6.0 Injection Well Plugging Plan

This chapter describes the injection well plugging plan the Alliance will implement in compliance with 40 CFR 146.92 after CO_2 injection has ceased and injection well monitoring activities have been completed. This plan applies to each of the four injection wells. Section 6.1 describes the tests that will be completed prior to plugging the injection wells. The details for plugging and abandoning the wells are provided in Section 6.2, including the methods and materials used to plug each injection well. Section 6.3 provides a list of references for sources cited in this chapter.

6.1 Injection Well Tests

The UIC Class VI permit regulations require that data be collected prior to plugging an injection well. Specifically, the bottom-hole pressure must be determined and the mechanical integrity of the well casing must be confirmed before proceeding to plug and abandon the well (40 CFR 146.92(a)). The procedures that will be used to generate these data, as required in 40 CFR 146.92(b), are described in the following sections.

6.1.1 Tests or Measures for Determining Bottom-Hole Reservoir Pressure

Bottom-hole pressure measurements will be used to determine the pressure required to squeeze the cement from the well casing into the injection reservoir. In addition, these data will be used to determine the need for well control equipment. The weight of brine required to prevent the well from flowing will be calculated using this information. The pressure measurements will also be used to determine the formulation of cement to be used to plug the well (i.e., cement-setting retardants may need to be added to the cement to prevent premature setting and curing of the cement).

Bottom-hole pressure measurements will be performed and recorded throughout the duration of the project. Pressure gauges will be placed in the injection tubing or within the deep casing string within the injection zone, and these pressure-measurement devices will allow for continuous, real-time, surface readout of the pressure data. The bottom-hole reservoir pressure will be obtained using the final measurements from the pressure gauges in the injection zone after the injection of CO_2.

After the bottom-hole pressure is determined, a buffered fluid (brine) will be used to flush and fill each well to maintain pressure control of the well. The bottom-hole pressure will be used to determine the proper weight of brine that should be used to stabilize each well.

6.1.2 Injection Well Testing to Ensure External Mechanical Integrity

The mechanical integrity of each well must be demonstrated after CO_2 injection and prior to the plugging of the well to ensure conduits between the injection zone and the USDWs or ground surface have not developed. External mechanical integrity will be evaluated by performing temperature logging on the injection well, as described in Section 5.3.2.

The temperature log will be run over the entire depth of each injection well. Data from the logging run will be evaluated for anomalies in the temperature curve, which would be indicative of fluid migration outside of the injection zone. These data will also be compared to data from the logs performed prior to injection of CO_2 into the well. Deviations between the temperature logs performed before and after the injection of CO_2 may indicate issues related to the integrity of the well casing or cement.

6.2 Plugging Plan

Each injection well casing will be plugged with cement and 6 percent water gel spacers to ensure that the well does not provide a conduit from the injection zone to the USDW zone or ground surface. As discussed in Chapter 4.0, two types of well completion designs are being considered: one with a perforated-cased horizontal lateral, the other with an open, uncased horizontal lateral. The procedures for plugging and abandoning both types of horizontal CO_2 injection wells are very similar, whether they are a cased and perforated completion or an open-hole completion. However, cement volumes will differ depending upon the total depth and horizontal length of the well. Table 6.1 summarizes the plugging plans for each type of well completion and describes intervals that will be plugged and the materials and methods that will be used to plug the intervals.

For both well completion designs, the portion of the well corresponding to the injection zone will be plugged using CO_2-resistant cement with a retainer method. Class A well cements are formulated in accordance with API Specification 10A (API 2010) standards and are similar to ASTM Type I Portland cements (ASTM C465, ASTM 2010). CO_2-resistant cement is formulated with the addition of pozzalan or other materials that reduce production of calcium hydroxide and calcium silicate hydrate, that weaken cements in the presence of CO_2. The cement retainer will be set at a depth of 3,900 ft, at the contact between the Eau Claire Formation and the Mount Simon Sandstone, and will be constructed of corrosion-resistant materials. Depending upon the horizontal length and well construction, approximately 450 to 1,475 sacks of CO_2-resistant cement will be used to plug the injection interval (this includes a 10 percent excess volume to be squeezed through the perforations into the Mount Simon Sandstone).

The pressure used to squeeze the cement will be determined from the bottom-hole pressure data measured before beginning the plugging and abandonment process. However, the injection pressure of the cement will not exceed the fracture pressure of the Mount Simon Sandstone. If it appears that the injection pressure will exceed the fracture pressure and the total amount of cement has not been pumped into the injection zone, cement pumping will cease and the tubing will be removed from the cement retainer to allow the pressure to return to static conditions. After allowing the pressure to reduce, the tubing will be re-strung through the cement retainer and cement pumping will be attempted again. A rapid increase in pressure on the tubing would indicate that the perforations have been sealed with cement, and no additional cement will be added to the zone or plug.

Figure 6.1 shows the details of cased injection wells after plugging and abandonment. Figure 6.2 shows the design for an uncased horizontal injection well closure.

After the remainder of the casing has been filled with cement, the casing sections will be cut off approximately 5 ft bgs, and a steel cap will be welded to the top of the deep casing string. The cap will have the well identification number, the UIC Class VI permit number, and the date of plug and abandonment inscribed on it. Soil will be backfilled around the well to bring the area around the well back to pre-well-installation grade. This area will then be planted with natural vegetation.

Table 6.1. Intervals to Be Plugged and Materials/Methods Used

Zone of Interest	Depth	Formation	Plugging Method	Plug Description	
Description	Cemented Interval	Name	Description	Type	Quantity
Perforated Interval (2,500 ft lateral)	3,900 – 7,004	Mt. Simon	Retainer	EverCRETE CO_2-Resistant or similar	666 sacks (15% Excess)
Retainer Plug	3,100 – 3,900	Various	Balanced Plug	EverCRETE CO_2-Resistant or similar	150 sacks
Gel Spacer	1,800 – 3,100	Various	Balanced Plug	6% freshwater gel	48.2 bbl
Intermediate Plug	1,500 – 1,800	Various	Balanced Plug	Class A Neat	53 sacks
Gel Spacer	700 – 1,500	Various	Balanced Plug	6% freshwater gel	30 bbl
Surface Plug	0 – 700	Various	Balanced Plug	Class A Neat	124 sacks
Perforated Interval (1,500 ft lateral)	3,900 – 6,004	Mt. Simon	Retainer	EverCRETE CO_2-Resistant or similar	450 sacks (15% Excess)
Retainer Plug	3,100 – 3,900	Various	Balanced Plug	EverCRETE CO_2-Resistant or similar	150 sacks
Gel Spacer	1,800 – 3,100	Various	Balanced Plug	6% freshwater gel	48.2 bbl
Intermediate Plug	1,500 – 1,800	Various	Balanced Plug	Class A Neat	53 sacks
Gel Spacer	700 – 1,500	Various	Balanced Plug	6% freshwater gel	30 bbl
Surface Plug	0 – 700	Various	Balanced Plug	Class A Neat	124 sacks
Open Hole Interval (2,500 ft lateral)	3,950 – 7,004	Mt. Simon	Retainer	EverCRETE CO_2-Resistant or similar	1,500 sacks (30% excess)
Retainer Plug	3,100 – 3,900	Various	Balanced Plug	EverCRETE EverCRETE CO_2-Resistant or similar CO_2-Resistant or similar	150 sacks
Gel Spacer	1,800 – 3,100	Various	Balanced Plug	6% freshwater gel	48.2 bbl
Intermediate Plug	1,500 – 1,800	Various	Balanced Plug	Class A Neat	53 sacks
Gel Spacer	700 – 1,500	Various	Balanced Plug	6% freshwater gel	30 bbl
Surface Plug	0 – 700	Various	Balanced Plug	Class A Neat	124 sacks
Open Hole Interval (1,500 ft lateral)	3,900 – 6,004	Mt. Simon	Retainer	EverCRETE CO_2-Resistant or similar	1,200 sacks (30% Excess)
Retainer Plug	3,100 – 3,900	Various	Balanced Plug	EverCRETE CO_2-Resistant or similar	150 sacks
Gel Spacer	1,800 – 3,100	Various	Balanced Plug	6% freshwater gel	48.2 bbl
Intermediate Plug	1,500 – 1,800	Various	Balanced Plug	Class A Neat	53 sacks
Gel Spacer	700 – 1,500	Various	Balanced Plug	6% freshwater gel	30 bbl
Surface Plug	0 – 700	Various	Balanced Plug	Class A Neat	124 sacks

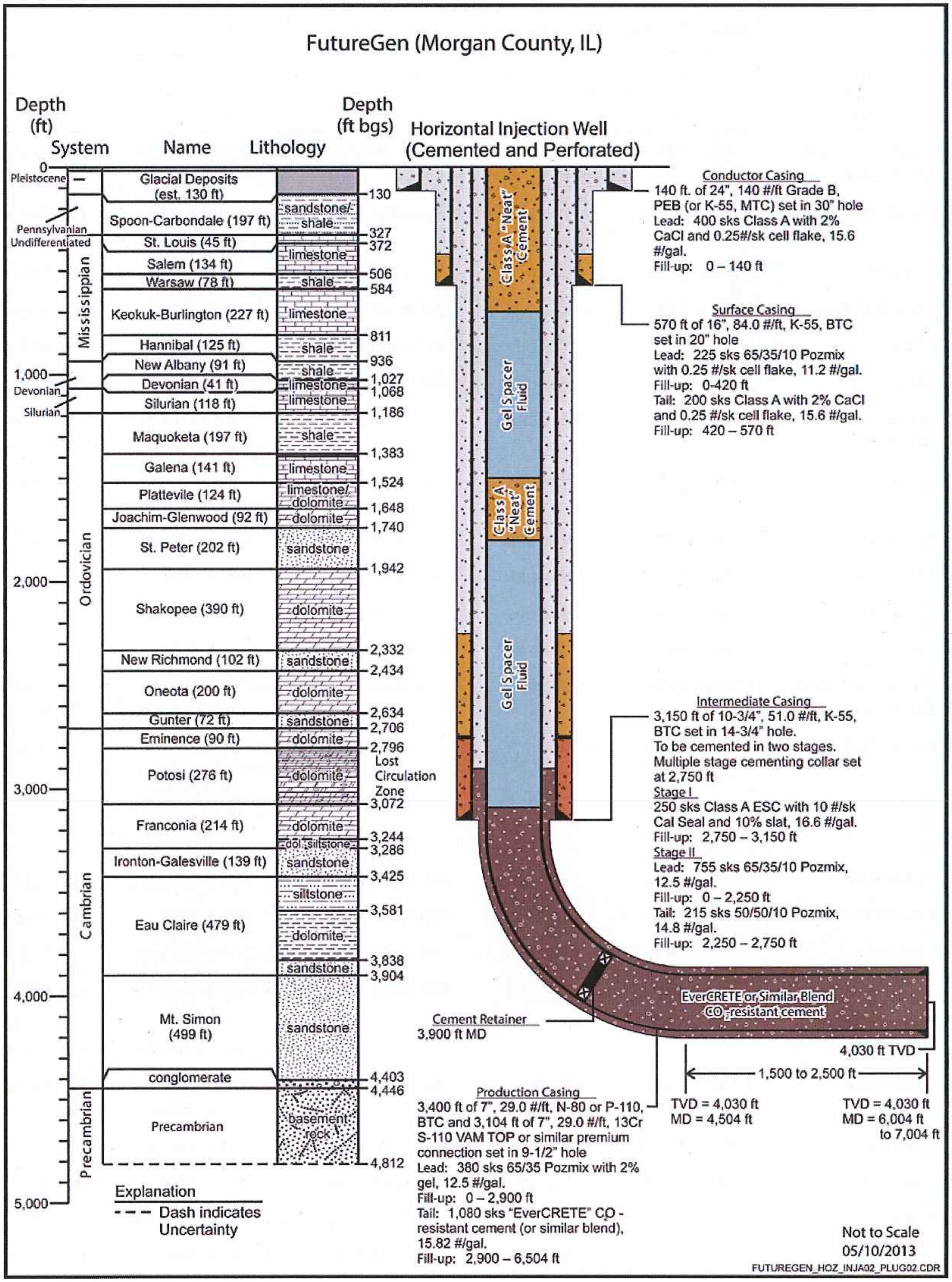

Figure 6.1. Diagram of Cased Injection Well After Plugging and Abandonment

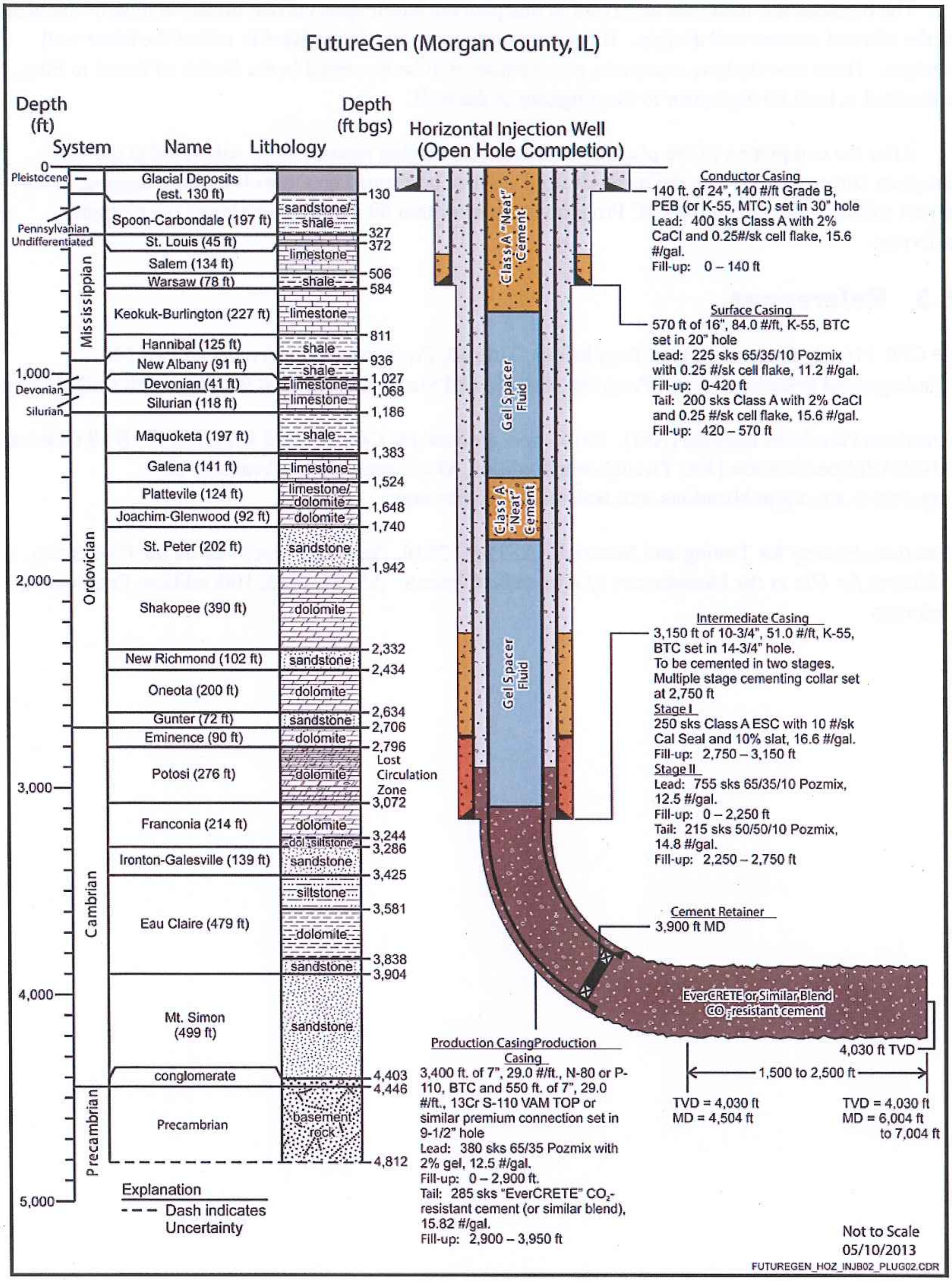

Figure 6.2. Diagram of Non-Cased Injection Well After Plugging and Abandonment

The methods and materials described in this plan are based upon current understanding of the geology at the site and current well designs. If necessary, the plans will be updated to reflect the latest well designs. These new designs, materials, and methods will be described in the Notice of Intent to Plug submitted at least 60 days prior to the plugging of the well.

After the completion of the plugging activities, a plugging report will be submitted to the UIC Program Director describing the methods used and test performed on the well during plugging. This report will be submitted to the UIC Program Director within 60 days of completing the plugging activities.

6.3 References

40 CFR 146.92. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 146, "Underground Injection Control Program: Criteria and Standards," Section 92, "Injection well plugging."

American Petroleum Institute (API). 2010. *Specification for Cements and Materials for Well Cementing.* ANSI/API Specification 10A, Twenty-fourth edition, Washington, D.C. Available at: http://www.api.org/publications-standards-and-statistics.aspx.

American Society for Testing and Materials (ASTM). 2010. *Standard Specification for Processing Additions for Use in the Manufacture of Hydraulic Cements.* ASTM C465, 10th edition, Englewood, Colorado.

7.0 Post-Injection Site Care and Site Closure Plan

This chapter presents the post-injection site care and site closure plan for the FutureGen 2.0 Morgan County CO_2 storage site in compliance with 40 CFR 146.93. Section 7.1 provides an overview of the computational modeling of the post-injection period that was conducted to determine the pressure differential and areal extent of the CO_2 plume; a full description of the computational modeling used in the development of the Alliance's UIC permit applications is provided in Chapter 3.0, Area of Review and Corrective Action Plan. The post-injection monitoring plan and the site closure plan are described in Sections 7.2 and 7.3, respectively. The post-injection site care and site closure plan was based on *Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells* (EPA 2010) and *Draft Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance for Owners and Operators* (EPA 2011). Upon cessation of injection, the Alliance will either submit an amended post-injection site care and site closure plan or demonstrate to EPA that no amendment to the plan is necessary, pursuant to 40 CFR 146.93(a)(3).

7.1 Computational Modeling for the Post-Injection Period

The same computational model used for calculating the AoR was used for the post-injection site care and site closure analysis. The model is described in more detail in Chapter 3.0. Results in this section were generated from model output for the site care period. For the representative case, the aqueous fluid and $scCO_2$ pressure and migration of CO_2 were simulated for 100 years. The computational model will be calibrated to monitoring data during the operational period to provide more accurate representation of CO_2 sequestration processes.

7.1.1 Pressure Differential

Changes in pressure relative to initial conditions were calculated from simulation results. Pre-injection pressures were defined as the initial pressure measured before injection begins. Simulations were conducted for 20 years of CO_2 injection at a rate of 1.1 MMT/yr distributed into the injection wells, followed by 80 years of post-injection. Table 7.1 lists predicted aqueous pressure differentials over time at the top of the injection zone and for one depth interval immediately above the primary confining zone (MW3, the ACZ early-detection monitoring well). The planned locations for injection and monitoring wells are shown in Figure 5.1 and in Figure 7.4 below. The model suggests a maximum injection pressure differential of 446 psi at the injection well at the time injection is stopped. Simulation results show the magnitude and area of elevated pressure gradually decreasing over time after injection stops.

Figure 7.1 shows the pressure differential versus time for monitoring well locations in the AoR and at the geometric centroid of the four horizontal injection wells. Simulated pressures at the top of the injection zone at the injection "point" increase during the 20-year injection period from 1,693 psi to a maximum of 2,139 psi. The highest pressures are in the immediate vicinity of each injection well. As shown, pressures at the injection and monitoring well locations decline over time after injection is stopped.

7.1.2 Predictions of CO_2 Migration During the Post-Injection Site Care Period

CO_2 migration during the post-injection site care period was modeled to predict CO_2 plume redistribution after injection ceases. The model predicts that the areal extent of the CO_2 plume (defined as

99.0 percent of the separate-phase CO_2 mass) increases during injection and for 2 years post-injection and then begins to decrease as buoyancy forces dominate and plume migration is predominately upward. Figure 7.2 shows the cumulative area of the CO_2 mass plume with time. The maximum plume extent, 6.46 mi^2, occurs at 22 years after the start of injection (2 years after the cessation of injection).

Table 7.1. Pressure Differential to Baseline Conditions at Well Location at the Base of the Ironton Formation for Well 3 and at the Top of the Injection Zone for the Rest of the Wells During and After Injection

	Pressure Differential (psi)				
Year	MW 1	MW 2	MW 3	MW 4	Injection Well
Distance from Injection Well (ft)	7,749	3,149	1,221	6,574	0
0 (Start injection)	0	0	0	0	0
1	116	166	0	119	289
2	155	209	0	160	339
3	181	236	0	187	365
4	200	255	0	206	381
5	215	271	0	221	393
10	263	319	0	270	424
15	292	343	1	300	438
20 Stop injection at year end)	313	358	2	320	446
21	228	242	2	234	258
22 (Approximate maximum extent of CO_2 Plume)	183	191	2	188	200
23	155	161	2	160	168
24	136	141	3	140	145
25	121	125	3	125	129
30	81	84	4	84	85
35	62	64	4	64	64
40	50	51	5	51	51
45	41	42	5	43	42
50	35	36	5	36	36
60	27	27	5	28	27
70	21	22	5	22	21
80	18	18	5	18	17
90	15	15	5	15	14
100	13	13	4	13	12

Well Identifier on Figure 7.1

MW 1	Stratigraphic Well (converted to Single-Level Monitoring Well)
MW 2	Injection Zone Multi-Level Monitoring Well
MW 3	ACZ Early-Detection Monitoring Well
MW 4	Injection Zone Single-Level Monitoring Well
Injection Well	Geometric centroid of four horizontal laterals

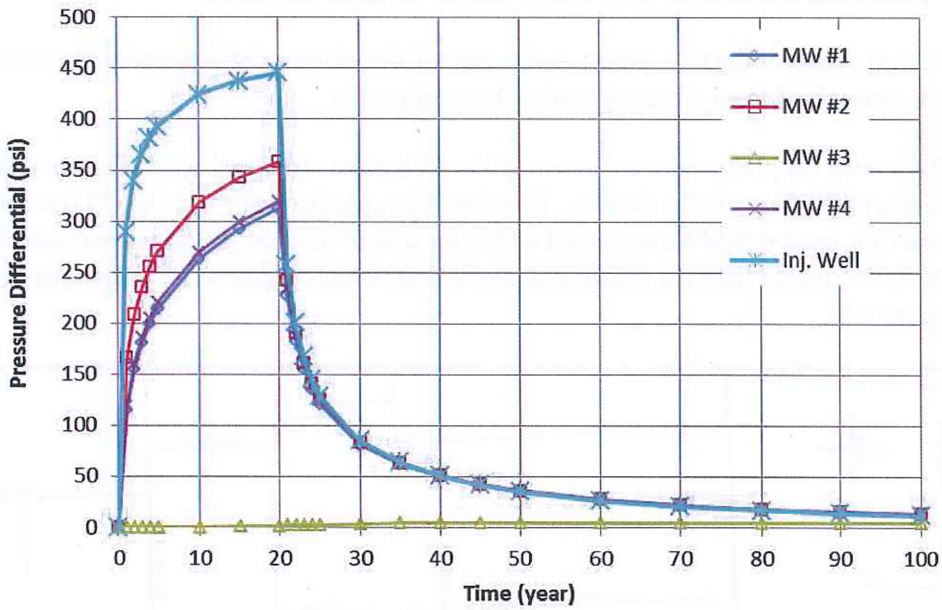

Figure 7.1. Simulated Pressure Differential Versus Time at Monitoring Well Locations

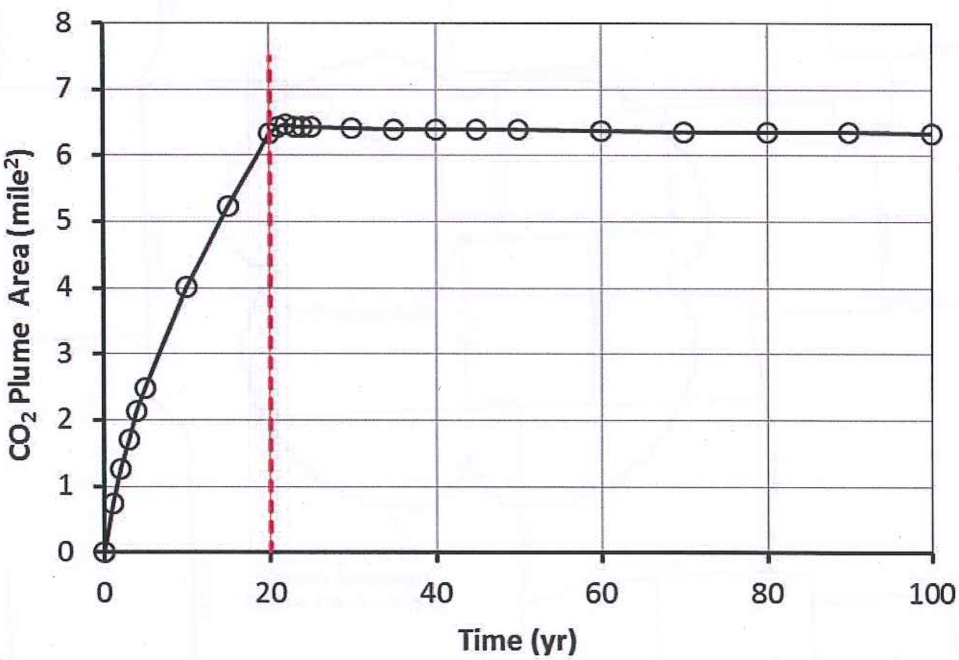

Figure 7.2. Simulated Plume Area over Time (the vertical dashed line denotes the time CO_2 injection ceases)

The physical trapping mechanisms that will facilitate the sequestration of the injected CO_2 are discussed in Section 3.1.2 in Chapter 3.0. No geochemical trapping mechanisms were modeled and such reactions are not expected to occur during the time frame of this project.

7.1.3 Predicted Extent of the CO_2 Plume at Site Closure

The predicted extent of the CO_2 plume at the time of site closure, 50 years after the cessation of CO_2 injection, was determined from the computational model results.

Figure 7.3 shows the predicted areal extent of the CO_2 plume (defined as 99.0 percent of the separate-phase CO_2 mass) at the time of site closure. The simulation predictions show that 99.0 percent of the separate-phase CO_2 mass would be contained within an area of 6.35 mi^2 at the time of site closure. This plume is only 1.7% smaller than the maximum plume area, which occurs at 22 years after the start of injection (Figure 7.2).

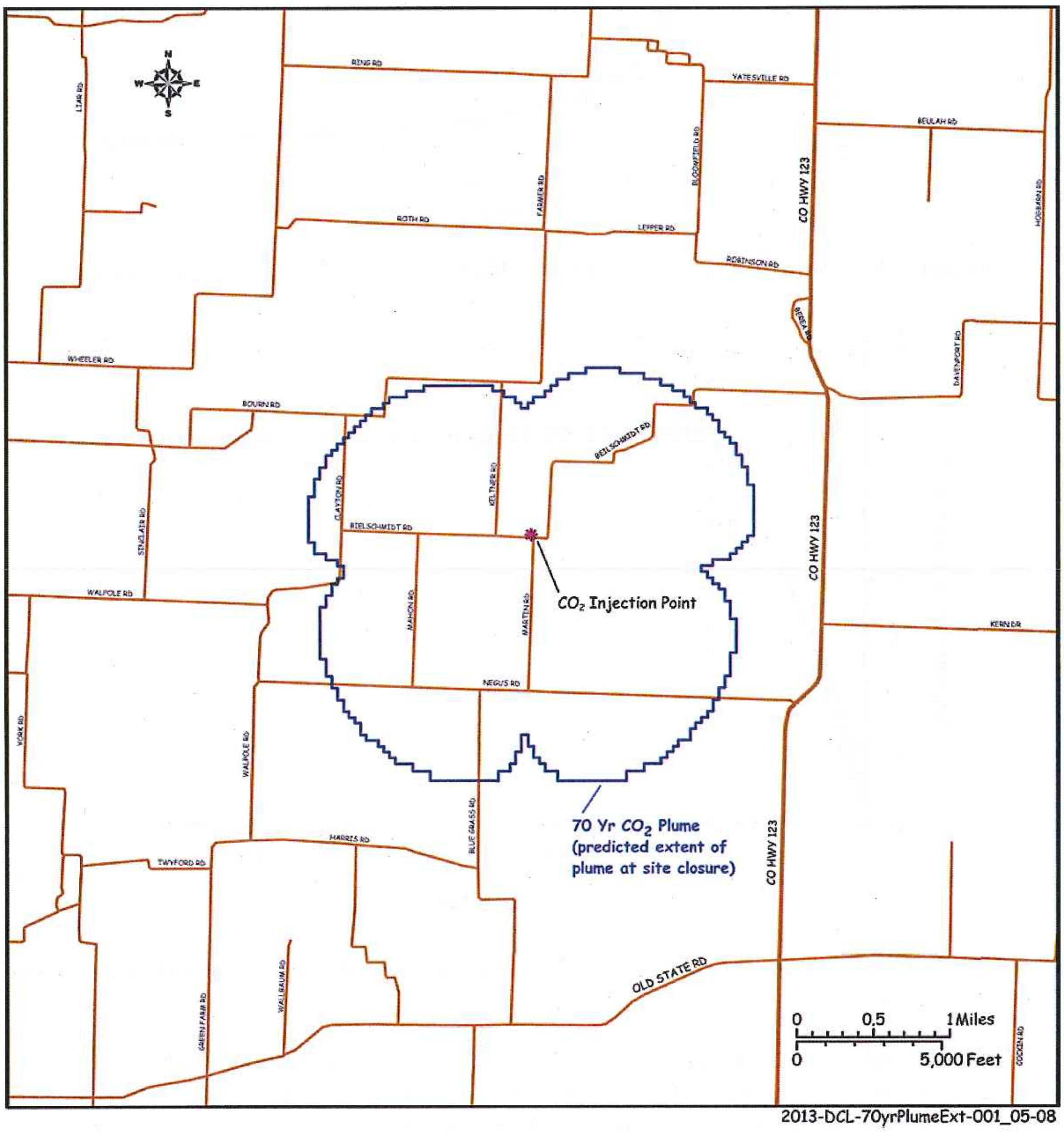

Figure 7.3. Simulated Areal Extent of the CO_2 Plume at the Time of Site Closure (70 years after CO_2 injection was initiated)

7.2 Post-Injection Monitoring Plan

Post-injection monitoring will include a combination of groundwater monitoring, storage zone pressure monitoring, and geophysical monitoring of the Morgan County CO_2 storage zone. The monitoring locations, methods, and schedule were designed to show the position of the CO_2 plume and pressure front and demonstrate that USDWs are not being endangered.

As shown in Section 7.1, lateral expansion of the CO_2 plume is projected to end at about year 22 (2 years after cessation of injection) and is relatively stable until the end of the simulation period (Figure 7.2). Pressure differentials (relative to pre-injection conditions) 25 years after cessation of injection (year 45) will decline by approximately 90 percent. The Alliance will continue to conduct monitoring as described in this plan for 50 years after cessation of CO_2 injection. Pursuant to 40 CFR 146.93((b)(2), however, the Alliance could propose a shorter post-injection site care monitoring period after injection ceases. Such a proposal would be made based on a demonstration to EPA that a shorter time period would be protective of USDWs.

7.2.1 Groundwater-Quality Monitoring

Groundwater monitoring will be conducted in a network of groundwater monitoring wells in the AoR during the post-injection site care period. Groundwater monitoring will include periodic sampling and analysis of water samples withdrawn from the wells. The groundwater samples will be analyzed for water quality and indicators of CO_2 movement into USDWs. The planned sampling frequency during the post-injection site care period will be every 5 years.

7.2.2 Carbon Dioxide Storage Zone and Pressure Monitoring

Carbon dioxide storage and pressure monitoring of the CO_2 storage zone will be conducted during the post-injection site care period with a combination of several injection zone monitoring wells and one ACZ early-detection monitoring well installed immediately above the primary confining zone. The objective of this monitoring is to detect CO_2 storage and pressure gradients, which may indicate potential for upward migration of brine with dissolved CO_2 into USDWs. As indicated in Figure 7.4 and described more fully in Chapter 5.0, Testing and Monitoring Plan, well installations will consist of four horizontal injection wells in the injection zone and an array of monitoring wells that includes injection zone, ACZ, and USDW monitoring:

- four injection wells, which will be plugged and abandoned after injection is stopped
- two single-level deep monitoring wells, which will be completed in the injection zone (one of these is the existing stratigraphic well)
- one multi-level completion located in close proximity to the injection wells, which will assess vertical anisotropy during subsequent site-characterization activities and monitor the vertical distribution of CO_2 within the injection zone
- one ACZ early-detection monitoring well, which will be installed within the first permeable interval above the confining zone. The ACZ monitoring well will be located near the injection well in the region of highest pressure buildup.
- one USDW monitoring well, which will be completed in the St. Peter Formation (the lowermost USDW) in proximity to the injection wells.

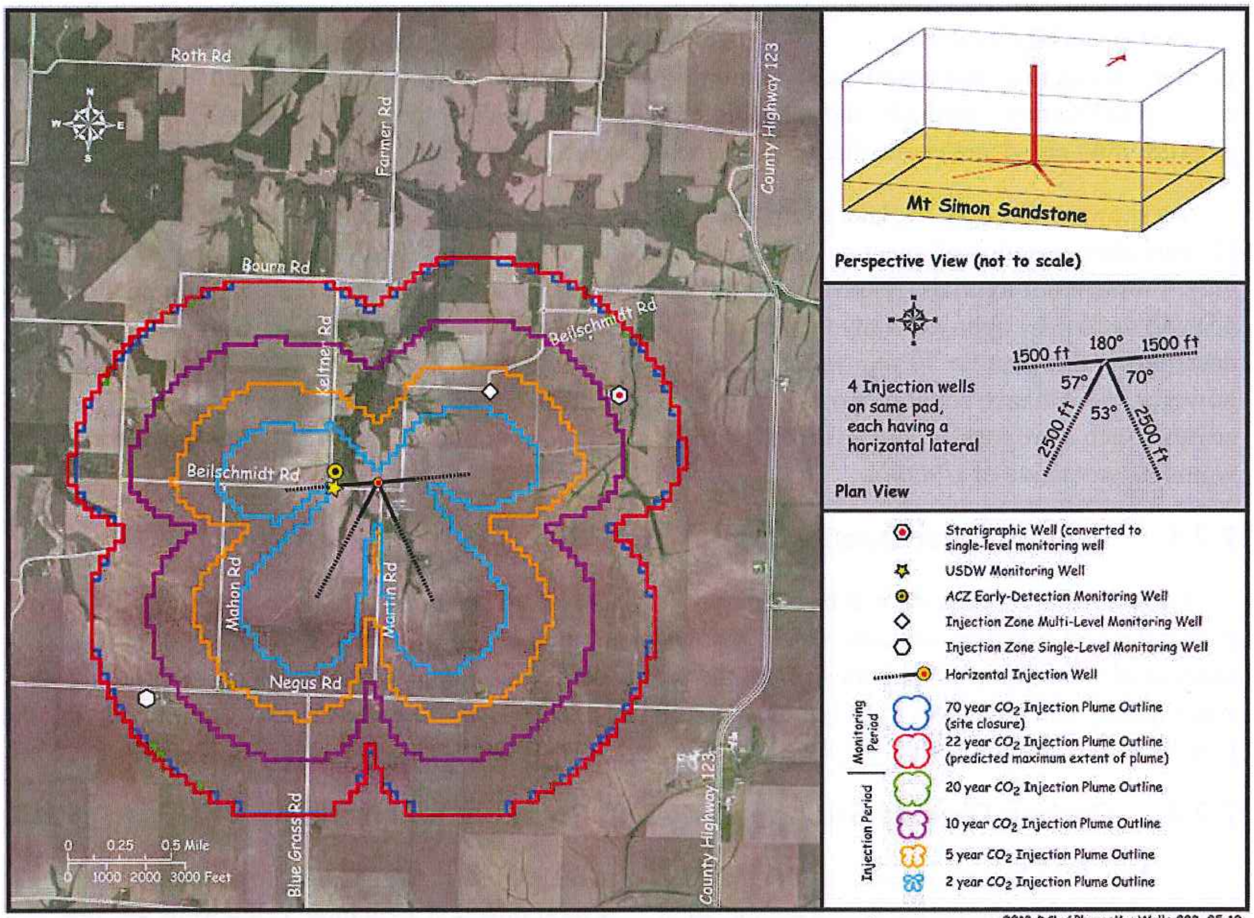

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Figure 7.4. Layout of the Horizontal Injection Wells and the Monitoring Wells and the Predicted Plume Boundaries at Different Years.

Continuous monitoring of pressure and temperature will be performed with downhole pressure/temperature transducers installed in the monitoring wells that are completed in the injection zone and above the confining zone. Pressure and temperature monitoring will be recorded with the downhole memory gauges and downloaded on a periodic basis. The Mount Simon Formation multi-level monitoring well is designed to monitor multiple discrete depth zones within the Mount Simon Formation. This installation will use either a 1) dedicated multi-level monitoring system (e.g., a Westbay System) within a single casing string completed with multiple sampling intervals or 2) a multi-level piezometer installation. Similar to the injection wells, this well will be instrumented to provide continuous pressure data-logging capabilities. The pressure gauges will be removed from the monitoring wells only when necessary (e.g., for data downloads and/or maintenance).

7.2.3 Geophysical Monitoring for CO_2 Plume Tracking

As discussed in Chapter 5.0, the Alliance proposes to undertake several testing and monitoring activities. Planned monitoring activities, and additional monitoring activities under consideration, are summarized in Tables 5.1 and 5.2, respectively. At a minimum, at least one indirect geophysical monitoring technique will be carried forward through the operational phases of the project. Monitoring approaches and methodologies will be evaluated and screened throughout the design and initial injection testing phase of the project to identify the most promising monitoring technologies under site-specific conditions. Using this screening process, the Alliance will conduct desktop studies to identify possible alternative testing and monitoring activities and will undertake field studies for those testing and monitoring alternatives that are found to be suitable.

7.2.4 Post-Injection Monitoring Locations, Methods, and Schedule

The post-injection monitoring locations, methods, and schedule are summarized in Table 7.2. Figure 7.4 shows the proposed well layout network. Final monitoring well locations will be determined during the site-characterization and construction phases. Overall, monitoring events will be scheduled every 5 to 10 years during the post-injection site care period. Groundwater quality will be monitored in the St. Peter Formation, which is designated as the lowermost USDW aquifer. As discussed previously, at least one indirect method will be used to monitor the CO_2 plume. Pressure monitoring will be performed in three deep monitoring wells and one ACZ well. Proposed monitoring methods are described in detail in Chapter 5.0

Table 7.2. Summary of Post-Injection Site Care Monitoring Schedule

Monitoring Method	Post-Injection Site Care Period
USDW Aquifer Monitoring	Every 5 years
Indirect Plume Monitoring	TBD
ACZ Pressure Differential Monitoring	Continuous
Injection Zone Pressure Differential Monitoring	Continuous

7.2.5 Reporting Schedule

During the post-injection site care period, monitoring reports will be prepared and submitted to the EPA Region 5 UIC office every 5 years. Post-injection site care monitoring reports will be submitted within 90 days of completion of field work associated with the monitoring event. The reports will summarize methods and results of the groundwater-quality monitoring, CO_2 storage zone pressure tracking, and indirect geophysical monitoring for CO_2 plume tracking. Monitoring reports will include appropriate sampling records, laboratory analysis, and field data.

7.2.6 Monitoring Plan Review and Maintenance

The post-injection site care monitoring plan will be reviewed prior to cessation of injection operations. Monitoring and operational results will be reviewed for adequacy in relation to objectives of the post-injection site care monitoring. The monitoring locations, methods, and schedule will be analyzed in relation to the size of the CO_2 storage zone, pressure front, and protection of USDWs. If the post-injection site care plan changes, a modified plan will be submitted to the EPA Region 5 UIC Branch for approval within 30 days of implementing the changes in the field.

The post-injection site care plan will be reviewed every 5 years during the post-injection site care period. Results of the plan review will be included in the post-injection site care monitoring reports. Monitoring and operational results will be reviewed for adequacy in relation to the objectives of post-injection site care monitoring. The monitoring locations, methods, and schedule will be analyzed in relation to the size of the CO_2 storage zone, pressure front, and protection of USDWs. In case of change to the post-injection site care plan, a modified plan will be submitted to the EPA Region 5 UIC Branch for approval within 30 days of making of the changes.

7.3 Site Closure Plan

Site closure will occur at the end of the post-injection site care period. Site closure activities will include decommissioning surface equipment, plugging monitoring wells, restoring the site, and preparing and submitting site closure reports. The EPA Region 5 UIC Branch will be notified at least 120 days before site closure. A revised site closure plan will be submitted if any changes have been made to the original site closure plan. After site closure is authorized, site closure field activities will be completed.

7.3.1 Surface Equipment Decommissioning

Surface equipment decommissioning will occur in two phases: the first phase will occur after the active injection phase, and the second phase will occur at the end of post-injection site care phase. The surface facilities at the storage site will include the Site Control Building and the WAPMMS (Well Annular Pressure Maintenance and Monitoring System) Building.

At the end of the active injection period, plume monitoring will continue, but there will be no further need for the pumping and control equipment. The Site Control Building will be demolished. All features will be removed except the WAPMMS Building, a 12-ft-wide access road with five parking spaces, a concrete sidewalk from the parking lot to the building, underground electrical and telephone services, and a chain-link fence surrounding the building. The common wall between the WAPMMS Building and the Site Control Building will be converted to an exterior wall. The injection wells will be plugged and capped below grade (see Chapter 6.0). The gravel pad will be removed. The WAPMMS Building at the storage site will be repurposed to act as the collection node for data from the plume monitoring equipment. The building will contain equipment to receive real-time data from the monitoring wells and other monitoring stations and send the data via an internet connection to be analyzed offsite during the 50-year post-injection monitoring period.

All surface facilities will be removed at the end of the post-injection site care phase. These facilities will include the WAPMMS Building, the access road with parking spaces, all sidewalks, underground electrical and telephone services, and fencing at the injection well sites. The site will be reclaimed to and returned to pre-development condition.

7.3.2 Monitoring Well Plugging

Upon site closure, all monitoring wells will be plugged and capped below grade in a manner similar to that described in Chapter 6.0, Injection Well Plugging Plan, for the injection wells. All deep monitoring wells at the site will be plugged to prevent any upward migration of the CO_2 or formation fluids to USDWs. Each of the deep monitoring wells will be plugged and abandoned using best practices to prevent and communication of fluids between the injection zone and the USDWs. The deep monitoring wells in the injection interval have a direct connection between the injection formation and ground surface. The well-plugging program will be designed to prevent communication between the injection zone and the USDWs.

Before the wells are plugged, the internal and external integrity of the wells will be confirmed by conducting cement-bond, temperature, and noise logs on each of the wells. In addition, a pressure fall-off test will be performed above the perforated intervals (where present) to confirm well integrity. The results of the logging and testing will be reviewed and approved by appropriate regulatory agencies prior to plugging the wells.

The wells with perforations (the injection zone monitoring wells and the ACZ monitoring wells) will be plugged using a CO_2-resistant cement retainer method to cement the perforated intervals and a balanced plug method to cement the well above the perforated zones and the cement retainer. The seismic monitoring well will not have perforations; therefore, only the balanced plug method will be used to plug these wells. Once the interior of the casing has been properly plugged with cement, the casing will be cut off below ground and capped. Regulations at the time of the plugging and abandonment will dictate the specifications regarding the depth at which the casing is cut and the method used to cap the well.

7.3.3 Site Restoration/Remedial Activities

After the active injection phase, surface areas of the storage site will be reclaimed and returned to pre-development condition. All gravel pads, access roads, and surface facilities will be removed, and the land will be reclaimed for agricultural or other pre-development uses.

At the end of the post-injection site care phase, all remaining surface facilities will be removed, including all remaining buildings, access roads and parking areas, sidewalks, underground electric and telecommunication facilities, and fencing. The land will be reclaimed for agricultural or other pre-development uses.

7.3.4 Site Closure Reporting

A site closure report will be submitted to the EPA Region 5 UIC Branch within 90 days of site closure. The site closure report will include the following information:

- documentation of appropriate well plugging, including a survey plat of the injection well location
- documentation of the well-plugging report to Illinois and local agencies that have authority over drilling activities at the facility site
- records reflecting the nature, composition, and volume of the CO_2 injected in UIC wells.

In association with site closure, a record of notation on the facility property deed will be added to provide any potential purchaser of the property with the following information:

- notification that the subsurface is used for CO_2 storage
- the name of the Illinois and local agencies and the EPA Region 5 Office to which the survey plat was submitted
- the volume of fluid injected, the injection zone, and the period over which injection occurred.

Post-injection site care and site closure records will be retained for 10 years after site closure. At the conclusion of this 10-year period, these records will be delivered to the EPA Region 5 UIC Branch for further storage.

7.4 References

40 CFR 146.93. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 146, "Underground Injection Control Program: Criteria and Standards." Section 93, "Post-injection site care and site closure."

EPA (U.S. Environmental Protection Agency). 2011. *Draft Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance for Owners and Operators*. EPA 816-D-10-012, Office of Water (4606M), Washington, D.C.

EPA (U.S. Environmental Protection Agency). 2010. *Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO_2) Geologic Sequestration (GS) Wells Final Rule* (40 CFR 146.93). Washington, D.C.

8.0 Class VI Emergency and Remedial Response Plan

This chapter describes the emergency and remedial response actions the Alliance would undertake at the Morgan County CO_2 storage site in the unlikely event of an emergency that could endanger an USDW within the AoR described in Chapter 3.0, Area of Review and Corrective Action Plan. This chapter is intended to demonstrate the Alliance's compliance with 40 CFR 146.94 and takes into account the EPA's March 2011 *Draft Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance for Owners and Operators*, including the "Sample Template of an Emergency and Remedial Response Plan" in Appendix E (EPA 2011). Prior to beginning operations, the Alliance will also prepare a comprehensive Emergency and Remedial Response Plan to address protection for all environmental resources and infrastructure that could be affected by an adverse event and will describe the actions the Alliance would undertake to protect such resources and infrastructure as needed.

Section 8.1 describes the development of the Alliance's Emergency and Remedial Response Plan, including the components of the plan developed for the protection of USDWs. Section 8.2 describes the emergency or remedial response actions the Alliance will undertake to protect USDWs if an adverse event were to occur. Section 8.3 describes the steps the Alliance will take to amend its Class VI Emergency and Remedial Response Plan as needed. Section 8.4 describes staff training and exercise procedures. Section 8.5 provides emergency contacts (to the extent known at the present time) and Section 8.6 describes communications with adjacent landowners and emergency response personnel. Section 8.7 describes the components of the communications plan and emergency procedures that will be developed for the Alliance's comprehensive Emergency and Remedial Response Plan. References for sources cited in this chapter are provided in Section 8.8.

8.1 Development of a Comprehensive Emergency and Remedial Response Plan

The Alliance will develop a comprehensive Emergency and Remedial Response Plan for its Morgan County CO_2 storage site. Following the EPA's recommendations in its draft guidance and in keeping with good business practices, the Alliance will identify what actions will be necessary in the unlikely event of an emergency at the site. The plan will ensure that site operators know which entities and individuals are to be notified and what actions need to be taken to expeditiously mitigate any emergency situation and protect human health and safety and the environment, including USDWs.

The Alliance will develop its comprehensive plan as follows:

1. Identify potential emergency scenarios that could occur during construction, operation, or post-injection site care. All potential emergency situations, regardless of likelihood, will be identified.
2. Identify the resources or infrastructure that could be adversely affected if the emergency events were to occur.
3. Describe the response actions that must be taken to address the emergency.
4. Prepare a list of facility emergency 24-hour contacts and a list of people to contact in an emergency.

5. Prepare a communications plan and emergency notification procedures describing the potential audiences and communication methods.

6. Prepare a Safety and Health Plan.

This comprehensive plan will be available to the EPA when it is completed.

To demonstrate compliance with the EPA's UIC Class VI regulations, the remainder of this chapter provides the part of the Alliance's Emergency and Remedial Response Plan that describes the actions the Alliance will take to address movement of the injection or formation fluids that could endanger a USDW during construction, operation, or post-injection site care periods.

8.1.1 Identification of Adverse Events

Despite the extensive efforts to site, engineer, construct, and operate the injection wells (as described throughout this supporting documentation), there are circumstances that, while unlikely, could lead to migration or a release of CO_2 requiring emergency and remedial response actions. Specifically, the movement of the CO_2 plume or pressure front could differ from the predicted AoR and, as a result, intercept transmissive faults and fractures or encounter previously unidentified fractures or abandoned wells. In addition, faults and fractures could be generated and become conduits for CO_2 or brine movement from the injection zone. Equipment malfunctions could also occur.

Risk Levels

Although the risk level (as expressed in terms of the likelihood of occurrence and the severity of the consequences) varies among these events, the Alliance has not attempted to assign risk levels to them as suggested in the EPA's draft guidance. Rather, the Alliance has developed emergency and remedial response actions for all possible events regardless of their probability of occurrence.

This section identifies adverse events that could occur during the construction, operation, and post-injection site care periods. For each event, the Alliance developed a thorough description of potential response actions that will be applied to stop, control, and remedy an unplanned release of CO_2 or brine from the injection zone in order to protect USDWs.

A set of adverse events has been identified that could indicate the potential for or result in the unintended release of CO_2 or movement of brine from the Mount Simon Sandstone. The possible scenarios consist of both slow and sudden releases of CO_2 or brine. Such releases will result in the implementation of emergency or remedial actions as described in Section 8.2.

Table 8.1 lists the potential adverse events that could occur during the construction, injection, and post-injection site care periods that will trigger response actions to protect USDWs.

Table 8.1. Potential Adverse Events

Injection Period
- Loss of mechanical integrity (injection or monitoring wells)
- Migration of CO_2 from injection zone through faults and fractures
- Migration of CO_2 from injection zone through undocumented wells
- Migration of CO_2 from injection zone through failure of the confining zone (loss of containment)
- Monitoring equipment failure or malfunction
- Movement of brine from injection zone
- Earthquake

Post-Injection Site Care Period
- Loss of mechanical integrity (monitoring wells)
- Migration of CO_2 from injection zone through faults and fractures
- Migration of CO_2 from injection zone through undocumented wells
- Migration of CO_2 from injection zone through failure of the confining zone (loss of containment)
- Monitoring equipment failure or malfunction
- Movement of brine from injection zone
- Earthquake

8.1.2 Resources or Infrastructure Potentially Affected

As described in Chapter 3.0, the delineated AoR (based on modeling results) is an area of approximately 5,000 ac. The Alliance also identified a 25-mi^2 survey area around the injection wells for assessment of any other possible conduits from the injection zone.

The land surface above the AoR and the survey area is used primarily for agriculture. Residences and farm-related buildings are scattered across the land surface, particularly along roads. Surface-water features such as creeks, streams, and impoundments formed by small earthen dams also are found in the area. Limited stretches of woodland parallel stretches of the streams. Most of the land surface is farmland. Shallow groundwater-supply wells are associated with residences.

Using Morgan County property records, the Alliance conducted an inventory of all buildings within the survey area. Then, using the Beacon™ web-based database, photographs of the structures on each parcel were viewed and building types on each parcel were categorized and tabulated. Approximately 65 residences were identified within the survey area, with 10 residences within the AoR. In the unlikely event that CO_2 or formation fluids (brine) from the injection zone move through release pathways (e.g., unknown faults or abandoned wells), brine may diffuse toward the over-pressurized, lowermost USDW (St. Peter Sandstone). It should be noted that no shallow groundwater-supply wells currently extend into this highly brackish USDW. It is extremely unlikely that CO_2 migration from the injection zone could reach and adversely affect shallow groundwater-supply wells or reach surface-water bodies.

Figure 8.1 shows the location of residences, known water wells, and surface-water bodies within the AoR and the survey area, relative to the Morgan County CO_2 storage site.

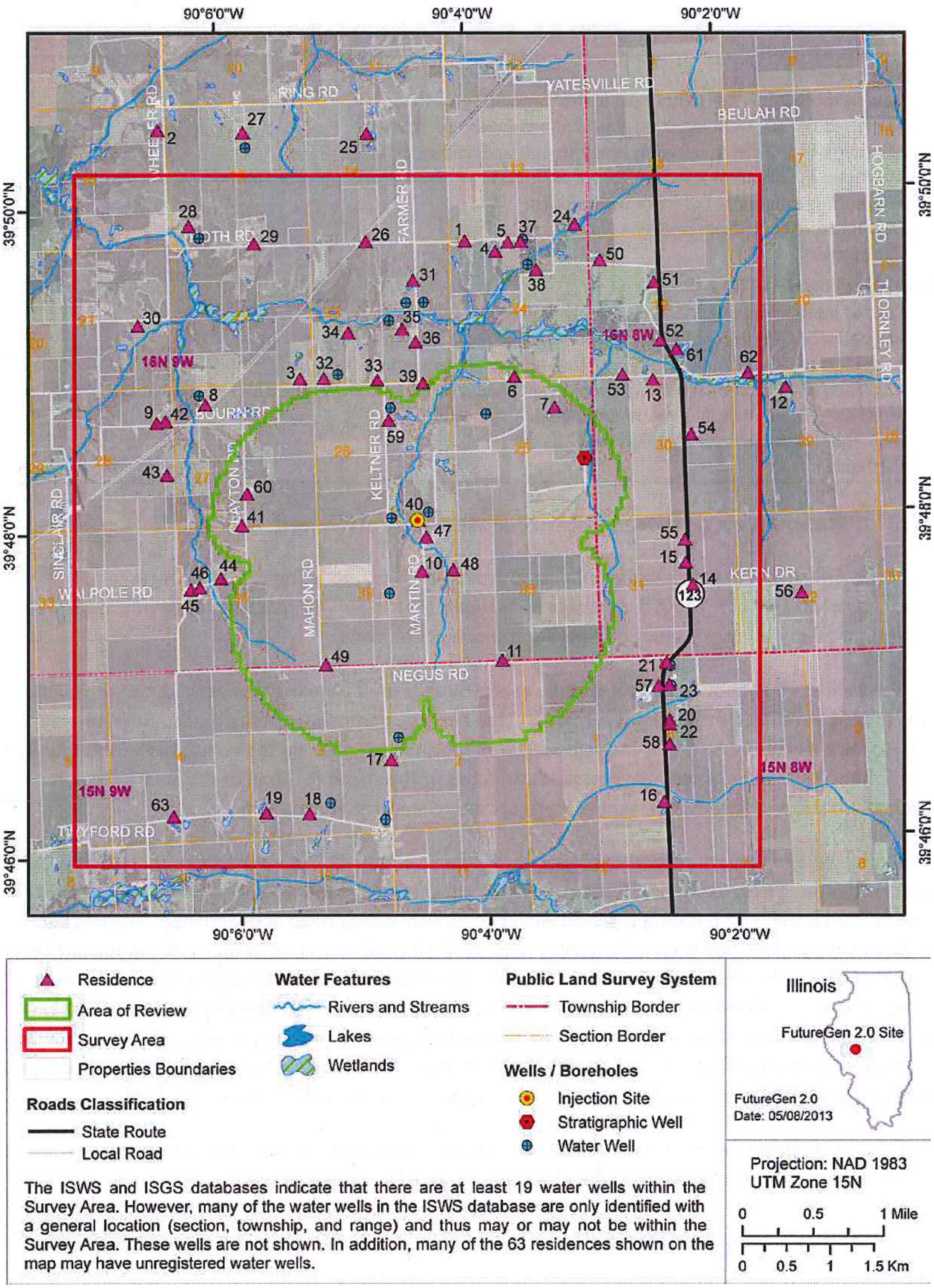

Figure 8.1. Map of Residences, Water Wells, and Surface-Water Features Within the Delineated AoR and Survey Area

8.2 Emergency and Remedial Response Actions to Protect USDWs

As described in other chapters of this supporting documentation, the Alliance has undertaken extensive efforts to characterize the proposed storage site, including identifying any possible geologic or other conduits between the injection zone and USDWs (see Chapter 2.0, Geology and Hydrology). The Alliance will also construct and operate the injection wells in compliance with UIC regulatory requirements (see Chapter 4.0, Construction and Operations Plan) and will implement a comprehensive testing and monitoring effort to verify that the Morgan County CO_2 storage site is operating as permitted and is not endangering USDWs (see Chapter 5.0, Testing and Monitoring). After injection ceases, the injection wells will be plugged in accordance with regulatory requirements (see Chapter 6.0, Injection Well Plugging Plan) and the site will continue to be monitored for as long as is required to demonstrate that USDWs will not be endangered (see Chapter 7.0, Post-Injection Site Care and Site Closure Plan). In sum, the Alliance has undertaken or has committed to undertaking all necessary actions to site, engineer, construct, and operate the injection wells in compliance with the applicable UIC regulations and to protect USDWs.

Despite these actions and commitments to prevent adverse events from occurring or to reduce the likelihood that adverse events will affect the permanent storage of CO_2 at the Morgan County site, if an adverse event did occur, the Alliance will deploy a variety of emergency or remedial responses depending on the circumstances (e.g., the location, type, and volume of a release) to protect USDWs. Table 8.2 summarizes the types of adverse events that could occur and the likely sequence of responses that will be undertaken to protect USDWs. Whether the adverse event occurred during construction, operation, or post-injection site care will affect the response. Emergency and remedial responses will be considered in a sequence of progressively more extensive actions. The list for each adverse event is ordered accordingly. This arrangement of responses is conceptual: the reality of an adverse event will determine the actual response(s) deployed. If any adverse event occurred, the Alliance will notify the EPA Director within 24 hours. Following actions taken to address the emergency, the Alliance will demonstrate the efficacy of the remedial response actions to the satisfaction of the Director before resuming injection operations. The Director will be informed when injection operations are scheduled to resume.

Table 8.2. Adverse Events Potentially Affecting USDWs

Event/Description	Time of Event	Avoidance Measures	Potential Response Actions	Response Personnel	Equipment
Loss of mechanical integrity (injection or monitoring wells): As a well is drilled, multiple concentric strings of casing are installed and cemented. If the cement seal with the outer annulus or inner annuli failed, there will be a pathway for cross contamination of formations, including USDWs. During injection, CO_2 could travel through geologic formations above the injection and confining zones into a USDW. Post-injection, CO_2 could travel through a compromised monitoring well into a USDW.	Construction/ drilling; operations/ injection; post-injection site care	Care in well construction particularly with respect to cement placement	Specific response will be dependent on the type of well (injection or monitoring). In general, the following will be undertaken: – Stop injection. – Check the monitoring record in an attempt to identify cause. – Log hole; check casing and borehole condition. – Repair annulus seal or replace casing. – Create a hydraulic barrier by reservoir pressure downstream of leak. – Grout or install chemical sealant barrier in an adjoining well to block leak. – Abandon well by completely closing it (seal with cement). – Drill new well if necessary. – Conduct groundwater remediation as required.	Drilling crew, supervising professionals, geotechnical subcontractors	Existing or newly mobilized drill rig, logging equipment, cement or casing as required
Migration of CO_2 from injection zone through faults and fractures: This could occur as a result of existing unknown faults or fractures or new, seismically induced faults or fractures.	Operations/ injection; post-injection site care	Extensive geophysical characterization has not identified faults or fractures	– Stop injection. – Assess cause by reviewing monitoring data. – Conduct geophysical survey in an attempt to locate leaks. – If warranted, resume injection, but reduce injection pressure by reducing flow rate or inject through additional injection wells. – Intensify monitoring to determine whether migration continues with continued injection.		

Table 8.2. (contd)

Event/Description	Time of Event	Avoidance Measures	Potential Response Actions	Response Personnel	Equipment
			– Lower reservoir pressure by removing liquids (water, brine, etc.) from the storage reservoir. – Intersect the migration with extraction wells in the vicinity of the leak, withdraw and re-inject. – Lower the reservoir pressure by promoting new pathways to access new volumes or strata in the storage reservoir. – Create a hydraulic barrier by increasing reservoir pressure upstream of the leak. – Inject grout or chemical sealant to block the leak. – Stop injection to stabilize the reservoir system. – Stop injection, extract CO2 from the reservoir, and re-inject in a more suitable location. – Conduct groundwater remediation as required.	Onsite operating staff, supervising professionals, geophysical consultants	Newly mobilized drill rig, geophysics monitoring trucks
Migration of CO_2 from injection zone through undocumented wells	Operations/ injection; post-injection site care	Drilling records and site walkthroughs were conducted. Only three wells were identified and none penetrate the confining zone.	– Stop injection. – Assess the cause by reviewing monitoring data. – Conduct a geophysical survey in an attempt to locate migration. – Repair leaking wells by re-plugging with cement. – Repair leaking injection wells with well-recompletion techniques such as replacing casing and packers or re-cementing annular spaces. – Plug and abandon wells that cannot be repaired.	Drilling crew, supervising professionals, geotechnical subcontractors	Newly mobilized drill rig, logging equipment, cement or casing as required

Table 8.2. (contd)

Event/Description	Time of Event	Avoidance Measures	Potential Response Actions	Response Personnel	Equipment
			– Create a hydraulic barrier by increasing reservoir pressure upstream of the leak. – Install chemical sealant or grout barriers to block leaks. – Conduct groundwater remediation as required.		
Migration of CO_2 from injection zone through failure of the confining zone (loss of containment)	Operations/ injection; post-injection site care	Careful monitoring and control of injection flow and pressure with periodic monitoring well sampling	– Stop injection. – Verify integrity of well bore. – Proceed to response for migration of CO2 through well bore, through faults or fractures, or through undocumented abandoned wells according to location of migration. – Conduct groundwater remediation as required.	Onsite operating staff, supervising professionals, geophysical consultants	Newly mobilized drill rig, geophysics monitoring trucks
Monitoring well equipment malfunction: Failure or malfunction of well instrumentation that monitors wellhead pressure, temperature, or annulus pressure could result in false readings. In this event, the reservoir could become over-pressurized, possibly resulting in hydraulic fractures in the confining zone.	Operations/ injection	Preventive maintenance of equipment	– Stop injection. – Review monitoring records. – Perform reservoir injection tests to determine extent of fracturing. – Completely close the well (seal with cement). – Drill new well if necessary. – Conduct groundwater remediation as required.	Drilling crew, supervising professionals, geotechnical and instrument subcontractors	Newly mobilized drill rig and/or instrument repair truck
Movement of brine from injection zone: This could occur as a result of existing unknown faults or fractures, seismically induced faults or fractures, or failure of the confining zone (loss of containment).	Operations/ injection; post-injection site care	Careful monitoring and control of injection flow and pressure with periodic monitoring well sampling.	– Stop injection. – Assess cause by reviewing monitoring data. – Proceed to response for migration of CO2 from injection zone through faults or fractures according to location of migration. – Conduct groundwater remediation as required.	Onsite operating staff, supervising professionals, geophysical consultants	Newly mobilized drill rig, geophysics monitoring trucks

Table 8.2. (contd)

Event/Description	Time of Event	Avoidance Measures	Potential Response Actions	Response Personnel	Equipment
Earthquake: If a seismic event were to occur, induced faults or fractures or well leakage could occur.	Operations/ injection; post-injection site care	The site is located in a seismically stable region.	– Stop injection. – Evaluate integrity of storage volume by gas pressure response and monitoring instrumentation. – If a leak is detected, conduct a geophysical survey to locate new fracture zone. – If warranted, resume injection but reduce injection pressure by reducing flow rate or inject through additional injection wells. – Intensify monitoring to determine whether migration is continuing with continued injection. – Lower reservoir pressure by removing liquids (water, brine, etc.) from the storage reservoir. – Intersect the migration with extraction wells in the vicinity of the leak, withdraw, and re-inject. – Lower the reservoir pressure by promoting new pathways to access new volumes or strata in the storage reservoir. – Create a hydraulic barrier by increasing reservoir pressure upstream of the leak. – Inject grout or chemical sealant to block leak. – Stop injection to stabilize reservoir system. – Stop injection, extract CO2 from reservoir, and re-inject in more suitable location. – Conduct groundwater remediation as required.	Onsite operations staff, drilling crew, supervising professionals, geotechnical contractors, mechanical contractors, as required	Newly mobilized drill rig, logging equipment, cement or casing, as required

Table 8.2. (contd)

Event/Description	Time of Event	Avoidance Measures	Potential Response Actions	Response Personnel	Equipment
Groundwater/USDW contamination: If there were a failure of the confining zone or injection or monitoring well, CO_2 or brine could reach groundwater, requiring remediation.	Operations/ injection; post-injection site care	The entire CO_2 injection project is focused on preventing escape of CO_2 while sequestering the CO_2. The FutureGen oxy-combustion process incorporates gas-cleaning processes to remove at least 97% of contaminants, including mercury, prior to injection. Trace contaminants that might be entrained in CO_2 leaking into USDWs will pose inconsequential risk to the water quality.	– Stop injection. – Assess cause by reviewing monitoring data. – Conduct a geophysical survey in an attempt to locate migration. – If the leak cannot be located or while pursuing corrective measures for the leak, the following remedies may be considered: ✓ Drill wells to intersect accumulations in groundwater, preferably near CO_2 aquifer entrance zones. Extract groundwater contaminated with gaseous or dissolved CO_2 water and treat ex situ. ✓ Dissolve mineralized CO_2 (carbonates) in water and extract as a dissolved phase through an extraction well for ex situ air stripping. ✓ Extract groundwater with metals mobilized by CO_2 and treat ex situ to remove metals and residual CO_2. ✓ Use hydraulic barriers to immobilize and contain contaminants by deploying injection and extraction wells. ✓ Deploy in situ chemical or biological treatment technologies to enhance biochemical degradation or stabilization of CO_2-related contaminants. ✓ Create a hydraulic barrier by	Drilling crew, supervising professionals, geotechnical subcontractors, environmental or water-treatment contractors	Water-treatment equipment, new wellhead plumbing to and from water-treatment equipment, reagents for optional in situ treatment, newly mobilized drill rig, logging equipment, cement or casing, as required

Table 8.2. (contd)

Event/Description	Time of Event	Avoidance Measures	Potential Response Actions	Response Personnel	Equipment
			increasing reservoir pressure upstream of a leak. ✓ Place grouts or chemical sealant barriers to block leaks. ✓ Discontinue injection. ✓ Provide individual water-treatment systems for each water-supply well user. The configuration for each ex situ treatment system will be determined by water chemistry. Applicable treatment technologies include but are not limited to aeration, pH adjustment, ion exchange, oxidizing filter (manganese greensand), membrane filtration, etc.)		

8.3 Amending the Emergency and Remedial Response Plan

The Alliance will review and, as necessary, revise its Emergency and Remedial Response Plan at least once every 5 years. In addition, the Alliance will review and, as necessary, revise its Emergency and Remedial Response Plan within 1 year of an AoR reevaluation or within 1 year after any significant changes to the facility such as the addition of injection or monitoring wells. Any revised plan will be submitted to the EPA UIC Program Director for approval. If, after a review, the Alliance determines that no revisions are necessary, the Alliance will submit its determination and the basis for it to the EPA UIC Program Director.

8.4 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 the responsibilities of their work assignments. Initial training will be conducted by, or under the supervision of, a project operations manager or a designated representative. Trainers will be thoroughly familiar with the operations plan and Emergency and Remedial Response Plan.

Facility personnel will participate in annual training that teaches them to perform their duties in ways that prevent the discharge of CO_2. 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.

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 the instructor's signature will be maintained.

8.5 Emergency Contacts

If a CO_2 release were detected, the Emergency Coordinator and Operations Manager on duty will be notified immediately. The Emergency Coordinator will be responsible for notifying offsite emergency agencies and resources. If the Emergency Coordinator was not available, the Operations Manager will contact outside emergency response organizations appropriate for the situation. These organizations are listed in Table 8.3. The EPA UIC Program Director will also be notified within 24 hours.

Agency emergency response services will also be provided by the ISGS, IDNR, and USGS Water Resources for Illinois.

Table 8.3. Outside Emergency Response

Agency	Location	Phone
Fire	Alexander, IL	911 217-478-3341
Ambulance	Jacksonville, IL	911 217-245-7540
Passavant Area Hospital	Jacksonville, IL	217-245-9541
State Police		217-786-7101
Illinois Emergency Management Agency	Springfield, IL	217-782-7860
Illinois Emergency Management Agency/Region Six	Springfield, IL	217-782-0922
Jacksonville/Morgan County Emergency Services & Disaster Agency	Jacksonville, IL	217-479-4616
Sheriff	Jacksonville, IL	217-245-4143

In addition to the emergency contact lists, a list of contacts for state agencies within the AoR is presented in Table 8.4. There are no federally recognized Native American Tribes located within the AoR.

Table 8.4. Agency Emergency Response

Agency	Person	Position	Address and Phone
Illinois State Geological Survey	Randall A. Locke, II	Environmental Geochemist and Head Geochemistry Section	Room 387, Natural Resources Building 15 E. Peabody University of Illinois Champaign, IL 61820 217-333-3866
Illinois Department of Natural Resources	-	Office of Law Enforcement	One Natural Resources Way Springfield, IL 62702 217-785-8407
USGS Water Resources for Illinois	-	Illinois Water Science Center	1201 W. University Avenue, Suite 100 Urbana, IL 61801 (217) 328-8747

8.6 Communications with Adjacent Landowners and Emergency Response Personnel

Prior to the start of CO_2 injection operations, the Alliance will formally communicate with landowners living adjacent to the storage site to provide information on the nature of the operations, potential risks, and appropriate response approaches under various emergency scenarios.

8.7 Communications Plan and Emergency Notification Procedures

The Alliance's comprehensive Emergency and Remedial Response Plan will include a communications plan and describe emergency notification procedures. Among other things, this will include the following information:

- emergency response contact(s) and role(s)
- communication methods (e.g., Internet, newspapers, public service announcements via broadcast radio or TV)
- other contacts: e.g., local water systems, CO_2 source(s) and pipeline operators, potentially affected landowners, regional response teams, etc.
- the location of the injection and monitoring wells (coordinates and directions to the storage site)
- a map of the area including the location of the wells, nearby population centers, and sensitive environments
- schematics and diagrams of the facility and the well, including the location of monitoring equipment and emergency shutoffs.

8.8 References

40 CFR 146.94. Code of Federal Regulations, Title 40, *Protection of Environment,* Part 146, "Underground Injection Control Program: Criteria and Standards," Section 94, "Emergency and remedial response."

EPA (U.S. Environmental Protection Agency). 2011. *Draft Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance for Owners and Operators.* EPA 816-D-10-012, Office of Water (4606M), Washington, D.C.