ENHANCED COAL BED METHANE PRODUCTION AND SEQUESTRATION OF CO_2 IN UNMINEABLE COAL SEAMS

Semi-Annual Technical Progress Report
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DISCLAIMER

ABSTRACT

This is the fifth semi-annual Technical Progress report under the subject agreement. During this report period, progress was made on reclamation of the north access road and north well site, and formulation of new drilling plans for the remaining project wells. These aspects of the project are discussed in detail in this report.

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ATTACHMENTS

INTRODUCTION

The availability of clean, affordable energy is essential for the prosperity and security of the United States and the world in the 21st century. Emissions of carbon dioxide (CO_2) into the atmosphere are an inherent part of electricity generation, transportation, and industrial processes that rely on fossil fuels. These energy-related activities are responsible for more than 80 percent of the U.S. greenhouse gas emissions, and most of these emissions are CO_2. Over the last few decades, an increased concentration of CO_2 in the earth's atmosphere has been observed. Carbon sequestration technology offers an approach to redirect CO_2 emissions into sinks (e.g., geologic formations, oceans, soils and vegetation) and potentially stabilize future atmospheric CO_2 levels. Coal seams are attractive CO_2 sequestration sinks, due to their abundance and proximity to electricity-generation facilities. The recovery of marketable coalbed methane (CBM) provides a value-added stream, potentially reducing the cost to sequester CO_2 gas. Much research is needed to evaluate this technology in terms of CO_2 storage capacity, sequestration stability, commercial feasibility and overall economics.

CONSOL Energy Inc., Research & Development (CONSOL), with support from the US DOE, has embarked on a seven-year program to construct and operate a coal bed sequestration site composed of a series of horizontally drilled wells that originate at the surface and extend through two overlying coal seams. Once completed, all of the wells will be used initially to drain CBM from both the upper (mineable) and lower (unmineable) coal seams. After sufficient depletion of the reservoir, centrally located wells in the lower coal seam will be converted from CBM drainage wells to CO_2 injection ports. CO_2 will be measured and injected into the lower unmineable coal seam while CBM continues to drain from both seams. In addition to metering all injected CO_2 and recovered CBM, the program includes additional monitoring wells to further examine horizontal and vertical migration of CO_2.

This is the fifth Technical Progress report for the project. Progress this period was focused on reclamation of the north access road and north well site, and development of revised drilling methods. This report provides a concise overview of project activities this period and plans for future work.

EXECUTIVE SUMMARY

During this report period, progress was made on reclamation of the north access road and north well site, and formulation of new drilling plans for the remaining project wells. These aspects of the project are discussed in detail in this report.

EXPERIMENTAL

Project well sites have not yet been completed; therefore no experimental work has begun.

RESULTS AND DISCUSSION

STATUS OF COOPERATIVE AGREEMENT

Quarterly project status reports (DOE F 4600.6) were issued to DOE on January 8 and April 21, as required. In December, the Waiver of Patent Rights was approved by USDOE. In February, CONSOL executed amendment M005, which revised the key personnel for the project. In March, CONSOL executed amendment M006, which obligated additional DOE funds to the project. In March, we participated in the Coal Sequestration Forum III in Baltimore, MD.

PROGRESS – NORTH WELL SITE

The three completed horizontal wells at the north well site are identified as MH-3, MH-4, and MH-5. The horizontal extension of well MH-3 was drilled in a southeast direction in the Pittsburgh seam (3,000 feet), the horizontal extension of well MH-4 was drilled in a southwest direction in the Pittsburgh seam (3,000 feet), and the horizontal extension of well MH-5 was drilled in a southeast direction in the Upper Freeport seam (~2,200 feet).

Efforts to dewater the north wells have been hampered at two (MH-4 and MH-5) of the three drilled north wells. Communication between the sump and the horizontal component of the well (in the coal seam) has not been fully established. Therefore, the tubing and rods were removed from the north site wells. The plans for re-working these wells are discussed in the Progress on Well Assessment section.

The reclamation mandated by the West Virginia Division of Environmental Protection (WVDEP) inspectors is in progress. These reclamations include: installing an access gate, re-establishing ditch lines along the access road, replacing damaged culverts, compacting the road surface, reclaiming the drill pits, and extensive grass seeding.

The remaining well at the north site in the Freeport Seam will be drilled per the revised drilling method discussed in the Progress on Well Assessment section and as depicted in Figures 1, 3, and 4. Well permits for the revised well design at the north well site were submitted to the WVDEP and permit approval is anticipated in May 2004.

PROGRESS - SOUTH WELL SITE

Revised drilling techniques are discussed in the Progress on Well Assessment section and shown in Figures 1 - 4. Well permits for the revised well designs at the south well site were submitted to the WVDEP and permit approval is anticipated in May 2004. Site preparation work at this well site was completed previously.

PROGRESS - CENTRAL WELL SITE

Revised drilling techniques are discussed in the Progress on Well Assessment section and shown in Figures 1, 3, and 4. Well permits for the revised well designs at the central well site were submitted to the WVDEP and permit approval is anticipated in May 2004. Site preparation work at this well site has not yet begun.

PROGRESS ON WELL ASSESSMENT

The north site wells MH-4 and MH-5 are experiencing communication problems between the sump and horizontal component of the well (in the coal seam). CNX Gas has experienced similar communication problems at non-DOE wells of comparable design and has reworked those wells by removing the sump casing and re-entering both the sump and horizontal element. After completing the rework, communication was established and the wells began producing significant volumes of both water and CBM. CNX Gas will rework the drilled north site wells in a similar fashion.

CNX Gas has embarked on other horizontal drilling projects with revised designs. Based on the completion and assessment of that work, CNX Gas has revised the drilling plan for the remaining DOE project wells. In lieu of a single well being drilled with a sump and horizontal element, a main production well will be drilled and a second well will be drilled to produce the horizontal element. This will allow for a perpendicular crossing of the production well and the horizontal element in the coal seam. The typical cross-section view of this design is depicted in Figure 4. This design will be implemented at all south wells, all center wells, and the one remaining north well.

A conceptual view of the project area is shown in Figure 1. The Pittsburgh and Freeport Seam plan views depicting the revised drill plan are shown in Figures 2 and 3, respectively.

The Pittsburgh Seam south site well will be drilled to produce two 3,000 foot horizontal laterals indicated by “NE (Pittsburgh – South Well)” and “NW (Pittsburgh – South Well)” in Figures 1 and 2. These horizontal laterals will be drilled via production well “B” and horizontal element well “A” as shown in Figures 1 and 2.

The Freeport Seam south site well will be drilled to produce two 3,000 foot horizontal laterals indicated by “NE (Freeport – South Well)” and “NW (Freeport – South Well)” in Figures 1 and 3. These horizontal laterals will be drilled via production well “D” and horizontal element well “C” as shown in Figures 1 and 3.

The Freeport Seam north site well will be drilled to produce one 3,000 foot horizontal lateral indicated by “SW (Freeport – North Well)” in Figures 1 and 3. These horizontal laterals will be drilled via production well “F” and horizontal element well “E” as shown in Figures 1 and 3.

The Freeport Seam center site wells will be drilled to produce four 1,000 foot horizontal laterals. Horizontal laterals “NE (Freeport – Center Well)” and “NW (Freeport – Center Well) will be drilled via production well “H” and horizontal element well “G” as shown in Figures 1 and 3. Horizontal laterals “SE (Freeport – Center Well)” and “SW (Freeport – Center Well) will be drilled via production well “J” and horizontal element well “I” as shown in Figures 1 and 3.

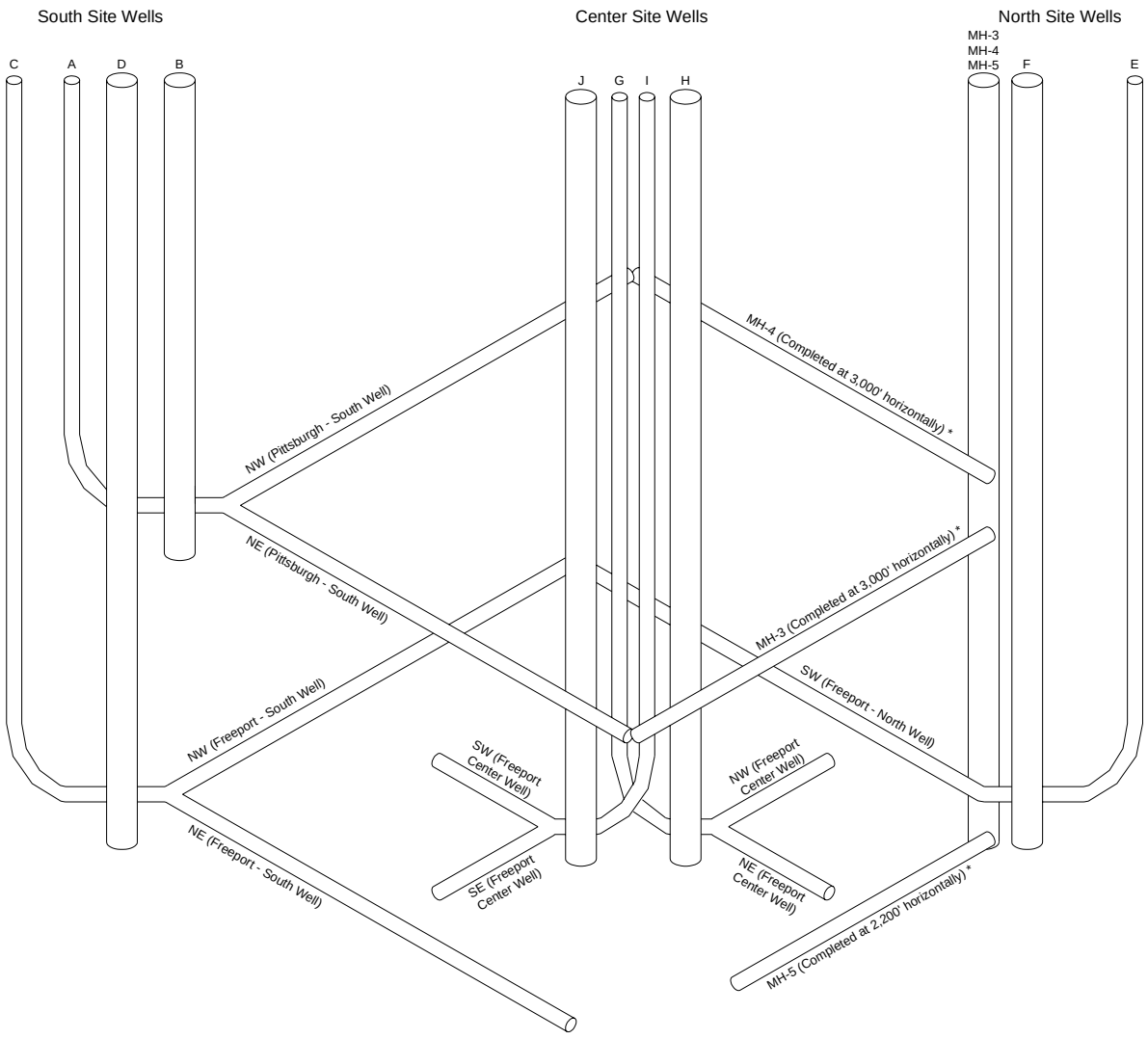
CONCLUSION

As directed by WVDEP inspectors, reclamation work is in progress along the north access road and well site. Dewatering of the three completed wells at the north well site was halted due to down-hole communication gaps linked to the sump design. Remediation measures for these wells were formulated and will be implemented this spring. Based on the results of that project, CNX Gas has developed a revised drill plan for the remaining project wells, which will be implemented beginning with those at the south well site.

REFERENCES

None

Figure 1
Conceptual Perspective View of Project Wells



* - Vertical portions of wells MH-3, MH-4, and MH-5 wells are depicted as one.

Figure 2
Revised Drilling Plan
Plan View of Pittsburgh Seam

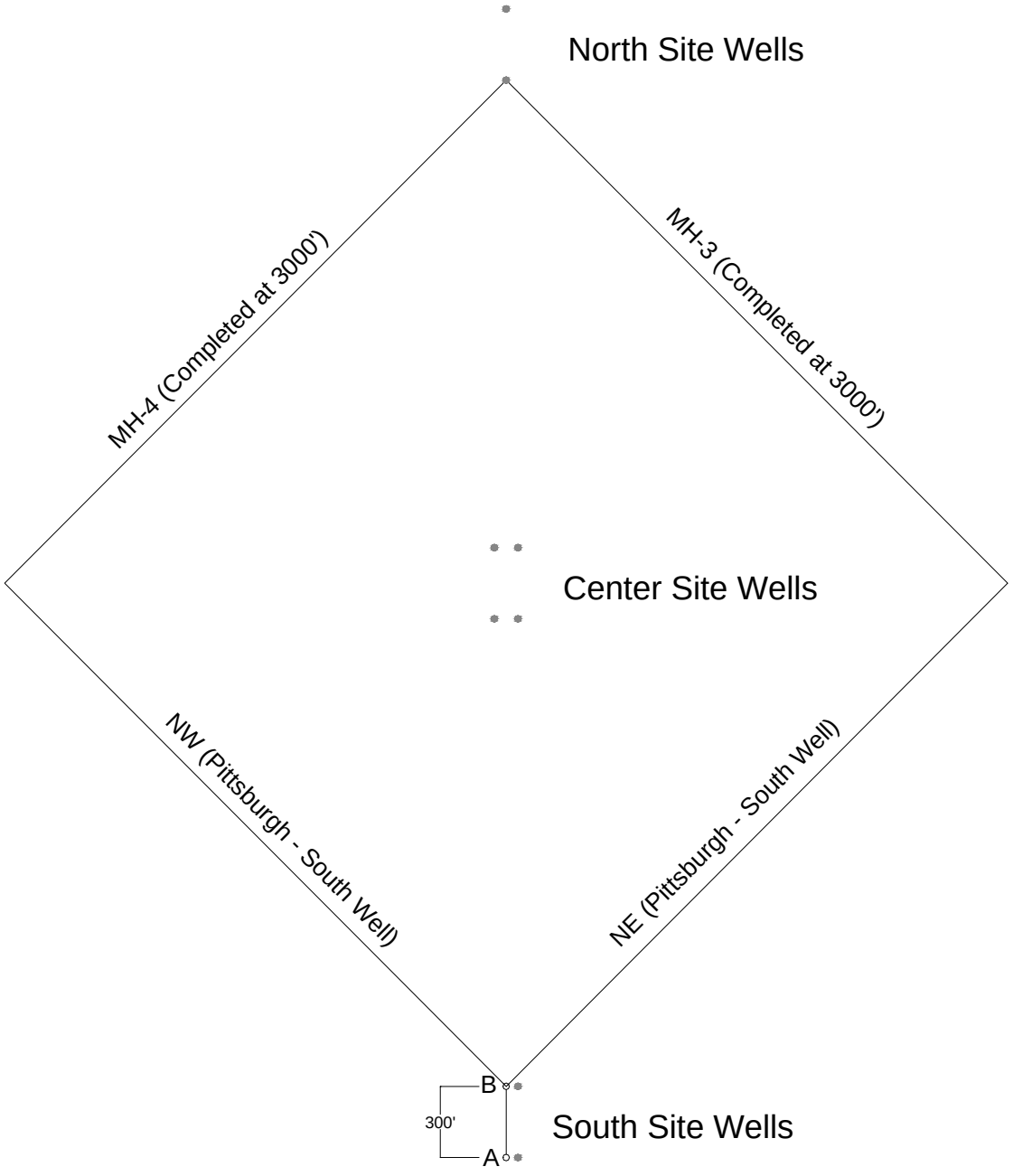


Figure 3
Revised Drilling Plan
Plan View of Freeport Seam

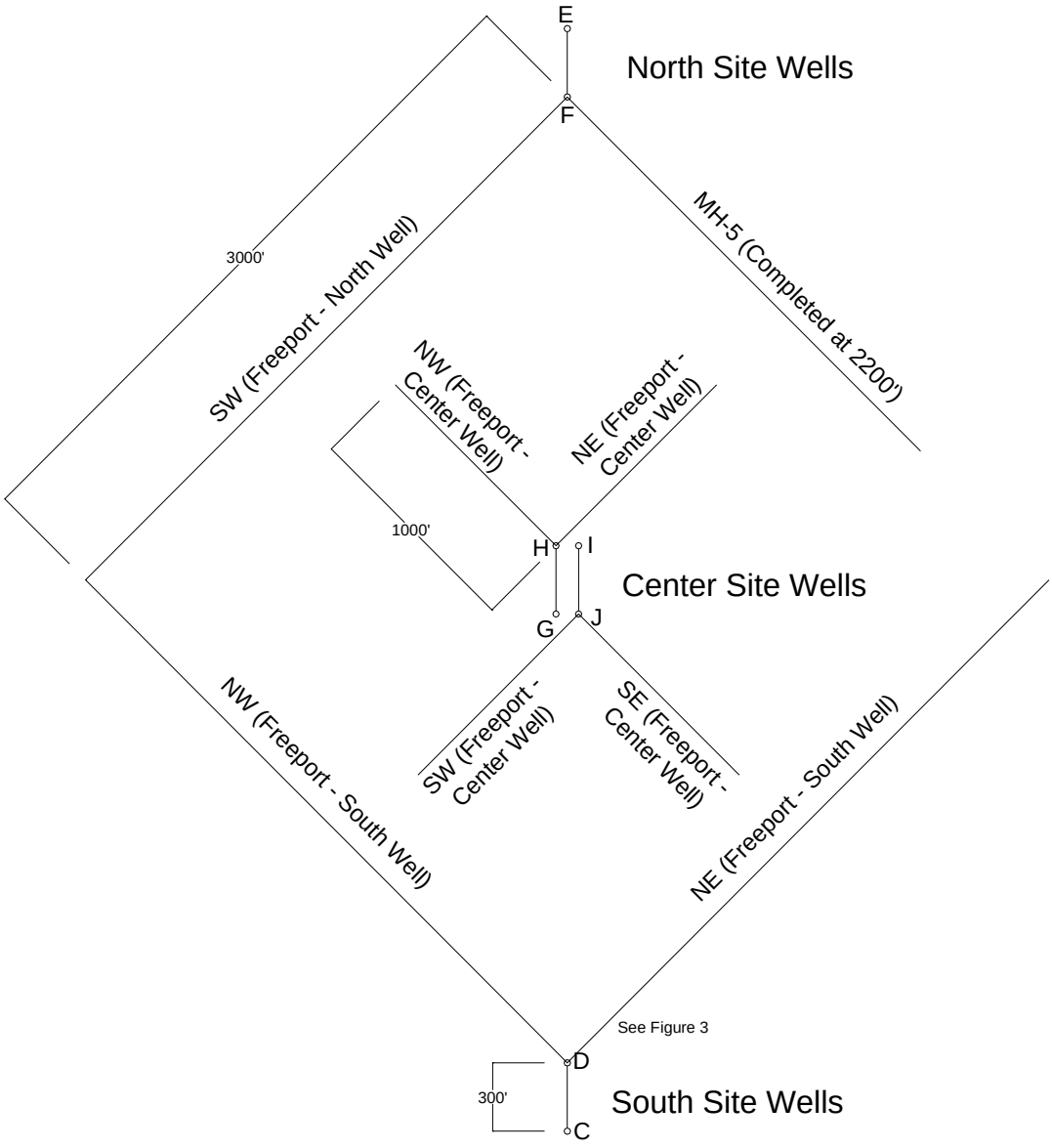


Figure 4
Revised Drilling Plan
Typical Cross-Section