

Application No. 45079, 45080, 46169, 46170, and 46171

EMERGENCY AND REMEDIAL RESPONSE PLAN

Pelican Sequestration Project

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1.0 Facility Information

Facility name: Pelican Sequestration Project
Pelican CCS 1, Pelican CCS 2, Pelican CCS 3, Pelican CCS 4, and Pelican CCS 5 wells

Facility contact: Tyler Spoede, Project Manager
5 Greenway Plaza Houston, TX 77046
713-985-6954 william_spoede@oxy.com

Well location: Livingston Parish, Louisiana

Well Name	Longitude (NAD 27)	Latitude (NAD 27)	Longitude (NAD 83)	Latitude (NAD 83)
Pelican CCS 1	-90° 40' 55.76"	30° 35' 19.16"	-90° 40' 56.10"	30° 35' 19.83"
Pelican CCS 2	-90° 40' 58.83"	30° 34' 53.98"	-90° 40' 59.17"	30° 34' 54.66"
Pelican CCS 3	-90° 43' 50.13"	30° 36' 10.56"	-90° 43' 50.48"	30° 36' 11.24"
Pelican CCS 4	-90° 44' 29.72"	30° 36' 41.03"	-90° 44' 30.06"	30° 36' 41.70"
Pelican CCS 5	-90° 46' 30.21"	30° 37' 35.26"	-90° 46' 30.56"	30° 37' 35.93°

This Emergency and Remedial Response Plan (ERRP) describes actions the Pelican Sequestration Hub, LLC 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 the Pelican Sequestration Hub, LLC obtains evidence that the injected CO₂ stream and/or associated pressure front may cause an endangerment to a USDW, the Pelican Sequestration Hub, LLC 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, Louisiana Department of Conservation and Energy (C&E) of the emergency event within 24 hours as required by LAC 43:XVII.3623(A)(2)(c).
4. Implement applicable portions of the approved ERRP.
5. Where the phrase "initiate shutdown plan" is used, Pelican Sequestration Hub, LLC will immediately cease injection.

2.0 Local Resources and Infrastructure

Resources in the vicinity of the Pelican Sequestration Project that may be affected as a result of an emergency event at the project site include USDWs, surface rivers and riverine, and nontidal, emergent wetlands. The USDWs that may be encountered while drilling are Chicot, Evangeline,

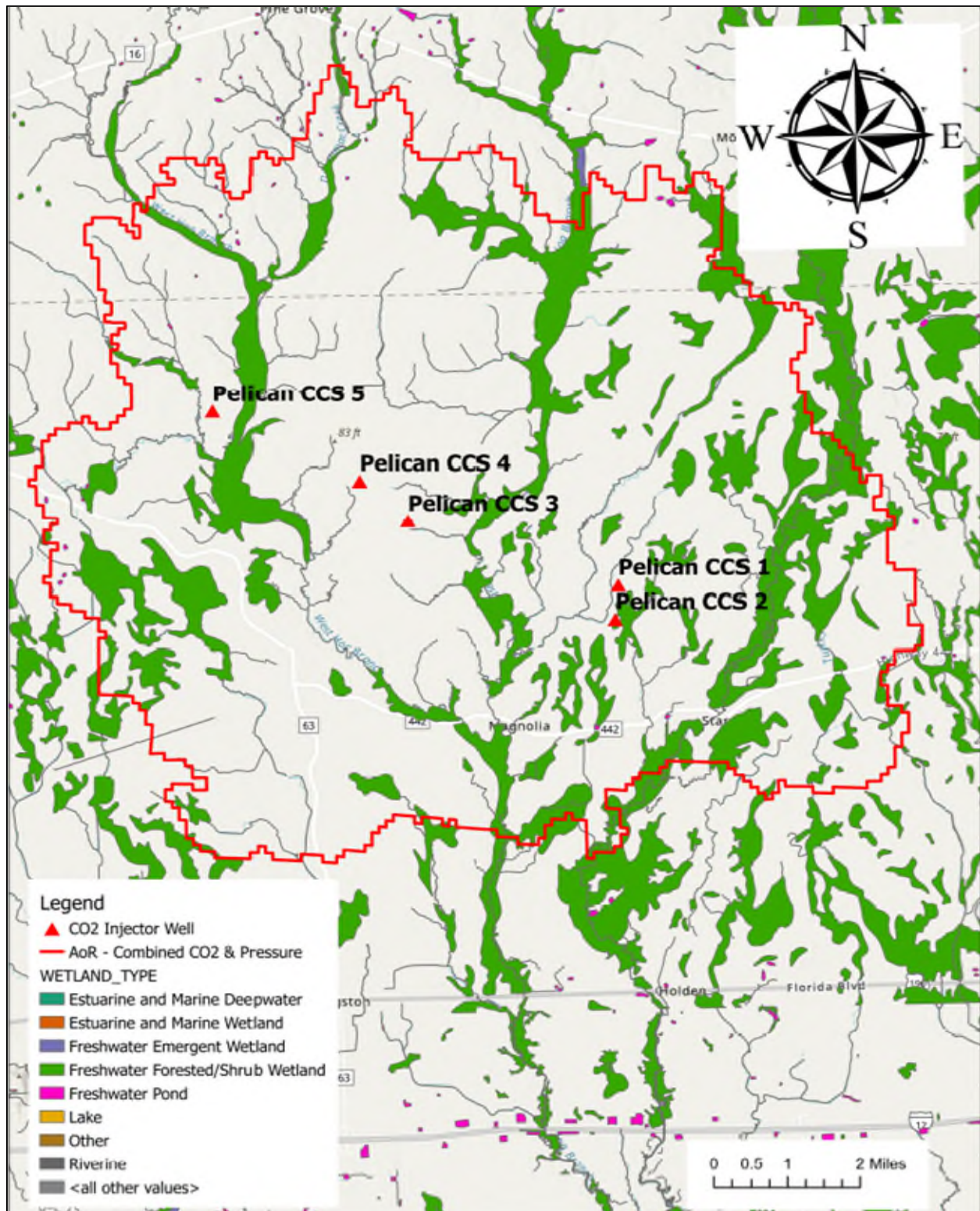
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and Jasper equivalent aquifers. The base of the lowermost USDW in the Pelican CCS 1 AoR is in the Jasper equivalent aquifer. In the project area, the depths vary from about 2,800'-subsea in the north to 3,400'-subsea in the south.

The physical geography of the AoR has the open water of the Tickfaw River to the east and south, the riverine of Bear Creek to the east and south, and the riverine of East Hog Branch to the west. Figure ERR-1 shows the surface water features within the project AoR. The surface water features include freshwater forested shrub wetlands and riverine.

The Area of Review and Corrective Action Plan document provides further details on the USDWs within the project area.

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**Figure ERR-1—Map of surface water features near the Pelican CO₂ Injection Wells**

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Infrastructure in the vicinity of the Pelican Sequestration Project that that may be affected as a result of an emergency at the project site include local timber operations on the surface of the AOR and several small communities in and around the AOR. An analysis of the communities is included in the Environmental Justice (EJ) document.

3.0 Potential Risk Scenarios

The events related to the Pelican Sequestration Project that could potentially result in an emergency response are included in Table ERR-1. This table lists the types of potential adverse incidents that will trigger response actions to protect USDWs, if the incidents occur during the construction, injection, or post-injection site care periods. The activities that the Pelican Sequestration Hub, LLC, will undertake in response to these incidents will result in the implementation of emergency or remedial actions. The worst-case consequences of various scenarios have been developed to ensure that response plans are in place for all eventualities.

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Table ERR-1–Potential Adverse Incidents

Construction / Pre-Injection Period
• Over-pressured gas flow (blowout) • Movement of brine between formations during drilling
Injection Period
• Loss of mechanical well integrity in injection or monitoring wells (e.g., tubing leak or vehicle strike) • Rapid and/or unexpected movement of CO₂ outside the defined AoR • Migration of CO₂ from the injection zone through faults and fractures • Migration of CO₂ from the injection zone through undocumented wells • Migration of CO₂ from the injection zone through failure of the confining zone (loss of containment) • Well monitoring equipment failure or malfunction (e.g., shutoff valve or pressure gauge) • Movement of brine or CO₂ from the injection zone to an overlying USDW or the land surface • A natural disaster (e.g., earthquake, tornado, hurricane, lightning strike) • Induced seismic event
Post-Injection Site Care Period
• Loss of mechanical well integrity in monitoring wells (e.g., tubing leak) • Rapid and/or unexpected movement of CO₂ outside the defined AoR • Migration of CO₂ from the injection zone through faults and fractures • Migration of CO₂ from the injection zone through undocumented wells • Migration of CO₂ from the injection zone through failure of the confining zone (loss of containment) • Monitoring equipment failure or malfunction • Movement of brine or CO₂ from the injection zone to an overlying USDW or the land surface • A natural disaster (e.g., earthquake, tornado, hurricane, lightning strike) • Induced 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 ERR- 2.

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Table ERR-2–Degrees of risk for emergency events

Emergency Condition	Definition
Major emergency	Known release or indication of a potential incident that poses an immediate (acute) risk to human health, resources, or infrastructure. Response actions involving local authorities (evacuation, isolation of areas, or restrictions on water usage) should be initiated. Example: well blowout during injection
Serious emergency	Incidents/releases posing potential (chronic) risk to human health, resources, or infrastructure, if conditions worsen or no mitigative or remedial response actions are taken. Examples: well seal failures, detection of increased pressure or indicators of CO ₂ in zones above caprock.
Minor emergency	Incident poses a challenge to the confinement barrier, but it does not result in the immediate release of CO ₂ or brine posing a risk to human health, resources, or infrastructure. Example: pressure in monitoring wells higher than anticipated.

4.0 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 listed in Table ERR-1 are detailed below.

4.1 Well Control Event

Loss of containment could occur during drilling and completions operations if the hydrostatic column controlling the well decreases below the formation pressure, allowing fluids to enter the well. No expected endangerment to the USDW or outside receptors.

Severity: Serious

Timing of event: Construction / Pre-Injection

Avoidance measures: Blow out prevention (BOP) equipment, kill fluid, well control training, kick drill, and lubricators for wireline operations

Detection methods: flow sensor, pressure sensor, tank level indicator, tripping displacement practices, and mud weight control

Potential response actions:

- Drilling
 1. Stop operation and restrict access to the Storage Site
 2. Close BOP
 3. Clear floor and secure area
 4. Execute well control procedure
 5. Evaluate drilling parameters and identify root cause

6. Continue operations
 - Completion
1. Stop operation and restrict access to the Storage Site
2. Close BOP
3. Clear floor and secure area
4. Execute well control procedure
5. Continue operations

Response personnel: Rig crew, rig manager, field superintendent, and project manager

4.2 Well Integrity Failure

Integrity loss of the injection well and/or monitoring well may endanger USDWs. Integrity loss may occur during the following scenarios:

- Movement of brine between formations during drilling
- Loss of mechanical integrity due to a tubing or packer leak in the injection well or monitoring well
- Loss of mechanical integrity due to a casing leak in the injection or monitoring wells

Well failure can be a result of either a casing, tubing or packer failure, or cement degradation from corrosion/erosion due to long-term CO₂ exposure. Automatic alarm and automatic shutoff systems will be installed to trigger digital notification and audible alarms if an injection well loses integrity during operation per LAC 43:XVII.3621(7)(a).

Injection operations may resume once well integrity has been demonstrated and meets the requirements under LAC 43:XVII.3627.

4.2.1 Movement of brine during drilling

Movement of brine during drilling could occur if there is a cross flow with losses during drilling activities. No expected endangerment to the USDW or outside receptors.

Severity: Minor

Timing of event: Construction / Pre-Injection

Avoidance measures: USDW covered with surface casing, casing test after cementing surface casing to check integrity, FIT test to verify shoe integrity, mud used in surface casing based on fresh water and clays, and cement bonding log

Detection methods: tank level sensor, mud lab test, pressure sensors, flow tensors, and tripping sheets

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Potential response actions:

1. Stop drilling and restrict access to the Storage Site
2. Check well level to detect lost circulation or influx
3. In case of loss, treat well with lost circulation material and evaluate mud weight and drilling parameters
4. In case of influx, control well without compromising shoe integrity
5. If the casing shoe is identified as leaking, squeeze to regain integrity
6. If the surface casing is identified as leaking, squeeze or casing patch are options

Response personnel: Rig crew, rig manager, and field superintendent*4.2.2 Loss of mechanical integrity; tubing or packing leak in injection well*

Loss of mechanical integrity due to a tubing or packing leak in the injection well could occur due to corrosion, damage in the tubulars during installation, fatigue, or higher load profiles. This loss could cause communication of the formation fluids with the annulus between the casing and tubing and sustained casing pressure. There is no loss of containment in this scenario. No expected endangerment to the USDW or outside receptors.

Severity: Serious**Timing of event:** Injection**Avoidance measures:** Coated tubing, inhibited packer fluid in annulus, corrosion monitoring plan, dry CO₂ injected, nickel-plated packers, trim level HH on tubing hanger and tree**Detection methods:** real-time pressure and temperature gauges at surface and downhole, electromagnetic casing inspection log, annular pressure test, and CO₂ leak sensor on the wellhead**Potential response actions:**

1. Follow protocol to stop operation, vent, or deviate CO₂ and restrict access to the Storage Site
2. Notify the Commissioner within 24 hours of the emergency event, per LAC 43:XVII.3629(A)(3)(a) and LAC 43:XVII.3623(A)(2)(c).
3. Troubleshoot the well
 - a. Continuously monitor well pressure and annulus pressure to assess integrity loss
4. If tubing leak is detected, discuss action plan with regulating authority and schedule well service to repair tubing
5. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner

Once a solution, remedy, or course of action has been determined:

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1. Notify the Commissioner regarding when injection can be expected to resume.
2. Will restore and demonstrate the mechanical integrity of the affected injection well to the satisfaction of the Commissioner,
3. Injection operations will resume with the written notification from the Commissioner that the impacted well has demonstrated mechanical integrity [per LAC 43:XVII §3609 (P)].

Response personnel: Operations engineer, field superintendent, project manager, and rig crew

4.2.3 Loss of mechanical integrity; tubing or packing leak in monitoring well

Loss of mechanical integrity due to a tubing or packing leak in the monitoring well could occur due to corrosion, damage in the tubulars during installation, fatigue, or higher load profiles. This loss could cause communication of the formation fluids with the annulus between the casing and tubing and sustained casing pressure. There is no loss of containment in this scenario. No expected endangerment to the USDW or outside receptors.

Severity: Minor

Timing of event: Injection and Post-Injection

Avoidance measures: Inhibited packer fluid in annulus, corrosion monitoring plan, nickel-plated packers

Detection methods: real-time pressure and temperature gauges at surface and downhole, electromagnetic casing inspection log, annular pressure test, and CO₂ leak sensor on the wellhead

Potential response actions:

1. If monitoring well is within the CO₂ plume, follow protocol to stop operation, vent, or deviate CO₂ and restrict access to the Storage Site
2. Troubleshoot the well
 - a. Continuously monitor well pressure and annulus pressure to assess integrity loss
3. If tubing leak is detected, evaluate leak, discuss action plan with regulating authority, and schedule well service to repair tubing
4. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner

Response personnel: Operations engineer, field superintendent, project manager, and rig crew

4.2.4 Loss of mechanical integrity; casing leak in injection well

Loss of mechanical integrity due to a casing leak in the injection well could occur due to corrosion, damage in the tubulars during installation, fatigue, or higher load profiles. This loss could cause

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a migration of CO₂ and brines through the casing, the cement sheet, and into different formation in the injection target or USDW.

Severity: Serious

Timing of event: Injection

Avoidance measures: CO₂-resistant cement and metallurgy across injection zone, injection through tubing and packer, nickel-plated packers, inhibited packer fluid in the annulus, cement to surface, corrosion monitoring plan, and CBL/USIT after installation

Detection methods: real-time pressure and temperature gauges at surface and downhole, electromagnetic casing inspection log, CO₂ leak sensor on the wellhead, real-time DTS fiber alongside of casing, flow rate monitoring, soil gas probes, neutron-activated logs, and USDW water monitoring

Potential response actions:

1. Follow protocol to stop operation, vent or deviate CO₂, and restrict access to the Storage Site
2. Notify the Commissioner within 24 hours of the emergency event, per LAC 43:XVII.3629(A)(3)(a) and LAC 43:XVII.3623(A)(2)(c).
3. Troubleshoot the well
 - a. Continuously monitor well pressure and annulus pressure to assess integrity loss
4. If casing leak is detected, discuss remediation and/or action plan with UIC Program Director
 - a. Evaluate if there is movement of CO₂ or brines to USDW or out of authorized zone
 - b. If USDW is affected, discuss remediation with Commissioner
 - c. Schedule well service to repair casing
5. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
6. Will restore and demonstrate the mechanical integrity of the affected injection well to the satisfaction of the Commissioner,
7. Injection operations will resume with the written notification from the Commissioner that the impacted well has demonstrated mechanical integrity [per LAC 43:XVII §3609 (P)].

Response personnel: Operations engineer, field superintendent, project manager, rig crew, and remediation contractors

4.2.5 Loss of mechanical integrity; casing leak in monitoring well

Loss of mechanical integrity due to a casing leak in the monitoring well could occur due to corrosion, damage in the tubulars during installation, fatigue, or higher load profiles. This loss could cause a migration of CO₂ and brines through the casing, the cement sheet, and into different formation in the injection target or USDW.

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Severity: Serious**Timing of event:** Injection and Post-Injection**Avoidance measures:** CO₂-resistant cement across injection zone, nickel-plated packers, inhibited packer fluid in the annulus, cement to surface, corrosion monitoring plan, and CBL/USIT after installation**Detection methods:** real-time pressure and temperature gauges at surface and downhole, electromagnetic casing inspection log, CO₂ leak sensor on the wellhead, soil gas probes, neutron-activated logs, and USDW water monitoring**Potential response actions:**

1. If monitoring well is within the CO₂ plume, follow protocol to stop operation, vent or deviate CO₂, and restrict access to the Storage Site
2. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
3. Troubleshoot the well
4. If casing leak is detected, discuss action plan with the Commissioner
 - a. Evaluate if there is movement of CO₂ or brines to USDW or out of authorized zone
5. If USDW is affected, discuss remediation and/or action plan with the Commissioner
 - a. Evaluate if there is movement of CO₂ or brines to USDW
 - b. If USDW is affected, discuss remediation with the Commissioner
 - c. Schedule well service to repair casing

Response personnel: Operations engineer, field superintendent, project manager, rig crew, and remediation contractors**4.3 Injection Well Monitoring Equipment Failure****4.3.1 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: Serious**Timing of event:** Injection**Avoidance measures:** Preventative maintenance program, and periodic inspections**Detection methods:** Real-time monitoring systems, redundancy, and field inspections**Potential response actions:**

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1. If there is an injury or property damage, contact field superintendent and activate emergency evacuation to secure location
2. Notify the Commissioner within 24 hours of the emergency event, per LAC 43:XVII.3629(A)(3)(a) and LAC 43:XVII.3623(A)(2)(c).
3. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
4. Determine the severity of the event, based on the information available, within 24 hours of notification.
5. Assess mechanical integrity of the system and propose repair actions, if necessary
6. Assess environmental impact and discuss remedial action with Commissioner
7. If assessment allows, discuss plan with the regulating authority to safety resume injection
8. Repair or replace instrumentation; calibrate equipment
9. Validate and demonstrate that the repaired or replaced equipment has been successfully brought back online and has continuous monitoring capabilities.
10. Review monitoring records and if needed, perform a fall-off test to evaluate reservoir

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, emergency teams, geologist, reservoir engineer, and monitoring staff

4.3.2 Monitoring Well Monitoring Equipment Failure

The failure of monitoring equipment for a monitoring well to detect wellhead pressure, temperature, and/or annulus pressure may indicate a problem with the monitoring well that could endanger USDWs.

Severity: Minor

Timing of event: Injection

Avoidance measures: Preventative maintenance program and periodic inspections

Detection methods: Real-time monitoring systems, redundancy, and field inspections

Potential response actions:

1. If the failure is a single surface monitoring device (e.g., surface pressure transmitter) that has a redundant device (i.e., second pressure transmitter) still in operation, then operations response is required to repair the device. No change to operations will be immediately planned.
2. If there is an injury or property damage, contact field superintendent and activate emergency evacuation to secure location
3. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner

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4. Notify the Commissioner within 24 hours of the emergency event, per LAC 43:XVII.3629(A)(3)(a) and LAC 43:XVII.3623(A)(2)(c).
5. Determine the severity of the event, based on the information available, within 24 hours of notification.
6. Assess mechanical integrity of the system and propose repair actions, if necessary
7. Assess environmental impact and discuss remedial action with Commissioner
8. If assessment allows, discuss plan with the regulating authority to safely resume injection
9. Repair or replace instrumentation; calibrate equipment
10. Validate and demonstrate that the repaired or replaced equipment has been successfully brought back online and has continuous monitoring capabilities.
11. Review monitoring records and if needed, perform a fall-off test to evaluate reservoir

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, emergency teams, geologist, reservoir engineer, and monitoring staff

4.4 Potential Brine or CO₂ Leakage Out of Zone

Potential brine or CO₂ leakage out of vertical zone from the injection well and/or monitoring well which may endanger USDWs. Integrity loss may occur during the following scenarios:

- Vertical migration of CO₂ or brine between formations through the injection well or monitoring well
- Vertical migration of CO₂ or brine between formations through legacy or plugged and abandoned (P&Ad) wells
- Vertical migration of CO₂ or brine between formations due to failure of the confining rock, faults, or fractures
- Lateral migration or CO₂ outside the defined AoR

4.4.1 Vertical migration of brine or CO₂ to USDW; injection well

Vertical migration of brine or CO₂ during injection could occur if there are induced stresses or a chemical reaction on the tubulars or cement of the injection well exposed to the CO₂ pressure or plume.

Severity: Serious

Timing of event: Injection

Avoidance measures: CO₂-resistant cement and metallurgy across injection zone, injection through tubing and packer, cement to surface, CBL/USIT after installation, and USDW covered as section barrier with surface casing and surface cement sheet

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Detection methods: CO₂ leak sensors on the wellhead, real-time DTS fiber alongside the casing, soil gas probes, USDW water monitoring, neutron-activated logs to be run for external mechanical integrity, pressure gauges at surface, and flow rate monitoring

Potential response actions:

1. Follow protocol to stop operation, vent or deviate CO₂, and restrict access to the Storage Site
2. Notify the Commissioner within 24 hours of the emergency event, per LAC 43:XVII.3629(A)(3)(a) and LAC 43:XVII.3623(A)(2)(c).
3. Troubleshoot the well
4. Evaluate if there is movement of CO₂ or brines to USDW
5. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
6. Discuss remediation options, action plan, and monitoring plan with Commissioner, if necessary
7. Discuss plan to repair the well with the regulating authority
8. Identify point of potential leakage
9. If leak is detected, discuss action plan with Commissioner
10. Identify the vertical extent of leakage of either Brines or CO₂ to overline saline aquifers or to USDW.
11. If the USDW is affected, discuss remediation and/or action plan with Commissioner; and
 - a. Within 24 hours of a release into the USDW, notify the local health authority, and notify adjacent landowners of impact.
 - b. Arrange for an alternate potable water supply if the contaminated USDW was being utilized and evidence indicates that injectate constituents introduced to the aquifer exceed drinking water standards.
 - c. Proceed with efforts to remediate the contaminated USDW to mitigate any unsafe conditions in discussion with Commissioner

Response personnel: Operations engineer, field superintendent, project manager, rig crew, and remediation contractors

4.4.2 Vertical migration of brine or CO₂ to USDW; monitoring well

Vertical migration of brine or CO₂ during injection or post-injection could occur if there are induced stresses or a chemical reaction on the tubulars or cement of the monitoring well exposed to the CO₂ pressure or plume.

Severity: Serious

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Timing of event: Injection and Post-Injection

Avoidance measures: CO₂-resistent cement across injection zone, cement to surface, CBL/USIT after installation, and USDW covered as section barrier with surface casing and surface cement sheet

Detection methods: CO₂ leak sensors on the wellhead, soil gas probes, USDW water monitoring, neutron-activated logs to be run for external mechanical integrity, and pressure gauges at surface

Potential response actions:

1. Follow protocol to stop operation, vent or deviate CO₂, and restrict access to the Storage Site
2. Troubleshoot the well
3. Evaluate if there is movement of CO₂ or brines into or out of USDW
4. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
5. Discuss remediation options, action plan, and monitoring plan with the Commissioner, if necessary
6. Discuss plan to repair or abandon the well with the regulating authority
7. If leak is detected, discuss action plan with the Commissioner
 - a. Evaluate if there is movement of CO₂ or brines to USDW
8. If USDW is affected, discuss remediation and/or action plan with the Commissioner; and
 - a. Within 24 hours of a release into the USDW, notify the local health authority, and notify adjacent landowners of impact.
 - b. Arrange for an alternate potable water supply if the contaminated USDW was being utilized and evidence indicates that injectate constituents introduced to the aquifer exceed drinking water standards.
9. Proceed with efforts to remediate the contaminated USDW to mitigate any unsafe conditions in discussion with Commissioner

Response personnel: Operations engineer, field superintendent, project manager, rig crew, and remediation contractors

4.4.3 Vertical migration of brine or CO₂ to USDW; legacy and P&A wells

Vertical migration of brine or CO₂ during injection or post-injection could occur if there is poor cement bonding, cement degradation, or cracking in the legacy or P&A wells exposed to the CO₂ pressure or plume.

Severity: Serious

Timing of event: Injection and Post-Injection

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Avoidance measures: Legacy wells to be properly abandoned for brine movement and CO₂ plume according to the corrective action plan and injectors will be abandoned as soon as CO₂ injection in the project ends unless they are left as monitoring wells

Detection methods: Soil gas probes, CO₂ leak sensors, and seismic surveying during AoR review periods

Potential response actions:

1. Follow protocol to stop operation, vent or deviate CO₂, and restrict access to the Storage Site
2. Evaluate if there is movement of CO₂ or brine to USDW due to a leak in a legacy or P&A well
3. Identify the point of leakage (i.e. legacy, P&A Well)
4. Inform community stakeholders and implement appropriate remedial actions in consultation with the UIC Program Director
5. Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary
6. If leak is detected, discuss action plan with CommissionerIdentify the vertical extent of leakage of either Brines or CO₂ to overline saline aquifers or to USDW.
7. If the USDW is affected, discuss remediation and/or action plan with Commissioner; and
 - a. Within 24 hours of a release into the USDW, notify the local healthy authority, and notify adjacent landowners of impact.
 - b. Arrange for an alternate potable water supply if the contaminated USDW was being utilized and evidence indicates that injectate constituents introduced to the aquifer exceed drinking water standards.
8. Proceed with efforts to remediate the contaminated USDW to mitigate any unsafe conditions in discussion with Commissioner
9. Proceed with corrective action plans once developed for the impacted Legacy or P&A well in concurrence with the reaulatory agency.

Response personnel: Operations engineer, field superintendent, project manager, rig crew, and remediation contractors

4.4.4 Vertical migration of brine or CO₂ to USDW; failure of confining rock, faults, or fractures

Vertical migration of brine or CO₂ during injection could occur if the pressure of the injection zone exceeds the sealing capacity of the caprock or seal above or if fault or fracture features are reactivated. Brine or CO₂ could leak to a shallower formation, including the USDW.

Severity: Serious

Timing of event: Injection

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Avoidance measures: Seismic survey in the area shows no through-going faults within the CO₂ plume extent, injection is limited to 90% of the fracture gradient, and extensive characterization of the rocks show good sealing capacity

Detection methods: USDW water sampling, 4D seismic, neutron-activated logs in monitoring wells, soil gas monitoring, and surface pressure monitoring

Potential response actions:

1. Follow protocol to stop operation, vent or deviate CO₂, and restrict access to the Storage Site
2. Assess root cause by reviewing monitoring data
3. If required, conduct geophysical survey to delineate potential leak path
4. Evaluate if there is movement of CO₂ or brine to USDW due to a failure of confining rock, faults, or fractures
5. Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary
6. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
7. If leak is detected, discuss action plan with Commissioner Identify the vertical extent of leakage of either Brines or CO₂ to overline saline aquifers or to USDW.
8. If the USDW is affected, discuss remediation and/or action plan with Commissioner; and
 - a. Within 24 hours of a release into the USDW, notify the local health authority and notify adjacent landowners of impact.
 - b. Arrange for an alternate potable water supply if the contaminated USDW was being utilized and evidence indicates that injectate constituents introduced to the aquifer exceed drinking water standards.
9. Proceed with efforts to remediate the contaminated USDW to mitigate any unsafe conditions in discussion with Commissioner
10. Actions to restore injection depend on nature of the leak path and extension

Response personnel: Monitoring staff, geologist, reservoir engineer, project manager, and remediation contractors

4.4.5 Lateral migration of CO₂ to outside the defined AoR

Lateral migration of CO₂ outside the defined AoR could occur during injection or post-injection if the plume moves faster or in an unexpected pattern and expands beyond the secure pore space and AoR for the project.

Severity: Serious

Timing of event: Injection and Post-Injection

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Avoidance measures: Detailed geologic model with stratigraphic well as a calibration, seismic survey integrated in the model, extensive characterization of the rocks and formation, AoR review and calibration at least every 5 years, and monitoring of the plume until stabilization

Detection methods: 4D seismic, neutron-activated logs in monitoring wells, and real-time pressure and temperature gauges in monitoring wells

Potential response actions:

- Injection
 1. Review monitoring data and trends compared with simulation
 2. Discuss findings with regulating authority; request to maintain injection during AoR evaluation if data shows that CO₂ will stay in secured pore space
 3. Perform logging in monitoring wells
 4. Conduct geophysical survey as required to evaluate AoR
 5. Recalibrate model and simulate new AoR
 6. Assess if additional corrective actions are needed and if additional pore space is needed
 7. Assess if remediation is needed; prepare action plan and review with regulating authority
 8. Present AoR review to regulating authority for approval; adjust monitoring plan
 9. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
- Post-Injection
 1. Review monitoring data and trends compared with simulation
 2. Discuss findings with regulating authority
 3. Conduct geophysical survey as required to evaluate AoR
 4. Recalibrate model and simulate new AoR
 5. Assess if additional corrective actions are needed and if additional pore space is needed
 6. Conduct geophysical survey as required to evaluate AoR
 7. Recalibrate model and simulate new AoR
 8. Assess if additional corrective actions are needed and if additional pore space is needed
 9. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner

Response personnel: Monitoring staff, geologist, reservoir engineer, and project manager

4.5 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. A major seismic event may disturb surface

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and/or subsurface facilities; and weather-related disasters (e.g., tornado, lightning strike, or hurricane/flooding) may affect surface facilities.

If a natural disaster occurs that affects normal operation of the injection well, perform the following:

Severity: Dependent on severity of event; potentially Major

Timing of event: Injection and Post-Injection

Avoidance measures: N/A

Detection methods: geophones array on surface to monitor induced seismicity will detect naturally occurring major seismic event. Weather alerts for severe weather.

Potential response actions:

- Major Seismic Event
 - Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
 - For event above Local Magnitude (ML) 2.0 within 5.6 miles of injection well
 1. Review monitoring parameters to validate normal operation
 2. If parameters indicate a potential mechanical integrity failure, follow procedure for event above ML 4.0
 3. Compare storage behavior with the model
 4. If needed, propose adjustments to operating conditions
 - For event above ML 4.0 within 5.6 miles of injection well
 1. If there is injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure location
 2. Follow protocol to stop injection
 3. Assess mechanical integrity of the system; propose repair actions based on findings
 4. Assess environmental impact; discuss remedial action with regulating authority, if necessary
 5. Review regional information and monitoring records to determine origin of the event
 6. If even is induced, reevaluate model, define new injection parameters, and discuss with regulating authority
 7. If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions
- Weather Disaster

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1. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
2. If there is injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure location
3. Evaluate and determine if attempted access to the injection or monitor wells immediately following the occurrence of such an event would constitute a risk to personnel safety.
 - a. If the site poses an immediate threat to human life or safety, evacuate the site to pre-determined muster points. Contact emergency personnel if warranted (911). Wait until the immediate threat has passed to evaluate damage and develop remedial procedures with the Commissioner and local response personnel.
 - b. If the site can be safely accessed, secure the injection and monitor wells and the surrounding area. Evaluate the damage to the wells, the surface facilities, and to the environment and develop a procedure to remediate with the Commissioner.
 - c. If contamination or the potential for endangerment is detected, identify and implement appropriate remedial actions (in consultation with the Commissioner), if the site conditions are safe for personnel.
4. Notify local health authority and first responders if the event and conditions pose a threat to the safety of the community.
5. Follow protocol to stop injection
 - a. In the event of a pending, known weather event, gradual cessation of injection may be appropriate to allow for surface depressurization and idle of pipelines as a measure to mitigate surface risk
6. Assess mechanical integrity of the system; propose repair actions based on findings
7. If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions

Response personnel: Operations engineer, field superintendent, project manager, geologist, reservoir engineer, monitoring staff, remediation contractors, and emergency teams

4.6 Induced Seismic Event

Based on the project operating conditions, it is highly unlikely that injection operations would ever induce a seismic event outside a 5.6-mile radius from the wellhead. Therefore, this portion of the response plan is developed for any seismic event with an epicenter within a 5.6-mile radius of the injection well.

A geophone array on surface will be used to monitor the area for seismicity.

Severity: Major

Timing of event: Injection

Avoidance measures: Seismic survey of the storage complex shows no faults that could be reactivated, detailed geomechanical model created to evaluate the storage complex, and region is seismically stable

Detection methods: Geophone array on surface

Potential response Actions:

- For event above ML 2.0 within 5.6 miles of injection well
 1. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
 2. Review monitoring parameters to validate normal operation
 3. If parameters indicate a potential mechanical integrity failure, follow procedure for event above ML 4.0
 4. Compare storage behavior with the model
 5. If needed, propose adjustments to operating conditions
- For event above ML 4.0 within 5.6 miles of injection well
 1. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
 2. If there is injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure location
 3. Follow protocol to stop injection
 4. Assess mechanical integrity of the system; propose repair actions based on findings
 5. Assess environmental impact; discuss remedial action with regulating authority, if necessary
 6. Review regional information and monitoring records to determine origin of the event
 7. If event is induced, reevaluate model, define new injection parameters, and discuss with regulating authority

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8. If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions

Response personnel: Operations engineer, field superintendent, project manager, geologist, reservoir engineer, monitoring staff, remediation contractors, and emergency teams

4.7 Surface Impacts

Surface impact may cause loss of containment during the follow scenarios

- External impact to the injection wellhead
- External impact to the monitoring wellhead
- External impact to the surface piping or buried pipelines

4.7.1 Loss of containment; external impact to injection wellhead

External impact to the injection wellhead due to heavy trucks or equipment could cause loss of containment of brine or CO₂ if the wellhead is disconnected from the well pipe or the surface pipeline.

Severity: Major

Timing of event: Injection

Avoidance measures: Fenced location and bollards installed, signage

Detection methods: Real-time pressure and temperature at the wellhead and surface facilities, field inspections, and OGI cameras

Potential response actions:

1. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
2. Automated shutdown will initiate; follow protocol to shutdown CO₂ delivery if the automated shutdown devices are not functional
3. If there is injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure location
4. Restrict access to the site, clear the location, and secure the perimeter
5. Contact well control special team to execute blowout emergency plan that may include capping the well, drilling a relief well to kill injector, repair well, and/or abandon well; discuss plan with regulating authority
6. Evaluate environmental impact to soil, water, and vegetation; present remediation plan to regulating authority
7. Execute remediation and install monitoring system as needed

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Response personnel: Operations engineer, field superintendent, project manager, rig crew, remediation contractors, and well control specialist

4.7.2 Loss of containment; external impact to monitoring wellhead

External impact to the monitoring wellhead due to heavy trucks or equipment could cause loss of containment of brine or CO₂ if the wellhead is disconnected

Severity: Serious

Timing of event: Injection and Post-Injection

Avoidance measures: Fenced location and bollards installed, signage, and reduced pressure in the monitoring well compared with the injection well

Detection methods: Real-time pressure and temperature at the wellhead and surface facilities and field inspections

Potential response actions:

1. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
2. Restrict access to the site, clear the location, and secure the perimeter
3. If there is injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure location
4. Contact well control special team to execute blowout emergency plan that may include capping the well, drilling a relief well to kill injector, repair well, and/or abandon well; discuss plan with regulating authority
5. Evaluate environmental impact to soil, water, and vegetation; present remediation plan to regulating authority
6. Execute remediation and install monitoring system as needed

Response personnel: Operations engineer, field superintendent, project manager, rig crew, remediation contractors, and well control specialist

4.7.3 Loss of containment; external impact to surface piping or buried pipeline

External impact to the surface piping or buried pipeline due to heavy trucks or equipment could cause loss of containment of brine or CO₂ if the pipe is ruptured.

Severity: Major

Timing of event: Injection

Avoidance measures: Fenced location and bollards installed to protect surface piping, field pipeline is buried, pipeline Right-of-Way identified with signage, and One Call 811 Program

Detection methods: Real-time pressure, temperature, and flow measurement; field inspections

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Potential response actions:

1. Inform community stakeholders and implement appropriate remedial actions in consultation with the Commissioner
2. Restrict access to the site, clear the location, and secure the perimeter
3. Automated shutdown will initiate; follow protocol to shutdown CO₂ delivery if the automated shutdown devices are not functional
4. If there is injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure location
5. Evaluate environmental impact to soil, water, and vegetation; present remediation plan to regulating authority
6. Execute remediation and install monitoring system as needed

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, and well control specialist

5.0 Response Personnel and Equipment

Site personnel, project personnel, and local authorities will be relied upon to implement the ERRP.

Monitoring, control, and routine maintenance of the injection operations will be the responsibility of the Injection Operations Staff. Site personnel are expected to include, at minimum, the positions listed below in Table ERR-3.

If an adverse event is discovered, the Operations Manager and Emergency Coordinator on duty will be notified immediately. The Emergency Coordinator will be responsible for notifying offsite emergency agencies and resources. The Operations Manager will contact outside emergency response organizations if the Emergency Coordinator is not available. The C&E Commissioner will also be notified within 24 hours, per LAC 43:XVII.3623(A)(2)(c).

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Table ERR-3—Operations Staff Descriptions

Position	Function	Qualifications
Emergency/Safety Coordinator	Responsible for notification of offsite support agencies in accordance with written procedures. Responsible for coordination and overseeing contact with the media.	Trained in the Communications Plan and Emergency Notification Procedures requirements as contained in the ERRP.
Operations Manager	Serves as the Emergency Response Manager responsible for the overall management of the Incident Response Team. Manages facility operations and personnel during an emergency and is responsible for implementation of appropriate emergency procedures and their follow-up activities.	Trained in the requirements of the ERRP and facility operations.
Project Manager	Serves as the Emergency Response Coordinator responsible for the overall communication between Incident Response Team members. Directs facility operations during an emergency and is responsible for communication between on-site personnel and professional services. Implements emergency procedures and ensures documentation of follow-up activities.	Trained in the requirements of the ERRP and facility operations.
Reservoir Engineer	Responsible for injection operation and monitoring. Lead incident response manager regarding injection and storage zone operation at the facility.	Undergraduate degree in engineering, related to chemical or reservoir, with at least 5 years of experience in reservoir dynamics and relevant monitoring interpretation.
Geologist/Geophysicist	Professional serving to assist in operation, maintenance, and monitoring of the injection process. Conducts routine data management and interpretation. Assists in implementing response actions regarding injection zone integrity.	Undergraduate degree in geophysics or geology with specialization in hydrology/fluid mechanics.
Operations Engineer	Oversees mechanical and fluid management operation of the injection wells, annulus pressure control system, and wellhead piping systems. Maintains and repairs injection-related equipment, including valves, instruments, and piping. Assists in mechanical and electronic control of the injection process.	Undergraduate degree in engineering, related to mechanical, chemical, or process control. Minimum of 2 years of experience in operation and service of equipment and instruments for pressurized well systems and wellhead controls.

A site-specific emergency contact list will be developed and maintained during the life of the project. Pelican Sequestration Hub, LLC, will provide the current site-specific emergency contact list to C&E.

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A list of contacts for state agencies having jurisdiction within the AoR and key local emergency agencies is presented below in Table ERR-4.

There are no federally recognized Native American Tribes located within the AOR. If a federally recognized Native American Tribe were to exist in the AoR at the time of a site emergency, then that tribe(s) will be notified of the site emergency at that time.

Table ERR-4—Contact information for key local, state, and other authorities

Agency	Location	Phone
Livingston Parish Fire District	Albany, LA	911 or 225-209-5353
Livingston Police Department	Livinston, LA	911 or 225-686-7153
North Oaks Medical Center	Hammond, LA	985-345-2700
State Police	Baton Rouge, LA	511 or 1-800-469-4828
Livingston Parish Sheriff	Livingston, LA	911 or 225-686-2241
Louisiana Office of Emergency Preparedness	Baton Rouge, LA	225-925-7500
Livingston Parish Office of Homeland Security and Emergency Preparedness (LOHSEP)	Livingston, LA	225-686-3066
US EPA Region 6	Dallas, TX	214-665-2294
Louisiana State Geological Survey	Baton Rouge, LA	225-578-5320
Louisiana Department of Conservation and Energy	Baron Rouge, LA	225-342-5569
US Geological Survey Water Resources for Louisiana	Baron Rouge, LA	225-298-5481

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, the Pelican Sequestration Hub, LLC, shall be responsible for its procurement.

6.0 Emergency Communications Plan

The Pelican Sequestration Hub, LLC, will communicate to the public about any event that requires an emergency response to ensure that the public understands what happened and whether there are any current or potential 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.

The Pelican Sequestration Hub, LLC, will describe what happened, current or potential 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), the Pelican Sequestration Hub, LLC, will provide periodic updates on the progress of the response action(s).

The Pelican Sequestration Hub, LLC, will communicate with entities who need to be informed about or act in response to the event, including local water systems, CO₂ source(s), pipeline operators, landowners, and Regional Response Teams (as part of the National Response Team).

If a seismic event occurs, the Pelican Sequestration Hub, LLC, will provide information about whether the event was naturally occurring or induced by the injection, whether any damage to the well or other structures in the area occurred, the investigative process, and what responses, if any, were taken by the Pelican Sequestration Hub, LLC or others.

7.0 Plan Review

This ERRP shall be reviewed:

- At least once every five (5) years following its approval by the permitting agency per LAC 43:XVII.3623(A)(4);
- Within one (1) year of an area of review (AOR) reevaluation per LAC 43:XVII.3623(A)(4);
- Within a prescribed period (to be determined by the permitting agency) following any significant changes to the injection process or injection facility or an emergency event per LAC 43:XVII.3623(A)(4)(b); or
- As required by the Commissioner per LAC 43:XVII.3623(A)(4)(c).

If the review indicates that no amendments to the ERRP are necessary, the Pelican Sequestration Hub, LLC, 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 a reasonable timeframe to be agreed upon with all affected parties and authorized regulatory bodies following an event that initiates the ERRP review procedure.

8.0 Staff Training and Exercise Procedures

All operations employees will receive training related to health and safety, operational procedures, and emergency response according to the roles and responsibilities of their work assignments. Initial training will be conducted by, or under the supervision of, the operations manager or a designated representative. Trainers will be thoroughly familiar with the Operations Plan and ERRP.

Facility personnel will participate in annual training that teaches them to perform their duties in ways that prevent CO₂ discharge. The training will include familiarization with operating procedures and equipment configurations appropriate to the job assignment as well as emergency response procedures, equipment, and instrumentation. New personnel will be instructed before beginning their work.

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Refresher training will be conducted at least annually for all operations personnel. Monthly briefings will be provided to operations personnel according to their respective responsibilities and will highlight recent operating incidents, actual experience in operating equipment, and recent storage reservoir monitoring information.

Only personnel who have been properly trained will participate in drilling, construction, operations, and equipment repair at the storage site. A record including the person's name, date of training, and instructor's signature will be maintained.