Carbon America

Making Climate Change History™

Attachment J: Emergency and Remedial Response Plan

SYD Denova 1

Carbon America

[40 CFR 146.94(a)]

Revision	Date	Notes	Written By	Approved By
A	11/21/2023	Issued for Approval		R. Keeling

1819 Denver West, Suite 300
Lakewood, CO 80401
www.CarbonAmerica.com

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1. Facility Information

[redacted]

This Emergency and Remedial Response Plan (ERRP) describes actions that [redacted] will 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.

[redacted] has emergency response experts with decades of experience on their team. Additionally, [redacted] contracted [redacted], a service of the American Chemistry Council (ACC) who has served the hazardous materials industry for nearly 50 years. [redacted] service provides 24/7 emergency response including highly trained emergency service specialists and advanced technical resources to provide a network of immediate critical response resources to the scene of leaks, spills, fires, exposures, or accidents. [redacted] will assist [redacted] with executing agency incident notifications and prepare detailed incident reports. They also provide access to medical experts for human and animal exposures and interpreter services in over 240 languages. [redacted].

Following pre-operational testing, [redacted] will amend the ERRP to address any changes to jurisdictional authority particularly related to pipelines to ensure that all aspects of this project, from source, to pipeline, to sink, are included in a single easy-to-execute emergency response document. The amended plan should also include any changes that are needed to address newly available or updated information about the site. For example:

- If the size or shape of the delineated AoR changes based on newly acquired information, the ERRP should address risk to all resources and infrastructure throughout the final, approved AoR.
- If pre-operational geochemical testing identifies additional USDWs within the AoR, the ERRP should address potential carbon dioxide or other fluid movement into these USDWs.
- If updated information about the geologic characteristics of the site indicate the presence of additional pathways for fluid movement, the ERRP should describe any associated carbon dioxide leakage or groundwater contamination scenarios and identify responses.

While the goals of proper siting, construction, and operation of a Class VI project are to prevent the occurrence of an emergency or adverse event, quick and effective response is vital for mitigating the effects of such an event.

The Class VI Rule requires owners or operators to report the following, within 24 hours:

- Any evidence that the carbon dioxide plume or pressure front may endanger a USDW
- Any noncompliance with a permit condition
- Any malfunction of the injection system
- Any triggering of a shut-off system or a loss of mechanical integrity
- A release of carbon dioxide to the atmosphere or biosphere

Initial information about emergency events or evidence of endangerment to a USDW may be:

- Reported via emergency "24-hour notices" from the owner or operator about an accident or adverse event
- The subject of public inquiries or comments about the facility
- Based on inspections or reviews of monitoring data (e.g., that increased levels of carbon dioxide or mobilized elements were detected outside the injection zone or in a USDW)

The U.S. Environmental Protection Agency (EPA) anticipates that emergency notifications will be initiated by phone or email and followed up by formal electronic submittals via the GSDT to comply with 40 CFR 146.91(e).

The Class VI Rule does not specify the content of the notifications; however, given the need for timely reporting, EPA anticipates that they will take the form of a brief letter to the Underground Injection Control (UIC) Program Director describing the following:

- What happened
- Time and date of the event
- Any immediate actions the owner or operator may have taken
- Initial information on any impacts to the well or the environment

Depending on the nature of the emergency, it may also be appropriate to notify local water systems, government agencies, etc. The UIC Program Administrator and [redacted] will communicate during the event to ensure that responses are taken expeditiously to mitigate risk and return the project to compliance.

2. Local Resources and Infrastructure

Resources in the vicinity of the [redacted] project site that may be affected resulting from an emergency event include public water supply wells, USDWs, various public facilities, oil and gas wells, surface water features, and agricultural land.

Infrastructure in the vicinity of the [redacted] project site that may be affected because of an emergency include agriculture related infrastructures, access roads, and bridges.

Resources and infrastructure addressed in this plan are shown in Figure J-1.

3. Potential Risk Scenarios

The following events related to the [redacted] project site that could potentially result in an emergency response:

- Injection or monitoring 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
- Unexpected CO_2 or formation fluid migration (through faults, fractures, or wells)
- Groundwater or surface water contamination
- A natural disaster (e.g., earthquake, tornado, lightning strike)

Response actions will depend on the severity of the event(s) triggering an emergency response. Emergency events are categorized as shown in Table J-1.

Table J-1. Degrees of Risk for Emergency Events

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.

4. 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 Section 3 are detailed in the following subsections. An adverse event scenario evaluation is provided in Table J-2, and adverse events and emergency response procedures are provided in Table J-3.

Table J-2. Adverse Event Scenario Evaluation

Event	Impact Severity	Degree of Risk (Emergency Type)	Likelihood	Project Phase	Avoidance Measure(s)	Detection Methods	Response Personnel	Equipment
Injection well failure	High	Major	Low	During Injection	Maintenance Monitoring	Pressure Monitoring	Facility Lead/ Management	Sensor/ instrumentation/ telemetry
Unexpected carbon dioxide migration	High	Serious	Medium	During/post-injection	Monitoring	Sampling/ testing	Management	Groundwater sampling instrumentation
Groundwater or surface water contamination	High	Serious	Medium	During/post-injection	Monitoring	Sampling/ testing	Management	Water sampling instrumentation
Natural disasters (fire, flood, storm)	Medium	Serious	Low	During/post-injection	Maintenance Monitoring	Fire alarms/ sensors; monitoring networks; communication system	Facility Lead/ Management	Fire/smoke sensors/ alarms; weather alert system

Table J-3. Adverse Event and Emergency Response Procedures

Event	Response Actions

Injection or monitoring well or equipment failure (including injection pressure, temperature, or annulus pressure monitoring equipment)	Major/Serious Emergency:
	• Stop injection (implement shut-down plan)
	• Notify emergency contacts
	• Notify UIC Program director within 24 hours
	• Conduct causal investigation and determine event severity
	• Employ standard well blowout evaluation methodologies
	  o Downhole logging/camera; internal testing; others
	• Employ standard well blowout repair methodologies
	  o Annular seal repair/replacement
	  o Casing repair/replacement
	  o Grout barrier
	• Evaluate resumed injection at reduced pressure
	• Reestablish/resume ongoing monitoring and maintenance (i.e., mechanical integrity testing)
	• Engage stakeholder communication plan
	• Identify and implement appropriate remedial actions (in coordination with the UIC Program Director) if contamination is detected

Injection or monitoring well or equipment failure (including injection pressure, temperature, or annulus pressure monitoring equipment)	Minor Emergency: • Conduct causal investigation and determine event severity • Evaluate potential loss of mechanical integrity • Implement shut-down plan and repair only if needed • Evaluate resumed injection at reduced pressure • Reestablish/resume ongoing monitoring and maintenance (i.e., mechanical integrity testing) • Engage stakeholder communication plan • Identify and implement appropriate remedial actions (in coordination with the UIC Program Director) if contamination is detected

Event	Response Actions

Unexpected brine CO_2 leakage/migration	• Stop injection (implement shut-down plan)
	• Notify emergency contacts
	• Notify UIC Program Director within 24 hours
	• Conduct causal investigation and determine event severity
	• Implement groundwater monitoring plan to evaluate if groundwater has been impacted
	• Evaluate potential alternative remedial technologies and develop corrective action plan in consultation with UIC Program Director:
	  ○ Develop plan to delineate impacts
	  ○ Develop remedial plan if needed
	  ○ Implement remedial plan/remedial monitoring
	• Conduct area survey to map leakage area
	• Engage stakeholder communication plan
	• Develop monitoring program
	• Evaluate resumed injection at reduced pressure
	• Implement monitoring during resumed injection

Groundwater or surface water contamination	• Stop injection (implement shut-down plan)
	• Notify emergency contacts, notify UIC Program Director within 24 hours
	• Conduct causal investigation and determine event severity
	• Conduct area survey to map leakage area
	• Develop water quality monitoring program
	• Evaluate potential alternative remedial technologies and develop corrective action plan in consultation with UIC Program Director:
	  ○ Develop plan to delineate impact with new monitoring wells
	  ○ Develop plan to remediate USDW as needed
	  ○ Arrange for alternative drinking water supply if appropriate
	  ○ Implement remedial plan/remedial monitoring
	• Engage stakeholder communication plan
	• Evaluate resumed injection at reduced pressure
	• Implement monitoring during resumed injection

Natural disaster (fire/flood/storm/earthquake)	• Stop injection (implement shut-down plan) • Notify emergency contacts • Notify UIC Program Director within 24 hours • Conduct causal investigation and determine event severity • Conduct area survey to inspect and map potential damage • Engage stakeholder communication plan • Develop corrective action plan as needed • Evaluate resumed injection at reduced pressure • Implement monitoring during resumed injection

1819 Denver West, Suite 300
Lakewood, CO 80401
www.CarbonAmerica.com

4.1 Well Integrity Failure

Integrity loss of the injection well and/or monitoring wells 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), [redacted] 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: This is considered a high-severity event based on its anticipated impact because this type of event has the potential to shut down all project operations over the long-term.

Timing of event: This event could possibly occur during injection but is not anticipated to be a concern once injection ceases.

Avoidance measures: Well maintenance and monitoring will be conducted continuously to avoid this scenario.

Detection methods: Pressure and mechanical integrity monitoring instrumentation will be deployed for well maintenance and monitoring.

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.
  - 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.

Response personnel: Lead facility personnel and [redacted] management will direct the initial response actions.

Equipment: Pressure and mechanical integrity monitoring instrumentation will be deployed for well maintenance and monitoring.

4.2 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: This is considered a low-severity event based on its anticipated impact because this type of event can likely be repaired in the short-term without the potential to shut down all project operations over the long-term.

Timing of event: This event could possibly occur during injection but is not anticipated to be a concern once injection ceases.

Avoidance measures: Well maintenance and monitoring will be conducted continuously to avoid this scenario.

Detection methods: Pressure and mechanical integrity monitoring instrumentation will be deployed for well maintenance and monitoring.

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 Minor emergency:
  - Conduct assessment to determine whether there has been a loss of mechanical integrity and determine event severity.
  - If there has been a loss of mechanical integrity, initiate shutdown plan.
  - Implement and repair plan if needed.
  - Evaluate resumed injection at reduced pressure.

Response personnel: Lead facility personnel and [redacted] management will direct the initial response actions.

Equipment: Pressure and mechanical integrity monitoring instrumentation will be deployed for well maintenance and monitoring.

4.3 Potential Brine or CO_2 Leakage to USDW or the Surface

In this scenario, there are elevated concentrations of indicator parameter(s) in groundwater sample(s) or other evidence of fluid (brine) or CO_2 leakage into a USDW.

Severity: This is considered a high-severity event based on its anticipated impact because this type of event has the potential to shut down all project operations over the long-term.

Timing of event: This event could possibly occur during injection, but is not anticipated to be a concern once injection ceases.

Avoidance measures: Monitoring will be conducted continuously to avoid or detect this scenario.

Detection methods: Instrumentation will be deployed, and sampling will be conducted for monitoring.

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.
  - Notify emergency contacts.
  - 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.
    - 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 CO or [redacted] to aerate CO_2-laden water, or implement [redacted]).
  - Continue groundwater remediation and monitoring on a frequent basis (frequency to be determined by [redacted] and the UIC Program Director) until unacceptable adverse USDW impact has been fully addressed.

Response personnel: Lead facility personnel and [redacted] management will direct the initial response actions.

Equipment: Sampling and monitoring instrumentation will be deployed for monitoring.

4.4 Natural Disaster

Well problems (integrity loss, leakage, or malfunction) may arise because 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: This is considered a medium-severity event based on its anticipated impact because this type of event likely does not have the potential to shut down all project operations over the long-term.

Timing of event: This event could possibly occur during injection or post-injection.

Avoidance measures: Weather event monitoring and U.S. Geological Survey (USGS) seismic network monitoring and communication will be implemented.

Detection methods: Weather event monitoring and USGS seismic network monitoring and communication will be implemented.

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.
  - Notify emergency contacts.
  - 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.

Response personnel: Lead facility personnel and [redacted] will direct the initial response actions.

Equipment: Weather instrumentation will be deployed for monitoring.

5. 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):

- Project Engineer(s)
- Facility Safety Manager(s)
- Environmental Manager(s)
- Facility Manager
- Facility Superintendent

A site-specific emergency contact list will be developed and maintained during the life of the [redacted] project. [redacted] will provide the current site-specific emergency contact list to the UIC Program Director prior to the commencement of injection and will update at least 7 days prior to any known personnel changes. Contact information for key local, state, and other authorities is provided in Table J-4.

Table J-4. Contact Information for Key Local, State, and Other Authorities

Agency	Contact Information
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

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, Denova shall be responsible for its procurement.

6. Emergency Communications Plan

[redacted] will communicate with the public about any event that requires an emergency response to ensure that the public understands what happened and whether there are any environmental or safety implications. The amount of information, timing, and communications method(s) will be appropriate to the event and its severity, and any impacts to drinking water, other environmental resources, and/or any impacts to the surrounding community.

[redacted] 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), [redacted] will provide periodic updates on the progress of the response action(s).

[redacted] will also communicate with entities who may need to be informed about or act in response to the event, including local water systems, CO_2 source(s) and pipeline operators, landowners, and Regional Response Teams (as part of the National Response Team).

Routine stakeholder communication can be engaged at various stages in the event evaluation, response action, or remedial process as deemed appropriate. The intent of the stakeholder communication plan is to deliver clear and timely project information to interested community members and first-responder personnel that may be involved in the event of a remedial process. This information will be delivered before injections commence, as well as in the unlikely occurrence of an adverse event or emergency. The stakeholder communication plan consists of the following elements:

- Community meetings
- Update meetings
- Contact information

Prior to injection, a neighborhood community meeting will be held jointly with the City of [redacted]. The meeting will be held to inform residents, businesses, police/fire personnel within the Area of Review (AoR) and project vicinity and/or others of the project background, operations, and schedule of upcoming activities such as facility construction or injection. Typically, such information would be provided in slideshow or visual presentation format with appropriate figures, diagrams, and related summary information for handouts. Initial meeting materials will provide phone and email address information for designated [redacted] contacts to develop an ongoing two-way line of communication.

As community interest dictates, additional update meetings may be held to present and discuss the details of adverse events that may have occurred. In addition, as further community interest dictates, update meetings may be held annually to inform the community of project milestones and accomplishments as well as any adverse events. A list of interested community members and their affiliation and contact information may be developed and maintained as project needs or community interest dictates.

As identified, [redacted] will also communicate with entities who may need to be informed or respond to emergency events, including local water systems, pipeline operators, landowners, and EPA Regional Response Teams (as part of the National Response Team).

7. Plan Review

This plan will be reviewed and updated as needed at least on an annual basis. Plan updates may include additional or alternative project personnel, information regarding facility upgrades, expansions, or modifications, a summary of past adverse events and remedial responses, AoR updates, remedial response effectiveness, plan improvements, communication procedures, lessons learned, or other relevant information. Updates may also be periodically appropriate to identify supplemental remedial response actions, equipment, or personnel training. The plan will also be updated within 1 year of an AoR reevaluation, following any significant changes to the injection process or the injections facility, following an emergency event occurrence, or as required by EPA. [redacted] may also provide documentation supporting the determination that no amendment is necessary.

Post-construction, this plan will be updated to include injection well construction information, schematics, and emergency shutoff controls and instrumentation. A step-by-step injection well shut-down plan will be included as needed. Facility reference schematics and maps will also be included.

This ERRP shall be reviewed:

- At least once every year
- Within 1 year of an AOR reevaluation

- Within 1 year 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, [redacted] 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 1 year following an event that initiates the ERRP review procedure.

8. Staff Training and Exercise Procedures

Facility personnel will be properly trained regarding this plan and companion facility safety and operations plans before injection commences. As noted above, this plan is envisioned to be implemented in companion with the facility Health and Safety Plan and master facility operations manual. In addition, facility personnel will be trained to communicate and coordinate in advance with local first-responder personnel.

Training will be updated at least on an annual basis. Mid-year training updates may also be completed as needed if additional equipment or procedures are introduced to facility operations such as routine, periodic, or one-time occurrences.

Training will include designation of an on-site facility emergency coordinator and explanatory instruction regarding the following:

- Emergency command center location(s)
- Facility configuration, regular facility operational procedures, safety zones, emergency meeting areas, required equipment, equipment access, and storage
- Seismic activity
- Health and Safety Plan overview, emergency and remedial response procedures and plan overview, emergency contacts, chain-of-command decision-making, facility shutdown and start up, and related information

A personnel record will be maintained to document completed training and updates. Training will be conducted by appropriate facility operations management, safety professionals, or their designee.

A specialty trained subcontractor will be on-call to address potential injection well blowout, injection well casing failure, or another similar event. [redacted] recognizes this as a unique event that requires specialty expertise and subcontractors to rapidly evaluate an issue, provide recommendations, and implement a suitable remedy in the field.

Figures

1819 Denver West, Suite 300
Lakewood, CO 80401
www.CarbonAmerica.com