State of Nebraska
Class II UIC Program
Peer Review

April, 2016
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**Introduction**

Underground injection is the placement of fluids, including but not limited to waste by-products, into the subsurface through a wellbore. Underground injection is not a new practice. The Chinese injected freshwater for salt extraction as early as A.D. 300. The first documented use of injection to dispose oilfield produced water (brine) was in Texas during the 1930s, over eighty years ago. Beginning in the 1930s, the oil and gas industry also began to inject produced water into pressure-depleted oil reservoirs in order to enhance recovery of crude oil resources. During the 1970s and 80s, oil refineries and chemical industries began to inject liquid wastes in deep disposal wells. Today, underground injection is used to remove more than 50 percent of the liquid hazardous waste, and more than 98 percent of salt water produced by onshore oil and gas operations from the surface environment\(^1\).

Some waste is an unavoidable by-product of a myriad of resource development and manufacturing processes that create thousands of products that we use in our daily lives including: steel, plastics, pharmaceuticals, fuels, and natural gas. Underground injection is an important waste management practice internationally and in the United States. Some renewable energy sources, such as geothermal, also rely on underground injection. Municipalities need underground injection to replenish aquifers (aquifer storage and recovery), combat saline water encroachment in coastal areas, to dispose of residual waste streams generated by treatment and desalination of water for public use, and to dispose treated sewage. While industries continue to develop ways to reduce waste volumes and recycle, generated wastes must be disposed in a safe manner. Various types of injection wells have unique associated benefits and risks. To dispose fluids safely, injection wells must be properly constructed, located in an appropriate geologic setting, operated, maintained and monitored in accordance with standards that are protective of our groundwater resources.

Liquid wastes can be managed in a variety of ways other than underground injection including: 1) treatment and release into surface waters, such as rivers, through a National Pollutant Discharge Elimination System (NPDES) permit issued pursuant to the federal Clean Water Act, 2) biological treatment, 3) incineration, 4) storage in evaporation pits, 5) discharge into percolation pits, and 6) beneficial re-use (e.g., irrigation, livestock watering, ice or dust control).

Each of these practices has its limitations and associated environmental risks. For many waste streams, including produced water generated during oil and gas exploration practices, the volumes are too great to rely solely on these alternative waste management practices. Furthermore, injecting highly saline fluids back into deep subsurface reservoirs that contain equally saline water is a common-sense waste management practice that poses fewer environmental or public health risks than these alternatives.

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Underground injection plays a crucial role in disposing residual wastes, especially those that would pose the greatest risks to society if managed by any other method, such as discharge to surface waters. In other words, if underground injection is restricted or eliminated, the result will be more, not less risk of environmental harm.

In 1974, Congress passed the Safe Drinking Water Act (SDWA), which required the U.S. Environmental Protection Agency (U.S.EPA) to develop minimum federal requirements for injection practices. Regulations adopted pursuant to the SDWA are now administered by U.S.EPA along with state and tribal partners that collectively constitute the UIC Program. The purpose of the UIC Program is to protect public health by preventing contamination of underground sources of drinking water (USDWs).

A USDW is defined as an “aquifer or its portion which supplies any public water system or contains a sufficient quantity of groundwater to supply a public water system, and either currently supplies a public water system, or contains less than 10,000 milligrams per liter of total dissolved solids and is not an exempted aquifer.” Most groundwater used for public drinking water today contains less than 500 milligrams per liter of Total Dissolved Solids (TDS), and most water that is treated for drinking water contains less than 3,000 milligrams per liter TDS. Therefore, the UIC Program ensures that water resources that could be treated and used as drinking water in the future are protected today.

After passage of the Safe Drinking Water Act (1974), U.S.EPA worked with a twelve-member state workgroup to develop the UIC Program rules (1976-1977). From the onset of rule development, regulatory officials sought to apply lessons learned from decades of injection experience. Prior to enactment of the federal regulations, U.S.EPA and state officials examined best practices as well as problems associated with injection well operations that pre-dated passage of the SDWA.

While developing the UIC Program regulatory framework, U.S.EPA and state officials recognized six pathways through which injected fluids could potentially migrate into USDWs. Officials sought to develop regulatory standards that mitigate and effectively address the following pathways:

- Migration of fluids through a faulty injection well casing;
- Migration of fluids through the annulus located between the casing and wellbore;
- Migration of fluids from an injection zone through the confining strata;
- Vertical migration of fluids through improperly abandoned and improperly completed wells that penetrate the injection zone;
- Lateral migration of fluids from within an injection zone into a protected portion of that stratum; and

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• Direct injection of fluids into or above an USDW\(^3\).

The U.S.EPA has defined six classes of injection wells that are permitted and regulated under the SDWA, which are summarized in the following table.

<table>
<thead>
<tr>
<th>U.S.EPA Classification</th>
<th>Injection Well Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS I</td>
<td>Wells used to inject waste beneath the lowermost USDW</td>
</tr>
<tr>
<td>CLASS II</td>
<td>Wells used to dispose of fluids associated with the production of oil and natural gas</td>
</tr>
<tr>
<td>CLASS III</td>
<td>Wells used to inject fluids for the extraction of minerals</td>
</tr>
<tr>
<td>CLASS IV</td>
<td>Wells used to dispose of hazardous or radioactive wastes into or above a USDW</td>
</tr>
<tr>
<td>CLASS V</td>
<td>Wells not included in the other classes generally used to inject non-hazardous waste</td>
</tr>
<tr>
<td>CLASS VI</td>
<td>Wells used to geologically sequester carbon dioxide to reduce greenhouse gas emissions</td>
</tr>
</tbody>
</table>

*Table 1 Injection well classification chart Source: after USEPA*

The U.S.EPA is charged with enforcement of the SDWA, and exercises that authority directly or through formal agreements with state and tribal partners, under their oversight. The U.S.EPA has given primary enforcement authority (primacy) over underground injection wells to those state agencies or tribes that have shown they are able to implement a UIC Program that is effective in protecting groundwater resources. These requirements are in Sections 1422 and 1425 of the SDWA, and the Federal Register (40 Code of Federal Regulations Sections 144 through 147. The states that U.S.EPA has determined have regulations, laws, and resources in place that meet the federal requirements and are authorized to run the UIC Program, are referred to as Primacy states. Primacy states manage their programs subject to periodic audits and program reviews conducted by U.S.EPA. In states that have not received primary responsibility for the UIC Program, U.S.EPA remains the responsible regulatory agency. These states are referred to as Direct Implementation (or DI) states, because U.S.EPA directly implements the federal UIC regulations in these states. Some states share responsibility with

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the U.S.EPA, with authority over some well classes residing at the state level, and other well classes being regulated by U.S.EPA.

**The Class II UIC Program**

Class II injection wells are used primarily to inject fluids that are associated with oil and gas exploration and production (E&P) activities including drilling, stimulation (hydraulic fracturing), and production operations. Since the inception of oil and gas exploration and development (1860), the oil and gas industry has been generating and managing produced water. Produced water is the water extracted from the subsurface during oil and gas E&P activities. Produced water occurs naturally within underground formations, and is brought to surface along with oil and gas through a cased wellbore.

Produced water is generated 1) while drilling through saline water zones that naturally occur in the subsurface and overlie the target oil and gas reservoir(s), 2) after stimulation of oil or gas reservoirs by hydraulic fracturing during the flow back and swabbing process, 3) during work-over operations, and 4) during day-to-day production operations. Long before hydraulic fracturing operations started in the 1940’s, the oil and gas industry generated large volumes of produced water that was capable of harming the environment if not properly managed.

Produced water characteristics and physical properties vary considerably depending on the geographic location of the field, the geological formation with which the produced water has been in contact for thousands of years, and the type of hydrocarbon product being produced. Produced water properties and volumes can even vary throughout the lifetime of an oil and gas well or reservoir. Produced waters can be highly saline, with salt concentrations exceeding 200,000 milligrams per liter of chloride (more than ten times as salty as sea water) or may be pure enough for agricultural or irrigation purposes. In addition, produced water commonly contains many organic and inorganic compounds that can lead to toxicity. Some of these are naturally occurring dissolved or emulsified hydrocarbons derived from associated crude oil while others are related to chemicals that have been added for well-control or reservoir stimulation purposes. These fluid wastes are specifically excluded from hazardous waste classification under the Resource Conservation and Recovery Act (RCRA).⁴

The 1980 amendments to the RCRA required U.S.EPA to conduct a study of the environmental and potential human health impacts associated with E&P wastes and their associated waste management practices. U.S.EPA completed its two-year study in 1987. Based on the findings in the Report to Congress, and on oral and written comments received during public hearings in the spring of 1988, on June 30, 1988, U.S.EPA decided not to recommend federal regulation of E&P wastes as hazardous wastes under Subtitle C of RCRA (U.S.EPA 1988). This determination is commonly referred to as the “RCRA exemption”. Although produced water is exempt from one

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section of RCRA, it is subject to requirements in RCRA Subtitle D and the Safe Drinking Water Act.

Approximately 20.5 billion barrels (bbl.) of produced water are generated by federal and state onshore operations in 2012. Generally, the volume of produced water from oil wells does not remain constant over time. The water-to-oil ratio can increase over the life of a conventional oil well. For such wells, water makes up a small percentage of produced fluids when the well is new. Over time, the percentage of water increases and the percentage of crude oil declines. On average, more than 7 bbl. of water are produced for each barrel of oil. For crude oil wells nearing the end of their productive lives, water can comprise as much as 98% of the fluid brought to the surface.

On the other hand, most shale gas wells generate most of their produced water after hydraulic fracturing operations are completed and pumping pressure is relieved from well. During the flow back process, water-based fracturing fluid mixed with natural formation (connate) water begins to flow back to surface. The majority of produced water recovered from typical shale gas operations is recovered during the first several months.5

Produced water is separated from crude oil or natural gas at the surface facility associated with producing oil and gas wells. It is delivered to Class II injection well facilities by pipeline or truck. Once delivered to the storage facility at the injection well, any remaining crude oil is skimmed, the water may be filtered to remove solids such as sand or silt, and the water may undergo other types of treatment prior to injection.

Today there are approximately 168,000 Class II injection wells operating in 31 states. There are three types of Class II injection wells:

- Hydrocarbon storage wells;
- Enhanced oil recovery wells; and,
- Produced water disposal wells.

Hydrocarbon storage wells are used to pump crude oil and other liquid hydrocarbons beneath underground salt deposits for temporary storage, prior to recovery, processing and use. Enhanced oil recovery (EOR) wells are used to prolong the productive life of oil wells within a specific oil field. Secondary recovery is an EOR process commonly referred to as water-flooding. Salty water produced with oil is separated from the oil at surface and re-injected in the oil-producing formation to drive oil to proximal, pumping oil wells completed in the same reservoir. This saline waste-water by-product is referred to as “produced water” or “salt water” because salts (sodium, calcium, magnesium, potassium chlorides) are the predominant dissolved constituents in produced water. Produced water disposal wells are sometimes

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referred to as “salt water disposal wells” because they inject fluids into deep saline reservoirs for disposal purposes. Nationally, approximately 60 percent of all salt water produced with onshore oil production wells is re-injected at Class II EOR wells, while 40 percent is injected for disposal.

As of 2012, U.S.EPA has awarded primacy for the Class II Program to 41 states and territories, and 2 tribes. The following map shows the distribution of Primacy states and Direct Implementation states.

Class II injection well regulations establish standards that address the six potential pathways in the following manner:

- Prior to issuance of a permit, geologists evaluate the suitability of a proposed site for injection. As part of the permit review process, geologists determine the depth of the deepest USDW, evaluate the adequacy of the proposed injection zone, and examine the thickness and nature of confining strata on a site specific basis.
- Permit writers establish the depth of surface casing necessary to extend through and isolate all USDWs.
- In addition to cemented surface casing, Class II injection wells must be constructed with multiple layers of protection (cemented, steel casing strings) between USDWs and the injected waste stream. Most Class II injection wells have three-to-six layers of protection between the injected fluid and the protected groundwater. Therefore, injected fluids can only enter USDWs as a result of faulty casing when there are multiple, concurrent failures of cemented, steel casing strings.
- Regulators establish injection pressure limits designed to confine injected fluids in the authorized injection zone.
- The mechanical integrity of casing and injection tubing are tested prior to commencement of injection operations and monitored on a regular, scheduled basis.
thereafter. Mechanical integrity tests must be conducted at least every five years, and more frequent tests may be required by rule or permit condition.

- All known wellbores that penetrate the proposed injection zone are evaluated within an “Area of Review” surrounding the proposed injection well. Wellbores that pose potential avenues for fluid migration by virtue of their construction or plugging status must be mitigated before injection can be authorized.
- Injection owners must monitor their operations and submit reports regarding injection pressures and fluid volumes.

Produced water is injected into depleted oil and gas reservoirs or deep reservoirs that are naturally saline. These saline reservoirs contain water with similar in chemistry to the injected produced water. Typically, produced water is injected into porous and permeable sandstone or dolomite formations that are overlain by “confining strata”.

Confining units consist of rock types that typically have low permeability, such as shale, halite (salt), anhydrite, and some limestone formations. When confining units overlie oil and gas reservoirs, they are also referred to as “cap rocks” because the strata have effectively sealed oil, natural gas and even CO2 in the underlying reservoir for millions of years with no, or minimal, leakage. The effectiveness of confining units has been further validated through extensive stratigraphic tests, and decades of successful experience at gas storage and injection operations.

Constructing a wellbore and maintaining mechanical integrity throughout injection operations is a key principal of injection well regulations. An injection well is said to have “mechanical integrity” if: 1) there are no significant leaks in the casing, including injection tubing (the string of steel pipe through which fluids are actually injected), and 2) there is no significant fluid movement behind casing (either behind cement or in un-cemented annular spaces) into a USDW. Class II regulations require operators to construct a well in a manner that mechanical integrity can be tested and monitored.

Injection well operators are required to verify that each Class II well has mechanical integrity before commencement of injection is approved; at least every five years thereafter; and every time down hole equipment, such as injection tubing or packer, is removed for servicing or repair. These standards are enforced to protect USDWs and ensure that fluids are injected into the authorized injection zone.

The Peer Review Process
The Ground Water Protection Council (GWPC) conducts the Class II UIC Peer Review process under the joint GWPC and Interstate Oil and Gas Compact Commission (IOGCC) “StatesFirst” Initiative. The purpose of this process is to assess the effectiveness of Class II UIC programs that have been delegated to states under Sections 1422 or 1425 of the Safe Drinking Water Act (SDWA).
The review team consists of the following persons:

1. Two volunteer state Class II UIC program persons from primacy programs of states that reside outside of the EPA Region of the state being reviewed
2. A GWPC staff member
3. A facilitator hired by the GWPC
4. A federal observer from the EPA Region in which the state being reviewed resides
5. Additional observers as requested by the state being reviewed

The review process and timing is as follows:

1. Initial contact with states to solicit volunteers for review (GWPC)
2. Coordination of timing for the review with the state program (GWPC)
3. Recruiting of review team members at least 60 days prior to the in-state interview (GWPC)
4. Distribution of the questionnaire to the state program to be reviewed at least 60 days prior to the in-state interview (GWPC)
5. Notification to state program of review team members at least 30 days prior to in-state review (GWPC)
6. Submission of the completed questionnaire to the GWPC at least 30 days prior to the in-state interview
7. Review of the completed questionnaire and development of follow-up questions no later than two weeks prior to the in-state interview (Review team)
8. In-state interview of up to 1 ½ days (Review team and state program staff)
9. Prepare draft report within 30-60 days following in-state interview (Non-observer team members, facilitator and GWPC representative)
10. Submission of draft report to state program (GWPC)
11. Review and comment submission by the state to GWPC within 15 days of receipt of draft
12. Revision of draft within 30-60 days following receipt of state program input (Non-observer team members, facilitator and GWPC representative)
13. Approval of the final report within 15 days of revision completion (GWPC Executive Director)
14. Posting of the final report on the GWPC website within 10 days following approval by GWPC Executive Director (GWPC)
15. If requested, distribution of 25 copies of the printed report to the state program (GWPC)
The general rules of a review include the following:

1. Review team members agree to operate under rules of confidentiality and may not discuss the review findings or draft report with persons who are not members of the team until the final report is published.

2. Observers are entitled to submit questions to the review team as part of the in-state interview but are not permitted to participate in drafting of the report.

3. Observers may submit comments on the draft report at their discretion.

4. Preparation and approval of the draft report will be accomplished using a consensus approach.

5. Minority reports, other than those that may be published by the reviewed state, are not allowed.

6. Comments in the report will not be attributed to any individual team member.

7. The GWPC is solely responsible for the content of the final report.

8. The report is the intellectual property of the GWPC and any distribution of or quotation from the report may only be done with the express permission of the GWPC.
Nebraska Class II UIC Peer Review

Review Team
The following persons conducted the Nebraska Peer Review:

State team members:
Scott Kell, Assistant Chief, Ohio Department of Natural Resources, Division of Oil and Gas Resources Management
Dan Jarvis, Field Operations Manager, Utah Department of Natural Resources, Division of Oil, Gas and Mining
Andrew Adgate, Program Manager, Underground Injection Control Program, Ohio Department of Natural Resources, Division of Oil and Gas Resources Management

GWPC staff and consultants:
Mike Nickolaus, Special Projects Director, GWPC
John Taylor, Former USEPA UIC Program Manager and GWPC Facilitator

Official observers:
Kurt Hildebrandt, Chief UIC Section, USEPA Region 7
Adam Peltz, Attorney Climate and Energy, Environmental Defense Fund
Marty Link, Water Quality Division Administrator, Nebraska Department of Environmental Quality

Executive Summary
The peer review of the Class II UIC program administered by the Nebraska Oil and Gas Conservation Commission (NOGCC) was conducted by a review team made up of UIC managers and technical staff from state Class II agencies of states outside of the EPA region in which Nebraska resides. This included an in-state interview of NOGCC staff and management at the NOGCC office in Sidney, Nebraska on November 11th, 2015. The in-state interview was based on responses to a comprehensive questionnaire completed by the state UIC staff and follow-up questions posed to the UIC staff during the interview. In addition, the interview team members reviewed the state’s statutes and rules governing the UIC program and other materials provided by the state.

Program Overview
The Nebraska Class II UIC program is managed by the NOGCC under the authority of Chapter 57, Revised Statutes of Nebraska, 1943 and Title 257, Nebraska Oil and Gas Conservation Commission. Nebraska obtained primacy for the Class II UIC program under Section 1425 of the SDWA on February 3, 1984.
The UIC program is managed by the Deputy Director of Oil and Gas. Overall management of the UIC program is supervised by the Director of Oil and Gas. UIC program responsibilities are handled by the Director and Deputy Director, based in Sidney, and two field inspector positions located in McCook and Sidney. Additional support is provided by the UIC Administrative Assistant.

In 2015, overall funding for the UIC program was $175,722. This consisted of funds from two sources:

1. $95,722 in state funds obtained from the general NOGCC appropriation funded by a conservation tax on oil and gas sold, permit fees, and interest on the NOGCC cash account; which is the account in which program funds are kept
2. $80,000 in grant funds from USEPA

The current inventory of Class II UIC wells in Nebraska includes 505 enhanced recovery wells and 145 disposal wells. Approximately 57 million barrels of fluid are injected into Class II wells annually. Since 2011, the NOGCC has issued an average of 10 Class II UIC permits per year. The vast majority of permits issued are conversions of existing wells to Class II status. Although the NOGCC issues area permits, each well is treated individually with respect to the permit application review process.

**Permitting and File Review**

All UIC permits are issued from the Sidney office. The UIC application review process is well conceived and designed to provide a good technical and administrative judgment of any proposed Class II well. Although permit reviews are conducted by more than one individual, routine communication is maintained between staff responsible for permit decisions. This insures consistent application of the principles used to determine permitting outcomes. The division does not distinguish between commercial and non-commercial wells for purposes of permit review. However, commercial wells are required to undergo an annual MIT. Reviews include a thorough technical review of well construction and operating specifications.

Commission staff indicated that file reviews are conducted on the same schedule as the MIT’s for a well. The NOGCC uses a ½ mile radius Area of Review (AOR) during the permit review process. This is twice the distance of most programs; which use a ¼ mile radius AOR. The NOGCC has the authority to deny permits for technical or bonding reasons but not specifically for enforcement status. The review team believes the NOGCC should consider utilizing existing enforcement status as a rationale for denying permits where appropriate.

The review team believes that the permitting process implemented by NOGCC provides appropriate protection for USDWs.
Financial Assurance
All wells in the UIC program must be bonded in accordance with Title 257, Chapter 3, Section 004. The amount of the bond is $10,000 per well or a blanket bond of $100,000 for any number of wells and may be in the form of an insurance bond or a Certificate of Deposit. Bonding is required for the duration of drilling, operation, plugging and site restoration of a well. The NOGCC provides for blanket bonds, but the amount of the bond is not dependent on the number of wells covered by the bond.

The review team believes the bonding requirement of $10,000 for individual wells is adequate but suggests setting a limit on the number of wells which can be included under one blanket bond because the NOGCC’s blanket bond amount of $100,000 would likely be inadequate to properly plug more than about 40 wells based on the average $2,500 per well plugging cost estimated by the NOGCC.

Public Outreach
Prior to the final determination of a permit application, a notice must be placed in a daily newspaper of general circulation in the county where the proposed well is located. The notice must include the applicant’s name, address and telephone number as well as the location of the proposed well and a description of the proposed operation. Comments are accepted for 15 business days following the publication date. The operator is also required to send a copy of the notice to all operators, owners and surface owners within ½ mile of the well location and must include an affidavit certifying that this has been done as part of the application.

Public comments regarding a permit application are initially handled by discussing the concerns via telephone conversations. This enables NOGCC to resolve most issues informally by providing explanations to questions. Should an issue remain unresolved; the person who has a comment or objection to the permit may receive a hearing on the matter before the NOGCC if they are determined to have standing. Public input is documented through the use of hearings transcripts and such comments are made a part of the application file.

The team believes the public notice and hearings requirements implemented by the NOGCC are sufficient to provide adequate public notice and input concerning the issuance of Class II permits.

Well Construction
All injection wells must have surface casing cemented to surface and set to a depth at least 50 feet below the base of all useable water containing 3,000 milligrams per liter (mg/L) of Total Dissolved Solids (TDS) or less. However, the policy of the NOGCC is to require casing and cementing below the lowest USDW.

Production/injection casing must be cemented across the proposed disposal zone and must extend vertically at least 50 feet above the uppermost perforation. The NOGCC has the
authority to request cement bond logs or have other evaluations implemented to ensure cement coverage is adequate.

The review team believes the well construction requirements are adequate to protect USDWs from contamination from injected fluids.

**Mechanical Integrity Testing**
Nebraska uses the standard annulus pressure test (SAPT) as a demonstration of Part I well component integrity. The NOGCC witnesses 100% of Part I MIT’s. Part II mechanical integrity is satisfied by cement records, cement bond logs, radioactive tracer surveys, or temperature logs. Officials at the NOGCC indicated that a cement bond log is the preferred method for demonstrating Part II mechanical integrity.

The review team believes the NOGCC program adequately addresses both parts of the mechanical integrity requirement.

**Inspections**
Inspections of Class II UIC wells are conducted by commission personnel at least annually and more frequently as needed. GIS mapping is used in conjunction with field data to enable risk-based inspection prioritizing. NOGCC supervisory personnel periodically accompany field inspectors for quality control purposes. Field inspectors use their tablets to record details of their field visits and then upload the information into RBDMS. Although inspection districts are assigned geographically, there is typically considerable overlap between the two state inspectors to avoid unnecessary travel. Inspectors witness 100% of all casing/tubing well integrity tests. Although there is no official complaint response time, the commission stated that complaints are typically responded to within 24 hours. Both of the inspectors currently employed by the division have undergone either the IOGCC Inspector Certification Course or the USEPA UIC Well Inspector Training Course and have also received training in soil remediation from the University of Tulsa.

The review team believes the field inspection program of the NOGCC program provides an adequate level of protection to USDWs.

**Compliance and Enforcement**
The NOGCC compliance and enforcement program relies heavily on the field presence of the inspection staff. Through their frequent visits and knowledge of the wells in their assigned areas, the inspectors are able to quickly respond to violations. Once a violation is identified, the operator is first called to see if the problem can be quickly resolved. After one or two attempts at resolution, depending on the nature of the violation, a Notice of Violation (NOV) is issued. For an exceedance of permitted injection pressure, the Central Office in Sidney is immediately notified and an NOV is normally issued. Voluntary self-reporting of violations,
when determined to be truthful, typically results in the violation being treated informally. These procedures usually result in a 95% rate of return to compliance.

For those cases where normal procedures do not result in a return to compliance, or it is otherwise called for, the NOGCC has civil penalty authority and has issued civil fines for specific violations.

The review team believes the compliance/ enforcement program implemented by the NOGCC is sufficient to ensure substantial compliance and has sufficient authority to compel a return to compliance in those cases where non-compliance does occur.

**Overall Program Findings**

The review team performed an in-depth review of the Nebraska UIC Class II program via a review of Nebraska regulations, responses to a questionnaire, and a one day state interview of UIC and NOGCC management staff. Information provided by the NOGCC prior to the peer review was of great assistance; however, much of the understanding of the program was achieved during the actual in-state interview. The NOGCC has a relatively small but knowledgeable staff, and the managers and staff show great flexibility in covering a wide range of duties. The review team was impressed with the quality of staff and the manner in which the program was being implemented. The EPA representative was also very helpful in providing a perspective on EPA Region 7’s oversight of the Nebraska program.

The suggestions and review team comments provided in this report represent opportunities to further strengthen the Nebraska Class II UIC Program. In all subject areas investigated as a part of this peer review, the NOGCC managed program has been found to provide the necessary elements, from both a regulatory and activity standpoint to protect USDWs.

**Part I: General Administrative Overview**

**Statutory Authorities and Regulatory Jurisdictions**

Overall responsibility for Nebraska’s Oil and Gas program, including the injection of produced fluids for disposal or enhanced recovery (UIC Class II wells), has been assigned by the state legislature to the NOGCC. The NOGCC was founded in 1959 and its mission is to foster, encourage and promote the development, production and utilization of natural resources of oil and gas in the state. The NOGCC board consists of three members appointed by the Governor, and the Director of the State Geological Survey serves the NOGCC in the capacity as its technical advisor, but with no power to vote. All NOGCC board members serve a term of four years, although the Governor may at any time remove any appointed member of the NOGCC board for cause, and by appointment, with the approval of the Legislature, fill any vacancy on the commission. At least one member of the NOGCC board is required to have had experience in the production of oil or gas.
The Powers and Duties of the Commission are found in Revised Statutes of Nebraska (RSN) Section 57-905. Specifically, RSN 57-905 (7) states, “The commission shall have authority to promulgate and to enforce rules, regulations and orders to effectuate the purposes and the intent of Sections 57-901 to 57-921.”

The NOGCC has authority to adopt rules and make orders as necessary to administer operations for and relating to the production of oil and gas. The NOGCC has exclusive jurisdiction over Class II injection wells and their related pits and ponds. The NOGCC has jurisdiction to hear any questions regarding multiple mineral development conflicts with oil and gas operations and to rule with respect to those questions.

The statutes established contain legal definitions for terms which are used throughout the program. NOGCC utilizes definitions related to the program within Title 267 Chapter 1 of the rules and regulations. In addition to the definitions in the rules and regulations in Chapter 1, NOGCC uses definitions for “Enhanced Recovery Injection Well” and “Disposal Well” which can be found in Chapter 4 Section 001 of the rules and regulations, for well classification purposes. A commercial facility, used for either enhanced recovery or disposal, includes single or multiple wells that are specifically engaged in the business of underground injection of brine generated by third party producers for a fee or compensation. In addition, the produced brine must originate off-site as a result of oil and gas production operations only, and must be transported to the facility by tank truck.

In Chapter 4 Section 002.03 of the rules and regulations, NOGCC ensures that new wells are designed so underground sources of drinking water are isolated and protected by requiring that injection wells have sufficient surface casing run to reach a depth below the base of all water sources that are less than three thousand (3,000) parts per million total dissolved solids or water sources that are or could be reasonably utilized as domestic fresh water unless those sources are exempted. In practice, NOGCC utilizes a more protective measurement of ten thousand (10,000) parts per million total dissolved solids when determining casing requirements for underground sources of drinking water protection. Thus, the practice, rather than the rules, protects aquifers that contain from 3,000 mg/L to 10,000 mg/L total dissolved solids (TDS) in order to provide additional USDW protection and meet the requirements of the federal UIC program.

The USEPA granted NOGCC primacy authority for permitting and regulating UIC Class II injection under Section 1425 of the Safe Drinking Water Act (SDWA) on February 4, 1984. This authority covers all lands of the state except those that are designated as Indian Country where the authority remains with US EPA Region VII. At the time of this peer review, the NOGCC regulated a total of 145 Class II-Disposal wells and 505 Class II-Enhanced Recovery wells.
Administration, Staffing and Funding

NOGCC funds the UIC program through two major sources, USEPA and state funds. The USEPA UIC grant of $80,000 also requires the state to fund at least 25% of the program. Since the funding levels available to USEPA for the UIC program have been essentially unchanged for the past 25 years, states have had to assume increasingly greater amounts of the total cost of running the UIC program. This is certainly the case in Nebraska, where the NOGCC commits the equivalent of 2 work years toward running the UIC program annually, yet the 75% USEPA grant is only able to cover 1.5 of those work years.

The remainder of the costs of the UIC program comes from three sources of state funding:

1) Conservation Tax on oil and gas sold;
2) Fees from permits and well plugging; and
3) Income Interest paid on the balance in the Cash Fund.

Most of these funds are generated by the Conservation Tax, as fees, $200 for a permit application and $100 for a well plugging, are relatively small. To date, these state funds have been adequate to allow the NOGCC the ability to maintain an appropriate field presence and accomplish the program goals and objectives. NOGCC has also utilized technology such as risk based field inspection, to maximize use of available resources. While the Nebraska legislature has always appropriated sufficient funds as raised through the Conservation Tax and fees, there remains the potential for cuts should the state encounter fiscal difficulties. Should state or USEPA funds be reduced, it would have a severe impact on the ability of the NOGCC to accomplish the UIC program goals, objectives and performance measures.

The NOGCC staff currently consists of nine positions, one of which is currently vacant. All members of the staff contribute toward UIC activities, although only two are shown on the USEPA grant application, due to limitations of available USEPA funds. Staff members include a Director, a Deputy Director, a Staff Engineer (currently vacant), a Business Manager, an Administrative Secretary, a Production Statistician, two Field Inspectors and an Information Technologist. The Director and Deputy Director have approximately 50 years of UIC experience between them, and a number of the other staff is also very experienced. The NOGCC provides a substantial regulatory presence in the field including inspecting every injection well at least one time per year, and witnessing every MIT and nearly all well abandonments. If the substantial state “overmatch” to the USEPA grant were to be eliminated, this field presence would be severely curtailed. If, at some point, more USEPA funds were to become available, the NOGCC would pursue the potential addition of a field inspector in southwest Nebraska, or the sharing of an inspector with the Nebraska DEQ (NDEQ).

Data Management Program

NOGCC maintains a comprehensive electronic data system to track information on wells and operators in Nebraska, along with other related information in their Risk Based Data
Management System (RBDMS). Through RBDMS, UIC data is fully integrated with oil and gas data. This system, which uses an Access user interface with SQL database, is capable of auto-generating periodic reports, letters, notices and forms such as Form 7520, as required by USEPA. All NOGCC staff have access rights to enter new or updated information into RBDMS, and information is typically added on a daily basis. Additionally, RBDMS has the ability for inputting directional information on horizontal wells. NOGCC also makes the information contained in the RBDMS available via their data mining system available on their website.

NOGCC has found RBDMS to be very efficient and effective for tracking their UIC program data and for mandatory UIC quarterly reporting. RBDMS allows for the sharing of permitting, inspection and enforcement data among all NOGCC staff including field inspectors. It also facilitates scheduling of MITs to ensure compliance with the 5-year cycle, as well as integrating GIS information for well sites and source water protection areas into the system. NOGCC is fortunate in having excellent IT personnel support on staff.

Currently, field inspectors utilize tablets to record data in the field, and this information is then uploaded to RBDMS. Enhancements to RBDMS are currently being developed which will provide field inspectors with real time access to all of the data in RBDMS while in the field, even in areas where on-line access is not available. This would include well history, well identification by location etc. The goal is to fully implement this new approach within the next year. At the same time, NOGCC will also be exploring ways to provide improved user interface with their data system for public use.

Although the NOGCC has been working on uploading data to USEPA’s new national database, there are still a wide range of problems with that system which need to be resolved before full electronic reporting can occur. In the interim, NOGCC continues to provide basic information to the UIC national database via a web server and reports all required information to Region 7 USEPA via the 7520 reporting forms.

The NOGCC maintains physical and electronic copies of records, forms, reports and other items which are required by the permit. These electronic and physical copies are kept at the NOGCC main office in Sidney, Nebraska. These documents are kept on site permanently and not discarded after a set period of time.

Interagency Coordination
NOGCC has a number of both formal and non-formal MOU’s with NDEQ. The only formal agreement with NDEQ relating to UIC covers the injection and withdrawal of air as a Class V experimental technology. However, NOGCC provides technical assistance, such as with deep injection well construction, and geologic information to NDEQ in cases of deep injection well applications, including the Class I wells which are located at the uranium mining sites in the state. NOGCC also tracks information on these wells within RBDMS for NDEQ. NDEQ in turn provides informal assistance to NOGCC when necessary for the Class II UIC wells located in
southeast Nebraska. An informal relationship with the Nebraska Geological Survey is maintained for informational purposes. Coordination with local governments also occurs in specific instances, especially in wellhead protection areas. In general, NOGCC facilitates communication with NDEQ, other local, state, federal, and non-governmental organizations primarily through national conferences such as those held by the GWPC and the IOGCC.

**Changes in Program Activities since Primacy**

The NOGCC UIC program has continued to operate effectively since primacy was approved, with only minor changes, such as new rules involving well stimulation and annulus rules which were added in 2013 and 2014. The most significant programmatic change has been the adoption of the RBDMS data management system, which has allowed effective tracking of all well related activities. The expansion of this system in 2016 to include electronic data capture and access in the field is expected to further strengthen the program.

**Identified Strengths**

1) The Nebraska UIC program has been effectively administered by NOGCC since the granting of primacy in 1984.

2) The use of the RBDMS data management system allows the agency to store and utilize regulatory aspects of UIC data that are critical to management of the Class II program. The upcoming modification to RBDMS will include the accessing of data in the field as well as immediate electronic field data capture into the system which will improve the reliability, timeliness, accuracy and value of data gathered in the field during inspections and testing. This is a positive upgrade of the data system.

3) With the Director and Deputy Director having approximately 50 years of UIC experience between them and the presence of other highly trained staff, the program benefits from an abundance of technical knowledge and expertise and a wealth of institutional knowledge. If possible, the agency should seek to impart this knowledge and expertise to junior staff to ensure continuity for the program in the future.

**Review Suggestions**

1. While NOGCC practices have assured that USDWs are protected to 10,000 TDS, these practices should be incorporated into rule to be consistent with Federal requirements and to assure that this standard will continue to be upheld in the future.

2. The staff engineer position is important to meeting the technical workload of the NOGCC UIC program. This position should be filled as soon as feasible.

**Part II: Permitting and Compliance Review**

**Permit Application Flow and Review Process**

Nebraska UIC applications are administered by the Nebraska UIC Director. To obtain a permit for a Class II well, the operator must submit an application to permit and drill the well (APD).
The majority of the recent Class II permits were for disposal wells. Disposal well applications, whether for commercial purposes or for a specific operator’s project, are roughly evenly split between conversions (50%) and new wells (50%). Applications for Enhanced Oil Recovery (EOR) wells are almost always conversions.

All steps of the application process are tracked through RBDMS. The original application is stored in paper files prior to final approval. After approval, the application is scanned as well as being added to hard copy files. Although the NOGCC does not require a fee to process a drilling permit, it does require a fee of two hundred fifty dollars ($250) for an application requiring a public hearing.

Applications are received by the Administrative Secretary. The Administrative Secretary performs a cursory review for completeness and passes the application on to the UIC staff. If the UIC staff formally determines the application is complete, per the requirements of Chapter 4, Section 004 of the Rules and Regulations, the application is returned to the Administrative Secretary for assignment of a case number and preparation of a legal notice for publication. Complete applications are then given to the Assistant Director for processing. If an application is found to be incomplete, the missing information or documents are flagged on a checklist containing the requirements as stated by the Rules and Regulations. The checklist and the application are then returned to the Administrative Secretary, who writes a formal letter to the Operator describing what information is needed for the application to be complete. The application is then placed in a pending file. If the application were to be voided or denied, the application would remain with the Commission.

**Technical Aspects of the Review Process**

Casing and cementing requirements for all wells in Nebraska are governed by NOGCC Rules and Regulations Chapter 3 Section 012. These rules ensure protection for all water bearing formations and provide protection against blowouts or uncontrolled flows.

Although Section 004.002.3 specifies protection for aquifers containing three thousand (3,000) parts per million (PPM) of total dissolved solids (TDS), in practice the NOGCC uses a more protective standard of ten thousand (10,000) PPM of TDS when determining casing requirements for protection of underground sources of drinking water (USDWs). The agency can provide an alternative construction method for new wells besides setting surface casing through the deepest USDW on a case-by-case basis. Additional operating requirements would be placed on the well including remedial cementing or increased frequency of mechanical integrity testing. NOGCC maintains maps and records, on their website, which show vertical and horizontal extents of USDWs. The deepest USDW is determined from either the evaluation of the open hole logs in the well or offset wells or by using maps and water quality data that are prepared under the supervision of the Nebraska Geological Survey. These maps and records are also available to the oil and gas industry. Operators in Nebraska generally consult with the NOGCC prior to permitting new wells to determine casing setting depths. Data from all sources
is reviewed by the UIC Staff to determine depth to deepest USDW. In situations where the USDW has not been mapped, the data that is available in literature and from well files is reviewed. Water analyses of the produced waters and waters from the proposed injection interval must be submitted with the application and are evaluated by the technical staff to insure compatibility. Nebraska regulations also require analysis of at least two freshwater wells within one mile of the proposed injection well to be submitted with any application for permit.

Injection pressures are based on a fracture gradient of 0.7 psi/ft. For wells being converted from production to Class II status, remedial cementing of casing is required if casing is not cemented below USDW’s.

Well construction and cementation for a UIC well must conform to the NOGCC rules and regulations and sound engineering practices. The NOGCC has no minimum surface casing depths, but the depth for a specific well is determined on a case-by-case basis using the reviewer’s knowledge and experience. The rule of thumb for surface casing is fifty (50) feet below the lowest aquifer. If an operator has submitted a proposed depth for the surface casing which the Commission deems to be insufficient, then the proposed depth will be stricken and the Commission will dictate the required depth. Long string casing is generally cemented from the bottom of the hole up into a major confining interval. This creates three (3) layers of protection, casing/cement, tubing and packer for all fresh water zones. A cement bond log or comparable log can be run on the cased and cemented well and submitted as part of the application. Copies of mechanical, electrical or radioactive logs, including gamma ray logs, for the proposed well that were run prior to the installation of casing must be submitted for review.

NOGCC requires all surface holes to be drilled with fresh water to protect underground sources of drinking water. After surface casing has been set and cemented, oil/salt drilling mud can be utilized depending on formation conditions. If oil/salt drilling mud is utilized, then the well is required to have surface casing which extends below the Chadron Formation. The maximum allowable injection pressure is calculated by depth, using a 0.7 psi/ft gradient. A Step Rate Test (SRT) may be conducted by the operator to establish a maximum pressure for the injection interval. Step Rate Tests are not common in Nebraska because most injection zones take water on a vacuum. The maximum injection pressure is typically 90% of breakdown pressure. In some cases, the Initial Shut-In Pressure (ISIP) from fracture data or an estimated fracture gradient has been used to calculate the maximum pressure. Injection above the fracture pressure is not allowed. Injection rates are limited by the volume that the injection zone will take at the assigned injection pressure and no specific rate is assigned.

Area of Review (AOR) Consideration and Procedures
The UIC staff performs a complete review of all wells within a fixed radius of ½ mile of each existing or proposed injection well. The fixed radius applies to all Class II wells. Each well within the AOR is reviewed for its construction and for local variations in the geology. Specific
attention is paid to the plugging records and cement bond logs to ensure the injected fluid will remain contained in the injection zone within the AOR. In the event that a problem is identified in a well within the AOR and the operator does not have the legal status to correct that problem, the permit application could be denied. However the NOGCC staff may use other methods such as a Zone of Endangering Influence (ZEI) calculation. The ZEI is a Theis equation designed to limit volumes and pressures within a specific area around a well. In the case of area permits, the NOGCC uses an AOR that extends ½ mile beyond the location of all injection wells within the proposed area.

If a Class II application passes the technical review by the UIC staff, the UIC Director will issue a permit allowing the operator to convert the well to an injection well and conduct a mechanical integrity test (MIT). If the well passes the MIT, the operator may begin injection. (See Part III for MIT requirements)

**Administrative Aspects of Permit Application Review**

All wells in the UIC program must be bonded in accordance with Chapter 3, Section 004 of the Rules and Regulations which requires an individual well bond of no less than $10,000 or a blanket bond of no less than $100,000. Although the rule specifies that a blanket bond shall be “no less than $100,000”, in practice this is the amount normally placed with the NOGCC. This means an operator may have an unlimited number of wells under a blanket bond of $100,000. The Director may refuse to accept a bond or add wells to a blanket bond if the operator or Surety Company has failed in the past to comply with statutes, rules or orders relating to the operation of wells; or for other good cause. Any person required to file a surety bond pursuant to this rule may post cash or certificate of deposit in the amount required.

An operator may request a modification of an existing Class II permit. If the change is considered a major modification such as a change or addition of an injection zone, a new public notice is required with its attendant waiting period. Minor modifications such as injection pressure increases do not require a public notice.

Prior to the final determination of permit issuance or denial, a legal notice must be placed in an area newspaper of general circulation where the proposed well is located. Notification requirements are specified in Chapter 4, Section 005 of the Rules and Regulations and include provisions for a notice of public hearing issued by the Commission that specifies the time and place of a hearing. NOGCC public notices occur after a legal notice has been posted in the paper. The permit applicant is required to provide notification, via certified mail or individual delivery, to affected citizens within the ½ mile radius of the well for which a permit is being sought. For horizontal well areas, an additional spacing around the outside of the area in a grid pattern must be used to notify the residents within the area. If no person required to be notified, or the Commission itself, files a written objection within 10 days of the notice, then the application is reviewed by the Hearing Examiner and an order/permit is written. If there is no objection to the permitting decision, the general turnaround time from receipt of an
application by the Commission is about 30 days. If objections are received within the 10 day response period, the application/case must be heard by the full Commission. An application for an enhanced recovery project requires a formal hearing before the Commission. If a notification period passes without any written objections NOGCC has the ability to have the case approved (around 90% of permits are done this way). All public comments (when feasible) which are received get a response confirming the receipt of the objections.

Public comments regarding a permit application are initially handled by discussing the concerns via telephone conversations. This enables NOGCC to resolve most issues informally by providing explanations to questions. NOGCC will determine if the person who has a comment or objection to the permit has standing and should receive a hearing on the matter. However, that determination may be appealed to the Commission. An enhanced recovery project requires a formal hearing and must be approved by the Commission. A disposal well will require a formal hearing only if an objection to the permit issuance is filed with the agency.

Formal hearings before the Commission are controlled by Chapter 6 (Rules of Practice and Procedure before the Oil and Gas Conservation Commission of the State of Nebraska.) Commission hearings are held at the NOGCC office in Sidney, Nebraska, on the last Tuesday of the month. Formal objections to the issuance of a permit are addressed at the Commission’s discretion during the hearing. Public input is documented through the use of hearing transcripts and such comments are made a part of the case file. Two of the three Commissioners must be present at the hearing. Decisions are based on evidence and testimony presented by interested parties and sworn-in experts. Sworn in experts are evaluated based on their experience as well as education. The Commission may listen to everyone attending who wishes to speak, but they will not be sworn-in as experts or considered interested parties if outside the area of review. The objector may bring an attorney and experts to present evidence and testimony during the hearing. Once the Commission has heard testimony from the interested parties and sworn-in experts it has to make a permit determination. Once a determination has been made a transcript, consisting of everything which occurred during the hearing is written to document the hearing. After a hearing, the Commission issues a written order or permit. If an application is denied by the Examiner, an applicant may challenge the permitting decision either informally or formally before the full Commission. Final determinations of the Commission are subject to judicial review.

Aquifer Exemptions
A number of aquifer exemptions were granted as part of the primacy application process, and only one (the Hunton Formation in southeast Nebraska in 1989) has been requested and approved since then. For example, aquifers below the Pierre Shale, such as the Cretaceous Dakota Sandstone, may contain groundwater with less than 10,000 mg/L of TDS. However, the Dakota Sandstone and other similar zones are also an oil producing zones that were designated as exempted aquifers in 1984 at the time U.S.EPA approved Nebraska’s application for primary
enforcement authority (primacy) over the Class II UIC Program. If an aquifer exemption was requested, the NOGCC would need to work with the Region 7 office of the Environmental Protection Agency (EPA) to evaluate the request.

Data Management Systems Use in Permit Application Review
NOGCC has used the Risk Based Data Management System (RBDMS) since the mid 1990’s to manage all data components of the Oil and Gas Program. Operators are allowed to file permit documentation with NOGCC electronically, but they are then converted to paper. The NOGCC is currently working on a project to electronically track and route permit applications to the appropriate staff. AOR reviews are done using the geographic information system (GIS). All well files have been scanned and are available to both staff and operators. The commission’s computer servers are managed through an on-campus server system. NOGCC has in-house programming expertise that supports system maintenance and updates to RBDMS.

Periodic File Review Process
NOGCC utilizes a routine schedule for performing file reviews on all UIC wells. Wells are generally selected for review as a result of 5 year mechanical integrity tests and fluid level due cycles. A file review will include analysis of the Class II well’s construction (casing and cement), its injection history, compliance history, inspection history and operator reporting. In the event that a deficiency is discovered during the review, NOGCC will contact the operator for additional data or to otherwise resolve the matter. NOGCC estimates that approximately 20-25% of UIC wells are subjected to a file review each year.

Identified Strengths

1) The UIC application review process is well conceived and designed to provide a good technical and administrative judgment of any proposed Class II well. Reviews include a thorough technical review of well construction and operating specifications.

2) The review team commends NOGCC on the use of a ½ mile area of review. This is twice the size of most other state programs and should be adequate to capture all wells that could pose a risk of acting as a conduit for upward fluid migration.

3) The ability of the agency to hold a permit application based on the operator’s responses, without the restriction of an artificial or arbitrary deadline, is a positive aspect of the program and should be continued.

4) The agency provides both direct notice and published notice of permit applications. This goes beyond the requirements of delegation.

5) Converted wells are held to the same standards as new wells.

Review Suggestions

1) The review team suggests that the agency prepare manuals on their various operating procedures, especially for permitting.

2) The number of wells included under a blanket bond should be limited to a number which could reasonably be plugged with the bond amount.
3) The NOGCC should consider revising the current rules to define USDW’s in a manner consistent with 40 CFR Part 144.3
4) If an aquifer exemption is requested, the NOGCC should work with the Region 7 office of the Environmental Protection Agency (EPA) to determine what specific additional regulatory language would need to be added to meet current requirements, in addition to the general authorities used for the existing aquifer exemptions.
5) NOGCC may want to consider publishing public notices for Class II wells on-line.
6) NOGCC may want to consider compliance history as a criterion when scheduling file reviews.

Part III: Well Construction

Casing, Cementing, Tubing and Packer Requirements
Operators must provide notice to NOGCC inspectors prior to spudding, plugging, and MITs. The NOGCC indicated to the review team that inspectors visit each well during construction.

The NOGCC applies the same construction standards to new wells and oil and gas wells that are converted into Class II Injection wells. Standard injection wells are constructed with five layers of protection (injection tubing, production/injection casing, surface casing, and cement behind surface and production casing strings).

All injection wells must have surface casing cemented to surface and set to a depth at least 50 feet below the base of all useable water containing 3,000 milligrams per liter (mg/L) of Total Dissolved Solids (TDS) or less. However, the policy of the NOGCC is to require casing and cementing below the lowest USDW. According to NOGCC officials, all usable water is contained in Tertiary aquifers that overlie a thick regional confining zone (the Cretaceous Pierre Shale Formation). The Pierre Shale separates usable groundwater that typically occurs within 300 feet of surface, from deeper disposal and hydrocarbon-bearing zones. Where aquifers containing groundwater with less than 10,000 mg./L TDS occur below the Pierre Shale, production/injection casings are cemented to extend at least 50 feet above the top of the uppermost perforations in those production or injection zones.

Production/injection casing must be cemented across the proposed disposal zone and must extend vertically at least 50 feet above the uppermost perforation. The NOGCC has the authority to request cement bond logs or have other evaluations implemented to ensure cement coverage is adequate.

Injection into Class II wells authorized after February 3, 1983, must be done through tubing set on a packer. The setting depth and conditions of packer setting are not specified.

Operators submit completion reports and geophysical logs to the NOGCC and these records are entered into RBDMS and stored in the well file.
MIT Procedures and Exceptions

Nearly all (95 percent) of Nebraska’s injection well operators utilize the Standard Annulus Pressure Test (SAPT) to demonstrate Part I of mechanical integrity. Operators of injection wells with configurations that do not allow for SAPT use temperature logs or radioactive tracer surveys to demonstrate Part I. Part II of mechanical integrity is satisfied by cement records, cement bond logs, radioactive tracer surveys, or temperature logs. Officials at the NOGCC indicated that a cement bond log is the preferred method for demonstrating Part II of mechanical integrity. The UIC Director reviews logs that are submitted to demonstrate integrity of injection wells.

NOGCC tracks all mechanical integrity testing through RBDMS and sends letters or emails to operators when a test is due. Commercial injection wells are tested every year; injection wells with production/injection casing that is not cemented above the Dakota formation are tested every three years, and standard, non-commercial injection wells are tested at least every five years. All injection wells must pass a mechanical integrity test prior to commencing operations, and after workover procedures. Injection wells that do not utilize tubing and packer assemblies can only inject freshwater, or must have a full-length, concentric liner installed. Injection wells without tubing and packer assemblies perform radioactive tracer tests to demonstrate mechanical integrity. NOGCC officials stated that only five percent of Nebraska’s injection wells fall into this category.

Identified Strengths

1) The team finds that the annual MIT requirement for commercial injection wells indicates a strong commitment to ensuring protecting of USDWs where large-scale UIC operations exist.

2) The team finds that the NOGCC’s commitment to witnessing 100% of MITs shows the agency is dedicated to their duty to verify well integrity and protect USDWs.

3) The team finds that the NOGCC’s MIT duration of 30 minutes is robust in comparison to other states’ MIT requirements.

4) The accessibility of well data during field inspections through the use of the tablets and electronic database is an advantage for the program. Proper testing is dependent upon access to complete and accurate well data.

5) Wells converted to injection wells are subject to the same construction standards as new wells.

6) Water well sampling and analysis required during the application process provides valuable baseline data that documents local groundwater quality prior to commencement of injection operations.
**Review Suggestions**

1) The team recommends the NOGCC continue to evaluate whether the additional safeguards and restrictions that are imposed on wells that are constructed without tubing and packer are adequate to effectively protect useable groundwater resources. The team acknowledges that only five percent of injection wells fall into this category and that risk appears to be minimal.

2) The team recommends the NOGCC continue to evaluate the minimum standard for the height of cement above the permitted injection zone, to determine if it is adequate to ensure confinement of injected fluid within the permitted injection zone.

3) The team recommends the NOGCC evaluate the need for a rule change to specify that the packer in a Class II well be set within a specified distance above the injection zone and inside a cemented casing interval.

**Part IV: Inspections**

**Witnessing of Mechanical Integrity Testing**

NOGCC inspectors witness 100 percent of mechanical integrity tests (MITs) and must be given a 24-hour notice prior to an operator performing an MIT. MITs are documented electronically and on paper forms which become part of the well record. Wells with tubing and packer installed have the tubing-casing annulus pressure tested to a pressure of three hundred (300) pounds per square inch. Wells without tubing and packer installed are tested to a pressure equal to one hundred twenty-five (125) percent of the maximum authorized injection pressure or at a pressure of three hundred (300) pounds per square inch, whichever is greater. An inspector may allow a less than 10 percent pressure variance based on their professional experience.

**Conduct and Management of Field Operations by the Agency**

The NOGCC coordinates inspections out of their office in Sidney. Class II wells are typically inspected once annually. However, the Director has the discretion to alter the inspection schedule based on several factors such as environmental sensitivity of the area, history of the well, identification of groundwater protection areas by the Nebraska Department of Environmental Quality (NDEQ) and other factors. All aspects of field inspections are addressed by the two NOGCC field inspectors. The inspectors undergo training from the IOGCC, U.S.EPA, GWPC, and the University of Tulsa in well integrity, soil remediation, and general inspections. Most injection wells are inspected on an annual basis while those in areas of greater risk are targeted for quarterly inspections. GIS mapping is used in conjunction with field data to enable risk-based inspection prioritizing. Field inspectors use their tablets to record details of their field visits and then upload the information into RBDMS. NOGCC inspectors carry their own state-issued gauges that are used to check injection well pressures and ensure that the
injection wells are operating within their permitted limits. NOGCC supervisory personnel will occasionally accompany the field staff during inspections, but the field staff is responsible for the selection and schedule of injection well inspections. In the event a well fails an MIT or the NOGCC is notified of a failure of MI, a site inspection is conducted to assure the well is not being operated.

Inspector’s field visits result in reports that are stored both electronically and in paper form at the NOGCC’s Sidney office. These inspection reports are reviewed by the UIC Director and the Administrative Assistant prior to becoming part of the well file. State policy requires that inspector-produced reports are retained indefinitely. Violations discovered during inspections are tracked manually and electronically by the UIC staff to ensure proper compliance with enforcement actions.

Field inspectors are equipped with tablets that are loaded with an electronic inspection program allowing them to conduct their inspections and upload the collected information immediately. Inspectors have access to the injection well permit and conditions during inspections through the electronic database being used in the field. The system also has the ability to provide directions to the wells and more updates and improvements, including a well finder application planned in the upcoming version.

Emergency and complaint response inspections are handled by the UIC Director and field inspection staff. The NOGCC has no statutory requirements to respond to complaints within a specified time, but it is the NOGCC’s policy to respond immediately.

Compliance and Enforcement

The compliance and enforcement program of the NOGCC relies on a strong field presence and inspection program. Field inspectors have wide discretion to enforce the rules and to insure compliance through informal operator contact. The enforcement system of the NOGCC has both informal and formal elements including telephone contact with operators, issuance of Notice of Violation (NOV’s), issuance of civil penalties for specific or continued non-compliance, and a formal hearings process that may result in additional penalties or permit revocation. According to the NOGCC staff, the rate of return to compliance prior to hearings is approximately 95%. Additionally, the NOGCC also utilizes a self-reporting, non-compliance system that provides for decreased penalties for certain violations where the truthfulness of the reporting can be verified.

Emergency and Citizen Complaint Response Procedures and Processes

Although the NOGCC does not have a specific timetable or response system relative to complaints, the agency has a policy of responding to citizen complaints within 24 hours of receipt. This response typically takes the form of a telephone contact with the complainant and a follow-up inspection as necessary. Depending upon the circumstances of the complaint and the findings of an inspection, the NOGCC may work informally with the operator and
complainant to resolve the issue or may take additional compliance or enforcement action where such action is deemed appropriate by the inspector and the management staff in Sidney.

**Identified Strengths**

1) The use of electronic field inspection systems allows inspectors to have data on wells in the field through online access. Future enhancements will include location based inspections in addition to well based inspection and offline access to data for areas where online access is not available.

2) The use of RBDMS including a GIS interface that shows injection wells that are located within source water protection areas enables NOGCC inspectors to conduct more frequent inspections based upon consideration of risk factors.

3) NOGCC field inspection staff is tasked with handling all aspects of oil and gas inspections which produces more seasoned inspectors to implement the rules and regulations governing the UIC program.

4) NOGCC inspectors are well trained. They undergo multiple training programs that are offered by leading state associations.

5) As a quality control measure, NOGCC program administrators review all inspection reports for completeness and accuracy prior to incorporation in the well file.

6) The NOGCC provides, maintains and calibrates state-issued gauges to inspectors to use during mechanical integrity tests and routine pressure monitoring at injection wells. This ensures that the inspector is able to check the integrity of injection wells without reliance on equipment supplied by the well owner.

7) The NOGCC has developed a practical web-based well viewer that allows anyone to easily locate and research wells in the state or adjacent states. The well viewer contains basic information about wells selected by the user and links to reports or permits that contain detailed information.

8) The team finds that the NOGCC’s policy of immediately responding to injection well complaints demonstrates the dedication the agency has to the citizens of Nebraska.

**Review Suggestions**

1) The team finds that while the NOGCC is providing satisfactory regulatory oversight of the state’s injection wells at current staffing levels, increasing inspection and office staff would allow the commission to be more flexible and witness more phases of the well construction process and operations.

2) The team recommends that the NOGCC continue to evaluate the adequacy of inspection frequency for Class II injection wells, with a special emphasis on disposal wells.
3) While NOGCC is to be commended for the enhanced safeguards taken for commercial wells, it might be beneficial to update protocols for commercial wells to include spot-checks of manifests and random sampling on a regular basis.

**Overall Program Findings**

Overall the review team finds that the Nebraska Class II UIC program managed by the NOGCC is well run and managed. The review team finds that the program provides appropriate protection for USDWs in accordance with the provisions of federally delegated UIC program requirements. The staff of the NOGCC has the professional and technical knowledge and experience needed to implement the program in a manner that is efficient and meets the requirements for an effective Class II UIC program under Section 1425 of the SDWA. The program is well organized and makes excellent use of professional staff and the latest data management processes to assure that USDWs are adequately protected.

Suggestions made in this report are intended to provide the state with considerations the team believes would make the program even better than it is currently. They are not intended to convey shortfalls in the program.
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