2. 40 CFR 145.22(a)(2) – Program Description

STATE OF ALASKA

ALASKA OIL AND GAS CONSERVATION COMMISSION

Underground Injection Control Program Description 40 CFR 145.23

Table of Contents

I. PROGRAM AUTHORITY AND SCOPE 3

II. OVERVIEW OF THE STATE UIC PROGRAM
(40 CFR 145.23(a)) 3

III. AOGCC ORGANIZATION AND STRUCTURE
(40 CFR 145.23(b) & (b)(1)) 5

IV. AOGCC STAFFING AND RESOURCES
(40 CFR 145.23(b) & (b)(1)) 7

V. ESTIMATED COSTS OF ESTABLISHING AND ADMINISTERING THE PROGRAM
(40 CFR 145.23(b)(2)) 8

VI. SOURCES AND AMOUNTS OF FUNDING
(40 CFR 145.23(b)(3)) 10

VII. PERMITTING, ADMINISTRATIVE, JUDICIAL PROCEDURES
(40 CFR 145.23(c)) 11

VIII. PERMIT DOCUMENTS
(40 CFR 145.23(d)) 20

IX. COMPLIANCE TRACKING AND ENFORCEMENT
(40 CFR 145.23(e)) 21

X. SCHEDULE FOR ISSUING PERMITS
(40 CFR 145.23(f)(1) & (2)) 22

XI. MECHANICAL INTEGRITY TESTING (MIT) REQUIREMENTS
(40 CFR 145.23(f)(3)) 22

XII. NEW PERMIT COMMUNICATION REQUIREMENTS
(40 CFR 145.23(f)(4)) 23

XIII. STATE UIC RULE
(40 CFR 145.23(f)(5)) 23

XIV. ENHANCED RECOVERY AND HYDROCARBON STORAGE COMPLIANCE PROGRAM
(40 CFR 145.23(f)(6)) 23

XV. STATE INJECTION WELL INVENTORY
(40 CFR 145.23(f)(7)) 24

XVI. USDW DESIGNATION, AQUIFER EXEMPTIONS AND INJECTION DEPTH WAIVERS
(40 CFR 145.23(f)(8) & (9) 25

XVII. NOTIFYING ADJACENT GOVERNMENTS – CLASS VI
(40 CFR 145.23(f)(13)) 26

XVIII. APPENDIX 27

I. PROGRAM AUTHORITY AND SCOPE

As mandated by the Safe Drinking Water Act (SDWA) of 1974 (as amended), the United States Environmental Protection Agency (EPA) has promulgated regulations establishing minimum requirements, technical criteria, and standards for State Underground Injection Control (UIC) programs to protect underground sources of drinking water (USDW). The SDWA charges EPA with the administration of the UIC program, including the promulgation of regulations and the authority to grant primacy to qualifying, individual states. Statutory authority for the UIC program can be found at 42 U.S.C. §300h *et seq*.

The Alaska Oil and Gas Conservation Commission (AOGCC) is submitting this program description as an element of an application to obtain primary enforcement authority (primacy) to administer the UIC Class VI program in the State of Alaska. To gain primacy for Class VI injection wells, the State of Alaska UIC program closely follows the federal UIC program and, as demonstrated in this submittal, is at least as stringent as the federal standards.

Alaska law was revised through ch. 2, SLA 23 (AS 31.05.030(h)) to direct the AOGCC to acquire primary enforcement responsibility for the control of underground injection in Class VI wells, and was further revised through ch. 23, SLA 24 to establish Alaska's carbon storage program through amendments to AS 38.05.700 - 38.05.795 (authority of the Alaska Department of Natural Resources to authorize carbon storage exploration and licensing) and to establish jurisdiction for the AOGCC to implement and oversee underground carbon storage (AS 41.06.105 - 41.06.210) The AOGCC adopted regulations through the Alaska Administrative Code (A.A.C., primarily Title 20, Chapter 25, Articles 400-1900) to implement Alaska's carbon storage program in a manner at least as stringent as federal law. State statutory authority to apply for Class VI primacy, adopt regulations, and charge fees is found in S 41.06.105, AS41.06.120, AS 41.06.125, and AS 41.06.160.

Any state that seeks primacy for the UIC program is required to submit a description of the program it proposes to administer in lieu of the federal program under state law, in accordance with 40 C.F.R. § 145.23. This program description (PD) aims to meet the delineated requirements of 40 C.F.R. § 145.23, as well as describe other necessary program details. Upon primacy, administration of the Class VI UIC program in Alaska will be implemented by AOGCC.

With the submission of this PD and the rest of Alaska's primacy application to EPA, AOGCC applies for primacy under 42 U.S.C. §300h-1 (Section 1422) for the SDWA-UIC Program, Class VI.

EPA will continue to directly implement all UIC programs, including Class VI, within Indian Country (as defined at 18 U.S.C. § 1151) within Alaska.

II. OVERVIEW OF THE STATE UIC PROGRAM (40 CFR 145.23(a))

Alaska's UIC program currently has primacy only for Class II injection wells. All other UIC well classes are directly implemented by the EPA. AOGCC is the lead agency for the Alaska UIC Program. Alaska's updated UIC program and regulations are designed to achieve Class VI primary

enforcement authority and allow AOGCC to regulate and enforce Class VI injection wells within the jurisdiction of the AOGCC.

Class VI UIC wells are geologic sequestration injection wells. Under Alaska law, the term "carbon storage" is used for "geologic sequestration" but has the same scope as the federal term. Class I, III, IV, and V injection wells are required to apply and receive a Permit to Drill (PTD) from AOGCC, but the injection operations are permitted in Alaska under the direct authority of EPA, specifically Region 10.

Class VI injection wells must be permitted. Upon submittal, each permit application will be reviewed for completeness. A preliminary decision to proceed with the development of a draft permit or a notice of intent to deny is then made. For applications moving on to the draft permit phase, a public notice will be issued allowing for 30 days of public comment The AOGCC will hold a public hearing on a completed permit application. Response to comments collected during the written comment period and the public hearing will be responded to along with the issuance of a final permit. Applications must include, but are not limited to, a technical evaluation, an area of review, a corrective action plan, a demonstration of financial responsibility, a demonstration of mechanical integrity, a contingency plan, a proposed testing and monitoring plan, a well plugging and abandonment plan, and an injection well operating plan.

The Alaska UIC Program does not apply to injection activities outside of the scope of the program, such as the underground injection of natural gas for purposes of storage, nor the underground injection of fluids or propping agents pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities, unless diesel fuels are used.

An aquifer, or portion thereof, may be proposed for exemption by AOGCC after public notice and opportunity for public hearing. AOGCC will submit the proposed aquifer exemption in writing to EPA. EPA will review aquifer exemption approval requests and may approve or deny in accordance with federal requirements. In accordance with 40 C.F.R. § 144.7(b)(3), an aquifer exemption identified under 40 C.F.R. § 146.4(b) is treated as a program revision under 40 C.F.R.§ 145.32 and becomes final upon approval by EPA (20 AAC 25.440(d)). An aquifer exemption identified under 40 C.F.R. § 146.4(c) shall become final if EPA has not disapproved the designation within 45 days of submittal, unless AOGCC and EPA agree that additional information is necessary for EPA's consideration of the proposed aquifer exemption. An expansion to the areal extent of an existing Class II aquifer exemption for a Class VI well is treated as a program revision under 40 C.F.R. § 145.32 and becomes final upon approval by EPA (implemented in 20 AAC 25.442(a)).

The issuance of a UIC permit and the denial or approval of an aquifer exemption are separate regulatory actions. If the injection activity is dependent on an aquifer exemption approval by EPA, AOGCC may issue the permit, but the permit will not be effective unless and until EPA approves the aquifer exemption. Therefore, injection, well construction, and any other activities requiring authorization will not be authorized unless and until EPA approves the aquifer exemption.

Alaska currently has zero (0) active Class VI injection wells. For Class VI injection wells

permitted by EPA prior to Alaska gaining Class VI primacy, AOGCC will begin administering the existing EPA Class VI UIC permits within Alaska state jurisdiction. At that time, AOGCC will modify the existing permits in a non- substantive manner for administerial purposes. Thereafter, AOGCC does not anticipate issuing many, if any, modifications or new facility permits during the first few years of the State UIC Program. However, there are a number of future opportunities related to Class VI carbon capture and sequestration that may increase the number of permits in the program.

III. AOGCC ORGANIZATION AND STRUCTURE (40 CFR 145.23(b) & (b)(1))

As was mentioned above, AOGCC will administer the Class II and Class VI UIC programs in the State of Alaska's jurisdiction. AOGCC is led by three commissioners: a Public Commissioner, a Petroleum Geology Commissioner, and a Petroleum Engineering Commissioner.

The AOGCC is an independent, quasi-judicial agency of the State of Alaska. It is established under the Alaska Oil and Gas Conservation Act (AS 31). Its regulatory authority is outlined in Title 20, Chapter 25 of the Alaska Administrative Code.

The AOGCC oversees oil and gas drilling, development and production, reservoir depletion, geothermal resources, and metering and inspection operations on all lands subject to the state's police powers.

The AOGCC acts to prevent waste, protect correlative rights, improve ultimate recovery and protect underground freshwater. It administers the Underground Injection Control (UIC) program for enhanced oil recovery and underground disposal of oil field waste in Alaska. It serves as an adjudicatory forum for resolving certain oil and gas disputes between owners, including the State. The AOGCC carries forth statutory mandates consistent with the protection of health, safety and the environment. It strives for cooperation with industry, while maintaining well-defined and essential regulatory requirements.

AOGCC senior staff will carry out most of the UIC duties required upon Class VI primacy and will be supported by AOGCC Commissioners, Alaska's Attorney General's Office (AGO), and staff of the Alaska Division of Natural Resources for long term monitoring.

A. Coverage of Programmatic Duties:

AOGCC staff currently has the capacity to take on the occasional and incidental duties Class VI primacy will bring without additional dedicated full-time-equated (FTE) employees or a portion thereof to the office. AOGCC can adjust this estimate at any time through contractors or program funding revisions.

Class VI UIC application reviews, issuance, general project oversight (including site characterization, modeling, well construction, well testing, risk analysis, review of operating, testing and monitoring data, injection well closure, and potential post-closure remediation determinations) and other appropriate duties will be conducted by existing AOGCC geologists, engineers, and technical specialists. AOGCC has in-house expertise and access to contractors with skills in the technical and policy areas relevant to evaluating

Class VI applications, issuing permits, and overseeing Geological Sequestration (GS) projects throughout their life span. The AOGCC process involves a team approach to permitting by assigning applications among staff with relevant areas of expertise. The table in Section IV below identifies the sources of this expertise. As required, third-party modelers and risk analysts will be engaged under contract. The AOGCC currently retains an independent expert in cement evaluation and well integrity, who is available for use in the evaluation and analysis of Class VI operations.

Class VI UIC duties are designed to be industry funded, as detailed in Section V below, and are represented as the "Carbon Engineering Assistant", "UIC Data Management", the "UIC Permit Specialist/Engineer", and the "UIC Permit Specialist/Geologist" roles in the "Class VI Annual Program Costs" table in Section V below. The "Carbon Engineering Assistant" role will be dedicated 1 FTE at a cost of $85,000 annually. The "UIC Data Management", "UIC Permit Specialist/Engineer", and "UIC Permit Specialist/Geologist" roles will be dedicated 0.25 FTE at a cost of $53,500 annually per role.

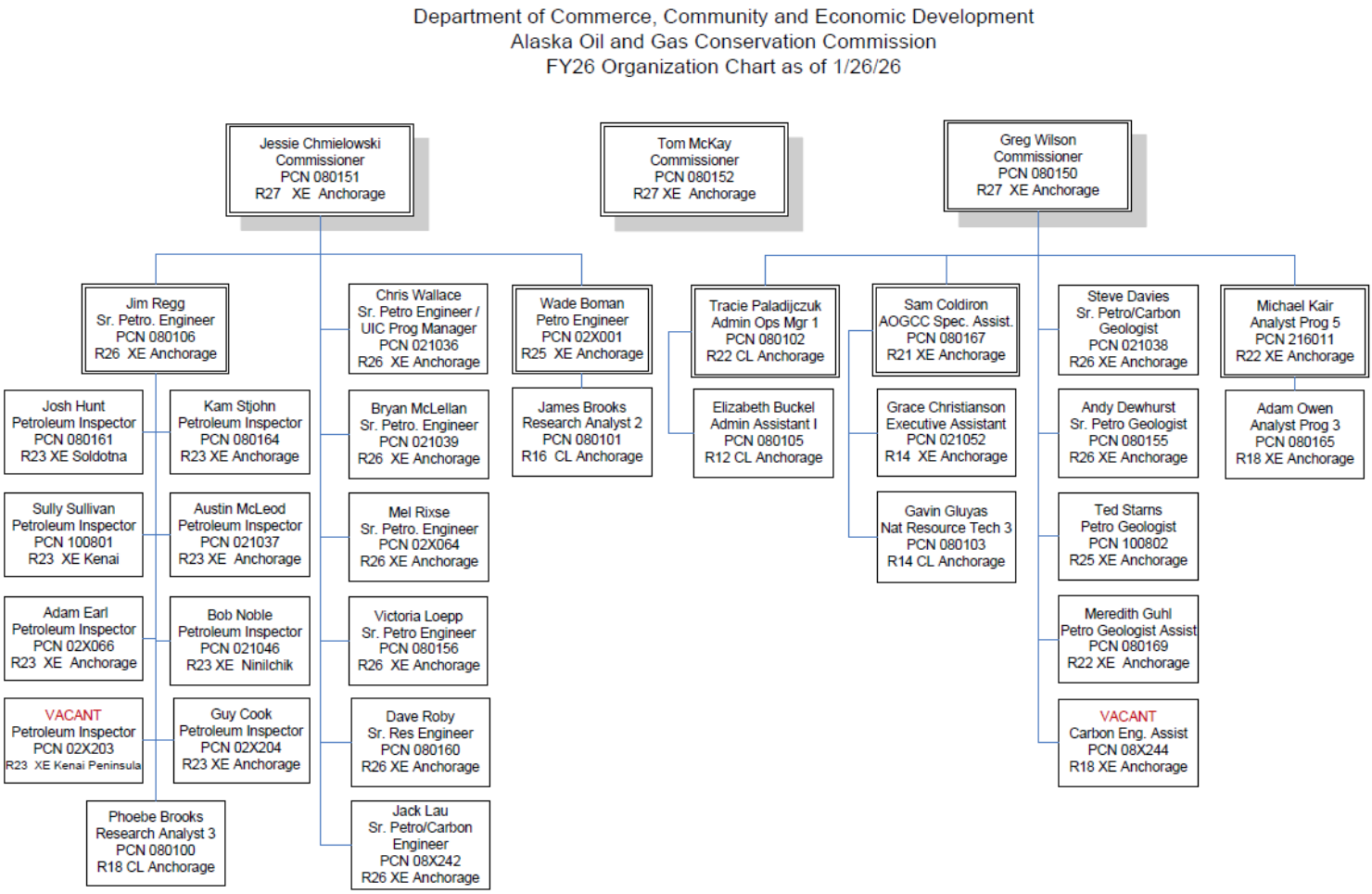
A Class VI applicant's financial assurance demonstration will be reviewed by AOGCC's staff. AOGCC has the ability to consult with expert staff of the Alaska Department of Revenue and to contract with consultants and experts in Class VI financial compliance.

The duties including overall UIC program administration, oversight, as well as policy matters, strategic planning, and budgeting, will be addressed by AOGCC's management and leadership teams which are represented as the "Leadership" role in the "Class VI Annual Program Costs" table in Section V below. The UIC "Leadership" role will be dedicated 0.15 FTE at a cost of $30,000 annually.

Specific regulatory issues will be addressed by the AOGCC's Commissioners, Assistant Attorney General, and technical staff in the "Legal, Compliance Assurance & Enforcement Support" role in the "Class VI Annual Program Costs" table in Section V below. The UIC "Legal, Compliance Assurance & Enforcement Support" role will be allocated $51,000 annually.

UIC inspections, compliance assistance, and compliance assurance will be conducted by AOGCC's Inspections Unit, comprised of AOGCC field inspectors, Inspection Supervisor, and Research Analyst. These duties are represented as the "UIC Inspections, Compliance, Enforcement" role in the "Class VI Annual Program Costs" table in Section V below. The "UIC Inspections, Compliance, Enforcement" role will be dedicated 1.00 FTE at a cost of $107,670 annually.

Class VI UIC enforcement will also be addressed by AOGCC's senior staff, with assistance from the AOGCC's Assistant Attorney General, and AOGCC Commissioners. These duties are represented as the "Legal, Compliance Assurance & Enforcement Support" role and the "Leadership" role in the "Class VI Annual Program Costs" table in Section V below.



IV. AOGCC STAFFING AND RESOURCES (40 CFR 145.23(b) & (b)(1))

The AOGCC's current UIC program is limited to Class II injection wells, and it is expected to gradually grow to include Class VI injection wells. Until a Class VI project develops, AOGCC will not add any FTE for the Class VI program. The AOGCC has calculated that 3.15 FTE as detailed in Section III(A) above, along with occasional and incidental assistance from the Alaska Assistant Attorney General dedicated to the AOGCC, will be sufficient to effectively carry out the duties of adding Class VI primacy to the existing UIC program. It should be noted that when the State UIC Class VI program adds permits, the program's revenue will increase due to its fee and revenue structure. This will allow AOGCC to dedicate more FTE to the UIC program as it grows.

Additionally, AOGCC has access to contractors if a need arises. If AOGCC determines capacity or resource is lacking in a particular area of expertise necessary to carry out the duties of the program, appropriately qualified contractors are available for AOGCC to acquire at that time. The table below identifies the sources of expertise AOGCC plans to utilize in administering the UIC program.

Expertise Area	In-House	Contractor
Site characterization, e.g., geologists, engineers, and log analysts/experts to review site characterization data submitted during permitting and throughout the project duration.	✓	✓
Modeling, e.g., geologists and reservoir modelers to evaluate area of review (AoR) delineation computational models during permitting and AoR re-evaluations.	✓	✓
Well construction and testing, e.g., well engineers, log analysts/experts, and geologists to review well construction information and operational reports on the performance of Class VI wells and review/evaluate testing and monitoring reports.	✓	✓
Finance experts to review financial responsibility information during permitting and annual evaluations of financial instruments[1].	✓	✓
Risk analysts to evaluate emergency and remedial response scenario probabilities and remediation cost estimates.		✓
Policy/regulatory experts on the UIC Program and the Class VI Rule to evaluate compliance with Class VI Rule requirements.	✓	
Enforcement/compliance, e.g., staff who can initiate and pursue appropriate enforcement actions when permit or rule requirements are violated.	✓	
Inspectors including well engineers or log analysts/experts to inspect wells or witness construction activities, workovers, and/or mechanical integrity tests.	✓	

V. ESTIMATED COSTS OF ESTABLISHING AND ADMINISTERING THE PROGRAM (40 CFR 145.23(b)(2))

All costs in this section refer exclusively to the Class VI program and do not include AOGCC Class II program administration costs. In the initial years after primacy, AOGCC estimates that $483,670.00 annually will cover the costs of running the Class VI UIC program. The program's initial sources of funding include billing for permitting and administrative services, annual fees from existing permits, billing for technical review, well installation fees, and the EPA Class VI primacy grant. As the program's size and needs change with time, revenues and allocations will be adjusted accordingly (*see* the program's fee and surcharge rules; 20 AAC 25.1290-1295).

Annual Program Costs and staff budget allocation are represented in the Annual Program Costs table below. For a description of the AOGCC staff who will carry out the Alaska Class VI program, including the number, occupations, and general duties of the employees, please *see* Section III(A) above.

[1] AOGCC will work with the Alaska Department of Revenue to review and approve financial compliance.

Class VI Annual Program Costs		
Role	Position	Cost
Administrative (Inventory, LTF, Fees, Billing)	Carbon Engineering Assistant (1.00 FTE)	$85,000.00
UIC Data Management	Sr Petroleum Engineer/UIC Program Manager (0.25 FTE)	$53,500.00
UIC Inspections, Compliance, Enforcement	AOGCC Petroleum Inspectors (1.0 FTE)	$107,670.00
UIC Permit Specialist / Engineer	Sr Petroleum /Carbon Engineer (0.25 FTE)	$53,500.00
UIC Permit Specialist / Geologist	Geologist (0.25 FTE)	$53,500.00
Legal, Compliance Assurance & Enforcement Support	Assistant Attorney General (0.25 FTE)	$51,000.00
Leadership	AOGCC Commissioner (0.15 FTE)	$30,000.00
Other Direct Costs		
Annual Staff Training	Technical Staff	$12,000.00
Staff Travel	Inspector	$7,500.00
Technical Assistance	Engineering / Modelling Consultants	$30,000.00
Total Cost		**$483,670.00**

Concerning the Class VI Annual Program Costs table above, the $12,000 "Annual Staff Training" allocation includes development and maintenance of training modules for AOGCC UIC staff training, staff time spent in training, as well as incidental staff attendance of virtual or in-person UIC-related conferences. The $7,500 "Staff Travel" allocation covers staff transportation for inspections and conferences.

While AOGCC anticipates the Class VI UIC program to grow in the future, the initial budget and allocations reflect the program's current size and a projection of its size in the first few years (significant growth is not expected). However, it should be noted that the fees associated with the UIC program in 20 AAC 25.1290-1295 were designed to generate funds as applications are received, allowing AOGCC to hire resources (both internally and externally) on an as-needed basis. If the need arises, AOGCC can hire from an established list of preferred professional service contractors or can hire outside of this list, should the need arise. Furthermore, AOGCC plans to adjust the budget and staff to align to the needs of the program on an ongoing basis.

VI. SOURCES AND AMOUNTS OF FUNDING (40 CFR 145.23(b)(3))

As was stated in the previous section, the estimated cost for establishing, administering and then maintaining the Alaska Class VI UIC program in its first two years is $967,340 ($483,670.00 annually). To meet these projected costs, the program will operate on a fee-for-service model.

AOGCC uses the term "fee-for-service" to mean the funding for the program will be industry generated through fees assessed to applicants and permittees of the program itself. Fees include fees associated with permitting, administrative and technical review by AOGCC staff, annual fees billed for area permits, per well permitting fees, and Class VI injection fees. There is currently not a State of Alaska legislative appropriation associated with the Class VI program, and any future legislative appropriation for the Class VI program would be subject to legislative approval. Additional funding for program administration and EPA reporting etc. is to be provided through the existing EPA Class VI primacy grant and future annual EPA Class VI grants.

The projected annual revenue from the aforementioned sources are represented in the table below:

Fees	**Annual Revenue**
Permitting & Administrative Fees	$88,150.00
Technical Review Fees	$156,260.00
Well Specific Permitting Fees	$59,260.00
Class VI Injection Fees	$220,000.00
Total Projected Revenue (Fees Only)	**$523,670.00**
Grant	**--**
EPA Primacy Grant	Up to $386,000.00
Total Projected Revenue (Fees + Grant)	**$909,670.00**

To meet the amount of funding necessary, AOGCC projects its program and fees will collect approximately $1,047,340 in the first two years which will comfortably cover the projected two-year cost of the program ($967,340) and allow for a reasonable margin of error. AOGCC has been awarded the UIC Class VI EPA grant of $1,930,000 over 5 years, $386,000 per year, ending September 30, 2029.

In the scenario where AOGCC receives zero Class VI applications, it will receive zero revenue from the Class VI regulated industry in the form of fees and surcharges. If the EPA grants are not sufficient to fully fund the Class VI UIC primacy program, the program would be re-evaluated and state funding, including legislative appropriations, could be considered.

Permitting and Administrative review by AOGCC staff includes tasks such as application review and management, issuing public notice, collecting public comment and facilitating public hearings, as well as AOGCC management and leadership review of draft permits. AOGCC estimates 2,600 hours of Permitting and Administration review annually in the initial years of the program. Review will be estimated and billed by the hour and includes tasks such as groundwater and injection well modeling review, well pre-construction, construction and completion review, aquifer review, monitoring proposal review and periodic report review. AOGCC estimates 3,900 hours of Technical Review in the initial years of the program. The AOGCC will utilize a fee structure under the Alaska UIC fee rules. AOGCC estimates zero to one Class VI well installation annually in the initial years of the program. EPA Region 10 is not currently processing any Class VI permit applications.

The permitting, administrative and technical review hourly rate fee will be calculated as actual state of Alaska fully loaded employee salary and fringe benefits, and include direct and indirect costs for AOGCC. AOGCC will issue an administrative order annually under 20 AAC 25.556 detailing the Class VI application fee structure and charges estimated for the program as specified in 20 AAC 25.1040, 20 AAC 25.1280, and 20 AAC 25.1290. The 20 AAC 25.1295 required injection surcharge will be included in the final permit issued under 20 AAC 25.1170 and will be adjusted annually.

Also, AOGCC will conduct reviews of its UIC budget, revenues, costs and allocations every year for the annual order. These reviews will ensure fees associated with the program and costs necessary to administer the program are reasonably balanced. In addition, these assessments will include consideration for the burden fees place on stakeholders.

VII. PERMITTING, ADMINISTRATIVE, JUDICIAL PROCEDURES (40 CFR 145.23(c))

A. Permitting

All permitting requirements in 40 CFR 145.11 are represented and required in state law through the Alaska Statutes or the Alaska Administrative Code (*see* the Attorney General's Statement component of Alaska's Primacy Application for more information).

As described in 20 AAC 25.444, which implements 40 CFR 144.19, an owner or operator that is injecting carbon dioxide shall apply for and obtain a storage facility permit under 20 AAC 25.1000 – 20 AAC 25.1900 when the primary purpose of injection is long-term carbon storage or there is an increased risk to underground sources of drinking water when compared to Class II operations.

The Class VI UIC storage facility application process will be initiated through a pre-application meeting under 20 AAC 25.1040 with the applicant in order to discuss proposed injection well(s), the site and the requirements for application submittal under 20 AAC 25.400-1900.

It should be noted that owners or operators of Class VI wells must submit all required reports, submittals, and notifications under Title 20, Chapter 25, Article 9 to AOGCC, and also to EPA through an electronic format approved by AOGCC and EPA (*see* 20 AAC 25.1610). At the time of this UIC Class VI primacy application submission, the approved electronic format for EPA submission is the Geologic Sequestration Data Tool (GSDT). AOGCC can receive submissions electronically via aogcc.permitting@alaska.gov or through an agreed file transfer protocol (FTP) site.

The storage facility application itself will follow Alaska's Class VI regulations and be comprised of administrative requirements and technical requirements. The administrative requirements section consists of general information gathering, such as the type of permit being applied for, the facility operator, the facility owner, the facility's land type and more (*see* 20 AAC 25.1080(a)(1)). The technical requirements of the application will consist of

a determination of the area of review (AoR), a facility and well map, an AoR map, a USDW map, lithologic maps of the local and regional area and more well class specific technical requirements which can be found in 20 AAC 25.1060, 20 AAC 25.1070 and 20 AAC 25.1080.

AOGCC's UIC permitting and regulatory process will include application submittal, administrative completeness review, substantive review, issuance of the draft permit, public notice, and final permit approval.

B. Application Review

The following steps will be taken when reviewing permit applications and issuing the final permit decision:

1. First, a storage operator seeking a permit for a storage facility shall request a preapplication meeting (20 AAC 25.1040).

2. In a preapplication meeting, the AOGCC staff and storage operator shall consider the prospective application, including the application fee under AS 41.06.120(c)(3), potential costs for application review identified in AS 41.06.120(c)(4), determination of storage reservoir capacity under AS 41.06.195, and determination of cost estimates for each phase of the proposed project under 20 AAC 25.1200, and may seek estimates of the cost of professional services required to prepare for and review the permit application. After the preapplication meeting, the AOGCC will prepare a phased application fee and schedule that sets out the fees the AOGCC determines under the criteria of AS 41.06.120(c)(3). This phased application fee will be finalized in cooperation with the storage operator, and the AOGCC may issue an order under 20 AAC 25.556 and 20 AAC 1040(c) that sets the phased application fee amount and schedule

3. Next, submittal of the application meeting the Storage facility permit application general requirements (20 AAC 25.1050) will occur electronically via aogcc.permitting@alaska.gov (prior to electronic forms) or through the FTP site established with access for the AOGCC and the applicant. Electronic submittal for Class VI wells will also occur through an EPA approved electronic format which is currently the Geologic Sequestration Data Tool (GSDT).
    a. The submittal package must also include the appropriate fee in accordance with 20 AAC 25.1290.

4. Next, an initial review of the application will be conducted in order to determine administrative completeness (20 AAC 25.1100).

5. Next, the substantive review process will determine if the proposed injection well(s) meet the requirements of the applicable rules (20 AAC 25.1000-1900).

6. If the reviewers identify any elements that may appear to be deficient with regard to an

applicable requirement, a request for additional information and a list of concerns and comments relevant to the application package will be prepared (20 AAC 25.1100).

a. If the applicant does not sufficiently respond to the request for additional information with the proper application information specified in 20 AAC 25.1000-1900, within a reasonable amount of time, the application will be denied and a denial letter will be issued to the applicant pursuant to 20 AAC 25.1150.
b. An administratively incomplete application does not rise to the level of a Draft Permit under 20 AAC 25.1100.

7. When all comments, information requests, and concerns have been satisfactorily addressed by the applicant, the AOGCC will tentatively decide whether to prepare a draft permit or to deny the application (20 AAC 25.1100).
    a. If the AOGCC decides to issue a draft permit, the applicant will be provided with the draft permit and the fact sheet and allowed reasonable time for informal comment prior to publicly noticing the draft permit and fact sheet.
    b. (*see* 20 AAC 25.1100(b) for application denial procedure)
    c. The AOGCC will notify in writing any affected state, tribe, or territory within the area of review identified under 20 AAC 25.1080(a)(20);(20 AAC 25.1080(b)).

8. Next, the AOGCC will give public notice that a draft permit has been prepared and allow 30 days for public comment (20 AAC 25.1150).
    a. If a hearing on amalgamating property interests is required under AS 41.06.140, the AOGCC will conduct a hearing in accordance with 20 AAC 25.540 (20 AAC 25.1085). The applicant must provide, as part of the permit application, a list of contacts for any affected state, tribe, or territory within the area of review (20 AAC 25.1080(a)(20)).
    b. Pursuant to 20 AAC 25.1150(c) which covers 40 CFR 124.10(c)(1)(i), (ii), and (iii) plus 40 CFR 145.11(a)(28). recipients of a copy of the public notice include:
        i. each mineral lessee, mineral owner, and mineral right owner of record within the storage reservoir and within one-half mile of the boundaries of the storage reservoir;
        ii. each surface owner of land overlying the storage reservoir and within one-half mile of the boundaries of the storage reservoir;
        iii. any additional persons that the AOGCC considers necessary;
        iv. the storage operator, applicant;
        v. the U.S. Environmental Protection Agency, Region 10, Drinking Water program;
        vi. the U.S. Environmental Protection Agency, Underground Injection Control Program;
        vii. the Alaska Department of Fish and Game;
        viii. the Alaska Department of Natural Resources;
        ix. the Alaska Historical Commission;
        x. the Office of History and Archeology within the Alaska Department of Natural Resources;

xi. the Alaska Department of Environmental Conservation;
xii. any affected States and Indian Tribes;
xiii. other appropriate governmental authorities, including any unit of local government having jurisdiction over the area covered by a proposed carbon storage project;
xiv. U.S. Army Corps of Engineers;
xv. federal and state agencies not listed above with jurisdiction over fish, shellfish, and wildlife resources and over coastal zone management plans;
xvi. persons on an area notice list developed by the AOGCC that includes persons who request in writing to be on the notice list, participants in past permit actions in the area of the proposed storage facility, and by notifying the public, through publication in newspaper of general circulation, or other written publication, of the opportunity to be on the notice list for an area proposed for carbon storage activities; and
xvii. any other federal or state agency, or tribe that the AOGCC knows has issued or is required to issue a permit for the same storage facility or carbon storage activity;

9. Thereafter, the AOGCC will respond to comments and issue a final Class VI well permit decision (20 AAC 25.1080). After a decision to issue a permit has been made, a package including the permit, a brief summary, an updated fact sheet, and a public notice announcement will be prepared for the AOGCC approval.
    a. In the event of permit denial, a letter stating the reasons for denial will be sent to the applicant (20 AAC 25.1150). The decision to deny the permit may be appealed through the appeals process under 20 AAC 25.1150 via a public hearing subject to the requirements of AS 41.06.125.

10. The AOGCC will notify in writing any affected state, tribe, or territory within the area of review identified under 20 AAC 25.1080(a)(20) and 20 AAC 25.1080(b)).

11. An approved permit is signed by the AOGCC, assigned an issuance date, an effective date, and an expiration date per 20 AAC 25.1160, if applicable.

12. New injection operations may not commence until well construction is complete, construction requirements are met, financial responsibility has been properly demonstrated, mechanical integrity has been demonstrated, and Approval to Inject has been granted by the AOGCC (20 AAC 25.1180).

C. Notes on Public Notice

1. For Class VI geologic storage facilities, public process and notice requirements are governed by 20 AAC 25.1000–1900. If required under AS 41.06.140 (amalgamating property interests), the AOGCC will conduct a hearing in accordance with 20 AAC 25.540 (20 AAC 25.1085).

2. As part of the permit application, the applicant must provide a list of contacts for any

affected state, tribe, or territory within the area of review (AoR) (20 AAC 25.1080(a)(20)).

3. The AOGCC will provide written notification to any affected state, tribe, or territory within the AoR identified in the application (20 AAC 25.1080(b)).

4. Notification under 20 AAC 25.1080(b) must be consistent with applicable federal requirements incorporated by reference, including 40 C.F.R. 145.23(f)(13), as applicable to the state UIC program.

D. Applicable Standards – National Primary Drinking Water Regulations Maintenance

A Class VI geologic storage facility may not allow the movement of fluids into an underground source of drinking water (USDW) if the presence of a contaminant may cause a violation of applicable drinking water standards. Compliance with applicable federal drinking water standards, including maximum contaminant levels (MCLs) established under 40 C.F.R. Part 141, are incorporated through the federal Class VI requirements through the AOGCC's adoption of federal UIC regulations for Class VI wells under 20 AAC 25.1000–1900.

Applicants must demonstrate, through site characterization, area of review (AoR) delineation, well construction, monitoring, and corrective action plans, that injection operations will not endanger USDWs (20 AAC 25.1070; 20 AAC 25.1080).

If federal drinking water standards are revised, those standards apply as incorporated by reference through the adopted federal regulations governing the Class VI program under 20 AAC 25.1000–1900.

E. Administrative and Judicial Procedures

1. Final Permit Decisions
    a. A final permit decision by AOGCC to grant, deny, modify, condition, or revoke a Class VI storage facility permit under 20 AAC 25.1000–1900 constitutes a final action of the AOGCC.
    b. Class VI permits are issued under the AOGCC's authority in AS 31.05 and more specifically AS 41.06.105 - 41.06.120, and the regulations adopted in 20 AAC 25, including the specific storage facility provisions of 20 AAC 25.1000–1900.

2. Administrative Reconsideration or Hearing Before the AOGCC
    a. A person directly and adversely affected by a final permit decision may request reconsideration or a hearing before the AOGCC in accordance with the AOGCC's adjudicatory authority under:
        i. AS 31.05.080 (hearings and investigations), and
        ii. AS 31.05.090 (judicial review of AOGCC decisions).
    b. If a hearing is required by statute, it will be conducted in accordance with 20 AAC 25.540, as referenced in 20 AAC 25.1085.

c. AOGCC proceedings are conducted in accordance with the Alaska Administrative Procedure Act, AS 44.62, to the extent applicable.

3. Judicial Review
    a. A final decision of the AOGCC is subject to judicial review in accordance with AS 31.05.090, and The Alaska Administrative Procedure Act (AS 44.62.560 - 44.62.570).
    b. Judicial review is taken to the Alaska Superior Court. The court reviews the administrative record developed before the AOGCC.

4. Effect of Appeal
    a. Unless otherwise ordered by the AOGCC or a court of competent jurisdiction, the filing of an administrative appeal or petition for judicial review does not automatically stay the effectiveness of a permit decision.

F. Data Management

AOGCC maintains an electronic document receiving system to accept electronic documents under the proposed UIC program sufficient to meet the requirements for a reporting system under an EPA-authorized state program pursuant to 40 CFR § 3.2000. Specifically, AOGCC will utilize a comprehensive data management program, to receive electronic documents in satisfaction of requirements under the UIC program, that is able to generate all data necessary with respect to such electronic documents including an enforceable copy of record (COR). The generated data, including the COR, meets all security, recordkeeping, and certification requirements of 40 CFR § 3.2000(b) Finally, the Alaska Attorney General's Office certifies that the State of Alaska has sufficient legal authority over enforcement of an electronic reporting system such that AOGCC's proposed data management program for UIC complies with the requirements of 40 CFR §3.2000(c) (*see* the Attorney General's Statement component of Alaska's Primacy Application for more information).

AOGCC has continued its progression toward a paperless office with tools like the Risk-Based Data Management System (RBDMS), Laserfiche, and more comprehensive electronic application and approvals. AOGCC has introduced an internal database application named Form Tracker that allows AOGCC staff and commissioners greater visibility in tracking the priority and status of the 10-401 Permit to Drill applications and the 10-403 Sundry Approvals as they progress through reviews and approvals. Specific to implementation of the UIC program, the public has access to non-confidential well records and all Orders through the AOGCC's website. Included are demonstration tutorials that guide an individual through accessing records. RBDMS also has proven to be an effective tool for AOGCC UIC inspections. The system is accessible by inspectors from their laptop computers with updates provided at least weekly. The AOGCC continues to enhance a MIT Tracking System using data in RBDMS to improve its ability to verify injection wells are tested on schedule and to the proper test pressure, and to track wells requiring increased monitoring.

G. Step-by-Step Procedure to Permit a Class VI Well

1. Confirm a Storage Facility Permit is Required
    a. A storage facility permit is required before constructing or operating a Class VI well (20 AAC 25.1020(a), (b)).
    b. No construction may begin before the permit is issued (20 AAC 25.1020(b)).
    c. Class VI wells cannot be authorized by rule and cannot be permitted as area permits (20 AAC 25.1020(a), (f)).
    d. Ensure injection will not allow movement of fluids into USDWs (20 AAC 25.1010(a)).

2. Demonstrate Proper Site Selection
    a. The operator must demonstrate the site meets minimum geologic criteria:
    b. Suitable injection zone (adequate thickness, porosity, permeability, areal extent) (20 AAC 25.1060(a)(1)).
    c. Confining zone free of transmissive faults/fractures and capable of containment (20 AAC 25.1060(a)(2)).
    d. Additional zones may be required for containment and monitoring (20 AAC 25.1060(b)).

3. Delineate the Area of Review (AoR) and Prepare Corrective Action Plan
    a. Before submitting the permit:
        i. Delineate the AoR using computational modeling (20 AAC 25.1070(a)).
        ii. Prepare an AoR and corrective action plan (20 AAC 25.1070(b)).
        iii. Include:
            1. Modeling method and assumptions (20 AAC 25.1070(b)(1)).
            2. Reevaluation frequency (not to exceed 5 years) (20 AAC 25.1070(b)(2)(A)).
            3. Conditions triggering early reevaluation (20 AAC 25.1070(b)(2)(B)).
            4. Corrective action procedures and phasing (20 AAC 25.1070(b)(2)(D)).
        iv. Identify all wells in the AoR that penetrate the injection or confining zone (20 AAC 25.1080(a)(4)).

4. Prepare the Storage Facility Permit Application
    a. Submit required information under 20 AAC 25.1080, including:
    b. Required Core Application Elements
    c. Federal permit application information (40 CFR 144.31 incorporated by reference) (20 AAC 25.1080(a)(1)).
    d. AoR map showing wells, USDWs, faults, surface features, etc. (20 AAC 25.1080(a)(2)).
    e. Detailed geologic and hydrogeologic information (20 AAC 25.1080(a)(3)).
    f. Well tabulation within AoR (20 AAC 25.1080(a)(4)).
    g. USDW mapping and stratigraphic cross sections (20 AAC 25.1080(a)(5)).

h. Baseline geochemical data (20 AAC 25.1080(a)(6)).
i. Proposed operating data (rates, pressures, CO_2 source and composition) (20 AAC 25.1080(a)(7)).
j. Pre-operational formation testing program (20 AAC 25.1080(a)(8)).
k. Stimulation program (if applicable) (20 AAC 25.1080(a)(9)).
l. Well construction procedures (20 AAC 25.1080(a)(12); 20 AAC 25.1210).
m. Testing and monitoring plan (20 AAC 25.1080(a)(15); 20 AAC 25.1250).
n. Plugging plan (20 AAC 25.1080(a)(16); 20 AAC 25.1300).
o. Post-injection site care and site closure plan (20 AAC 25.1080(a)(17); 20 AAC 25.1310).
p. Emergency and remedial response plan (20 AAC 25.1080(a)(19); 20 AAC 25.1260).
q. List of affected states, tribes, or territories within AoR (20 AAC 25.1080(a)(20)).
r. The AOGCC will notify affected jurisdictions (20 AAC 25.1080(b)).

5. Demonstrate Financial Responsibility (20 AAC 25.1200)
    a. Before permit issuance, the operator must demonstrate financial responsibility sufficient to address endangerment of underground sources of drinking water and to cover the cost (20 AAC 25.1200 (b); 20 AAC 25.1080 (a)(14) of :
        i. Corrective action (20 AAC 25.1200(b)(1); 20 AAC 25.1070).
        ii. Plugging (20 AAC 25.1200(2); 20 AAC 25.1300).
        iii. Post-injection site care and closure (20 AAC 25.1200(b)(3); 20 AAC 25.1310).
        iv. Emergency and remedial response (20 AAC 25.1200(4); 20 AAC 25.1260).
    b. Financial Requirements Include:
        i. Detailed third-party cost estimates (20 AAC 25.1200(n)).
        ii. AOGCC approval of financial instruments (20 AAC 25.1200(f)).
        iii. Acceptable instruments (trust fund, surety bond, letter of credit, escrow, insurance, etc.) (20 AAC 25.1200(g)).
        iv. Ongoing annual updates and inflation adjustments (20 AAC 25.1200(o)).
        v. Maintenance of financial responsibility until certificate of completion (20 AAC 25.1200(*l)*; 20 AAC 25.1320).

6. AOGCC Review Prior to Construction Approval
    a. Before authorizing operation, the AOGCC will review:
        i. Final AoR based on logging and testing data (20 AAC 25.1080(c)(1)).
        ii. Updates to geologic data (20 AAC 25.1080(c)(2)).
        iii. Compatibility of CO_2 stream with formation and well materials (20 AAC 25.1080(c)(3)).
        iv. Formation testing results (20 AAC 25.1080(c)(4)).
        v. Final construction procedures (20 AAC 25.1080(c)(5); 20 AAC 25.1210).
        vi. Status of corrective action (20 AAC 25.1080(c)(6)).

vii. Logging and testing data (20 AAC 25.1080(c)(7); 20 AAC 25.1220).
viii. Demonstration of mechanical integrity (20 AAC 25.1080(c)(8); 20 AAC 25.1240).

7. Construct Well in Compliance with Class VI Standards
    a. Well must:
        i. Prevent fluid movement into USDWs (20 AAC 25.1210(a)(1)).
        ii. Allow testing and workover (20 AAC 25.1210(a)(2)).
        iii. Allow continuous annulus monitoring (20 AAC 25.1210(a)(3)).
        iv. Use casing and cement designed for life of facility (20 AAC 25.1210(b)).

8. Obtain Authorization to Inject
    a. Injection may begin only after:
        i. AOGCC review of logging/testing results (20 AAC 25.1080(c)(7)).
        ii. Mechanical integrity demonstration (20 AAC 25.1080(c)(8)).
        iii. Corrective action status acceptable (20 AAC 25.1080(c)(6)).
        iv. All required plans finalized and incorporated.

9. Ongoing Obligations After Permit Issuance
    a. During operations, the operator must:
        i. Reevaluate AoR at least every 5 years or sooner if triggered (20 AAC 25.1070(b)(2)).
        ii. Maintain financial responsibility (20 AAC 25.1200(l)).
        iii. Adjust cost estimates annually and after plan modifications (20 AAC 25.1200(o), (p)).
        iv. Notify AOGCC of bankruptcy or adverse financial conditions (20 AAC 25.1200(q)).
        v. Comply with emergency action requirements (20 AAC 25.1010(b), (c)).
        vi. Comply with testing and monitoring requirements (20 AAC 25.1250**).**

10. Summary Permit Flow:
    a. Confirm permit required (20 AAC 25.1020)
    b. Demonstrate suitable geologic site (20 AAC 25.1060)
    c. Delineate AoR and plan corrective action (20 AAC 25.1070)
    d. Submit complete permit application (20 AAC 25.1080)
    e. Demonstrate financial responsibility (20 AAC 25.1200)
    f. AOGCC review of testing/logging and MI (20 AAC 25.1080(c))
    g. Construct well per Class VI standards (20 AAC 25.1210)
    h. Obtain authorization to inject (20 AAC 25.1180(d)(2)
    i. Maintain compliance throughout project life

VIII. PERMIT DOCUMENTS (40 CFR 145.23(d))

A. Applications

AOGCC maintains electronic application forms for Class VI permits and are provided in Appendix A-1. The applicant shall submit an original Permit Application.

Documents shall be submitted using an AOGCC and EPA-approved electronic format.

B. Permits

AOGCC maintains electronic Permit templates for Class VI and are provided in Appendix A-2.

C. Reporting

AOGCC will use existing EPA 7520 and inventory forms for reporting purposes. UIC permitting and compliance/inspection data collected through forms 7520-1, -2A, -2B, -3, and -4 and annual well inventory will be reported to EPA via the UIC Data Application (https://uicdata.epa.gov/). The 7520 forms are important informational documents covering Alaska UIC Program activities such as permit review, issuance, compliance, and inspections. The Alaska UIC Program will submit the 7520 form data to EPA Region 10 biannually in accordance with the schedule below. The 7520 forms and instructions are available at EPA's UIC website, https://www.epa.gov/uic/underground- injection-control-reporting-forms-state-summary-information.

Reporting Requirements	Midyear (Second Quarter) Forms (7520 -2A, -2B, -4)	End of Year (Fourth Quarter) Forms (7520-1, -2A, -2B, -3, -4, inventory)
Reporting Period	October 1 – March 30	April 1 – September 30
Final Submittal to EPA UIC Data Application	May 15	November 15

IX. COMPLIANCE TRACKING AND ENFORCEMENT (40 CFR 145.23(e))

A. Compliance Monitoring

Compliance monitoring will, at a minimum, include on-site inspections conducted by AOGCC's Petroleum Inspectors and a review of operating and monitoring reports submitted in compliance with permit requirements and the applicable Class VI UIC rules in Title 20, Chapter 25, Article 9 Carbon Storage of the Alaska Administrative Code to verify that the construction, completion, operation, maintenance, and site closure of permitted facilities are performed according to approved plans and specifications and meet all permit and regulatory requirements.

The state's compliance monitoring program includes the following activities:

- Reviewing plans and reports (e.g., well completion reports, test results, workover reports) submitted by permit applicants or owners or operators.
- Conducting site inspections to verify or witness construction, operation and testing/maintenance procedures. Site inspections will be conducted by AOGCC's petroleum inspectors and will be followed by the issuance of an inspection report on the facility's compliance status with applicable state law and the UIC program.
- Investigating complaints alleging improper construction, completion, operation or maintenance of a UIC project.
- Performing compliance monitoring (e.g., reviewing monitoring, operating and maintenance data) to verify compliance with permit conditions, regulations and any other conditions or stipulations.
- Conducting annual inspections and compliance follow-up inspections of permitted facilities.

AOGCC shall submit to the EPA quarterly non-compliance reports as specified in 40 CFR § 144.8(a). Reports will be submitted in accordance with the following schedule (or as otherwise specified in AOGCC's MOA or Class VI Award - Terms and Conditions):

- January, February, March – due May 31
- April, May, June – due August 31
- July, August, September – due November 30
- October, November, December – due February 28

Annual reports shall be for the calendar year ending December 31, with reports completed and available to the public no more than 60 days later.

B. Enforcement Procedures

Any person violating applicable Alaska Revised Statutes, Alaska Administrative Code, or any condition of a UIC permit, or any rule or order of AOGCC is subject to enforcement action. The agency is responsible for initiating, pursuing and resolving enforcement actions. Enforcement proceedings may result in modification, revocation or suspension of any permit issued under authority of the UIC Program.

The AOGCC will handle minor UIC program violations in accordance with 20 AAC 25.1650. A penalty or other enforcement action under 20 AAC 25.1000 - 1900 shall be governed by the process set out in 20 AAC 25.535. Tools for handling minor violations include, correspondence between AOGCC staff and the alleged violator and issuance of a Notice of Investigation (NOI), or a Notice of Violation (NOV). 20 AAC 25.535 sets out how the AOGCC determines that a violation exists, issues notices of violation, requires compliance through orders, assesses civil penalties, and conducts hearings and appeals.

AOGCC staff use a database to electronically track all NOIs, NOVs, Compliance Orders, Enforcement Orders, and AGO referrals.

The Class VI regulations include strong protections for communities to prevent

contamination of underground drinking water sources (USDWs). These regulatory protections include a variety of measures, including proper site characterization and strict construction, operating, and monitoring requirements to ensure well and formation integrity, proper plugging of wells, and long-term project management and post-injection site care to ensure leakage prevention. AOGCC will properly implement and enforce these requirements to protect communities from potential harms associated with injection wells. AOGCC will make reports of enforcement activities accessible to the public.

X. SCHEDULE FOR ISSUING PERMITS (40 CFR 145.23(f)(1) & (2))

The land within the state of Alaska under state jurisdiction has a total of zero (0) existing federally issued Class VI UIC permits, and zero in processing by EPA Region 10.

The AOGCC does not anticipate issuing any new Class VI permits in the near future and therefore has not drafted a priority schedule for permit issuance.

XI. MECHANICAL INTEGRITY TESTING (MIT) REQUIREMENTS (40 CFR 145.23(f)(3))

A. MIT Implementation Table

Well Class	Internal MIT	External MIT
VI	Initial and continuous monitoring as described in Section B below.	Annual

B. MIT Implementation

Permittees shall conduct Mechanical Integrity Testing (MIT) to demonstrate that there is no significant leak in the casing, tubing, or packer; and there is no significant fluid movement into an USDW through channels adjacent to the well bore. To evaluate the absence of significant leaks the operator will, following an initial annulus pressure test, continuously monitor injection pressure, rate, injected volumes, pressure on the annulus between tubing and long-string casing, and annulus fluid volume. Reports of the data and other pertinent information must be submitted to AOGCC in accordance with the regulations and the authorizing permit. UIC Permit conditions may require additional internal and/or external MITs if routine well monitoring indicates significant fluid movement within the well annulus or into the surrounding formation. As per 20 AAC 25.1240(d), AOGCC may require the operator to run a casing inspection log (to determine the presence or absence of corrosion) at a frequency specified in the testing and monitoring plan at 20 AAC 25.1250.

Class VI MIT includes annual external MIT. Tracer surveys, temperature or noise logs will also be performed annually for Class VI wells to determine the absence of significant fluid movement.

Acceptable methods for determining mechanical integrity are specified in 20 AAC 25.1240 or as specified in the UIC Permit. The Permittee must provide at least 24 hours advance

notice of the intent to conduct a MIT, and it is the intent of AOGCC to routinely witness testing. AOGCC will continue to conduct routine inspections that include witnessing well control testing, workover testing, well abandonment, review of reports (well completion and operations), investigating complaints, and observing MIT.

XII. NEW PERMIT COMMUNICATION REQUIREMENTS (40 CFR 145.23(f)(4))

AOGCC is not aware of any Class VI UIC facilities located within the state of Alaska under EPA or state jurisdiction, therefore there will not be any transfer of Class VI permits in Alaska.

XIII. STATE UIC RULE (40 CFR 145.23(f)(5))

AOGCC adopted regulations to implement the UIC program for Class VI, with most Class VI specific requirements in 20 AAC 25.435; 20 AAC 25.442; 20 AAC 25.444; and 20 AAC 25.1000 - 1900. These regulations will be effective April 18, 2026.

XIV. ENHANCED RECOVERY AND HYDROCARBON STORAGE COMPLIANCE PROGRAM (40 CFR 145.23(f)(6))

AOGGC currently has primacy over UIC Class II wells permitted in Alaska's state jurisdiction. Class II-R (enhanced recovery) wells are utilized for the injection of fluids (including brine, freshwater, steam, polymers, and carbon dioxide) into petroleum bearing formations for the purpose of enhanced recovery operations.
Class II-D (disposal or saltwater disposal) wells are utilized for the disposal of fluids associated with the production of oil and natural gas and are authorized by AOGCC under 20 AAC 25.252.
Class II-H (hydrocarbon storage) wells store hydrocarbons that are liquid at standard temperature and pressure. There are currently no UIC Class II hydrocarbon storage wells in the state of Alaska. Natural gas storage wells do not fall under the jurisdiction of the UIC Program and are regulated and authorized by AOGCC under 20 AAC 25.252.

All Class II wells shall be constructed per the requirements specified in 20 AAC 25.030 and 20 AAC 25.412. The operator is required to monitor and report the injection pressure, flow rate, and cumulative volume monthly and annually for enhanced recovery and hydrocarbon storage wells in accordance with 20 AAC 25.430 and 20 AAC 25.432.

As required in 20 AAC 25.025, the operator shall assume full financial responsibility to close, plug, and abandon all enhanced recovery and hydrocarbon storage wells. The permittee shall demonstrate financial assurance to AOGCC by the submission of a surety bond, or other financial assurances, such as a financial statement.

AOGCC is not proposing to authorize by rule any existing enhanced recovery or hydrocarbon storage wells.

XV. STATE INJECTION WELL INVENTORY (40 CFR 145.23(f)(7))

The table below represents the number of UIC facilities, the injection well classes, and the number

of issued permits for UIC wells under AOGCC or EPA jurisdiction. The numbers are current as of March 25, 2026. For context, AOGCC manages an additional 4,011 active wells that are not within the UIC program as they are primarily oil and/or gas producing wells.

AOGCC has an electronic Risk Based Data Management System (RBDMS) database that was established in order to manage permitted injection wells and inventory wells that are authorized for injection. Please reference Section VII – Subsection H – Data Management, above.

Injection Well Class (Authority)	UIC Regulated Facilities	Number of Issued Permits	Number of Wells
I (EPA)	21	21	23
II-R (Enhanced Recovery) (AOGCC)	46	46	1638
II-D (disposal) (AOGCC)	47	47	50
II-H (hydrocarbon storage) (AOGCC)	0	0	0
VI	0	0	0

XVI. USDW DESIGNATION, AQUIFER EXEMPTIONS AND INJECTION DEPTH WAIVERS (40 CFR 145.23(f)(8) & (9))

A. USDW Designations

AOGCC will make USDW determinations for each UIC application. Applications will require a written narrative describing the hydrogeology of each aquifer such as the lithology and the geologic structure (joints, faults, folds, strike, and dip). The description should include the hydrology of the aquifer such as hydraulic conductivity, saturated thickness, observed yields, and groundwater flow directions. A generalized discussion of hydrocarbon, mineral or geothermal potential in the state should also be included in the narrative. Groundwater quality of each aquifer including tabulation of average range of major ions, Total Dissolved Solids (TDS), and trace metal concentrations, and all supporting materials (including references) should be provided in the description.

B. Aquifer Exemptions

Please reference rules 20 AAC 25.435, 20 AAC 25.440, and 20 AAC 25.442 for aquifer exemptions (AEs).

As described in 20 AAC 25.435, other than an approved aquifer exemption expansion that meets the criteria under 20 AAC 25.442 (d), new aquifer exemptions shall not be issued for a Class VI well.

When a request for an AE is made by an applicant or a permittee, AOGCC will consult

with EPA as soon as is reasonably possible. These early discussions will serve to identify potential technical or legal issues that may require additional consideration prior to submitting an AOGCC-proposed AE to EPA. In addition to procedures for AEs in 20 AAC 25.435, 20 AAC 25.440, and 20 AAC 25.442, AOGCC will use the Aquifer Exemption Checklist in compiling necessary information to determine the eligibility of an aquifer for exemption (*see* Appendix A-3).

As described in 20 AAC 25.435 and 20 AAC 25.990, all USDWs which have not been exempted, are protected as such. Issuances, modifications, or revocations and reissuances of permits that necessitate new AEs or enlargements of a previously approved AE proposed by AOGCC are not final until approved by EPA, except those that meet the criteria in 20 AAC 25.440, which become final if EPA has not disapproved the proposed designation within 45 days. The state will utilize an AE checklist in Appendix A-3, as a guide for reviewing AE requests and will submit the checklist for EPA's review when seeking approval of the proposed AE. For approval of an AE, the EPA must determine that the state has demonstrated the aquifer or the portion of the aquifer identified as exempt does not serve as a source of drinking water per the regulatory criteria in 40 CFR 146.4. EPA shall document all reasons and factors considered in a Statement of Basis or decision memorandum regarding the final AE decision. The Statement of Basis should include explanations of the factual, technical, and legal bases for the determination.

As described in 20 AAC 25.442, which implements 40 CFR §144.7(d), an owner or operator of Class II enhanced recovery operation under 20 AAC 25.402 may request that the AOGCC approve an expansion to the areal extent of an aquifer exemption already in place for a Class II enhanced oil or enhanced gas recovery well under 20 AAC 25.440 for the exclusive purpose of Class VI well injection for carbon storage. A request under this section will be treated as a substantial revision to the approved state underground injection control program under 40 C.F.R. 145.32 and will not be final until approved by the United States Environmental Protection Agency.

The issuance of a UIC permit and the approval or denial of an AE are separate regulatory actions. If the operation of a UIC facility in a UIC permit is dependent on EPA's approval of an AE or AE expansion, AOGCC may issue the permit under the condition that injection is not authorized until the AE is approved by EPA.

C. EPA Approved Aquifer Exemptions

EPA has issued determinations of no USDW's in Alaska for Class I, as well as issued Class II AE during Class II primacy rule codification at:
https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-147/subpart-C/section-147.102

AOGCC has issued AE for Class II after primacy, and also issued AE for gas storage operations (not UIC), AOGCC issued AE's are available on AOGCC's website at: http://aogweb.state.ak.us/WebLinkSearch

EPA has an aquifer exemptions mapping application available at:
https://www.epa.gov/uic/aquifer-exemptions-mapthat

D. Class VI Injection Depth Waivers

Class VI Carbon Sequestration wells are typically required to inject below the lowermost USDW. 20 AAC 25.1270 allows an applicant to request a waiver of the injection depth requirement upon concurrence from EPA. The issuance of a Class VI UIC permit and the written concurrence or non-concurrence of an injection depth waiver (IDW) are separate regulatory actions. If the operation of a Class VI UIC facility in a UIC permit is dependent on EPA's written concurrence with a proposed IDW, AOGCC may issue the permit under the condition that injection is not authorized until written concurrence has been made by EPA.

XVII. NOTIFYING ADJACENT GOVERNMENTS – CLASS VI (40 CFR 145.23(f)(13))

After an application for a Class VI well is submitted to AOGCC and EPA via the Geologic Sequestration Data Tool (GSDT) and is deemed administratively complete per 20 AAC 25.1100, AOGCC staff will begin the substantive review of the application. If AOGCC staff determine during the substantive review that the area of review (AoR) crosses State, Tribal, or International boundaries e.g. Canada, resulting in the need for trans-boundary coordination related to an injection operation, AOGCC will notify in writing an appropriate representative of the affected entity. AOGCC's authority, as stated at AS 41.06.110, applies to all land in the state lawfully subject to its police powers, including land of the United States and land subject to the jurisdiction of the United States. Alaska lands generally include all land between the mean high tide line and three miles offshore of the mean low tideline. EPA will continue to directly implement all UIC programs, including Class VI, within Indian Country (as defined at 18 U.S.C. § 1151) within Alaska.

XVIII. APPENDIX

A-1: Application Forms

- Alaska UIC Class VI Permit Application Template
- 10-401 Class VI Permit to Drill
- 10-403 Class VI Sundry Application
- 10-404 Class VI Sundry Report
- 10-407 Class VI Completion Report
- 10-426 MIT Form

A-2: Permit Template

- Alaska UIC Class VI Permit Template

A-3: Aquifer Exemption Checklist

A-4 EPA GST Templates

- Area of Review and Corrective Action Plan
- Class VI Permit Application Narrative
- Construction Details
- Emergency and Remedial Response Plan
- Financial Assurance Demonstration
- Post-Injection Site Care and Site Closure Plan
- Injection Well Plugging Plan
- Class VI Pre-Operation Narrative
- Pre-Operational Testing Program
- Quality Assurance and Surveillance Plan
- Stimulation Program
- Operating and Reporting Conditions
- Testing and Monitoring Plan

Program Description Appendices

Appendix A-1 – Application Forms

Application Form Class VI

STATE OF ALASKA

UNDERGROUND INJECTION CONTROL PROGRAM

CLASS VI INJECTION WELL PERMIT APPLICATION

Last Revised: 2026

TABLE OF CONTENTS

General Instructions		5
Procedural Information		6
Class VI Injection Well Permit Application		8
Alaska UIC Class VI Permit Application Outline		11
Part A	Determination of Area of Review (AOR)	11
Part B	Permit Application Maps	12
Part C	Table of Artificial Penetration Data	17
Part D	Corrective Action Plan	17
Part E	Formation Testing Program	17
Part F	Well Stimulation Program	17
Part G	Injection Well Construction Plan	18
Part H	Injection Well Construction Details	18
Part I	Injection Well Operation Plan and Procedures	18
Part J	Monitoring, Recording, and Reporting Plan	18
Part K	Emergency and Remedial Response Plan	19
Part L	Plugging and Abandonment Plan	20
Part M	Financial Responsibility	20
Part N	Site Care and Closure Plan	21
Part O	Injection Depth Waiver	21
Part P	Aquifer Exemption	24

GENERAL INSTRUCTIONS

The Alaska Underground Injection Control (UIC) Alaska Administrative Code (A.A.C. Title 20 Chapter 25 Article 9) regulate the injection of carbon dioxide for geologic storage. The following instructions outline the procedures, documents, and information needed for a Class VI injection well permit application.

Alaska Oil and Gas Conservation Commission (AOGCC) recommends that applicants consult EPA's Class VI permit application templates at https://www.epa.gov/uic/class-vi-permit-application-templates for recommendations and considerations on how to develop the various components of the application. Current EPA provided Application Narrative templates are:

- Class VI Permit Application Narrative
- Class VI Pre-Operation Narrative

Current EPA provided Application Attachment templates are:

- Summary of Requirements
- Area Of Review and Corrective Action Plan
- Testing and Monitoring Plan
- Quality Assurance and Surveillance Plan (QSAP)
- Plugging Plan
- Post-injection Site Care (PISC) and Site Closure Plan
- Emergency and Remedial Response Plan
- Construction Details
- Pre-operational Testing Program
- Financial Assurance Demonstration
- Stimulation Program

The applicant shall submit an original Class VI Injection Well Permit Application (this form), and the EPA provided templates (as above) and, as applicable, a Permit to Drill (Form 10-401) or Application for Sundry Approvals (Form 10-403). AOGCC forms are available at https://www.commerce.alaska.gov/web/aogcc/Forms

All documents shall be submitted electronically through AOGCC's permitting email at aogcc.permitting@alaska.gov and through EPA's established Geologic Sequestration Data Tool (GSDT) at https://gsdt.pnnl.gov .

If the required reports cannot be submitted, or require further documentation that cannot be submitted on the GSDT portal, then submit items to aogcc.permitting@alaska.gov.

Telephone inquiries: (907) 279-1433
Email inquiries: aogcc.permitting@alaska.gov

1. Confidential Business Information (CBI): The information provided in the permit application must be of sufficient detail to allow AOGCC to make informed decisions in setting permit conditions. However, if the submitted documents, or portions thereof, are considered confidential, the applicant must follow appropriate procedures in requesting CBI status for those documents, or portions thereof, as detailed in the Alaska Public Records Act, AS 40.25.100 – AS 40.25.295 and regulation 20 AAC 25.1600.

   According to the Law, any person who provides to a governmental entity a record that the person believes should be protected as business confidential shall provide with the record a written claim of business confidentiality and a concise statement of reasons supporting the claim of business confidentiality. When the records in question relate to a program for which the State has been delegated primacy, as is the case for the UIC Program, the standards of the Freedom of Information Act, 5 U.S.C. Section 552 (FOIA) shall apply. Furthermore, the regulation of the U.S. Environmental Protection Agency interpreting FOIA as it appears at 40 CFR Part 2 (1992 version) shall also apply. Since permit applications are published during the public comment period, the applicant should provide an approved redacted copy of the permit application and the accompanying technical report.

2. Signature on Application: The person who signs the application form will often be the applicant; when another person signs on behalf of the applicant, his/her title or relationship to the applicant should be shown in the space provided. In all cases, the person signing the form should be authorized to do so by the applicant. An application submitted by a corporation must be signed by a responsible corporate officer or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the activity described in the form originates. In the case of a partnership or a sole proprietorship, the application must be signed by a general partner or the proprietor, respectively. In the case of a municipal, state, federal or other public facility, the application must be signed by either a principal executive officer, ranking elected official or other duly authorized employee. The AOGCC shall require a person signing an application on behalf of an applicant to provide proof of authorization (20 AAC 25.1030; 40 CFR Part 144.32).

3. An application will not be processed until all information required to properly review the application has been obtained. When an application is severely lacking in detail or the applicant fails to submit additionally requested information in a timely manner, the application may be returned.

PROCEDURAL INFORMATION

The staff will review the application for completeness. During the completeness review, the applicant may be contacted for clarification or additional information. When all pertinent information is present, a notice that an application has been received may be given to other state agencies and local governmental entities interested in water quality control and industrial waste management. A preliminary draft permit will be prepared by the AOGCC and transmitted to the applicant for review. Comments from the applicant may result in changes to the draft permit, after concurrence by the AOGCC. The draft permit will be subjected to a 30-day public comment period. A public hearing may be requested. In either case, a notice will be provided to inform the public that a draft permit has been prepared.

Requirements for the public notice include:

1. That a public notice be published for each draft permit, major permit modification, or permit renewal that has been prepared. The notice will appear within each county where the proposed facility or discharge is located and each county affected by the discharge.
2. The AOGCC will mail notice of the application to affected persons and certain governmental entities.

A public hearing will be scheduled regarding an application when requested by the AOGCC, the applicant, or any affected person within thirty (30) days following newspaper publication.

AOGCC may act upon a permit application, a draft permit, a major permit modification, or renewal of a permit without holding a public hearing when:

1. Adequate public notice and comment period has been provided, including:
   (a) notice of the application has been mailed to persons possibly affected by the proposed permit;
   (b) notice has been published at least once in a newspaper, regularly published, or circulated within each county where the proposed facility or discharge is located and, in each county, affected by the discharge; and
2. Within thirty (30) days following publication of the AOGCC's notice the AOGCC, the applicant, or an affected person has not requested a public hearing; or
3. An application to amend a permit resulting in an improvement of the quality of the fluid authorized to be injected and if the applicant does not seek to increase significantly the quantity of fluid to be injected or to change materially the pattern or place of injection.

After resolution of any public comment the AOGCC shall issue or deny the draft permit, major permit modification, or permit renewal. Within thirty (30) days of issuance, a copy of the permit or permit denial will be mailed to the applicant.

ALASKA OIL AND GAS CONSERVATION COMMISSION
Underground Injection Control (UIC) Program
CLASS VI INJECTION WELL PERMIT APPLICATION

(Reference to 20 AAC 25 in parentheses indicates sections of Alaska's Administrative Code and Code of Federal Regulations, respectively, requiring information.)

1. Type of Permit Application (check one)
   - □ Initial Application (new facility)
   - □ Initial Application (conversion from other well type)
   - □ Permit Renewal, Original Permit No. _____
   - □ Date Injection Commenced _____
   - □ Permit Modification, Original Permit No. _____
   - □ Date Injection Commenced _____
   - □ Application to Convert a Well to Class VI, Original Permit No. _____

2. Type of Permit (check one)
   - □ Individual (Single) Well Permit

3. Facility Operator (Applicant must be the operator if owner/operator are different) (20 AAC 25.1030(b) and 40 CFR 144.31(b))

   Name: _____
   (Individual, Corporation or Other Legal Entity)

   Address: _____
   (Permanent Mailing Address)

   City:_____ State: _____ Zip:_____

   Telephone Number: _____

   Email Address: _____

4. Facility Owner
   (20 AAC 25.1080(a)(1) and 40 CFR 144.31(e)(4))

   Name: _____
   (Individual, Corporation or Other Legal Entity)

   Address: _____
   (Permanent Mailing Address)

   City:_____ State: _____ Zip:_____

Telephone Number: _____

Email Address: _____

5. Facility ownership status: □Federal □State □Private □Public
   □Other (20 AAC 25.1080(a)(1) and 40 CFR 144.31(e)(4))

6. List those persons or firms authorized to act for the applicant during the processing of the permit application. Include a complete mailing address and telephone number:

7. List all activities conducted at this facility that require an environmental permit under federal, state, or local statutes, rules, or ordinances (e.g., NPDES, NESHAPS, AZPDES, Aquifer Protection Permit, etc.).
   (20 AAC 25.1080(a)(1) and 40 CFR 144.31(e)(1))

8. List all environmental permits or construction approvals received or applied for relevant to this facility or this location under federal, state, or local statutes, rules, or ordinances.
   (20 AAC 25.1080(a)(1) and 40 CFR 144.31(e)(6))

9. Provide a brief description of the nature of the business at the facility including generation of the fluid to be injected (include appropriate North American Industry Classification System (NAICS) Codes).
   (20 AAC 25.1080(a)(1) and 40 CFR 144.31(e)(3) and (8))

10. Location of Proposed Class VI Injection Well Operation: (20 AAC 25.1080(a)(1) and (40 CFR 144.31(e)(2))

    Facility name: _____

    Facility mailing address: _____

    Facility location description: _____

    Street address: _____

    City: _____

    County: _____ Lease or Field Project Name: _____

    Well Name: _____ API Number: _____

    No. of Wells* : _____

For each well provide the following:

Township; Range; Section; and 1/4, 1/4 Section:_____

Latitude: _____

Longitude:_____

* Location(s) of injection well(s) should be identified on all maps included in this application.

11. Are the proposed injection well(s) located on Indian land? □ Yes □ No
(20 AAC 25.1080(a)(1) and 40 CFR 144.31(e)(5))

12. A list of contacts, submitted to the AOGCC, that identifies any state, tribe, or territory within the area of review of the proposed storage facility. (20 AAC 25.1080(a)(20) and 40 CFR 145.23)

13. Certification of information submitted on the application form.
(20 AAC 25.1030(d) and 40 CFR 144.32)

_____

(Name of Company Official: Type or Print

_____

Legibly) (Title)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____

Date: _____

CLASS VI INJECTION
WELL PERMIT APPLICATION OUTLINE

The Class VI injection well permit application must contain all parts detailed in the outline below. The term "AOGCC' in the outline below refers to the AOGCC or an appointed representative, i.e. the UIC staff reviewing the permit application. The UIC staff, upon demonstrating justifications, may make adjustments in the requirements set forth in this Outline below. References in parentheses refer to sections in the Alaska Administrative Code (20 AAC 25) and the Code of Federal Regulations (40 CFR) that apply to the associated data requirements. AOGCC recommends that applicants consult EPA's Class VI permit application templates at https://www.epa.gov/uic/class-vi-permit-application-templates for recommendations and considerations on how to develop the various components of the application.

Note: The required plans, programs, and attachments below must be approved by the AOGCC. Once approved, they may be included in the permit as an enforceable attachment.

Part A – Determination of Area of Review (AOR)

Submit details of the method and the calculations used to determine the area of review. Refer to 20 AAC 25.1070 for the acceptable method for determining the area of review for Class VI wells. A radius area of review is determined by computational modeling that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream and is based on available site characterization, monitoring, and operational data.

The storage facility operator must prepare, maintain, and comply with a plan to reevaluate the area of review periodically on a fixed frequency (not to exceed five years) that meets the requirements of this section and is acceptable to the AOGCC. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The AoR and Corrective Action Plan should describe:

(i) Computational modeling approach, including inputs (e.g., site geology and hydrology, porosity and permeability and other rock properties, operational information, fracture pressure and fracture gradient); model domain; constitutive relationships; and initial and boundary conditions.
(ii) Computational modeling results (i.e., predictions of system behavior, model calibration and validation).
(iii) The delineated AoR and critical pressure calculations.
(iv) The AoR reevaluation cycle and triggers for AoR reevaluations prior to the next scheduled reevaluation.

The AoR and Corrective Action Plan should also include/embed:

(i) The tabulation of data on wells within the AoR (part C); and
(ii) A Corrective Action Plan (part D); the Plan should also include a plan for site access and a corrective action schedule.

(20 AAC 25.1070 and 40 CFR 146.84)

Part B - Permit Application Information

Regional Geology, Hydrogeology, and Local Structural Geology

AOGCC recommends that the maps and cross sections required by 20 AAC 25.1070 and 25.1080 be accompanied by a brief narrative describing the regional geology and hydrogeology (e.g., including stratigraphy, structure, and tectonic history) near the proposed injection site, as well as local structural geology. Recommended considerations include:

(i) What are characteristics of the injection and confining zones (names, lithology, depth, etc.)?
- How consistent are these characteristics regionally?

(ii) What is the general geologic history of the region and the project site?

(iii) What are the major geologic features (e.g., faults, synclines/anticlines, etc.) near the proposed injection site?
- How does the proposed project site fit into the regional geologic setting?

(iv) Associated figures may include:
- maps, cross sections, and stratigraphic columns showing regional geologic features and characteristics.

(20 AAC 25.1080)

Maps and Cross Sections of the AoR

AOGCC recommends that the maps and cross sections required by 20 AAC 25.1080(a)(3)(A) be accompanied by a brief narrative description interpreting the figures and providing an overview of key features important to the project.

Recommended considerations include:

(i) What is the spatial relationship between the proposed project site and regional geologic features such as faults or the lowermost USDW? What is the relationship between the proposed injection formation and other site-specific geologic characteristics?

(ii) Is there any evidence of regional formation pinch-out? Is the proposed storage site influenced by a structural trap (e.g., faults or a dome)?

(iii) What is the lateral extent of the proposed injection and confining formations? Are they continuous throughout the proposed site? How was this determined?

(iv) Are there any secondary confining zones between the proposed injection formation and the lowermost USDW?

(v) Associated figures may include:
- Map identifying the location of all wells, subsurface sites, surface water, and other features listed in 20 AAC 25.1080(a)(2) that are within the AoR.
- Maps and cross section with information including lithology, the sequence of geologic units (including the proposed injection formations, confining units, and USDWs), approximate formation thicknesses, lateral extent of units, correlation of units in the vicinity of the proposed project site.

(20 AAC 25.1080(a)(3)(A))

Faults and Fractures

AOGCC recommends the following considerations:

(i) Are there known or suspected faults and/or fractures within the AoR? Do these features transect the injection zone?

(ii) What information was used to determine that faults and fractures do not pose a threat to containment? How was this determination made?
(iii) How stable are faults? What is the sealing capacity of faults/fractures? What methods were used to determine the stability and sealing capacity?
(iv) Is there evidence that faults and/or fractures in the injection zone may provide conduits for preferential fluid flow?
(v) What uncertainties are there in fault and fracture characterization data? How might these uncertainties be addressed with pre-operational testing?
(vi) Associated figures may include:
- Map showing the location, orientation, and properties of all known or suspected faults and fractures that may transect the confining zone(s) in the AoR.
- Map identifying major faults and fractures in the injection zone, with information on the connectivity and extent of these features.
- Results of geophysical survey data used to delineate faults and characterize their geometry.
- Other plots or figures to support a determination of fault stability and potential for reactivation.

(20 AAC 25.1080(a)(3)(B) and 40 CFR 146.82(a)(3)(ii))

Injection and Confining Zone Details

AOGCC recommends the following considerations:

(i) What is the depth, areal extent, and thickness of the injection and confining zones? What methods were used to determine this?
(ii) How variable is the thickness of the injection and confining zones within the AoR? How might this affect carbon dioxide storage and confinement?
(iii) How many samples were used to determine injection and confining zone properties? How is this sufficient to characterize formation mineralogy? To characterize porosity and permeability?
(iv) What is the mineralogy and petrology of the injection and confining zones?
(v) Are any geochemical reactions more likely given the mineralogical makeup of either the injection or confining zone? How might these geochemical reactions affect carbon dioxide storage and containment? Note that this information may overlap with the discussion of site geochemistry. Please include cross-references as applicable.
(vi) Is the mineralogy of the injection and confining zones compatible with the proposed carbon dioxide stream?
(vii) What is the average permeability and porosity of the injection and confining zones? What is the spatial distribution of porosity and permeability values within the injection and confining zones?
(viii) What data were used to determine permeability and porosity?
(ix) What is the estimated storage capacity and injectivity of the injection zone? What is the integrity of the confining zone?
(x) What is the capillary pressure of the confining zone? How was this determined? Does this significantly affect the ability of carbon dioxide to penetrate the confining zone?
(xi) What indirect geophysical methods were employed to determine the extent, depth, thickness, and lithology of the injection and confining zones? How well did these results compare to other characterization methods (e.g., core analysis, wireline logs, etc.)?

(xii) What additional information may be required to adequately characterize the injection and confining zones? Will this information be collected during pre-operational testing?
(xiii) What sources of uncertainty are there? How will these be addressed?
(xiv) Associated figures may include:
- Isopach and isochore maps showing stratigraphic and vertical thickness.
- Well log data (if available).
- Geophysical survey results.
- Maps showing locations and depths of samples collected (if any).
- Maps and/or cross sections showing the distribution of porosity and permeability within the confining and injection zones. Note: Similar maps and cross sections may need to be included with the AoR and Corrective Action Plan. Please include cross-references as applicable.
- Tabular results of permeability and porosity data (from the laboratory) or the results of field measurements and estimations of permeability and porosity distribution.

(20 AAC 25.1080(a)(3)(C) and 40 CFR 146.82(a)(3)(iii))

Geomechanical and Petrophysical Information

AOGCC recommends the following considerations:

(i) What methods were used to determine the geomechanical and petrophysical characteristics of the confining zone? How many samples were collected? From what depths?
(ii) Where any fractures identified through geomechanical tests? Please cross-reference the faults and fractures section as applicable.
(iii) What is the average ductility of the confining zone? How consistent is this throughout the confining zone?
(iv) What is the average rock strength of the confining zone? How consistent is this?
(v) What is the in situ stress field of the confining zone? Is this consistent with the proposed injection pressures and fault stability analyses?
(vi) What is the average pore pressure of the confining zone (if available at this stage of the project)?
(vii) Were there any anomalies or uncertainties in the data? How will these be addressed during pre-operational testing?
(viii) How consistent are the results of different tests? What are the causes of any inconsistencies? Can these be addressed with additional testing?
(ix) Associated figures may include:
- Results in a tabular and/or graphical form.

(20 AAC 25.1080(a)(3)(D) and 40 CFR 146.82(a)(3)(iv))

Seismic History

Please include a brief narrative description of the seismic history of the project site, as required by 20 AAC 25.1080(a)(3)(E). This description should include the presence and depth of all seismic sources, and a demonstration that seismic activity does not pose a threat to carbon dioxide containment. Note that as applicable, the information included in this subsection should be consistent with the Testing and Monitoring Plan (20 AAC 25.1250) and the Emergency and Remedial Response Plan (20 AAC 25.1260). AOGCC recommends the following considerations:

(i) What sources of data were used to characterize the seismic history of the site? Be sure to cite references as applicable.

(ii) What seismic sources exist within the AoR and regionally? How active are these sources?
(iii) Was a seismic risk threshold used or established to determine site-specific earthquake risk? What was the source of this threshold, or how was it calculated?
(iv) If data suggests a substantial risk of seismic activity, what is the risk to subsurface containment? What other geologic data (e.g., geomechanical data, fault stability analyses, etc.) help demonstrate that seismic activity does not pose a risk to containment?
(v) Associated figures may include:
- Tabular presentation of seismic sources and depths.
- Tabular presentation of historical seismic events and relevant details.
- Map showing the location and depth of known seismic sources within and near the AoR.

(20 AAC 25.1080(a)(3)(E) and 40 CFR 146.82(a)(3)(v))

Hydrologic and Hydrogeologic Information

AOGCC recommends the following considerations:

(i) What is the depth and location of all USDWs, water wells, and springs within the AoR? What is the direction of regional groundwater flow?
(ii) What sources of data were used to determine regional and site-specific hydrologic and hydrogeologic characteristics? What, if any, field surveys or additional methods were used to fill data gaps?]
(iii) Associated figures may include:

Maps and cross sections indicating the location and depth of USDWs. Note that information pertaining to the location and depth of USDWs within the AoR should be included in the cross sections submitted to satisfy requirements at 20 AAC 25.1080(a)(3)(A).

- Potentiometric or isopach maps.

(20 AAC 25.1080(a)(3)(F) 20 AAC 25.1080(a)(5) and 40 CFR 146.82(a)(3)(vi), 146.82(a)(5))

Other Information (Including Surface Air and/or Soil Gas Data, if Applicable)

Please provide a narrative description of any other information that is relevant to the site characterization. If surface air and/or soil gas monitoring is required by the UIC Program Director as part of the Testing and Monitoring Plan, baseline data should be presented in this section. AOGCC recommends the following considerations:

(i) Where any other analyses or assessments of the site conducted to support site characterization? What methods were used? What were the results?
(ii) If gas monitoring was conducted to collect baseline data, what methods were used? Why was gas monitoring necessary or requested? What were the results?

Site Suitability – Minimum Criteria for Siting

Please provide a description of how the proposed injection site meets the suitability requirements set forth at 20 AAC 25.1060. This demonstration should draw upon and synthesize the site characterization data described in 20 AAC 25.1060. Please frame this discussion to match the rule requirements, demonstrating that the injection zone can accommodate the total anticipated carbon dioxide volume and that the confining zone has sufficient integrity to contain the proposed injected volume and any displaced fluids. AOGCC recommends the following considerations:

(i) What is the subsurface distribution of lithological facies? What are the implications for carbon

dioxide plume migration?

(ii) How will carbon dioxide be confined to the injection zone? How do the site characterization data demonstrate the lack of potential leakage pathways?

(iii) How will the carbon dioxide stream interact with well materials and subsurface formations (injection and confining zones)?

(iv) What is the total storage capacity of the injection zone? How was this determined? How is this sufficient to receive the proposed amount of carbon dioxide?

(v) Are there any potential concerns regarding confining zone integrity? What site characterization data support this determination?

(vi) Is secondary confinement necessary to ensure USDW protection? If so, what is the secondary confining zone, what are its characteristics, and how will it prevent the migration of carbon dioxide and displaced fluids into USDWs? Note that the need for characterizing an additional confining zone is ultimately determined by the UIC Program Director.

(20 AAC 25.1060 and 40 CFR 146.83)

1. Map of Area of Review (AOR)

Submit a map extending beyond the property boundaries of the injection well(s) or project area (area permit). The following items listed in public records or otherwise known to the applicant and occurring within the area of review of the facility property boundary must be included on the map:

(i) The number or name, and location of all injection wells, producing wells, abandoned wells, plugged wells or dry holes, deep stratigraphic boreholes, State- or EPA-approved subsurface cleanup sites;

(ii) Surface bodies of water, springs, mines (surface and subsurface);

(iii) Quarries, water wells, other pertinent surface features;

(iv) Structures intended for human occupancy;

(v) State, Tribal, and Territory boundaries, and roads; and

(vi) Faults, if known or suspected.

Only information of public record is required to be included on this map;

(20 AAC 25.1080(a)(2) and 40 CFR 146.82(a)(2))

2. Maps and Cross Sections of USDWs

Submit maps and stratigraphic cross sections indicating the general vertical and lateral limits of all USDWs, water wells and springs within the area of review, their positions relative to the injection zone(s), and the direction of water movement, where known.

An Underground Source of Drinking Water (USDW) is an aquifer or a portion thereof that:

A. Supplies any public water system, **or** contains a sufficient quantity of ground water to supply a public water system (a sustainable delivery of 1 gallon per minute); **and**

1. currently supplies drinking water for human consumption; **or**
2. contains fewer than 10,000 mg/l total dissolved solids (TDS); **and**

B. Is not an exempted aquifer. (See 20 AAC 25.440 and 25.1900 for definition and criteria of 'exempt aquifer').

(20 AAC 25.1080(a)(5) and 40 CFR 146.82(a)(5))

3. **Geologic Structure and Lithology**

Submit information on the geologic structure and hydrogeologic properties of the proposed storage site and overlying formations, including:

(i) Maps and cross sections of the area of review;

(ii) The location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone(s) in the area of review and a determination that they would not interfere with containment;

(iii) Data on the depth, areal extent, thickness, mineralogy, porosity, permeability, and capillary pressure of the injection and confining zone(s); including geology/facies changes based on field data which may include geologic cores, outcrop data, seismic surveys, well logs, and names and lithologic descriptions;

(iv) Geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone(s);

(v) Information on the seismic history including the presence and depth of seismic sources and a determination that the seismicity would not interfere with containment; and

(vi) Geologic and topographic maps and cross sections illustrating regional geology, hydrogeology, and the geologic structure of the local area.

(20 AAC 25.1080(a)(3) and 40 CFR 146.82(a)(3))

Part C – Tabulation of Artificial Penetration Data

Submit a tabulation of data on wells within the area of review included on the AOR Map (Part B, Map 2) that penetrate the proposed injection zone. Such data shall include a description of each well type, construction, date drilled, location, depth, record of plugging and/or completion, any water quality data, and any additional information the AOGCC may require.

(20 AAC 25.1080(a)(4) and 40 CFR 146.82(a)(4))

Part D – Corrective Action Plan

Submit a corrective action plan describing the necessary steps or modifications to prevent movement of fluid into underground sources of drinking water through any artificial penetrations into the injection zone, within the AOR, that are improperly sealed, completed, or abandoned.

(20 AAC 25.1070 and 40 CFR 146.84

Part E – Formation Testing Program

Submit a proposed pre-operational formation testing program to obtain an analysis of the physical and chemical characteristics of the injection zones, confining zones, fracture pressure, and formation fluids in the receiving formation. The pre-operational testing program should also include procedures for well testing and formation testing (including fall-off testing).

(20 AAC 25.1080(a)(8) 20 AAC 25.1220, and 40 CFR 146.82(a)(8); 146.87)

Part F – Well Stimulation Program

Submit a proposed well stimulation program, a description of the stimulation fluids to be used (including additives and diverting agents), stimulation procedures, and a determination that stimulation will not interfere with containment.

(20 AAC 25.1080(a)(9) and 40 CFR 146.82(a)(9))

Part G – Injection Well Construction Plan

Submit a well construction plan that includes details of the cementing and casing program, logging procedures, information on planned MITs and annulus pressure testing, deviation checks, and a drilling, testing, and coring program that conform with the Class VI well construction requirements in 20 AAC 25.1210 and 40 CFR 146.86.

(R18-9-J657(B)(12); 40 CFR 146.82(a)(12))

Part H – Injection Well Construction Details

Submit schematic or other appropriate drawings of the surface and subsurface construction details of the well that meet the construction requirements of 20 AAC 25.1210 tabular descriptions of open hole diameters and intervals and casing, tubing, and packer specifications.

(20 AAC 25.1080(a)(11) and 40 CFR 146.82(a)(11))

Part I – Injection Well Operation Plan and Procedures

Submit a description of the proposed injection procedure and proposed operating data for the geologic sequestration site, including:

(i) average and maximum daily rate and volume, and/or mass, and total anticipated volume, and/or mass, of the carbon dioxide stream;
(ii) average and maximum injection pressure;
(iii) the source of the carbon dioxide stream;
(iv) An analysis of the chemical and physical characteristics of the carbon dioxide stream;
(v) Maximum injection pressure (at surface and bottom-hole),
(vi) Annulus pressure, and
(vii) Annulus pressure/tubing differential; and
(viii) Description of well shut down procedures

(20 AAC 25.1080(a)(7) and (10) and 40 CFR 146.82(a)(7) and (10))

Part J – Monitoring, Recording, and Reporting Plan

The storage facility operator of a Class VI well must prepare, maintain, and comply with a testing and monitoring plan to verify that the geologic sequestration project is operating as permitted and is not endangering USDWs. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The testing and monitoring plan must be submitted with the permit application, for AOGCC approval, and must include a description of how the owner or operator will meet the requirements of this section, including accessing sites for all necessary monitoring and testing during the life of the project. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. Testing and monitoring associated with geologic sequestration projects must, at a minimum, include:

(i) Analysis of the carbon dioxide stream with sufficient frequency to yield data representative of its chemical and physical characteristics;
(ii) Installation and use of continuous recording devices to monitor injection pressure, rate, and volume; the pressure on the annulus between the tubing and the long string casing; and the annulus fluid volume added;
(iii) Corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion;
(iv) Periodic monitoring of the ground water quality and geochemical changes above the confining

zone(s) that may be a result of carbon dioxide movement through the confining zone(s) or additional identified zones;

(v) A demonstration of external mechanical integrity at least once per year;

(vi) A pressure fall-off test at least once every five years;

(vii) Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front);

(viii) The AOGCC may require surface air monitoring and/or soil gas monitoring to detect movement of carbon dioxide that could endanger a USDW;

(ix) Any additional monitoring, as required by the AOGCC, necessary to support, upgrade, and improve computational modeling of the area of review evaluation;

(x) The storage facility operator shall periodically review the testing and monitoring plan to incorporate monitoring data collected. In no case shall the owner or operator review the testing and monitoring plan less often than once every five years. Based on this review, the owner or operator shall submit an amended testing and monitoring plan or demonstrate to the AOGCC that no amendment to the testing and monitoring plan is needed.

(xi) A quality assurance and surveillance plan for all testing and monitoring requirements.

The owner or operator must provide at a minimum, the following reports to the AOGCC and the US EPA, in an electronic format approved by the AOGCC and EPA, as specified in 20 AAC 25.1610 for each Class VI permit:

(i) Semi-annual reports documenting changes to the physical, chemical, and other relevant characteristics of the carbon dioxide stream from the proposed operating data and the results of monitoring prescribed under 20 AAC 25.1610.

(ii) Report, within 30 days, the results of periodic tests of mechanical integrity; any well workover; and any other test of the injection well conducted by the permittee if required by the AOGCC.

(iii) Report, within 24 hours any noncompliance with a permit condition, or malfunction of the injection system, which may cause fluid migration into or between USDWs; or any failure to maintain mechanical integrity; or pursuant to compliance with the requirement at 20 AAC 25.1610.

(iv) Owners or operators must notify the AOGCC in writing 30 days in advance of any planned well workover; stimulation activities, and any other planned test of the injection well conducted by the permittee.

(v) Owners or operators must submit and retain all required reports, submittals, and notifications under Part J of this application.

(20 AAC 25.1250 and 20 AAC 25.1610 and 40 CFR 146.90 and 146.91)

Part K – Emergency and Remedial Response Plan

Submit an emergency and remedial response plan to address movement of the injection or formation fluids or potential movement of the pressure front that may cause endangerment to USDWs. The Emergency and Remedial Response Plan should describe: local resources and infrastructure, emergency identification and response actions for each identified scenario (including natural seismic events), response personnel and equipment, an emergency communications plan, plan reviews/updates, and staff training and exercise procedures. The owner/operator shall review the plan no less frequently than every five years. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.

(20 AAC 25.1080 20 AAC 25.1260 and 40 CFR 146.82, 40 CFR 146.94)

Part L – Plugging and Abandonment Plan

Submit a plugging and abandonment plan that meets the requirements of 20 AAC 25.1300 and prior to plugging, the owner/operator must flush each well, determine bottom hole reservoir pressure, and perform a final external mechanical integrity test. The plugging and abandonment plan should also include information on plugs (including a schematic) and a description of plugging procedures. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.

(20 AAC 25.1300 and 40 CFR 146.92)

Part M – Class VI; Post-Injection Site Care and Site Closure

The owner or operator of a Class VI well must prepare, maintain, and comply with a plan for post-injection site care and site closure that meets the requirements of 20 AAC 25.1310. The Post-Injection Site Care and Site Closure Plan should describe: pre- and post-injection pressure differential and predicted position of the CO2 plume and pressure front at site closure; a post-injection monitoring plan; information on alternative post-injection site care timeframe (if requested); non-endangerment demonstration criteria; and site closure plan (monitoring well plugging and site closure report). The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit:

(i) Upon cessation of injection of carbon dioxide into a storage reservoir, but before application for a certificate of completion, the storage operator must either submit an amended post-injection site care and site closure plan or demonstrate to the AOGCC through monitoring data and modeling results that no amendment to the plan is needed. An amendment to the post-injection site care and site closure plan must be approved by the AOGCC and be incorporated into the storage facility permit, and is subject to the permit modification requirements of 20 AAC 25.1410 or 20 AAC 25.1430, as appropriate.

(ii) At any time during the life of the storage facility, the storage operator may modify and resubmit the post-injection site care and site closure plan for the AOGCC's approval not more than 30 days after the change.

(iii) Upon cessation of injection of carbon dioxide into a storage reservoir, and before a storage operator applies for a certificate of completion under 20 AAC 25.1320, the storage operator shall monitor the site to show the position of the carbon dioxide plume and pressure front and demonstrate, to the AOGCC, that underground sources of drinking water are not being endangered.

(iv) Following the cessation of injection, the storage operator shall continue to conduct monitoring as specified in the AOGCC-approved post-injection site care and site closure plan for at least 50 years or for the duration of the alternative timeframe approved by the AOGCC pursuant to requirements in 20 AAC 25.1310(h), unless the storage operator makes a demonstration under and 20 AAC 25.1310(g). A post-injection site care plan must require the storage operator to continue monitoring the storage facility until the storage facility no longer poses a danger to underground sources of drinking water and the demonstration under 20 AAC 25.1310(g) is submitted by the storage operator and approved by the AOGCC.

(v) Notwithstanding 20 AAC 25.1310(f), if the storage operator demonstrates to the satisfaction of the AOGCC before 50 years after cessation of carbon dioxide injections, or before to the end of the approved alternative timeframe based on monitoring and other site-specific data, that the storage facility no longer poses a danger to underground sources of drinking water, the

AOGCC may approve an amendment to the post-injection site care and site closure plan to reduce the frequency of monitoring or may authorize site closure through a certificate of completion under 20 AAC 25.3120 before the end of the 50-year period or before the end of the approved alternative timeframe, if the AOGCC finds substantial evidence that the storage facility no longer poses a risk of endangerment to underground sources of drinking water. If the AOGCC does not approve the demonstration, the storage operator shall submit to the AOGCC a plan to continue post-injection site care until a demonstration can be made and approved by the AOGCC.

(vi) Not less than 120 days before expiration of the approved monitoring period under this section, the storage operator shall either apply to the AOGCC for an additional monitoring period, or for a certificate of completion under AS 41.06.170 and 20 AAC 25.1320.

(vii) A certificate of completion must identify all actions the storage operator has taken must take for final site closure, including the plugging of all monitoring wells in a manner approved by the AOGCC and which will not allow movement of injection or formation fluid that endanger underground sources of drinking water.

(viii) Not more than 90 days after the AOGCC approves a certificate of completion, the storage operator shall submit a report to the AOGCC, the report shall be retained at a location designated by the AOGCC for not less than 10 years. The report must include: Each owner or operator of a Class VI injection well identified in the certificate of completion issued by the AOGCC shall must record, before transfer of the storage facility to the Department of Natural Resources under AS 41.06.170 , a notation on the deed to the facility property or any other document that is normally examined during title search that will in perpetuity provide any potential purchaser of the property the information required under 20 AAC 25.1320(f).

(ix) The storage operator must retain for 10 years following issuance of the certificate of completion, records collected during the post-injection site care period. The storage operator shall deliver the records to the Department of Natural Resources at the conclusion of the retention period, and the Department of Natural Resources will maintain the records. The AOGCC will be notified by the Department of Natural Resources when the records are delivered to the department.

(20 AAC 25.1310, 25.1320 and 40 CFR 146.93)

Part N – Financial Responsibility

Submit a Financial Responsibility Instrument approved by the AOGCC to demonstrate financial resources necessary for corrective action, well plugging and/or abandoning the Class VI injection well(s), post-injection site care and site closure, emergency and remedial response sufficient to address endangerment of USDWs. Because the cost estimate must be based on the costs to the regulatory agency of hiring a third party to perform the required activities per 20 AAC 25.1200(n), it is recommended that applicants solicit and submit cost estimates developed by third parties. The financial responsibility demonstration should also include draft instrument language.

(20 AAC 25.1200 and 40 CFR 146.85)

Part O – Injection Depth Waiver

A storage operator seeking a waiver of the requirement to inject below the lowermost underground source of drinking water shall also refer to 20 AAC 25.1270 and submit a supplemental report as required under that section. A supplemental report is not a part of the permit application. The storage operator shall submit a supplemental report concurrent with permit application. The supplemental report

must:

(i) Demonstrate that the injection zone is laterally continuous, is not an underground source of drinking water, and is not hydraulically connected to an underground sources of drinking water; does not outcrop; has adequate injectivity, volume, and sufficient porosity to safely contain the injected carbon dioxide and formation fluid fluids; and has appropriate geochemistry;

(ii) Demonstrate that the injection zone is bounded by laterally continuous, impermeable confining units above and below the injection zone adequate to prevent fluid movement and pressure buildup outside of the injection zone; and that the confining unit is free of transmissive faults and fractures; the report must further characterize the regional fracture properties and contain a demonstration that such fractures will not interfere with injection, serve as conduits, or endanger underground sources of drinking water;

(iii) A demonstration, using computational modeling, that USDWs above and below the injection zone will not be endangered as a result of fluid movement. This modeling should be conducted in conjunction with the area of review determination, as described in 20 AAC 25.1070, and is subject to requirement under 20 AAC 25.1070(c), and periodic reevaluation, as set forth in 20 AAC 25.1070(e).

(iv) A demonstration of how well design and construction, in conjunction with the waiver, will ensure isolation of the injectate in lieu of requirements at 20 AAC 25.1210(a)(1) and will meet well construction requirements under 20 AAC 25.1210.

(v) A description of how the monitoring and testing and any additional plans will be tailored to the storage facility to ensure protection of USDWs above and below the injection zone(s) if a waiver is granted.

(vi) Information on the location of all the public water supplies affected, reasonably likely to be affected, or served by USDWs in the area of review.

(vii) Any other information requested by the AOGCC that the EPA Regional Administrator requires to inform the EPA Regional Administrator's decision to issue a waiver.

To assist the EPA Regional Administrator's decision on whether to grant a waiver of the injection depth requirements at 20 AAC 25.1210(a)(1), the AOGCC will submit, to the EPA Regional Administrator, documentation of the following:

(i) An evaluation of the following information as it relates to siting, construction, and operation of a storage facility with a waiver: including

a) the integrity of the upper and lower confining units;
b) the suitability of the injection zone, including lateral continuity; lack of transmissive faults and fractures or knowledge of current or planned artificial penetrations into the injection zone or formations below the injection zone;
c) the potential capacity of the geologic formation to sequester carbon dioxide, accounting for the availability of alternative injection sites;
d) all other site characterization data, the proposed emergency and remedial response plan, and a demonstration of financial responsibility;
e) community needs, demands, and supply from drinking water resources;
f) planned needs, potential or future use of underground sources of drinking water and non-underground sources of drinking water in the area;
g) planned or permitted water, hydrocarbon, or mineral resource exploitation potential of the proposed injection formation and other formation above and below the injection

zone to determine if there are any plans to drill through the formation to access resources in or beneath the proposed injection zone formation;

h) the proposed plan for securing alternative resources or treating an underground source of drinking water formation waters in the event of contamination related to the carbon storage injection activity

(ii) a summary of the AOGCC's consultation with the Department of Environmental Conservation and any tribe having jurisdiction over lands within the area of review of a well for which a waiver is sought.

(iii) any other applicable considerations or information requested by the AOGCC, and any written information submitted by the commissioner of the Department of Environmental Conservation.

Upon receipt of a waiver to inject below the lower-most USDW, the owner/operator must comply with the following:

(i) All requirements at 20 AAC 25.1070, 20 AAC 25.1200, 20 AAC 25.1230, 20 AAC 25.1240, 20 AAC 25.1610, 20 AAC 25.1300 and 20 AAC 25.1260;

(ii) All requirements at 20 AAC 25.1210 with the following modified requirements:

a. A storage operator shall ensure that a Class VI well with an injection depth waiver is constructed and completed to prevent movement of fluid into any unauthorized zones including USDWs.

b. The casing and cementing program must be designed to prevent the movement of fluid into any unauthorized zone including USDWs in lieu of the requirements of 20 AAC 25.1210.

c. The surface casing must extend through the base of the nearest USDW directly above the injection zone and be cemented to the surface; or, at the AOGCC's discretion, another formation above the injection zone and below the nearest USDW above the injection zone.

(iii) All requirements at 20 AAC 25.1250 with the following modifications:

a. The storage operator shall monitor the groundwater quality, geochemical changes, and pressure in the first USDWs immediately above and below the injection zone; and in any other formations at the discretion of the AOGCC.

b. Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure e.g. the pressure front, by using direct methods to monitor for pressure changes in the injection zone; and, indirect methods e.g. seismic, electrical, gravity, or electromagnetic surveys or down-hole carbon dioxide detection tools, unless the AOGCC determines, based on site-specific geology, that such methods are not appropriate.

(iv) All requirements under 20 AAC 25.1310 with the following, modified post-injection site care monitoring requirements:

a. The storage operator shall monitor the groundwater quality, geochemical changes, and pressure in the first USDWs immediately above and below the injection zone; and in any other formations at the discretion of the AOGCC.

b. Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure e.g. the pressure front, by using direct methods in the injection zone; and indirect methods including, seismic, electrical, gravity, or electromagnetic surveys or down-hole carbon dioxide detection tools, unless the AOGCC determines based on site-specific geology, that such methods are not appropriate.

(v) Any additional requirements requested by the AOGCC designed to ensure protection of USDWs above and below the injection zone.

(20 AAC 25.1270 and 40 CFR 146.95)

Part P – Aquifer Exemption

The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for carbon storage under 20 AAC 25.442 and 40 CFR 144.7(d) if it meets the following criteria:

(i) it does not currently serve as a source of drinking water; and

(ii) the total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l; and

(iii) it is not reasonably expected to supply a public water system.

(20 AAC 25.442 20 AAC 25.440 and 40 CFR 144.7(d); 40 CFR 146.4)

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION

PERMIT TO DRILL

20 AAC 25.005

1a. Type of Work:	1b. Proposed Well Class:				1c. Specify if well is proposed for:
Drill ☐ Lateral ☐	Stratigraphic Test ☐	Exploratory - Gas ☐	Service - WAG ☐	Service - Disp ☐	Coalbed Gas ☐ Gas Hydrates ☐
Redrill ☐ Reentry ☐	Exploratory - Oil ☐	Development - Oil ☐	Service - Winj ☐	Single Zone ☐	Geothermal ☐ Shale Gas ☐
		Development - Gas ☐	Service - Class VI ☐	Multiple Zone ☐	

2. Operator Name:	5. Bond: Blanket ☐ Single Well ☐ Bond No.	11. Well Name and Number:
3. Address:	6. Proposed Depth: MD: TVD:	12. Field/Pool(s):
4a. Location of Well (Governmental Section): Surface:	7. Property Designation:	
Top of Productive Horizon:	8. DNR Approval Number:	13. Approximate Spud Date:
Total Depth:	9. Acres in Property:	14. Distance to Nearest Property:
4b. Location of Well (State Base Plane Coordinates - NAD 27): Surface: x- y- Zone-	10. KB Elevation above MSL (ft): GL / BF Elevation above MSL (ft):	15. Distance to Nearest Well Open to Same Pool:
16. Deviated wells: Kickoff depth: feet Maximum Hole Angle: degrees	17. Maximum Potential Pressures in psig (see 20 AAC 25.035) Downhole: Surface:	

18. Casing Program:		Specifications				Top - Setting Depth - Bottom				Cement Quantity, c.f. or sacks
Hole	Casing	Weight	Grade	Coupling	Length	MD	TVD	MD	TVD	(including stage data)

19. **PRESENT WELL CONDITION SUMMARY** (To be completed for Redrill and Re-Entry Operations)

Total Depth MD (ft):	Total Depth TVD (ft):	Plugs (measured):	Effect. Depth MD (ft):	Effect. Depth TVD (ft):	Junk (measured):

Casing	Length	Size	Cement Volume	MD	TVD
Conductor/Structural					
Surface					
Intermediate					
Production					
Liner					

Perforation Depth MD (ft):	Perforation Depth TVD (ft):

Hydraulic Fracture planned? Yes ☐ No ☐

20. Attachments: Property Plat ☐ BOP Sketch ☐ Diverter Sketch ☐ Drilling Program ☐ Seabed Report ☐ Time v. Depth Plot ☐ Drilling Fluid Program ☐ Shallow Hazard Analysis ☐ 20 AAC 25.050 requirements ☐

21. I hereby certify that the foregoing is true and the procedure approved herein will not be deviated from without prior written approval.

Contact Name:
Authorized Name: Contact Email:
Authorized Title: Contact Phone:

Authorized Signature: Date:

Commission Use Only

Permit to Drill Number:	API Number:	Permit Approval Date:	See cover letter for other requirements.

Conditions of approval : If box is checked, well may not be used to explore for, test, or produce coalbed methane, gas hydrates, or gas contained in shales: ☐

Samples req'd: Yes ☐ No ☐ Mud log req'd: Yes ☐ No ☐
H_2S measures: Yes ☐ No ☐ Directional svy req'd: Yes ☐ No ☐
Spacing exception req'd: Yes ☐ No ☐ Inclination-only svy req'd: Yes ☐ No ☐
Post initial injection MIT req'd: Yes ☐ No ☐

Approved by: COMMISSIONER APPROVED BY THE COMMISSION Date:

Comm.	Comm.	Sr Pet Eng	Sr Pet Geo	Sr Res Eng

Form 10-401 Revised 3/2021

This permit is valid for 24 months from the date of approval per 20 AAC 25.005(g)

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION

APPLICATION FOR SUNDRY APPROVALS

20 AAC 25.280

1. Type of Request: Abandon ☐ Plug Perforations ☐ Fracture Stimulate ☐ Repair Well ☐ Operations shutdown ☐
Suspend ☐ Perforate ☐ Other Stimulate ☐ Pull Tubing ☐ Change Approved Program ☐
Plug for Redrill ☐ Perforate New Pool ☐ Re-enter Susp Well ☐ Alter Casing ☐ Other: _____ ☐

2. Operator Name:

3. Address:

4. Current Well Class:
Exploratory ☐ Development ☐
Stratigraphic ☐ Service ☐

5. Permit to Drill Number:

6. API Number:

7. If perforating:
What Regulation or Conservation Order governs well spacing in this pool?
Will perfs require a spacing exception due to property boundaries? Yes ☐ No ☐

8. Well Name and Number:

9. Property Designation (Lease Number):

10. Field: Current Pools: Proposed Pools:

11. **PRESENT WELL CONDITION SUMMARY**

Total Depth MD (ft):	Total Depth TVD (ft):	Effective Depth MD:	Effective Depth TVD:	MPSP (psi):	Plugs (MD):	Junk (MD):

Casing	Length	Size	MD	TVD	Burst	Collapse
Structural						
Conductor						
Surface						
Intermediate						
Production						
Liner						

Perforation Depth MD (ft):	Perforation Depth TVD (ft):	Tubing Size:	Tubing Grade:	Tubing MD (ft):

Packers and SSSV Type:

Packers and SSSV MD (ft) and TVD (ft):

12. Attachments: Proposal Summary ☐ Wellbore schematic ☐
Detailed Operations Program ☐ BOP Sketch ☐

13. Well Class after proposed work:
Exploratory ☐ Stratigraphic ☐ Development ☐ Service ☐

14. Estimated Date for Commencing Operations:

15. Well Status after proposed work:
OIL ☐ WINJ ☐ WDSPL ☐ Class VI ☐
GAS ☐ WAG ☐ GSTOR ☐ Suspended ☐
GINJ ☐ Op Shutdown ☐ Abandoned ☐

16. Verbal Approval: Date:
AOGCC Representative:

17. I hereby certify that the foregoing is true and the procedure approved herein will not be deviated from without prior written approval.

Contact Name:

Authorized Name and Digital Signature with Date:

Contact Email:

Contact Phone:

Authorized Title:

AOGCC USE ONLY

Conditions of approval: Notify AOGCC so that a representative may witness

Sundry Number:

Plug Integrity ☐ BOP Test ☐ Mechanical Integrity Test ☐ Location Clearance ☐

Other Conditions of Approval:

Suspension Expiration Date:

Post Initial Injection MIT Req'd? Yes ☐ No ☐

Subsequent Form Required:

Approved by: COMMISSIONER APPROVED BY THE AOGCC Date:

Comm.	Comm.	Sr Pet Eng	Sr Pet Geo	Sr Res Eng

Approved application valid for 12 months from date of approval.

Submit PDF to aogcc.permitting@alaska.gov

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION

REPORT OF SUNDRY WELL OPERATIONS

1. Operations Performed:									
	Susp Well Insp ☐	Plug Perforations ☐	Fracture Stimulate ☐	Pull Tubing ☐	Operations shutdown ☐
	Install Whipstock ☐	Perforate ☐	Other Stimulate ☐	Alter Casing ☐	Change Approved Program ☐
	Mod Artificial Lift ☐	Perforate New Pool ☐	Repair Well ☐	Coiled Tubing Ops ☐	Other: _____ ☐

2. Operator Name	4. Well Class Before Work: Development ☐ Exploratory ☐ Stratigraphic ☐ Service ☐	5. Permit to Drill Number:
3. Address:		6. API Number:

7. Property Designation (Lease Number):	8. Well Name and Number:
9. Logs (List logs and submit electronic data per 20AAC25.071):	10. Field/Pool(s):

11. Present Well Condition Summary:

Total Depth	measured _____ feet	Plugs	measured _____ feet		
	true vertical _____ feet	Junk	measured _____ feet		
Effective Depth	measured _____ feet	Packer	measured _____ feet		
	true vertical _____ feet		true vertical _____ feet		

Casing	Length	Size	MD	TVD	Burst	Collapse
Structural						
Conductor						
Surface						
Intermediate						
Production						
Liner						

Perforation depth Measured depth _____ feet

True Vertical depth _____ feet

Tubing (size, grade, measured and true vertical depth) _____ _____ _____ _____

Packers and SSSV (type, measured and true vertical depth) _____ _____ _____ _____

12. Stimulation or cement squeeze summary:
Intervals treated (measured):

Treatment descriptions including volumes used and final pressure:

13a. Representative Daily Average Production or Injection Data

	Oil-Bbl	Gas-Mcf	Water-Bbl	Casing Pressure	Tubing Pressure
Prior to well operation:					
Subsequent to operation:					

13b. Pools active after work:

14. Attachments (required per 20 AAC 25.070, 25.071, & 25.283)
Daily Report of Well Operations ☐
Copies of Logs and Surveys Run ☐
Electronic Fracture Stimulation Data ☐

15. Well Class after work:
Exploratory ☐ Development ☐ Service ☐ Stratigraphic ☐

16. Well Status after work:
Oil ☐ Gas ☐ WDSPL ☐
GSTOR ☐ WINJ ☐ WAG ☐ GINJ ☐ SUSP ☐ Class VI ☐

17. I hereby certify that the foregoing is true and correct to the best of my knowledge.

Sundry Number or N/A if C.O. Exempt:

Authorized Name and
Digital Signature with Date: _____

Contact Name: _____
Contact Email: _____
Contact Phone: _____

Authorized Title: _____

Sr Pet Eng:	Sr Pet Geo:	Sr Res Eng:

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

1a. Well Status: Oil ☐ Gas ☐ SPLUG ☐ Other ☐ Abandoned ☐ (20AAC 25.105) Suspended ☐ (20AAC 25.110) GINJ ☐ WINJ ☐ WAG ☐ WDSPL ☐ Class VI ☐ No. of Completions: _____		1b. Well Class: Development ☐ Exploratory ☐ Service ☐ Stratigraphic Test ☐
2. Operator Name:	6. Date Comp., Susp., or Aband.:	14. Permit to Drill Number / Sundry:
3. Address:	7. Date Spudded:	15. API Number:
4a. Location of Well (Governmental Section): Surface: Top of Productive Interval: Total Depth:	8. Date TD Reached: 9. Ref Elevations: KB: GL: BF: 10. Plug Back Depth MD/TVD:	16. Well Name and Number: 17. Field / Pool(s): 18. Property Designation:
4b. Location of Well (State Base Plane Coordinates, NAD 27): Surface: x- y- Zone- TPI: x- y- Zone- Total Depth: x- y- Zone-	11. Total Depth MD/TVD: 12. SSSV Depth MD/TVD:	19. DNR Approval Number: 20. Thickness of Permafrost MD/TVD:
5. Directional or Inclination Survey: Yes ☐ (attached) No ☐ Submit electronic information per 20 AAC 25.050	13. Water Depth, if Offshore: (ft MSL)	21. Re-drill/Lateral Top Window MD/TVD:

22. Logs Obtained: List all logs run and, pursuant to AS 31.05.030 and 20 AAC 25.071, submit all electronic data within 90 days of completion, suspension, or abandonment; or within 90 days of acquisition of the log, whichever occurs first. Types of logs to be listed include, but are not limited to: mud log, spontaneous potential, gamma ray, caliper, resistivity, porosity, magnetic resonance, dipmeter, formation tester, temperature, cement evaluation, casing collar locator, jewelry, and perforation record. Acronyms may be used. Attach a separate page only if necessary.

23. CASING, LINER AND CEMENTING RECORD

CASING	WT. PER FT.	GRADE	SETTING DEPTH MD		SETTING DEPTH TVD		HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
			TOP	BOTTOM	TOP	BOTTOM			

24. Open to production or injection? Yes ☐ No ☐
If Yes, list each interval open (MD/TVD of Top and Bottom; Perforation Size and Number; Date perf'd or liner run):

25. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD/TVD)

26. ACID, FRACTURE, CEMENT SQUEEZE, ETC.

Was hydraulic fracturing used during completion? Yes ☐ No ☐
Per 20 AAC 25.283 (i)(2) attach electronic information

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED

27. PRODUCTION TEST

Date First Production:			Method of Operation (Flowing, gas lift, etc.): sldklfjsdlkgj				
Date of Test:	Hours Tested:	Production for Test Period →	Oil-Bbl:	Gas-MCF:	Water-Bbl:	Choke Size:	Gas-Oil Ratio:
Flow Tubing Press.	Casing Press:	Calculated 24-Hour Rate →	Oil-Bbl:	Gas-MCF:	Water-Bbl:	Oil Gravity - API (corr):	

Sr Pet Eng	Sr Pet Geo	Sr Res Eng

28. CORE DATA Conventional Core(s): Yes ☐ No ☐ Sidewall Cores: Yes ☐ No ☐

If Yes, list formations and intervals cored (MD/TVD, From/To), and briefly summarize lithology and presence of oil, gas or water (submit separate pages if needed). Submit detailed descriptions, core chips, photographs, and all subsequent laboratory analytical results per 20 AAC 25.071 no matter when acquired.

29. GEOLOGIC MARKERS and POOL BOUNDARIES: (list all encountered)

NAME	MD	TVD
Permafrost - Top		
Permafrost - Base		
Top of Productive Interval		
Formation Name at TD:		

30. FORMATION TESTS

Well tested? Yes ☐ No ☐

If Yes, list intervals and formations tested, briefly summarizing test results for each. Attach separate pages if needed and submit detailed test info including reports and Excel or ASCII tables per 20 AAC 25.071.

31. List of Attachments:

Information to be attached includes, but is not limited to: summary of daily operations, wellbore schematic, directional or inclination survey, as-built, core analysis, paleontological report, production or well test results, per 20 AAC 25.070.

32. I hereby certify that the foregoing is true and correct to the best of my knowledge.

Authorized Name and Digital Signature with Date:

Authorized Title:

Contact Name:

Contact Email:

Contact Phone:

INSTRUCTIONS

General: This form and the required attachments provide a complete and concise record for each well drilled in Alaska. Submit a current well schematic diagram with each 10-407. Submit 10-407 and attachments in PDF format to aogcc.permitting@alaska.gov. All laboratory analytical reports from a well must be submitted to the AOGCC, no matter when the analyses are conducted per 20 AAC 25.071.

Item 1a: Multiple completion is defined as a well producing from more than one pool with production from each pool completely segregated. Each segregated pool is a completion.

Item 1b: Well Class - Service wells: Gas Injection, Water Injection, Water-Alternating-Gas Injection, Salt Water Disposal, Water Supply for Injection, Observation, or Other.

Item 4b: TPI (Top of Producing Interval).

Item 9: The Kelly Bushing, Ground Level, and Base Flange elevations in feet above Mean Sea Level. Use same as reference for depth measurements given in other spaces on this form and in any attachments.

Item 15: The API number reported to AOGCC must be 14 digits (ex: 50-029-20123-00-00).

Item 19: Report the Division of Oil & Gas / Division of Mining Land and Water: Plan of Operations (LO/Region YY-123), Land Use Permit (LAS 12345), and/or Easement (ADL 123456) number.

Item 20: Report measured depth and true vertical thickness of permafrost. Provide MD and TVD for the top and base of permafrost in Box 29.

Item 22: Review the reporting requirements of 20 AAC 25.071 and, pursuant to AS 31.05.030, submit all electronic data within 90 days of completion, suspension, or abandonment; or 90 days after log acquisition, whichever occurs first.

Item 23: Attached supplemental records should show the details of any multiple stage cementing and the location of the cementing tool.

Item 24: If this well is completed for separate production from more than one interval (multiple completion), so state in item 1, and in item 23 show the producing intervals for only the interval reported in item 26. (Submit a separate form for each additional interval to be separately produced, showing the data pertinent to such interval).

Item 27: Method of Operation: Flowing, Gas Lift, Rod Pump, Hydraulic Pump, Submersible, Water Injection, Gas Injection, Shut-in, or Other (explain).

Item 28: Provide a listing of intervals cored and the corresponding formations, and a brief description in this box. Pursuant to 20 AAC 25.071, submit detailed descriptions, core chips, photographs, and all subsequent laboratory analytical results, including, but not limited to: porosity, permeability, fluid saturation, fluid composition, fluid fluorescence, vitrinite reflectance, geochemical, or paleontology.

Item 30: Provide a listing of intervals tested and the corresponding formation, and a brief summary in this box. Submit detailed test and analytical laboratory information required by 20 AAC 25.071.

Item 31: Pursuant to 20 AAC 25.070, attach to this form: well schematic diagram, summary of daily well operations, directional or inclination survey, and other tests as required including, but not limited to: core analysis, paleontological report, production or well test results.

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION
Mechanical Integrity Test

Submit to: jim.regg@alaska.gov; AOGCC.Inspectors@alaska.gov; phoebe.brooks@alaska.gov chris.wallace@alaska.gov

OPERATOR: _____
FIELD / UNIT / PAD: _____
DATE: _____
OPERATOR REP: _____
AOGCC REP: _____

Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												
Well				Pressures:	Pretest	Initial	15 Min.	30 Min.	45 Min.	60 Min.		
PTD		Type Inj		Tubing							Type Test	
Packer TVD		BBL Pump		IA							Interval	
Test psi		BBL Return		OA							**Result**	
Notes:												

TYPE INJ Codes
W = Water
G = Gas
S = Slurry
I = Industrial Wastewater
N = Not Injecting

TYPE TEST Codes
P = Pressure Test
O = Other (describe in Notes)

INTERVAL Codes
I = Initial Test
4 = Four Year Cycle
V = Required by Variance
O = Other (describe in notes)

Result Codes
P = Pass
F = Fail
I = Inconclusive

Appendix A-2 Permit Template

Alaska UIC Permit Template Class VI

UNDERGROUND INJECTION CONTROL PROGRAM

PERMIT to Construct and Inject Class VI Injection Wells

Permit No. UIC-AKVI-FYXX-#

[PROJECT NAME] Project

[DESCRIPTIVE LOCATION], Alaska

Issued to:
[COMPANY NAME]
[ADDRESS LINE 1]
[ADDRESS LINE 2]
[ADDRESS LINE 3]

AUTHORIZING SIGNATURES

Name of Commissioner Chair, Commissioner	Name of Commissioner Commissioner	Name of Commissioner Commissioner

Signed this ___ day of_____, 20 ___

Table of Contents

AUTHORIZING SIGNATURE 2

PART I. AUTHORIZATION TO CONSTRUCT AND INJECT 7

PART II. SPECIFIC PERMIT CONDITIONS 9

A. REQUIREMENTS PRIOR TO DRILLING, TESTING, CONSTRUCTING, OR OPERATING 9

1. Financial Assurance 9

2. Field Demonstration Submittal, Notification, and Reporting 9

B. WELL CONSTRUCTION 9

1. Siting 9

2. Casing and Cementing 9

3. Tubing and Packer Specification 9

C. CONDITIONS FOR WELLS AND PROPOSED WELLS 10

1. Surface Location 10

2. Well Construction Details 10

3. Proposed Well Construction Details 10

4. Injection Formation Testing 10

5. Injection Interval 11

6. Monitoring Devices 11

7. Pressure Fall-Off Test (FOT) 11

8. Proposed Changes and Workovers 11

9. Testing during Drilling and Construction of Proposed Well 12

D. AREA OF REVIEW AND CORRECTIVE ACTION 12

E. WELL OPERATION 13

1. Injection Pressure Limitation 13

2. Stimulation Program 13

3. Additional Injection Limitation 13
4. Annulus Fluid 13
5. Annulus/Tubing Pressure Differential 13
6. Automatic Alarms and Automatic Shut-off System 13
7. Precautions to Prevent Well Blowouts 14
8. Circumstances Under Which Injection Must Cease 14
9. Approaches for Ceasing Injection 14
F. MECHANICAL INTEGRITY 14
1. Standards 14
2. Mechanical Integrity Testing 15
3. Prior Notice and Reporting 16
4. Gauge and Meter Calibration 16
5. Loss of Mechanical Integrity 16
6. Mechanical Integrity Testing on Request from AOGCC 17
G. TESTING AND MONITORING 17
1. Testing and Monitoring Plan 17
2. Carbon Dioxide Stream Analysis 17
3. Continuous Monitoring 18
4. Corrosion Monitoring 18
5. Groundwater Quality Monitoring 18
6. External Mechanical Integrity Testing 18
7. Pressure Fall-Off Test 18
8. Plume and Pressure Front Tracking 18
9. Surface Air and/or Soil Gas Monitoring 19
10. Additional Monitoring 19
H. REPORTING AND RECORDKEEPING 19
1. Electronic Reporting 19
2. Semi-Annual Reports 19

3. 24-Hour Reporting 19
4. Reports on Well Tests and Workovers 20
5. Records 20
I. INJECTION WELL PLUGGING 21
1. Prior to Well Plugging 21
2. Well Plugging Plan 21
3. Revision of Well Plugging Plan 21
4. Notice of Plugging 21
5. Plugging and Abandonment Approval and Report 21
6. Temporary Abandonment 21
J. POST-INJECTION SITE CARE AND CLOSURE 22
1. Post-Injection Site Care and Site Closure Plan 22
2. Carbon Dioxide Plume and Pressure Front Monitoring 22
3. Notification and Well Plugging 23
4. Site Closure Report and Recordkeeping 23
K. EMERGENCY AND REMEDIAL RESPONSE 23
L. FINANCIAL ASSURANCE REQUIREMENTS 24
1. Demonstration of Financial Responsibility 24
2. Cost Estimate Updates 24
3. Notification 24
4. Establishing Other Coverage 25
M. DURATION OF PERMIT 25
PART III. GENERAL PERMIT CONDITIONS 25
A. EFFECT OF PERMIT 25
B. PERMIT ACTIONS 26
1. Modification, Revocation and Reissuance, or Termination 26
2. Minor Modifications 26
3. Transfers 26

C. SEVERABILITY 26

D. CONFIDENTIALITY 26

E. GENERAL DUTIES AND REQUIREMENTS 27

1. Duty to Comply 27

2. Definitions 27

3. Penalties for Violations of Permit Conditions 27

4. Need to Halt or Reduce Activity not a Defense 27

5. Duty to Mitigate 27

6. Proper Operation and Maintenance 27

7. Property Rights 28

8. Duty to Provide Information 28

9. Inspection and Entry 28

10. Signatory Requirements 29

11. Additional Reporting Requirements 29

12. Duration; Storage Facility Permit Continuation of Expiring Permit 30

ATTACHMENT A – Injection Well Operation Plan and Procedures
ATTACHMENT B – Project Location Maps
ATTACHMENT C –Schematics and Construction Details
ATTACHMENT D – Reporting Forms
ATTACHMENT E – Area of Review and Corrective Action Plan
ATTACHMENT F – Geophysical Logging Requirements
ATTACHMENT G – Pressure Falloff Requirements
ATTACHMENT H – Testing and Monitoring Plan
ATTACHMENT I – Plugging and Abandonment Plan
ATTACHMENT J – Financial Assurance Demonstration
ATTACHMENT K – Stimulation Program
ATTACHMENT L – Emergency and Remedial Response Plan
ATTACHMENT M – Post Injection Site Care and Site Closure Plan

PART I. AUTHORIZATION TO CONSTRUCT AND INJECT

Pursuant to the Underground Injection Control regulations of the Alaska Oil and Gas Conservation Commission (AOGCC) codified at Title 20 of the Alaska Administrative Code, Chapter 25, Article 9 Carbon Storage [COMPANY NAME], [ADDRESS LINE 1], [LINE 2 LINE3] is hereby authorized, contingent upon Permit conditions, to construct and operate a Class VI storage facility used to dispose and store Carbon Dioxide (CO2) generated by the Permittee's facility [for non-commercial facilities DURING THE MANUFACTURE OF XXX; for commercial facilities AND FROM OTHER SOURCES] at the [PROJECT NAME]. The Project is in [PROJECT LOCATION], Alaska, approximately [DISTANCE AND DIRECTION TO NEAREST LANDMARK], as depicted in Attachment B. The location is [LOCATION DESCRIPTION (Include Section, Township, Range, with latitude/longitude)]. The well [IS/WILL BE] located [DESCRIBE LOCATION].

The injection zone is within the [FORMATION NAME] Formation at the [FOR WELLS NOT YET DRILLED USE APPROXIMATE] depths of [NUMBER] feet to [NUMBER] feet below ground level. The authorized injection interval is within the [FORMATION NAME] Formation at the [FOR WELLS NOT YET DRILLED USE APPROXIMATE] depths of [NUMBER] to [NUMBER] feet below ground level.

[DESCRIBE INJECTATE AND SOURCE OR PRODUCTION PROCESS] [INDICATE IF AQUIFER EXEMPTION EXPANSION IS REQUIRED OR HAS BEEN APPROVED.]
For the permitted wells within the Area of Review (AOR), AOGCC will issue authorization to drill and construct only after requirements of Financial Responsibility in Part II, Section L of this Permit have been met. AOGCC will grant authorization to inject only after the requirements of Part II, Sections C, D, E and F of this Permit have been met. Operation of injection [WELL ID] will be limited to a maximum volume of [SPECIFY QUANTITY] and pressure of [SPECIFY QUANTITY]. All conditions set forth herein refer to Title 20, Chapter 25, Article 9 of the Alaska Administrative Code (AAC), which are regulations in effect on the date that this Permit is effective.

This Permit consists of [NUMBER] pages plus Attachments, and includes all items listed in the Table of Contents. Further, it is based upon representations made by [COMPANY NAME] (the Permittee) and on other information contained in the administrative record. It is the responsibility of the Permittee to read, understand, and comply with all terms and conditions of this Permit.

This Permit and the authorization to construct, operate, and inject are issued for a period to include the approximate [NUMBER]-year Project operation unless terminated under the conditions set forth in Part III, Section B.1 of this Permit. This Permit and authorization to inject shall also include additional post-closure monitoring for at least fifty (50) years following cessation of injection unless an alternative timeframe is approved by AOGCC.

This Permit is issued on [DATE] and becomes effective on [DATE]. This Permit is issued for a period of xx years unless the Permit is terminated under the conditions set forth in Part III.B.1. or administratively extended under the conditions set forth in Part III.E.

Name of Commissioner Chair, Commissioner	Name of Commissioner Commissioner	Name of Commissioner Commissioner

PART II. SPECIFIC PERMIT CONDITIONS

A. REQUIREMENTS PRIOR TO DRILLING, TESTING, CONSTRUCTING, OR OPERATING

1. Financial Assurance

The Permittee shall supply evidence of financial assurance prior to commencing any well drilling and construction, in accordance with Section L of this part.

2. Field Demonstration Submittal, Notification, and Reporting

a. Prior to each demonstration or test required in this Permit, the Permittee shall submit plans and specifications for procedures to the AOGCC for approval 90 days prior to demonstration or testing activities. No demonstration or test in these sections may proceed without prior written approval from AOGCC.
b. The Permittee must notify AOGCC at least thirty (30) days prior to performing any required field demonstrations or test, after AOGCC approves the plans/procedures for testing, in order to allow AOGCC to arrange to witness if so elected.
c. The Permittee shall submit results of each demonstration or test required in Part II of this Permit to AOGCC within thirty (30) days of completion, unless otherwise noted. [INCLUDE SECTION ON AQUIFER EXEMPTION EXPANSION IF APPLICABLE – SEE 20 AAC 25.442]

B. WELL CONSTRUCTION

1. Siting

The Permittee has demonstrated to the satisfaction of the AOGCC that the well is in an area with suitable geology in accordance with the requirements of 20 AAC 25.1060.

2. Casing and Cementing

Casing and cement or other materials used in the construction of the well must have sufficient structural strength for the life of the geologic sequestration project. All well materials must be compatible with all fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the AOGCC. The casing and cementing program must prevent the movement of fluids into or between USDWs for the expected life of the well in accordance with 20 AAC 25.1210. The casing and cement used in the construction of this well are shown in Attachment C of this Permit and in the administrative record for this Permit. Any change must be submitted in an electronic format for approval by the AOGCC before installation.

3. Tubing and Packer Specification 20 AAC 25.1210(d)

Tubing and packer materials used in the construction of the well must be compatible with fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the AOGCC. The Permittee shall inject only through tubing with a packer set within the long string casing at a point within

or below the confining zone immediately above the injection zone. The tubing and packer used in the well are represented in engineering drawings contained in Attachment C of this Permit. Any change must be submitted in an electronic format for approval by the AOGCC before installation.

C. CONDITIONS FOR WELLS AND PROPOSED WELLS

1. **Surface Location**
   [DESCRIBE LOCATION OF EXISTING AND PROPOSED WELLS]

2. **Well Construction Details**
   A well schematic for each well is contained in Attachment C of this Permit. The Permittee shall at all times maintain the well consistent with this well schematic.

3. **Proposed Well Construction Details**
   The Permittee shall submit an updated well schematic for each proposed well and must receive written AOGCC approval prior to commencing drilling and construction of the well.

4. **Injection Formation Testing**
   Prior to the AOGCC authorizing injection, the Permittee shall perform all pre- injection logging, sampling, and testing specified at 20 AAC 25.1220. This testing shall include:

   a. Logs, surveys and tests to determine or verify the depth, thickness, porosity, permeability, lithology, and formation fluid salinity in all relevant geologic formations. These tests shall include:
      i. Deviation checks;
      ii. Logs and tests before and upon installation of the surface casing;
      iii. Logs and tests before and upon installation of the long-string casing;
      iv. Tests to demonstrate internal and external mechanical integrity; and
      v. Any alternative methods that are required by and/or approved by the AOGCC.
      vi. Whole cores or sidewall cores of the injection zone and confining system and formation fluid samples from the injection zone;
      vii. Records of the fluid temperature, pH, conductivity, reservoir pressure, and static fluid level of the injection zone;
      viii. Tests to provide information about the injection and confining zones, including calculated fracture pressure and the physical and chemical characteristics of the injection and confining zones and the formation fluids in the injection zone;
      ix. Tests to determine maximum allowable injection pressure; and
      x. Tests to verify hydrogeologic characteristics of the injection zone, including:
         a) A pressure fall-off test and
         b) A pumping test or injectivity tests.

The Permittee shall submit to the AOGCC for approval in an electronic format a schedule for logging and testing activities 30 days prior to conducting the first test and submit any changes to the schedule 30 days prior to the next scheduled test. The Permittee must provide the AOGCC or

their representative with the opportunity to witness all logging, sampling, and testing required under this Section.

5. **Injection Interval**
   The Wells will inject into the [DESCRIBE FORMATION] within the [NAME OF FACILITY]. Injection by the Wells area only permitted into [FORMATION NAME] Formation within the depth range as depicted in the as-built diagrams in Attachment C (i.e., at a depth of approximately [NUMBER] to [NUMBER] feet bgs).

6. **Monitoring Devices**
   The Permittee shall maintain continuous monitoring devices and use them to monitor injection pressure, flow rate, volume, the pressure on the annulus between the tubing and the long string of casing, annulus fluid level, and temperature. This monitoring shall be performed as described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250. The Permittee shall maintain for AOGCC's inspection at the facility an appropriately scaled, continuous record of these monitoring results as well as original files of any digitally recorded information pertaining to these operations.

7. **Pressure Fall-Off Test (FOT)**
   The Permittee shall conduct a pressure fall-off test at least once every five years unless more frequent testing is required by the AOGCC based on site- specific information. The test shall be performed as described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250.

8. **Proposed Changes and Workovers**
   The Permittee shall give advance notice to AOGCC as soon as possible, pursuant to and in accordance with A.A.C. R18-9-D635, of any planned physical alterations or additions to the Well, including sidetracking and deepening or perforating additional intervals. Any changes in well construction, including changes in casing, tubing, packers, and/or perforations other than minor changes, require prior written approval by AOGCC and may require a permit modification under the requirements of A.A.C. R18-9-C632. Modifications that are considered routine in well construction details, such as tubing dimensions and strengths, packer models, types and setting depths, and perforation interval changes within the permitted injection zone may be processed by AOGCC as minor permit modifications consistent with A.A.C. R18-9-C633.

   For the Well, the Permittee shall provide all records of well workovers, logging, or other subsequent test data to AOGCC within sixty (60) days of completion of the activity.

   The Permittee shall submit all reports required by this Permit using the appropriate reporting forms contained in Attachment D.

   The Permittee shall perform a Mechanical Integrity Test (MIT), using the procedures set forth in Part II.F, within thirty (30) days of completion of workovers or alterations and prior to resuming injection activities, in accordance with Part II.D.1. The Permittee shall provide results of the MIT to AOGCC within sixty (60) days of completion.

9. Testing during Drilling and Construction of Proposed Well

The Permittee shall include logs and other tests conducted during drilling and construction including, at a minimum, deviation checks, casing logs, and injection formation tests as outlined in 20 AAC 25.1220. The Permittee shall conduct Open Hole logs over the entire open hole sequence below the conductor casing.

The Permittee shall conduct formation evaluation logs and tests and shall provide and use those results to estimate and report values for porosity, permeability, compressibility, static formation pressure, effective thickness, lithology, and rock mechanical properties for both the injection and confining zones identified within the permitted geological sequence.
The Permittee shall collect and analyze full-diameter cores from the overlying confining unit [NAME OF FORMATION] and within the [NAME OF FORMATION] Formation during drilling of the Proposed Well.

At a minimum, the owner or operator must determine or calculate the following information concerning the injection and confining zone(s):

a. fracture pressure;
b. other physical and chemical characteristics of the injection and confining zone(s); and
c. physical and chemical characteristics of the formation fluids in the injection zone(s).
   Upon completion, but prior to operation, the owner or operator must conduct the following tests to verify hydrogeologic characteristics of the injection zone(s):
   i. a pressure fall-off test; and,
   ii. a pump test; or
   iii. injectivity tests.

D. AREA OF REVIEW AND CORRECTIVE ACTION

The Area of Review (AOR) is the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity. The AOR is delineated using computational modeling that accounts for the physical and chemical properties of all phases of the injected CO2 stream and is based on available site characterization, monitoring, and operational data. The Permittee shall maintain and comply with the approved Area of Review and Corrective Action Plan (Attachment E of this Permit) which is an enforceable condition of this Permit and shall meet the requirements of 20 AAC 25.1070.

At the fixed frequency specified in Attachment E, or more frequently when monitoring and operational conditions warrant, the Permittee must reevaluate the AOR and perform corrective action and update Attachment E or demonstrate to the AOGCC that no update is needed.

Following each AOR reevaluation or a demonstration that no evaluation is needed, the Permittee shall submit the resultant information in an electronic format to the AOGCC for review and approval of the AOR results. Once approved by the AOGCC, the revised Area of Review and Corrective Action Plan will become an enforceable condition of this Permit.

E. WELL OPERATION

1. Injection Pressure Limitation

Except during stimulation, the Permittee must ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone(s) so as to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection zone(s). In no case shall injection pressure initiate fractures or propagate existing fractures in the confining zone or cause the movement of injection or formation fluids into a USDW. The maximum injection pressure limit is listed in Part I of this Permit.

2. Stimulation Program

Pursuant to requirements at 20 AAC 25.1080, all stimulation programs proposed by the Permittee must be approved by the AOGCC as a permit modification and incorporated into Attachment K of this Permit.

3. Additional Injection Limitation

No injectate other than that identified in Part I of this Permit shall be injected except fluids used for stimulation, rework, and well tests as approved by the AOGCC.

4. Annulus Fluid

The Permittee must fill the annulus between the tubing and the long string casing with a non-corrosive fluid approved by the AOGCC.

5. Annulus/Tubing Pressure Differential

Except during workovers or times of annulus maintenance, the Permittee must maintain on the annulus a pressure that exceeds the operating injection pressure as specified in Part I of this Permit, unless the AOGCC determines that such requirement might harm the integrity of the well or endanger USDWs.

6. Automatic Alarms and Automatic Shut-off System

a. The Permittee must:
   i. Install, continuously operate, and maintain an automatic alarm and an automatic shut-off system or, at the discretion of the AOGCC, down- hole shut- off systems, or other mechanical devices that provide equivalent protection; and
   ii. Successfully demonstrate the functionality of the alarm system and shut-off system prior to the AOGCC authorizing injection, and at a minimum of once every twelfth month after the last approved demonstration.

b. Testing under this Section must involve subjecting the system to simulated failure conditions and must be witnessed by the AOGCC or his or her representative unless the AOGCC authorizes an unwitnessed test in advance. The Permittee must provide notice in an electronic format 30 days prior to running the test and must provide the AOGCC or their representative the opportunity to attend. The test must be documented using either a mechanical or digital device which records the value of the parameter of interest, or by a service company job record. A final report including any additional interpretation necessary for evaluation of the testing must be submitted in an electronic

format within the time period specified in Section H of this Permit.

7. Precautions to Prevent Well Blowouts

At all times, the Permittee shall maintain on the well a pressure which will prevent the return of the injection fluid to the surface. The well bore must be filled with a high specific gravity fluid during workovers to maintain a positive (downward) gradient and/or a plug shall be installed which can resist the pressure differential. A blowout preventer must be installed and kept in proper operational condition whenever the wellhead is removed to work on the well. The Permittee shall follow procedures such as those below to assure that a backflow or blowout does not occur:

a. Limit the temperature and/or corrosivity of the injectate; and
b. Develop procedures necessary to assure that pressure imbalances do not occur.

8. Circumstances Under Which Injection Must Cease

Injection shall cease when any of the following circumstances arises:

a. Failure of the well to pass a mechanical integrity test;
b. A loss of mechanical integrity during operation;
c. The automatic alarm or automatic shut-off system is triggered;
d. A significant unexpected change in the annulus or injection pressure;
e. The AOGCC determines that the well lacks mechanical integrity; or
f. The Permittee is unable to maintain compliance with any permit condition or regulatory requirement and the AOGCC determines that injection should cease.

9. Approaches for Ceasing Injection

a. The Permittee must shut-in the well by gradual reduction in the injection pressure as outlined in Attachment A of this Permit; or
b. The Permittee must immediately cease injection and shut-in the well as outlined in the 20 AAC 25.1260 Emergency and Remedial Response Plan (Attachment L of this Permit).

F. MECHANICAL INTEGRITY

1. Standards

Other than during periods of well workover (maintenance) approved by the AOGCC in which the sealed tubing-casing annulus is disassembled for maintenance or corrective procedures, the injection well must have and maintain mechanical integrity consistent with 20 AAC 25.1240 A.C.C. R18-9-J664. To meet these requirements, mechanical integrity tests/demonstrations must be witnessed by the AOGCC or an authorized representative of the AOGCC unless prior approval has been granted by the AOGCC to run an un-witnessed test. In order to conduct testing without an AOGCC representative, the following procedures must be followed.

a. The Permittee must submit prior notification in an electronic format within the time period specified in Section L(3) of this Permit, including the information that no AOGCC representative is available, and receive permission from the AOGCC to proceed;
b. The test must be performed in accordance with the Testing and Monitoring Plan

(Attachment H of this Permit) and documented using either a mechanical or digital device that records the value of the parameter of interest; and a final report including any additional interpretation necessary for evaluation of the testing must be submitted in an electronic format within the time period specified in Section H of this Permit.

2. Mechanical Integrity Testing

The Permittee shall conduct a casing inspection log and mechanical integrity testing as follows:

a. Prior to receiving authorization to inject, the Permittee shall perform the following testing to demonstrate internal mechanical integrity pursuant to 20 AAC 25.1220:
   i. A pressure test with liquid or gas; and
   ii. A casing inspection log; or
   iii. An alternative approved by the AOGCC that has been approved by the Administrator.

b. Prior to receiving authorization to inject, the Permittee shall perform the following testing to demonstrate external mechanical integrity pursuant to 20 AAC 25.1220:
   i. A tracer survey such as an oxygen activation log; or
   ii. A temperature or noise log; or
   iii. An alternative approved by the AOGCC that has been approved by the Administrator pursuant to requirements at 20 AAC 25.1240.

c. Other than during periods of well workover (maintenance) approved by the AOGCC in which the sealed tubing-casing annulus is disassembled for maintenance or corrective procedures, the Permittee must continuously monitor injection pressure, injection rate, injection volumes; pressure on the annulus between tubing and long string casing; and annulus fluid volume as specified in 20 AAC 25.1240.

d. At least once per year, the Permittee must perform the following testing to demonstrate external mechanical integrity:
   i. An Administrator-approved tracer survey such as an oxygen- activation log; or
   ii. A temperature or noise log. The AOGCC may require such tests whenever the well is worked over; or
   iii. An alternative approved by the AOGCC that has been approved by the Administrator.

e. After any workover that may compromise the internal mechanical integrity of the well, the well shall be tested by means of a pressure test approved by the AOGCC and the well must pass the test to demonstrate mechanical integrity.

f. Prior to plugging the well, the Permittee shall demonstrate external mechanical integrity as described in the Injection Well Plugging Plan and that meets the requirements of 20 AAC 25.1300.

g. The AOGCC may require the use of any other tests to demonstrate mechanical integrity other than those listed above with the written approval of the Administrator pursuant to requirements at 20 AAC 25.1240.

3. Prior Notice and Reporting

a. The Permittee shall notify the AOGCC in an electronic format of his or her intent to demonstrate mechanical integrity in an electronic format at least 30 days prior to such demonstration. At the discretion of the AOGCC a shorter time period may be allowed.

b. Reports of mechanical integrity demonstrations which include logs must include an interpretation of results by a knowledgeable log analyst. The Permittee shall report in an electronic format the results of a mechanical integrity demonstration within the time period specified in Section H of this Permit.

4. Gauge and Meter Calibration

The Permittee shall calibrate all gauges used in mechanical integrity demonstrations and other required monitoring to an accuracy of not less than 0.5 percent of full scale, within one year prior to each required test. The date of the most recent calibration shall be noted on or near the gauge or meter. A copy of the calibration certificate shall be submitted to the AOGCC in an electronic format with the report of the test.

Pressure gauge resolution shall be no greater than five psi. Certain mechanical integrity and other testing may require greater accuracy and shall be identified in the procedure submitted to the AOGCC prior to the test.

5. Loss of Mechanical Integrity

a. If the Permittee or the AOGCC finds that the well fails to demonstrate mechanical integrity during a test, or fails to maintain mechanical integrity during operation, or that a loss of mechanical integrity as defined by 20 AAC 25.1240 is suspected during operation (such as a significant unexpected change in the annulus or injection pressure), the Permittee must:

   i. Cease injection in accordance with Attachments A or L of this Permit;

   ii. Take all steps reasonably necessary to determine whether there may have been a release of the injected CO2 stream or formation fluids into any unauthorized zone. If there is evidence of USDW endangerment, implement the Emergency and Remedial Response Plan (Attachment L of this Permit);

   iii. Follow the reporting requirements as directed in Section H of this Permit;

   iv. Restore and demonstrate mechanical integrity to the satisfaction of the AOGCC and receive written approval from the AOGCC prior to resuming injection; and

   v. Notify the AOGCC in an electronic format when injection can be expected to resume.

b. If a shutdown (i.e., down-hole or at the surface) is triggered, the Permittee must immediately investigate and identify as expeditiously as possible the cause of the shutdown. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required indicates that the well may be lacking mechanical integrity, the Permittee must take the actions listed above in Section F(5)(a)(i) through (v).

c. If the well loses mechanical integrity prior to the next scheduled test date, then the well must either be plugged or repaired and retested within 30 days of losing mechanical integrity. The Permittee shall not resume injection until mechanical integrity is

demonstrated and the AOGCC gives written approval to recommence injection in cases where the well has lost mechanical integrity.

6. Mechanical Integrity Testing on Request from AOGCC

The Permittee shall demonstrate mechanical integrity at any time upon written notice from the AOGCC.

G. TESTING AND MONITORING

1. Testing and Monitoring Plan

a. The Permittee shall maintain and comply with the approved Testing and Monitoring Plan (Attachment H of this Permit) and with the requirements in 20 AAC 25.1230 and 20 AAC 25.1250. The Testing and Monitoring Plan is an enforceable condition of this Permit. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Procedures for all testing and monitoring under this Permit must be submitted to the AOGCC in an electronic format for approval at least 30 days prior to the test. In performing all testing and monitoring under this Permit, the Permittee must follow the procedures approved by the AOGCC. If the Permittee is unable to follow the AOGCC approved procedures, then, the Permittee must contact the AOGCC at least 30 days prior to testing to discuss options, if any are feasible. When the test report is submitted, a full explanation must be provided as to why any approved procedures were not followed. If the approved procedures were not followed, AOGCC may take an appropriate action, including but not limited to, requiring the Permittee to re-run the test.

b. The Permittee must update the Testing and Monitoring Plan as required at 20 AAC 25.1250 to incorporate monitoring and operational data and in response to AOR reevaluations required under Section D of this Permit or demonstrate to the AOGCC that no update is needed. The amended Testing and Monitoring Plan or demonstration shall be submitted to the AOGCC in an electronic format within one year of an AOR reevaluation; following any significant changes to the facility such as addition of monitoring wells or newly permitted injection wells within the AOR; or when required by the AOGCC.

c. Following each update of the Testing and Monitoring Plan or a demonstration that no update is needed, the Permittee shall submit the resultant information in an electronic format to the AOGCC for review and approval of the results. Once approved by the AOGCC, the revised Testing and Monitoring Plan will become an enforceable condition of this Permit.

2. Carbon Dioxide Stream Analysis

The Permittee shall analyze the CO2 stream with sufficient frequency to yield data representative of its chemical and physical characteristics, as described in the Testing and Monitoring Plan and to meet the requirements of 20 AAC 25.1250(a)(1).

3. Continuous Monitoring

The Permittee shall maintain continuous monitoring devices and use them to monitor injection pressure, flow rate, volume, the pressure on the annulus between the tubing and the long string of casing, annulus fluid level, and temperature. This monitoring shall be

performed as described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250(a)(2). The Permittee shall maintain for AOGCC's inspection at the facility an appropriately scaled, continuous record of these monitoring results as well as original files of any digitally recorded information pertaining to these operations.

4. **Corrosion Monitoring**
   The Permittee shall perform corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion on a quarterly basis using the procedures described in the Testing and Monitoring Plan and in accordance with 20 AAC 25.1250(a)(3) to ensure that the well components meet the minimum standards for material strength and performance set forth in 20 AAC 25.1210.

5. **Groundwater Quality Monitoring**
   The Permittee shall monitor ground water quality and geochemical changes above the confining zone(s) that may be a result of CO2 movement through the confining zone(s) or additional identified zones. This monitoring shall be performed for the parameters identified in the Testing and Monitoring Plan at the locations and depths, and at frequencies described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250.

6. **External Mechanical Integrity Testing**
   The Permittee shall demonstrate external mechanical integrity as described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250(a)(5).

7. **Pressure Fall-Off Test**
   The Permittee shall conduct a pressure fall-off test at least once every five years unless more frequent testing is required by the AOGCC based on site-specific information. The test shall be performed as described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250(a)(6).

8. **Plume and Pressure Front Tracking**
   The Permittee shall track the extent of the CO2 plume and the presence or absence of elevated pressure (e.g., the pressure front) as described in the Testing and Monitoring Plan.

   a. The Permittee shall use direct methods to track the position of the CO2 plume and the pressure front in the injection zone as described in the Testing and Monitoring Plan and to meet the requirements of 20 AAC 25.1250(a)(7)(A).
   b. The Permittee shall use indirect methods to track the position of the CO2 plume and pressure front as described in the Testing and Monitoring Plan and to meet the requirements of 20 AAC 25.1250(a)(7)(B).

9. **Surface Air and/or Soil Gas Monitoring**
   The Permittee shall conduct any surface air monitoring and/or soil gas monitoring required by the AOGCC to detect movement of CO2 that could endanger a USDW at the frequency and locations described in the Testing and Monitoring Plan to meet the requirements of 20 AAC 25.1250.

10. Additional Monitoring

If required by the AOGCC as provided in 20 AAC 25.1250, the Permittee shall perform any additional monitoring determined to be necessary to support, upgrade, and improve computational modeling of the AOR evaluation required under 20 AAC 25.1070 and to determine compliance with standards under 20 AAC 25.1070 or 20 AAC 25.1210. This monitoring shall be performed as described in a modification to the Testing and Monitoring Plan.

H. REPORTING AND RECORDKEEPING

1. Electronic Reporting

Electronic reports, submittals, notifications and records made and maintained by the Permittee under this Permit must be in an electronic format approved by the AOGCC. The Permittee shall electronically submit all required reports to the AOGCC.

2. Semi-Annual Reports

The Permittee shall submit semi-annual reports containing:

a. Any changes to the physical, chemical, and other relevant characteristics of the CO2 stream from the proposed operating data;
b. Monthly average, maximum, and minimum values for injection pressure, flow rate and daily volume, temperature, and annular pressure;
c. A description of any event that exceeds operating parameters for annulus pressure or injection pressure specified in the permit;
d. A description of any event which triggers the shut-off systems required in Section (E)(6) of this Permit pursuant to 20 AAC 25.1230(e) and the response taken;
e. The monthly volume and/or mass of the CO2 stream injected over the reporting period and the volume and/or mass injected cumulatively over the life of the project;
f. Monthly annulus fluid volume added; and
g. Results of the monitoring prescribed under 20 AAC 25.1250.

3. 24-Hour Reporting

The Permittee shall report to AOGCC any non-compliance which may endanger health or the environment and/or any events that require implementation of actions in the Emergency and Remedial Response Plan (Attachment L of this Permit). The following information shall be provided orally within 24 hours from the time the Permittee becomes aware of the circumstances.

a. Any evidence that the injected CO2 stream or associated pressure front may cause an endangerment to a USDW;
b. Any non-compliance with a permit condition, malfunction of the injection system, or loss of mechanical integrity, which may cause fluid migration into or between USDWs;
c. Any triggering of a shut-off system (i.e., down-hole or at the surface);
d. Any failure to maintain mechanical integrity; or
e. Pursuant to compliance with the requirement in 20 AAC 25.1250(a)(8) for surface air/soil gas monitoring or other monitoring technologies, if required by AOGCC, any release of CO2 to the atmosphere or biosphere.

4. **Reports on Well Tests and Workovers**
   Report, within 30 days, the results of:
   a. Periodic tests of mechanical integrity;
   b. Any well workover, including simulation;
   c. Any other test of the injection well conducted by the Permittee if required by the AOGCC; and
   d. Any test of any monitoring well required by this Permit.

5. **Records**

   a. The Permittee shall retain records and all monitoring information, including all calibration and maintenance records and all original chart recordings for continuous monitoring instrumentation and copies of all reports required by this Permit (including records from pre-injection, active injection, and post- injection phases) for a period of at least 10 years from collection. Monitoring records shall include: the date, exact place, and time of sampling or measurements; The name(s) of the individual(s) who performed the sampling or measurements; A precise description of both sampling methodology and the handling of samples; The date(s) analyses were performed; The name(s) of the individual(s) who performed the analyses; The analytical techniques or methods used; and the results of such analyses.
   b. All data collected under 20 AAC 25.1080 and any supplemental information (e.g. modeling inputs for AOR delineations and reevaluations, plan modifications) shall be maintained for a period of at least 10 years after site closure.
   c. The Permittee shall retain records concerning the nature and composition of all injected fluids until 10 years after site closure.
   d. Well plugging reports, post-injection site care data, including, if appropriate, data and information used to develop the demonstration of the alternative post- injection site care timeframe, and the site closure report collected pursuant to requirements at 20 AAC 25.1320(e) and (g) shall be retained for ten years after site closure.
   e. The retention periods specified in Section H(5)(a) through (d) of this Permit may be extended by request of the AOGCC at any time. The Permittee shall continue to retain records after the retention period specified in Section H(5)(a) through (d) of this Permit or any requested extension thereof expires unless the Permittee delivers the records to the AOGCC or obtains written approval from the AOGCC to discard the records.

I. INJECTION WELL PLUGGING

1. **Prior to Well Plugging**
   Prior to plugging, the owner or operator must flush each Class VI injection well with a buffer fluid, determine bottom hole pressure, and perform a final mechanical integrity test.

2. **Well Plugging Plan**
   The Permittee shall maintain and comply with the approved Well Plugging Plan (Attachment I of this Permit) which is an enforceable condition of this Permit.

3. **Revision of Well Plugging Plan**
   If the permittee finds it necessary to change the Well Plugging Plan, a revised plan shall be

submitted in an electronic format to the AOGCC for written approval. Any amendments to the Well Plugging Plan must be approved by the AOGCC and must be incorporated into the permit, and are subject to the permit.

4. Notice of Plugging

The Permittee must notify the AOGCC in writing in an electronic format at least sixty (60) days before plugging of a well. At the discretion of the AOGCC, a shorter notice period may be allowed.

5. Plugging and Abandonment Approval and Report

a. The permittee must receive written approval of the AOGCC before plugging the well and shall plug and abandon the well in accordance with 20 AAC 25.1300 R18-9-667, as provided in the Well Plugging Plan (Attachment I of this permit).

b. Within sixty (60) days after plugging, the permittee must submit in an electronic format a plugging report to the AOGCC. The report must be certified as accurate by the permittee and by the person who performed the plugging operation (if other than the permittee.) The permittee shall retain the well plugging report in an electronic format for 10 years following site closure. The report must include:

i. A statement that the well was plugged in accordance with the Well Plugging Plan previously approved by the AOGCC (Attachment I of this permit); or

ii. If the actual plugging differed from the approved plan, a statement describing the actual plugging and an updated plan specifying the differences from the plan previously submitted and explaining why the AOGCC should approve such deviation. If the AOGCC determines that a deviation from the plan incorporated in this permit may
endanger underground sources of drinking water, the permittee shall replug the well as required by the AOGCC.

6. Temporary Abandonment

In accordance with R18-9-D636, the permittee shall continue to comply with the conditions of this permit, including all monitoring and reporting requirements according to the frequencies outlined in the permit. The well shall also be tested to ensure that it maintains mechanical integrity, according to the requirements and frequency specified in Section F(2) of this permit.

J. POST-INJECTION SITE CARE AND CLOSURE

1. Post-Injection Site Care and Site Closure Plan

The Permittee shall maintain and comply with the Post-Injection Site Care and Site Closure Plan, found as Attachment M of this Permit. The permittee shall:

a. Upon cessation of injection and in response to AoR reevaluations required under Section II(D) of this permit, either submit in an electronic format for the AOGCC's approval an amended Post-Injection Site Care and Site Closure Plan or demonstrate

through monitoring data and modeling results that no amendment to the plan is needed.

b. At any time during the life of the project, the permittee may modify and resubmit in an electronic format the Post-Injection Site Care and Site Closure Plan for the AOGCC's approval. The permittee may, as part of such modifications to the Plan, request a modification to the post-injection site care timeframe that includes documentation of the information pursuant to the requirements in 20 AAC 25.1310(h) A.A.C R18-9-J668(C)(1).

2. Carbon Dioxide Plume and Pressure Front Monitoring

The Permittee shall monitor the site following the cessation of injection to show the position of the CO2 plume and pressure front and demonstrate that USDWs are not being endangered, as specified in the Post-Injection Site Care and Site Closure Plan pursuant to the requirements in 20 AAC 25.1310(f). The Permittee shall continue to conduct post-injection site monitoring for at least 50 years or for the duration of any alternative timeframe approved by the AOGCC, including:

a. Ground water quality monitoring;
b. Tracking the position of the carbon dioxide plume and pressure front including direct pressure monitoring and geochemical plume monitoring and the use of indirect methods;
c. Internal and external MITs of wells used for post-injection monitoring;
d. Any other required monitoring, e.g., soil gas and/or surface air monitoring described in the Post-Injection Site Care and Site Closure Plan;
e. The permittee shall submit in an electronic format the results of all monitoring performed according to the schedule identified in the Post-Injection Site Care and Site Closure Plan; and
f. The permittee shall continue to conduct post-injection site monitoring for the duration of the alternative timeframe approved pursuant to 20 AAC 25.1310(h) and the Post-Injection Site Care and Site Closure Plan and until the AOGCC has authorized site closure.
g. The post-injection monitoring must continue until the project no longer poses an endangerment to USDWs and the demonstration pursuant to 20 AAC 25.1310(f) and is approved by the AOGCC in accordance with 20 AAC 25.1310(g).

Prior to authorization for site closure, the Permittee shall submit to the AOGCC for review and approval a demonstration based on monitoring and other site-specific data, that no additional monitoring is needed to ensure the geologic sequestration project does not pose an endangerment to USDWs. The AOGCC reserves the right to amend the post- injection site monitoring requirements (including extend the monitoring period) if the CO2 plume and the associated pressure front have not stabilized or there is a concern that USDWs are being endangered.

3. Notification and Well Plugging

The Permittee shall notify the AOGCC in an electronic format at least 120 days before site closure. At this time, if any changes to the approved Post-Injection Site Care and Site Closure Plan in Attachment M of this Permit are proposed, the Permittee shall submit a revised plan.

After the AOGCC has authorized site closure, the Permittee shall plug all monitoring in a manner which will not allow movement of injection or formation fluids that endangers a USDW. The Permittee shall also restore the site to its pre- injection condition.

4. Site Closure Report and Recordkeeping

The Permittee shall submit a site closure report in an electronic format to the AOGCC within 90 days of site closure. The report must include the information specified in 20 AAC 25.1310(f).

The Permittee shall record a notation on the deed to the facility property or any other document that is normally examined during a title search that will in perpetuity provide any potential purchaser of the property the information listed 20 AAC 25.1320(f).

The Permittee shall retain for 10 years following site closure an electronic copy of the records collected during the post-injection site care period. The Permittee shall deliver the records in an electronic format to the AOGCC at the conclusion of the retention period, and the records must thereafter be retained at a location designated by the AOGCC for that purpose.

K. EMERGENCY AND REMEDIAL RESPONSE

The Emergency and Remedial Response Plan describes actions the Permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods. The Permittee shall maintain and comply with the approved Emergency and Remedial Response Plan (Attachment L of this Permit), which is an enforceable condition of this Permit.

If the Permittee obtains evidence that the injected CO2 and/or associated pressure front may cause endangerment to a USDW, the Permittee must:

1. Immediately cease injection;
2. Take all steps reasonably necessary to identify and characterize any release;
3. Notify the AOGCC within 24 hours; and
4. Implement the Emergency and Remedial Response Plan.

   At the frequency specified in the Area of Review and Corrective Action Plan, or more frequently when monitoring and operational conditions warrant, but not less often than once every five years, the Permittee shall review and update the Emergency and Remedial Response Plan or demonstrate to the AOGCC that no update is needed. The amended Emergency and Remedial Response Plan or demonstration shall be submitted to the AOGCC in an electronic format within one year of an AOR reevaluation; following any significant changes to the facility such as addition of injection wells; or when required by the AOGCC.

L. FINANCIAL ASSURANCE REQUIREMENTS

1. Demonstration of Financial Responsibility

The Permittee shall maintain financial responsibility and resources to meet the conditions of this Permit and address endangerment of USDWs. Financial responsibility shall be maintained through all phases of the project using one or more of the qualifying instruments listed in 20 AAC 25.1200(a) and approved by the AOGCC. The financial assurance mechanism is found in Attachment J of this Permit.

The financial instrument(s) must be sufficient to cover the cost of:

a. Corrective action under 20 AAC 25.1070;
b. Injection well plugging under 20 AAC 25.1300;
c. Post injection site care and site closure under 20 AAC 25.1310; and
d. Emergency and remedial response under 20 AAC 25.1260.

Authority to construct, inject, and operate the wells under the authority of this Permit will be granted only after the financial instrument has been secured and approved by the AOGCC. The Permittee shall post an approved financial instrument in the amount of [SPECIFY $ AMOUNT PLUS CONTINGENCY] for all the phases of the geologic sequestration project prior to issue a Class VI permit.

2. Cost Estimate Updates

During the active life of the geologic sequestration project, the Permittee must adjust the cost estimate for inflation within sixty (60) days prior to the anniversary date of the establishment of the financial instrument(s) and provide this adjustment to the AOGCC in an electronic format. The Permittee must also provide to the AOGCC written updates of adjustments to the cost estimate within sixty (60) days of any amendments to the Area of Review and Corrective Action Plan, Injection Well Plugging Plan, Post-Injection Site Care and Site Closure Plan, and Emergency and Remedial Response Plan included in this Permit.

3. Notification

a. Whenever the current cost estimate increases to an amount greater than the face amount of a financial instrument currently in use, the Permittee, within sixty (60) days after the increase, must either cause the face amount to be increased to an amount at least equal to the current cost estimate and submit evidence of such increase to the AOGCC, or obtain other financial responsibility instruments to cover the increase. Whenever the current cost estimate decreases, the face amount of the financial assurance instrument may be reduced to the amount of the current cost estimate only after the Permittee has received written approval from the AOGCC.
b. The Permittee must notify the AOGCC by certified mail and in an electronic format of adverse financial conditions such as bankruptcy that may affect the ability to carry out injection well plugging, post-injection site care and site closure, and any applicable ongoing actions under Corrective Action and/or Emergency and Remedial Response.
    i. In the event that the Permittee or the third-party provider of a financial responsibility instrument is going through a bankruptcy, the Permittee must notify the AOGCC by certified mail and in an electronic format of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the Permittee as debtor, within 10 days after commencement of the proceeding.
    ii. A guarantor of a corporate guarantee must make such a notification if he or she is

named as debtor, as required under the terms of the guarantee.

iii. A Permittee who fulfills the requirements of paragraph 1 of this section by obtaining a trust fund, surety bond, letter of credit, escrow account, or insurance policy will be deemed to be without the required financial assurance in the event of bankruptcy of the trustee or issuing institution, or a suspension or revocation of the authority of the trustee institution to act as trustee of the institution issuing the trust fund, surety bond, letter of credit, escrow account, or insurance policy.

4. Establishing Other Coverage

The Permittee must establish other financial assurance or liability coverage acceptable to the AOGCC, within sixty (60) days of the occurrence of the events in Section L(2) or L(3) of this Permit.

M. DURATION OF PERMIT

This Permit and the authorization to inject are issued for a period of [SPECIFY DURATION] years unless terminated under the conditions set forth in Part III.B.1. or administratively extended under the conditions set forth in Part III.E.11.

PART III. GENERAL PERMIT CONDITIONS.

A. EFFECT OF PERMIT

The Permittee is allowed to engage in underground injection well construction and operation in accordance with the conditions of this Permit. The Permittee shall not construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant (as defined by 20 AAC 25.1900(15)) into USDWs (as defined 20 AAC 25.990.

Any underground injection activity not specifically authorized in this Permit is prohibited. The Permittee must comply with all applicable provisions of 20 AAC 25 18. Such compliance does not constitute a defense to any action brought under Section 1431 of the SDWA, 42 U.S.C. §300(i), or any other common law, statute, or regulation other than Part C of the SDWA. Issuance of this Permit does not convey property rights of any sort or any exclusive privilege, nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Nothing in this Permit shall be construed to relieve the Permittee of any duties under all applicable laws and regulations.

B. PERMIT ACTIONS

1. Modification, Revocation and Reissuance, or Termination

AOGCC may, for cause or upon request from the Permittee, modify, revoke and reissue, or terminate this Permit in accordance with 20 AAC 25.1410 and 20 AAC 25.1420. The permit is also subject to minor modifications for causes as specified in 20 AAC 25.1430. The filing of a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated non- compliance by the Permittee, does not stay the applicability or enforceability of any permit condition. AOGCC may also

modify, revoke and reissue, or terminate this Permit in accordance with any amendments to the SDWA if the amendments have applicability to this Permit.

2. Minor Modifications

Upon the consent of the permittee, the AOGCC may modify a permit to make the corrections or allowances for minor changes in the permitted activity as listed in 20 AAC 25.1430 R18- 9-C633. Any permit modification not processed as a minor modification under 20 AAC 25.1430 R18 R18-9-633 must be made for cause, and with a draft permit and public notice as required in 20 AAC 25.1410 R18-9-C632.

3. Transfers

This Permit is not transferable to any person unless notice is first provided to AOGCC and the Permittee complies with requirements of 20 AAC 25.1400. AOGCC may require modification or revocation and reissuance of the permit to change the name of the Permittee and incorporate such other requirements as may be necessary under the SDWA.

C. SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit or the application of any provision of this Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby.

D. CONFIDENTIALITY

In accordance with 20 AAC 25.1600, any information submitted to AOGCC pursuant to this Permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, AOGCC may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures contained in Alaska Public Records Act, AS 40.25100 - AS 40.25.295 A.R.S. § 49-205 (Public Information). Claims of confidentiality for the following information will be denied:

1. Name and address of the Permittee, or
2. Information dealing with the existence, absence, or level of contaminants in drinking water.

E. GENERAL DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with all applicable UIC Program regulations and conditions of this Permit, except to the extent and for the duration such non- compliance is authorized by an emergency permit issued in accordance with 20 AAC 25. Any permit non-compliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal

application. Such non- compliance may also be grounds for enforcement action under the Resource Conservation and Recovery Act (RCRA).

2. **Definitions**
   All terms used in this permit shall have the meaning set forth in 20 AAC 25.990 and 20 AAC 25.1900 and Underground Injection Control regulations specified at 20 AAC 25. Unless specifically stated otherwise, all references to "days" in this permit should be interpreted as calendar days.

3. **Penalties for Violations of Permit Conditions**
   Any person who violates a permit requirement is subject to civil penalties, fines, and other enforcement action under the SDWA and 20 AAC 25.535 and may also be subject to enforcement actions pursuant to RCRA. Any person who willfully violates permit conditions may be subject to criminal prosecution.

4. **Need to Halt or Reduce Activity not a Defense 20 AAC 25.1120(c)**
   It shall not be a defense, for the Permittee in an enforcement action, that it would have been necessary to halt or reduce the permitted activity to maintain compliance with the conditions of this Permit.

5. **Duty to Mitigate 20 AAC 25.1120(d)**
   The Permittee shall take all reasonable steps to minimize and correct any adverse impact on the environment resulting from non-compliance with this Permit.

6. **Proper Operation and Maintenance 20 AAC 25.1120(e)**
   The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit.

   Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This responsibility requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit. A storage operator shall give notice to the AOGCC as soon as possible of any planned physical alterations or additions to the storage facility.

7. **Property Rights 20 AAC 25.1120(g)**
   Except as provided by AS 41.06.165; the storage facility permit does not convey any property rights of any sort, or any exclusive privilege; nor does it authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations.

8. **Duty to Provide Information 20 AAC 25.1120(h)**
   The Permittee shall furnish to AOGCC, within a time specified, any information which AOGCC may request to determine whether cause exists for modifying, revoking, and

reissuing, or terminating this Permit, or to determine compliance with this Permit.

The Permittee shall also furnish to AOGCC, upon request, copies of records required to be kept by this Permit.

9. Inspection and Entry 20 AAC 25.1120(i)

The storage operator shall allow the AOGCC or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

(1) enter the storage facility premises where the regulated facility or activity is located or conducted or where records must be kept under the conditions of the permit;

(2) have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;

(3) inspect at reasonable times, any facilities, equipment, including monitoring and control equipment, practices, or operations regulated or required under the permit; and

(4) sample or monitor at reasonable times, for the purposes of assuring permit compliance, or as otherwise authorized by the Safe Drinking Water Act, any substance or parameters at any location. The Permittee shall allow AOGCC, or an authorized representative, upon the presentation of credentials and other documents as may be required pursuant to 20 AAC 25.1120(i) to:

a. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Permit;

b. Have access to and copy, at reasonable times, any records that are kept under the conditions of this Permit;

c. Inspect and photograph at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any location.

10. Signatory Requirements

All applications, reports, or other information submitted to AOGCC shall be signed and certified by a responsible corporate officer or duly authorized representative according to 20 AAC 25.1030(e), 40 C.F.R. 144.32(b), and 20 AAC 25.1030(g).

11. Additional Reporting Requirements

a. Planned Changes - The Permittee shall give notice to AOGCC as soon as possible of any planned physical alterations or additions to the permitted facility affecting any of the terms and conditions of the permit.

b. Anticipated non-compliance 20 AAC 25.1120(a)- The storage operator shall give advance notice to the AOGCC of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The Permittee shall give advance notice to AOGCC of any planned changes in the permitted facility or activity which may result in non-compliance with permit requirements.

c. Compliance Schedules 20 AAC 25.1140 –

(a) As required by the AOGCC on a case-by-case basis, the storage operator shall submit to the AOGCC identified actions to be taken to achieve full compliance with the requirements of a storage facility permit and associated Class VI well. A schedule of compliance must require compliance as soon as possible, and in no case later than three years after the date of the storage facility permit under 20 AAC 25.1170. If the permit establishes a schedule of compliance that exceeds one year from the date of the storage facility permit under 20 AAC 25.1170, the schedule of compliance must set forth interim requirements and dates for completion; the time between interim dates must not exceed one year. If the time necessary for completion of any interim requirement is more than one year, and is not readily divisible into stages for completion, the storage facility permit must specify interim dated for the submission of reports of progress toward completion of the interim requirements and shall indicate a project completion date. The permit must require that, if the AOGCC requires a schedule of compliance, the storage operator shall submit a progress report to the AOGCC not later than 30 days after each interim date and the final date of completion.

(b) A storage operator shall report any noncompliance which may endanger health or the environment, including:

(1) any monitoring or other information which indicates that any contaminant may endanger underground sources of drinking water;

(2) any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

(c) A storage operator shall orally report noncompliance covered by (b) of this section to the AOGCC within 24 hours from the time the storage operator becomes aware of the noncompliance. A storage operator shall provide a written submission to the AOGCC within 5 days of the time the storage operator becomes aware of the non-compliance, including

(1) a description of the noncompliance and its cause;

(2) the period of noncompliance, including exact dates and times,

(3) if the noncompliance has not been corrected, the anticipated time it is expected to continue; and

(4) steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(d) For noncompliance not covered by (b) of this section, the storage operator shall report all instances of noncompliance not reported in (c) of this section, at the time monitoring reports required by 20 AAC 25.1250 and 20 AAC 25.1610 are submitted. The reports must contain the information listed in paragraph (c) of this section,

(e) When a storage operator becomes aware that the storage operator failed to submit any relevant facts in a storage facility permit application, or submitted incorrect information in a storage facility permit application or in any report to the AOGCC, the storage operator shall promptly submit such facts or information to the AOGCC.

d. Reports of compliance or non-compliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Permit shall be submitted to AOGCC no later than thirty (30) days following each schedule date.
e. A written submission of all non-compliance shall also be provided to AOGCC within five (5) days of the time the Permittee becomes aware of the circumstances. The written submission shall contain: a description of the non- compliance and its cause; the period of non-compliance, including exact dates and times; if the non- compliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the non-compliance.
f. Other non-compliance - At the time monitoring reports are submitted, the Permittee shall report in writing all other instances of non-compliance not otherwise reported.
g. Other Information - If the Permittee becomes aware that it failed to submit all relevant facts in the permit application or submitted incorrect information in the permit application or in any report to AOGCC, the Permittee shall submit such facts or information within two (2) weeks of the time such facts or information becomes known.

12. Duration; Storage Facility Permit Continuation of Expiring Permit

a. Upon approval of a storage facility permit, the AOGCC will issue the permit for the operating life of the facility and the post-injection site care period specified in the permit. The AOGCC will review each storage facility permit, including each associated Class VI well permit, not less than once every five years to determine if it should be modified, revoked and reissued, terminated, or a minor modification made as provided in this chapter. The term of a permit may not be extended by modification beyond the maximum duration specified in this subsection except as provided in (d) of this section.
b. The AOGCC may issue a storage facility permit for a duration that is less than the full allowable term under (a) of this section.
c. A storage facility permit, including a Class VI well permit and authorization to inject for a Class VI well, may only be transferred, modified, revoked and reissued, terminated, or a minor modification made as provided in 20 AAC 25.1410 or, 20 AAC 25.1430, as applicable.
d. The conditions of an expired storage facility permit may continue until the effective date of a new permit if the storage operator has submitted a timely and complete application under 20 AAC 25.1080, and the AOGCC, through no fault of the storage operator, does not issue a new permit with an effective date on or before the expiration date of the previous permit. A permit continued under this subsection remains fully effective and enforceable. When a storage operator is not in compliance with the terms of an expiring or expired storage facility permit, the AOGCC may
   (1) initiate enforcement action, including civil penalties under AS 41.06.180;
   (2) issue a notice of intent to deny the new permit; in the event of a notice of intent to deny, the storage operator must cease activities authorized by the permit, except for approved well plugging and abandonment under 20 AAC 25.1300, or be subject to enforcement action;
   (3) issue a new permit consistent with the requirements and process of 20 AAC 25.1410; or
   (4) take other actions authorized by AS 41.06.110 or 20 AAC 25.
e. Duty to Reapply - If AOGCC requires the Permittee to continue an activity regulated by this Permit past the expiration date of this Permit, the Permittee must submit a complete

application for a new permit at least one hundred and eighty (180) days before this Permit expires.

f. Permit Extensions – 20 AAC 25.1160(d) The conditions and requirements of an expired permit continue in force and effect in accordance with 5 U.S.C.§558(c) until the effective date of a new permit, if:
   i. The Permittee has submitted a timely and complete application for a new permit; and
   ii. AOGCC, through no fault of the Permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit.

Appendix A-3 Aquifer Exemption Checklist

Aquifer Exemption Checklist

Reviewed by: _____ ***Date*** _____

A- Regulatory Background and Purpose

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.3 may be determined to be an "exempted aquifer". The aquifer exemption criteria at 146.4 must be met as follows:

- Class I-V wells must meet criteria **146.4(a) and 146.4(b)(1)**; or **146.4(a) and 146.4(b)(2)**; or **146.4(a) and 146.4(b)(3)**; or **146.4(a) and 146.4(b)(4)**; or **146.4(a) and 146.4(c).**
- Class VI wells must meet the criteria **146.4(d)**[1].

Regardless of the AE request or the type of injection activity, in all cases, first and foremost a demonstration that the aquifer or portion thereof does not currently serve as a source of drinking water is the required first step in the process. **EPA must evaluate each AE request to ensure the criteria are met prior to approval. EPA should also document its rationale for approving or disapproving each AE request in its statement of basis and, in case of exemptions that are substantial program revisions, EPA must provide public notice and an opportunity for the public to comment and request a public hearing.**

The purpose of this checklist is to ensure that appropriate and adequate information is collected to facilitate review of AE requests, and documentation of AE decisions. Some information described here may not apply to all AE requests.

B- General Information

AE request received by EPA on _____

Is the aquifer exemption Substantial_____ **Non-Substantial**_____
Describe basis for substantial/non-substantial determination_____
Is the aquifer exemption Complex? (Existence of drinking water wells, populated area ...) _____
Did the state or tribe provide public notice and opportunity for public hearing on the aquifer exemption request (144.7 (b)) Y/N
Were there any public comments? Y/N If yes, identify where they may be located_____
Date(s) of notice(s) published_____, Public meeting(s) held_____, Hearing held _____, any notable findings or pending litigation _____
Describe the notice and comment process and the final decision_____
Describe the basis for the decision to exempt the aquifer or the basis for the decision to withhold or deny approval of the exemptions request_____
Any anticipated issues associated with EPA approval or disapproval of the AE request Y/N_____
Any meetings between EPA/States/Tribes/Operator to discuss issues Y/N list_____

Is the request submitted by a primacy state or tribe? Y/N If yes name the State/Tribe/Agency _____ **Contact:**_____
AE identified by the Primacy State or tribe and submitted for EPA review and final determination on _____

Name of the Owner/operator_____
Well/Project Name:_____ **Well Class** _____
Purpose of injection: _____(mineral mining/oil and gas/other)

Where is the proposed aquifer exemption located? Township, Section, Range, Quarter Section or other method used to identify the area _____ Latitude and longitude information _____County_____ City_____ State_____ Add information about distance to nearest Town, County _____

Name of aquifer or portion of aquifer to be exempted _____

_____

[1] Additional Class VI only requirements in 40 CFR 144.7(d)(1) and (2) apply. This checklist does not address those requirements.

Areal extent of the area proposed for exemption_____

Depth and thickness of the aquifer _____

Discuss the total dissolved solid (TDS) content of the aquifer, including the TDS at the top and bottom of the exempted zone, and the locations and depths of all fluids samples taken. _____

C- Regulatory Criteria

An aquifer or a portion thereof may be determined to be an exempted aquifer for Class I-V wells if it meets the criteria in paragraphs (a) –(c) below. Other than EPA approved aquifer exemption expansions that meet the criteria set forth in 146.4(d), new aquifer exemptions for Class VI wells shall not be issued.

146.4: ( ) (a) ***Not currently used as a drinking water source*** **and:**

( ) **(b)(1)** It is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or Class II operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible; or

( ) **(b)(2)** It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or

( ) **(b)(3)** It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

( ) **(b)(4)** It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or

( ) **(c)** TDS is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

( ) **(d)** *The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under § 144.7(d) if it does not currently serve as a source of drinking water; and the TDS is more than 3,000 mg/l and less than 10,000 mg/l; and it is not reasonably expected to supply a public water system.*

1- Demonstration that the aquifer or portion thereof does not currently serve as a source of drinking water per 146.4(a)

Describe the proposed exempted area and how it was determined:_____

_____

TDS:_____ **Top:**_____ **Bottom:**_____

Lithology: _____

Permeability: _____ **Porosity:** _____ **Groundwater flow direction:** _____

Upper and Lower Confining Zone(s) and description of vertical confinement from USDWs:

_____

Oil or mineral production history:_____

Are there any public or private drinking water wells within and nearby the proposed exempted area for which the proposed exempted portion of the aquifer might be a source of drinking water Y/N if yes, list all those wells

_____

- *Include*: pertinent map(s) visually showing the areal extent of exemption boundary, depth and thickness of the aquifer proposed for exemption, all known subsurface structures such as faults affecting the aquifer, and each of the inventoried water well locations by well # or owner name.
- *Include*: Table of all inventoried water wells showing: Well Name/#, Owner, (Private/Public), Contact information, Purpose of well (Domestic, Irrigation, Livestock, etc.), depth of source water, name of aquifer, well completion data, age of well (if known), and the primary source of well data (Applicant/State/Tribe/EPA).
- *Include*: Map showing the areal extent of exemption boundary, all domestic water wells considered potentially down gradient of the exemption and hydraulically connected to the exemption. If wells are deemed horizontally and/or vertically isolated from the exemption, this should be foot noted on the Table as well. Use arrow(s) to indicate the direction and speed of GW in the aquifer proposed for exemption.

- Describe the evidence presented in the application and/or methodology used to conclude GW direction and speed when relevant.
- *Include*: any source water assessment and/or protection areas and designated sole source aquifers located within the delineated area.

What is the appropriate area to examine for drinking water wells? Although guidance 34 says it should be a minimum of 1/4 mile, the determination of the appropriate area is on a case by case basis. Describe area and give a rationale.

Are there any public or private drinking water wells or springs capturing (or that will be capturing) or producing drinking water from the aquifer or portion thereof within the proposed exemption area? Y/N*

- Evaluate the capture zone of the well (s) in the area near the proposed project (i.e., the volume of the aquifer(s) or portion(s) thereof from within which groundwater is expected to be captured by that well).
- A drinking water well's current source of water is the volume (or portion) of an aquifer which contains water that will be produced by a well in its lifetime. What parameters were considered to determine the lifetime of the well?

_____

- (*) If the answer to this question is Yes, therefore the aquifer currently serves as a source of drinking water.

2- Demonstration that the aquifer or portion thereof is mineral, hydrocarbon or geothermal energy producing per 146.4(b)(1)

Did the permit applicant for a Class II or III operation demonstrate as part of the permit application that the aquifer or portion thereof contains minerals or hydrocarbons that, considering their quantity and location are expected to be commercially producible? Did the permit applicant furnish the data necessary to make the demonstration as required by 40 C.F.R. 144.7(c)(1) and (2)? Summarize this demonstration and data _____

- Include narrative statement, logs, maps, data and state issued permit.
- If the proposed exemption is to allow a Class II enhanced oil recovery well operation in a field or project containing aquifers from which hydrocarbon were previously produced, commercial producibility shall be presumed by the Director upon a demonstration of historical production having occurred in the project area or field. Many times it may be necessary to slightly expand an existing Class II operation to recover hydrocarbons and an aquifer exemption for the expanded area may be needed. If the expanded exemption for the Class II EOR well is for a well field or project area where hydrocarbons were previously produced, commercial producibility would be presumed.
- For new or existing Class II wells not located in a field or project containing aquifers from which hydrocarbons were previously produced, information such as logs, core data, formation description, formation depth, formation thickness and formation parameters such as permeability or porosity shall be considered by the Director, to the extent available.
- Many Class II injection well permit applicants may consider much information concerning production potential to be proprietary. As a matter of policy, some states/tribes do not allow any information submitted as part of a permit application to be confidential. In those cases where potential production information is not being submitted, EPA would need some record basis for concluding that the permit application demonstrates that the aquifer contains commercially producible minerals or hydrocarbons. For example, the permit application may include the results of any R & D pilot project. In this case, the applicant should state the reasons for believing that there are commercially producible quantities of minerals within the expanded area. Also, exemptions relating to new or existing Class II wells not located in a field or project containing aquifers from which hydrocarbons were previously produced should include the following types of information:
  - a- Production history of the well if it is a former production well which is being converted.
  - b- Description of any drill stem tests run on the horizon in question. This should include information on the amount of oil and water produced during the test
  - c- Production history of other wells in the vicinity which produce from the horizon in question.
  - d- Description of the project, if it is an enhanced recovery operation including the number of wells and there location.

For Class III wells, the Director must require an applicant to furnish data necessary to demonstrate that the aquifer is expected to be mineral or hydrocarbon producing and the Director must consider information contained in the mining plan for the proposed project, such as a map and general description of the mining zone, general information on the mineralogy and geochemistry of the mining zone, analysis of the amenability of the mining zone to the proposed mining

method, and a time-table of planned development of the mining zone. Information to be provided may also include: a summary of logging which indicates that commercially producible quantities of minerals or hydrocarbons are present.

3- Demonstration that the aquifer or portion thereof is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical per 146.4(b)(2)

Is the aquifer or portion thereof situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical? _____

- List evidence in the application showing how this demonstration was made.
- EPA consideration of an aquifer exemption request under this provision would include information related to: The availability of less costly and more readily available alternative supplies, the adequacy of alternatives to meet present and future needs, and costs for treatment (including cost of disposal of treatment residuals) and or development associated with the use of the aquifer.
- The economic evaluation, submitted by the applicant, should consider the above factors, and these that follow:

1. Distance from the proposed exempted aquifer to public water supplies.
2. Current sources of water supply for potential users of the proposed exempted aquifer.
3. Availability, quantity and quality of alternative water supply sources.
4. Analysis of future water supply needs within the general area.
5. Depth of proposed exempted aquifer.
6. Quality of the water in the proposed exempted aquifer.

4- Demonstration that the aquifer or portion thereof is too contaminated per 146.4(b)(3)

Is the aquifer or portion thereof proposed for exemption so contaminated that it would be economically or technologically impractical to render that water fit for human consumption _____

- List evidence in the application showing that the area to be exempted is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption.
- Economic considerations would also weigh heavily in EPA's decision on aquifer exemption requests under this section. Unlike the previous section, the economics involved are controlled by the cost of technology to render water fit for human consumption. Treatment methods can usually be found to render water potable. However, costs of that treatment may often be prohibitive either in absolute terms or compared to the cost to develop alternative water supplies.
- EPA's evaluation of aquifer exemption requests under this section will consider the following information submitted by the applicant:

(a) Concentrations, types, and source of contaminants in the aquifer.
(b) If contamination is a result of a release, whether contamination source has been abated.
(c) Extent of contaminated area.
(d) Probability that the contaminant plume will pass through the proposed exempted area.
(e) Ability of treatment to remove contaminants from ground water.
(f) Current and alternative water supplies in the area.
(g) Costs to develop current and future water supplies, cost to develop water supply from proposed exempted aquifer. This should include well construction costs, transportation costs, water treatment costs, etc.
(h) Projections on future use of the proposed aquifer.

5- Demonstration that the aquifer or portion thereof is located over a Class III well mining area subject to subsidence or catastrophic collapse per 146.4(b)(4)

Is the aquifer or portion thereof proposed for exemption located over a Class III well mining area subject to subsidence or catastrophic collapse?

- List evidence in the application showing that the area to be exempted is located over a Class III well mining area subject to subsidence or catastrophic collapse_____

- Discuss the mining method and why that method necessarily causes subsidence or catastrophic collapse. The possibility that non-exempted underground sources of drinking would be contaminated due to the collapse should also be addressed in the application.

6- Demonstration that the aquifer or portion thereof has TDS more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system per 146.4(c)

Is the TDS of the aquifer or portion thereof proposed for exemption more than 3,000 and less than 10,000 mg/l?_____
Is the aquifer proposed for exemption or portion thereof not reasonably expected to supply a public water system?____

- Identify and discuss the information on which the determination that the total dissolved solids content of the ground water in the proposed exemption is more than 3,000 and less than 10,000 mg/l and the aquifer is not reasonably expected to supply a public water system.
- Include information about the quality and availability of water from the aquifer proposed for exemption. Also, the exemption request must analyze the potential for public water supply use of the aquifer. This may include: a description of current sources of public water supply in the area, a discussion of the adequacy of current water supply sources to supply future needs, population projections, economy, future technology, and a discussion of other available water supply sources within the area.

7- Demonstration that a Class II aquifer exemption may be expanded to Class VI per 146.4(d) *(Refer to additional requirements in EPA's regulations for Class VI aquifer exemptions for this demonstration)*

May the areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well be expanded for the exclusive purpose of Class VI injection for geologic sequestration under § 144.7(d)? _____

- List evidence in the application showing an existing Class II operation associated with AE that is being converted into Class VI_____

Appendix A-4 EPA GST Templates

AREA OF REVIEW AND CORRECTIVE ACTION PLAN
40 CFR 146.84(b)

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the Area of Review (AoR) and Corrective Action Plan. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate maps, figures, references, etc. should also be included to support the text of the plan.

Note for all images and maps: Please document the location of each image using consistent latitude/longitude coordinates. This applies to images in both plan view and cross section including, but not necessarily limited to: model grid, rock properties and regional geologic information, AoR plume and pressure front maps, and maps documenting the locations of other wells within the AoR.

Remember that, pursuant to 40 CFR 146.94(a) of the federal Class VI Rule, the requirement to maintain and implement an approved AoR and Corrective Action Plan is directly enforceable regardless of whether the requirement is a condition of the permit. For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

To avoid duplicative reporting, you are encouraged to provide relevant cross-references to other submissions made with the GSDT.

Facility Information

Facility name:	INSERT FACILITY NAME INSERT WELL NUMBER
Facility contact:	INSERT CONTACT NAME/CONTACT TITLE INSERT ADDRESS INSERT PHONE NUMBER/EMAIL ADDRESS

Well location: INSERT CITY, COUNTY, STATE
INSERT LAT/LONG COORDINATES

Computational Modeling Approach

[Please summarize the approach used for AoR modeling and delineation with narrative descriptions and supplemental figures and tables, to fulfil the requirement at 40 CFR 146.84(b)(1). Data relevant to these sections should be uploaded to the GSDT. The summary should include information in all of the subsections outlined below. Information should be presented in a way that demonstrates site-specific compliance with the Class VI Rule and thoroughly explains model construction and methodology.

Note: Supplemental information such as raw data in a tabular format (e.g., detailed model grid information, porosity and permeability distributions) should be uploaded directly to the GSDT. Figures and graphics included in the AoR and Corrective Action plan should be used to supplement narrative descriptions of model approach and results.]

Model Background

[Recommended considerations include:

- *What is the model name and the author(s)/institution?*
- *For what purpose was this model developed? Why was it selected for this project?*
- *What phases are accounted for by the model?*
- *What methods, equations (including primary equation of state), or relationships does the model rely on? What are the key assumptions?*
- *What processes were modeled (e.g., heat transport, multifluid flow, etc.)? These should match the processes selected in the AoR and Corrective Action module of the GSDT.*
- *What were the reasons behind the selection of these specific processes? How will these processes inform AoR delineation?*
- *How might the selection of modeled processes change during AoR reevaluations? If they do change, how will the original model output be compared to subsequent reevaluations?]*

Site Geology and Hydrology

[Recommended considerations include:

- *What site-specific data are available for geology and hydrology?*
- *Identify and describe the injection and confining zones within the geologic context of the region and site (e.g., stratigraphy, depositional history, deformational/tectonic history, hydrogeology), as pertains to the modeling effort. Include maps/cross sections and cite references as necessary.)*

(Associated figures and graphics may include:

- *Geologic and hydrologic maps and cross sections.*
- *Regional or local stratigraphic columns.]*

Model Domain

Model domain information is summarized in Table 1.
[Recommended considerations include:

- *What is the size of the modeled area?*
- *What is the grid scaling?*
- *Is the grid scaling consistent throughout the geologic units and distance from the injection well?*
- *How was the model domain generated (e.g., describe any software programs used)?]*

[Associated figures and graphics may include:

- *Plan view and cross-sectional figures showing the horizontal and vertical extent of the model grid.]*

Table 1. Model domain information.

Coordinate System			
Horizontal Datum			
Coordinate System Units			
Zone			
FIPSZONE		**ADSZONE**	
Coordinate of X min		**Coordinate of X max**	
Coordinate of Y min		**Coordinate of Y max**	
Elevation of bottom of domain		**Elevation of bottom of domain**	

Porosity and Permeability

[Recommended considerations include:

- *What literature and site-specific data were used to determine the porosity and permeability of the injection and confining zones?*
    - *How many samples or data sources were used? What method(s) were used?*
    - *What was the spatial distribution of the samples?*
- *How do the porosity and permeability vary across the unit(s)? How were porosity and permeability distributions determined?*

- *How will porosity and permeability information collected during pre-operational testing be incorporated into the AoR modeling and delineation?*
- *Does the site-specific data match expectations and/or other regional data collected from within the formation?]*

[Associated figures and graphics may include:

- *Plan view, cross-sectional, and/or 3-D figures showing the porosity or permeability distribution within the model domain.*
- *Bar charts or line charts showing porosity and permeability distributions in various rock layers.]*

Constitutive Relationships and Other Rock Properties

[Recommended considerations include:

- *What constitutive relationships (e.g., liquid saturation vs. capillary pressure) were included in the model? Why were these included?*
- *What methods or experiments were used to determine constitutive relationships?*
- *Was rock compressibility included as a model parameter? If so, how was it determined?]*

[Associated figures and graphics may include:

- *Graphs showing constitutive relationships for relevant rock types (correlation curves) for each defined constitutive relationship.*
- *Any other graphical presentation of fitted functional forms.]*

Boundary Conditions

[Recommended considerations include:

- *What boundary conditions were specified and why?*
- *What assumptions were made?]*

Initial Conditions

Initial conditions for the model are given in Table 2.
[If parameters are spatially variable, be sure to describe this variability and supplement it with relevant figures and graphics. Any raw data or detailed tabular data regarding the spatial distribution of initial conditions should be uploaded directly to the GSDT AoR module.]

Table 2. Initial conditions.

Parameter	Value or Range	Units	Corresponding Elevation (ft MSL)	Data Source
Temperature				
Formation pressure				
Fluid density				
Salinity				
Brine viscosity				
Rock compressibility				

Operational Information

Details on the injection operation are presented in Table 3.
[Note: Operating information should be specified for each injection well or production/ withdrawal well separately, both in this plan and in the GSDT's AoR and Corrective Action module.]

Table 3. Operating details. *[Modify the number of wells as needed.]*

Operating Information	Injection Well 1	Injection Well 2	Injection Well 3
Location (global coordinates) X Y			
Model coordinates (Insert units) X Y			
No. of perforated intervals			
Perforated interval (Insert units) Z top Z bottom			
Wellbore diameter (Insert units)			
Planned injection period Start End			
Injection duration (Insert units)			
Injection rate (Insert units)*			

*If planned injection rates change year to year, add rows to reflect this difference, and include an average injection rate per year (or interval if applicable).

Fracture Pressure and Fracture Gradient

Calculated fracture gradient and maximum injection pressure values are given in Table 4. *[Recommended considerations include:*

- *What types of tests were conducted to determine the fracture pressure and fracture gradient for the injection and confining zones? What procedures were used?*
- *What intervals were tested?*
- *Are the results consistent with the literature/available data from nearby wells?*
- *Will fracture pressure be measured during pre-operational testing? If so, how will that information be incorporated into AoR modeling and delineation?]*

Table 4. Injection pressure details. *[Modify the number of wells as needed.]*

Injection Pressure Details	Injection Well 1	Injection Well 2	Injection Well 3
Fracture gradient (Insert units)			
Maximum injection pressure (90% of fracture pressure) (Insert units)			
Elevation corresponding to maximum injection pressure (Insert units)			
Elevation at the top of the perforated interval (Insert units)			
Calculated maximum injection pressure at the top of the perforated interval (Insert units)			

Computational Modeling Results

Predictions of System Behavior

[Note: Modeling results should be presented both as time-series data and as snapshots. Time-series data should be provided for specific locations (e.g., monitoring well) over the lifetime of the project, and snapshot data should be provided for the entire model domain at a specific time (e.g., at 1 year, 5 years, 30 years, etc.) Please see the GSDT AoR and Corrective Action Module for more details and specific recommended variables to include.]

[Recommended considerations include:

- *What are the positions of the plume and pressure front at the end of the model timeframe? (Include one or more maps as necessary.)*
- *What are the geographic boundaries of the delineated AoR? (Include one or more maps as necessary.)*
- *How does the AoR evolve over time throughout the lifetime of the project? How long does it take to reach maximum extent? Does the AoR decrease after reaching the maximum extent?*

- *Are there any key uncertainties identified during modeling? How will these be addressed through pre-operational testing (if applicable)?*
- *How does the selected AoR accurately define the maximum plume and pressure front extent throughout the lifetime of the project?*
- *How will the computational model output be compared to AoR reevaluations? How will model results be used to evaluate the accuracy of AoR predictions over time?]*

[Associated figures and graphics may include:

- *Multiple time series and snapshot maps showing the modeled plume and pressure front in plan view.*
- *Cross sections showing the vertical and horizontal extent of the AoR.*
- *Graph showing the relative contribution of each CO_2 phase (e.g., total mass, gas phase, dissolved phase, trapped gas, etc.) over time.]*

Model Calibration and Validation

[Recommended considerations include:

- *What calibration or history-matching has been conducted?*
- *What data sources were used?*
- *What methods were used for sensitivity analysis? Why were these methods selected? What were the results? Note: Sensitivity analyses are not required by 40 CFR 146.84, but are recommended by EPA. However, if you are proposing an alternative PISC timeframe, sensitivity analyses are required pursuant to 40 CFR 146.93(c)(2)(vi), to identify and assess parameters that contribute significantly to uncertainty.]*

[Associated figures and graphics may include:

- *Comparison maps showing modeled AoR extent using different parameters (e.g., decreased injection zone porosity, increased reservoir permeability, etc.).*
- *Graphical results of any sensitivity analyses performed.*
- *Boundary plots and uncertainty plots (if applicable) for various CO2 phases, plume area, and reservoir pressure.]*

AoR Delineation

Critical Pressure Calculations

[Recommended considerations include:

- *What method was used to calculate the critical pressure? (Cite references as necessary.)*
- *What are the assumptions used in these calculations?*
- *What parameters were specified as input, and which were calculated?]*

AoR Delineation

[Note: the AoR delineation must reflect anticipated operating data (including anticipated injection pressures, rates, and volumes over the proposed life of the project), pursuant to 40 CFR 146.84(c)(1)(i).]

[Recommended considerations include:

- *How was the AoR delineation selected (what model results were used to define the AoR)? Justify how the AoR delineation represents the largest area in which USDWs may be endangered by the injection activity.*
- *How might the AoR delineation be verified and/or changed during AoR reevaluation, or following pre-operational testing?*
- *What are the locations of the injection well(s) and any monitoring wells used to track plume and pressure front migration? How will results of testing and monitoring in these wells help verify the extent and location of the delineated AoR?]*

[Associated figures and graphics may include:

- *Map(s) of the AoR showing the AoR delineation relative to injection/monitoring well locations, the predicted maximum extent of the plume and/or pressure front, or other important features.]*

Corrective Action

Tabulation of Wells within the AoR

[Note: Files with the locations of all wells within the AoR should be uploaded to the GSDT. The operator is encouraged to provide a map of these wells as part of this plan.]

Wells within the AoR

[Recommended considerations include:

- *What databases or other information sources were used to identify these wells?*
- *What is the type and status of each well (e.g., operating Class II injection well, temporarily abandoned oil well, etc.)? (Attach tables as necessary.)*
- *Are there historical wells believed to be in the area that may not be captured in available data sources?]*

Wells Penetrating the Confining Zone

[Recommended considerations include:

- *How were the depths of these wells determined?*

- *What is the type and status of each well (e.g., operating Class II injection well, temporarily abandoned oil well, etc.)? (Attach tables as necessary.)*
- *What is the condition of each well?*
- *If corrective action is needed, what activities will be completed and when?]*

Plan for Site Access

[Recommended considerations include:

- *What agreements have been made for access so that corrective action can be performed?*
- *For what period of time has site access been guaranteed?]*

Corrective Action Schedule

[Recommended considerations include:

- *Will phased corrective action be conducted? What is the specific schedule that will be implemented? How will the proposed phased corrective action schedule protect USDWs?*
- *What benchmarks or triggers are included as part of a phased corrective action plan? What information was used to determine these triggers?*
- *How might the results of testing and monitoring, and/or AoR reevaluation inform changes to the phased corrective action plan?]*

Reevaluation Schedule and Criteria

AoR Reevaluation Cycle

INSERT PERMIT APPLICANT NAME will reevaluate the above described AoR every X years during the injection and post-injection phases.

[Note: Pursuant to 40 CFR 146.84(e), AoR reevaluation must occur at least once every five years. The operator is also required to include in the reevaluation plan any benchmarks or milestones (e.g., from testing and monitoring) that may trigger additional AoR reevaluations.]

[Recommended considerations include:

- *What are the specific procedures that will be followed for the AoR reevaluation? (Provide a list of steps or similar description.)*
- *What monitoring and operational data will be used? What specific thresholds or benchmarks will be used to determine if the testing and monitoring data are consistent with the model predictions?*
- *How will new data be incorporated into the model?*
- *How will model reevaluations be compared to the initial AoR modeling and delineation?]*

Triggers for AoR Reevaluations Prior to the Next Scheduled Reevaluation

[Recommended considerations include:

- *What changes in what specific parameters (temperature, pressure, RST saturation, etc.) would trigger a reevaluation? What are the quantitative thresholds for these determinations?*
- *What other events (e.g., a seismic event) would trigger an AoR reevaluation?]*

INSERT PERMIT APPLICANT NAME will discuss any such events with the UIC Program Director to determine if an AoR reevaluation is required. If an unscheduled reevaluation is triggered, INSERT PERMIT APPLICANT NAME will perform the steps described at the beginning of this section of this Plan.

CLASS VI PERMIT APPLICATION NARRATIVE
40 CFR 146.82(a)

INSERT PROJECT NAME

INSTRUCTIONS

To reduce the potential for redundancy and to organize permit application components in a manner that facilitates efficient review by the permitting authority, EPA recommends that Class VI permit applicants submit both:

1. A narrative with a characterization of the proposed site, overall strategies for site operations, and other general project information (compiled into a single file and submitted using the Project Information Tracking module of the GSDT).
2. Specific, detailed information required by certain Class VI Rule provisions (submitted using other GSDT modules, which are tailored to the applicable Class VI Rule requirements).

This template provides a suggested outline for the narrative component of the permit application. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the permit application.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific permit application development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate maps, figures, references, etc. should also be included to support the text. If desired, appendices, attachments, or other supplemental information associated with the narrative that do not fit into one of the specific GSDT modules can be uploaded directly to the Project Information Tracking module using the module field designated for "any other information requested by the UIC Program Director."

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents.

This narrative file does not need to repeat any information submitted with the GSDT, but it should clearly reference these other submissions to ensure that all Class VI requirements are met. EPA recommends that you review the GSDT modules and/or user guides for each topic area below before developing your narrative, to avoid duplicating efforts or information.

After completing the narrative, upload it to the Project Information Tracking GSDT module, on the Initial Permit Application tab. EPA recommends converting to PDF prior to uploading.

Project Background and Contact Information

[In this section, provide a brief overview of your proposed project. Examples of potential content include (but are not limited to):

- *Project goals.*
- *Partners/collaborators.*
- *Overview of the project timeframe.*
- *Proposed injection mass/volume and CO_2 source.*
- *Whether an injection depth waiver or aquifer exemption expansion is being requested.*

Also, include a list of state, tribe, and territory contacts as described at 40 CFR 146.82(a)(20).

Key project and facility details required by 40 CFR 146.82(a)(1) can be submitted directly in the Project Information Tracking module of the GSDT.]

GSDT Submission - Project Background and Contact Information
GSDT Module: Project Information Tracking ***Tab(s):*** General Information tab; Facility Information and Owner/Operator Information tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Required project and facility details ***[40 CFR 146.82(a)(1)]***

Site Characterization

[In this section, provide text, tables, figures, and/or other relevant material to fulfill the site characterization requirements for the permit application, listed at 40 CFR 146.82(a)(2), (3), (5), and (6). Please cite references as appropriate. You may attach supporting documentation in one o more separate files using the field for "any other information requested by the UIC Program Director" in the Project Information Tracking module.

The Class VI Rule recognizes that project sites will have varying levels of pre-existing information and that some data submitted with a permit application will be preliminary. As part of the site characterization narrative, EPA recommends discussing data gaps and uncertainties that will be addressed through the formation testing program and other activities conducted after well construction/conversion, but before receiving authorization to inject.

In general, the subsections below follow the order used in the UIC Program Class VI Well Site Characterization Guidance; see that document for further information.]

Regional Geology, Hydrogeology, and Local Structural Geology [40 CFR 146.82(a)(3)(vi)]

[EPA recommends that the maps and cross sections required by 40 CFR 146.82(a)(3)(vi) be accompanied by a brief narrative describing the regional geology and hydrogeology (e.g.,

including stratigraphy, structure, and tectonic history) near the proposed injection site, as well as local structural geology.

Recommended considerations include:

- *What are characteristics of the injection and confining zones (names, lithology, depth, etc.)? How consistent are these characteristics regionally?*
- *What is the general geologic history of the region and the project site?*
- *What are the major geologic features (e.g., faults, synclines/anticlines, etc.) near the proposed injection site?*
- *How does the proposed project site fit into the regional geologic setting?]*

[Associated figures may include:

- *Maps, cross sections, and stratigraphic columns showing regional geologic features and characteristics.]*

Maps and Cross Sections of the AoR [40 CFR 146.82(a)(2), 146.82(a)(3)(i)]

[EPA recommends that the maps and cross sections required by 40 CFR 146.82(a)(2) and (3)(i) be accompanied by a brief narrative description interpreting the figures and providing an overview of key features important to the project.

Recommended considerations include:

- *What is the spatial relationship between the proposed project site and regional geologic features such as faults or the lowermost USDW? What is the relationship between the proposed injection formation and other site-specific geologic characteristics?*
- *Is there any evidence of regional formation pinch-out? Is the proposed storage site influenced by a structural trap (e.g., faults or a dome)?*
- *What is the lateral extent of the proposed injection and confining formations? Are they continuous throughout the proposed site? How was this determined?*
- *Are there any secondary confining zones between the proposed injection formation and the lowermost USDW?]*

[Associated figures may include:

- *Map identifying the location of all wells, subsurface sites, surface water, and other features listed in 40 CFR 146.82(a)(2) that are within the AoR.*
- *Maps and cross section with information including lithology, the sequence of geologic units (including the proposed injection formations, confining units, and USDWs), approximate formation thicknesses, lateral extent of units, correlation of units in the vicinity of the proposed project site.]*

Faults and Fractures [40 CFR 146.82(a)(3)(ii)]

[Recommended considerations include:

- *Are there known or suspected faults and/or fractures within the AoR? Do these features transect the injection zone?*
- *What information was used to determine that faults and fractures do not pose a threat to containment? How was this determination made?*
- *How stable are faults? What is the sealing capacity of faults/fractures? What methods were used to determine the stability and sealing capacity?*
- *Is there evidence that faults and/or fractures in the injection zone may provide conduits for preferential fluid flow?*
- *What uncertainties are there in fault and fracture characterization data? How might these uncertainties be addressed with pre-operational testing?]*

[Associated figures may include:

- *Map showing the location, orientation, and properties of all known or suspected faults and fractures that may transect the confining zone(s) in the AoR.*
- *Map identifying major faults and fractures in the injection zone, with information on the connectivity and extent of these features.*
- *Results of geophysical survey data used to delineate faults and characterize their geometry.*
- *Other plots or figures to support a determination of fault stability and potential for reactivation.]*

Injection and Confining Zone Details [40 CFR 146.82(a)(3)(iii)]

[Recommended considerations include:

- *What is the depth, areal extent, and thickness of the injection and confining zones? What methods were used to determine this?*
- *How variable is the thickness of the injection and confining zones within the AoR? How might this affect carbon dioxide storage and confinement?*
- *How many samples were used to determine injection and confining zone properties? How is this sufficient to characterize formation mineralogy? To characterize porosity and permeability?*
- *What is the mineralogy and petrology of the injection and confining zones?*
- *Are any geochemical reactions more likely given the mineralogical makeup of either the injection or confining zone? How might these geochemical reactions affect carbon dioxide storage and containment? Note: This information may overlap with the discussion of site geochemistry. Please include cross-references as applicable.*

- *Is the mineralogy of the injection and confining zones compatible with the proposed carbon dioxide stream?*
- *What is the average permeability and porosity of the injection and confining zones? What is the spatial distribution of porosity and permeability values within the injection and confining zones?*
- *What data were used to determine permeability and porosity?*
- *What is the estimated storage capacity and injectivity of the injection zone? What is the integrity of the confining zone?*
- *What is the capillary pressure of the confining zone? How was this determined? Does this significantly affect the ability of carbon dioxide to penetrate the confining zone?*
- *What indirect geophysical methods were employed to determine the extent, depth, thickness, and lithology of the injection and confining zones? How well did these results compare to other characterization methods (e.g., core analysis, wireline logs, etc.)?*
- *What additional information may be required to adequately characterize the injection and confining zones? Will this information be collected during pre-operational testing?*
- *What sources of uncertainty are there? How will these be addressed?]*

[Associated figures may include:

- *Isopach and isochore maps showing stratigraphic and vertical thickness.*
- *Well log data (if available).*
- *Geophysical survey results.*
- *Maps showing locations and depths of samples collected (if any).*
- *Maps and/or cross sections showing the distribution of porosity and permeability within the confining and injection zones. Note: Similar maps and cross sections may need to be included with the AoR and Corrective Action Plan. Please include cross-references as applicable.*
- *Tabular results of permeability and porosity data (from the laboratory) or the results of field measurements and estimations of permeability and porosity distribution.]*

Geomechanical and Petrophysical Information [40 CFR 146.82(a)(3)(iv)]

[Recommended considerations include:

- *What methods were used to determine the geomechanical and petrophysical characteristics of the confining zone? How many samples were collected? From what depths?*
- *Where any fractures identified through geomechanical tests? Please cross-reference the Faults and Fractures section as applicable.*
- *What is the average ductility of the confining zone? How consistent is this throughout the confining zone?*

- *What is the average rock strength of the confining zone? How consistent is this?*
- *What is the in situ stress field of the confining zone? Is this consistent with the proposed injection pressures and fault stability analyses?*
- *What is the average pore pressure of the confining zone (if available at this stage of the project)?*
- *Were there any anomalies or uncertainties in the data? How will these be addressed during pre-operational testing?*
- *How consistent are the results of different tests? What are the causes of any inconsistencies? Can these be addressed with additional testing?]*

[Associated figures may include:

- *Results in a tabular and/or graphical form.]*

Seismic History [40 CFR 146.82(a)(3)(v)]

[Please include a brief narrative description of the seismic history of the project site, as required by 40 CFR 146.82(a)(3)(v). This description should include the presence and depth of all seismic sources, and a demonstration that seismic activity does not pose a threat to carbon dioxide containment.

Note: As applicable, the information included in this subsection should be consistent with the Testing and Monitoring Plan [40 CFR 146.90] and the Emergency and Remedial Response Plan [40 CFR 146.94].

Recommended considerations include:

- *What sources of data were used to characterize the seismic history of the site? Be sure to cite references as applicable.*
- *What seismic sources exist within the AoR and regionally? How active are these sources?*
- *Was a seismic risk threshold used or established to determine site-specific earthquake risk? What was the source of this threshold, or how was it calculated?*
- *If data suggests a substantial risk of seismic activity, what is the risk to subsurface containment? What other geologic data (e.g., geomechanical data, fault stability analyses, etc.) help demonstrate that seismic activity does not pose a risk to containment?]*

[Associated figures may include:

- *Tabular presentation of seismic sources and depths.*
- *Tabular presentation of historical seismic events and relevant details.*
- *Map showing the location and depth of known seismic sources within and near the AoR.]*

Hydrologic and Hydrogeologic Information [40 CFR 146.82(a)(3)(vi), 146.82(a)(5)]

[Recommended considerations include:

- *What is the depth and location of all USDWs, water wells, and springs within the AoR? What is the direction of regional groundwater flow?*
- *What sources of data were used to determine regional and site-specific hydrologic and hydrogeologic characteristics? What, if any, field surveys or additional methods were used to fill data gaps?]*

[Associated figures may include:

- *Maps and cross sections indicating the location and depth of USDWs. Note: Information pertaining to the location and depth of USDWs within the AoR should be included in the cross sections submitted to satisfy requirements at 40 CFR 146.82(a)(3)(i).*
- *Potentiometric or isopach maps.]*

Geochemistry [40 CFR 146.82(a)(6)]

[Recommended considerations include:

- *What are the sources of data used to determine fluid- and solid-phase geochemistry at the project site? Was any primary data collected (e.g., from a test well) for this permit?*
- *Are there any limitations or uncertainties regarding the quality of pre-existing data used to characterize geochemistry?*
- *What parameters were analyzed? Why were these parameters selected? Were the same parameters analyzed for all formations (injection, confining, USDWs, etc.)? Note: The parameters analyzed for site characterization should be consistent with the testing and monitoring and PISC plans. If there are differences, please discuss the reasons.*
- *How many samples were collected? Where were they collected? What methods were used to analyze the parameters listed above?*
- *What is the solid-phase geochemistry of critical formations (injection and confining zones) and any other relevant formations?*
- *Was any geochemical modeling done to identify major reactions that may occur in either the injection or confining zone? What calculations or models were used? What was the input data? What were the results?*
- *Are geochemical reactions expected to play a significant role in trapping? Cross-reference the AoR plan as applicable.*
- *How is the geochemical data presented in this section representative of the injection and confining zones?]*

[Associated figures may include:

- *Tabular baseline fluid chemistry data.*

- *Graphical baseline fluid chemistry data.*
- *Sampling locations and dates.*
- *Maps showing geochemical results in the context of the AoR (if possible).]*

Other Information (Including Surface Air and/or Soil Gas Data, if Applicable)

[Please provide a narrative description of any other information that is relevant to the site characterization. If surface air and/or soil gas monitoring is required by the UIC Program Director as part of the Testing and Monitoring Plan, baseline data should be presented in this section.]

[Recommended considerations include:

- *Where any other analyses or assessments of the site conducted to support site characterization? What methods were used? What were the results?*
- *If gas monitoring was conducted to collect baseline data, what methods were used? Why was gas monitoring necessary or requested? What were the results?]*

Site Suitability [40 CFR 146.83]

[Please provide a description of how the proposed injection site meets the suitability requirements set forth at 40 CFR 146.83. This demonstration should draw upon and synthesize the site characterization data described above. Please frame this discussion to match the rule requirements, demonstrating that the injection zone can accommodate the total anticipated carbon dioxide volume and that the confining zone has sufficient integrity to contain the proposed injected volume and any displaced fluids.]

[Recommended considerations include:

- *What is the subsurface distribution of lithological facies? What are the implications for carbon dioxide plume migration?*
- *How will carbon dioxide be confined to the injection zone? How do the site characterization data demonstrate the lack of potential leakage pathways?*
- *How will the carbon dioxide stream interact with well materials and subsurface formations (injection and confining zones)?*
- *What is the total storage capacity of the injection zone? How was this determined? How is this sufficient to receive the proposed amount of carbon dioxide?*
- *Are there any potential concerns regarding confining zone integrity? What site characterization data support this determination?*
- *Is secondary confinement necessary to ensure USDW protection? If so, what is the secondary confining zone, what are its characteristics, and how will it prevent the migration of carbon dioxide and displaced fluids into USDWs?]*

AoR and Corrective Action

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT, it can be included here.

Upload your proposed AoR and Corrective Action Plan and provide detailed modeling/well tabulation information using the AoR and Corrective Action module.]

AoR and Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Tabulation of all wells within AoR that penetrate confining zone ***[40 CFR 146.82(a)(4)]*** ☐ AoR and Corrective Action Plan ***[40 CFR 146.82(a)(13) and 146.84(b)]*** ☐ Computational modeling details ***[40 CFR 146.84(c)]***

Financial Responsibility

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Submit detailed cost estimate and financial instrument information using the Financial Responsibility Demonstration module.]

Financial Responsibility GSDT Submissions
GSDT Module: Financial Responsibility Demonstration ***Tab(s):*** Cost Estimate tab and all applicable financial instrument tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Demonstration of financial responsibility ***[40 CFR 146.82(a)(14) and 146.85]***

Injection Well Construction

[In this section, provide text, tables, and/or figures to fulfill the injection well construction data requirements for the permit application, listed at 40 CFR 146.82(a)(9), (11), and (12). Also include or attach any other information necessary to demonstrate/establish compliance with the requirements at 40 CFR 146.86.

Please state at the start of this section if the proposed injection project is using a new or existing well. If an existing well is being modified for use as a Class VI well, existing materials (e.g.,

data, schematics, etc.) can be attached and referenced, and submitted information should meet the requirements at 40 CFR 146.81(c).

Note: Schematics or other graphics showing the surface and subsurface well construction details are required pursuant to 40 CFR 146.82(a)(11) and should be supplemented with a brief narrative description and/or annotations on the graphic.]

Proposed Stimulation Program [40 CFR 146.82(a)(9)]

[Recommended considerations include:

- *Is a stimulation program necessary? When will stimulation occur?*
- *What stimulation methods will be used? How will the proposed stimulation methods ensure that no new fractures develop, and that containment will be maintained?*
- *Will any chemicals be added to aid stimulation? Are there any compatibility issues between these chemicals and the injection and confining zones?*
- *What methods were used to determine the maximum safe injection pressure for the stimulation program?]*

Construction Procedures [40 CFR 146.82(a)(12)]

[Please provide a brief evaluation of proposed injection well construction procedures, with specific details to demonstrate an understanding of down-hole stresses and the maintenance of mechanical integrity.

Note: The Class VI rule at 40 CFR 146.86(b) requires specific information related to well construction materials (casing, cement, tubing, packer). Some of this information may be included in other components of the permit application. Please include cross-references as applicable.]

[Recommended considerations include:

- *How will well construction prevent the movement of fluids into or between USDWs?*
- *How do proposed construction procedures permit the use of testing and monitoring devices, both within the borehole and within the annulus?*
- *What contingency plans are in place to respond to unexpected events during drilling (e.g., excessive deviation, loss of drill string, loss of circulation, cement issues etc.)? What remedial methods will be used to address these issues? How will these methods ensure USDW protection?*
- *What formal standards (e.g., API, ASTM, etc.) apply to the proposed well materials (casing, cement, tubing, packer)?*
- *Are all proposed well materials compatible with the carbon dioxide stream and formation fluids? How was this determined?]*

Casing and Cementing

[In addition to a brief narrative description of proposed casing and cement, please use Table 1 to provide specific details on the proposed casing strings to meet the requirements at 40 CFR 146.86(b)(iv).]

[Recommended considerations include:

- *What is the average down-hole temperature? How will this affect casing and cement performance throughout the life of the project?*
- *Is the structural strength of the proposed casing sufficient for the life of the injection project? Is there any indication that structural strength may decrease over time? How will this be addressed during injection and PISC?*
- *What type of cement will be used? How much? Are there any additives proposed?*
- *What is the cementing procedure? Will cementing occur through staging?*
- *How will the mechanical integrity of the cement and casing be verified? How will this demonstrate that USDWs are not endangered?]*

Table 1. Casing details.

Casing String	**Casing Depth Interval and Units**	**Borehole Diameter**	**Wall Thickness**	**External Diameter**	**Casing Material** (e.g., weight/ grade/ connection)	**String Weight**
Conductor						
Surface						
Long String						
Add other casing types as applicable						

Tubing and Packer

[Please provide information related to the tubing and packer materials in Table 2. The information in this table meets the minimum requirements at 40 CFR 146.86(c).]

Table 2. Tubing and packer details.

Material	**Setting Depth Interval and Units**	**Tensile Strength**	**Burst Strength**	**Collapse Strength**	**Material** (e.g., weight/grade/ connection)
Tubing					
Additional materials					

Pre-Operational Logging and Testing

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Submit your proposed pre-operational testing program using the Pre-Operational Testing module.]

Pre-Operational Logging and Testing GSDT Submissions
GSDT Module: Pre-Operational Testing ***Tab(s):*** Welcome tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Proposed pre-operational testing program ***[40 CFR 146.82(a)(8) and 146.87]***

Well Operation

[Provide text, tables, and/or figures to fulfill the operating data requirements for the permit application, listed at 40 CFR 146.82(a)(7) and (10). Also include or attach any other information necessary to demonstrate/establish compliance with the requirements at 40 CFR 146.88. Please use a table like the one below to present the proposed operational information.]

Operational Procedures [40 CFR 146.82(a)(10)]

[Please provide a brief narrative describing the proposed operational procedures. This should supplement the data presented in Table 3 below.

Recommended considerations include:

- *What calculations or methods were used to determine the operational values presented in Table 3?*
- *How do the values for the parameters listed below relate to the critical fracture pressure and other geological and hydrological parameters?*
- *Are operational parameters likely to stay constant for the lifetime of the injection project? What might trigger a change? What changes might be made?]*

Proposed Carbon Dioxide Stream [40 CFR 146.82(a)(7)(iii) and (iv)]

[Recommended considerations include:

- *What is the source(s) of the carbon dioxide stream?*
- *What are the physical and chemical characteristics of the carbon dioxide stream? What methods were used to determine this information?*

- *What is the corrosiveness of the carbon dioxide stream? How will the stream behave under the proposed operational conditions (e.g., down-hole P/T) for the lifetime of the injection project?]*

Table 3. Proposed operational procedures.

Parameters/Conditions	Limit or Permitted Value	Unit
Maximum Injection Pressure		
Surface		
Downhole		
Average Injection Pressure		
Surface		
Downhole		
Maximum Injection Rate		
Average Injection Rate		
Maximum Injection Volume and/or Mass		
Average Injection Volume and/or Mass		
Annulus Pressure		
Annulus Pressure/Tubing Differential		

Testing and Monitoring

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Upload your Testing and Monitoring Plan using the Project Plan Submissions module.]

Testing and Monitoring GSDT Submissions

GSDT Module: Project Plan Submissions
Tab(s): Testing and Monitoring tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:
☐ Testing and Monitoring Plan ***[40 CFR 146.82(a)(15) and 146.90]***

Injection Well Plugging

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Upload your Injection Well Plugging Plan using the Project Plan Submission module.]

Injection Well Plugging GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Injection Well Plugging tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Injection Well Plugging Plan ***[40 CFR 146.82(a)(16) and 146.92(b)]***

Post-Injection Site Care (PISC) and Site Closure

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Please indicate whether you are proposing an alternative PISC timeframe. Upload your PISC and Site Closure Plan using the Project Plan Submission module and, if desired, upload information pertaining to the alternative PISC timeframe demonstration using the Alternative PISC Timeframe Demonstration module.]

PISC and Site Closure GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** PISC and Site Closure tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ PISC and Site Closure Plan ***[40 CFR 146.82(a)(17) and 146.93(a)]***
GSDT Module: Alternative PISC Timeframe Demonstration ***Tab(s):*** All tabs (only if an alternative PISC timeframe is requested) Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Alternative PISC timeframe demonstration ***[40 CFR 146.82(a)(18) and 146.93(c)]***

Emergency and Remedial Response

[Please provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Upload your Emergency and Remedial Response Plan using the Project Plan Submission module.]

Emergency and Remedial Response GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Emergency and Remedial Response tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Emergency and Remedial Response Plan ***[40 CFR 146.82(a)(19) and 146.94(a)]***

Injection Depth Waiver and Aquifer Exemption Expansion

[If you are requesting an injection depth waiver or an areal expansion of an existing aquifer exemption, indicate that here and provide a short description of the information and files submitted to the GSDT, with references to the rule requirements those submissions satisfy. These items are not official components of the Class VI permit application, but are considered supplemental or associated submissions. Remember that if a depth waiver or aquifer exemption expansion is requested, there will be implications for other components of the permit application (e.g., in the Testing and Monitoring Plan).

Submit these items, if desired, using the Injection Depth Waivers and Aquifer Exemption Expansions module.]

Injection Depth Waiver and Aquifer Exemption Expansion GSDT Submissions
GSDT Module: Injection Depth Waivers and Aquifer Exemption Expansions ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Injection Depth Waiver supplemental report ***[40 CFR 146.82(d) and 146.95(a)]*** ☐ Aquifer exemption expansion request and data ***[40 CFR 146.4(d) and 144.7(d)]***

Optional Additional Project Information [40 CFR 144.4]

[The following is a list of Federal laws that may apply prior to the issuance of UIC permits. When any of these laws are applicable, EPA must ensure that they are followed. The optional additional information requested below will assist EPA in its analyses to satisfy these laws.

- *The Wild and Scenic Rivers Act, 16 U.S.C. 1273 et seq. Identify any national wild and scenic river that may be impacted by the activities associated with the proposed project.*
- *The National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq. Identify properties listed or eligible for listing in the National Register of Historic Places that may be affected by the activities associated with the proposed project. If previous historic and cultural resource survey(s) have been conducted, provide the results of the survey(s).*
- *The Endangered Species Act, 16 U.S.C. 1531 et seq. Identify any endangered or threatened species that may be affected by the activities associated with the proposed project. If a previous endangered or threatened species survey has been conducted, provide the results of the survey.*

- *The Coastal Zone Management Act, 16 U.S.C. 1451 et seq. Identify any coastal zones that may be affected by the activities associated with the proposed project.]*

Other Information

[Provide any other information requested by the UIC Program Director, or that is not specifically requested/required but may be useful for the permit application, in this section to fulfill the requirement at 40 CFR 146.82(a)(21). You can also provide information in a separate file or files using the designated field on the Initial Permit Application tab of the Project Information Tracking module.]

CONSTRUCTION DETAILS

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the construction details summary for a Class VI well. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

Facility Information

Facility name:	INSERT FACILITY NAME INSERT WELL NUMBER
Facility contact:	INSERT CONTACT NAME/CONTACT TITLE INSERT ADDRESS INSERT PHONE NUMBER/EMAIL ADDRESS
Well location:	INSERT CITY, COUNTY, STATE INSERT LAT/LONG COORDINATES

Introduction

The construction details for the INSERT NAME OF WELL(S) are described in this attachment.

Injection Well Construction Details

Table 1. Open Hole Diameters and Intervals

Name	**Depth Interval** Insert units	**Open Hole Diameter** Insert units	**Comment**
Conductor			
Surface			
Intermediate			
Long-string			

Table 2. Casing Specifications

Name	**Depth Interval Insert units**	**Outside Diameter Insert units**	**Inside Diameter Insert units**	**Weight Insert units**	**Grade (API)**	**Design Coupling (Short or Long Threaded)**	**Thermal Conductivity Insert units**	**Burst Strength Insert units**	**Collapse Strength Insert units**
Conductor									
Surface									
Intermediate									
Long-string									

Table 3. Tubing Specifications

Name	**Depth Interval Insert units**	**Outside Diameter Insert units**	**Inside Diameter Insert units**	**Weight Insert units**	**Grade (API)**	**Design Coupling (Short or Long Thread)**	**Burst strength Insert units**	**Collapse strength Insert units**
Injection tubing								

Table 4. Packer Specifications

[Add rows to this table if needed.]

Packer Type and Material	**Packer Setting Depth Insert units**	**Length Insert units**	**Nominal Casing Weight Insert units**	**Packer Main Body Outer Diameter Insert units**	**Packer Inner Diameter Insert units**

Tensile Rating Insert units	**Burst Rating Insert units**	**Collapse Rating Insert units**	**Max. Casing Inner Diameter Insert units**	**Min. Casing Inner Diameter Insert units**

Injection Well Construction Diagrams

Well construction diagrams appear on the following page(s).

INSERT WELL SCHEMATIC(S)

EMERGENCY AND REMEDIAL RESPONSE PLAN
40 CFR 146.94(a)

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline for the Emergency and Remedial Response Plan. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate maps, figures, references, etc. should also be included to support the text of the plan.

Remember that, pursuant to 40 CFR 146.94(a) of the federal Class VI Rule, the requirement to maintain and implement an approved Emergency and Remedial Response Plan is directly enforceable regardless of whether the requirement is a condition of the permit. For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

To avoid duplicative reporting, you are encouraged to provide relevant cross-references to other submissions made with the GSDT.

Facility Information

Facility name:	INSERT FACILITY NAME INSERT WELL NUMBER
Facility contact:	INSERT CONTACT NAME/CONTACT TITLE INSERT ADDRESS INSERT PHONE NUMBER/EMAIL ADDRESS
Well location:	INSERT CITY, COUNTY, STATE INSERT LAT/LONG COORDINATES

This Emergency and Remedial Response Plan (ERRP) describes actions that INSERT PERMIT APPLICANT NAME shall take to address movement of the injection fluid or formation fluid in a manner that may endanger an underground source of drinking water (USDW) during the construction, operation, or post-injection site care periods.

If INSERT PERMIT APPLICANT NAME obtains evidence that the injected CO_2 stream and/or associated pressure front may cause an endangerment to a USDW, INSERT PERMIT APPLICANT NAME must perform the following actions:

1. Initiate shutdown plan for the injection well.
2. Take all steps reasonably necessary to identify and characterize any release.
3. Notify the permitting agency (UIC Program Director) of the emergency event within 24 hours.
4. Implement applicable portions of the approved ERRP.

Where the phrase "initiate shutdown plan" is used, the following protocol will be employed: INSERT PERMIT APPLICANT NAME will immediately cease injection. However, in some circumstances, INSERT PERMIT APPLICANT NAME will, in consultation with the UIC Program Director, determine whether gradual cessation of injection (using the parameters set forth in the Summary of Requirements of the Class VI permit) is appropriate.

Local Resources and Infrastructure

Resources in the vicinity of the INSERT FACILITY NAME that may be affected as a result of an emergency event at the project site include: *[Recommended considerations include relevant resources such as USDWs.]*

Infrastructure in the vicinity of the INSERT FACILITY NAME that that may be affected as a result of an emergency at the project site include: *[Recommended considerations include relevant infrastructure such as drinking water treatment plants.]*

Resources and infrastructure addressed in this plan are shown in Figure 1. *[Use as many figures as needed to appropriately depict resources and infrastructure addressed in this plan.]*

INSERT FIGURE *(full-page size is preferred)*

Figure 1. Map of the site resources and infrastructure.

Potential Risk Scenarios

The following events related to the INSERT FACILITY NAME that could potentially result in an emergency response: *[This list is not exhaustive and is provided as an example; modify as appropriate. This list should match the scenarios described in the next section below.]*

- Injection or monitoring (verification) well integrity failure;
- Injection well monitoring equipment failure (e.g., shut-off valve or pressure gauge, etc.);
- Fluid (e.g. brine) or CO_2 leakage to a USDW or the surface;
- A natural disaster (e.g., earthquake, tornado, lightning strike); or
- Induced or natural seismic event.

Response actions will depend on the severity of the event(s) triggering an emergency response. "Emergency events" are categorized as shown in Table 1.

Table 1. Degrees of risk for emergency events. *[This table is provided as an example; modify as appropriate.]*

Emergency Condition	Definition
Major emergency	Event poses immediate substantial risk to human health, resources, or infrastructure. Emergency actions involving local authorities (evacuation or isolation of areas) should be initiated.
Serious emergency	Event poses potential serious (or significant) near term risk to human health, resources, or infrastructure if conditions worsen or no response actions taken.
Minor emergency	Event poses no immediate risk to human health, resources, or infrastructure.

Emergency Identification and Response Actions

Steps to identify and characterize the event will be dependent on the specific issue identified, and the severity of the event. The potential risk scenarios identified in Part 2 are detailed below.

[The following sections are provided as examples. Add/delete scenarios and responses to the sections below as appropriate.]

Well Integrity Failure

Integrity loss of the injection well and/or verification well may endanger USDWs. Integrity loss may have occurred if the following events occur:

- Automatic shutdown devices are activated:
    - Wellhead pressure exceeds the specified shutdown pressure specified in the permit.
    - Annulus pressure indicates a loss of external or internal well containment.
    - Pursuant to 40 CFR 146.91(c)(3), INSERT PERMIT APPLICANT NAME must notify the UIC Program Director within 24 hours of any triggering of a shut-off system (i.e., down-hole or at the service).
- Mechanical integrity test results identify a loss of mechanical integrity.

Severity: *[Describe the severity of the event (i.e., Low, Medium, High) based on a risk evaluation of its potential impact, and how the severity was determined.]*

Timing of event: *[Present the phase during which the event could occur (i.e., pre-injection, injection and/or post-injection phases).]*

Avoidance measures: *[Describe the planned operational practices (e.g., well maintenance, injection within permitted limits) in place to avoid the scenario.]*

Detection methods: *[Describe the activities (i.e., described in the Testing and Monitoring Plan or triggers based on continuous well monitoring) that would detect the event.]*

Potential response actions:

- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- Determine the severity of the event, based on the information available, within 24 hours of notification.
- For a Major or Serious emergency:
    - Initiate shutdown plan. *[Insert appropriate additional steps.]*
    - If contamination is detected, identify and implement appropriate remedial actions (in consultation with the UIC Program Director).

- For a Minor emergency:
    - Conduct assessment to determine whether there has been a loss of mechanical integrity.
    - If there has been a loss of mechanical integrity, initiate shutdown plan. *[Insert appropriate additional steps.]*

Response personnel: *[Identify the on-call or available staff (e.g., operator staff, contractor staff) who would respond to the scenario.]*

Equipment: *[Describe the types of equipment (e.g., drill rig, logging equipment, and cement or casing as required) that would be used to implement the response actions described.]*

Injection Well Monitoring Equipment Failure

The failure of monitoring equipment for wellhead pressure, temperature, and/or annulus pressure may indicate a problem with the injection well that could endanger USDWs.

Severity: *[Describe the severity of the event (i.e., Low, Medium, High) based on a risk evaluation of its potential impact, and how the severity was determined.]*

Timing of event: *[Present the phase during which the event could occur (i.e., pre-injection, injection and/or post-injection phases).]*

Avoidance measures: *[Describe the planned operational practices (e.g., well maintenance, injection within permitted limits) in place to avoid the scenario.]*

Detection methods: *[Describe the activities (i.e., described in the Testing and Monitoring Plan or triggers based on continuous well monitoring) that would detect the event.]*

Potential Response actions:

- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- Determine the severity of the event, based on the information available, within 24 hours of notification.
- For a Major or Serious emergency:
    - Initiate shutdown plan. *[Insert appropriate additional steps.]*
    - Identify and, if necessary, implement appropriate remedial actions (in consultation with the UIC Program Director).
- For a Minor emergency:
    - Conduct assessment to determine whether there has been a loss of mechanical integrity.
    - If there has been a loss of mechanical integrity, initiate shutdown plan. *[Insert appropriate additional steps.]*

Response personnel: *[Identify the on-call or available staff (e.g., operator staff, contractor staff) who would respond to the scenario.]*

Equipment: *[Describe the types of equipment (e.g., drill rig, logging equipment, and cement or casing as required) that would be used to implement the response actions described.]*

Potential Brine or CO_2 Leakage to USDW or the Surface

Elevated concentrations of indicator parameter(s) in groundwater sample(s) or other evidence of fluid (brine) or CO_2 leakage into a USDW.

Severity: *[Describe the severity of the event (i.e., Low, Medium, High) based on a risk evaluation of its potential impact, and how the severity was determined.]*

Timing of event: *[Present the phase during which the event could occur (i.e., pre-injection, injection and/or post-injection phases).]*

Avoidance measures: *[Describe the planned operational practices (e.g., injection within permitted limits) in place to avoid the scenario.]*

Detection methods: *[Describe the activities (i.e., described in the Testing and Monitoring Plan or triggers based on continuous well monitoring) that would detect the event.]*

Potential Response actions:

- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- Determine the severity of the event, based on the information available, within 24 hours of notification.
- For all emergencies (Major, Serious, or Minor):
    - Initiate shutdown plan.
    - *[Insert appropriate additional steps.]*
    - If the presence of indicator parameters are confirmed, develop (in consultation with the UIC Program Director) a case-specific work plan to:
        - Install additional groundwater monitoring points near the affected groundwater well(s) to delineate the extent of impact; and
        - Remediate unacceptable impacts to the affected USDW.
    - Arrange for an alternate potable water supply, if the USDW was being utilized and has been caused to exceed drinking water standards.
    - Proceed with efforts to remediate USDW to mitigate any unsafe conditions (e.g., install system to intercept/extract brine or CO2or "pump and treat" to aerate CO2-laden water).
    - Continue groundwater remediation and monitoring on a frequent basis (frequency to be determined by INSERT PERMIT APPLICANT NAME and the UIC Program Director) until unacceptable adverse USDW impact has been fully addressed.

Response personnel: *[Identify the on-call or available staff (e.g., operator staff, contractor staff) who would respond to the scenario.]*

Equipment: *[Describe the types of equipment (e.g., groundwater remediation equipment) that would be used to implement the response actions described.]*

Natural Disaster

Well problems (integrity loss, leakage, or malfunction) may arise as a result of a natural disaster affecting the normal operation of the injection well. An earthquake may disturb surface and/or subsurface facilities; and weather-related disasters (e.g., tornado or lightning strike) may affect surface facilities.

Severity: *[Describe the severity of the event (i.e., Low, Medium, High) based on a risk evaluation of its potential impact, and how the severity was determined.]*

Timing of event: *[Present the phase during which the event could occur (i.e., pre-injection, injection and/or post-injection phases).]*

Avoidance measures: N/A

Detection methods: N/A

Potential Response actions:

If a natural disaster occurs that affects normal operation of the injection well, perform the following:

- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- Determine the severity of the event, based on the information available, within 24 hours of notification.
- For a Major or Serious emergency:
    - Initiate shutdown plan. *[Insert appropriate additional steps.]*
    - If contamination or endangerment is detected, identify and implement appropriate remedial actions (in consultation with the UIC Program Director).
- For a Minor emergency:
    - Conduct assessment to determine whether there has been a loss of mechanical integrity.
    - If there has been a loss of mechanical integrity, initiate shutdown plan. *[Insert appropriate additional steps.]*

Response personnel: *[Identify the on-call or available staff (e.g., operator staff, contractor staff) who would respond to the scenario.]*

Equipment: *[Describe the types of equipment (e.g., groundwater remediation equipment, drill rig, logging equipment, and cement or casing as required) that would be used to implement the response actions described.]*

Induced or Natural Seismic Event

[The following introductory text is provided as an example.] Based on the project operating conditions, it is highly unlikely that injection operations would ever induce a seismic event outside an INSERT X mile radius from the wellhead. Therefore this portion of the response plan is developed for any seismic event with an epicenter within an INSERT X mile radius of the injection well.

To monitor the area for seismicity, INSERT BRIEF DESCRIPTION OF THE SEISMIC MONITORING APPROACH BASED ON THE TESTING AND MONITORING PLAN.

Based on the periodic analysis of the monitoring data, observed level of seismic activity, and local reporting of felt events, the site will be assigned an operating state. The operating state is determined using threshold criteria which correspond to the site's potential risk and level of seismic activity. The operating state provides operating personnel information about the potential risk of further seismic activity and guides them through a series of response actions.

Severity: *[Describe the severity of the event (i.e., Low, Medium, High) based on a risk evaluation of its potential impact, and how the severity was determined.]*

Timing of event: *[Present the phase during which the event could occur (i.e., pre-injection, injection and/or post-injection phases).]*

Avoidance measures: N/A *[Describe the planned operational practices (e.g., injection within permitted limits) in place to avoid the scenario.]*

Detection methods: *[Describe the activities (i.e., described in the Testing and Monitoring Plan or triggers based on continuous well monitoring) that would detect the event.]*

Potential Response actions:

The seismic monitoring system structure is presented in Table 2. The table corresponds each level of operating state with the threshold conditions and operational response actions.

Table 2. Seismic monitoring system, for seismic events > M1.0 with an epicenter within an INSERT X mile radius of the injection well.
[This table is provided as an example; replace or modify it as appropriate.]

Operating State	Threshold Condition[1,2]	Response Action[3]
Green	Seismic events less than or equal to M1.5	1. Continue normal operation within permitted levels.
Yellow	Five (5) or more seismic events within a 30 day period having a magnitude greater than M1.5 but less than or equal to M2.0	1. Continue normal operation within permitted levels. 2. Within 24 hours of the incident, notify the UIC Program Director of the operating status of the well.
Orange	Seismic event greater than M1.5 and local observation or felt report Seismic event greater than M2.0 and no felt report	1. Continue normal operation within permitted levels. 2. Within 24 hours of the incident, notify the UIC Program Director, of the operating status of the well. 3. Review seismic and operational data. 4. Report findings to the UIC Program Director and issue corrective actions.

[1] Specified magnitudes refer to magnitudes determined by local INSERT ORGANIZATION NAME or USGS seismic monitoring stations or reported by the USGS National Earthquake Information Center using the national seismic network.

[2] "Felt report" and "local observation and report" refer to events confirmed by local reports of felt ground motion or reported on the USGS "Did You Feel It?" reporting system.

[3] Reporting findings to the UIC Program Director and issuing corrective action will occur within 25 business days (five weeks) of change in operating state.

Operating State	Threshold Condition[1,2]	Response Action[3]
Magenta	Seismic event greater than M2.0 and local observation or report	1. Initiate rate reduction plan. 2. Vent CO_2 from surface facilities. 3. Within 24 hours of the incident, notify the UIC Program Director, of the operating status of the well. 4. Limit access to wellhead to authorized personnel only. 5. Communicate with facility personnel and local authorities to initiate evacuation plans, as necessary. *[Insert additional appropriate steps.]* 6. Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure; identify and implement appropriate remedial actions (in consultation with the UIC Program Director). 7. Determine if leaks to ground water or surface water occurred. 8. If USDW contamination is detected: a. Notify the UIC Program Director within 24 hours of the determination. b. *[Insert additional appropriate steps.]* 9. Review seismic and operational data. 10. Report findings to the UIC Program Director and issue corrective actions.
Red	Seismic event greater than M2.0, and local observation or report, and local report and confirmation of damage[4] Seismic event >M3.5	1. Initiate shutdown plan. 2. Vent CO_2 from surface facilities. 3. Within 24 hours of the incident, notify the UIC Program Director of the operating status of the well. 4. Limit access to wellhead to authorized personnel only. 5. Communicate with facility personnel and local authorities to initiate evacuation plans, as necessary. 6. Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure; identify and implement appropriate remedial actions (in consultation with the UIC Program Director). *[Insert additional appropriate steps.]* 7. Determine if leaks to ground water or surface water occurred. 8. If USDW contamination is detected: a. Notify the UIC Program Director within 24 hours of the determination. b. *[Insert additional appropriate steps.]* 9. Review seismic and operational data. 10. Report findings to the UIC Program Director and issue corrective actions.

[4] Onset of damage is defined as cosmetic damage to structures, such as bricks dislodged from chimneys and parapet walls, broken windows, and fallen objects from walls, shelves, and cabinets.

Response personnel: *[Identify the on-call or available staff (e.g., operator staff, contractor staff) who would respond to the scenario.]*

Equipment: *[Describe the types of equipment (e.g., groundwater remediation equipment, drill rig, logging equipment, and cement or casing as required) that would be used to implement the response actions described.]*

Response Personnel and Equipment

Site personnel, project personnel, and local authorities will be relied upon to implement this ERRP.

Site personnel to be notified (not listed in order of notification): *[This list is provided as an example; modify as appropriate to include all appropriate facility staff and their titles/roles.]*

1. Project Engineer(s)
2. Plant Safety Manager(s)
3. Environmental Manager(s)
4. Plant Manager
5. Plant Superintendent

A site-specific emergency contact list will be developed and maintained during the life of the project. INSERT PERMIT APPLICANT NAME will provide the current site-specific emergency contact list to the UIC Program Director.

Table 3. Contact information for key local, state, and other authorities. *[The organizations in this table are provided as examples.]*

Agency	Phone Number
Local police	
State police	
State emergency management agency	
Environmental services contractor	
UIC Program Director	
EPA National Response Center (24 hours)	800-424-8802
State geological survey	
INSERT *add rows as needed*	

Equipment needed in the event of an emergency and remedial response will vary, depending on the triggering emergency event. Response actions (cessation of injection, well shut-in, and evacuation) will generally not require specialized equipment to implement. Where specialized equipment (such as a drilling rig or logging equipment) is required, INSERT NAME OR ORGANIZATION shall be responsible for its procurement.

Emergency Communications Plan

[The following items are provided as examples. Add/delete/expand upon the activities the activities listed below to describe public communication in the event of an emergency.]

INSERT PERMIT APPLICANT NAME will communicate to the public about any event that requires an emergency response to ensure that the public understands what happened and whether or not there are any environmental or safety implications. The amount of information, timing, and communications method(s) will be appropriate to the event, its severity, whether any impacts to drinking water or other environmental resources occurred, any impacts to the surrounding community, and their awareness of the event.

INSERT PERMIT APPLICANT NAME will describe what happened, any impacts to the environment or other local resources, how the event was investigated, what responses were taken, and the status of the response. For responses that occur over the long-term (e.g., ongoing cleanups), INSERT PERMIT APPLICANT NAME will provide periodic updates on the progress of the response action(s).

INSERT PERMIT APPLICANT NAME will also communicate with entities who may need to be informed about or take action in response to the event, including local water systems, CO2 source(s) and pipeline operators, land owners, and Regional Response Teams (as part of the National Response Team).

Plan Review

This ERRP shall be reviewed:

- At least once every five (5) years following its approval by the permitting agency;
- Within one (1) year of an area of review (AOR) reevaluation;
- Within INSERT TIME following any significant changes to the injection process or the injection facility, or an emergency event; or
- As required by the permitting agency.

If the review indicates that no amendments to the ERRP are necessary, INSERT PERMIT APPLICANT NAME will provide the permitting agency with the documentation supporting the "no amendment necessary" determination.

If the review indicates that amendments to the ERRP are necessary, amendments shall be made and submitted to the permitting agency within INSERT TIME following an event that initiates the ERRP review procedure.

Staff Training and Exercise Procedures

[Recommended considerations include:

- *What training or drill procedures will be implemented? (For example, provide a list of steps or similar description, or attach a manual if available.)*
- *Who will receive the training and how often will it be provided?]*
- *What training or drill procedures will be implemented? (For example, provide a list of steps or similar description, or attach a manual if available.)*

FINANCIAL ASSURANCE DEMONSTRATION
40 CFR 146.85

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the financial assurance demonstration.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns).

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents.

Facility Information

Facility name: INSERT FACILITY NAME
INSERT WELL NUMBER

Facility contact: INSERT CONTACT NAME/CONTACT TITLE
INSERT ADDRESS
INSERT PHONE NUMBER/EMAIL ADDRESS

Well location: INSERT CITY, COUNTY, STATE
INSERT LAT/LONG COORDINATES

INSERT PERMIT APPLICANT is providing financial responsibility pursuant to 40 CFR 146.85. INSERT PERMIT APPLICANT is using a INSERT MECHANISM(S) to cover the costs of: corrective action, emergency and remedial response, injection well plugging, post-injection site care, and site closure.

The estimated costs of each of these activities, as provided by INSERT PERMIT APPLICANT, are presented in Table 1.

Table 1. Cost Estimates for Activities to be Covered by Financial Responsibility.

Activity	Total Cost ($)
Corrective Action	
Plugging Injection Wells	
Post-Injection Site Care	
Site Closure	
Emergency and Remedial Response	

[Insert or attach the instrument text.

If a pay-in schedule is applicable to any instruments/activities, present this information as well.]

POST-INJECTION SITE CARE AND SITE CLOSURE PLAN
40 CFR 146.93(a)

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the Post-Injection Site Care (PISC) and Site Closure Plan. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate maps, figures, references, etc. should also be included to support the text of the plan.

Remember that, pursuant to 40 CFR 146.94(a) of the federal Class VI Rule, the requirement to maintain and implement an approved PISC and Site Closure Plan is directly enforceable regardless of whether the requirement is a condition of the permit. For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

To avoid duplicative reporting, you are encouraged to provide relevant cross-references to other submissions made with the GSDT.

Facility Information

Facility name:	INSERT FACILITY NAME INSERT WELL NUMBER
Facility contact:	INSERT CONTACT NAME/CONTACT TITLE INSERT ADDRESS INSERT PHONE NUMBER/EMAIL ADDRESS
Well location:	INSERT CITY, COUNTY, STATE INSERT LAT/LONG COORDINATES

This Post-Injection Site Care (PISC) and Site Closure plan describes the activities that INSERT PERMIT APPLICANT NAME will perform to meet the requirements of 40 CFR 146.93. INSERT PERMIT APPLICANT NAME will monitor ground water quality and track the position of the carbon dioxide plume and pressure front for INSERT PISC TIMEFRAME. INSERT PERMIT APPLICANT NAME may not cease post-injection monitoring until a demonstration of non-endangerment of USDWs has been approved by the UIC Program Director pursuant to 40 CFR 146.93(b)(3). Following approval for site closure, INSERT PERMIT APPLICANT NAME will plug all monitoring wells, restore the site to its original condition, and submit a site closure report and associated documentation.

Pre- and Post-Injection Pressure Differential [40 CFR 146.93(a)(2)(i)]

Based on the modeling of the pressure front as part of the AoR delineation, pressure at the injection well is expected to decrease to pre-injection levels by INSERT TIME, as described below. Additional information on the projected post-injection pressure declines and differentials is presented in the permit application and the AoR and Corrective Action Plan.

[Recommended considerations include:

- *At what rate is pressure expected to decline at the injection and monitoring wells?*
- *What is the maximum predicted injection pressure differential over the life of the project? When does that occur?]*

Predicted Position of the CO_2 Plume and Associated Pressure Front at Site Closure [40 CFR 146.93(a)(2)(ii)]

Figure 1 shows the predicted extent of the plume and pressure front at the end of the PISC timeframe, representing the maximum extent of the plume and pressure front. This map is based on the final AoR delineation modeling results submitted pursuant to 40 CFR 146.84.

INSERT FIGURE *(full-page size is preferred)*

Figure 1. Map of the predicted extent of the CO_2 plume and pressure front at site closure.

Post-Injection Monitoring Plan [40 CFR 146.93(b)(1)]

Performing INSERT PLANNED MONITORING METHODS as described in the following sections during the post-injection phase will meet the requirements of 40 CFR 146.93(b)(1). The results of all post-injection phase testing and monitoring will be submitted annually, within INSERT TIME, as described under "Schedule for Submitting Post-Injection Monitoring Results," below.

[Recommended considerations include:

- *Briefly describe the types of monitoring that will be employed. What wells/monitoring sites will be used? Where are they located? What subsurface zones do they target?*
- *How will access be guaranteed to the monitoring wells?]*

[Please reference or attach a quality assurance and surveillance plan (QASP) for all testing and monitoring activities, e.g., as described in/attached to the Testing and Monitoring Plan.]

Monitoring Above the Confining Zone

Table 1 presents the monitoring methods, locations, and frequencies for monitoring above the confining zone. Table 2 identifies the parameters to be monitored and the analytical methods INSERT PERMIT APPLICANT NAME will employ.

[Recommended considerations include:

- *What is the specific schedule for each monitoring activity? For example, "Logging will take place up to 45 days before the anniversary date of authorization of injection each year or will be alternatively scheduled with the prior approval of the UIC Program Director."*
- *Will monitoring locations/frequencies be fixed or adaptive (e.g., according to the evolution and growth of the plume)? What specific, quantitative triggers or timeframes will be used for phased or adaptive monitoring?*
- *What is the depth or elevation below mean sea level of each monitoring interval? What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?*
- *What type(s) of data or output will result from each monitoring method?*
- *For continuous monitoring methods, how often will data be sampled and recorded? (Refer to Table 3.)*
- *For methods involving fluid sample collection (refer to the QASP as necessary):*
    - *What materials will be used? What sample collection procedures will be implemented to ensure a representative sample?*
    - *Where will sample analysis be conducted? What chain of custody procedures will be implemented?*
    - *What are the detection limits for the analytical methods that will be used?*

- *How will it be determined if data deviate from baseline, predicted, or average values?]*

Table 1. Monitoring of ground water quality and geochemical changes above the confining zone. *[If indirect monitoring techniques such as logging will be used to complement direct fluid sampling, they can also be included in this table.]*

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
INSERT Formation 1				
INSERT Formation 2				
INSERT Formation 3				
Add more rows as needed				

Table 2. Summary of analytical and field parameters for ground water samples.

Parameters	Analytical Methods
INSERT FORMATION NAME	
INSERT Parameter 1	
INSERT Parameter 2	
INSERT Parameter 3	
Add more rows as needed	
INSERT FORMATION NAME	
INSERT Parameter 1	
INSERT Parameter 2	
INSERT Parameter 3	
Add more rows as needed	

Table 3. Sampling and recording frequencies for continuous monitoring.

Parameter	Device(s)	Location	Min. Sampling Frequency	Min. Recording Frequency
INSERT Parameter 1				
INSERT Parameter 2				
INSERT Parameter 3				
Add more rows as needed				

Notes:

- Sampling frequency refers to how often the monitoring device obtains data from the well for a particular parameter. For example, a recording device might sample a pressure transducer monitoring injection pressure once every two seconds and save this value in memory.
- Recording frequency refers to how often the sampled information gets recorded to digital format (such as a computer hard drive). For example, the data from the injection pressure transducer might be recorded to a hard drive once every minute.

Carbon Dioxide Plume and Pressure Front Tracking [40 CFR 146.93(a)(2)(iii)]

INSERT PERMIT APPLICANT NAME will employ direct and indirect methods to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure.

Table 4 presents the direct and indirect methods that INSERT PERMIT APPLICANT NAME will use to monitor the CO_2 plume, including the activities, locations, and frequencies INSERT PERMIT APPLICANT NAME will employ. The parameters to be analyzed as part of fluid sampling in the INSERT INJECTION ZONE NAME (and associated analytical methods) are presented in Table 5.

Table 6 presents the direct and indirect methods that INSERT PERMIT APPLICANT NAME will use to monitor the pressure front, including the activities, locations, and frequencies INSERT PERMIT APPLICANT NAME will employ.

Fluid sampling will be performed as described in INSERT SECTION of the QASP; sample handling and custody will be performed as described in INSERT SECTION of the QASP; and quality control will be ensured using the methods described in INSERT SECTION of the QASP. Quality assurance procedures for seismic monitoring methods are presented in INSERT SECTION of the QASP.

[Recommended considerations include:

- *What is the specific schedule for each monitoring activity? For example, "Logging will take place up to 45 days before the anniversary date of authorization of injection each year or will be alternatively scheduled with the prior approval of the UIC Program Director."*
- *Will monitoring locations/frequencies be fixed or adaptive (e.g., according to the evolution of the plume)? What specific, quantitative triggers or timeframes will be used for phased or adaptive monitoring?*

- *What is the depth or elevation below mean sea level of each monitoring interval?*
- *What type(s) of data or output will result from each monitoring method?*
- *What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?*
- *For continuous monitoring methods, how often will data be sampled and recorded? (Refer to Table 4.)*
- *How will it be determined if data deviate from baseline, predicted, or average values?*
- *How will the various monitoring results be synthesized to monitor the extent of the plume and pressure front, verify the AoR delineation, and support the non-endangerment demonstration ? (Refer to the "Non-Endangerment Demonstration Criteria" section as needed.)]*

Table 4. Post-injection phase plume monitoring.

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
DIRECT PLUME MONITORING				
INSERT Formation 1				
INSERT Formation 2				
INSERT Formation 3				
Add more rows as needed				
INDIRECT PLUME MONITORING				
INSERT Formation 1				
INSERT Formation 2				
INSERT Formation 3				
Add more rows as needed				

Table 5. Summary of analytical and field parameters for fluid sampling in the injection zone.

Parameters	Analytical Methods
INSERT FORMATION NAME	
INSERT Parameter 1	
INSERT Parameter 2	
INSERT Parameter 3	
Add more rows as needed	

Table 6. Post-injection phase pressure-front monitoring.

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
DIRECT PRESSURE-FRONT MONITORING				
INSERT Formation 1				
INSERT Formation 2				
INSERT Formation 3				
Add more rows as needed				
INDIRECT PRESSURE-FRONT MONITORING				
INSERT Formation 1				
INSERT Formation 2				
INSERT Formation 3				
Add more rows as needed				

Schedule for Submitting Post-Injection Monitoring Results [40 CFR 146.93(a)(2)(iv)]

All post-injection site care monitoring data and monitoring results collected using the methods described above will be submitted to EPA in reports submitted on INSERT SCHEDULE. The reports will contain information and data generated during the reporting period; i.e. well-based *monitoring data, sample analysis, and the results from updated site models.*

[Recommended considerations include:

- *When and at what frequency will results be reported to EPA?]*

Alternative Post-Injection Site Care Timeframe [40 CFR 146.93(c)]

[Note: Only include this section if you are requesting an alternative PISC timeframe.

For each section listed below, please provide a brief narrative description of how data and calculations support a demonstration of an alternative PISC timeframe. The information needed to support the demonstration of the alternative PISC timeframe may be included in other sections of the permit application. In this section, please describe the relevant information in the context of the alternative PISC timeframe to demonstrate that the alternative timeframe is appropriate given site-specific geologic and hydrologic conditions and the results of AoR modeling. Include specific cross-references to other plans (e.g., AoR and Corrective Action, Testing and Monitoring) and the permit application/associated submissions, as appropriate to avoid duplicative reporting. Figures should be included to supplement the narrative description of the alternative PISC timeframe when appropriate. Supporting documentation, references, etc. can be uploaded to the Alternative PISC Timeframe Demonstration module of the GSDT. Using this module will help to ensure that information is submitted to fulfil all relevant requirements.]

INSERT PERMIT APPLICANT NAME will conduct post-injection monitoring for INSERT TIMEFRAME following the cessation of injection operations. A justification for this alternative

PISC timeframe is provided below. Regardless of the alternative PISC timeframe, monitoring and reporting as described in the sections above will continue until INSERT PERMIT APPLICANT NAME demonstrates, based on monitoring and other site-specific data, that no additional monitoring is needed to ensure that the project does not pose an endangerment to any USDWs, per the requirements at 40 CFR 146.93(b)(2) or (3).

Computational Modeling Results – 40 CFR 146.93(c)(1)(i)

[Recommended considerations include:

- *How are the plume and pressure expected to evolve over time during the proposed timeframe?*
- *What are the results of sensitivity analyses performed on the AoR model? What parameters contribute to model uncertainty? How/to what extent will this uncertainty be addressed through testing and monitoring activities?*
- *How do proposed operational conditions support the alternative PISC timeframe demonstration?]*

[Associated figures may include:

- *Maps showing the predicted extent of the plume and pressure front during the alternative PISC timeframe.*
- *Cross sections showing the temporal evolution of the carbon dioxide plume and pressure front during the post-injection phase, specifically upward migration, and other related figures to present predicted system behavior during the post-injection phase.*
- *Results of sensitivity analyses (e.g., in charts or maps). Note that sensitivity analysis of computational modeling is required for an alternative PISC timeframe demonstration. EPA recommends that a description of the methods used for sensitivity analysis be included in the AoR and Corrective Action Plan.]*

Predicted Timeframe for Pressure Decline – 40 CFR 146.93(c)(1)(ii)

[Recommended considerations include:

- *What is the maximum spatial extent of the pressure front? When is this predicted to be reached?*
- *How rapidly is pressure predicted to decline following cessation of injection? Is pressure decline homogenous or heterogeneous within the AoR?*
- *Based on sensitivity analyses, what parameters affect predicted pressure decline and to what extent?*
- *If site-specific pressure monitoring data are available, how do they support the alternative PISC timeframe demonstration? (For plan amendments made during the injection or post-injection phases.)]*

[Associated figures may include:

- *Maps and cross sections showing the location of the pressure front at relevant time intervals during the post-injection phase.*
- *Time-series charts showing pressure buildup during injection and pressure falloff during the post-injection phase. These plots should include an indication of important threshold values, such as critical pressure, pre-injection pressure levels, or a predicted steady-state level.*
- *Pressure decline profiles at specific locations (e.g., injection well, monitoring wells, etc.) over time.*
- *Results of sensitivity analyses with respect to pressure (charts or maps).]*

Predicted Rate of Plume Migration – 40 CFR 146.93(c)(1)(iii)

[Recommended considerations include:

- *What is the maximum spatial extent of the plume? When is this predicted to be reached?*
- *What is the predicted plume migration rate during the injection and post-injection phases? When is the plume migration rate expected to be effectively zero?*
- *Based on sensitivity analyses, what parameters affect predicted plume migration and to what extent?*
- *If site-specific monitoring data are available, how do direct and indirect plume monitoring results compare to AoR predictions? (For plan amendments made during the injection or post-injection phases.)]*

[Associated figures may include:

- *Maps and cross sections showing the location of the plume at relevant time intervals during the post-injection phase.*
- *Predicted CO_2 saturation profiles at specific locations (e.g., injection well, monitoring wells, etc.) over time.]*

Site-Specific Trapping Processes – 40 CFR 146.93(c)(1)(iv)-(vi)

[The trapping processes described here should match those accounted for during the delineation of the AoR. The discussion of trapping processes and rates should incorporate computational modeling and reflect the conceptual geological model of the site. Trapping predictions should be based on the most recent AoR reevaluation, if applicable.

Recommended considerations include:

- *What are the physical and chemical trapping processes considered for this project?*
- *How were trapping rates determined? What sources of data were used to estimate or calculate trapping rates? Provide citations to literature as necessary.*

- *What parameters were used to estimate trapping rates? What assumptions were used for estimation?*
- *Do trapping rates or the primary trapping processes change over time throughout the lifetime of the project?*
- *Is there the potential for CO_2 mineralization due to site-specific geochemistry? What processes control this mineralization? What is the expected extent of mineralization? (Note: If mineralization is considered a major trapping process, make sure to account for this during AoR modeling and delineation.)]*

[Associated figures or attachments may include:

- *Laboratory analysis reports (or a cross-reference to materials submitted elsewhere).*
- *Tables and/or graphs for key trapping mechanisms (e.g., capillary trapping, mineralization) showing trapping rates over time.*
- *Graphs showing the proportion of CO_2 in each phase (gas, aqueous, trapped) over time.]*

Confining Zone Characterization – 40 CFR 146.93(c)(1)(vii)

[Recommended considerations include:

- *What site-specific confining zone characteristics support the demonstration of the alternative PISC timeframe?*
- *What are the characteristics of the regions of the confining zone predicted to come into contact with the CO_2 plume or mobilized fluids? Are these characteristics expected to change over time? Are there any effects of prolonged contact with CO2 or mobilized fluids?*
- *How were the results of confining zone characterization used in computational modeling? How do they relate to pressure decline, plume migration, and trapping?*
- *If available, how do the results of testing and monitoring support the site characterization? Are there discrepancies between the site characterization conducted for the permit application (40 CFR 164.82(a)(3)(ii) and (iii)) and the results of testing and monitoring or pre-operational testing? (For plan amendments made during the injection or post-injection phases.)]*

Assessment of Fluid Movement Potential – 40 CFR 146.93(c)(1)(viii)-(ix)

[The description of the potential for fluid movement through conduits should also include information on the construction and plugging of any abandoned wells in the AoR. This should include an assessment of any corrective action performed on those wells, as defined in the AoR and Corrective Action Plan.

Recommended considerations include:

- *Are there any wells in the AoR that could potentially act as conduits for fluid movement? If so, have they been plugged? If not, what corrective action is planned?*

- *Is the CO_2 plume (or mobilized fluids) predicted to reach any potential conduits after the cessation of injection? How long is it expected to take the plume to reach those conduits? What corrective action is planned?*
- *What plugging methods were used for abandoned wells within the AoR? What construction methods were used?*
- *How will the proposed injection well construction ensure protection of USDWs after the cessation of injection?]*

[Associated figures or attachments may include:

- *Map of all wells within the AoR (or a cross-reference to a map submitted elsewhere) including locations and depth.*
- *Relevant construction, plugging, or testing documentation (or cross-references to materials submitted elsewhere).*
- *Testing and monitoring results relevant to well integrity (e.g., internal and external MITs, indirect monitoring results, etc.). (This item applies to plan amendments made during the injection or post-injection phases.)]*

Location of USDWs – 40 CFR 146.93(c)(1)(x)

[Recommended considerations include:

- *How far (vertically and laterally) is the injection zone from the nearest USDW (above and/or below)? How far is the nearest USDW from the predicted maximum plume extent?*
- *How was the location of the lowermost USDW determined? How did other factors (e.g., pressure and plume migration analysis, trapping processes and rates, potential conduits for fluid movement) contribute to the evaluation of USDW location relative to the CO_2 plume?*
- *In the context of an alternative PISC timeframe, how does the information presented in the sections above relate to the distance between the CO_2 plume and the nearest USDW? How do these relationships help demonstrate the alternative PISC timeframe?]*

Non-Endangerment Demonstration Criteria

Prior to approval of the end of the post-injection phase, INSERT PERMIT APPLICANT NAME will submit a demonstration of non-endangerment of USDWs to the UIC Program Director, per 40 CFR 146.93(b)(2) and (3).

The owner or operator will issue a report to the UIC Program Director. This report will make a demonstration of USDW non-endangerment based on the evaluation of the site monitoring data used in conjunction with the project's computational model. The report will detail how the non-endangerment demonstration evaluation uses site-specific conditions to confirm and demonstrate non-endangerment. The report will include all relevant monitoring data and interpretations upon which the non-endangerment demonstration is based, model documentation and all supporting data, and any other information necessary for the UIC

Program Director to review the analysis. The report will include the following sections:

Introduction and Overview

A summary of relevant background information will be provided, including the operational history of the injection project, the date of the non-endangerment demonstration relative to the post-injection period outlined in this PISC and Site Closure Plan, and a general overview of how monitoring and modeling results will be used together to support a demonstration of USDW non-endangerment.

Summary of Existing Monitoring Data

A summary of all previous monitoring data collected at the site, pursuant to the Testing and Monitoring Plan of this permit and this PISC and Site Closure Plan, including data collected during the injection and post-injection phases of the project, will be submitted to help demonstrate non-endangerment. Data submittals will be in a format acceptable to the UIC Program Director [40 CFR 146.91(e)], and will include a narrative explanation of monitoring activities, including the dates of all monitoring events, changes to the monitoring program over time, and an explanation of all monitoring infrastructure that has existed at the site. Data will be compared with baseline data collected during site characterization [40 CFR 146.82(a)(6) and 146.87(d)(3)].

[Note: EPA recommends that, for the remaining subsections, applicants consider how site-specific information be used to make a non-endangerment demonstration. On what criteria will the demonstration be based? Add or adjust sections as necessary to include all planned methods/strategies.]

Summary of Computational Modeling History

[Recommended considerations include:

- *What computational modeling results may be used to demonstrate non-endangerment?*
- *What types of data will be used to compare modeling and monitoring results?*
- *What will the specific metrics of comparison be? How will agreement be demonstrated?*
- *If there is major disagreement between monitoring and modeling results at the time of the demonstration, how will that be reconciled?]*

Evaluation of Reservoir Pressure

[Recommended considerations include:

- *What types of data will be used to evaluate the extent of the pressure front?*
- *How will this information be compared to model predictions?]*

Evaluation of Carbon Dioxide Plume

[Recommended considerations include:

- *What types of data will be used to evaluate the extent of the CO_2 plume?*
- *How will this information be compared to model predictions?]*

Evaluation of Emergencies or Other Events

[Recommended considerations include:

- *What types of data will be used to demonstrate that mobilized formation fluids do not pose a danger to USDWs?*
- *How will this information be compared to model predictions?*
- *What are the nearest artificial penetrations or other potential conduits?*
- *Where are they located with respect to the position of the plume and pressure front?*
- *How will the quality of well construction and plugging for artificial penetrations be evaluated?]*

Site Closure Plan

INSERT PERMIT APPLICANT NAME will conduct site closure activities to meet the requirements of 40 CFR 146.93(e) as described below. INSERT PERMIT APPLICANT NAME will submit a final Site Closure Plan and notify the permitting agency at least 120 days prior of its intent to close the site. Once the permitting agency has approved closure of the site, INSERT PERMIT APPLICANT NAME will plug the monitoring wells and submit a site closure report to EPA. The activities, as described below, represent the planned activities based on information provided to EPA. The actual site closure plan may employ different methods and procedures. A final Site Closure Plan will be submitted to the UIC Program Director for approval with the notification of the intent to close the site.

Plugging Monitoring Wells

[Recommended considerations include:

- *What are the specific procedures that will be followed? (Provide a detailed list of steps and a representative schematic.)*
- *What materials will be used for plugging (type, quantity, etc.)?*
- *What methods will be used for volume calculations?*
- *What well tests will be conducted before plugging?*
- *What other associated activities will be conducted (e.g., infrastructure removal or site restoration in compliance with state or local requirements)?]*

Site Closure Report

A site closure report will be prepared and submitted within 90 days following site closure, documenting the following *[add detail to the text below, as appropriate]*:

- Plugging of the verification and geophysical wells (and the injection well if it has not previously been plugged),
- Location of sealed injection well on a plat of survey that has been submitted to the local zoning authority,
- Notifications to state and local authorities as required at 40 CFR 146.93(f)(2),
- Records regarding the nature, composition, and volume of the injected CO_2, and
- Post-injection monitoring records.

INSERT PERMIT APPLICANT NAME will record a notation to the property's deed on which the injection well was located that will indicate the following *[add detail to the text below, as appropriate]*:

- That the property was used for carbon dioxide sequestration,
- The name of the local agency to which a plat of survey with injection well location was submitted,
- The volume of fluid injected,
- The formation into which the fluid was injected, and
- The period over which the injection occurred.

The site closure report will be submitted to the permitting agency and maintained by the owner or operator for a period of 10 years following site closure. Additionally, the owner or operator will maintain the records collected during the post-injection period for a period of 10 years after which these records will be delivered to the UIC Program Director.

INJECTION WELL PLUGGING PLAN
40 CFR 146.92(b)

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the Injection Well Plugging Plan. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.

Remember that, pursuant to 40 CFR 146.94(a) of the federal Class VI Rule, the requirement to maintain and implement an approved Injection Well Plugging Plan is directly enforceable regardless of whether the requirement is a condition of the permit. For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

To avoid duplicative reporting, you are encouraged to provide relevant cross-references to other submissions made with the GSDT.

Facility Information

Facility name: INSERT FACILITY NAME
INSERT WELL NUMBER

Facility contact: INSERT CONTACT NAME/CONTACT TITLE
INSERT ADDRESS
INSERT PHONE NUMBER/EMAIL ADDRESS

Well location: INSERT CITY, COUNTY, STATE
INSERT LAT/LONG COORDINATES

INSERT PERMIT APPLICANT NAME will conduct injection well plugging and abandonment according to the procedures below.

Planned Tests or Measures to Determine Bottom-Hole Reservoir Pressure

[Recommended considerations include:

- *What tests or methods will be used to determine bottom-hole reservoir pressure? (Provide a list of steps or similar description.)]*

Planned External Mechanical Integrity Test(s)

INSERT PERMIT APPLICANT NAME will conduct at least one of the tests listed in Table 1 to verify external mechanical integrity prior to plugging the injection well as required by 40 CFR 146.92(a).

[Recommended considerations include:

- *What are the specific procedures that will be followed for each type of test? (Provide a list of steps or similar description.)*
- *What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?*
- *What will constitute a "pass" or "fail" for each test?]*

Table 1. Planned MITs.

Test Description	Location
INSERT Test 1	
INSERT Test 2	
INSERT Test 3	
Add rows as needed	

Information on Plugs

INSERT PERMIT APPLICANT NAME will use the materials and methods noted in Table 2 to plug the injection well. The volume and depth of the plug or plugs will depend on the final geology and downhole conditions of the well as assessed during construction. The cement(s) formulated for plugging will be compatible with the carbon dioxide stream. The cement formulation and required certification documents will be submitted to the agency with the well plugging plan. The owner or operator will report the wet density and will retain duplicate samples of the cement used for each plug.

[Recommended considerations include:

- *What methods will be used for volume calculations?]*

Plan revision number: INSERT
Plan revision date: INSERT

Table 2. Plugging details.

Plug Information	Plug #1	Plug #2	Plug #3	Plug #4	Plug #5	Plug #6	Plug #7
Diameter of boring in which plug will be placed (Insert units)							
Depth to bottom of tubing or drill pipe (Insert units)							
Sacks of cement to be used							
Slurry volume to be pumped (Insert units)							
Slurry weight (lb./gal)							
Calculated top of plug (Insert units)							
Bottom of plug (Insert units)							
Type of cement or other material							
Method of emplacement (e.g., balance method, retainer method, or two-plug method)							

Narrative Description of Plugging Procedures

Notifications, Permits, and Inspections

In compliance with 40 CFR 146.92(c), INSERT PERMIT APPLICANT NAME will notify the regulatory agency at least 60 days before plugging the well and provide updated Injection Well Plugging Plan, if applicable.

[Recommended considerations include:

- *Will any other notifications, permits, or inspections be needed?]*

Plugging Procedures

[Recommended considerations include:

- *What are the specific procedures that will be followed? (Provide a detailed list of steps and a representative schematic.)*
- *What contingency procedures/measures will be used?]*

CLASS VI PRE-OPERATION NARRATIVE
40 CFR 146.82(c)

INSERT PROJECT NAME

INSTRUCTIONS

To reduce the potential for redundancy and to organize pre-operational information in a manner that facilitates efficient review by the permitting authority, EPA recommends that Class VI owners or operators submit both:

1. A narrative describing updated site characterization information, synthesizing the results of pre-operational logging and testing, and other general project information (compiled into a single file and submitted using the Project Information Tracking module of the GSDT).
2. Specific, detailed information required by certain Class VI Rule provisions (submitted using other GSDT modules, which are tailored to the applicable Class VI Rule requirements).

This template provides a suggested outline for the narrative component of the pre-operational submissions. Permittees are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in this narrative.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific narrative development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate maps, figures, references, etc. should also be included to support the text. If desired, appendices, attachments, or other supplemental information associated with the narrative that do not fit into one of the specific GSDT modules can be uploaded directly to the Project Information Tracking module using the module field designated for "any other information requested by the UIC Program Director."

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents.

This narrative file does not need to repeat any information submitted with the GSDT, but it should clearly reference these other submissions to ensure that all Class VI requirements are met. EPA recommends that you review the GSDT modules and/or user guides for each topic area below before developing your narrative, to avoid duplicating efforts or information.

After completing the narrative, upload it to the Project Information Tracking GSDT module, on the Updated Information tab. EPA recommends converting to PDF prior to uploading.

Project Background Information

[In this section, please update proposed project information as necessary to reflect information collected during pre-operational testing and logging. Specifically, please indicate if changes are made to the project timeframe, proposed injection mass/volume, CO_2 source, or CO_2 composition.

Key project and facility details can be updated directly in the Project Information Tracking module of the GSDT.]

GSDT Submission - Project Background and Contact Information
GSDT Module: Project Information Tracking ***Tab(s):*** General Information tab; Facility Information and Owner/Operator Information tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Required project and facility details ***[40 CFR 146.82(a)(1)]*** ☐ NO UPDATES NECESSARY

Final AoR Model and Delineation [40 CFR 146.82(c)(1)]

[Please provide a short description of the information and files submitted to the GSDT related to the final AoR model and delineation that incorporates the results of pre-operational testing and logging, with references to the rule requirements those submissions satisfy. If there is additional information that could not be submitted using the forms in the GSDT, it can be included here.

Recommended considerations include:

- *How does the final AoR delineation based on site-specific well data compare to the original modeling effort?*
- *How were pre-operational testing and logging results incorporated into the final AoR model? What, if any, data from the original permit application were used in the updated AoR model?*
- *What might be the cause(s) of differences between the model results?*
- *Do the results of the final AoR modeling effort indicate that changes to operational procedures (e.g., injection rate, injection pressure) are necessary?*
- *Does the updated AoR include any additional wells/artificial penetrations not included in the tabulation of wells submitted to meet the requirements at 40 CFR 146.82(a)(4)?]*

[Associated figures may include:

- *Map showing the maximum vertical and lateral extent of the plume and/or pressure front.*
- *Map showing the delineated AoR with the location of the proposed injection well and any monitoring wells.*

Upload files related to the final AoR modeling and delineation effort and provide detailed modeling/well tabulation information using the AoR and Corrective Action module.]

AoR and Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Final computational modeling details ***[40 CFR 146.82(c)(1) and 146.84(c)]*** ☐ Tabulation of all wells within final AoR that penetrate confining zone ***[40 CFR 146.82(a)(4)]***

Site Characterization Updates [40 CFR 146.82(c)(2)]

[In this section, please provide a narrative description of any relevant updates to information on the geologic structure and hydrogeologic properties of the proposed storage site, based on the results of site-specific pre-operational testing and logging. This description should be supplemented by site-specific figures and graphics based on pre-operational testing results. Please frame this discussion to match the sections in the 146.82(a) narrative submitted with the original permit application.

These sections are provided below for reference, along with the corresponding rule citations.]

[Recommended considerations include:

- *How well do site-specific pre-operational testing and logging results compare to the data used in the original permit application? What are the differences between the original and updated site characterization?*
- *What specific testing and logging results led to updates in the site characterization?*
- *How well do pre-operational testing and logging results compare to literature and regional geologic and hydrogeologic data? What are the possible reasons for the differences?*
- *How do the data collected as part of pre-operational testing and logging inform a comprehensive understanding of site-specific conditions? Are any additional testing and monitoring methods required to gain a greater understanding?]*

[Associated figures may include:

- *Site-specific stratigraphic columns.*
- *Figures showing the location and extent of identified faults or major fractures.]*

Regional Geology, Hydrogeology, and Local Structural Geology [40 CFR 146.82(a)(3)(vi)]

[See recommendations above.]

Maps and Cross Sections of the AoR [40 CFR 146.82(a)(2), 146.82(a)(3)(i)]

[Note: Updated maps and cross sections showing the final AoR are required per the Class VI Rule.

See recommendations above.]

Faults and Fractures [40 CFR 146.82(a)(3)(ii)]

[See recommendations above.]

Injection and Confining Zone Details [40 CFR 146.82(a)(3)(iii)]

[See recommendations above.]

Geomechanical and Petrophysical Information [40 CFR 146.82(a)(3)(iv)]

[See recommendations above.]

Seismic History [40 CFR 146.82(a)(3)(v)]

[See recommendations above.]

Hydrologic and Hydrogeologic Information [40 CFR 146.82(a)(3)(vi), 146.82(a)(5)]

[See recommendations above.]

Geochemistry [40 CFR 146.82(a)(6)]

[See recommendations above.]

Other Information (Including Surface Air and/or Soil Gas Data, if Applicable)

[See recommendations above.]

Site Suitability [40 CFR 146.83]

[See recommendations above.]

Compatibility of the CO_2 Stream [40 CFR 146.82(c)(3)]

[In this section, please provide a narrative description of the compatibility of the CO_2 stream with injection zone fluids, minerals in the injection and confining zones, and well construction materials. This should be based on the results of the pre-operational testing program.

Note: For additional guidance on evaluating the compatibility of the CO_2 stream with subsurface fluids, solids, and well materials, please see Section 3.3. of EPA's UIC Program Class VI Site Characterization Guidance.]

[Recommended considerations include:

- *What pre-operational testing and logging results were used to determine the compatibility of the CO_2 stream with formation fluids, solids, and well materials? Are there any limitations in the data or major uncertainties that remain after pre-operational testing?*
- *Were any geochemical models or laboratory experiments used to determine compatibility? What models, if any, were used, and what were the results? If laboratory experiments were conducted, from what depths and formations were relevant core samples collected? Note: EPA strongly recommends using geochemical models to assess the potential impacts of CO_2 injection on subsurface materials.*
- *If models or laboratory experiments were not used, what literature and site-specific information are used to evaluate the interactions between the CO_2 stream and subsurface materials? What literature-derived reaction rates were investigated? How was site-specific information incorporated into this assessment? Note: The permit applicant may provide a detailed discussion of geochemical characteristics as the evaluation of CO_2 stream compatibility in limited circumstances, and with the agreement of the UIC Program Director.*
- *Will subsurface interactions between injectate, fluids, and/or solids lead to mineral precipitation or dissolution? Is this expected to affect permeability, porosity, or injectivity?*
- *If permeability, porosity, or injectivity are expected to be affected, how was this information incorporated into the final AoR model and delineation?*
- *Will the introduction of CO_2 lead to geochemical changes that might cause the mobilization of trace elements (e.g., lead or arsenic) from formation minerals?*
- *Is there evidence that the interactions between the injectate and well cement cause deterioration of the cement and a loss of mechanical integrity?*
- *Based on the results of formation testing, are any changes to the composition of the proposed CO_2 stream or the Testing and Monitoring Plan necessary?]*

Pre-Operational Logging and Testing [40 CFR 146.82(c)(4),(7) and 146.87]

[In this section, please provide a narrative summary of the results of the formation testing program required by 40 CFR 146.82(a)(8). The summary should synthesize the results, demonstrate a comprehensive understanding of site-specific geology and hydrology, and reference Class VI rule requirements at 40 CFR 146.87 as applicable. Actual pre-operational testing and logging data should be submitted directly to the GSDT's Pre-Operational Testing module. Please provide a description of the files uploaded to the GSDT to meet the requirements of 40 CFR 146.87.

Note: The sections below follow the structure of the UIC Program Class VI Site Characterization Guidance. Please see that document for more detailed information on methods for analyzing and reporting the results of pre-operational testing.]

[Recommended considerations include:

- *How do the pre-operational testing and logging results demonstrate that the injection and confining zones are suitable for receiving and containing injected fluids?*
- *How well do the results of pre-operational testing compare to the information submitted with the initial permit application?*
- *If the proposed well is being transitioned from a different class of injection well, what testing, monitoring, and logging data were collected previously?]*

Well Logging [40 CFR 146.87(a)(2) and (3)]

[Recommended considerations include:

- *What well logs were run? Why were these logs selected? When were the logs run?*
- *Are the data collected from well logs consistent with available site characterization data in the permit application? Do the data support other assessments of stratigraphy and formation properties?*
- *Were logs run in multiple wells to evaluate lateral continuity?*
- *If the data collected form well logs differs significantly from other sources of data, what implications are there for operational procedures, AoR delineation, and the project plan?]*

[Associated figures may include:

- *Wireline log results for critical intervals (injection and confining zones).*
- *Correlation plots if multiple wells were logged.]*

Core Analyses [40 CFR 146.87(b)]

[Recommended considerations include:

- *Were the core collected from the injection well or a stratigraphic well? If they were collected from a stratigraphic well, what data supports the assumption that the cores will represent the injection well?*
- *What type(s) of cores were collected? What depths were the cores collected from? How many cores were collected from the confining and injection zones?*
- *How does the collected core catalog sufficiently support stratigraphic correlation, interpretation of depositional environments, and wireline log calibration?*
- *What laboratory analyses were conducted on the cores?*
- *Were any major anomalies identified in the cores?]*

[Associated figures may include:

- *Photomicrographs of thin sections in the injection and confining zones.*

- *If cores were collected from a stratigraphic well, correlation plots to the injection well.]*

Characterization of Injection Formation Fluid Properties [40 CFR 146.87(b) and (c)]

[Recommended considerations include:

- *At what depths were formation fluids sampled? How many samples were collected?*
- *When during well construction and drilling was fluid collected?*
- *What types of sampling equipment was used? What field procedures were followed?*
- *Are the collected fluids representative of the injection formation?*
- *How will fluid analysis support a determination of the compatibility of the injectate with the formation fluids?*
- *Was there any anomalous data?]*

Fracture Pressure of the Injection and Confining Zones [40 CFR 146.87(d)(1)]

[Recommended considerations include:

- *What method(s) was used to determine or calculate fracture pressure? Was a step-rate test conducted?*
- *What test conditions were obtained? Was a constant injection rate used? Where were pressure gauges located? If gauges were located at the surface, what correction factors were used?*
- *Are the results of fracture pressure calculations consistent with expected fracture pressures identified in the initial permit application?*
- *How does the calculated fracture pressure compare with data from core tests or other wells in the region?*
- *Are any changes to the proposed maximum injection pressure necessary given the results of the pre-operational fracture pressure determination?]*

Hydrogeologic Testing [40 CFR 146.87(e)(1)-(3)]

[Recommended considerations include:

- *How do the results of hydrogeologic testing verify porosity, permeability, and connectivity data collected from well and core logs?*
- *Is there any evidence of a local reduction in permeability due to the well construction process (skin factor)? If so, is this expected to impact injection operations?*
- *Do the results of hydrogeologic testing suggest that a stimulation program is necessary to increase injectivity?]*

[Associated figures may include:

- *Semi-log plots of fall-off and injectivity/pump test results.]*

Pressure Fall-Off Tests

[Recommended considerations include:

- *What injection and shut-in periods were used for the fall-off test? Why were these periods selected?*
- *Was flow rate constant through the injection period? Was the test conducted over a sufficient period of time?*
- *Are fall-off test data used to verify computational model results?*
- *What data or information demonstrate the validity of the fall-off test results?*
- *Were any non-linearities identified in the fall-off test results? If so, what may be the cause? What other pre-operational testing data can help explain the non-linearities?*
- *How consistent are the results of the fall-off test with other site-specific data?]*

Injectivity and Pump Tests

[Recommended considerations include:

- *What type of test was conducted (injectivity or pump)? Why was this test selected for this particular site?*
- *What calibration procedures were used?*
- *What information demonstrates that the test results are valid? What data was used to verify the results?]*

Pre-Operational Logging and Testing GSDT Submissions
GSDT Module: Pre-Operational Testing ***Tab(s):*** All tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Logging and testing results ***[40 CFR 146.82(c)(7) and 146.87]***

Final Injection Well Construction Procedures [40 CFR 146.82(c)(5)]

[Please provide a brief description of the final injection well construction procedures to meet the requirement at 40 CFR 146.82(c)(5), with specific details to demonstrate an understanding of site-specific conditions based on the results of pre-operational testing and logging. Also include or attach any other information necessary to demonstrate/establish compliance with the requirements at 40 CFR 146.86.

Note: Schematics or other graphics showing the surface and subsurface well construction details will have been submitted to meet the requirements at 40 CFR 146.82(a)(11). If no changes to the well construction are required, please provide a brief description that justifies

the continued applicability of the original schematics and graphics. Otherwise, please submit updated schematics.]

Casing and Cementing

[Please provide a brief narrative description of changes, if any, made to the casing and cement prior to and during pre-operational testing, and update the corresponding table from the 40 CFR 146.82(a) narrative.]

Table 1. Casing details.

Casing String	**Casing Depth Range and Units**	**Borehole Diameter and Units**	**Wall Thickness and Units**	**External Diameter and Units**	**Casing Material** (e.g., weight/ grade/ connection)	**String Weight and Units**
Conductor						
Surface						
Long String						
Insert other casing types as applicable						

Tubing and Packer

[Please provide any updates related to the tubing and packer materials in the corresponding table from the 40 CFR 146.82(a) narrative.]

Table 2. Tubing and packer details.

Material	**Setting Depth Range and Units**	**Tensile Strength and Units**	**Burst Strength and Units**	**Collapse Strength and Units**	**Material** (e.g., weight/grade/ connection)
Tubing					
Insert additional materials as applicable					

Corrective Action Status [40 CFR 146.82(c)(6)]

[Please describe the status of corrective action for wells within the final AoR, to meet the requirements of 40 CFR 146.82(c)(6). This description must indicate the number, type, and location of all plugs used to perform corrective action. Relevant documentation such as well plugging records should be uploaded directly to the GSDT.]

[Recommended considerations include:

- *Was any corrective action required on wells within the AoR? Was any remedial cementing conducted?*
- *If a phased corrective action plan is used, what is the current stage of that process?]*

Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action module ***Tab(s):*** Corrective Action tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Corrective action documentation ***[40 CFR 146.82(c)(6)]*** ☐ NO UPDATES NECESSARY

Demonstration of Mechanical Integrity [40 CFR 146.82(c)(8) and 146.89]

[Please provide a brief description of the results of mechanical integrity testing on the proposed injection well to meet the requirements of 40 CFR 146.82(c)(8). This description should support a demonstration of mechanical integrity to meet the requirements at 40 CFR 146.89.

Recommended considerations include:

- *What approved methods were used to demonstrate mechanical integrity?*
- *What are the results of the mechanical integrity test? Is there evidence of leaks or fluid movement in the wellbore?*
- *Do the results of pre-operational mechanical integrity testing indicate that changes need to be made to the mechanical integrity evaluations as specified in the testing and monitoring plan?]*

Plan Updates [40 CFR 146.82(c)(9)]

[Please provide a short description of any plan updates that are necessary as a result of pre-operational testing results. If no updates are required, please provide a brief narrative demonstrating that changes are not necessary. If there is additional information that could not be submitted using the forms in the GSDT it can be included here.

Note: Any updated plan must be resubmitted to the GSDT as described below. Be sure to include a revision number for any updated plan when submitting it to the GSDT.]

AoR and Corrective Action

[Upload your updated AoR and Corrective Action Plan using the AoR and Corrective Action module.]

AoR and Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Updated AoR and Corrective Action Plan ***[40 CFR 146.82(c)(9) and 146.84(b)]*** ☐ NO UPDATES NECESSARY

Testing and Monitoring

[Upload your updated Testing and Monitoring Plan using the Project Plan Submissions module.]

Testing and Monitoring GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Testing and Monitoring tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Updated Testing and Monitoring Plan ***[40 CFR 146.82(c)(9) and 146.90]*** ☐ NO UPDATES NECESSARY

Injection Well Plugging

[Upload your updated Injection Well Plugging Plan using the Project Plan Submission module.]

Injection Well Plugging GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Injection Well Plugging tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Updated Injection Well Plugging Plan ***[40 CFR 146.82(c)(9) and 146.90]*** ☐ NO UPDATES NECESSARY

Post-Injection Site Care (PISC) and Site Closure

[If an alternative PISC timeframe is proposed, please provide a brief description of the pre-operational testing results that support the proposed alternative timeframe, or provide updates to the existing alternative timeframe demonstration as needed.

Upload your updated PISC and Site Closure Plan to the Project Plan Submissions module. If applicable, upload your alternative PISC timeframe demonstration to the Alternative PISC Timeframe Demonstration module.]

PISC and Site Closure GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** PISC and Site Closure tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Updated PISC and Site Closure Plan ***[40 CFR 146.82(c)(9) and 146.90]*** ☐ NO UPDATES NECESSARY
GSDT Module: Alternative PISC Timeframe Demonstration ***Tab(s):*** All tabs (only if an alternative PISC timeframe is requested) Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Updated alternative PISC timeframe demonstration ***[40 CFR 146.82(c)(9) and 146.90]*** ☐ NO UPDATES NECESSARY

Emergency and Remedial Response

[Upload your updated Emergency and Remedial Response Plan to the Project Plan Submissions module.]

Emergency and Remedial Response GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Emergency and Remedial Response tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Updated Emergency and Remedial Response Plan ***[40 CFR 146.82(c)(9) and 146.90]*** ☐ NO UPDATES NECESSARY

Well Operation [40 CFR 146.88]

[Please describe updates to the well operational procedures and/or proposed carbon dioxide stream, if applicable, that are necessary based on the results of pre-operational testing. If no updates are required, it will be assumed that the operational information provided in the 40 CFR 146.82(a) narrative still applies. Changes to well operational procedures or the carbon dioxide stream should be reflected in the final AoR model and delineation described earlier in this narrative.

If updates are necessary, please update tables (such as the one below), and/or figures that were submitted to fulfill the operating data requirements for the permit application, listed at 40 CFR 146.82(a)(7) and (10). Also include or attach any other information necessary to demonstrate/establish compliance with the requirements at 40 CFR 146.88.]

Table 3. Proposed operational procedures.

Parameters/Conditions	Original Permit Value	Updated Value	Unit
Maximum Injection Pressure			
Surface			
Downhole			
Average Injection Pressure			
Surface			
Downhole			
Maximum Injection Rate			
Average Injection Rate			
Maximum Injection Volume and/or Mass			
Average Injection Volume and/or Mass			
Annulus Pressure			
Annulus Pressure/Tubing Differential			

Optional Additional Project Information [40 CFR 144.4]

[The following is a list of Federal laws that may apply prior to the issuance of UIC permits. When any of these laws are applicable, EPA must ensure that they are followed. The optional additional information requested below will assist EPA in its analyses to satisfy these laws. If this information was provided in the initial permit application narrative and has changed based on the results of pre-operational testing (e.g., based on a change in the delineated AoR), please update as appropriate.

- *The Wild and Scenic Rivers Act, 16 U.S.C. 1273 et seq. Identify any national wild and scenic river that may be impacted by the activities associated with the proposed project.*
- *The National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq. Identify properties listed or eligible for listing in the National Register of Historic Places that may be affected by the activities associated with the proposed project. If previous historic and cultural resource survey(s) have been conducted, provide the results of the survey(s).*
- *The Endangered Species Act, 16 U.S.C. 1531 et seq. Identify any endangered or threatened species that may be affected by the activities associated with the proposed project. If a previous endangered or threatened species survey has been conducted, provide the results of the survey.*
- *The Coastal Zone Management Act, 16 U.S.C. 1451 et seq. Identify any coastal zones that may be affected by the activities associated with the proposed project.]*

Other Information

[Provide any other information requested by the UIC Program Director, or any information that is not specifically requested/required but may be useful to support your submission, in this section to fulfill the requirement at 40 CFR 146.82(c)(10). You can also provide information in a separate file or files using the designated field on the Updated Information tab of the Project Information Tracking module.]

PRE-OPERATIONAL TESTING PROGRAM

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the pre-operational testing program for a Class VI well. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

Facility Information

Facility name: INSERT FACILITY NAME
INSERT WELL NUMBER

Facility contact: INSERT CONTACT NAME/CONTACT TITLE
INSERT ADDRESS
INSERT PHONE NUMBER/EMAIL ADDRESS

Well location: INSERT CITY, COUNTY, STATE
INSERT LAT/LONG COORDINATES

Introduction

The testing activities at the INSERT NAME OF WELL(S) described in this attachment are restricted to the pre-injection phase. Testing and monitoring activities during the injection and post-injection phases are described in the Testing and Monitoring Plan, along with other non-well related pre-injection baseline activities such as geochemical monitoring.

Pre-Injection Testing Plan – Injection Well

The following tests and logs will be conducted during drilling, casing installation and after casing installation in accordance with the testing required under 40 CFR 146.87(a), (b), (c), and (d). The tests and procedures are described below and in the Proposed Injection Well Construction Information section of the permit application.

[For an existing well that is being re-permitted as a Class VI well, identify any tests that have been completed and that demonstrate that the well was built according to Class VI construction standards or demonstrate that the well was engineered and constructed to meet the requirements of 40 CFR 146.86. Also identify any remaining testing to be performed.]

Deviation Checks

Deviation measurements will be conducted approximately every Insert interval and units during construction of the well.

Tests and Logs

To be performed during drilling

[List and describe the tests to be performed, for example:

- *Array Compensated True Resistivity Log*
- *Spontaneous Potential Logs*
- *Caliper Logs*
- *Borehole Temperature Logs*
- *Extended Range Micro Imager (XRMI) Composite Plot*
- *Extended Range Micro Imager (XRMI) Correlation Plot*
- *Compensated Spectral Natural Gamma Log*
- *Magnetic Resonance Imaging Analysis*
- *Spectral Density Dual Spaced Neutron Log*
- *Drill Stem Testing*
- *Mud Logging*
- *Fracture Studies]*

To be performed during and after casing installation

[List and describe the tests to be performed, for example:

- *Radial Cement Bond Log*
- *Annular Hole Volume Plot*
- *Variable Density Logs]*

Demonstration of mechanical integrity

Below is a summary of the MITs and pressure fall-off tests to be performed prior to injection:

Table 1. Pre-Operational Testing Schedule *Insert a description of each MIT, fall-off test, etc. and the time when the test will be performed, e.g., prior to operation.*

Class VI Rule Citation	Rule Description	Test Description	Program Period
40 CFR 146.89(a)(1)	MIT - Internal		
40 CFR 146.87(a)(4)	MIT - External		
40 CFR 146.87(a)(4)	MIT - External		
40 CFR 146.87(e)(1)	Testing prior to operating		

INSERT OPERATOR will notify EPA least 30 days prior to conducting the test and provide a detailed description of the testing procedure. Notice and the opportunity to witness these tests/logs shall be provided to EPA at least 48 hours in advance of a given test/log.

Pre-Injection Testing Plan – Deep Monitoring Well Insert Name/Number

[While not required, EPA recommends that Class VI well owners or operators test deep monitoring wells (i.e., that penetrate the confining zone) in a similar manner as the testing performed on the injection well. Describe any such tests to be performed.]

Deviation Checks

Deviation measurements will be conducted approximately every Insert interval and units during construction of the well.

Tests and Logs

To be performed during drilling

[List and describe the tests to be performed.]

To be performed during and after casing installation

[List and describe the tests to be performed.]

Demonstration of mechanical integrity

Below is a summary of the MITs to be performed on the deep monitoring well(s), Insert Name(s)/Number(s), after installation and prior to commencing CO_2 injection operations:

Table 2. MITs *Insert a description of each MIT and the time when the test will be performed, e.g., prior to operation.*

Test Name	Test Description	Program Period
MIT - Internal		
MIT - External		

Notice and the opportunity to witness the test/log shall be provided to EPA at least 48 hours in advance of a given test/log.

Annulus Pressure Test Procedures for Injection Well:

[Provide step-by-step testing procedures.]

Annulus Pressure Test Procedures for Monitoring Well Insert Name/Number:

[Provide step-by-step testing procedures; repeat as necessary based on monitoring well design.]

Pressure Fall-Off Test Procedures:

[Provide step-by-step testing procedures. As appropriate, describe general operational concerns, site-specific pretest planning activities, and procedures for conducting the fall-off test.]

Class VI Injection Well: Quality Assurance and Surveillance Plan

INSERT DATE

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for a Quality Assurance and Surveillance Plan for a Class VI well. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

Table of Contents

Title and Approval Sheet ..... **vi**

Distribution List ..... **vii**

A. Project Management **1**

A.1. Project/Task Organization **1**
A.1.a/b. Key Individuals and Responsibilities 1
A.1.c. Independence from Project QA Manager and Data Gathering 1
A.1.d. QA Project Plan Responsibility 1
A.1.e. Organizational Chart for Key Project Personnel 1

A.2. Problem Definition/Background **1**
A.2.a. Reasoning 1
A.2.b. Reasons for Initiating the Project 1
A.2.c. Regulatory Information, Applicable Criteria, Action Limits 1

A.3. Project/Task Description **1**
A.3.a/b. Summary of Work to be Performed 1
A.3.c. Geographic Locations 4
A.3.d. Resource and Time Constraints 4

A.4.Quality Objectives and Criteria **4**
A.4.a. Performance/Measurement Criteria 4
A.4.b. Precision 8
A.4.c. Bias 8
A.4.d. Representativeness 8
A.4.e. Completeness 8
A.4.f. Comparability 8
A.4.g. Method Sensitivity 8

A.5. Special Training/Certifications **10**
A.5.a. Specialized Training and Certifications 10
A.5.b/c. Training Provider and Responsibility 10

A.6. Documentation and Records **10**
A.6.a. Report Format and Package Information 10
A.6.b. Other Project Documents, Records, and Electronic Files 10
A.6.c/d. Data Storage and Duration 10
A.6.e. QASP Distribution Responsibility 11

B. Data Generation and Acquisition **11**

B.1. Sampling Process Design **11**
B.1.a. Design Strategy 11
CO_2 Stream Monitoring Strategy 11
Corrosion Monitoring Strategy 11
Shallow Groundwater Monitoring Strategy 11
Deep Groundwater Monitoring Strategy 11
B.1.b. Type and Number of Samples/Test Runs 11
B.1.c. Site/Sampling Locations 11

B.1.d. Sampling Site Contingency 11
B.1.e. Activity Schedule 11
B.1.f. Critical/Informational Data 11
B.1.g. Sources of Variability 11

B.2. Sampling Methods 11
B.2.a/b. Sampling SOPs 11
B.2.c. In-situ Monitoring 12
B.2.d. Continuous Monitoring 12
B.2.e. Sample Homogenization, Composition, Filtration 12
B.2.f. Sample Containers and Volumes 12
B.2.g. Sample Preservation 12
B.2.h. Cleaning/Decontamination of Sampling Equipment 12
B.2.i. Support Facilities 12
B.2.j. Corrective Action, Personnel, and Documentation 12

B.3. Sample Handling and Custody 12
B.3.a. Maximum Hold Time/Time Before Retrieval 12
B.3.b. Sample Transportation 12
B.3.c. Sampling Documentation 13
B.3.d. Sample Identification 13
B.3.e. Sample Chain-of-Custody 13

B.4. Analytical Methods 13
B.4.a. Analytical SOPs 13
B.4.b. Equipment/Instrumentation Needed 14
B.4.c. Method Performance Criteria 14
B.4.d. Analytical Failure 14
B.4.e. Sample Disposal 14
B.4.f. Laboratory Turnaround 14
B.4.g. Method Validation for Nonstandard Methods 14

B.5. Quality Control 14
B.5.a. QC activities 14
Blanks 14
Duplicates 14
B.5.b. Exceeding Control Limits 14
B.5.c. Calculating Applicable QC Statistics 14
Charge Balance 14
Mass Balance 14
Outliers 14

B.6. Instrument/Equipment Testing, Inspection, and Maintenance 14

B.7. Instrument/Equipment Calibration and Frequency 15
B.7.a. Calibration and Frequency of Calibration 15
B.7.b. Calibration Methodology 15
B.7.c. Calibration Resolution and Documentation 15

B.8. Inspection/Acceptance for Supplies and Consumables 15
B.8.a/b. Supplies, Consumables, and Responsibilities 15

B.9. Nondirect Measurements 15
B.9.a. Data Sources 15
B.9.b. Relevance to Project 15
B.9.c. Acceptance Criteria 15
B.9.d. Resources/Facilities Needed 15
B.9.e. Validity Limits and Operating Conditions 15

B.10. Data Management 15
B.10.a. Data Management Scheme 15
B.10.b. Recordkeeping and Tracking Practices 15
B.10.c. Data Handling Equipment/Procedures 15
B.10.d. Responsibility 15
B.10.e. Data Archival and Retrieval 16
B.10.f. Hardware and Software Configurations 16
B.10.g. Checklists and Forms 16

C. Assessment and Oversight 16

C.1. Assessments and Response Actions 16
C.1.a. Activities to be Conducted 16
C.1.b. Responsibility for Conducting Assessments 16
C.1.c. Assessment Reporting 16
C.1.d. Corrective Action 16

C.2. Reports to Management 16
C.2.a/b. QA status Reports 16

D. Data Validation and Usability 16

D.1. Data Review, Verification, and Validation 16
D.1.a. Criteria for Accepting, Rejecting, or Qualifying Data 16

D.2. Verification and Validation Methods 16
D.2.a. Data Verification and Validation Processes 16
D.2.b. Data Verification and Validation Responsibility 16
D.2.c. Issue Resolution Process and Responsibility 17
D.2.d. Checklist, Forms, and Calculations 17

D.3. Reconciliation with User Requirements 17
D.3.a. Evaluation of Data Uncertainty 17
D.3.b. Data Limitations Reporting 17

References 17

Appendices 17

List of Tables

List of Figures

Title and Approval Sheet

This Quality Assurance and Surveillance Plan (QASP) is approved for use and implementation at INSERT FACILITY. The signatures below denote the approval of this document and intent to abide by the procedures outlined within it.

[Add lines as needed to include all appropriate staff.]

Signature INSERT TYPED NAME INSERT TITLE	Date
Signature INSERT TYPED NAME INSERT TITLE	Date
Signature INSERT TYPED NAME INSERT TITLE	Date

Distribution List

The following project participants will receive the completed Quality Assurance and Surveillance Plan (QASP) and all future updates for the duration of the project.

[Include names, titles, business addresses, and telephone numbers for all appropriate staff.]

A. Project Management

A.1. Project/Task Organization

A.1.a/b. Key Individuals and Responsibilities

A.1.c. Independence from Project QA Manager and Data Gathering

A.1.d. QA Project Plan Responsibility

A.1.e. Organizational Chart for Key Project Personnel

A.2. Problem Definition/Background

A.2.a. Reasoning

A.2.b. Reasons for Initiating the Project

A.2.c. Regulatory Information, Applicable Criteria, Action Limits

A.3. Project/Task Description

A.3.a/b. Summary of Work to be Performed

[Refer to Table INSERT NUMBER X, Summary of Testing and Monitoring, for a high-level list of planned activities.

To avoid the need to update the QASP if minor changes to the project's Testing and Monitoring Plan are made (e.g., increasing monitoring frequency), refer to the Testing and Monitoring Plan for the monitoring schedule instead of including the schedule here.]

Table Insert Number X. Summary of Testing and Monitoring.

Activity	Location(s)	Method	Analytical Technique	Lab/Custody	Purpose
Carbon dioxide stream analysis					
Injection rate and volume					
Injection pressure					
Annular pressure					
Downhole pressure/ temperature					
Corrosion monitoring					
Mechanical integrity					
Insert Other activity					
Insert Other activity					
Insert Other activity					

[Add separate summary tables for specific activities (e.g., ground water monitoring), if necessary.]

Table Insert Number X. Instrumentation Summary.

Monitoring Location	Instrument Type	Monitoring Target (Formation or Other)	Data Collection Location(s)	Explanation
CO_2 Facility	Insert Instrument 1			
	Insert Instrument 2			
Monitoring Well Insert #1	Insert Instrument 1			
	Insert Instrument 2			
Monitoring Well Insert #2	Insert Instrument 1			
	Insert Instrument 2			
Insert Other location	Insert Instrument 1			
	Insert Instrument 2			

[Add separate summary tables for specific activities (e.g., geophysical surveys), if necessary.]

A.3.c. Geographic Locations

A.3.d. Resource and Time Constraints

A.4.Quality Objectives and Criteria

A.4.a. Performance/Measurement Criteria

[Refer to the tables below for specific analytical parameters and testing/monitoring outputs.]

Table Insert Number X. Summary of Analytical and Field Parameters for Fluid Samples in INSERT FORMATION NAME.

[The table below includes some example parameters; include additional parameters (or delete parameters) as appropriate.]

Parameters	Analytical Methods(1)	Detection Limit/Range	Typical Precisions	QC Requirements
Cations: List specific cations				
Anions: List specific anions				
Dissolved CO_2				
Total dissolved solids				
Alkalinity				
pH (field)				
Specific conductance (field)				
Temperature (field)				
Insert Other parameter				
Insert Other parameter				
Insert Other parameter				

Note 1: An equivalent method may be employed with the prior approval of the UIC Program Director.

Table Insert Number X. Summary of Analytical Parameters for CO_2 Stream.

[The table below includes some example parameters; include additional parameters (or delete parameters) as appropriate.]

Parameters	Analytical Methods[(1)]	Detection Limit/Range	Typical Precisions	QC Requirements
Oxygen				
Nitrogen				
Carbon monoxide				
Oxides of nitrogen				
Total hydrocarbons				
Methane				
Acetaldehyde				
Sulfur dioxide				
Hydrogen sulfide				
Ethanol				
CO_2 purity				
Insert Other parameter				
Insert Other parameter				
Insert Other parameter				

Note 1: An equivalent method may be employed with the prior approval of the UIC Program Director.

Table Insert Number X. Summary of Analytical Parameters for Corrosion Coupons.

[Add or delete parameters as needed.]

Parameters	Analytical Methods	Detection Limit/Range	Typical Precisions	QC Requirements
Mass				
Thickness				
Insert Other parameter				
Insert Other parameter				
Insert Other parameter				

Table Insert Number X. Summary of Measurement Parameters for Field Gauges.

[Add or delete parameters as needed.]

Parameters	Methods	Detection Limit/Range	Typical Precisions	QC Requirements
Booster pump discharge pressure				
Injection tubing temperature				
Annulus pressure				
Injection tubing pressure				
Wellhead pressure				
Downhole temperature				
Injection mass flow rate				
Insert Other parameter				
Insert Other parameter				
Insert Other parameter				

Table Insert Number X. Actionable Testing and Monitoring Outputs.

[Add or delete outputs as needed. Ensure entries are consistent with the Emergency and Remedial Response Plan, where appropriate.]

Activity or Parameter	Project Action Limit	Detection Limit	Anticipated Reading
External mechanical integrity (Insert test type)			
Internal mechanical integrity (Insert measurement type)			
Surface pressure			
Downhole pressure			
Water quality (Insert formation)			
Above-confining-zone pressure (Insert formation)			
Insert Other parameter			
Insert Other parameter			
Insert Other parameter			

[For Sections A.4.b through A.4.g, refer to the tables below as needed. These tables are provided as examples; add or remove tables (or rows/columns within the tables) as needed based on instruments or methods to be used.]

A.4.b. Precision

A.4.c. Bias

A.4.d. Representativeness

A.4.e. Completeness

A.4.f. Comparability

A.4.g. Method Sensitivity

Table Insert Number X. Pressure and Temperature—Downhole Gauge Specifications.

Parameter	Value
Calibrated working pressure range	
Initial pressure accuracy	
Pressure resolution	
Pressure drift stability	
Calibrated working temperature range	
Initial temperature accuracy	
Temperature resolution	
Temperature drift stability	
Max temperature	
Instrument calibration frequency	

Table Insert Number X. Representative Logging Tool Specifications.

Parameter	Insert Tool #1	Insert Tool #2	Insert Tool #3	Insert Tool #4
Logging speed				
Vertical resolution				
Investigation				
Temperature rating				
Pressure rating				

Table Insert Number X. Pressure Field Gauge.

Parameter	Value
Calibrated working pressure range	
Initial pressure accuracy	
Pressure resolution	
Pressure drift stability	

Table Insert Number X. Pressure Field Gauge—Injection Tubing Pressure.

Parameter	Value
Calibrated working pressure range	
Initial pressure accuracy	
Pressure resolution	
Pressure drift stability	

Table Insert Number X. Pressure Field Gauge—Annulus Pressure.

Parameter	Value
Calibrated working pressure range	
Initial pressure accuracy	
Pressure resolution	
Pressure drift stability	

Table Insert Number X. Temperature Field Gauge—Injection Tubing Temperature.

Parameter	Value
Calibrated working temperature range	
Initial temperature accuracy	
Temperature resolution	
Temperature drift stability	

Table Insert Number X. Mass Flow Rate Field Gauge—CO_2 Mass Flow Rate.

Parameter	Value
Calibrated working flow rate range	
Initial mass flow rate accuracy	
Mass flow rate resolution	
Mass flow rate drift stability	

A.5. Special Training/Certifications

A.5.a. Specialized Training and Certifications

A.5.b/c. Training Provider and Responsibility

A.6. Documentation and Records

A.6.a. Report Format and Package Information

A.6.b. Other Project Documents, Records, and Electronic Files

A.6.c/d. Data Storage and Duration

A.6.e. QASP Distribution Responsibility

B. Data Generation and Acquisition

B.1. Sampling Process Design

B.1.a. Design Strategy

CO_2 Stream Monitoring Strategy

Corrosion Monitoring Strategy

Shallow Groundwater Monitoring Strategy

Deep Groundwater Monitoring Strategy

[Add subsections to Section B.1.a if additional types of monitoring are planned.]

B.1.b. Type and Number of Samples/Test Runs

B.1.c. Site/Sampling Locations

B.1.d. Sampling Site Contingency

B.1.e. Activity Schedule

B.1.f. Critical/Informational Data

B.1.g. Sources of Variability

B.2. Sampling Methods

B.2.a/b. Sampling SOPs

[Refer to the table below for stabilization criteria during well purging.]

Table Insert Number X. Stabilization Criteria of Water Quality Parameters During Shallow Well Purging.

[Add/delete parameters as needed.]

Field Parameter	Stabilization Criteria
pH	
Temperature	
Specific conductance	
Dissolved oxygen	
Turbidity	

B.2.c. In-situ Monitoring

B.2.d. Continuous Monitoring

B.2.e. Sample Homogenization, Composition, Filtration

B.2.f. Sample Containers and Volumes

[Refer to the tables below as needed for sample container, preservation, and holding time information.]

B.2.g. Sample Preservation

[Refer to the tables below as needed for sample container, preservation, and holding time information.]

B.2.h. Cleaning/Decontamination of Sampling Equipment

B.2.i. Support Facilities

B.2.j. Corrective Action, Personnel, and Documentation

B.3. Sample Handling and Custody

B.3.a. Maximum Hold Time/Time Before Retrieval

[Refer to the tables below as needed for sample container, preservation, and holding time information.]

B.3.b. Sample Transportation

B.3.c. Sampling Documentation

B.3.d. Sample Identification

Table Insert Number X. Summary of Sample Containers, Preservation Treatments, and Holding Times for CO_2 Gas Stream Analysis.

[Add or delete rows as needed.]

Sample	Volume/Container Material	Preservation Technique	Sample Holding time (max)
CO_2 gas stream			

Table Insert Number X. Summary of Anticipated Sample Containers, Preservation Treatments, and Holding Times for Ground Water Samples.

[The table below includes some example parameters; include additional parameters (or delete parameters) as appropriate.]

Target Parameters	Volume/Container Material	Preservation Technique	Sample Holding Time
Cations: List specific cations			
Anions: List specific anions			
Dissolved CO_2			
Isotopes: List specific isotopes			
Alkalinity			
Field Confirmation: List specific parameters			
Insert Other parameter			
Insert Other parameter			
Insert Other parameter			

B.3.e. Sample Chain-of-Custody

B.4. Analytical Methods

B.4.a. Analytical SOPs

B.4.b. Equipment/Instrumentation Needed

B.4.c. Method Performance Criteria

B.4.d. Analytical Failure

B.4.e. Sample Disposal

B.4.f. Laboratory Turnaround

B.4.g. Method Validation for Nonstandard Methods

B.5. Quality Control

B.5.a. QC activities

Blanks

Duplicates

B.5.b. Exceeding Control Limits

B.5.c. Calculating Applicable QC Statistics

Charge Balance

Mass Balance

Outliers

B.6. Instrument/Equipment Testing, Inspection, and Maintenance

B.7. Instrument/Equipment Calibration and Frequency

B.7.a. Calibration and Frequency of Calibration

B.7.b. Calibration Methodology

B.7.c. Calibration Resolution and Documentation

B.8. Inspection/Acceptance for Supplies and Consumables

B.8.a/b. Supplies, Consumables, and Responsibilities

B.9. Nondirect Measurements

B.9.a. Data Sources

B.9.b. Relevance to Project

B.9.c. Acceptance Criteria

B.9.d. Resources/Facilities Needed

B.9.e. Validity Limits and Operating Conditions

B.10. Data Management

B.10.a. Data Management Scheme

B.10.b. Recordkeeping and Tracking Practices

B.10.c. Data Handling Equipment/Procedures

B.10.d. Responsibility

B.10.e. Data Archival and Retrieval

B.10.f. Hardware and Software Configurations

B.10.g. Checklists and Forms

C. Assessment and Oversight

C.1. Assessments and Response Actions

C.1.a. Activities to be Conducted

C.1.b. Responsibility for Conducting Assessments

C.1.c. Assessment Reporting

C.1.d. Corrective Action

C.2. Reports to Management

C.2.a/b. QA status Reports

D. Data Validation and Usability

D.1. Data Review, Verification, and Validation

D.1.a. Criteria for Accepting, Rejecting, or Qualifying Data

D.2. Verification and Validation Methods

D.2.a. Data Verification and Validation Processes

D.2.b. Data Verification and Validation Responsibility

D.2.c. Issue Resolution Process and Responsibility

D.2.d. Checklist, Forms, and Calculations

D.3. Reconciliation with User Requirements

D.3.a. Evaluation of Data Uncertainty

D.3.b. Data Limitations Reporting

References

Appendices

[Include, as needed, additional information that supports the QASP. Examples may include detailed proceures, sampling, or calibration information; materials from equipment manufacurers; information provided by subcontractors who will perform certain testing and monitoring activities; or sample worksheets to document testing and monitoring results. To support consistency with other permit documents (e.g., the Testing and Mointoring Plan, the PISC and Site Closure Plan, and the Emergency and Remedial Response Plan), consider what information is best included in those documents vs. in this QASP.]

STIMULATION PROGRAM
40 CFR 146.82(a)(9)

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the stimulation program.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents.

Facility Information

Facility name: INSERT FACILITY NAME
INSERT WELL NUMBER

Facility contact: INSERT CONTACT NAME/CONTACT TITLE
INSERT ADDRESS
INSERT PHONE NUMBER/EMAIL ADDRESS

Well location: INSERT CITY, COUNTY, STATE
INSERT LAT/LONG COORDINATES

[Regardless of whether stimulation is anticipated, include the paragraph below.]

Stimulation to enhance the injectivity potential of the injection zone may be necessary. Stimulation may involve but is not limited to flowing fluids into or out of the well, increasing or connecting pore spaces in the injection formation, or other activities that are intended to allow the injectate to move more readily into the injection formation. Advance notice of all proposed stimulation activities must be provided to the Director, as detailed below, prior to conducting the stimulation. The permittee must describe any fluids to be utilized for stimulation activities and the permittee must demonstrate that the stimulation will not interfere with containment. The permittee must submit proposed procedures for all stimulation activities to the Director in writing at least 30 days in advance, per 40 CFR 146.91(d)(2). Within the 30-day notice period, EPA may: deny the stimulation; approve the stimulation as proposed; or approve the stimulation

with conditions. The permittee must carry out the stimulation procedures, including any conditions, as approved or set forth by EPA.

[If stimulation is anticipated and the specific procedures are known, EPA recommends providing the information below. If the well is re-permitted, and any stimulation was performed, EPA recommends describing the procedures and results (e.g., changes in injectivity).]

Introduction/Purpose

[Describe what is expected to be achieved via the proposed stimulation, e.g., remove drilling mud, dissolve carbonate minerals, etc.]

Stimulation Fluids

[Describe the stimulation fluids to be used, including their anticipated volumes/ranges of volumes, anticipated concentrations/ranges of concentrations, and purpose.]

Additives

[Describe any additives to be used (e.g., corrosion inhibitors, clay inhibitors, biocides, complexing agents, or surfactants), including their anticipated volumes/ranges of volumes, anticipated concentrations/ranges of concentrations, and purpose.]

Diverters

[Describe any diverting agents to be used (e.g., calcium carbonate, naphthalene flakes, or mixtures of waxes, guar, and cellulose), including their anticipated volumes/ranges of volumes, anticipated concentrations/ranges of concentrations, and purpose.]

Stimulation Procedures

[Describe the step-by-step procedures that will be employed during stimulation.]

SUMMARY OF REQUIREMENTS

CLASS VI OPERATING AND REPORTING CONDITIONS

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the summary of operating and reporting requirements. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns).

For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents.

Facility Information

Facility name: INSERT FACILITY NAME
INSERT WELL NUMBER

Well location: INSERT CITY, COUNTY, STATE
INSERT LAT/LONG COORDINATES

Table 1. Injection Well Operating Conditions

PARAMETER/CONDITION	LIMITATION or PERMITTED VALUE
Maximum Injection Pressure - Surface	
Maximum Injection Pressure - Bottomhole	
Annulus Pressure	
Annulus Pressure/Tubing Differential	
Maximum CO_2 Injection Rate	

[Continuous monitoring of injection pressure, rate, and volume and the pressure on the annulus between the tubing and the long-string casing is required; include additional monitoring parameters (e.g., of temperature) as appropriate.]

The maximum injection pressure, which serves to prevent confining-formation fracturing, was determined: using the fracture gradient obtained from INSERT INFORMATION SOURCE multiplied by 0.9, per 40 CFR 146.88(a). *[Adjust this paragraph as needed, e.g., if the maximum injection pressure is lower than 90 percent of the fracture pressure of the confining zone.]*

Routine Shutdown Procedure

For injection shutdowns occurring under routine conditions (e.g., for well workovers), the permittee will reduce CO_2 injection at a rate of INSERT X tons per day over a INSERT X day period to ensure protection of health, safety, and the environment. (Procedures that address immediately shutting in the well are in the Emergency and Remedial Response Plan of this permit.) *[Modify or add to this paragraph as needed to describe any project-specific considerations.]*

Table 2. Class VI Injection Well Reporting Requirements

ACTIVITY	REPORTING REQUIREMENTS
CO_2 stream characterization	Semi-annually
Injection pressure, injection rate, injection volume, pressure on the annulus, and annulus fluid level	Semi-annually
Corrosion monitoring	Semi-annually
External MITs	Within 30 days of completion of test
Pressure fall-off testing	In the next semi-annual report

Note: All testing and monitoring frequencies and methodologies are included in the Testing and Monitoring Plan of this permit.

Table 3. Class VI Project Reporting Requirements

[Include rows for additional activities (e.g., surface air and/or soil gas monitoring) as appropriate.]

ACTIVITY	REPORTING REQUIREMENTS
Groundwater quality monitoring	Semi-annually
Plume and pressure front tracking	In the next semi-annual report
Monitoring well MITs	Within 30 days of completion of test
Financial responsibility updates pursuant to H.2 and H.3(a) of this permit	Within 60 days of update

Note: All testing and monitoring frequencies and methodologies are included in the Testing and Monitoring Plan of this permit.

[If necessary, add sections for any other project-specific operating conditions, e.g., startup procedures.]

TESTING AND MONITORING PLAN
40 CFR 146.90

INSERT PROJECT NAME

INSTRUCTIONS

This template provides a suggested outline and recommendations for the Testing and Monitoring Plan. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided in this template. States with Class VI primacy have requirements that are at least as stringent as EPA's. If your Class VI well is in a primacy state, consult your permitting authority about any additional requirements for what must be included in the plan.

In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.

Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate maps, figures, references, etc. should also be included to support the text of the plan.

Remember that, pursuant to 40 CFR 146.94(a) of the federal Class VI Rule, the requirement to maintain and implement an approved Testing and Monitoring Plan is directly enforceable regardless of whether the requirement is a condition of the permit. For more information, see EPA's Class VI guidance documents at https://www.epa.gov/uic/class-vi-guidance-documents. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan.

To avoid duplicative reporting, you are encouraged to provide relevant cross-references to other submissions made with the GSDT.

Facility Information

Facility name:	INSERT FACILITY NAME INSERT WELL NUMBER
Facility contact:	INSERT CONTACT NAME/CONTACT TITLE INSERT ADDRESS INSERT PHONE NUMBER/EMAIL ADDRESS
Well location:	INSERT CITY, COUNTY, STATE INSERT LAT/LONG COORDINATES

This Testing and Monitoring Plan describes how INSERT PERMIT APPLICANT NAME will monitor the INSERT FACILITY NAME site pursuant to 40 CFR 146.90. In addition to demonstrating that the well is operating as planned, the carbon dioxide plume and pressure front are moving as predicted, and that there is no endangerment to USDWs, the monitoring data will be used to validate and adjust the geological models used to predict the distribution of the CO_2 within the storage zone to support AoR reevaluations and a non-endangerment demonstration.

Results of the testing and monitoring activities described below may trigger action according to the Emergency and Remedial Response Plan.

Overall Strategy and Approach for Testing and Monitoring

[EPA encourages permit applicants/owners or operators to include a short "big-picture" summary of their testing and monitoring approach to demonstrate how they will meet all the applicable requirements of the Class VI Rule. You may use this section to provide a brief narrative description of how the proposed testing and monitoring activities support an overall strategy to fulfil the requirements of the Class VI Rule, demonstrate USDW non-endangerment, and collect sufficient data on site-specific system behavior to support decision-making at project milestones.]

[Recommended considerations include:

- *What is the spatial distribution (depth and areal extent) of the proposed monitoring network, and what is the general schedule for data collection? What site-specific considerations were used to determine data collection locations and frequency?*
- *How does the overall testing and monitoring strategy fit the regional and local site characterization and risk profile? For example, if the region has a history of induced or natural seismic events, how will the Testing and Monitoring Plan account for this?*
- *If specific areas or issues of potential concern were identified during site characterization, AoR delineation modeling, or pre-operational logging/testing, how will the testing and monitoring strategy address these concerns?*
- *Generally, how will collected data be compared to baseline data or otherwise applied to demonstrate Class VI Rule compliance/USDW non-endangerment, verify predictions from computational modeling, and provide support for project decision making?]*

Quality assurance procedures

[Please reference or attach a quality assurance and surveillance plan (QASP) for all testing and monitoring activities, which is required pursuant to 146.90(k) in the Testing and Monitoring Plan. A template for the QASP is available.]

Reporting procedures

INSERT PERMIT APPLICANT NAME will report the results of all testing and monitoring activities to EPA in compliance with the requirements under 40 CFR 146.91.

Carbon Dioxide Stream Analysis [40 CFR 146.90(a)]

INSERT PERMIT APPLICANT NAME will analyze the CO_2 stream during the operation period to yield data representative of its chemical and physical characteristics and to meet the requirements of 40 CFR 146.90(a).

Sampling location and frequency

[Recommended considerations include:

- *What is the specific schedule for CO_2 stream sampling? For example, "Sampling will take place quarterly, by the following dates each year: 3 months after the date of authorization of injection, 6 months after the date of authorization of injection, 9 months after the date of authorization of injection, and 12 months after the date of authorization of injection."*
- *The Class VI Rule requires that the CO_2 stream be analyzed at a sufficient frequency to yield data representative of chemical and physical CO_2 stream characteristics. How was this "sufficient frequency" determined in the context of this project?*
- *How will it be determined if data deviate from baseline, predicted, or average values?*
- *If tracers are used, where/how and at what concentration will they be added?*
- *Will certain changes in CO_2 stream chemical and physical characteristics trigger a change in sampling schedule? For example:*
    - *If the well is shut-in for X amount of time, the CO_2 stream will be analyzed X (days, weeks) after operations resume.*
    - *An alternative CO_2 stream sampling schedule (define) based on injected amount, not time, will be triggered if the Summary of Requirements to this permit is modified or if injection activities deviate significantly (define) from expected rates (e.g., if injection volume is less than X over X period).*
    - *A significant (define) change in chemical or physical characteristics of the CO_2 stream will trigger additional sampling at a frequency of X to collect sufficient data to characterize the CO_2 stream.]*

Analytical parameters

INSERT PERMIT APPLICANT NAME will analyze the CO_2 for the constituents identified in Table 1 using the methods listed.

Table 1. Summary of analytical parameters for CO_2 stream.

Parameter	Analytical Method(s)
Insert Parameter 1	
Insert Parameter 2	
Insert Parameter 3	

Parameter	Analytical Method(s)
Add rows as needed	

Sampling methods

[Recommended considerations include:

- *Where will sample collection take place?*
- *What materials/equipment will be used?*
- *What sample collection procedures will be implemented to ensure a representative sample? (Refer to the QASP as appropriate.)]*

Laboratory to be used/chain of custody and analysis procedures

[Recommended considerations include:

- *Where will this analysis be conducted? What chain of custody procedures will be implemented? (Refer to the QASP as appropriate.)*
- *What are the detection limits for the analytical methods that will be used? (Refer to the QASP as appropriate.)]*

Continuous Recording of Operational Parameters [40 CFR 146.88(e)(1), 146.89(b) and 146.90(b)]

INSERT PERMIT APPLICANT NAME will install and use continuous recording devices to monitor injection pressure, rate, and volume; the pressure on the annulus between the tubing and the long string casing; the annulus fluid volume added; and the temperature of the CO_2 stream, as required at 40 CFR 146.88(e)(1), 146.89(b), and 146.90(b).

Monitoring location and frequency

INSERT PERMIT APPLICANT NAME will perform the activities identified in Table 2 to monitor operational parameters and verify internal mechanical integrity of the injection well. All monitoring will take place at the locations and frequencies shown in the table.

[Note: As applicable, please provide sampling/recording frequencies for both active operation and shut-in periods.]

Table 2. Sampling devices, locations, and frequencies for continuous monitoring.

Parameter	Device(s)	Location	Min. Sampling Frequency	Min. Recording Frequency
Insert Injection pressure				
Insert Injection rate				

Parameter	Device(s)	Location	Min. Sampling Frequency	Min. Recording Frequency
Insert Injection volume				
Insert Annular pressure				
Insert Annulus fluid volume				
Insert CO_2 stream temperature				
Add rows as needed				

Notes:

- Sampling frequency refers to how often the monitoring device obtains data from the well for a particular parameter. For example, a recording device might sample a pressure transducer monitoring injection pressure once every two seconds and save this value in memory.
- Recording frequency refers to how often the sampled information gets recorded to digital format (such as a computer hard drive). For example, the data from the injection pressure transducer might be recorded to a hard drive once every minute.

Monitoring details

[EPA recommends that, for each the parameters required by the Class VI Rule (injection pressure, injection rate, injection volume, annular pressure, annulus fluid volume, and CO_2 stream temperature) and any optional operational parameters that will be monitored (e.g., bottomhole pressure/temperature), the plan specify the following:

- *Where specifically will this monitoring take place? What equipment/instrumentation will be used and how often will data be sampled/recorded? (Refer to Table 2 as appropriate.)*
- *What are the instrument calibration standards, precision, and tolerances? How will any necessary supporting information (e.g., fluid density) be measured or calculated? (Refer to the QASP as appropriate.)*
- *If applicable, what formulas or conversion factors will be used? (Provide citations as appropriate.)*
- *How will it be determined if data deviate from baseline, predicted, or average values?*
- *How will the data be used to demonstrate internal mechanical integrity, pursuant to 40 CFR 146.89(b)?*
- *How might changes in injection rate or annular pressure trigger additional sample collection or change the sampling schedule for other aspects of the Testing and Monitoring Plan (above confining zone monitoring, mechanical integrity testing, etc.)?]*

Corrosion Monitoring

To meet the requirements of 40 CFR 146.90(c), INSERT PERMIT APPLICANT NAME will monitor well materials during the operation period for loss of mass, thickness, cracking, pitting, and other signs of corrosion to ensure that the well components meet the minimum standards for material strength and performance.

INSERT PERMIT APPLICANT NAME will monitor corrosion using INSERT METHOD and collect samples according to the description below.

Monitoring location and frequency

[Recommended considerations include:

- *What is the specific schedule for corrosion monitoring? For example, "This monitoring will occur quarterly, by the following dates each year: 3 months after the date of authorization of injection, 6 months after the date of authorization of injection, 9 months after the date of authorization of injection, and 12 months after the date of authorization of injection."*
- *Will additional corrosion monitoring be added if there are deviations from expected operations? For example, the quarterly monitoring schedule could be supplemented with samples collected based on injected volume (rather than time) to ensure sufficient characterization of well materials.]*

Sample description

[Recommended considerations include:

- *What materials will be monitored for corrosion? (Refer to Table 3; modify table as necessary for methods other than corrosion coupons.)*
- *What baseline assessment will be conducted prior to exposing the materials to corrosive conditions?]*

Table 3. List of equipment with material of construction. *[Specify the equipment to be tested (e.g., corrosion coupons or loops)]*

Equipment Coupon	Material of Construction
Insert Well component 1	
Insert Well component 2	
Insert Well component 3	
Add rows as needed	

Monitoring details

[Recommended considerations include:

- *How will the system be designed to ensure samples are exposed to representative conditions?*
- *What techniques will be used to assess and quantify the corrosion? (Cite references as necessary.)*
- *How will it be determined if data deviate from baseline, predicted, or average values?*

- *Will any additional wellbore tests be conducted (e.g., periodic wireline logs) to supplement the corrosion tests described above?*
- *Will any verification tests will be done to demonstrate that the methods described above are accurately representing downhole conditions?]*

Above Confining Zone Monitoring

INSERT PERMIT APPLICANT NAME will monitor groundwater quality and geochemical changes above the confining zone during the operation period to meet the requirements of 40 CFR 146.90(d).

To meet the requirements at 40 CFR 146.95(f)(3)(i), INSERT PERMIT APPLICANT NAME will also monitor groundwater quality, geochemical changes, and pressure in the first USDWs immediately above and below the injection zone(s). *[Delete this paragraph if the project will not be operating under an injection depth waiver.]*

Monitoring location and frequency

Table 4 shows the planned monitoring methods, locations, and frequencies for groundwater quality and geochemical monitoring above the confining zone.

[Recommended considerations include:

- *What is the specific schedule for sampling? Define terms such as "quarterly," for example:*
    - *Quarterly sampling will take place by the following dates each year: 3 months after the date of authorization of injection, 6 months after the date of authorization of injection, 9 months after the date of authorization of injection, and 12 months after the date of authorization of injection.*
    - *Semi-annual sampling will take place by the following dates each year: 6 months after the date of authorization of injection and 12 months after the date of authorization of injection.*
    - *Annual sampling will occur up to 45 days before the anniversary date of authorization of injection each year.*
    - *Logging will take place up to 45 days before the anniversary date of authorization of injection each year.*
- *What is the depth or elevation below mean sea level of each sampling interval?*
- *How will it be determined if data deviate from baseline, predicted, or average values?*
- *How is the network of monitoring wells sufficient to monitor above the confining zone throughout the AoR, given specific geologic characteristics of the site? A map showing monitoring well locations relative to the AoR delineation is encouraged.*
- *Are there any geochemical changes that might trigger a change in the sampling schedule? If so, how will the schedule change to sufficiently identify leaks/characterize groundwater quality above the confining zone?*

- *How will indirect monitoring activities (if used) complement direct fluid sampling to create a comprehensive leak detection/groundwater monitoring strategy?*
- *Is any phased monitoring planned based on predicted plume migration within the AoR?]*

Table 4. Monitoring of groundwater quality and geochemical changes above the confining zone.
[If indirect monitoring techniques such as logging will be used to complement direct fluid sampling, they can also be included in this table.]

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
Insert Formation 1				
Insert Formation 2				
Insert Formation 3				
Add rows as needed				

Analytical parameters

Table 5 identifies the parameters to be monitored and the analytical methods INSERT PERMIT APPLICANT will use.

[Recommended considerations include:

- *How will the suite of parameters presented in Table 5 be sufficient to meet site-specific monitoring objectives? What criteria will be used to determine if additional parameters are needed during the life of the project?*
- *If tracers are used, what detected concentrations will trigger additional action?]*

Table 5. Summary of analytical and field parameters for groundwater samples.

Parameters	Analytical Methods
INSERT FORMATION NAME	
Insert Parameter 1	
Insert Parameter 2	
Insert Parameter 3	
Add rows as needed	
INSERT FORMATION NAME	
Insert Parameter 1	
Insert Parameter 2	
Insert Parameter 3	
Add rows as needed	

Sampling methods

[Recommended considerations include:

- *What materials will be used?*
- *What sample collection procedures will be implemented to ensure a representative sample? (Refer to the QASP as necessary.)]*

Laboratory to be used/chain of custody procedures

[Recommended considerations include:

- *Where will this analysis be conducted? What chain of custody procedures will be implemented? (Refer to the QASP as necessary.)*
- *What are the detection limits for the analytical methods that will be used? (Refer to the QASP as necessary.)]*

External Mechanical Integrity Testing

INSERT PERMIT APPLICANT NAME will conduct at least one of the tests presented in Table 6 periodically during the injection phase to verify external MI as required at 146.89(c) and 146.90.

Testing location and frequency

[Recommended considerations include:

- *When specifically will MITs be performed? For example, "MITs will be performed annually, up to 45 days before the anniversary date of authorization of injection each year."]*

Table 6. MITs.

Test Description	Location
Insert Test 1	
Insert Test 2	
Insert Test 3	
Add rows as needed	

Testing details

[Recommended considerations include:

- *What are the specific procedures that will be followed for each type of test? (Provide a list of steps or similar description.)*

- *What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?*
- *What will constitute a "pass" or "fail" for each test?*
- *Will any other data be used to demonstrate that there are no significant leaks? For example, continuous monitoring of annulus and injection pressure can be used to identify the presence of leaks.*
- *Will any MIT(s) be conducted on monitoring wells? It may be important to demonstrate mechanical integrity for any wells that penetrate the confining zone. If MITs will be conducted on monitoring wells, this information can also be included in Table.]*

Pressure Fall-Off Testing

INSERT PERMIT APPLICANT NAME will perform pressure fall-off tests during the injection phase as described below to meet the requirements of 40 CFR 146.90(f).

Testing location and frequency

[Recommended considerations include:

- *When will pressure fall-off tests be performed? For example, "During injection, approximately half way through the injection phase (i.e., year 2.5) and at the end of the injection period."]*

Testing details

[Recommended considerations include:

- *What are the specific procedures that will be followed for the test? (For example, provide a list of steps or similar description.)*
- *What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?]*

Carbon Dioxide Plume and Pressure Front Tracking

INSERT PERMIT APPLICANT NAME will employ direct and indirect methods to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure during the operation period to meet the requirements of 40 CFR 146.90(g).

Plume monitoring location and frequency

Table 7 presents the methods that INSERT PERMIT APPLICANT NAME will use to monitor the position of the CO_2 plume, including the activities, locations, and frequencies INSERT PERMIT APPLICANT NAME will employ. The parameters to be analyzed as part of fluid sampling in the injection zone and associated analytical methods are presented in Table 8.

Quality assurance procedures for these methods are presented in INSERT SECTION X of the QASP.

[Recommended considerations include:

- *What is the specific schedule for each monitoring activity? For example, "Logging will take place up to 45 days before the anniversary date of authorization of injection each year."*
- *For continuous monitoring methods, how often will data be sampled and recorded?*
- *Will monitoring locations/frequencies be fixed or adaptive (e.g., according to the evolution and growth of the plume)? What specific, quantitative triggers or timeframes will be used for phased or adaptive monitoring? Consider including one or more maps showing monitoring locations relative to the AoR delineation and the anticipated position of the plume at certain time intervals (e.g., predicted arrival times at monitoring locations).*
- *What is the depth or elevation below mean sea level of each monitoring interval?]*

Plume monitoring details

[Recommended considerations include:

- *What type(s) of data or output will result from each monitoring method?*
- *What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?*
- *For methods involving fluid sample collection (refer to the QASP as necessary):*
    - *What materials will be used?*
    - *What sample collection procedures will be implemented to ensure a representative sample?*
    - *Where will sample analysis be conducted? What chain of custody procedures will be implemented?*
    - *What are the detection limits for the analytical methods that will be used?*
- *For geophysical methods, what data processing procedures will be implemented?*
- *How will it be determined if data deviate from baseline, predicted, or average values? For point locations, how will plume arrival determined? (e.g., using criteria related to CO_2 saturation values, tracer concentrations, etc.)*
- *How will the proposed combination of direct and indirect monitoring satisfy the requirements at 40 CFR 146.90(g)? For example, how will data from the various proposed monitoring methods complement each other? How will the various monitoring results be synthesized to monitor the extent of the plume and verify the AoR delineation?]*

Table 7. Plume monitoring activities.

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
DIRECT PLUME MONITORING				
Insert Formation 1				
Insert Formation 2				
Insert Formation 3				
Add rows as needed				
INDIRECT PLUME MONITORING				
Insert Formation 1				
Insert Formation 2				
Insert Formation 3				
Add rows as needed				

Table 8. Summary of analytical and field parameters for fluid sampling in the injection zone.

Parameters	Analytical Methods
FORMATION NAME	
Insert Parameter 1	
Insert Parameter 2	
Insert Parameter 3	
Add rows as needed	

Pressure-front monitoring location and frequency

Table 9 presents the methods that INSERT PERMIT APPLICANT NAME will use to monitor the position of the pressure front, including the activities, locations, and frequencies INSERT PERMIT APPLICANT NAME will employ.

Quality assurance procedures for these methods are presented in SECTION X of the QASP.

[Recommended considerations include:

- *What is the specific schedule for each monitoring activity? For example, "Logging will take place up to 45 days before the anniversary date of authorization of injection each year."*
- *For continuous monitoring methods, how often will data be sampled and recorded?*
- *Will monitoring locations/frequencies be fixed or adaptive (e.g., according to the evolution and growth of the pressure front)? What specific, quantitative triggers or timeframes will be used for phased or adaptive monitoring? Consider including one or more maps showing monitoring locations relative to the AoR delineation and the*

anticipated position of the pressure front at certain time intervals (e.g., predicted arrival times at monitoring locations).

- *What is the depth or elevation below mean sea level of each monitoring interval?]*

Pressure-front monitoring details

[Recommended considerations include:

- *What type(s) of data or output will result from each monitoring method?*
- *What gauges or other equipment will be used? What is the range, precision, etc. of the equipment?*
- *For geophysical methods, what data processing procedures will be implemented?*
- *How will it be determined if data deviate from baseline, predicted, or average values?*
- *How will the proposed combination of direct and indirect monitoring satisfy the requirements at 40 CFR 146.90(g)? For example, how will data from the various proposed monitoring methods complement each other? How will the various monitoring results be synthesized to monitor the extent of the plume and verify the AoR delineation?]*

Table 9. Pressure-front monitoring activities.

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
DIRECT PRESSURE-FRONT MONITORING				
Insert Formation 1				
Insert Formation 2				
Insert Formation 3				
Add rows as needed				
INDIRECT PRESSURE-FRONT MONITORING				
Insert Formation 1				
Insert Formation 2				
Insert Formation 3				
Add rows as needed				

Soil Gas Monitoring/Other Testing and Monitoring

[Additional testing and monitoring may need to be added as required by the UIC Program Director. If so, describe sampling locations (e.g., in areas, such as near faults, fractures, or abandoned well bores with potential for carbon dioxide migration) and monitoring methods.]