

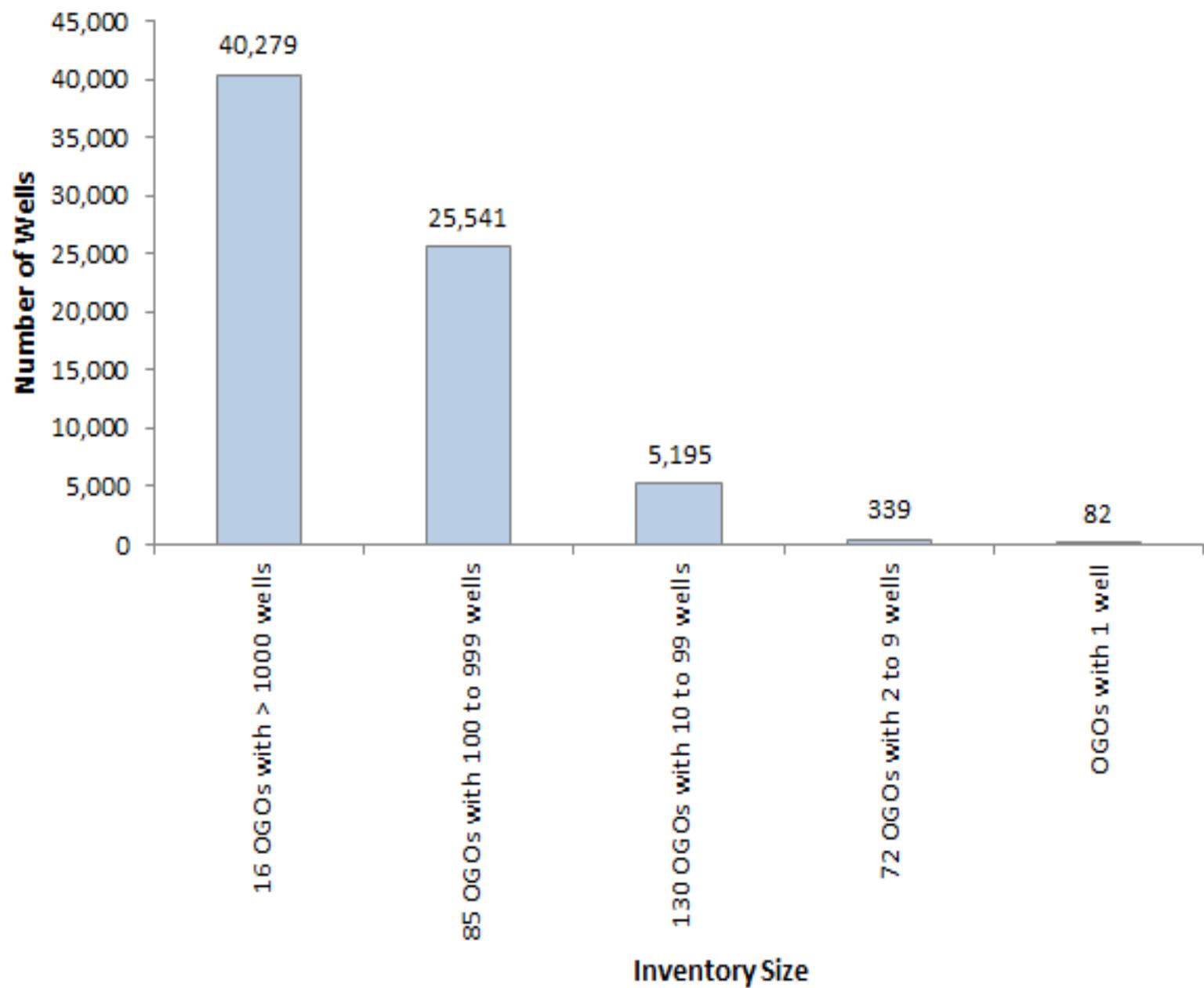


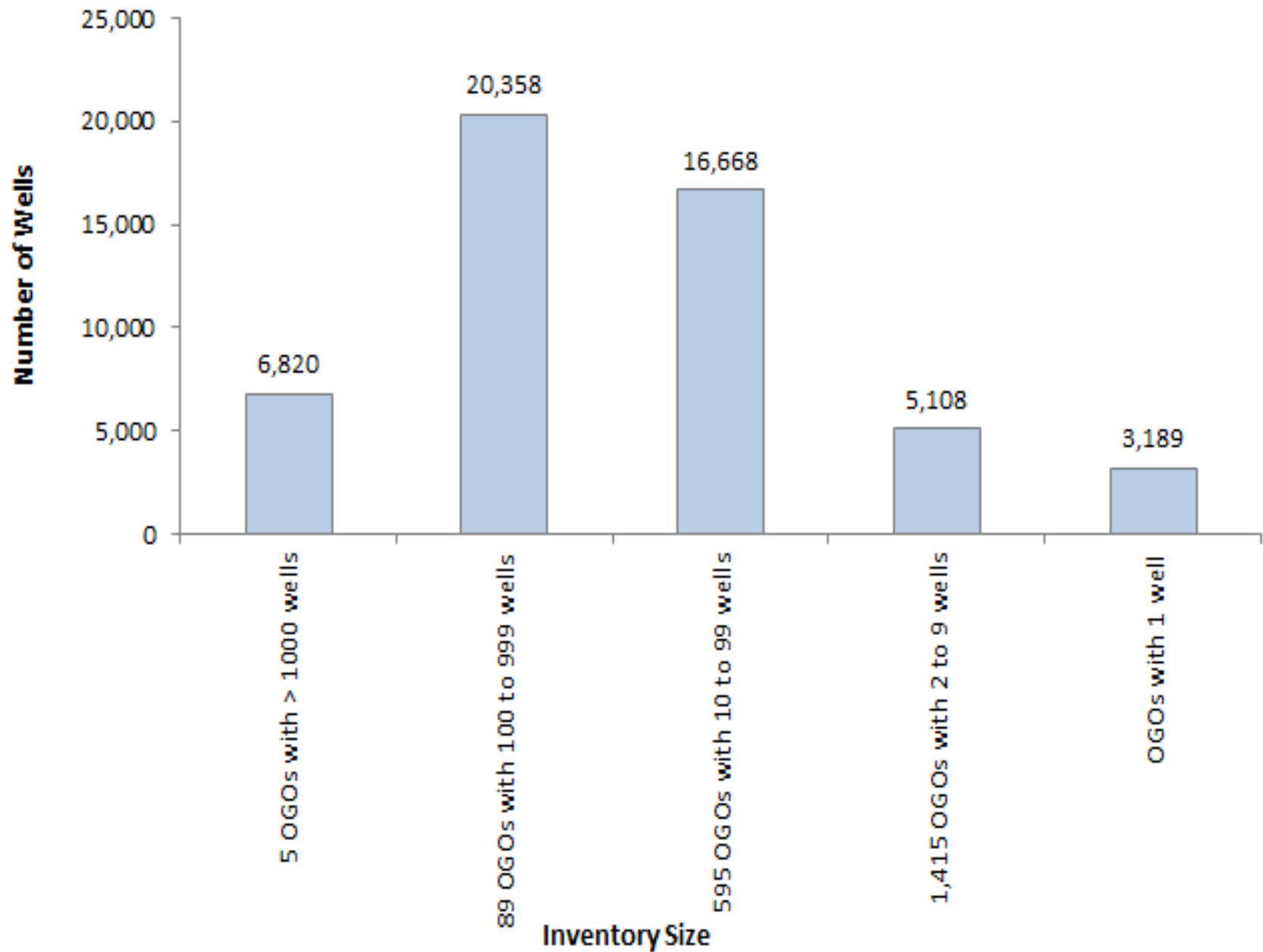
pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

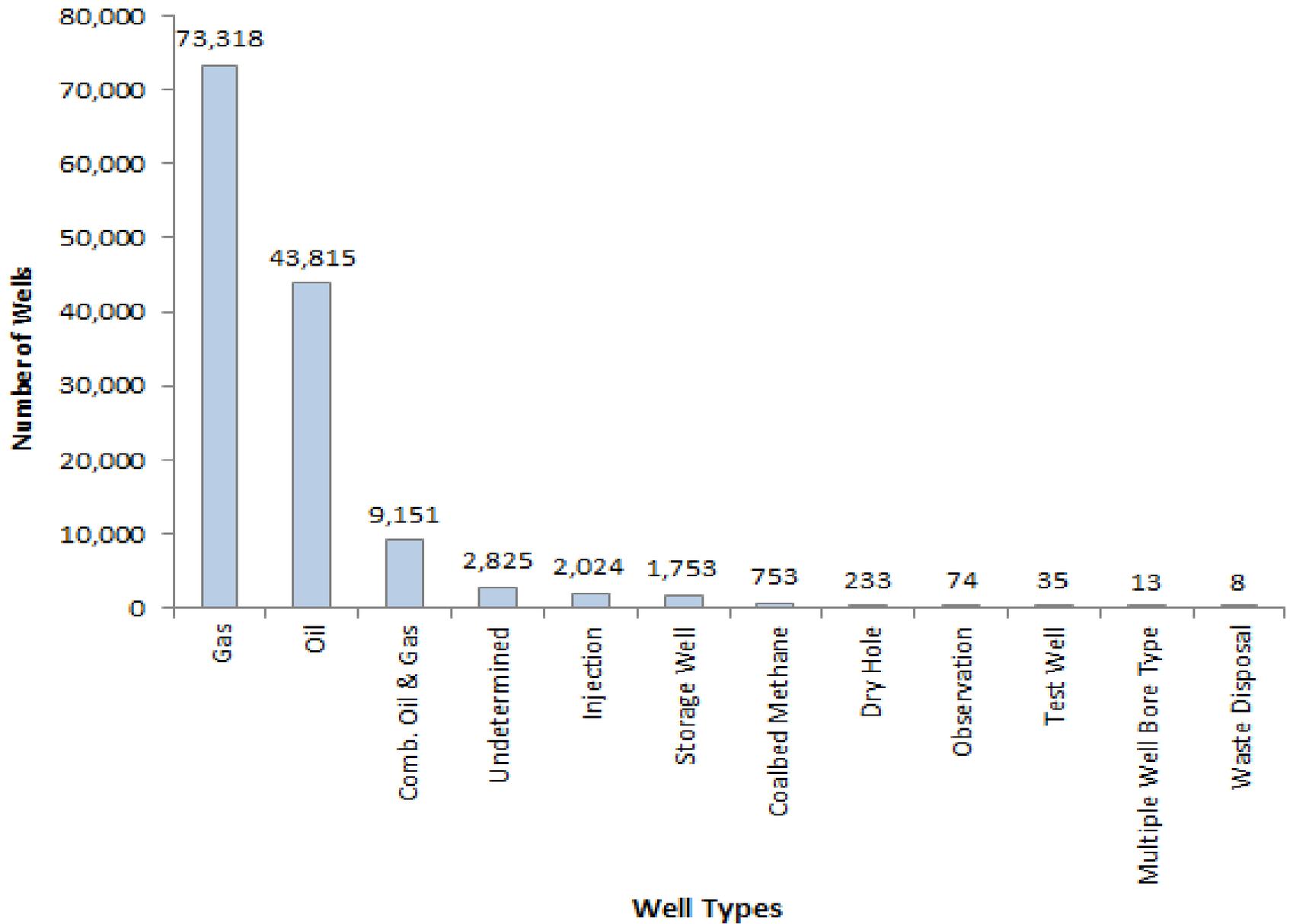
Oil and Gas Management

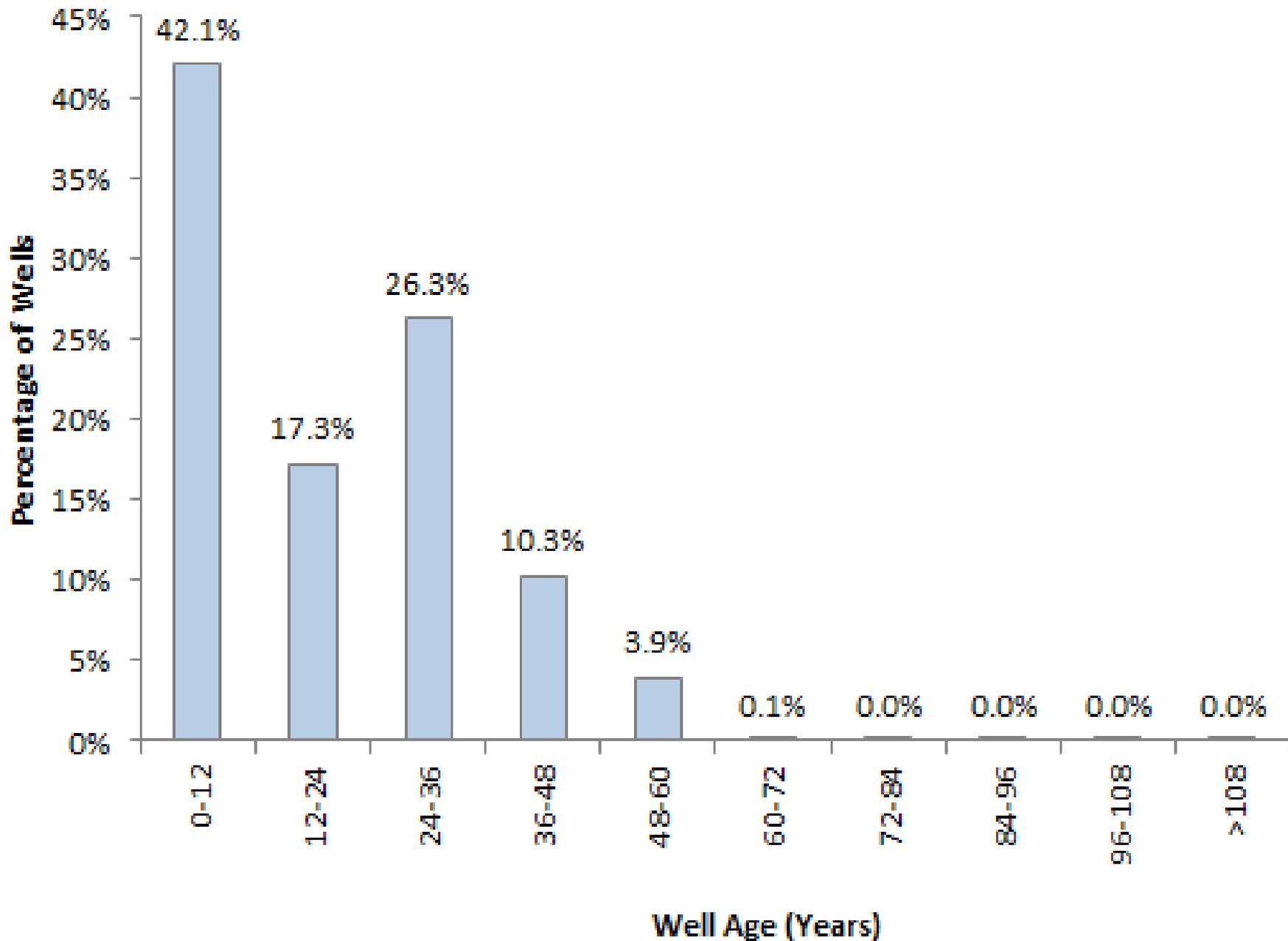


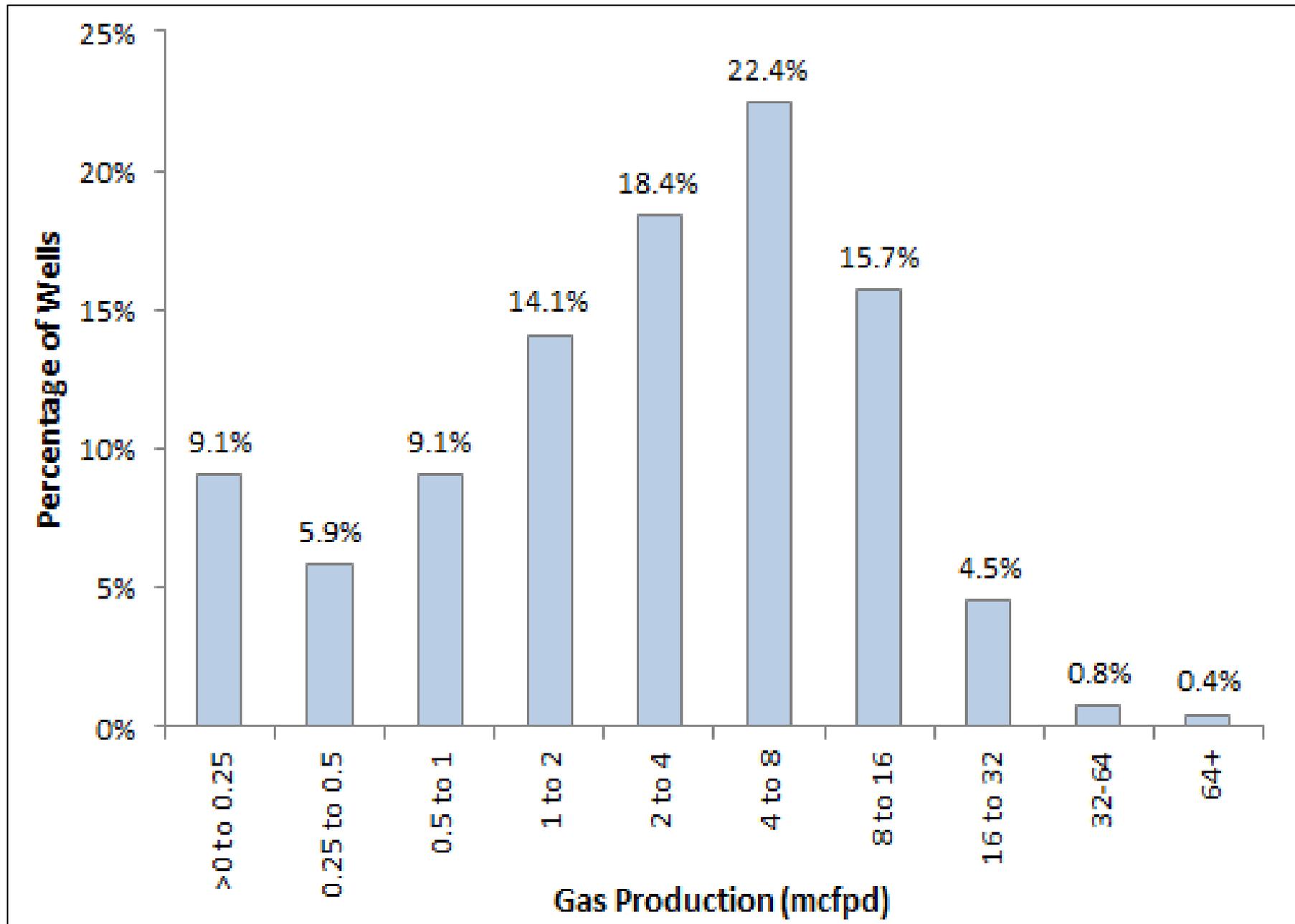
PA DEP Conventional Operator Case Study

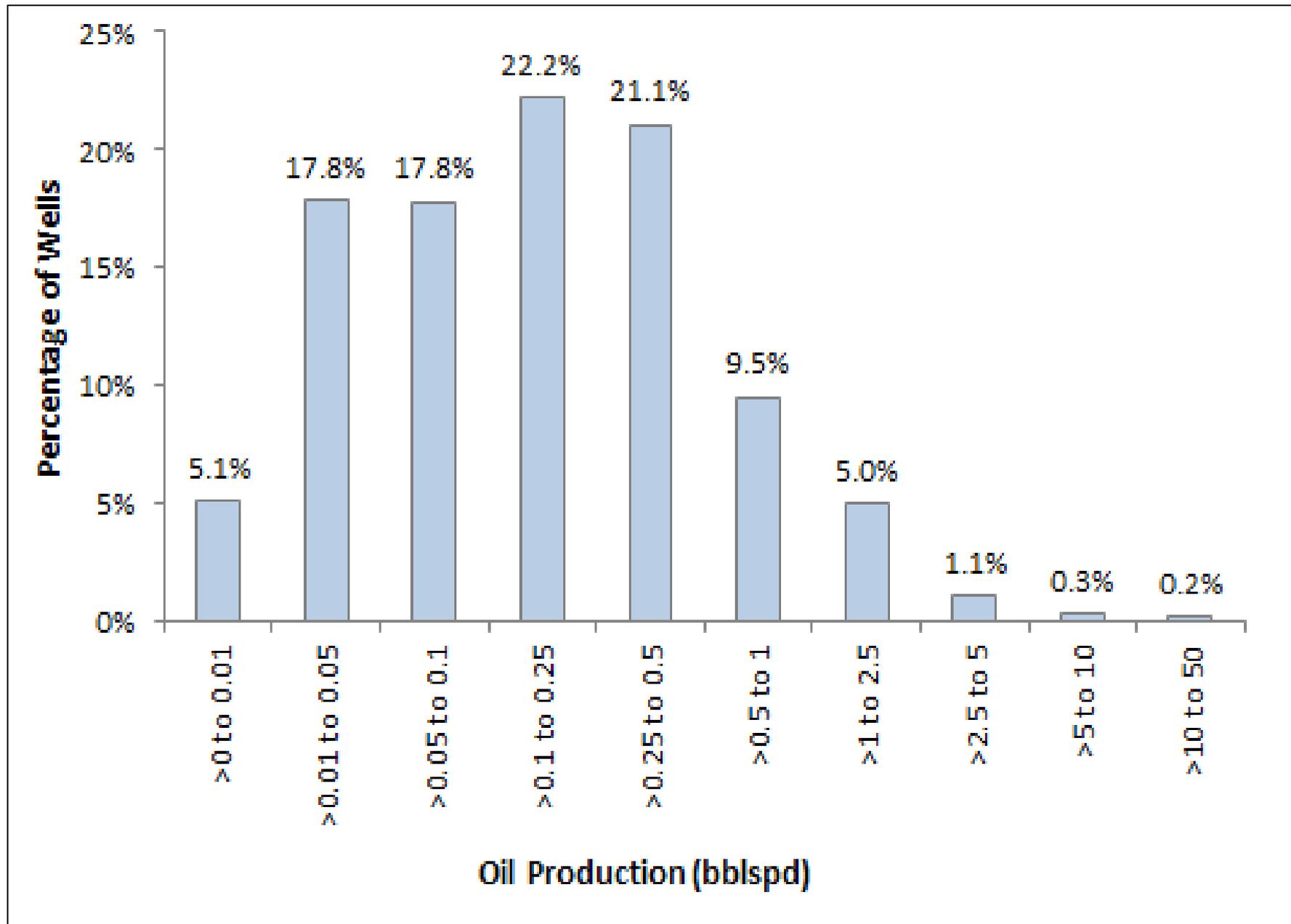


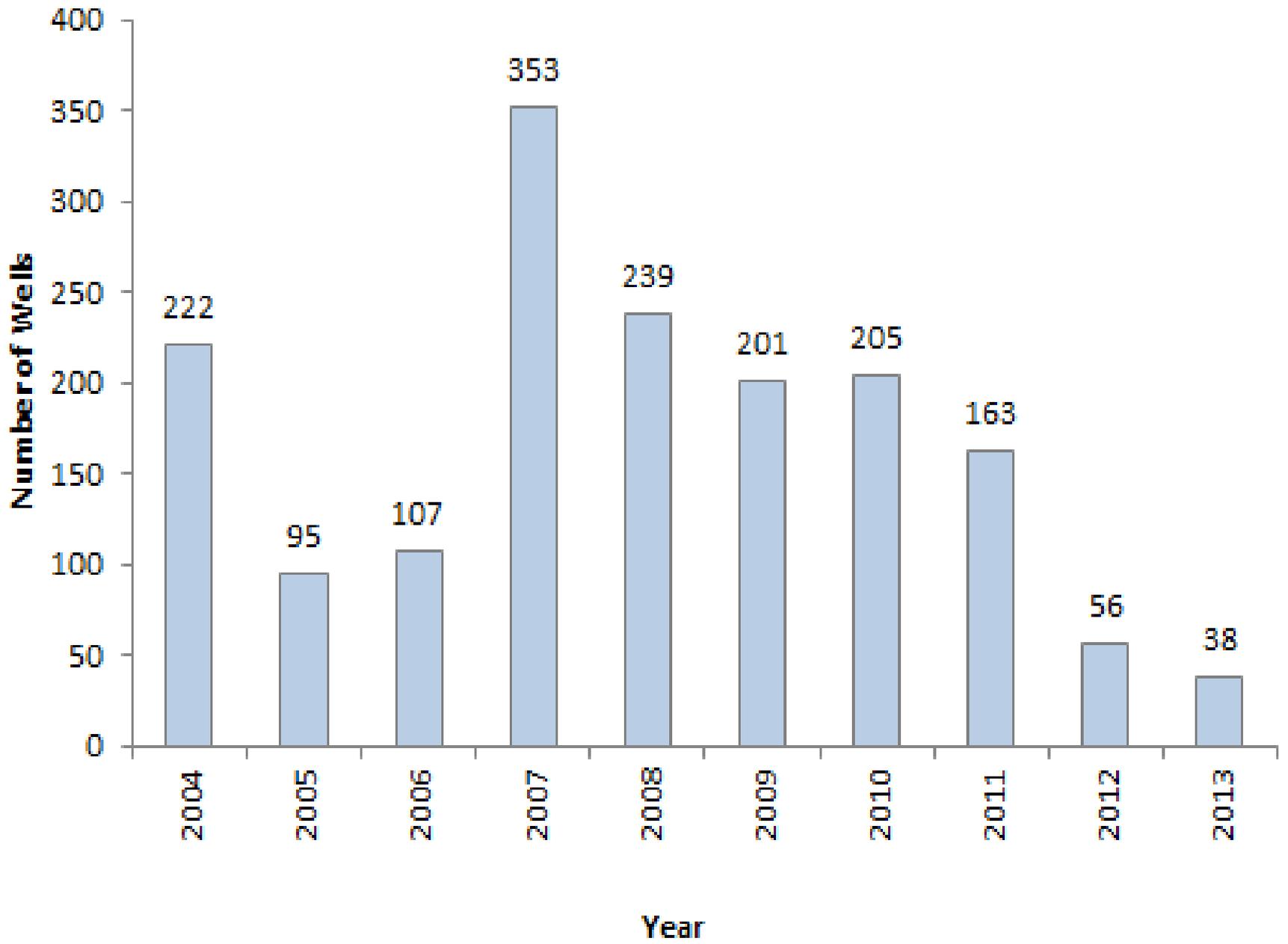


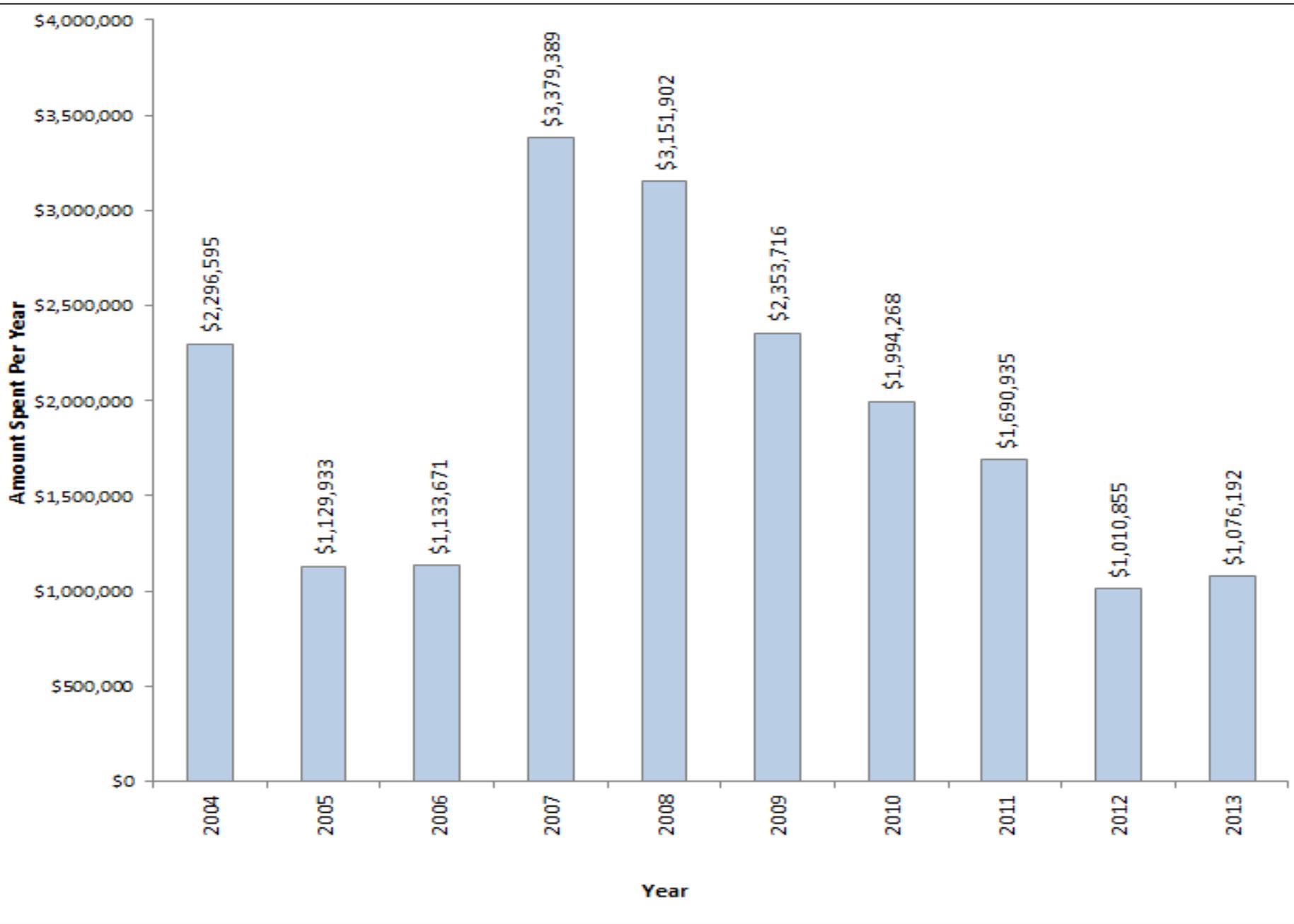






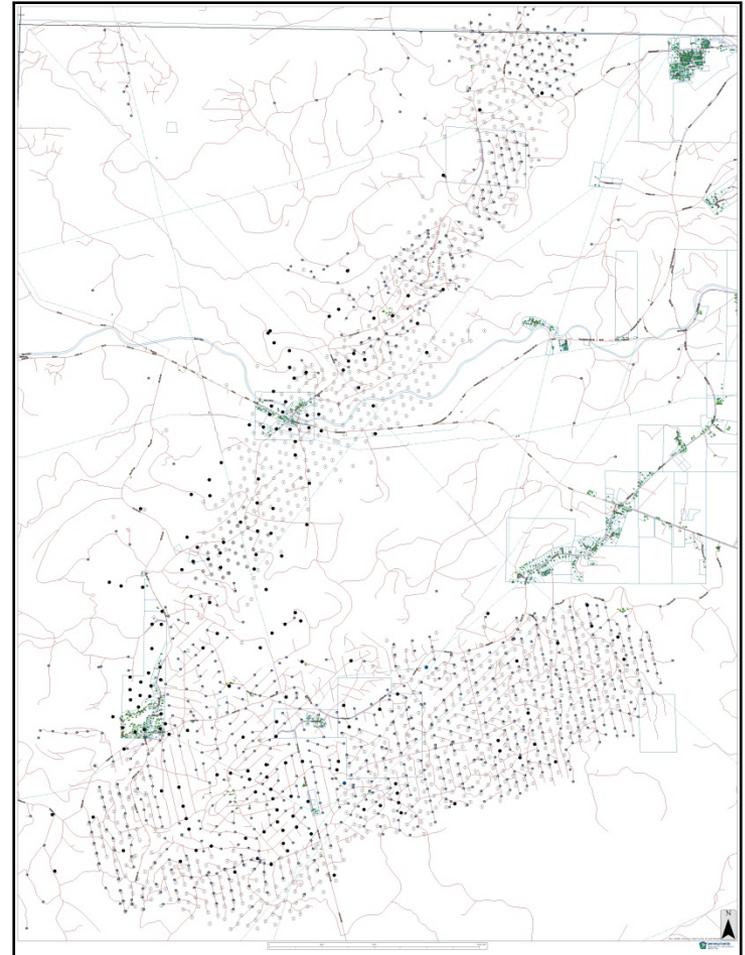






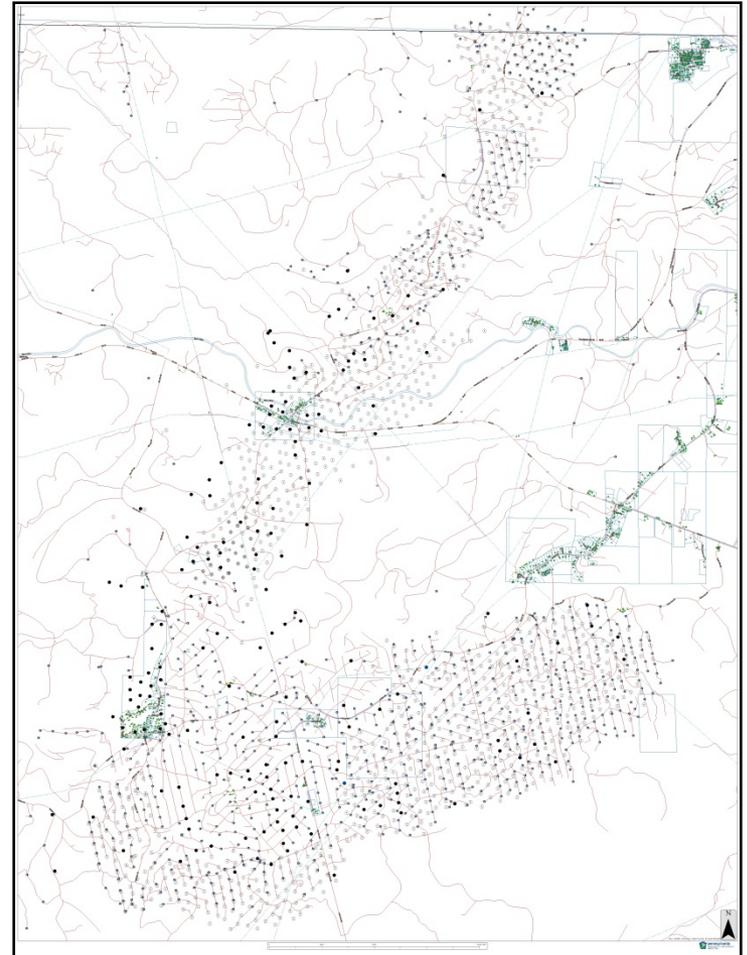
Conventional Case Study

- Operator Inventory: 1,796 wells
 - Abandoned: 14
 - Active: 1,578 (~934 Producing / ~644 injection)
 - DEP Plugged: 5
 - Operator Plugged: 199
- When the lease is plugged and abandoned there will be an estimated 136 miles to 150 miles of road to be removed (@ 400' spacing).
- Assuming there is a culvert every 1,000' that would mean there could be an estimated 718 to 792 culverts to be removed and disposed of. Even if they were crushed to allow 50 in a roll-off, they would still need 15 to 16 roll-offs for culverts.



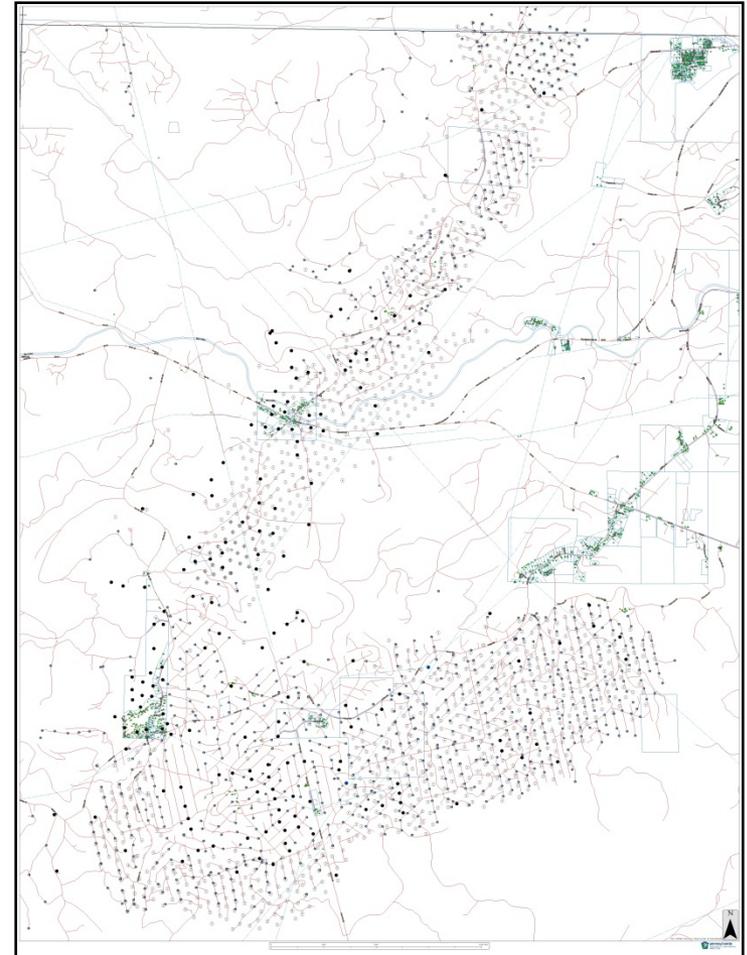
Conventional Case Study

- If the roads are an average of 20' wide, there would be 330 to 364 acres of disturbance from roads to be reclaimed.
- To cover this area with the required 3 tons/acre of mulch, you would need 35,983 – 62,338 bales of hay or straw.
- The mulch costs alone at \$3/ bale would be \$107,949 – \$187,013. This estimate does not include seed, fertilizer or labor costs.



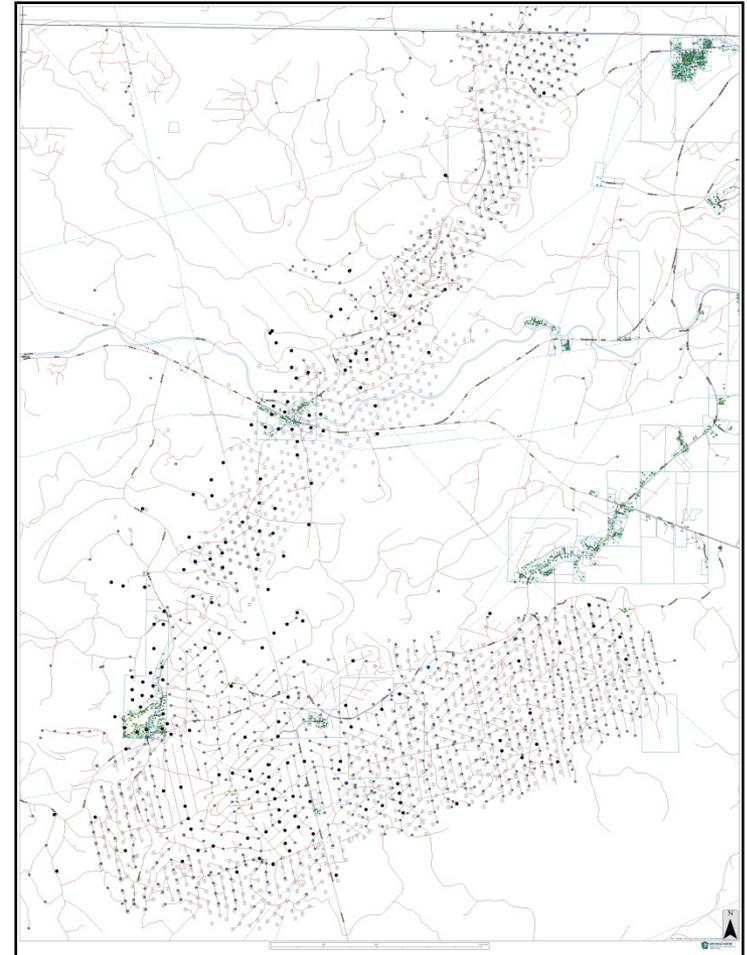
Conventional Case Study

- There are three pressure plants and multiple tank batteries to remove with contaminated soil at each.
- There are over 2 dozen buildings and more than 100 storage tanks to remove, each with additional areas for parking and equipment storage in need of reclamation.
- The additional disturbance from building and tank battery removal along with the associated parking and storage areas could result in an additional 100 to 200 acres of reclamation.
- This additional reclamation would result in an additional 10,909 – 34,286 bales of hay or straw, at a cost of \$32,727 – \$102,857. Again this estimate does not include seed, fertilizer or labor costs.



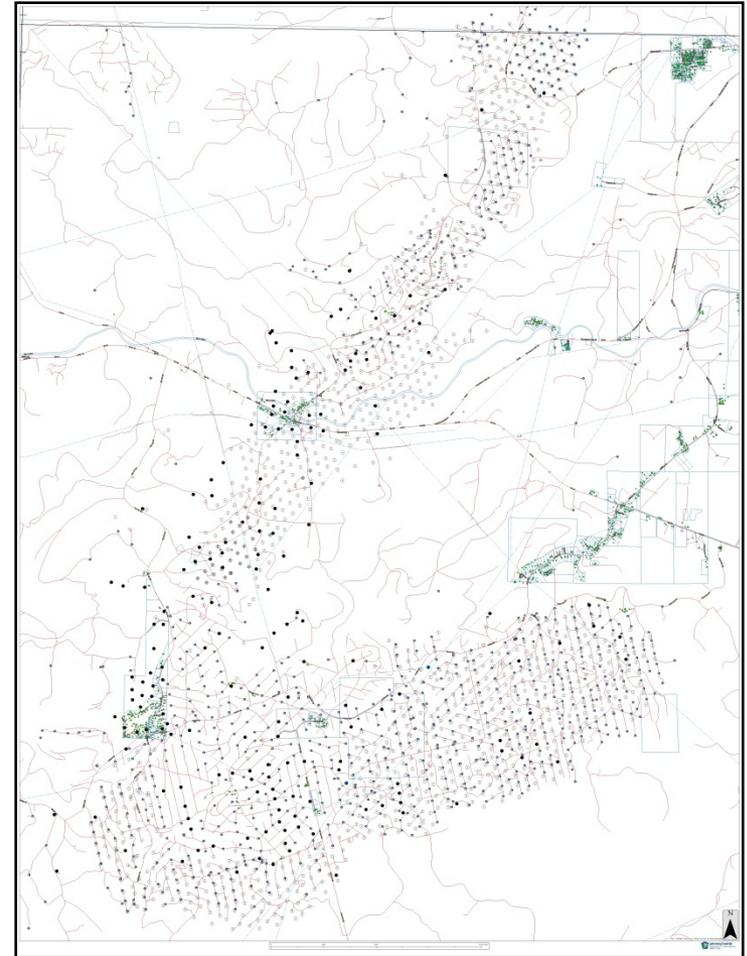
Conventional Case Study

- Due to complications observed on other water floods, it may be necessary to produce some of the wells as others are plugged to relieve pressure on the formation in order to properly plug the wells.
- Unlike during the normal production of the lease, where the produced fluid is recycled back into the formation, if they are producing the lease to relieve pressure they will incur costs associated with the disposal of the produced fluid.
- Since 2012, operator has produced an average of 6,287.68 Bbl of produced fluid per day. If it were necessary to haul all of that produced fluid to treatment it would cost approximately \$73,544 per day.



Conventional Case Study

- There are approximately 644 injection wells on this project. EPA estimates a cost of \$5,000 – \$6,000 per well to plug the injection wells.
- At that price, it would cost approximately \$3,220,000 – \$3,864,000 to plug the injectors alone.
- That would leave the other 934 active and 14 abandoned wells to be plugged at an additional cost.
- Assuming the cost to plug the remaining 946 wells is the same, it can then be estimated that it will cost an additional \$4,730,000 - \$5,676,000 to plug these 946 wells.



Conventional Case Study

- Operator has hit the limits of the profitable lease area so additional drilling is not likely.
- Since 2012 Oil production has dropped 19,827.67 Bbl/year, while at the same time they 31 new wells are added each year. Once new well drilling ceases this rate of decline will worsen dramatically.