

IN SITU ENHANCED BIOREMEDIATION USING BIOBARRIERS & BIOLOGICAL GRID TO TREAT A LARGE DILUTE TRICHLOROETHENE PLUME

Sowmya Suryanarayanan

Praveen Srivastav, PhD, P.G., Susan Watson P.E.,

Robert E. Mayer P.G.

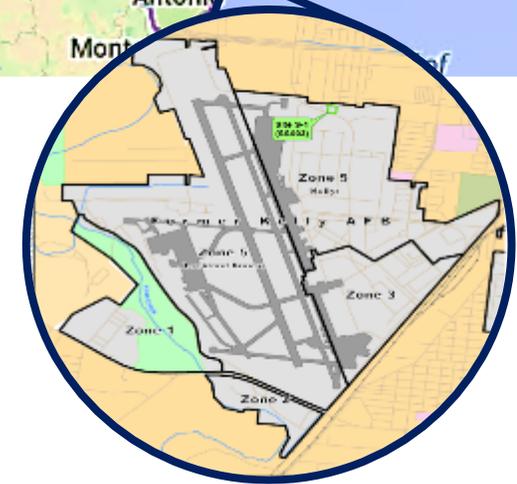
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KELLY AIR FORCE BASE

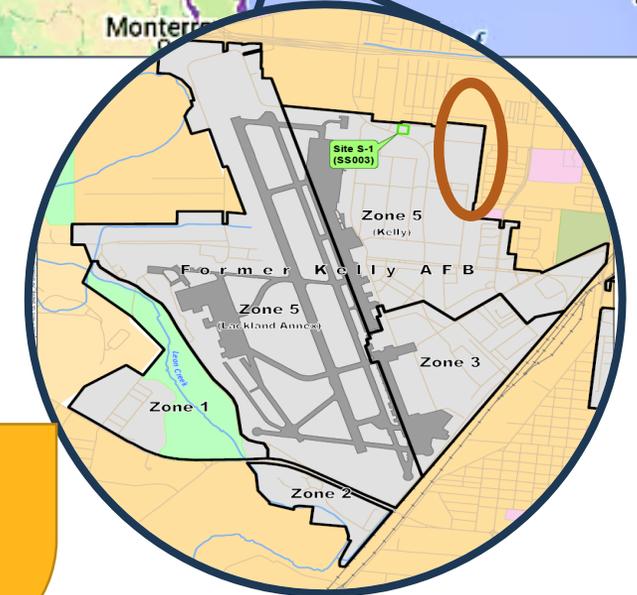
- › Over 12,000 Workers
- › Houses, Schools & Colleges
- › 70 public & private organizations
- › Aerospace, cyber security, Manufacturing



OUTLINE

- › Background
- › Past Remedial Actions
- › Remedial Design Approach
- › Remediation Overview & Results
- › Field Implementation & Challenges
- › Conclusions & Future Work

Former Kelly AFB



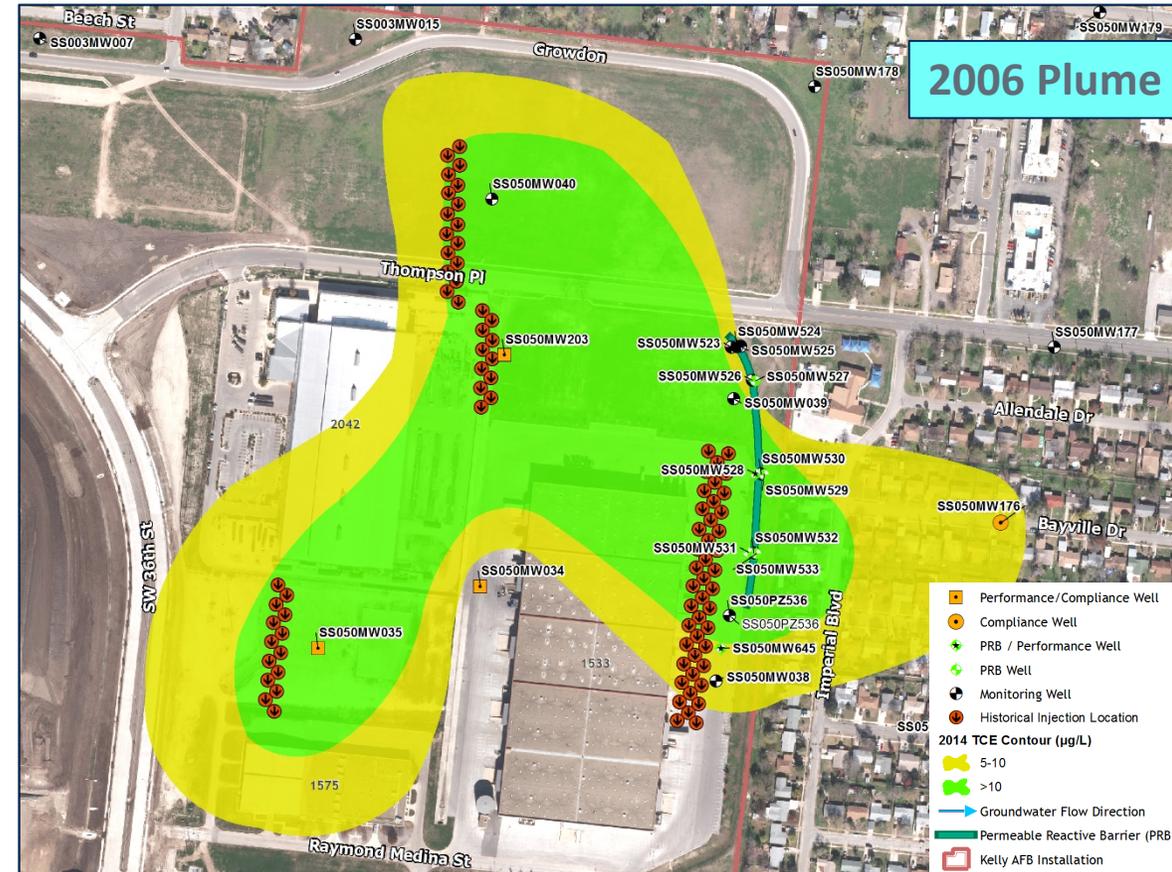
**5
ZONES**

**39
SITES**

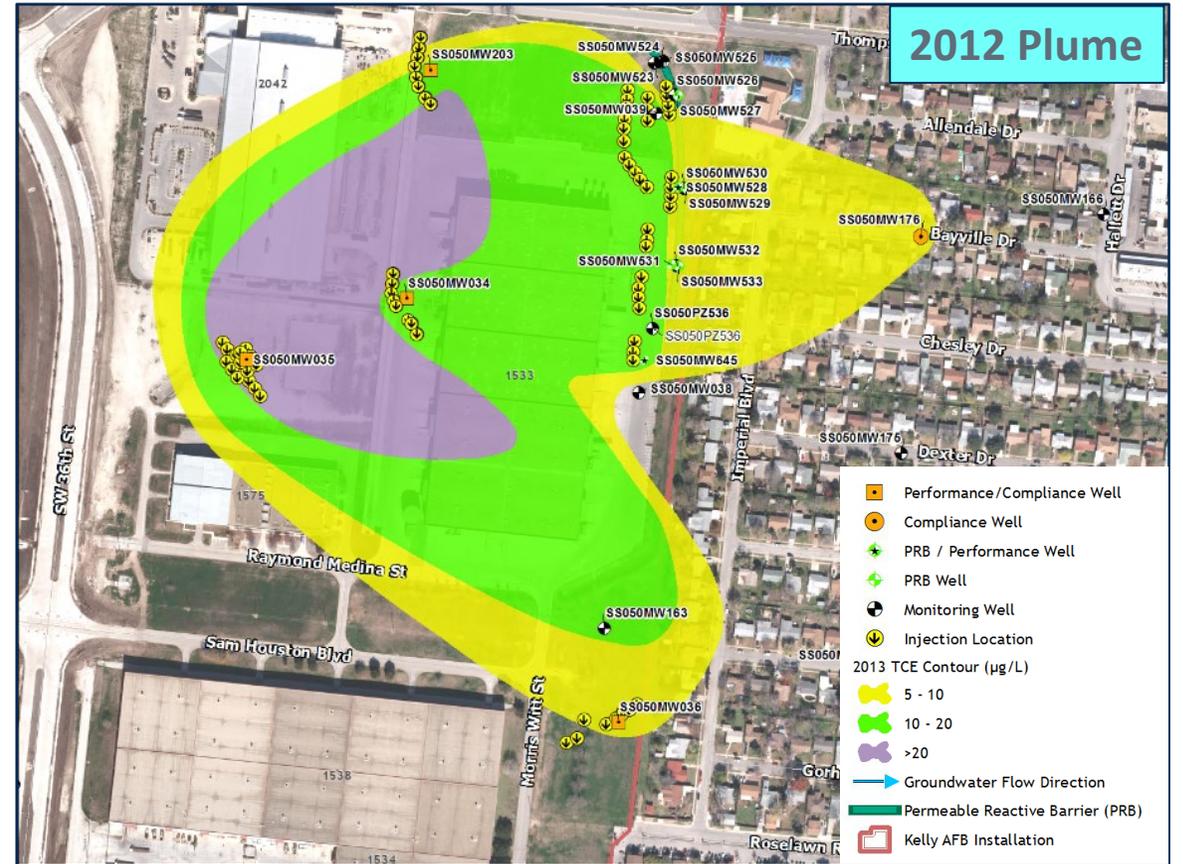
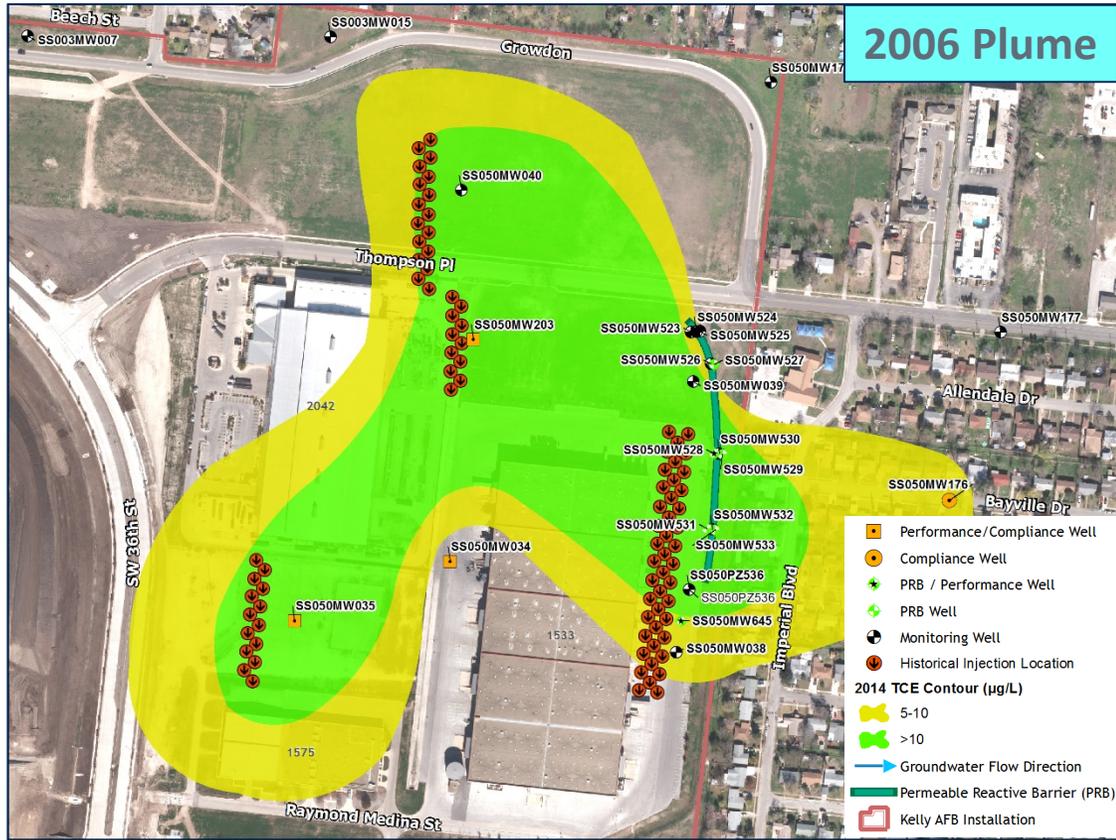
**10 ADAPTIVE
TECHNOLOGIES**

Past Remedial Actions

- 2002 : ZVI PRB installed in to prevent off-base migration of TCE plume
 - ZVI PRB 650 feet long and 2.25 to 2.5 feet wide
 - Bottom of PRB ranges in depth from 36 to 43.5 ft bgs
- 2008: Injections conducted upgradient of PRB
 - HRC-3DMe[®]
 - 86 DPT points
 - 1,578 gallons
- Monitored natural attenuation



Past Remedial Results



PBR Awarded
2011

Planning
2011-2012

Remediation
2012-2017

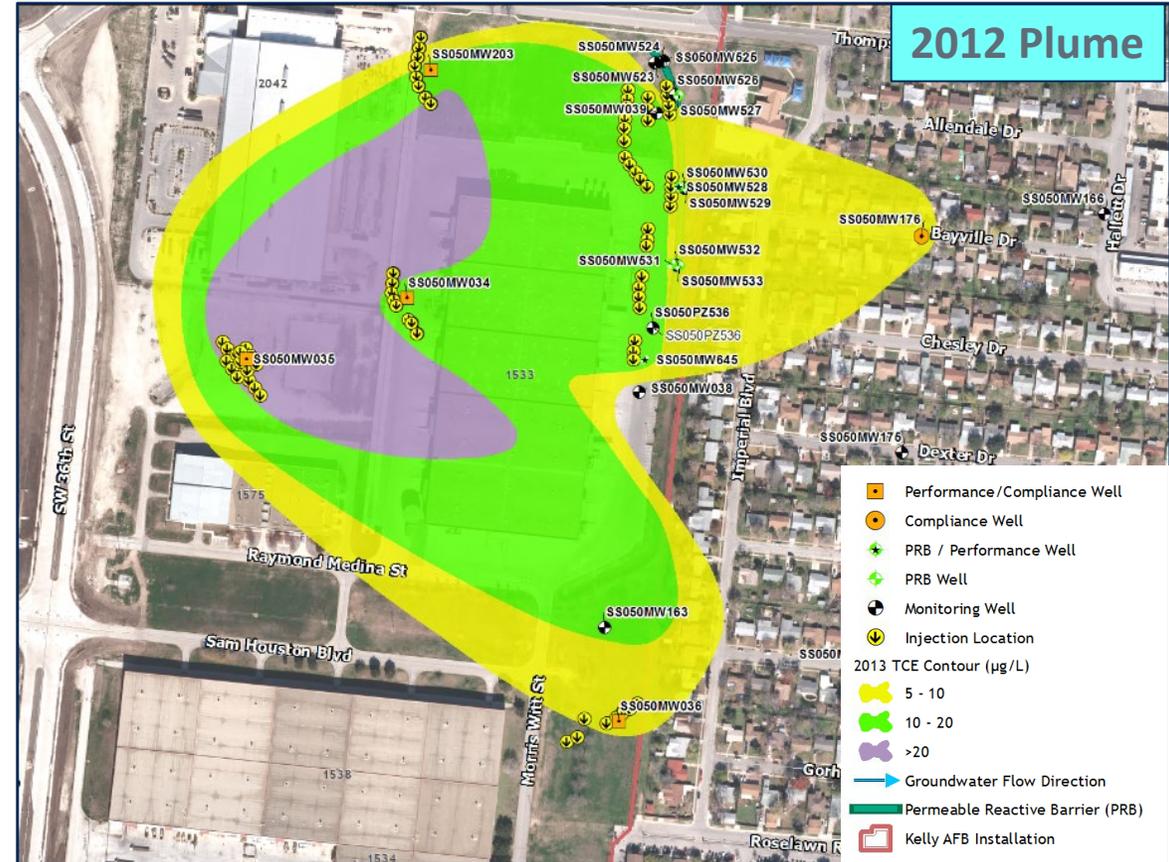
CoC < MCL
2017-2020

Site Closure
2020



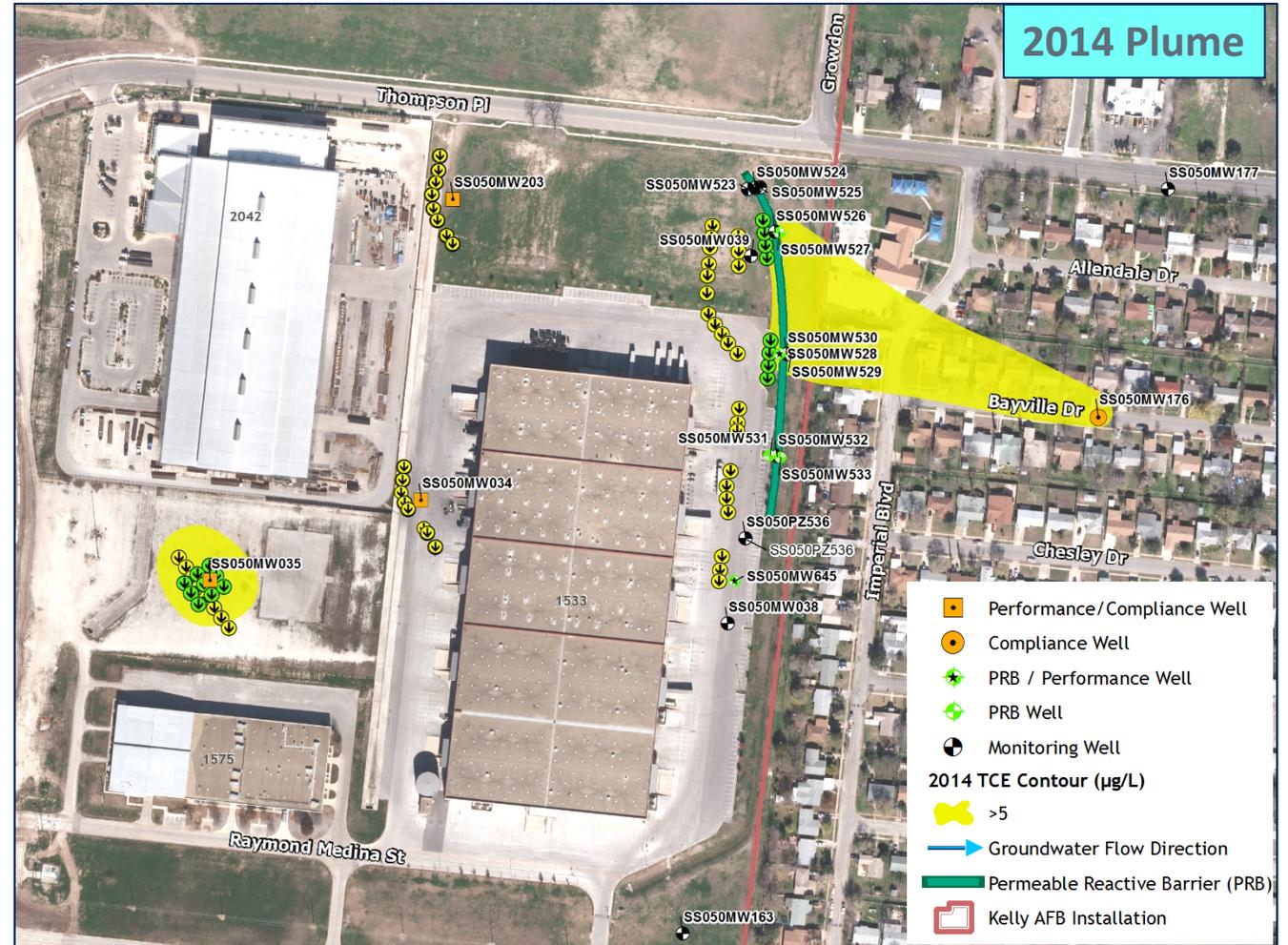
Initial Design Approach (Round 1)

- › Round 1: 24 Jul – 19 Aug 2013
- › Installed 5 biowalls upgradient of the PRB
- › ISEB injections using EVO, microbial culture (SDC-9™) and nutrients
- › Injections complement the ZVI PRB
- › Installed 57 temporary injection points and injected 56,000 gallons
- › Depth of injections: 26 – 38 ft bgs

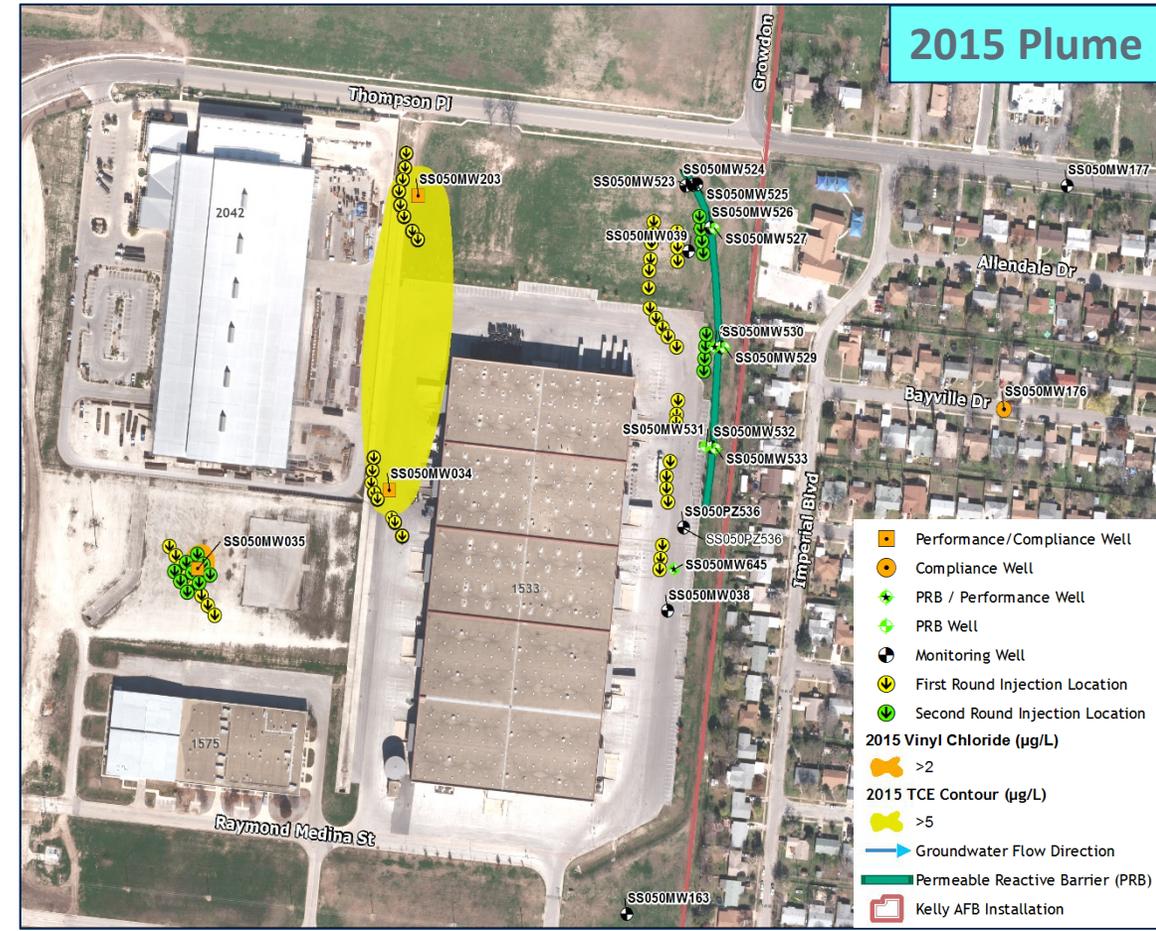
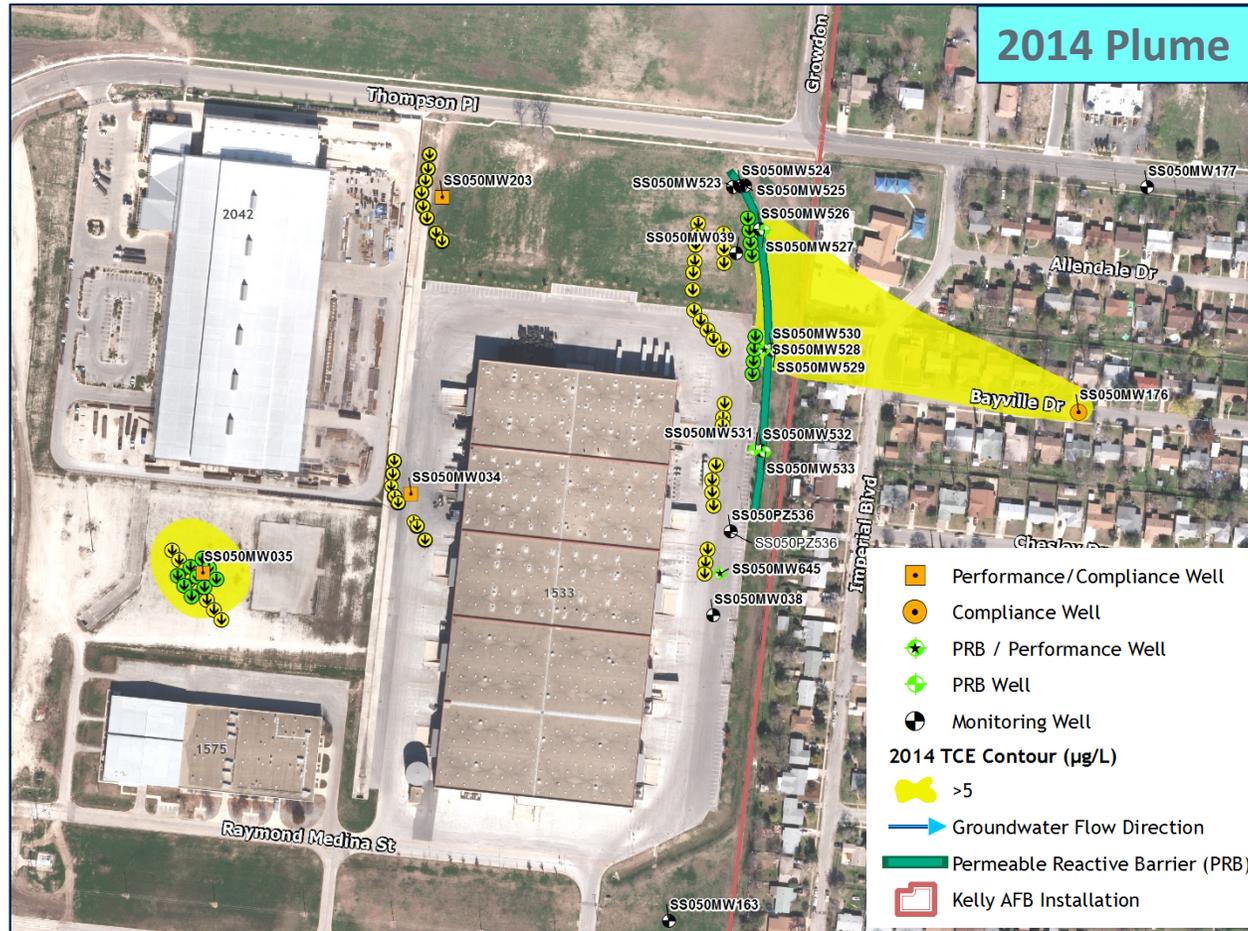


Round 2 Injection

- › Round 1: 17 Oct – 12 Nov 2014
- › Installed a biowall upgradient of the PRB and biogrid in the vicinity of contaminated well
- › ISEB injections using EVO, microbial culture (SDC-9™) and nutrients
- › Installed 17 temporary injection points and injected 12,500 gallons
- › Temporary injections points with DPT rods and inflatable packers used to minimize surfacing
- › Depth of injections: 28 – 40 ft bgs

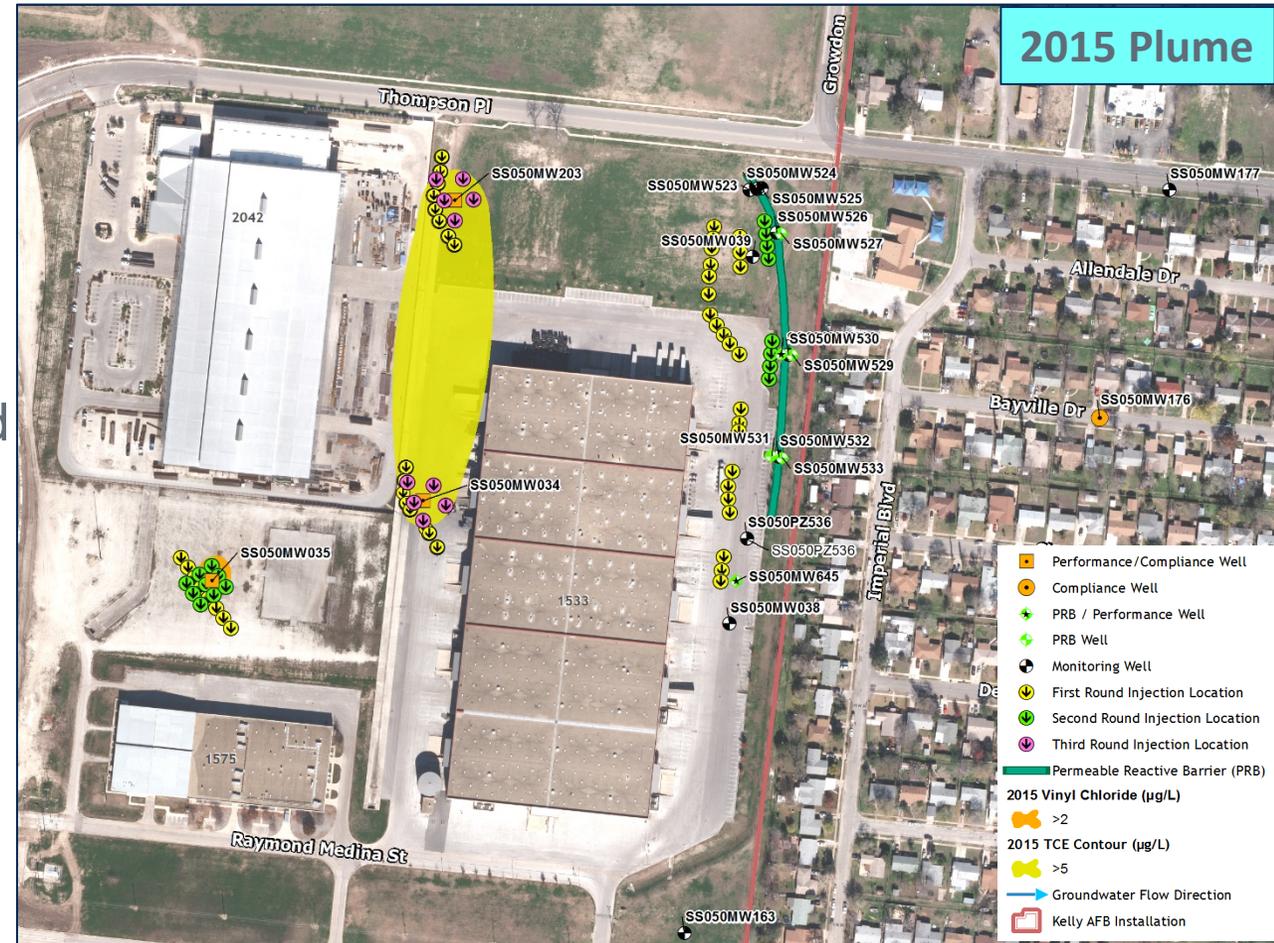


Remediation Overview (Round 2)

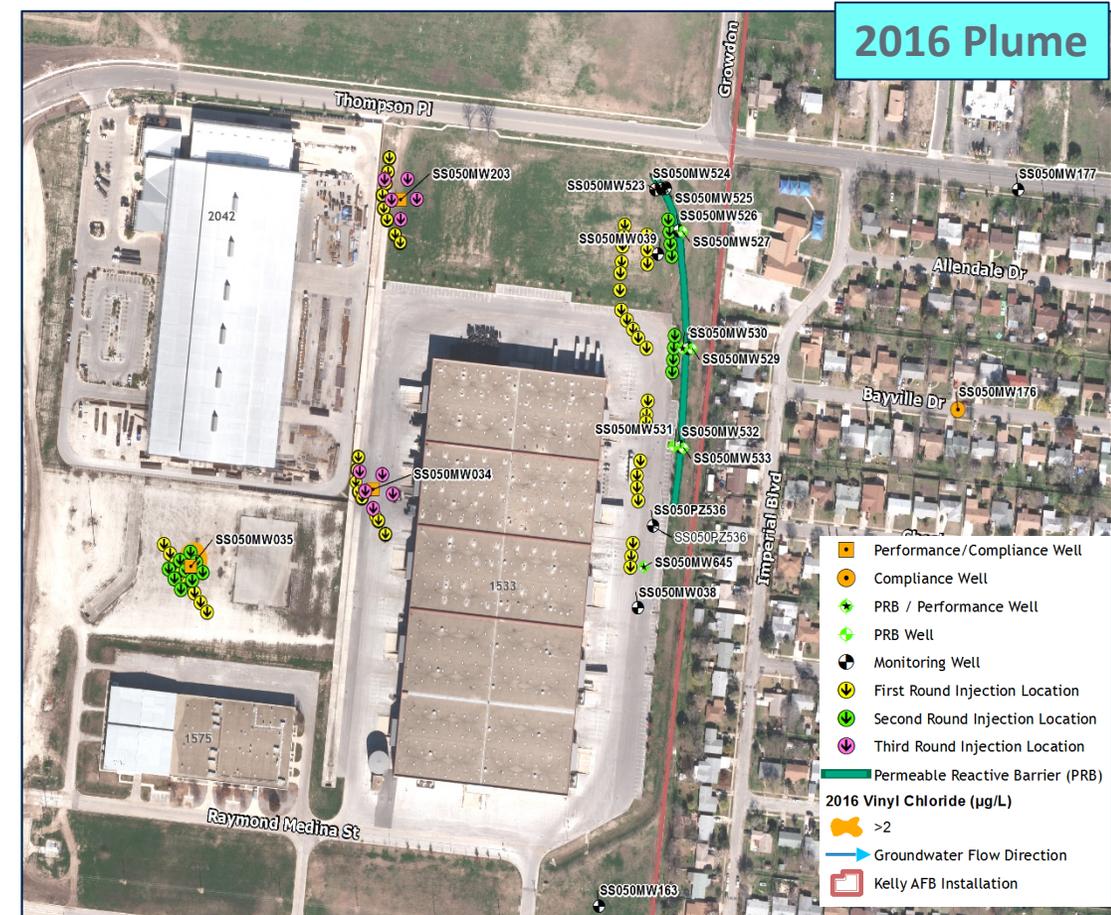
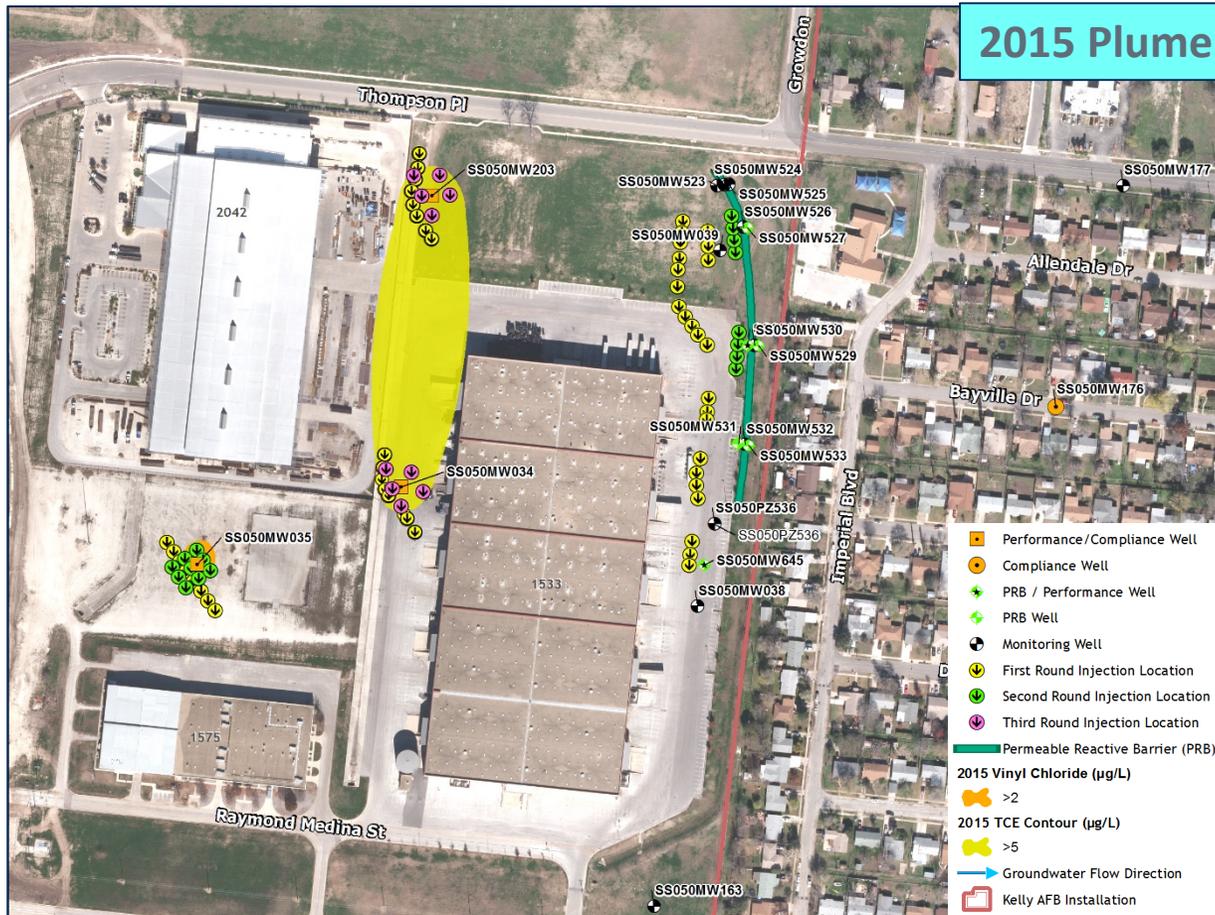


Round 3 Injection

- › Round 3: 10 Dec – 13 Dec 2015
- › Installed a biowall upgradient of the PRB and biogrid in the vicinity of contaminated well
- › ISEB injections using EVO, ferrous gluconate, microbial culture (SDC-9™) and nutrients
- › Installed 10 injection wells for injections
- › Injected 10,000 gallons
- › Depth of injections: 25 – 40 ft bgs

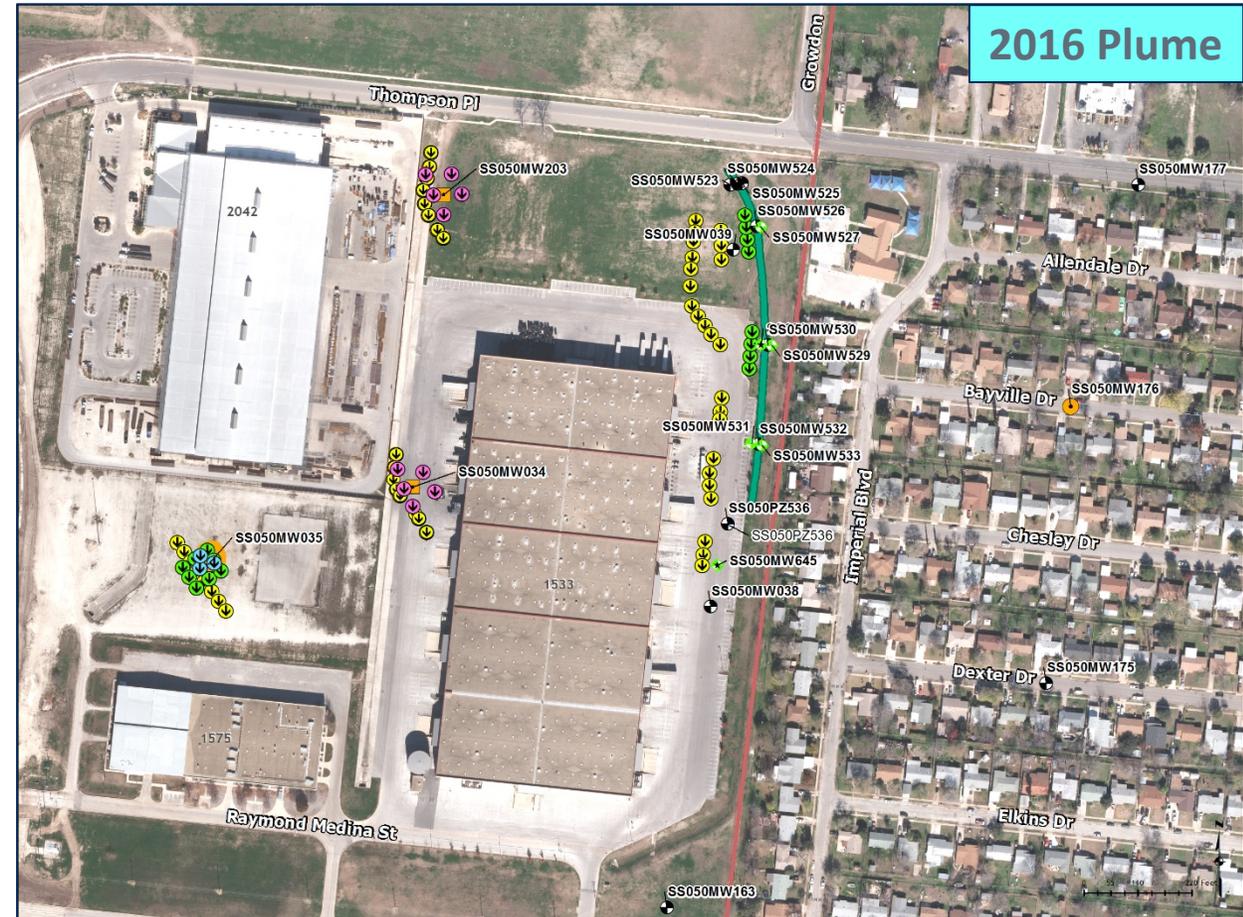


Remediation Overview (Round 3)

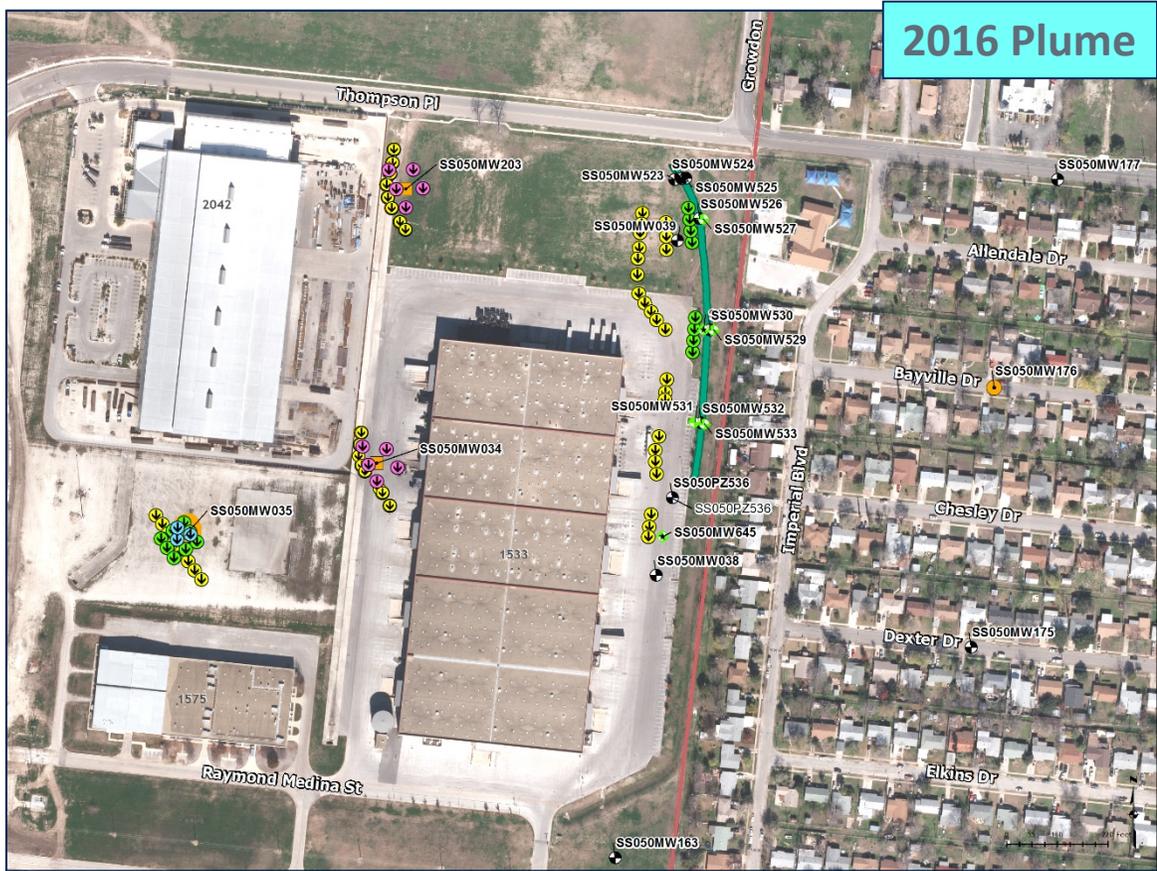


Round 4 Injection

- › Round 4: 13 Mar 2017
- › ISEB injections using EVO, ferrous gluconate, microbial culture (SDC-9TM) and nutrients
- › Installed 3 injection wells for injections
- › Injected 1,500 gallons
- › Depth of injections: 22 – 32 ft bgs



Remediation Overview (Round 4)



Field Implementation & Challenges

Challenges

- › Hard lithology made it tough to drill
- › Heavy surfacing encountered in some areas
- › Presence of active building structures

Workarounds

- › Predrilled injection points with an auger rig
- › Used injection wells to reduce surfacing
- › Used temporary injection points with inflatable packers to create a better seal and prevent surfacing
- › Added additional amendment volume to adjacent injection points

CONCLUSIONS & FUTURE WORK

- › Continue monitoring for one more year to ensure concentrations remain below MCL

QUESTIONS

Sowmya Suryanarayanan

Sowmya.Suryanarayana@APTIM.com

