Materials: Oxygen. Reducing agents. Alkalies. Combustible materials. Organics. Wood. Dust. Paper. Dirt. Decomposition catalysts. Metals. Metal salts. Metal ions. Copper or copper alloys. Galvanized iron. Metal Oxides. Acids. Salts.

Hazardous Decomposition Products: Oxygen. Material decomposes with the potential to produce a rupture of unvented closed containers. This material decomposes if contaminated, causing fire and possible explosions. Oxygen can be liberated at temperatures above ambient.

11. TOXICOLOGICAL INFORMATION

Component	Oral LD50	Dermal LD50	Inhalation LC50
Hydrogen Peroxide	Rat: 801 mg/kg	Rabbit: 2000 mg/kg	4H Rat: 2.0 g/m3

Acute Toxicity Estimate (ATE):

Oral:	1,602 mg/kg
Dermal:	4,000 mg/kg
Inhalation Vapor:	4.0000 mg/L
Inhalation Dust/Mist:	4.0000 mg/L

Routes of Exposure: Eyes. Skin. Inhalation. Ingestion.

Eye Contact: CORROSIVE-Causes severe irritation and burns. May cause: corneal damage. permanent eye damage. blindness. Effects may be delayed.

Skin Contact: CORROSIVE-Causes severe irritation and burns. Contact with concentrated liquid for a short period of time may cause a temporary whitening or bleaching of the skin.

Skin Absorption: Practically non-toxic if absorbed through the skin.

Inhalation: CORROSIVE-Causes severe irritation and burns. High concentrations of vapor or mist may cause severe irritation of the: nose. throat. respiratory tract. Excessive exposure may cause: pulmonary edema. death. Toxic by inhalation. Effects may be delayed.

Ingestion: CORROSIVE-Causes severe irritation and burns. Moderately toxic by ingestion. May cause: gastrointestinal irritation. nausea. vomiting. diarrhea. ulcerations. burns. edema (fluid in lungs). death. The rapid releasing of oxygen can cause distension and bleeding of the mucosa in the stomach and lead to severe damage of the intestinal organs, especially in the event of greater intake of the product.

Medical Conditions Aggravated by Exposure to Product: Lung disorders. Eye disorders.

Other: None known.

Cancer Information:
This product does not contain 0.1% or more of the known or potential carcinogens listed in NTP, IARC, or OSHA.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information: Hydrogen Peroxide:
Slightly toxic. Fish 96 h LC50 between 10-37 mg/l
Moderately toxic. Daphnia magna (Water flea) EC50 = 7.7 mg/L
Moderately toxic. Daphnia pulex (Water flea) EC50 = 2.4 mg/L
Slightly toxic. Bacteria EC50 = 30 mg/L
Highly toxic. Algae EC50 = 0.85 mg/L

Chemical Fate Information: Hydrogen peroxide in the aquatic environment is subject to various reduction or oxidation processes and decomposes into water and oxygen. Hydrogen peroxide half-life in freshwater ranged from 8 hours to 20 days, in air from 10-20 hours and in soils from minutes to hours depending upon microbiological activity and metal contaminants.

Material may have some potential to bioaccumulate but will likely degrade in most environments before accumulation can occur.

Will likely be in environment due to its water solubility but will likely degreade over time.

13. DISPOSAL CONSIDERATIONS

Hazardous Waste Number: D001, D002
Disposal Method: Dispose of in a permitted hazardous waste management facility following all local, state and federal regulations. Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive or otherwise different from federal laws and regulations. Since emptied containers retain product residue, follow label warnings even after container is emptied. DO NOT pressurize, cut, weld, solder, drill, grind or expose empty containers to heat, flame, sparks or other sources of ignition. Empty containers should be triple rinsed with water before discarding.

14. TRANSPORT INFORMATION

DOT (Department of Transportation):

Identification Number:	UN2014
Proper Shipping Name:	HYDROGEN PEROXIDE, AQUEOUS SOLUTION
Hazard Class:	5.1 (8)
Packing Group:	II
Label Required:	OXIDIZER; CORROSIVE

15. REGULATORY INFORMATION

TSCA Inventory Status: This product or all components of this product are listed on the EPA/TSCA Inventory of Chemical Substances.

SARA Title III Section 311/312 Category Hazards:

Immediate (Acute)	Delayed (Chronic)	Fire Hazard	Pressure Release	Reactive
Yes	No	Yes	No	No

Regulated Components: Component	CAS Number	CERCLA RQ	SARA EHS	SARA 313	U.S. HAP	WI HAP	Prop 65
Hydrogen Peroxide	7722-84-1	No	Yes	No	No	Yes	No

Note: * SARA RQ and TPQ are for Hydrogen Peroxide (Conc.> 52%).

16. OTHER INFORMATION

Hazard Rating System
Health: 3
Flammability: 0
Reactivity: 1
* = Chronic Health Hazard

NFPA Rating System
Health: 3
Flammability: 0
Reactivity: 1
Special Hazard: OX

MSDS Abbreviations
N.A. = Not Applicable
N.D. = Not Determined
HAP = Hazardous Air Pollutant
VOC = Volatile Organic Compound
C = Ceiling Limit
N.E./Not Estab. = Not Established

MSDS Prepared by: JB

Reason for Revision: New format. Changes made throughout the MSDS.

Revised: 01-31-2014
Replaces: 01-27-2014

The data in this Material Safety Data Sheet relates to the specific material designated and does not relate to its use in combination with any other material or process. The data contained is believed to be correct. However, since conditions of use are outside our control it should not be taken as warranty or representation for which HYDRITE CHEMICAL CO. assumes legal responsibility. This information is provided solely for your consideration, investigation, and verification.

SAFETY DATA SHEET

Version 5.2
Revision Date 06/27/2014
Print Date 12/22/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Iron(II) sulfate heptahydrate

Product Number : F7002
Brand : Sigma-Aldrich
Index-No. : 026-003-01-4

CAS-No. : 7782-63-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statement(s)
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/ eye protection/ face protection.
P301 + P312 IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove

	contact lenses, if present and easy to do. Continue rinsing.
P321	Specific treatment (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Ferrous sulfate heptahydrate
Formula	:	$FeO_4S \cdot 7H_2O$
Molecular Weight	:	278.01 g/mol
CAS-No.	:	7782-63-0
EC-No.	:	231-753-5
Index-No.	:	026-003-01-4

Hazardous components

Component	Classification	Concentration
Ferrous sulfate heptahydrate		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; H302, H315, H319	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2 Special hazards arising from the substance or mixture
Sulphur oxides, Iron oxides

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
The product itself does not burn.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Air sensitive. Store under inert gas. hygroscopic

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ferrous sulfate heptahydrate	7782-63-0	TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract & skin irritation varies		
		TWA	1 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	3.0 - 4.0 at 50 g/l at 25 °C (77 °F)
e)	Melting point/freezing point	Melting point/range: 64 °C (147 °F)
f)	Initial boiling point and boiling range	no data available
g)	Flash point	not applicable
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	14.6 hPa (11.0 mmHg) at 25 °C (77 °F)
l)	Vapour density	no data available
m)	Relative density	1.898 g/cm3 at 25 °C (77 °F)
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	no data available
p)	Auto-ignition temperature	no data available

q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information

Bulk density	1,300 kg/m3

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
no data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - mouse - 1,520 mg/kg

Inhalation: no data available

Dermal: no data available

LD50 Intraperitoneal - mouse - 245 mg/kg

LD50 Intravenous - mouse - 51 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: NO8510000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
no data available

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Ferrous sulfate heptahydrate)
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ferrous sulfate heptahydrate	7782-63-0	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ferrous sulfate heptahydrate	7782-63-0	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ferrous sulfate heptahydrate	7782-63-0	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
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Product Safety – Americas Region
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