

BROWARD ENVIRONMENTAL REMEDIATION TIMES



Summer 2020

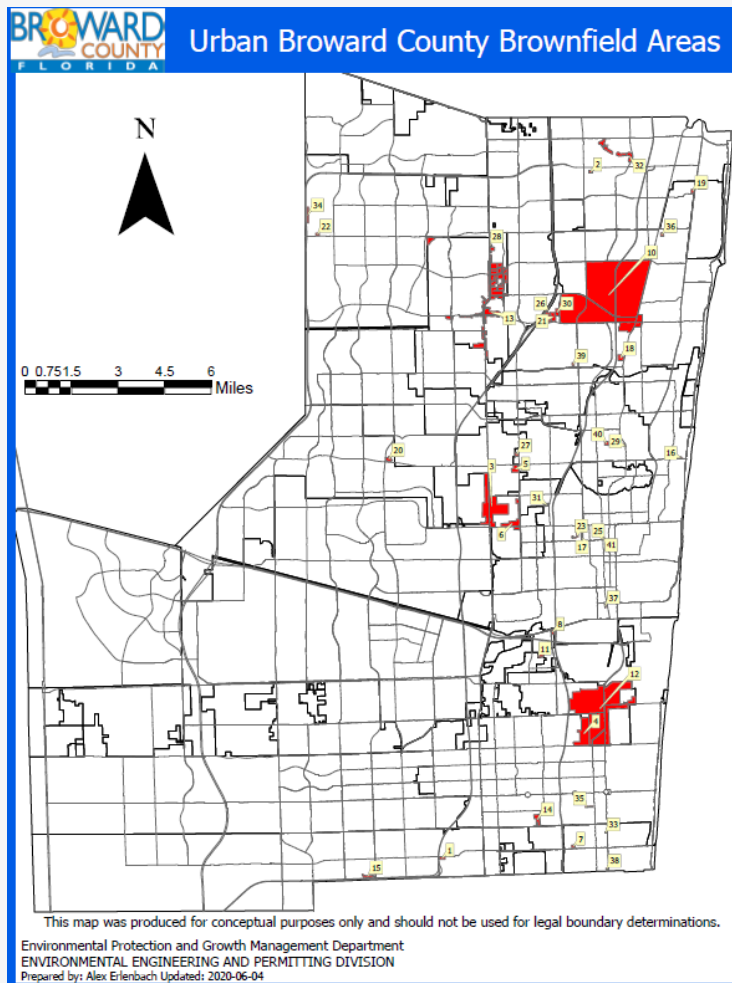
Adaptability

We are all feeling the challenges of the COVID-19 pandemic, and many of us thought that life would return to normal by now. The County has taken proactive measures to provide information in real time to the public as well as to enforce Emergency Orders issued by the County Administrator. We have all adapted to many circumstances that we did not think possible. We're all doing our best and are in this together! Make sure to stay tuned to the [County's COVID-19 response website](#) for the latest information.

Brownfield Annual Report

The Brownfield Annual Report has been published and sent to the Florida Department of Environmental Protection. There are now **41 Brownfield-designated areas within Broward County**, consisting of approximately 6,986 acres (10.9 square miles).

The report and the updated GIS maps can be found [here](#).



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Brought to you by the Environmental Engineering and Permitting Division

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Discussion- Performance of In Situ Chemical Oxidation Remediation Technology

The [“Optimizing Injection Strategies and In Situ Remediation Performance \(OIS-ISP-1\)”](#), developed by the Interstate Technology & Regulatory Council, describes how in situ treatment ineffectiveness can be avoided through effective upfront characterization and design to develop an adequate conceptual site model (CSM), and by conducting in-progress enhancements to both delivery technologies and amendments.

in situ treatment ineffectiveness can be avoided through effective upfront characterization and design

An adequate CSM will assist in the:

- Selection of amendments
- Delivery technologies
- Dosing requirements to avoid failure to meet remediation objectives

This discussion focuses on the section of OIS-ISP-1 that **addresses performance failures when injecting chemical oxidants amendment (COAs) into the subsurface to treat contaminants of concern (COCs)** such as: BTEX, MTBE, TPH, and chlorinated solvents. COAs cause degradation or transformation of the COCs by oxidation and reduction reactions.

Commonly used COAs include:

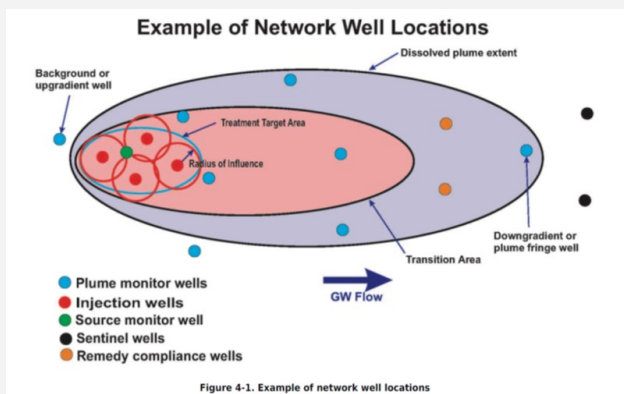
- Potassium or Sodium Permanganate
- Fenton’s catalyzed hydrogen peroxide
- Hydrogen Peroxide
- Ozone
- Sodium Persulfate

Other amendments that are also approved by the Florida Department of Environmental Protection’s Bureau of Petroleum Storage Systems for compliance

with Underground Injection Control regulations and groundwater (GW) criteria.

Remediation Objectives

- The **primary remediation objective is to reduce the levels of COCs** from the baseline levels to the cleanup target levels (CTLs), or to levels that are feasible to transition to another cleanup technology such as natural attenuation monitoring for GW. Baseline levels are established prior to the initiation of remediation either by using historical soil or GW quality data and/or by conducting one or more separate baseline sampling events.
- Another objective is to **achieve no rebound of treated COCs levels long after the completion of COAs injections**. After the COAs are depleted, the untreated COCs levels could steadily increase by back-diffusion from storage areas with low permeability, porous areas, or in fractured rocks.
- Prior to the completing the project, the GW should meet all applicable primary and secondary standards (or background quality) that were impacted by any residuals associated with the ingredients of the injected COAs, by any by-products or intermediates (e.g. hexavalent chromium), and by impurities.
- The data collected should confirm that the treatment target area (TTA, shown in Figure 4.1) was influenced, the COAs were delivered at the design target concentrations, and the systems used to perform treatment operated as designed.



Failure to meet Remediation Objectives

Failure to meet the objective to reduce the COCs levels is **most likely due to the lack of sufficient COAs contacting and completely reacting with all the COCs present in the TTA.**

Some reasons include:

- The injection delivery equipment fails to distribute COAs throughout the radius of influence (ROI) shown in figure 4.1 with adequate residence time to allow complete reactions of the COAs with the COCs. The distribution is mainly controlled by the density of injection points, the volume of COAs injected, the injection pressure, and the permeability of the subsurface. With low density of injection points, the COAs are likely to be exhausted before reaching the boundaries of the ROI. Depletion of COAs may be due to insufficient volume, or high total oxygen demand (TOD). TOD is the measure of the amount of a specific oxidant consumed by all constituents (COCs and non-COCs) present in the subsurface. Monitoring data from wells in the network are required to evaluate the success of the delivery process, and the vertical and lateral distribution of COAs. Successful COAs distribution can be confirmed by monitoring an indicator such as the electrode potential. Also, monitoring flowrates, pressures,

changes in GW elevations, and tracers or COAs at observation wells can be used to evaluate hydraulic performance across injection network.

- Improving the distribution by injecting a higher volume of COAs could increase the distance traveled and the degree of contact of the COAs with the COCs. However, injection pressures should be designed to avoid fracturing the low permeability areas or cause eruptions of COAs at the surface.
- In addition to increasing cost, high volumes of COAs may cause the spreading of COCs beyond the TTA. Increasing the density of the injection spacing is a better option to increase contact with all the COCs in the TTA.
- Failure to meet objectives could occur if COAs are masking or displacing the COCs instead of treating the COCs. Monitoring of Intermediary compounds or end products formed during treatment reactions would indicate if reactions are occurring. Decision errors in selecting COAs or dosing amount may result in the failure to create conditions necessary for degradation/destruction of all the COCs to end products at a statistically significant rate. Site-specific data from bench-scale testing should be chosen instead of vendor dosing calculator which

uses default data.

- Fouling of the distribution pathways when using fixed injection wells can cause non-uniform distribution. Fouling is a process in which a well screen, filter pack, and/or the surrounding formation become clogged over time. Fouling is not an issue using direct push injections which generally produces a more uniform distribution of COAs. Injection wells are often used if there is a plan to do multiple rounds of injection or if long-term COAs additions are planned.

Conclusion

To minimize failure to meet remediation objectives, OIS-ISP-1 emphasized the importance of proactive planning using an adequate CSM. According to OIS-ISP-1, many challenges encountered during in situ remediation can be overcome with a thorough understanding of the contaminant phase and distribution, site hydrogeology and biogeochemistry, and the COAs physical and chemical characteristics. When failures do occur, it is required to re-evaluate the basis of the original remedial action plan decisions beginning by refining the CSM with new data collected.

Well Permits

Contractors installing, abandoning or modifying wells in Broward County are required to obtain permits from the [Broward County Department of Health](#). The permits are required for wells used to extract groundwater from the aquifer (ex. monitoring wells, recovery wells, etc.)

The Florida Department of Environmental Protection (FDEP) delegated the well permitting program to Broward County Department of Health. The well permitting program ensures the wells are **installed or abandoned properly by a licensed well contractor** in accordance with FDEP's Water Well Permitting and Construction Requirements provided in Chapter 62-532 of the Florida Administrative Code. **The use of a licensed well contractor is required to protect the groundwater aquifer from contamination entering through defective wells.**

The wells permit is the State of Florida DEP Form 62-532.900 (1) - *State of Florida Permit Application to Construct, Repair, Modify, or Abandon a Well*. The permit documents the construction details, the licensed drilling contractor and location of the wells. The permit is valid for one year after the date of issuance.

At the time of article, the costs of the permits are the following:

- The permitting cost is \$75 for the installation of the first monitoring well and \$50 for the installation of each additional well in the permit.
- The permitting cost is \$50 for the abandonment of the first monitoring well and \$25 for the abandonment of each additional well in the permit.

Please note: the cost of the permits may change in the future.

Petroleum Restoration Program (PRP)

Contractors installing or abandoning wells authorized by the FDEP's PRP, with an executed Site Access Agreement, are authorized to act as the site owner's representative to obtain the well permits. Section 5 of Site Access Agreement contains

the following statement:

5. Environmental Infrastructure and Well Permits. The owner authorizes the Department and the Contractor to act as its authorized representative in signing all required forms and documents necessary for obtaining applicable permits related to environmental infrastructure improvements including well construction, repair, maintenance, modification, and abandonment pursuant to Chapter 373 F.S.

In the submittal of an invoice the PRP, a copy of the receipt paid directly to the Broward County Department of Health is required to receive payment for the well permits.

Conclusion

In conclusion, contractors installing, abandoning or modifying wells in Broward County are required to obtain permits from the Broward County Department of Health. The permits help protect the underlying aquifer for improperly installed, modified or abandoned wells. The well permits are required in the reports submitted to Broward County that document the well installation and abandonment activities.

Resources

[Chapter 62-532 of Florida Administrative Code](#)

[The Broward Country Department of Health Well Construction information](#)

[The Petroleum Restoration Program Site Access Agreement](#)

Questions about this article?

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ANNOUNCEMENTS

[FLERA \(Florida Local Environmental Resource Agencies\)](#)

[The Annual conference](#) will be held virtually on October 14 & 15; registration and details to be announced soon!

[2020 Florida Remediation Conference: Canceled](#)

[Next year's event](#) to be held in Orlando, November 2021. We'll see you next year!

[Florida Annual Brownfields Conference](#)

Join [this year's event](#) virtually on October 3-6, 2020.