



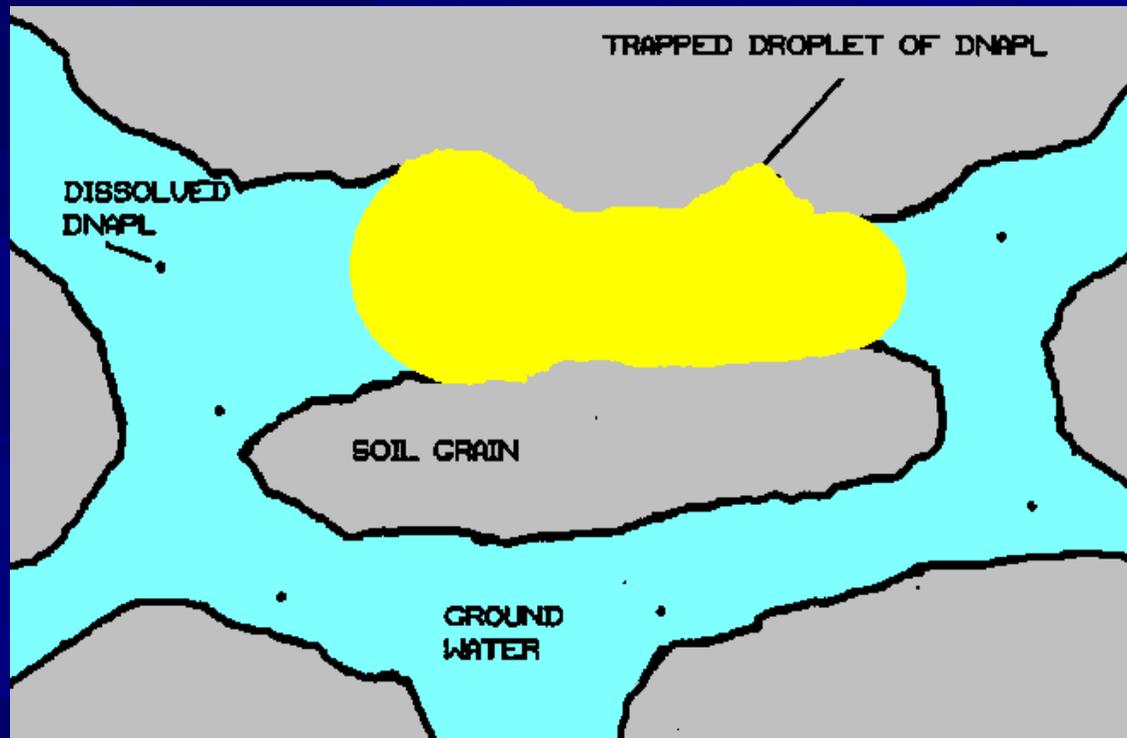
**Expedited Petroleum  
Free Product  
Recovery Removal  
Using Surfactants  
May 23, 2012**

# EcoVac's Patented SURFAC<sup>®</sup> Process

- SURFAC<sup>®</sup> = Surfactant injection combined with dual-phase/multi-phase extraction
- Patented process
- Exposes impacted soils for direct (and undiluted) contact by the surfactant (horizontally, as well as **following vertical migration pathways**)
- Hydraulic control of the plume ensures complete NAPL capture and mitigation of plume movement
- EcoVac has completed 70 SURFAC<sup>®</sup> projects in 13 states incl. Ohio (ave. >95% NAPL removal)

# NAPL is Trapped by Capillary Forces/Interfacial Tension

High  
oil/water  
interfacial  
tension  
makes  
NAPL  
immobile.

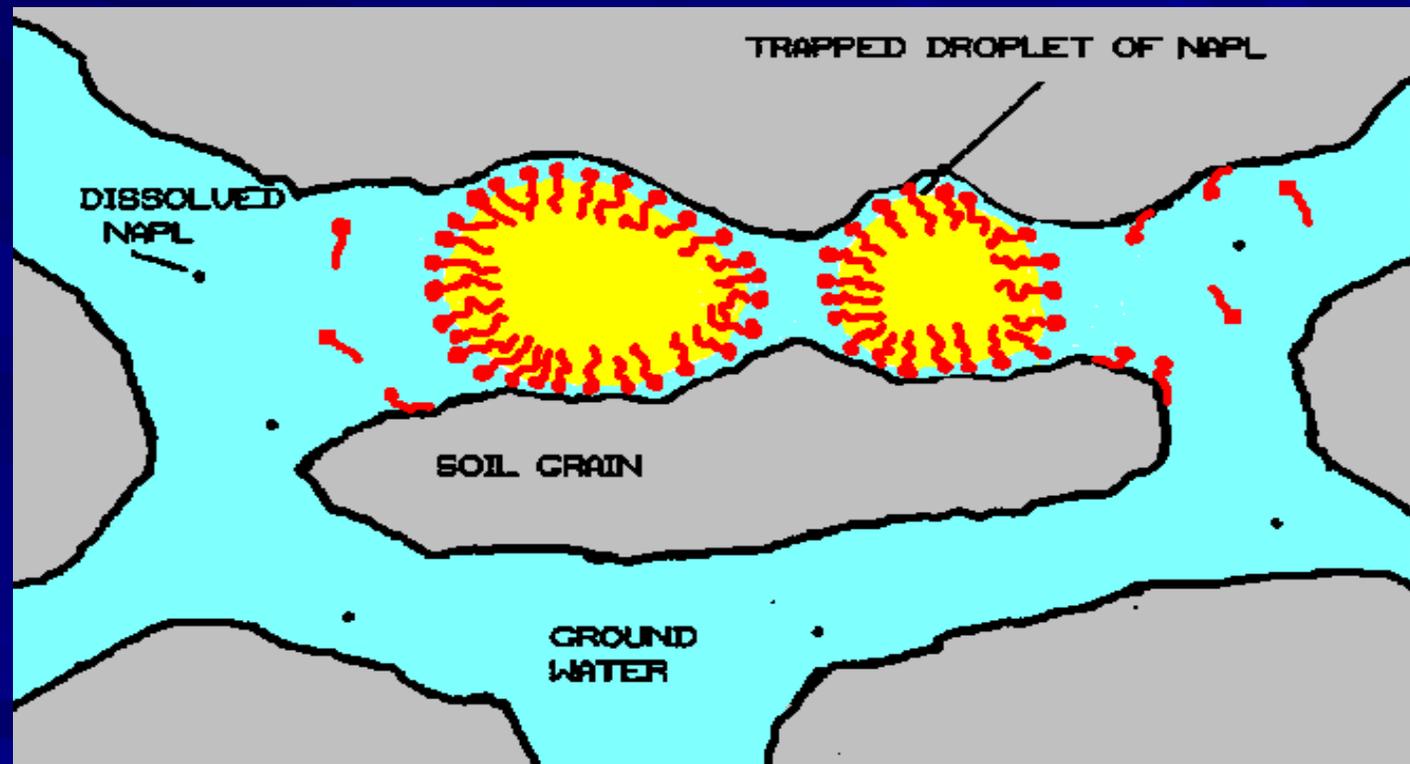


Low water  
Solubility  
-- 100s to  
1000s of  
flushings/  
years to  
dissolve  
the NAPL.

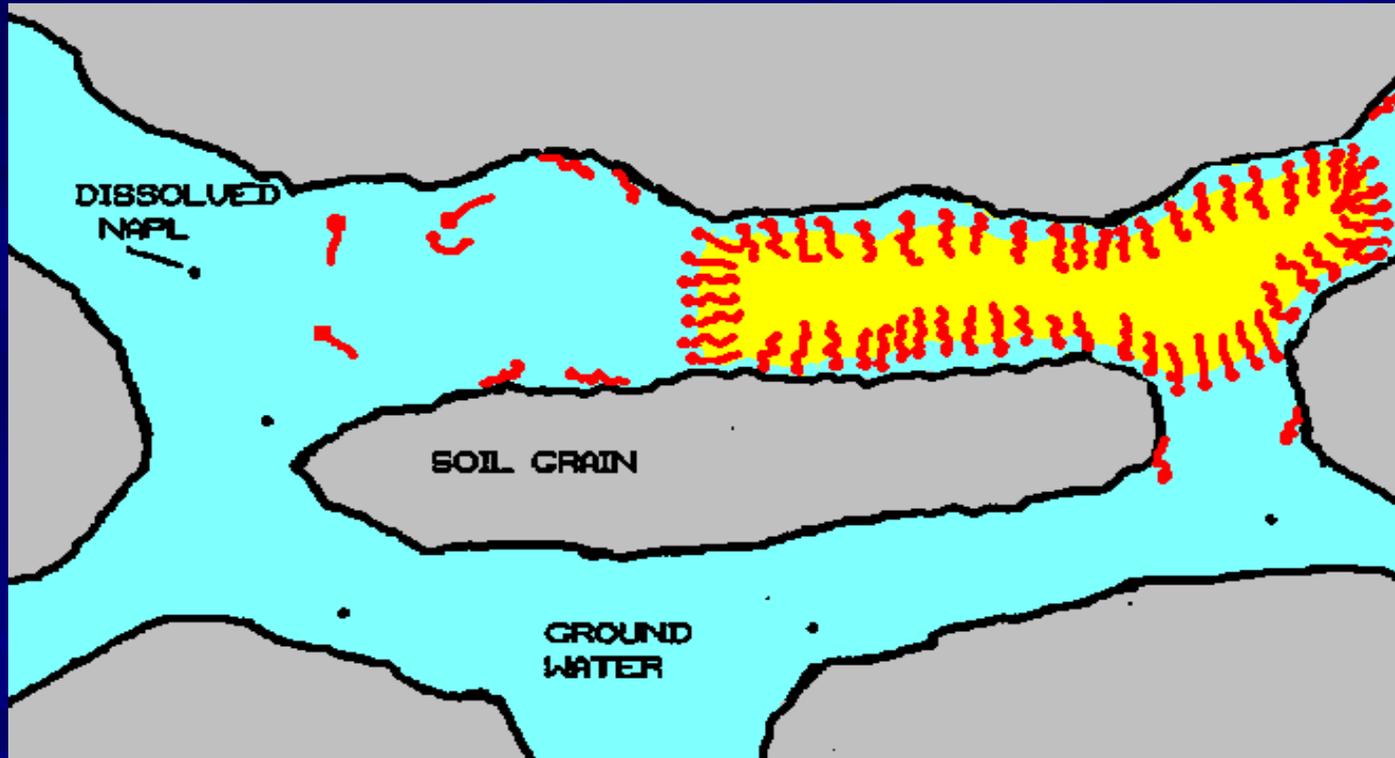
# Surfactants

## Lower Interfacial Tension and Reduce Capillary Forces

The surfactant  
reduces the  
oil/water  
interfacial  
tension



**NAPL is mobilized and  
begins to flow towards the extraction well**



## Typical SURFAC<sup>®</sup> Sequence

- Site information review/site evaluation
- Treatability testing
- Pilot testing
- Field implementation



# Norman, OK SURFAC<sup>®</sup> Site

---

- Two former gasoline stations
- ~2.5 acre NAPL plume (as much as >3 ft) ~620 ft x ~280 ft in size, impacting numerous active businesses (also beneath two streets, including a 5 lane highway)
- Clay/sandy clay/clayey sand grading to a clayey silty fine grained sand – DTW 18-23 ft
- EFR<sup>®</sup> and SURFAC<sup>®</sup> performed May 29 to June 30, 2007 (33 days)



W Main St

W Main St

W Main St

W Main St

Collier Dr

Thompson Dr

50 feet 20 m

© 2010 Microsoft Corporation © 2009 NAVTEQ © AND Pictometry Bird's Eye © 2009 Pictometry International Corp

Norman Ok  
SPH Plume



2.5± Acre SPH  
Plume



W Main St

2000 W Main St, Norman, OK 73069

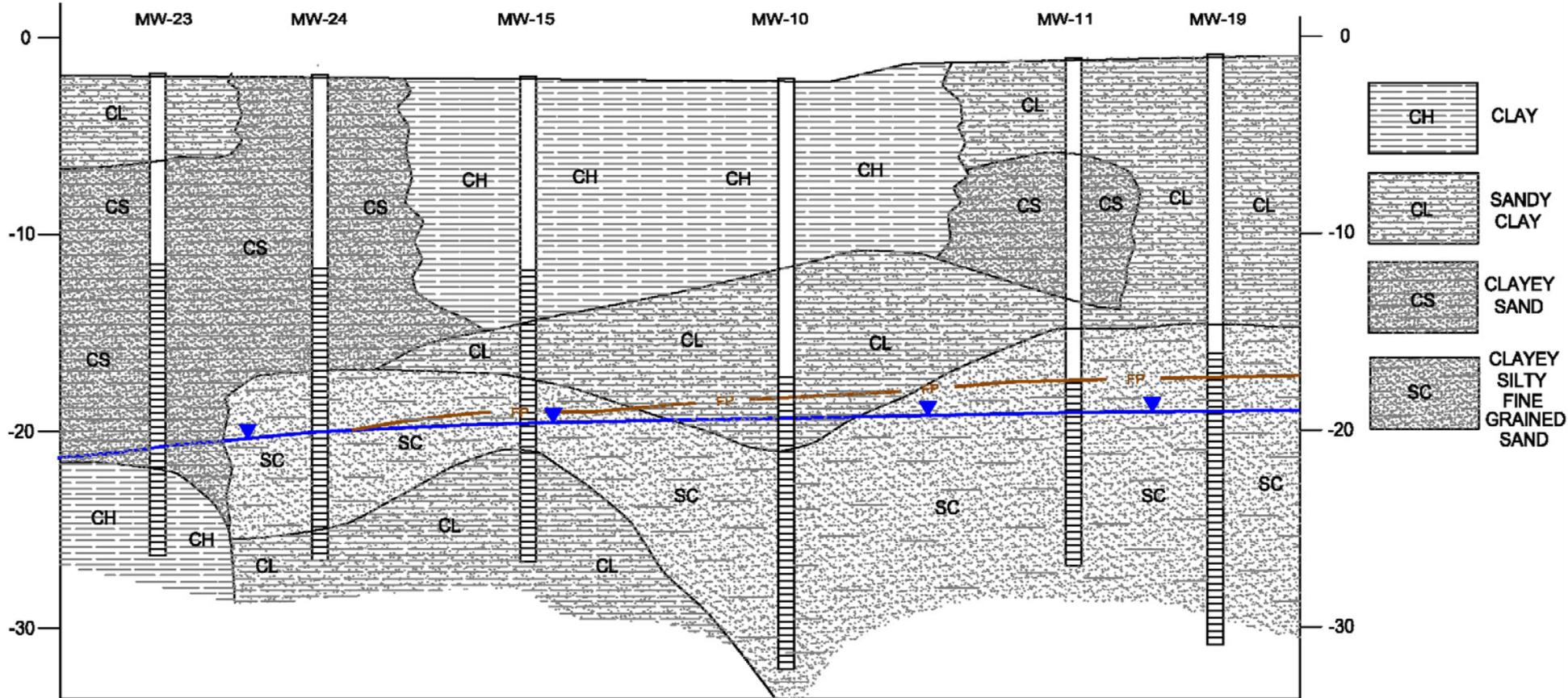
FMR  
UST

FMR  
UST

Thompson Dr



# NORMAN, OK CROSS SECTION



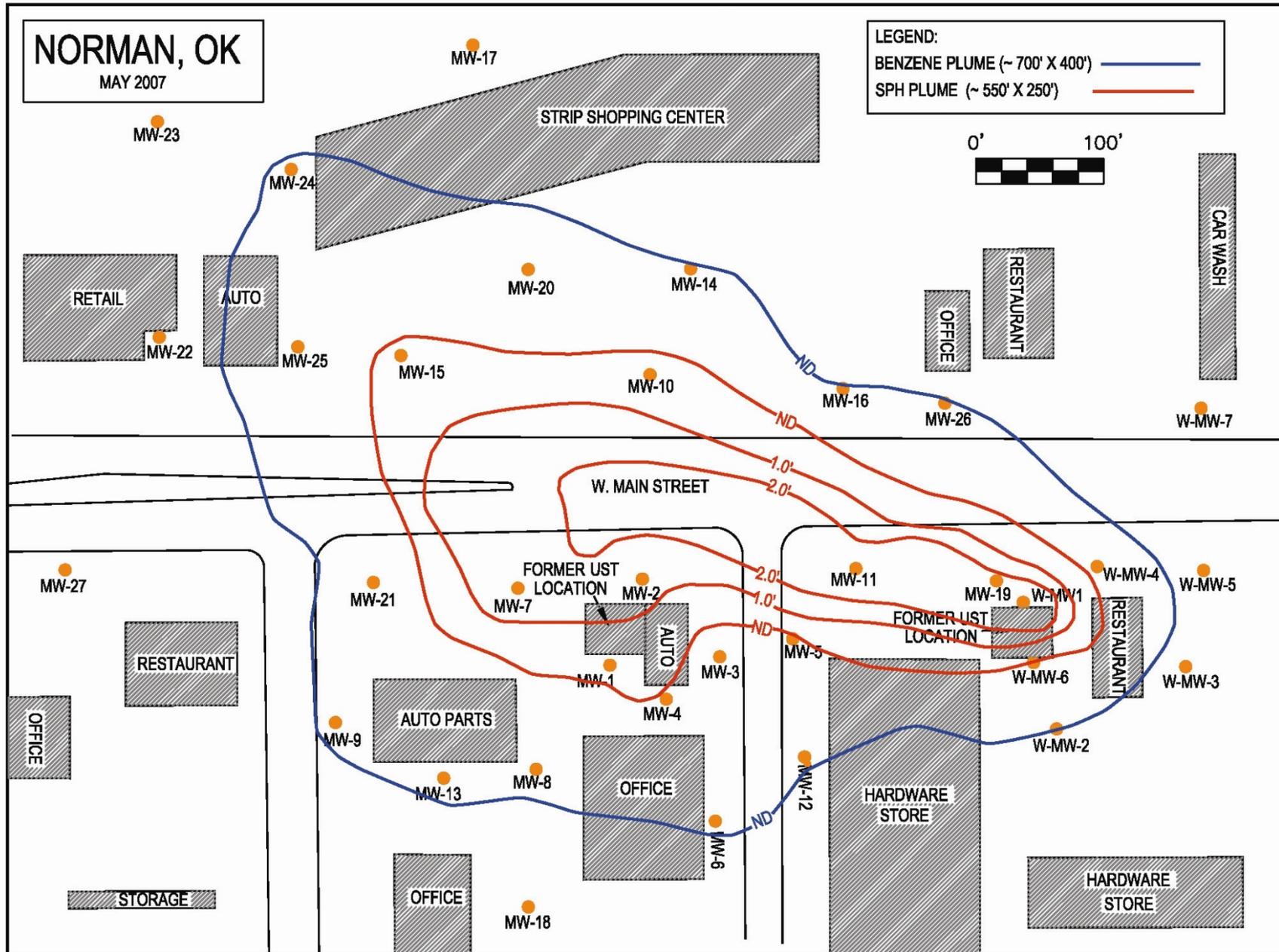
# NORMAN, OK

MAY 2007

## LEGEND:

BENZENE PLUME (~ 700' X 400')

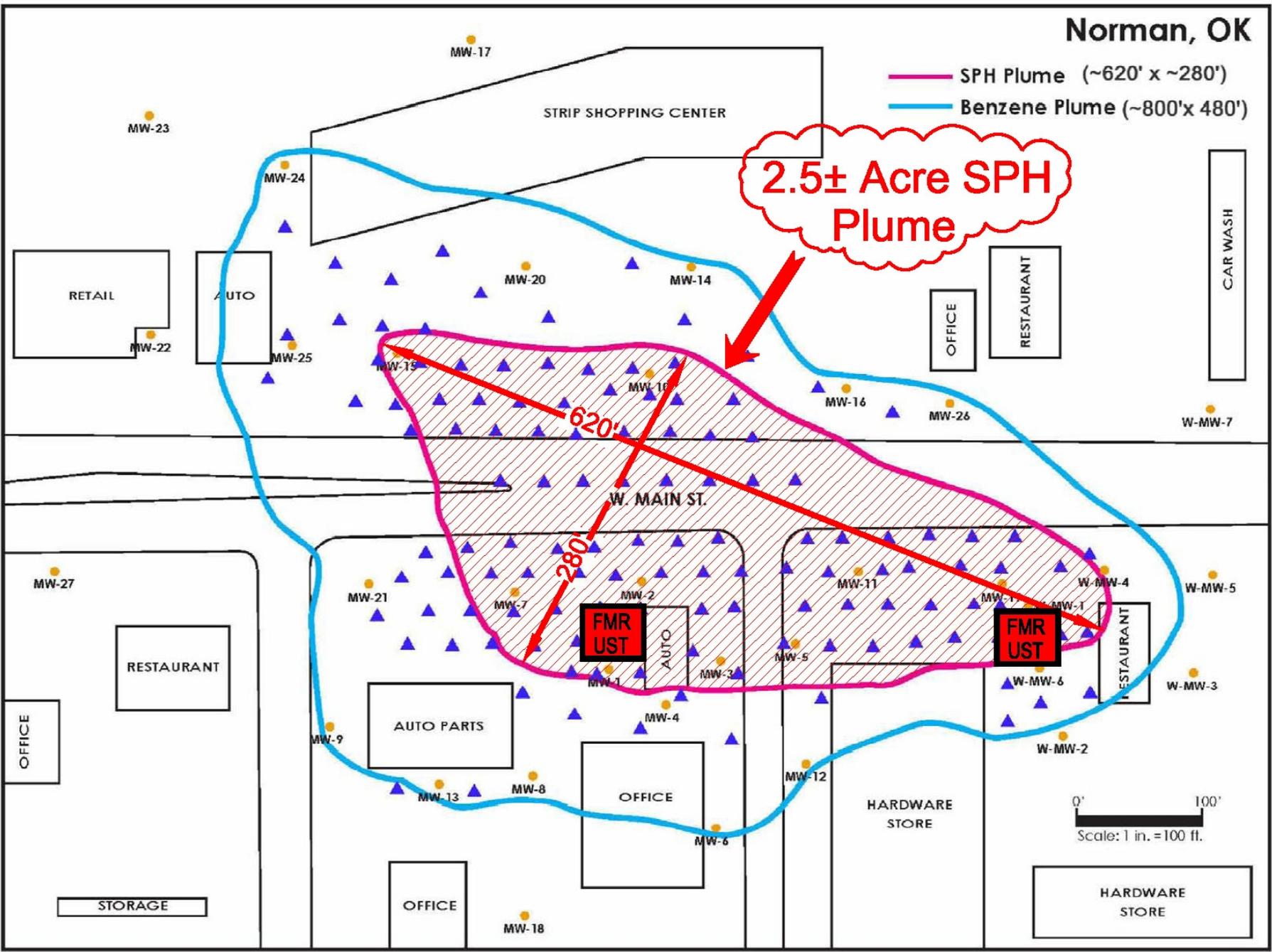
SPH PLUME (~ 550' X 250')



# Norman, OK

— SPH Plume (~620' x ~280')  
— Benzene Plume (~800' x 480')

2.5± Acre SPH Plume



TWIN PEAKS  
AUTO SALES  
BUY-SELL-TRADE

ECO VAC

THE DOMINANT

GA006





# Norman, OK Site Summary

---

- **~2.5 acre** NAPL plume (max. >3 ft) ~620 ft x ~280 ft in size, impacting numerous active businesses (also beneath two streets, including a 5 lane highway)
- EFR<sup>®</sup> and SURFAC<sup>®</sup> performed May 29 to June 30, 2007 (33 days)
- **NAPL completely removed after only 33 days** (in addition to decreases in the benzene plume)

# SURFAC<sup>®</sup> Advantages

- Cost effective (\$50,000 to \$487,638)
- Demonstrated success over a wide range of lithology and hydrogeologic conditions
- **Direct and undiluted contact** with the impacted media **horizontally and vertically** under controlled conditions
- Widespread regulatory acceptance
- Can utilize the existing monitor well network at many sites
- Minimal to no disruption to operating facilities
- NAPL completely removed and/or site closure at 78% of the sites (most with a single application)
- Average NAPL removal is >95%
- Rapid project completion – **projects can be completed within 15 to 60 days following pilot testing**

# Contact Information

[www.ecovacservices.com](http://www.ecovacservices.com)

**Mathew Wittich**

**859-266-5053**

**Cell 859-619-8947**

[mathew.wittich@ecovacservices.com](mailto:mathew.wittich@ecovacservices.com)



[www.ecovacservices.com](http://www.ecovacservices.com)  
1.888.432.6822