Natural State
RENEWABLES

# CLASS VI PERMIT EMERGENCY AND REMEDIAL RESPONSE PLAN

**40 CFR 146.94(a)**

NATURAL STATE RENEWABLES INC.
NIMBUS ARCCS INC.
Ouachita County, Arkansas

Prepared By:
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Revision No. 0
April 2025

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# 1.0 FACILITY INFORMATION

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Class VI Injection Well Nos. 1-4

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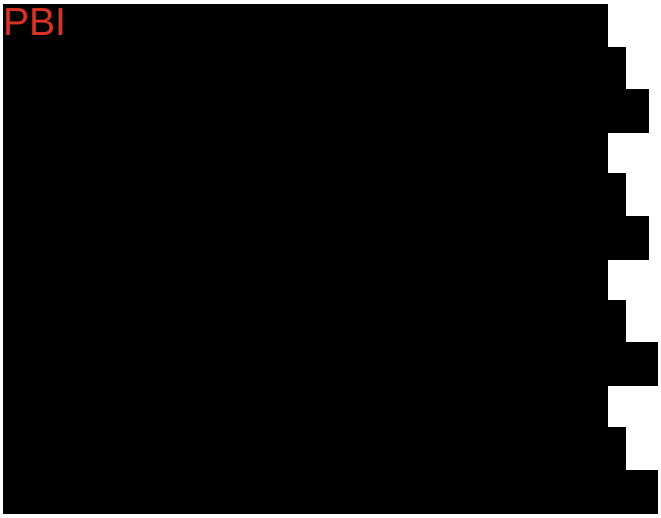


This document will define the requirements for the Emergency and Remedial Response Plan (ERRP) for a Class VI well as required by Code of Federal Regulations, Title 40 – Protection of the Environment Section, Part 146 – Underground Injection control program: Criteria and standards, Subpart H – Criteria and Standards Applicable to Class VI Wells, Section 146.94. (40-CFR-146.94)

This ERRP describes actions that Natural State Renewables (NSR) – Nimbus ARCCS shall take to address movement of the injection fluid or formation fluid in a manner that could endanger the

underground source of drinking water (USDW) during the construction, operation, or post-injection site care periods.

If NSR - Nimbus ARCCS obtains evidence that the injected $CO_2$ stream and/or associated pressure front may cause an endangerment to the USDW, NSR will perform the following actions:

1. Initiate shutdown plan for the injection well(s).
2. Take all steps reasonably necessary to identify and characterize the nature of 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: NSR - Nimbus ARCCS will immediately cease injection. However, in some circumstances, NSR - Nimbus ARCCS 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 safe and appropriate.

## 1.1 PROJECT WELL DESIGNATION

A tabulation of the well naming convention used in this permit application is shown below.

| NSR – NIMBUS ARCCS WELL NAMING TABLE | |
|---|---|
| **Well Identification** | **Well Name** |
| Nimbus ARCCS Injection Well No. 1 | Nimbus INJ-1 |
| Nimbus ARCCS Injection Well No. 2 | Nimbus INJ-2 |
| Nimbus ARCCS Injection Well No. 3 | Nimbus INJ-3 |
| Nimbus ARCCS Injection Well No. 4 | Nimbus INJ-4 |
| Nimbus ARCCS Above Confining Zone Monitor Well | Nimbus SM-1 |
| Nimbus ARCCS In Zone Monitor Well No. 1 | Nimbus DM-1 |
| Nimbus ARCCS In Zone Monitor Well No. 2 | Nimbus DM-2 |
| Nimbus ARCCS In Zone Monitor Well No. 3 | Nimbus DM-3 |

## 2.0 LOCAL RESOURCES AND INFRASTRUCTURE

The NSR Nimbus ARCCS site is located southwest of the city of Camden in Ouachita County, Arkansas. According to the most recent Census data in 2020, Ouachita County had a population of 22,650 people. Ouachita County ranks the 30th largest county by population of 75 counties in Arkansas. By land area, Ouachita County encompasses 740 square miles (1,900 $km^2$), of which 733 (1,180 $km^2$) square miles is land, and 7 square miles (11 $km^2$) is water. The economy of Ouachita County, Arkansas employs approximately 8.57 thousand people. The largest industries are manufacturing, health care and social assistance, and public administration.

Resources in the vicinity of the NSR Nimbus ARCCS site that may be affected as a result of an emergency event at the project site include:

- Local USDW impacts from groundwater wells
- Surficial water bodies

These freshwater resources, which have been identified as being located within or proximal to the project site, have been determined to be at least 1,000 feet above the proposed subsurface injection reservoir targets. Although there is little likelihood that facility operations at the project site would negatively impact any of these freshwater resources at any point in time during the lifetime of those operations, the protection of these important resources is still considered of paramount importance and will be discussed throughout this ERRP.

Infrastructure in the vicinity of the NSR Nimbus ARCCS site that may be affected as a result of an emergency at the project site include:

- Railways – freight train rail lines run by Union Pacific Railroad.
- Roads – main public roads for traffic in the area next to the facility.
    - Arkansas Hwy 79
    - Arkansas Hwy 57
    - US Hwy 278
- Major City
    - Camden

Resources and infrastructure near the NSR-Nimbus ARCCS site are addressed in this plan are shown in Figures 1 and 2.

# 3.0 POTENTIAL RISK SCENARIOS

The following sections of this ERRP address events that could potentially result in an emergency response by NSR - Nimbus ARCCS. Risks have been identified for incidents that could occur:

- During the construction (drilling and completion) phase of the injection and monitor wells
- During the injection operation phase of the facility
- During the post-closure and site closure operations phase

During each such phase, all on-site personnel will be required to wear the appropriate personal protective equipment (PPE) for any potential hazardous materials and risks associated with that operational phase of the Nimbus ARCCS injection wells at the NSR facility.

## 3.1 CONSTRUCTION PHASE

Risks associated with the drilling and completion of the injection and monitor wells are:

- Potential well control events (see section 4.2)
- Potential migration of fluids between formations (see section 4.1)

Safety programs and training will be in place during the drilling and completion of injection and monitoring wells. A detailed Health, Safety, and Environmental (HSE) plan will be developed, along with selected vendors, to meet Occupational Safety and Health Act (OSHA) standards to safely perform the initial phase of project development. Every operator and contractor will have the right, obligation, authority, and responsibility to stop work or any action that is deemed unsafe or could negatively impact the environment. It should be noted that all subterranean strata that will be drilled into or through by the proposed injection and monitor wells are known to be normally pressured strata (*i.e.,* not abnormally pressured or geopressured).

## 3.2 INJECTION OPERATION PHASE

Risks associated with the injection operation phase of the project have been identified as follows:

- Mechanical integrity of the injection and monitor wells (see section 4.3)
- Injection well monitoring equipment failure (*e.g.*, shut-off valve or pressure gauge, *etc*.) (see section 4.4)

- Migration of $CO_2$ (see section 4.5)
    - Potential vertical migration of $CO_2$ to a USDW (via defective casing or cement bond in an injection or monitor well, or geological defect)
    - Potential lateral migration of $CO_2$ outside the defined Sequestration Complex and Area of Review (AoR)
- A natural disaster (see section 4.6)
    - Natural disaster (*e.g.,* earthquake, tornado, hurricane, lightning strike) (*very low risk*)
    - Induced seismic event (*very low risk*)
- Topsides Facility Failure (see section 4.7)
    - Over pressurization of topsides facility resulting in catastrophic failure and potential personnel injury

## 3.3 POST INJECTION SITE CARE AND CLOSURE PHASE

Risks associated with the Post Injection Site Closure (PISC) care, which consists of the monitoring of the $CO_2$ for a duration period set by the permit parameters, have been identified as follows:

- Mechanical integrity of monitor wells
- Monitoring equipment failure
- Potential vertical migration of $CO_2$ to a USDW (through natural or manmade conduits)
- Potential lateral migration of $CO_2$ outside defined Sequestration Complex or AoR
- A natural disaster (*e.g.,* earthquake, tornado, hurricane, lightning strike) (*very low risk*)

## 3.4 DEGREES OF RISK

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**

| 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 immediately. |

| Emergency Condition | Definition |
|---|---|
| Serious emergency | Event poses potential serious (or significant) near term risk to human health, resources, or infrastructure if conditions worsen or no response actions are taken. |
| Minor emergency | Event poses no immediate risk to human health, resources, or infrastructure. |

Monitoring and alarm systems will provide notifications of a potential leak of $CO_2$ or formation fluids out of regulatory zones, from the injection wells, monitoring wells, or surface facilities (*i.e.,* pipelines, storage systems, *etc.*). Alarms will also be set to monitor injection parameters, mechanical well integrity, and the injection system integrity [40 CFR 146.88 (e)(2)]. If data shows that there is leakage from the reservoir system or a mechanical well failure, the operator will follow the initial steps to assess the emergency risks as defined above. Secondly, the operator/facility will follow the actions identified below:

1. The project will activate the emergency and remediation response protocol consistent with this ERRP and circumstances of the event.
2. The Environmental Protection Agency (EPA) Region 6 Underground Injection Control Program Director (UIC Program Director) will immediately be notified within 24 hours of the event being discovered.
3. The Arkansas Department of Environmental Quality Underground Injection Control Program Director (ADEQ UIC Program Director) will immediately be notified within 24 hours of the event being discovered.

The acting UIC Program Director in authority at the Federal or State level (depending on status of primacy for Class VI programs) may allow the operator to resume injection prior to remediation if the storage operator demonstrates that the injection operation will not endanger the USDW.

# 4.0 EMERGENCY IDENTIFICATION AND RESPONSE ACTION

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 are based upon construction, operation, and closure activities associated with the lifetime of the project. The potential risks are identified in Table 2 and discussed in the following Sections. Impact severity is based upon the definitions in Table 1 (see Section 3.4). Risk likelihood is based upon experience in well drilling, operation, and maintenance in other classes of injection wells.

**Table 2: Potential Risks and Detection**

| Potential Emergency Event | Location | Phase* | Impact Severity | Risk Likelihood | Detection |
|---|---|---|---|---|---|
| **4.1** Contamination of USDW with Drilling Fluids | Wellbore | C | Minor | Very Unlikely | Loss of circulation while drilling |
| **4.2** Well Control Event | Well | C | Serious to Major | Very Unlikely | Unexpected changes in well fluid levels occur while drilling. Influx of hazardous gases from formations |
| **4.3** Injection Well Integrity Failure | Casing, annulus, tubing, or packer | I | Minor | Unlikely | Loss in annular fluid pressure or tubing pressure; unusual injection rate changes |
| **4.4** Injection Well Monitoring Equipment Failure | Wellhead | I | Minor to Serious | Unlikely | Failure of parameter-monitoring equipment |
| **4.5** Potential Injectate Leakage to a USDW | Well or AoR | I, PI | Minor to Serious | Very Unlikely | Onset of elevated injectate concentrations in monitoring well.<br>Temperature survey vertical profile anomalies. |
| **4.6** Natural Disaster | Well or AoR | I, PI | Minor to Major | Very Unlikely | NA |
| **4.7** Topside Failure | Compression and transport | I | Minor to Serious | Unlikely | Loss of pressure, visual (ice, snow), gas detectors etc. |

**Note: C = Construction Period, I = Injection Phase and PI = Post Injection Period*

## 4.1 CONTAMINATION OF USDW WITH DRILLING FLUIDS

During the construction phase, there is a low risk of potential drilling fluids contaminating a USDW due to crossflow and losses into the formation. Losses will be monitored during all phases of the drilling of the injection and monitoring wells. The surface hole will be drilled using a water-based mud system to protect the formation above, across, and directly beneath the USDW. Best practice drilling methods and procedures will be employed to limit a potential leakage event. Monitoring parameters such as tank levels, flow lines, and flow pressures will lead to a first detection response.

The surface casing will be set into an impermeable layer at depths greater than the lowermost USDW. The surface casing will then be cemented to surface [40 CFR 146.86(b)(2)], and cement integrity will be verified through a cement bond log (CBL) prior to proceeding to the next phase of drilling. This will protect and isolate the USDW's from potential contamination during the deeper drilling operations and during injection operations.

### 4.1.1 Impact Severity and Risk

The potential risk of a contamination of a USDW because of drilling and construction of the well is considered low. First, the volume of drilling fluid used to drill through the shallow reservoirs that comprise the USDW is relatively small compared to the USDW, and the time required to drill through that interval is very short (typically 24-48 hours). Second, the non-toxic gels and mud additives used to drill the interval likely seal off the wellbore (with a wall cake) shortly after drilling. Finally, there is a long and established history of the successful and safe setting of surface casing in hundreds and thousands of wells – typically oil and gas test wells - nationwide.

If there is a documented (localized) invasion / contamination of the USDW with the non-toxic drilling fluid, the impact would be considered a minor emergency event, as such a release would not constitute an immediate risk to human health, resources, or infrastructure. At the first detection of a potential event, drilling operations will cease, and the situation will be evaluated and mitigated. It should be noted, however, that the best mitigation of such an event would be the setting and cementing of the surface casing across the USDW, as originally contemplated. If such a release to the USDW occurs after the surface casing has been set and cemented, the leak will be sealed off in accordance with the following Potential Response Actions.

### 4.1.2 Potential Response Actions

In the very unlikely event of a release to the USDW during drilling operations conducted after the surface casing has been set and cemented, the following steps will be undertaken:

1. Cease all drilling operations and assess fluid levels in wellbore.
2. Evaluate the drilling parameters, tank levels, and flow lines.
3. Determine amount of potential fluid losses and at what specific depth.
4. Treat mud with lost circulation materials and adjust mud weight to allow for continuation of drilling operation continuation.
5. Check for leaks in casing and at the casing shoe. **IF** detected squeeze/patch identified defect.
6. Verify integrity of cement with additional CBL run(s), if required.

If a leak is detected in the surface casing, it will be squeezed with additional cement or patched, and the post-repair cement integrity will then be re-affirmed prior to resuming drilling operations.

Drilling operations will only resume once the post-repair testing of the surface casing and its cement job confirms its integrity. The casing shoe of the surface casing will also be pressure-tested to verify its integrity prior to proceeding to the next phase of drilling.

### 4.1.3 Response Personnel and Equipment

During the drilling phase the personnel responsible for monitoring and detection will be the rig crew, who will immediately report any indication of a release to the USDW to the company man. The company man will then immediately cease all drilling operations and stabilize the well. The project supervisor will then be notified and the next steps in the response plan will be initiated. The tank levels and pressure and flow meters will be checked and recalibrated if required.

Refer to Section 5.0 for contact details.

## 4.2 WELL CONTROL EVENT

During the drilling phase, if a well control event occurs it could potentially lead to the influx and subsequent movement of formation fluid or formation gases from one zone to another. Such a well control event would be caused by the formation pressure of one zone being greater than the hydrostatic pressure of the drilling mud column that would otherwise maintain “overbalanced”

mud weight conditions, leading to the sudden influx of fluids and/or gases (*i.e.*, a well "kick"). The inverse can also take place, where the overbalance of the mud is too great, and the well will incur mud losses whilst drilling.

### 4.2.1 Impact Severity and Risk

The severity of this type of event is relatively low if the cause of the event is immediately and properly addressed. However, if not immediately mitigated a well control event can become a highly severe and dangerous problem if it leads to a loss of control and presents an impact to human health and infrastructure. The risk of this type of severe event to occur at the NSR Nimbus ARCCS site is considered very low and highly unlikely. Multiple oil and gas test wells of varying depths have been drilled within a four-mile radius of the project site without one single severe loss of control event having been recorded. The drilling records and other records filed with the State for those wells have been thoroughly reviewed and integrated into the well drilling and completion procedures that will be conducted for the injection and monitor wells. These records clearly indicate the top of any abnormally pressured (geopressured) strata is located at a depth well below the base of Sequestration Complex; accordingly, the threat of encountering a geopressured zone during the drilling of any injection or monitor well is highly unlikely.

During the drilling of the injection and monitoring wells, parameters such as flow, volume, and pressure of the drilling fluid will be closely monitored, as will be all tank fluid levels and fluid circulation rates. Mud weight control will also be utilized to prevent the influx or movement of fluid or gases across zones and to reduce the potential for a loss of well control (kick or blowout) event to occur. Instruments and procedures used for monitoring during drilling will include:

1. Flow sensor
2. Pressure sensor
3. Tank level indicator
4. "Tripping" (replacement of the bottom-hole assembly) displacement practices (pursuant to industry drilling operational procedures)
5. Mud weight control

Controls in place to remediate such an event include the following:

1. Blowout prevention (BOP) equipment

2. "Kill" (high-density) fluid or drilling mud additives on site
3. Well control training (as per the drilling company practices and protocols)
4. BOP testing protocol (per manufacture specifications and state requirements)

These project controls have been historically demonstrated to be effective for well control during the drilling of wells in the project site area.

### 4.2.2 Response Actions

If a Well Control event occurs, the following response actions will be taken:

1. Cease all drilling operations and assess fluid levels in wellbore.
2. Close the blow out preventor (BOP).
3. Secure the rig floor and surrounding rig area.
4. Initiate the Well Control Procedures.
5. Evaluate the drilling parameters that may have led to the Well Control event or may be used to mitigate the event.
6. Verify cause of the problem and ascertain the risk to human health, if any.
7. Adjust mud weight to suppress the influx or movement of formation fluids or gases.

### 4.2.3 Response Personnel and Equipment

In addition to the above steps, if a severe Well Control event does occur, the site will be evacuated, and the appropriate emergency response personnel (identified in Section 5.0) will be contacted. The emergency communication plan set forth in Section 6.0 will also be enacted. The cause of the Well Control event will only be evaluated after the site has been secured and poses no immediate threat to human health and life.

The initial personnel responsible for monitoring and detection will be the rig crew and "tool pusher" rig chief, who will immediately report any indication of a release to the USDW to the company man. The company man will then notify the project supervisor and initiate the first step of the response plan, which is to immediately cease all drilling operations. All tank levels and pressure and flow meters will be checked and recalibrated if required.

If the event is serious to major, the response personnel that would be contacted may also include:

- Local/State police
- Fire Department
- Federal Response Personnel
- Disaster-specific response teams.

Refer to Section 5.0 for contact details.

## 4.3 INJECTION WELL INTEGRITY FAILURE

The loss of casing integrity in an injection well during active injection could lead to a well failure and potentially endanger the USDW. A loss of integrity and/or well failure may be determined to have occurred based upon the observance of one of the following events:

1. The wellhead pressure deviates significantly from specified / anticipated pressures as set forth in the permits filed for the well;
2. The casing annulus pressure indicates a loss of external or internal well integrity; or
3. An annual MIT indicates a loss of mechanical integrity.

Well failure can be a result of either a casing, tubing or packer failure, or cement degradation from corrosion/erosion due to long-term $CO_2$ 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 40 CFR 146.88(e)(2).

Pursuant to 40 CFR 146.91(c)(3), NSR - Nimbus ARCCS will notify the UIC Program Director within 24 hours of any triggering of a shut-off system (*i.e.*, downhole or at the surface).

### 4.3.1 Impact Severity and Risk

The potential risk of well integrity failure is low. The mechanical integrity of the well will be demonstrated annually using annulus pressure tests (APT), mechanical integrity tests (MIT), and/or approved cased-hole wireline logging tools (differential temperature survey). Additionally, the annulus system will be continuously monitored to detect for the potential loss of integrity. Such monitoring would also result in the immediate, “real-time” detection of any substantive changes in injection pressures or the rate of flow of injectates into the well. Automatic alarm and shutoff systems will be set to trigger digital notification and audible alarms in the event of loss of integrity, notifying NSR -Nimbus ARCCS operations personnel immediately. Due to this robust system of

monitoring and rapid leak detection, the severity and impact of such an incident is expected to be minor. Therefore, it is expected that a loss in injection well integrity will not provide an imminent risk to human health, resources, or infrastructure.

### 4.3.2 Response Actions

If it is determined that an injection well has suffered a loss of mechanical integrity, either by unexplained deviations observed during continuous monitoring or during annual mechanical integrity testing, NSR - Nimbus ARCCS will:

1. Immediately cease injection operations (if not already triggered by automatic shut-off).
2. Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
3. Determine the severity of the event, based on the information available, within 24 hours of notification.

If a loss of mechanical integrity is determined to have occurred, NSR - Nimbus ARCCS will initiate the additional steps identified below:

1. Initiate the shutdown plan, which will cut off injection operations to the affected well.
2. If contamination is detected, the facility will identify and implement appropriate remedial actions (in consultation with the UIC Program Director).
3. Run well diagnostics to determine the physical location of leak(s) in the wellbore.
4. Perform remedial workover operations on the well to reestablish mechanical integrity (in consultation with the UIC Program Director).

Once a solution, remedy, or course of action has been determined NSR - Nimbus ARCCS will:

1. Notify the UIC Program Director 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 UIC Program Director prior to resuming injection operations.

### 4.3.3 Response Personnel and Equipment

The initial personnel responsible for well integrity monitoring will be site personnel involved with the well operations: the Operations Manager and his team, the Environmental Health and Safety Manager, and the Drilling Manager. If well integrity has been lost, additional personnel such as engineering and remediation specialists will be consulted to determine the extent of the problem

and establish a path/solution. The equipment involved in such remediation would likely range from the use of wireline investigative tools, pressure testing gauges, and other remedial equipment, to the potential replacement of the failed surface or downhole equipment, as deemed necessary. External specialists visiting the site will have to adhere to the same safety protocols and standards as NSR - Nimbus ARCCS personnel.

Refer to Section 5.0 for contact details.

## 4.4 INJECTION WELL MONITORING EQUIPMENT FAILURE

NSR - Nimbus ARCCS 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 per 40 CFR 146.88(e)(1), 146.89(b), and 146.90(b). The failure of installed equipment designed to continuously monitor wellhead pressure, temperature, and/or annular pressure may indicate a mechanical problem has developed in the injection well(s) that could endanger the USDW. All such monitoring equipment will integrate automatic alarms that, in addition to immediately notifying the appropriate personnel, may trigger an automatic shutdown of injection operations if a serious mechanical problem is detected.

### 4.4.1 Impact Severity and Risk

The likelihood of failure of one or more of the monitoring components is dependent on the routine maintenance and calibration of such equipment. NSR - Nimbus ARCCS will implement a routine inspection and calibration schedule designed for all equipment, including monitoring equipment that will be utilized in ongoing facility operations. The risk of such equipment failure would thus be low. The impact severity would also be low since the failure of any one component of the monitoring system will not constitute or lead to an immediate risk to human health or infrastructure. Instead, such a failure would simply and temporarily halt injection operations at the facility until the equipment that has failed has been repaired or replaced.

### 4.4.2 Response Actions

If a component of the monitoring system fails, the following response actions will be performed:

1. Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
2. Determine the severity of the event, based on the information available, within 24 hours of notification.

After the initial assessment, NSR - Nimbus ARCCS will:

1. Initiate shutdown plan and cease injection to the affected well(s).
2. Identify the monitoring equipment that either failed or alerted the system to the occurrence of such a failure.
3. Verify that the failure that occurred is only associated with the failure of a component of the monitoring system. **IF** it is determined that the failure is also attributable to a loss of well integrity, follow procedures in Section 4.3 of this plan as well.
4. Check the calibration and run a diagnostic analysis of the equipment that is indicated to have failed per manufacturers specifications.
5. If possible, repair and recalibrate the equipment that failed. Otherwise, replace the equipment that failed with new equipment of a similar or better design.
6. Validate and demonstrate that the repaired or replaced equipment has been successfully brought back online and has continuous monitoring capabilities.
7. Resume injection operations once the complete monitoring system has been restored to full capability and is fully online.

### 4.4.3 Response Personnel and Equipment

The personnel responsible for response will be those involved with the well operations: the Operations Manager and his team, the Environmental Health and Safety Manager, and the Drilling Manager. The equipment involved in such remediation would likely range from the use of pressure testing gauges and other remedial equipment to the potential replacement of the failed monitoring equipment, as deemed necessary.

Refer to Section 5.0 for contact details.

## 4.5 POTENTIAL INJECTATE LEAKAGE TO A USDW

Elevated concentrations of an indicator parameter detected in groundwater samples or other evidence of fluid (brine) or $CO_2$ leakage into the USDW may be detected during routine sampling. The vertical migration of $CO_2$ could potentially occur in an injection well, a monitor well, through

natural defects in the confining zone, or in a pre-existing artificial penetration (*i.e.,* a legacy well) which may act as a conduit to the USDW within the AoR.

The detection of vertical injectate leakage above the Confining Zone (ACZ) will be facilitated by the real-time continuous monitoring of reservoir pressure as well as adaptive sampling of the saline Tokio Formation, if triggered via pressure and temperature changes. Sampling at any point during injection operations will be compared to the established baseline sample collected pre-injection. Adaptive groundwater sampling is detailed in the *"E.1 - Testing and Monitoring Plan*" submitted in Module E. Adaptive sampling (frequency and spatial distribution) of the formation directly overlying the confining zone, may also trigger sampling of shallow ground water monitoring wells completed within the Sparta Aquifer system.

### 4.5.1 Impact Severity and Risk

Significant mechanical barriers to $CO_2$ leakage and robust monitoring controls will be put in place to reduce the potential risk of vertical $CO_2$ leakage to the USDW. In the injection wells, all casing strings will be cemented to surface. The cement used across the targeted injection zones of the Hosston , Cotton Valley A, Cotton Valley B and Upper Smackover Formations, will be comprised of a $CO_2$ resistant cement. The area of review is fault bounded by sealing faults which have been identified with either the existing well data or with the existing 2D seismic data that has been acquired and reprocessed. Reservoir modeling has shown that the $CO_2$ plume is fully contained within the fault block. Artificial penetrations within the modeled Plume and critical pressure extent are discussed in the "*Area of Review and Corrective Action Plan*" submitted in Module B and have been evaluated on their potential to act as conduits. The known faults and artificial penetration evaluations have determined neither will act as conduits to the USDW.

Should an unlikely leakage event occur in one of the legacy wells, depending on the amount of $CO_2$ or brine leakage and the time that might have elapsed between the onset and subsequent discovery of such a leak, the severity of such leakage event could range from minor to serious.

### 4.5.2 Response Actions

If the vertical leakage of brine or $CO_2$ has been detected, the following initial steps will be performed:

1. Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
2. Determine the severity of the event, based on the information available, within 24 hours of notification.

After the initial assessment, NSR - Nimbus ARCCS will:

1. Initiate a shutdown plan and cease injection operations.
2. Identify the point of potential leakage. Potential sources to be checked are:
   a. Injection wells
   b. Monitoring wells
   c. Legacy wells located within the AoR
3. Initiate adaptive sampling in the ACZ Monitoring Well (NSR - Nimbus ARCCS Above Confining Zone Monitor Well (Nimbus SM-1)).
4. Initiate adaptive sampling of groundwater from the USDW.
5. If the presence of indicator parameters in the groundwater is confirmed, NSR - Nimbus ARCCS will 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.
6. Within 24 hours of a release into the USDW, NSR - Nimbus ARCCS will notify the local health authority, place a notice in a newspaper of general circulation, and notify adjacent landowners.
7. 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 (*e.g.*, install system to intercept/extract brine or $CO_2$ or "pump and treat" to aerate $CO_2$-laden water).
9. Continue groundwater remediation and monitoring on an adaptive basis (frequency to be determined by NSR - Nimbus ARCCS and the UIC Program Director) until the adverse impact on the USDW has been fully addressed.

### 4.5.3 Response Personnel and Equipment

The parties responsible will be the site personnel involved with the well operations including: the

Operations Manager and his team, the Environmental Health and Safety Manager, and the Drilling Manager. Additionally, the project manager, technical consultants, remediation experts, and local health authority will be engaged.

The type of equipment involved in remediation would be dependent on the type and severity of the leak. Such equipment would likely range from the use of workover rigs, additional $CO_2$ resistant cement, and other remedial equipment to the potential installation of downhole remediation equipment (pumps, filters, *etc*.), as deemed necessary.

Refer to Section 5.0 for contact details.

## 4.6 NATURAL DISASTER

Well problems (integrity loss, leakage, or malfunction) may arise because of a natural disaster affecting the normal operation of the injection wells during operations or post injection periods. A moderate to severe earthquake could disturb surface and/or subsurface facilities; and weather-related disasters (*e.g.,* tornado, hurricane, forest fire, or lightning strike) could temporarily affect operations of the surface and monitoring facilities.

Note that the NSR - Nimbus ARCCS site is located in the Northern Gulf Coastal Plain, which before 1983 was a region of seismic quiescence. Waste brine disposal operations commenced in 1983, near El Dorado, and resulted in several documented earthquakes attributed to reactivation of the nearby symmetrical graben-horst fault system, the South Arkansas Fault Zone (Cox and VanArsdale, 1991). Historically documented earthquakes associated with this fault system are well below damaging levels and are primarily located south of the site along the fault zone and would not impact on the integrity of injection operations. Additionally, routine sequestration operations will be performed at low injection rates and injection pressures will remain below 90% of the formation fracture gradients. Adherence to these low injection rates, pressure and fracture gradient operations will help minimize any potential induced seismic events. Detailed information on the seismicity of southern Arkansas within the AoR and the surrounding Ouachita County area is contained within Section 2.5 – Seismicity of the "*Project Narrative Report*" submitted in Module A.

A potential natural disaster related to severe weather (lighting, tornadoes, flooding, freezing, forest fire, *etc.)* could temporarily impact the AoR and impede the normal operation of the facility as well as access to the injection and monitor wells. Over the past 20 years, the largest natural disaster risk is related to flooding or severe weather events.

### 4.6.1 Impact Severity and Risk

The impact severity could range from a minor to a major event for all natural disasters. The event severity would be dependent upon the type and cause of the natural disaster. A severe natural disaster could temporarily limit safe access to the injection and monitor wells. However, historical weather and climate patterns of the region indicate a low level of risk for a serious event caused by a natural disaster. Regardless, the threat of all potentially severe event occurrences is being considered.

### 4.6.2 Response Actions

Regardless of the level of severity, the following initial responses will be taken:

1. Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
2. Determine the severity of the event (minor, serious, or major), based on the information available, within 24 hours of notification.
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.

Once a severity level has been determined, additional response actions will be taken. See the following subsections.

#### *4.6.2.1 Major or Serious Emergency*

1. Initiate the shutdown plan and cease injection.
2. Check for additional hazardous conditions that may have resulted from the natural disaster.
3. Determine the accessibility to the injection and monitor wells.
4. Perform safety checks for all personnel regarding hazards.
    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 UIC Program Director 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 UIC Program Director.

c. If contamination or the potential for endangerment is detected, identify, and implement appropriate remedial actions (in consultation with the UIC Program Director), if the site conditions are safe for personnel.

5. Notify the local health authority and first responders if the event and conditions pose a threat to the safety of the community.

Once a solution, remedy, or course of action has been determined, NSR - Nimbus ARCCS will:

1. Notify the UIC Program Director regarding when injection can be expected to resume.
2. Will restore operational capability to and demonstrate the mechanical integrity of all injection and monitor wells to the satisfaction of the UIC Program Director prior to resuming injection operations.

#### *4.6.2.2 Minor Emergency*

1. Conduct assessment to determine whether there has been a loss of mechanical integrity because of the natural disaster.
2. If there has been a loss of mechanical integrity, initiate shutdown plan and follow the steps outlined in Section 4.3.2 of this plan.

Once a solution, remedy, or course of action has been determined, NSR - Nimbus ARCCS will:

1. Notify the UIC Program Director regarding when injection can be expected to resume.
2. Will restore operational capability to and demonstrate mechanical integrity of all injection and monitor wells to the satisfaction of the UIC Program Director prior to resuming injection operations.

### 4.6.3 Response Personnel and Equipment

The response personnel that would be contacted or deployed immediately following the occurrence of a natural disaster will be dependent on severity of the event. At a minimum (minor event) level, the following personnel will be contacted:

- NSR - Nimbus ARCCS – Operations Manager on duty
- NSR - Nimbus ARCCS – GM Project Site
- NSR - Nimbus ARCCS – Facility Manager on duty

- NSR - Nimbus ARCCS – Senior Project Manager (PM)
- NSR - Nimbus ARCCS - Remediation contractors
- NSR - Nimbus ARCCS - Corporate Communications

If the event is serious to major, the response personnel that would be contacted may also include:

- Local/State police
- Fire Department
- Federal Response Personnel
- Disaster-specific response teams.

A listing of all potential response personnel for the public is contained in the following section.

Refer to Section 5.0 for contact details.

## 4.7 POTENTIAL TOPSIDES FACILITY FAILURE

Topsides (surface) facility failure will have little impact on USDW, but does have the risk of personnel injury, and facility shutdown. Possible over pressurization of topsides facility can result in catastrophic failure and potential personnel injury, as well as possible topsides facility failure of $CO_2$ containment resulting in possible exposure to personnel (very low risk, non-confined space)

### 4.7.1 Impact Severity and Risk

The design robustness will be the main mitigation against over pressurization failure and $CO_2$ leakage to atmosphere. While the USDW will not be affected by a potential topsides failure, it does pose a risk to personnel.

Should an unlikely event occur, the severity of the incident could range from minor to serious.

### 4.7.2 Response Actions

If a topsides failure has occurred resulting in personnel injury or a loss of $CO_2$ containment, the following initial steps will be performed:

1. Initiate a shutdown plan and cease injection operations as soon as the event has occurred.
2. Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
3. Determine the severity of the event, based on the information available, within 24 hours of notification.

After the initial assessment, NSR - Nimbus ARCCS will:

1. Identify the point of potential leakage. Potential sources to be checked.

### 4.7.3 Response Personnel and Equipment

The parties responsible will be the site personnel involved with the injection operations including: the Operations Manager and his team, the Environmental Health and Safety Manager. Additionally, the Project Manager, technical consultants, remediation experts, and local health authority will be engaged.

The type of equipment involved in remediation would be dependent on the type and severity of the failure.

Refer to Section 5.0 for contact details.

# 5.0 OVERALL 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):

**Table 3: Contact Information for NSR – Nimbus ARCCS Affiliated Personnel (table will be updated prior to permit to construct, based on most up to date information)**

| Company | Authority or Location | Phone Number |
|---|---|---|
| NSR - Nimbus ARCCS | Operations Manager | TBD |
| NSR - Nimbus ARCCS | Injection well operator on duty | TBD |
| NSR - Nimbus ARCCS | Project Manager | TBD |
| NSR - Nimbus ARCCS | HSE Manager | TBD |
| NSR - Nimbus ARCCS | Corporate Communications | TBD |
| NSR - Nimbus ARCCS | Facilities Safety Manager(s) | TBD |
| NSR - Nimbus ARCCS | Environmental Manager(s) | TBD |
| NSR - Nimbus ARCCS | Plant Manager | TBD |
| NSR - Nimbus ARCCS | Plant Superintendent | TBD |
| NSR - Nimbus ARCCS | All facility personnel | TBD |
| NSR - Nimbus ARCCS | Remediation contractors | TBD |
| NSR - Nimbus ARCCS | Well Engineering manager | TBD |
| NSR - Nimbus ARCCS | Drilling “tool pusher” rig chief, | TBD |
| NSR - Nimbus ARCCS | Drilling “the company man” | TBD |
| NSR - Nimbus ARCCS | Drilling project supervisor | TBD |

A site-specific emergency contact list will be developed and maintained during the life of the project. NSR - Nimbus ARCCS will provide the current site-specific emergency contact list in Table 3 to the UIC Program Director. Table 4 presents Contact Information for Key Local, State, and Other Authorities.

**Table 4: Contact Information for Key Local, State, and Other Authorities**

| Agency | Authority or Location | Phone Number |
|---|---|---|
| Local Police | Camden Police Department | 911 or (870) 836-5755 |
| Local Fire | Camden Fire Department | 911 or (870) 836-2413 |
| Local Hospital | Ouachita Medical Center | 911 (870) 836-1000 |
| Local County Emergency Management | Ouachita County Office of Emergency Management | 870-837-2037 |
| Sheriff | Ouachita County Sheriff's Office | 911 or (870) 231-5300 |
| State Police | Arkansas State Police | 911 or (501) 618-8000 |
| State Emergency Management Agency | Arkansas Division of Emergency Management (ADEM) | (501) 683-6700 |
| Environmental Services Contractor | Vendor to be Determined | -- |
| ADEQ UIC Program Director | North Little Rock, Arkansas | (501) 682-0744 |
| EPA Region 6 UIC Class VI Director | Dallas, Texas | (214) 665-7150 |
| EPA National Response Center (24 hours) | -- | (800) 424-8802 |
| Arkansas State Geological Survey | North Little Rock, Arkansas | (501) 296-1877 |

Equipment needed in the event of an emergency and remedial response will vary, depending on the triggering of the emergency event. Response actions (cessation of injection, well shut-in, and evacuation) will generally not require specialized equipment to implement. When additional specialized equipment (such as a drilling rig or logging equipment) is required, NSR - Nimbus ARCCS shall be responsible for its procurement.

At any given moment, the public might have questions with regards to the ongoing operations, not related to a specific emergency event. To accommodate these questions NSR - Nimbus ARCCS will implement an email address and phone number where the public can make general inquiries with regard to the project. These communication channels will be promoted on the NSR - Nimbus ARCCS website and via other means.

# 6.0 EMERGENCY COMMUNICATIONS PLAN

At the earliest possible opportunity, NSR - Nimbus ARCCS will promptly communicate to the public about any event that requires an emergency response. This will 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, 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.

NSR - Nimbus ARCCS 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), NSR - Nimbus ARCCS will provide periodic updates on the progress of the response action(s).

NSR - Nimbus ARCCS will also communicate with entities that may need to be informed about or act in response to the event, including local water systems, pipeline operators, landowners, and Regional Response Teams (as part of the National Response Team). Additional agencies will be contacted if affected.

An emergency contact list will be maintained during the lifetime of the project (Construction, Operation, and Closure). The emergency contact list will be comprised of all facility management and essential personnel that would be notified, activated and/or deployed in case of an event. One person will be designated by the facility to manage all points of communication with the public.

# 7.0 PLAN REVIEW PROCESS

This ERRP shall be reviewed:

- At least once every five (5) years following its approval by the permitting agency;
- Within one (1) year of any AOR re-evaluation;
- Within one (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, NSR - Nimbus ARCCS 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

NSR - Nimbus ARCCS will develop a training plan (with accompanying manual) for all facility employees. The manual will be developed in alignment with standards set forth by the Occupational Safety and Health Administration (OSHA). Training will be provided to all personnel that will be involved with the injection and monitor wells, the monitoring systems, and the surface facility systems. Training will be periodic and completed on an annual basis (at a minimum).

All personnel will be required to wear personal protective equipment (PPE) while they are working at the project site. The minimum PPE that will be required while onsite will apply to all personnel, contractors, and visitors: It will consist of the following:

- Hard hats
- Safety glasses
- Protective footwear (safety-toed boots)

The specific training, required PPE, and exercise plan will be finalized once the project is ready to go online. All personnel will be trained prior to the commencement of operations at the Project Facility site. Personnel will also participate in routine retraining and skill-specific "refresher" courses over the life of the project. Some roles will require annual, or semi-annual, updates to their training program (to be identified once those roles are established).

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Prepared for: Natural State RENEWABLES

NSR-Natural State Renewables- Nimbus ARCCS (Ouachita Co., AR)

**Figure 1**
**Locations of Resources & Infrastructure Near the Nimbus ARCCS Site (Areal Look)**

| | | | |
|---|---|---|---|
| PROJECT INFO: Ouachita County Arkansas | | SCALE INFO: See Figure | |
| DATE: April 2025 | PROJECT NAME: 230087MRA | BY: GKS CHECK BY: GKS | SHEET 1 OF 1 |

Geostock Sandia

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Prepared for: Natural State RENEWABLES

NSR-Natural State Renewables- Nimbus ARCCS (Ouachita Co., AR)

**Figure 2**
**Locations of Resources & Infrastructure Near the Nimbus ARCCS Site (Topo Look)**

| | | | |
|---|---|---|---|
| PROJECT INFO: Ouachita County Arkansas | | SCALE INFO: See Figure | |
| DATE: April 2025 | PROJECT NAME: 230087MRA | BY: GKS CHECK BY: GKS | SHEET 1 OF 1 |

Geostock Sandia