Case Study: VC3

Vertebrae Injection Max Control

No Further Action Achieved

SITE
Convenience Store Facility, Jacksonville, FL

CONTAMINATION
Gasoline Range Organics in ground water

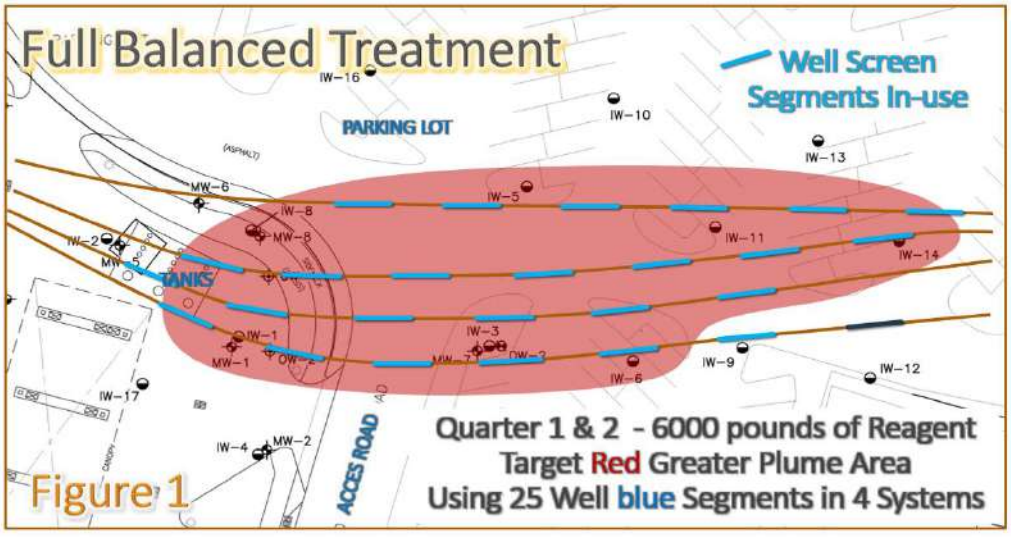
BACKGROUND
A known release of gasoline fuel at this facility led to ground water contamination. Due to site activities, the length of the plume, and multiple properties being involved, typical technologies were determined to not be feasible. Implementation was completed using Vertebrae™ and chemical injection under a performance based contract.

PRE-CLEAN DATA
In multiple wells across the site, concentrations of BTEX constituents were in the parts per million (ppm) range. The lithology is fine sand on top of a clayey sand at 23 ft. The plume traveled at a depth of 15-23 ft, which is below the top of the water table (5 ft). The lithology and hydrologic factors caused this occurrence.

A SUMMARY OF REMEDIATION ACTIVITIES
- The full scale implementation began in February 2015 with Vertebrae installation and injection. An automated injection system injected 3,000 pounds of activated reagent over 45 days of injection per quarter. Twenty five injection segments (500 feet total of well screens) were adjusted to target areas based on feedback data.
- The drilling went under 3 underground storage tanks, a roadway, gas, sewer, water, electric, and irrigation line and under 3 rows of a parking lot. Business disruption was minimized. The system was placed in a desirable location. **The installation of the wells and system took 7 days.**

CLEAR DIFFERENCES BETWEEN VERTEBRAE WELL SYSTEMS AND TRADITIONAL HORIZONTAL REMEDIATION WELLS
One aspect of traditional horizontal remediation wells is that there is the possibility of a lack of 'even' coverage. There is a chance, despite design efforts, for a preferential pathway, sand lenses, or other channeling effects to cause uneven treatment. However, with Vertebrae Well Systems, this possibility is eliminated with individual well control (Figure 1, control by 25 well segments).

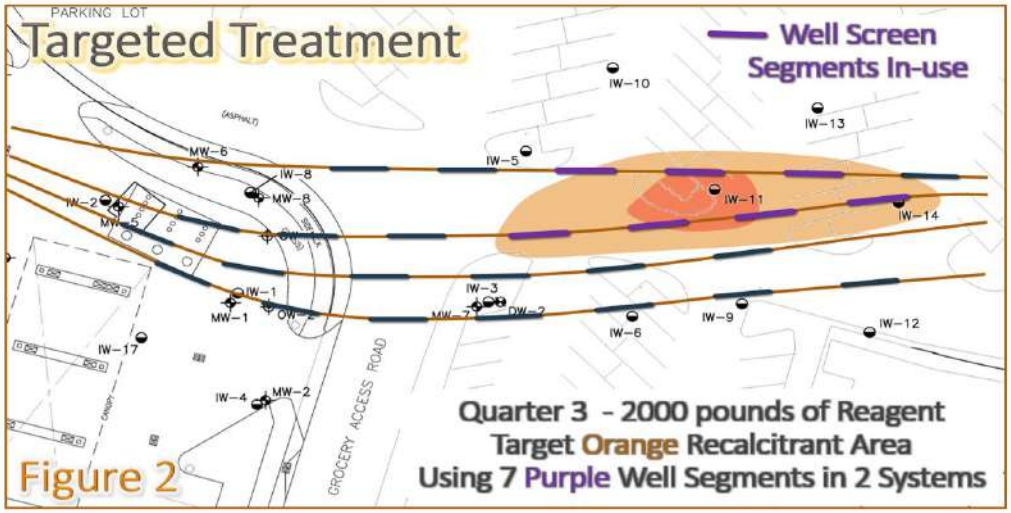
FIGURE 1
The Vertebrae well system layout: by using this system, complete and even coverage of the plume was maintained while avoiding major disruption of surrounding businesses, roadways, and utilities. Two quarters of treatment were completed using the entire layout.



Furthermore and more importantly, when the plume changes from treatment, attenuation, or seasonal effects, the Vertebrae Well System allows adaptation to continue the proper treatment. For instance, the plume concentrations indicated the recalcitrant area was toward the rear of the plume. After two quarters of treatment the injection was redirected to target the remaining area (Figure 2). This could not have been accomplished with traditional horizontal remediation wells.

FIGURE 2

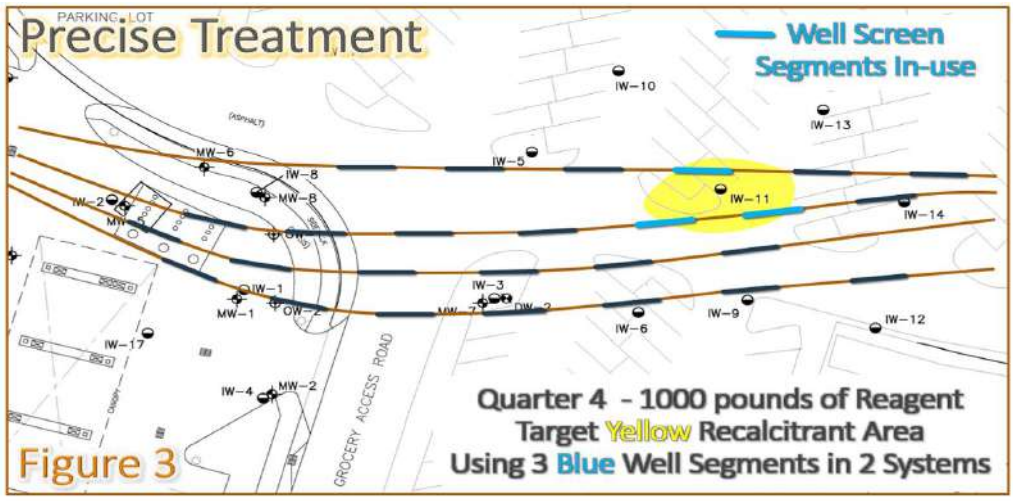
The third quarter polish addressed the two remaining recalcitrant wells (orange shaded area). After sampling, one recalcitrant well remained which was addressed during the final quarter polish. (Figure 2, purple segments used for injection).



Then in a perfect feedback loop, data was collected confirming our effort to adjust worked, and a final quarter was further adjusted to target the last well remaining to report concentration above the regulatory limits (Figure 3, purple segments used for injection).

FIGURE 3

The fourth quarter polish addressed the one remaining recalcitrant well (yellow shaded area) with 3 Vertebrae segments demonstrating pinpoint control. (Figure 3, blue segments used for injection).



RESULTS SUMMARY

The reduction at the site was quick and goals were met on time. After 6 quarters of operation the site was recommended for No Further Action status and was closed in May 2018. The benefits of implementing a Vertebrae™ and oxidant injection strategy were clear and evident in this application. The easy installation minimized business disruption by running under several properties and a busy traffic area. The reagent was applied in a controlled and robust way, far better than traditional horizontal wells, and the mass was quickly reduced and resulted in successful closure of the site.

CONCLUSION

Vertebrae™ is a better solution than conventional wells and provides the much needed control to old horizontal wells at lower costs. It provides more contact with the plume, minimizes business disruptions, and removes unsightly well vaults, all while being faster, safer and more cost effective.

VERTEBRAE™ WELL SYSTEMS
2150 W Northwest Hwy
Grapevine, Texas 76051
Phone 855.797.8360
Vertebraewells.com