

Appendix H in an Old Oilfield

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Oklahoma Corporation Commission**

Background

- In a fairly new gated community in NW OKC, recent homebuyer Mrs. Z complained that her water well tasted salty.
- Soon after, her neighbors were also complaining
- Since this was a historic oilfield area, the OWRB contacted Corp Comm, and our Field Inspector came out and sampled the wells.



Z Well



25 Aug. 2011 ^North West
White evap. Salt rim,
dead/dying irrigated plants
Brad Ice

Background

- All but one of the wells tested were over the secondary salt drinking water standards.
- Later we learned that two original subdivision homeowners had had wells in their backyard, with later new wells in the front yards. **Red Flag!**
- According to one homeowner, his backyard well was **bad when bought from the developer 8 years before**; he arranged for a new, better front one....
- We were only able to get partway downhole in one backyard well; barely touched water in the other.

Sampling Results

Na/Cl <0.6 indicates oilfield source

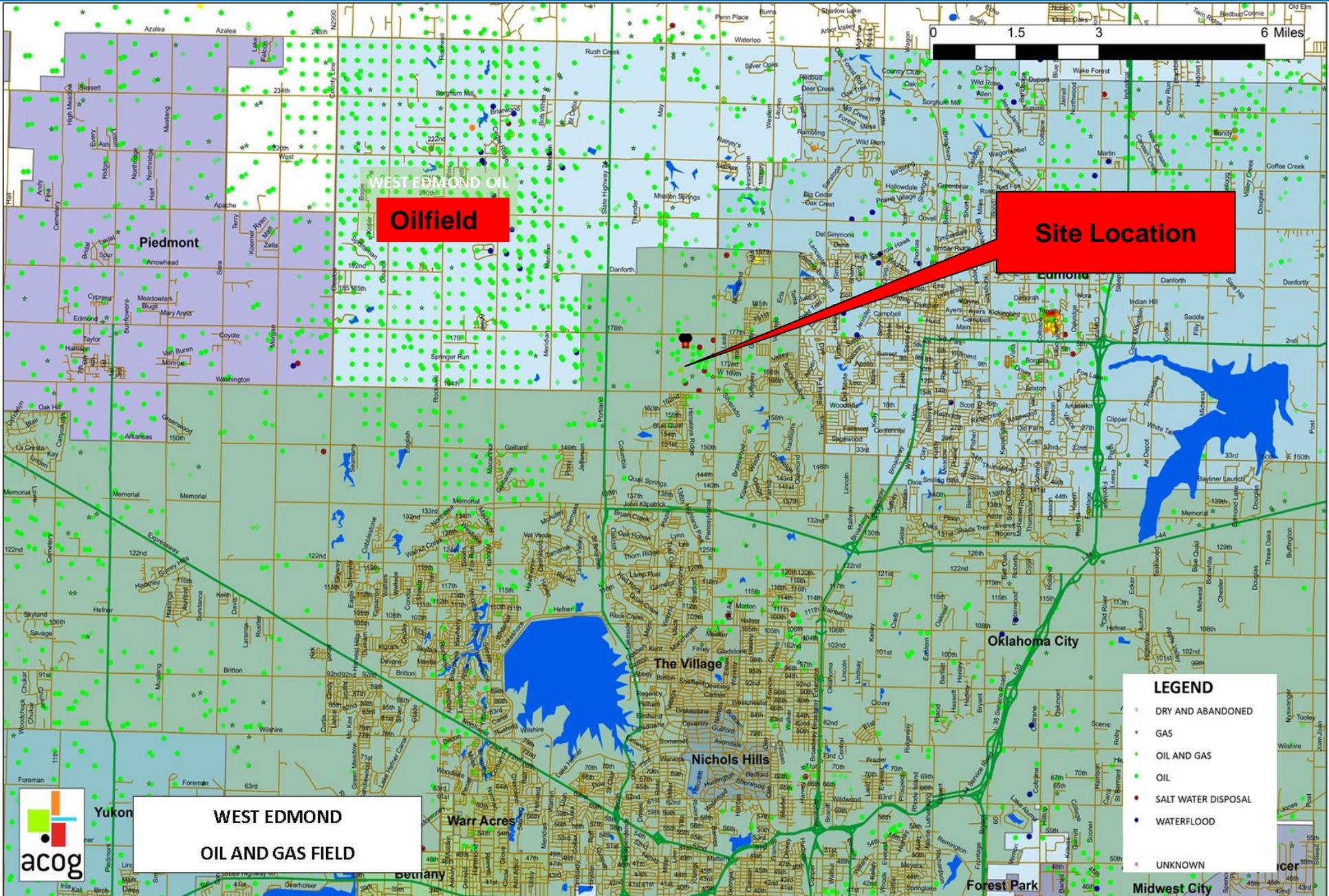
Wells ~300' deep; only got to ~150' B backyard

Who	Na ppm	Cl ppm	SO4 ppm	TDS or TotlSolSalts	Na/Cl
Z	1314	3323	798	7597	0.395
L	665	2171	370	4996	0.306
C	438	1047	722	3247	0.418
D	210	460	357	1756	0.457
N	184	139	302	1095	0.662
B Frontyard	92	417	79	1327	0.441
B Backyard				1600	

Highlighted **Orange** or **Yellow** - exceeds secondary drinking water standards

Sampling data

- Five of the 6 Wells exceeded secondary drinking water standard (250 ppm) for chlorides
- These five have a sodium/chloride (Na/Cl) ratio below 0.6, indicating an oilfield source.
- Five wells – not the same 5 – were also high in sulfates (SO_4), but that is fairly common in central Oklahoma in the Garber sandstone area. BASO4.
- The lowest chloride well, still elevated in sulfate, did NOT have an oilfield Na/Cl ratio.



WEST EDMOND OIL

Oilfield

Site Location

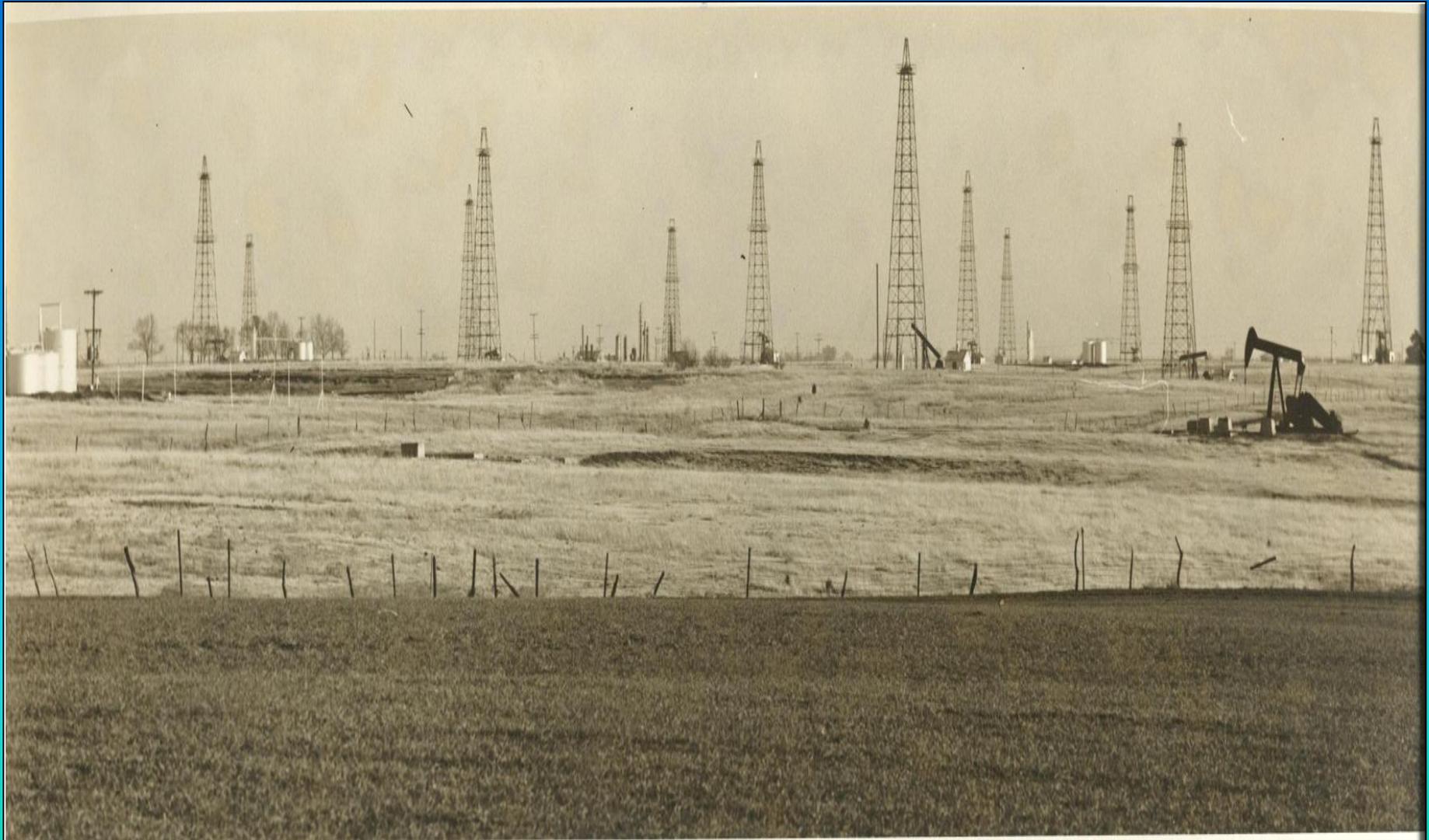
**WEST EDMOND
OIL AND GAS FIELD**

LEGEND

- DRY AND ABANDONED
- GAS
- OIL AND GAS
- OIL
- SALT WATER DISPOSAL
- WATERFLOOD
- UNKNOWN

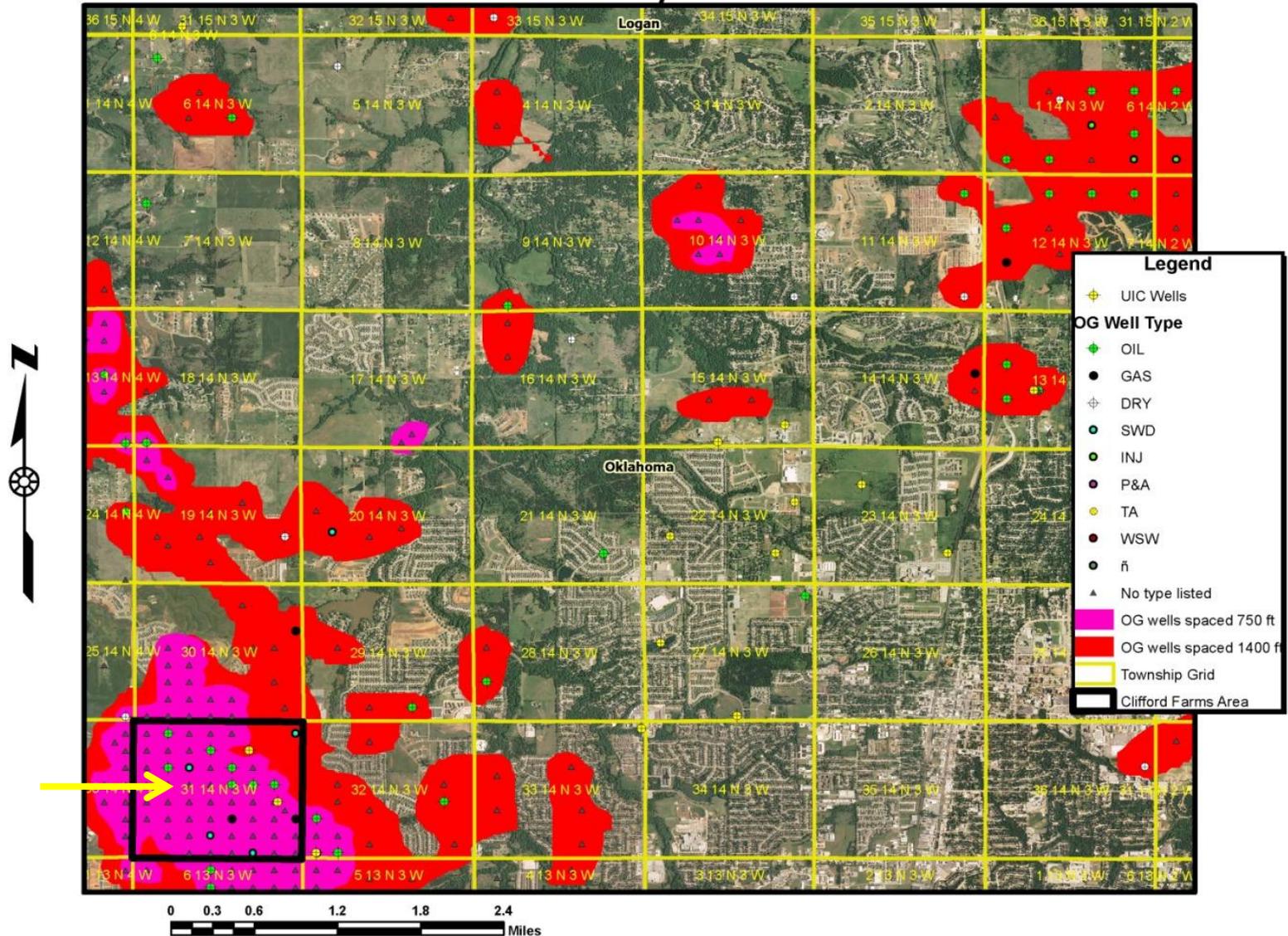


WEST EDMOND OIL FIELD CIRCA 1945

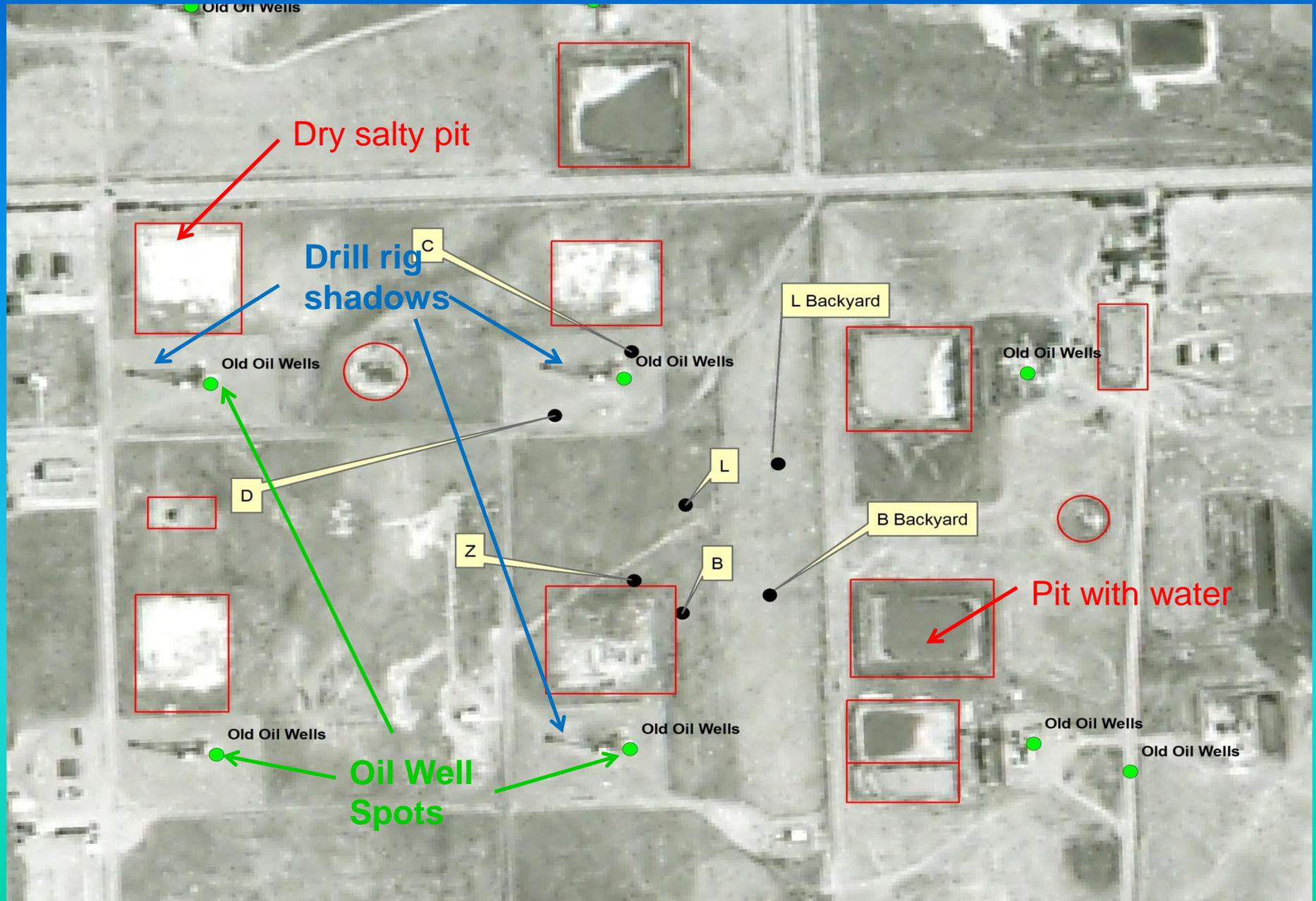


Over 40 wells + Pits etc. per Sq Mile

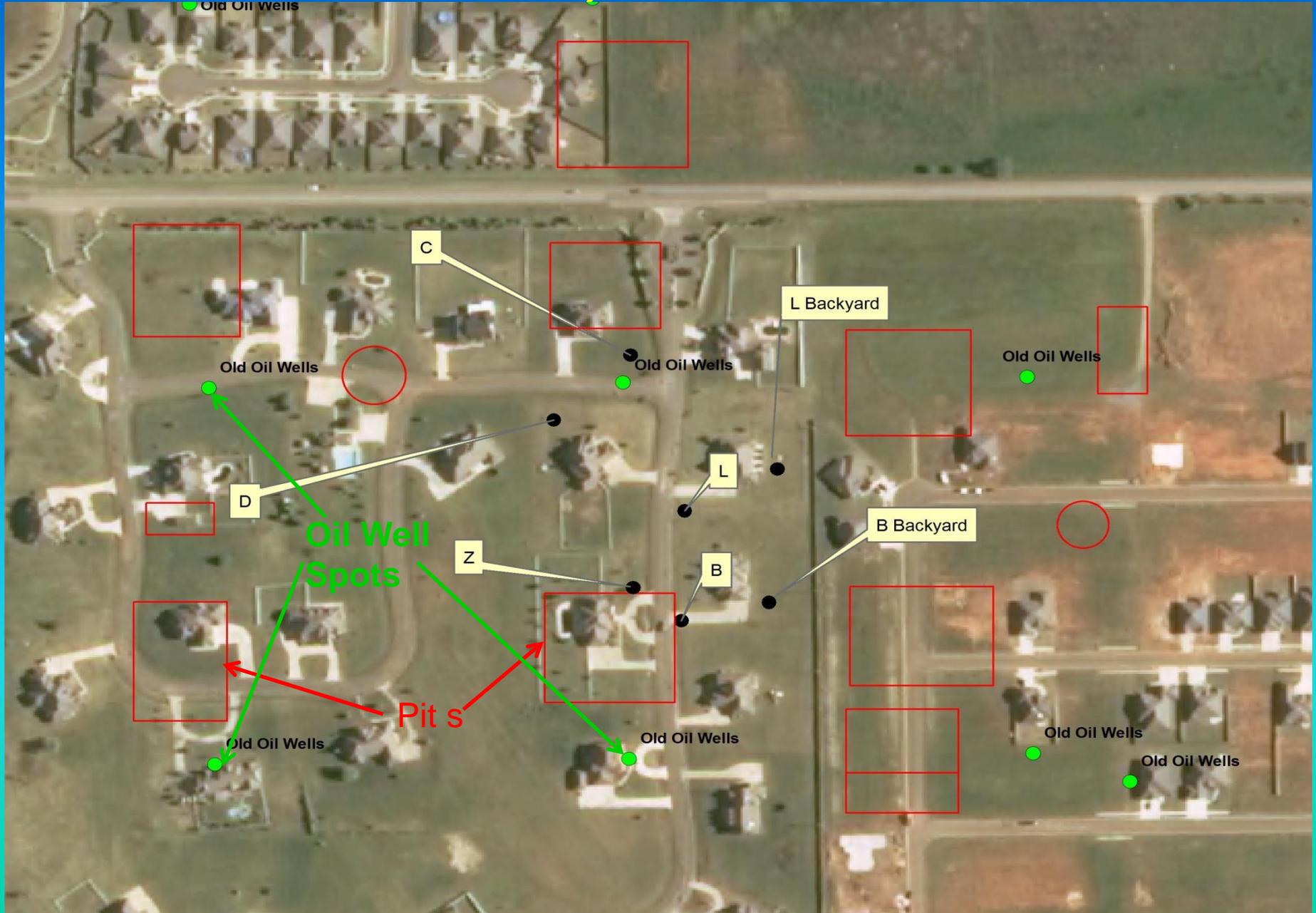
Oklahoma County 14N 3W Wells



1941 Aerial Showing Drill Rigs, Pits



Old Pits & Wells, Modern Air Photo



Oilfield Brines

- This is in the old Edmond oilfields area.
- The USGS database of OK Produced Oilfield Brines OK had from 90 well samples in the Edmond, Edmond N, and Edmond W fields.
- These produced waters are very saline, with **chlorides up to 217,587 ppm**. Very little water this saline can pollute fresh water.

Conclusions

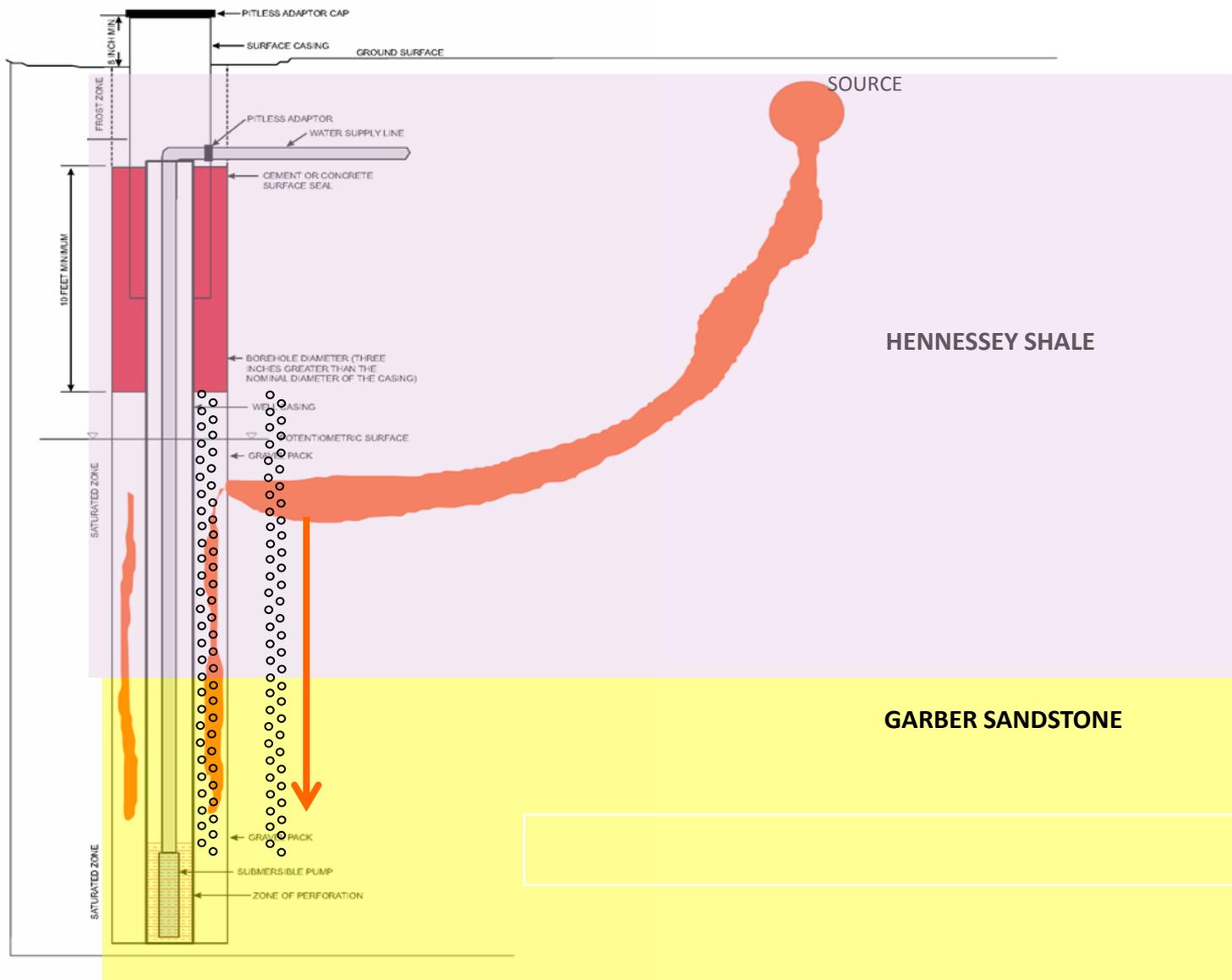
- The homes are sitting on an old oilfield;
- 2 water wells were drilled by/in a former pit, and another is beside a former well;
- The Na/Cl ratio strongly suggested oilfield source, so
- **Old Oilfield Activity and Spills Are Probably Responsible For The Well Pollution**
- Which pits, spills, wells, pipelines, or other exact source(s) had to be determined

Conclusions

However – we were confident that

- **The open, surface to 300' deep gravel pack water well construction channeled pit/wellsite (spill) surface contaminants down into the Garber Aquifer.**
- **Especially the abandoned backyard wells!**

Well Pack Can Channel Contaminants



In effect, the water wells, by design, have polluted themselves and the aquifer

Especially the unplugged backyard wells

Intermediate Solutions

- The city was persuaded to bring a water line into the subdivision, so the homeowners could connect to clean drinking water (at a \$\$ cost) - done;
- And
- **Corp Comm's Brownfields program will pay for, and OWRB oversee, having now-unused water wells drilled out and plugged to prevent the spread of more contaminants down into the aquifer .**

Other Work

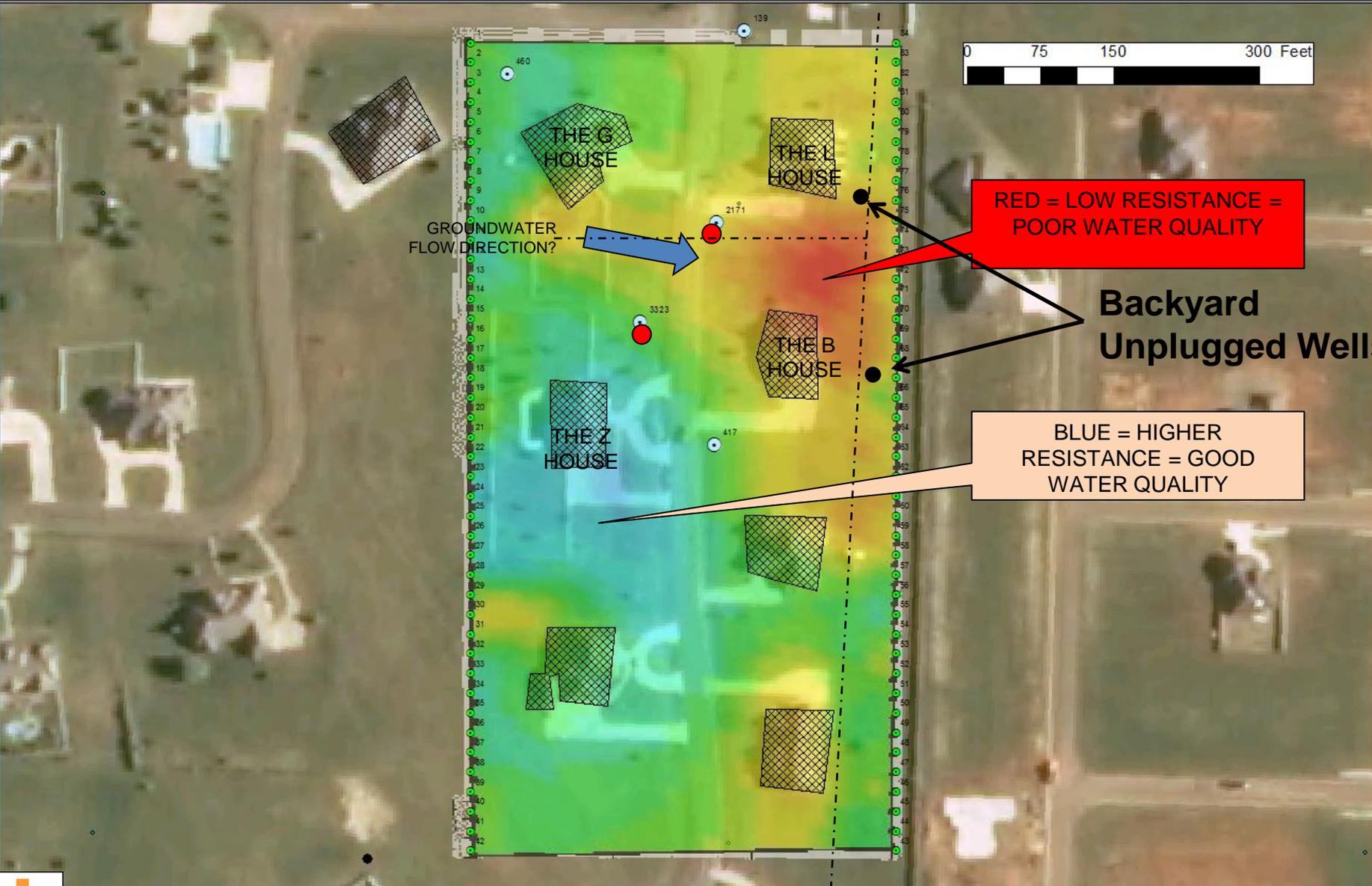
Geophysics – Some done, more will be

- To locate sources of the problem, and
- Where the saline GW plume is, to
- **decide which wells most need plugging (limited \$\$ budget).**

Resistivity line



When Preconceptions Bite You



RED = LOW RESISTANCE = POOR WATER QUALITY

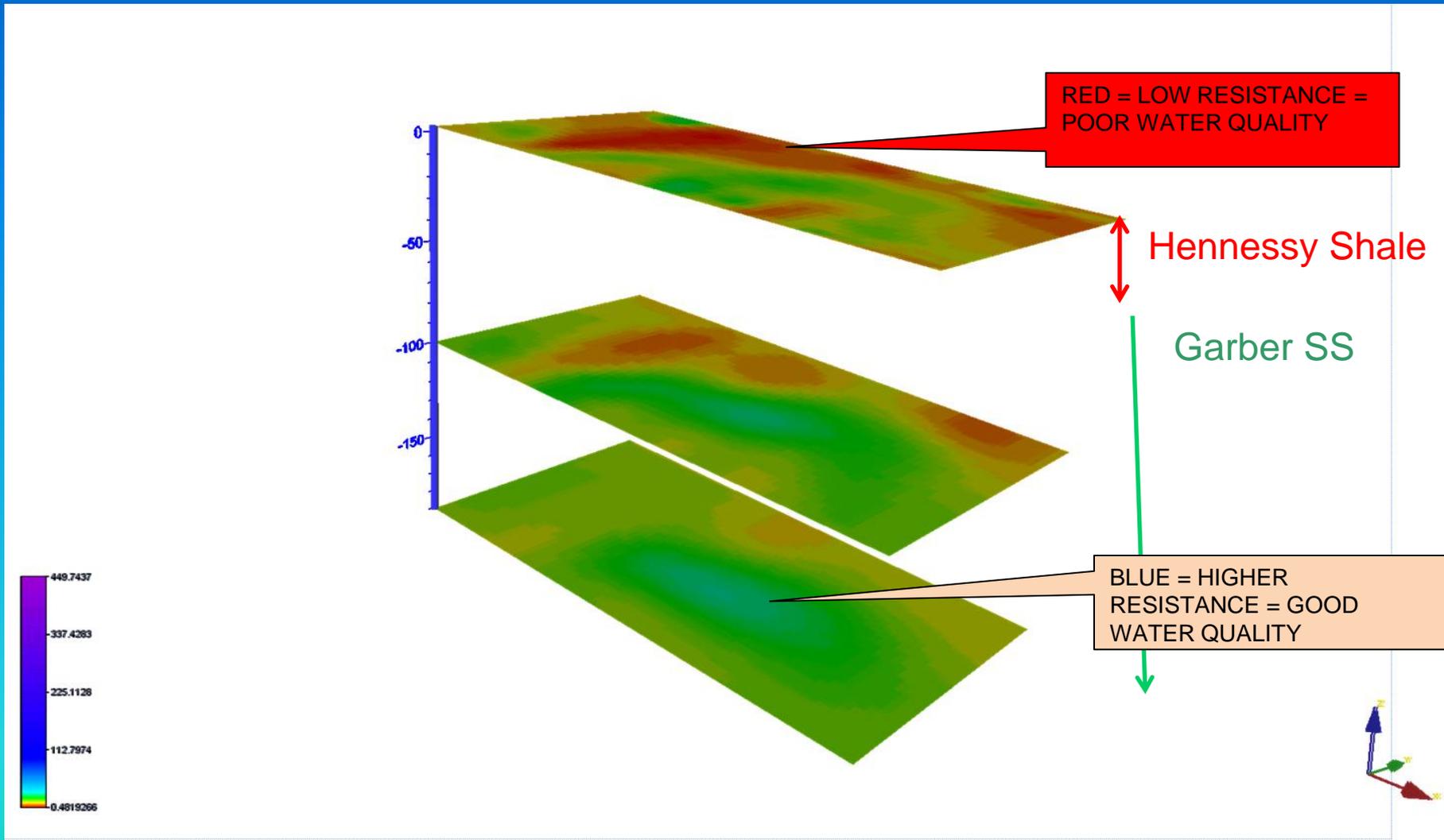
Backyard Unplugged Wells

BLUE = HIGHER RESISTANCE = GOOD WATER QUALITY



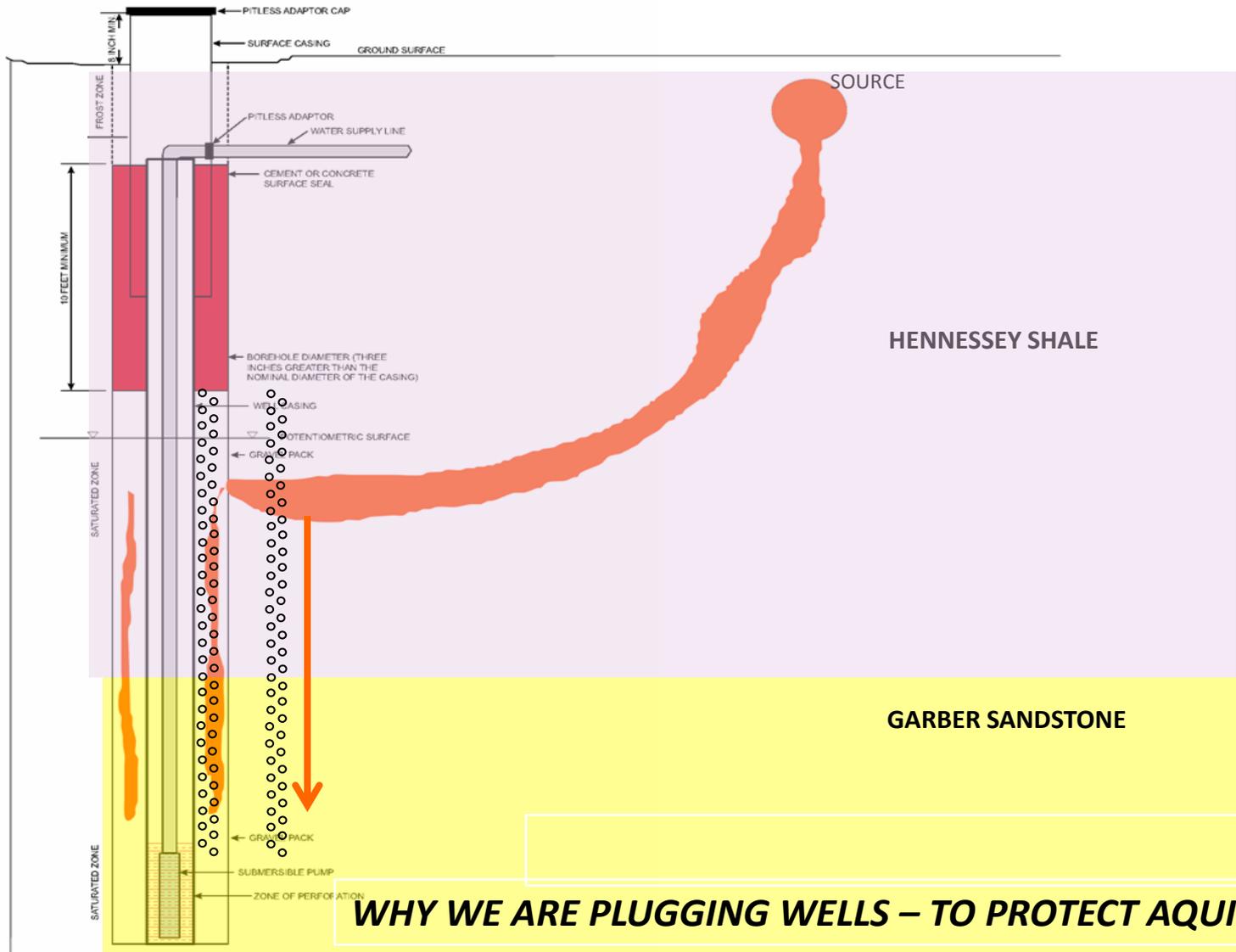
Geophysical Array CF01

----- Approx. Loc. 1940's era oil/water gathering lines



Geophysical Array CF01

Why We are Plugging the Wells



WHY WE ARE PLUGGING WELLS – TO PROTECT AQUIFER

Why Appendix H Here?

To Prevent Poorly Constructed Wells on Empty Lots In Area!

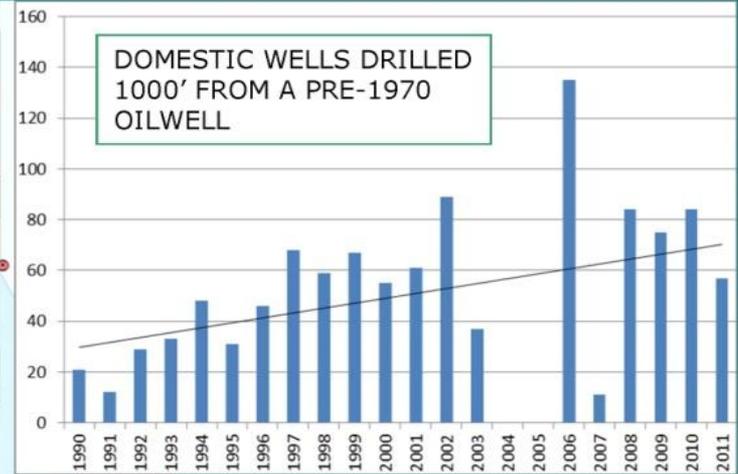
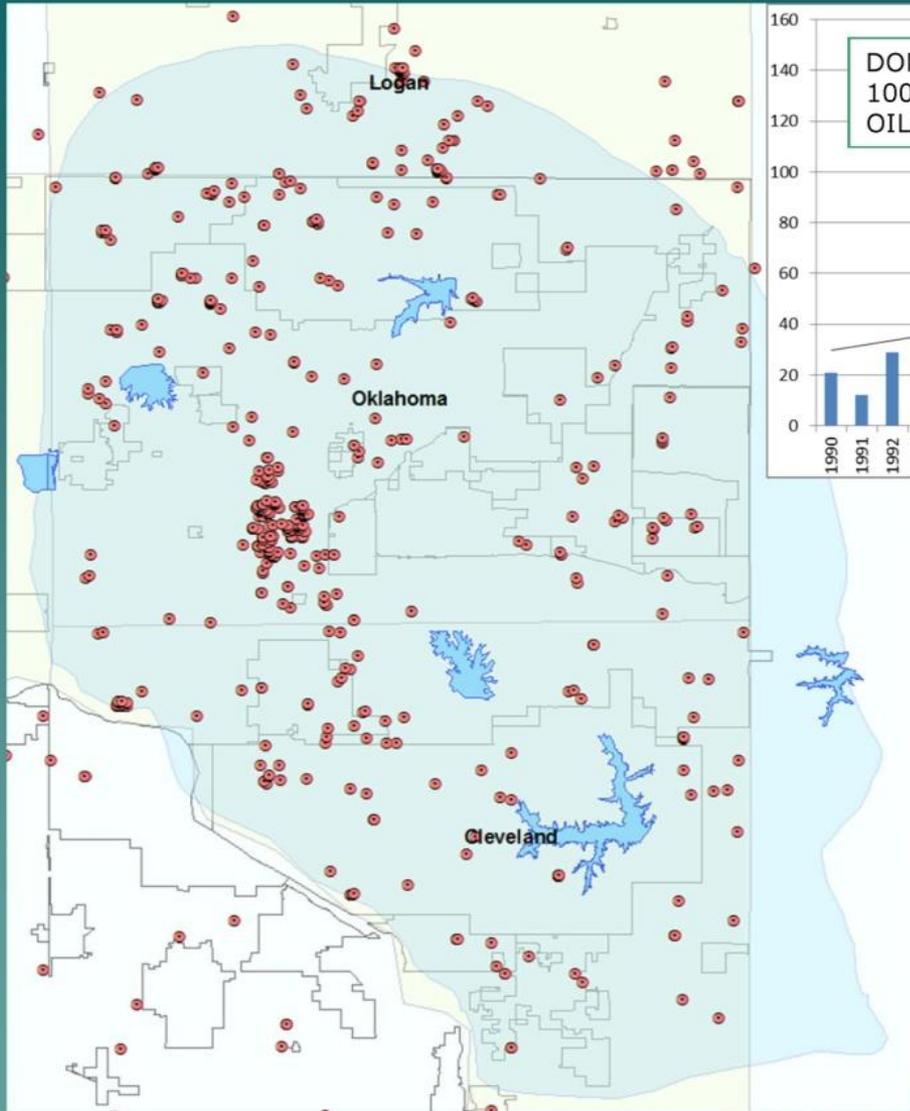


Appendix H Proposal

- In the area where the wells, pits, and shallow pollutants are the most likely, we want to
- Require future water wells to be cased and cemented from the surface to 50' deep, with gravel pack allowed only BELOW that.
- This will help prevent shallow pollutants from entering the water wells and traveling down the gravel pack into the aquifer.

Future Potential App H Areas

APPENDIX H LISTING



OTHER POTENTIAL APPENDIX H AREAS?