Denbury Carbon Solutions, LLC

Testing and Monitoring Plan

Orion Storage Facility, Baldwin County, Alabama

Denbury

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ACZ	Above Confining Zone
AoR	Area of Review
ASTM	American Society for Testing and Materials
BHP	Bottom Hole Pressure
BHT	Bottom Hole Temperature
CO_2	Carbon Dioxide
CFR	Code of Federal Regulations
CM	Corrective Maintenance
EM	Electromagnetic
ERRP	Emergency and Remedial Response Plan
InSAR	Interferometric Synthetic Aperture Radar
mg/L	Milligram per Liter
P/T	Pressure and temperature
PM	Preventive
PNL	Pulsed Neutron Log
QASP	Quality Assurance and Surveillance Plan
QC	Quality Control
QSP	Quarterly Sample Plan
SRT	Step Rate Test
TDS	Total Dissolved Solids
USDW	Underground Source of Drinking Water
USEPA	United States Environmental Protection Agency
USIT	Ultrasonic Imager Tool

1.0 FACILITY INFORMATION

Facility Name: Orion Storage Facility

[redacted]

Mailing Address: 5851 Legacy Circle, Suite 1200

Plano, Texas 75024

[redacted]

This Testing and Monitoring Plan describes how Denbury Carbon Solutions, LLC (Denbury) will monitor the Orion Storage Facility site pursuant to 40 CFR 146.90. In addition to demonstrating that the well is operating as planned, the carbon dioxide (CO_2) plume and pressure front are moving as predicted, and that there is no endangerment to underground sources of drinking water (USDW), the monitoring data will be used to validate and adjust the geological models used to predict the distribution of the carbon dioxide within the storage zone to support Area of Review (AoR) reevaluations and a non-endangerment demonstration.

Results of the testing and monitoring activities described below may trigger action according to the Emergency and Remedial Response Plan (ERRP).

2.0 OVERALL STRATEGY AND APPROACH FOR TESTING AND MONITORING

This Testing and Monitoring plan for the Orion Storage Facility includes an analysis of the injected CO_2, periodic testing of the injection well, a corrosion-monitoring plan for the CO_2 injection well components, a leak detection and monitoring plan for surface components of the CO_2 injection system, and a leak detection plan to monitor for potential movement of the CO_2 outside of the storage reservoir. As such, this plan simultaneously meets the permit requirements for three required monitoring activities:

1) Corrosion monitoring and prevention;
2) Surface leak detection and monitoring; and
3) Subsurface leak detection and monitoring.

A combination of the above monitoring efforts will be used to verify that the geologic storage project is operating as permitted and is protecting USDWs. An overview of these individual monitoring efforts is provided in Table 1 along with the part of the storage site that is monitored by each method. A regular assessment and adaptation of the monitoring program (i.e., a minimum of every 5 years) will be conducted to ensure that it remains appropriate for the site and is adequately tracking the injected CO_2, thereby providing an accurate assessment of the performance of the surface/subsurface equipment and subsurface geologic structures in containing the stored CO_2. If needed, alterations to the monitoring program (i.e., technologies applied,

frequency of testing, etc.) will be submitted for approval by United States Environmental Protection Agency (USEPA). Results of pertinent analyses and data evaluations conducted as part of the monitoring program will be compiled and reported, as required. [redacted]

Additional details of the individual efforts of the monitoring program are provided in the remainder of this document.

[redacted]

2.1 QUALITY ASSURANCE AND SURVEILLANCE PROCEDURES

A quality assurance and surveillance plan (QASP) for all testing and monitoring activities, pursuant to 40 CFR 146.90(k), is provided in the Appendix to this Testing and Monitoring Plan.

2.2 REPORTING PROCEDURES

Denbury will report the results of all testing and monitoring activities to the USEPA in compliance with the requirements under 40 CFR 146.91.

3.0 ANALYSIS OF INJECTED CO_2 AND INJECTION WELL TESTING

3.1 CO_2 ANALYSIS

Prior to injection, Denbury will determine the chemical and physical characteristics of the CO_2 stream using appropriate analytical methods as described in the attached QASP document. [redacted]

[redacted]

3.1.1 Analysis Parameters

According to the requirements of 40 CFR 146.90 (Testing and Monitoring Requirements) of the Class VI UIC Regulation, analysis of the CO_2 stream is required with sufficient frequency to provide data representative of its chemical and physical characteristics. [redacted]

3.1.2 Sampling Method

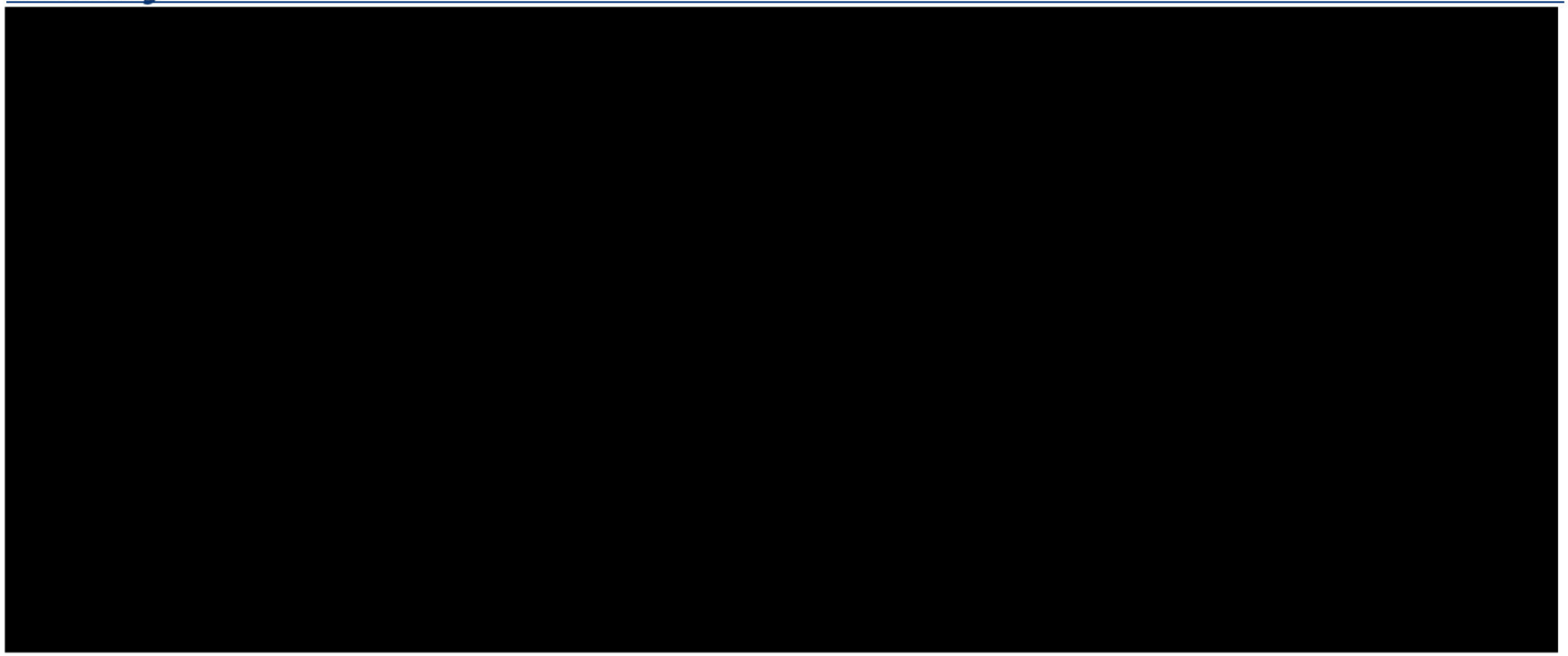
[redacted]

3.2 INJECTION WELL INTEGRITY TESTS

Until the CO_2 injection well is plugged, Denbury will be able to monitor its external mechanical integrity. [redacted]

4.0 CONTINUOUS RECORDING OF OPERATIONAL PARAMETERS

Denbury will ensure operation of continuous recording devices and alarms and automatic shut-off systems as required by 40 CFR 146.88(e) [redacted]



[redacted]

5.0 CORROSION MONITORING AND PREVENTION PLAN

[redacted]

[redacted]

6.0 SURFACE LEAK DETECTION AND MONITORING PLAN

[redacted]

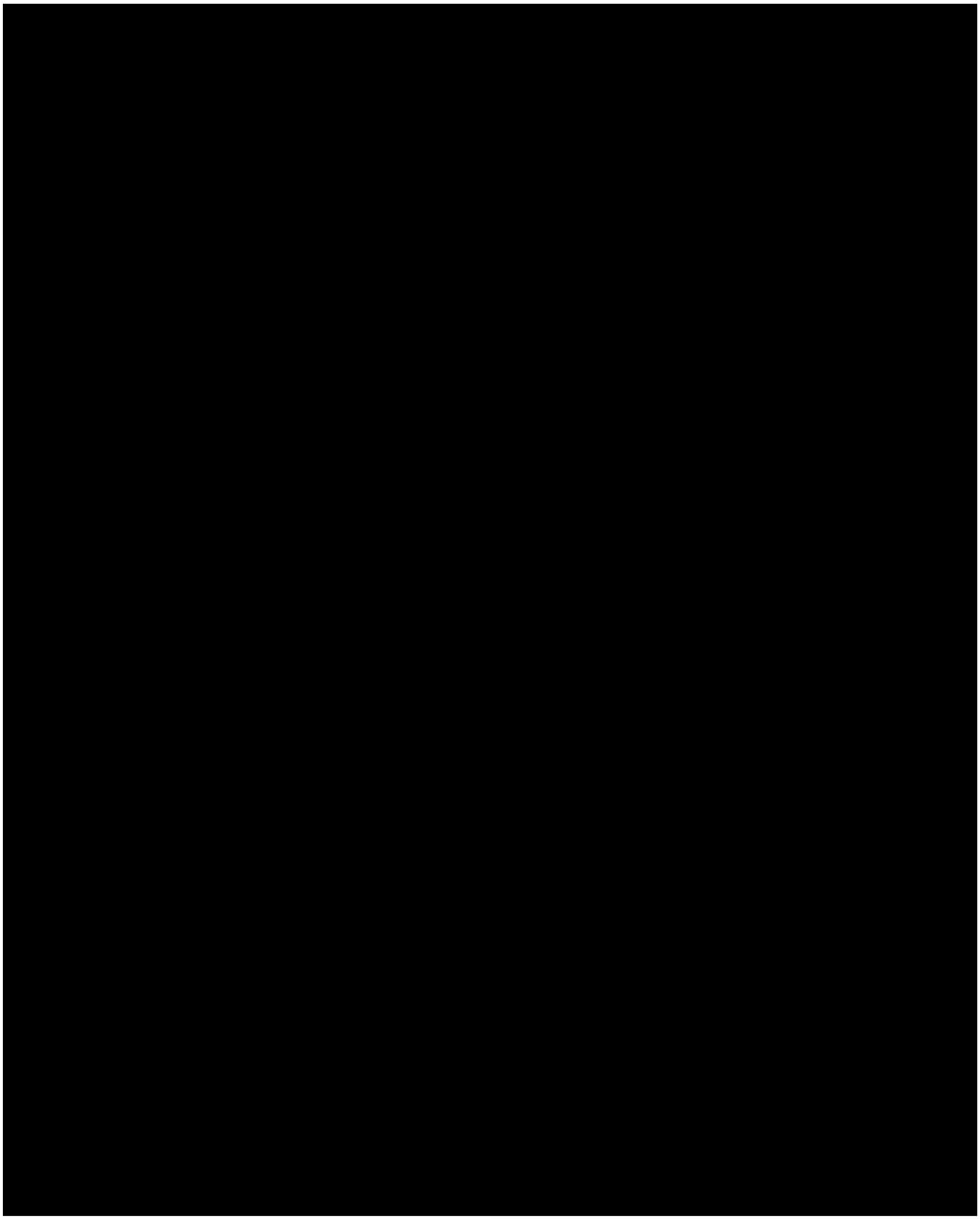
7.0 SUBSURFACE LEAK DETECTION AND MONITORING PLAN

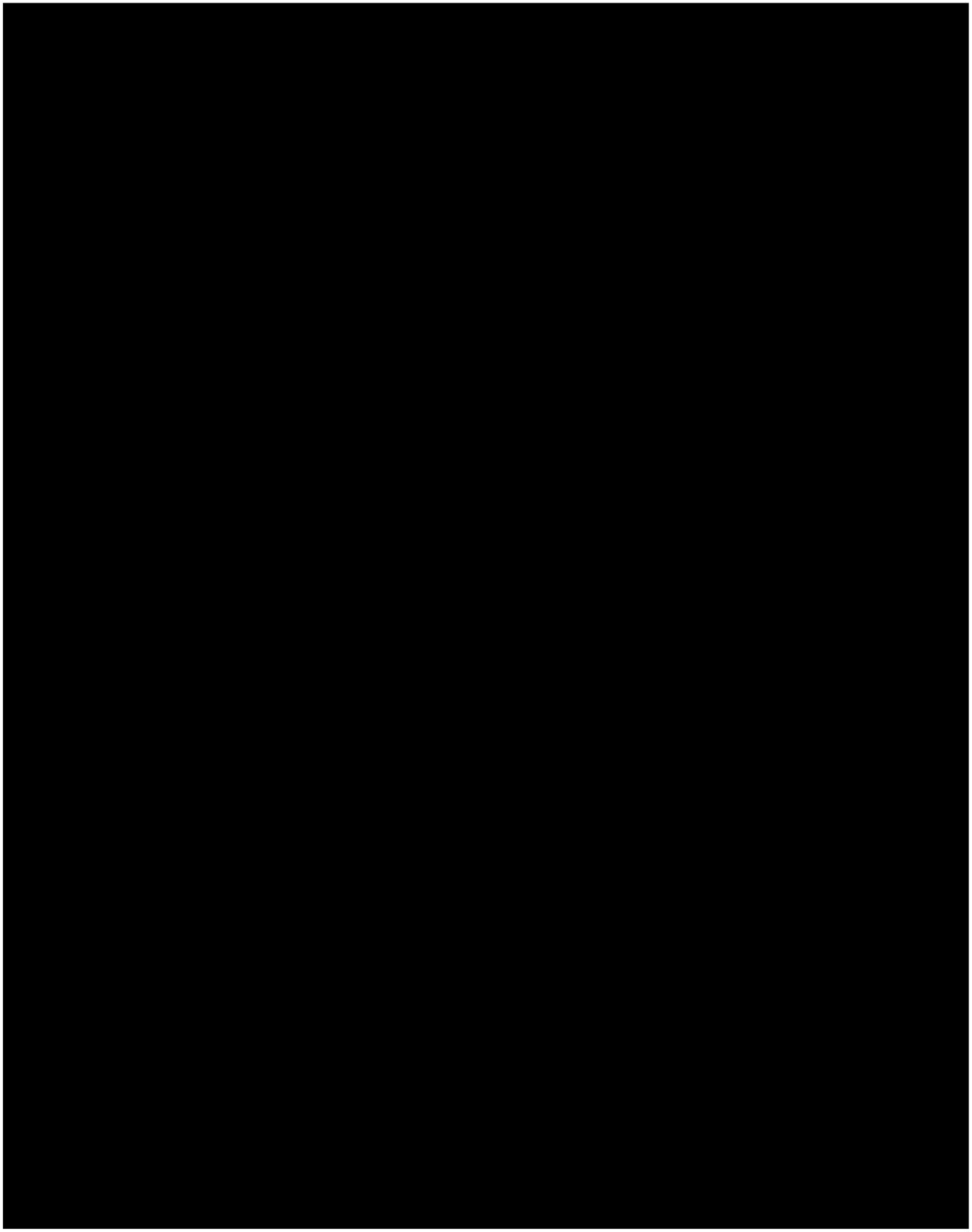
[redacted]

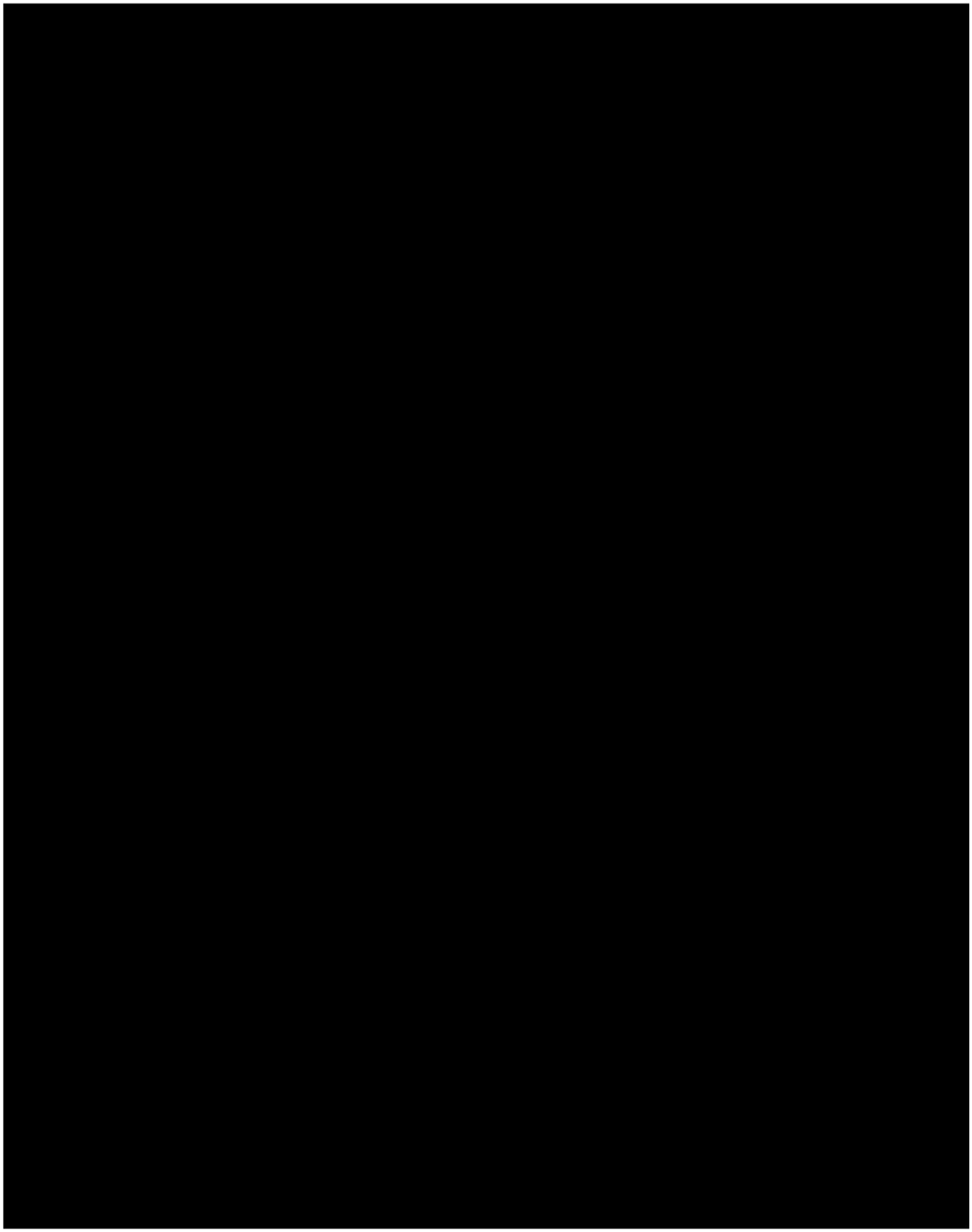
[redacted]

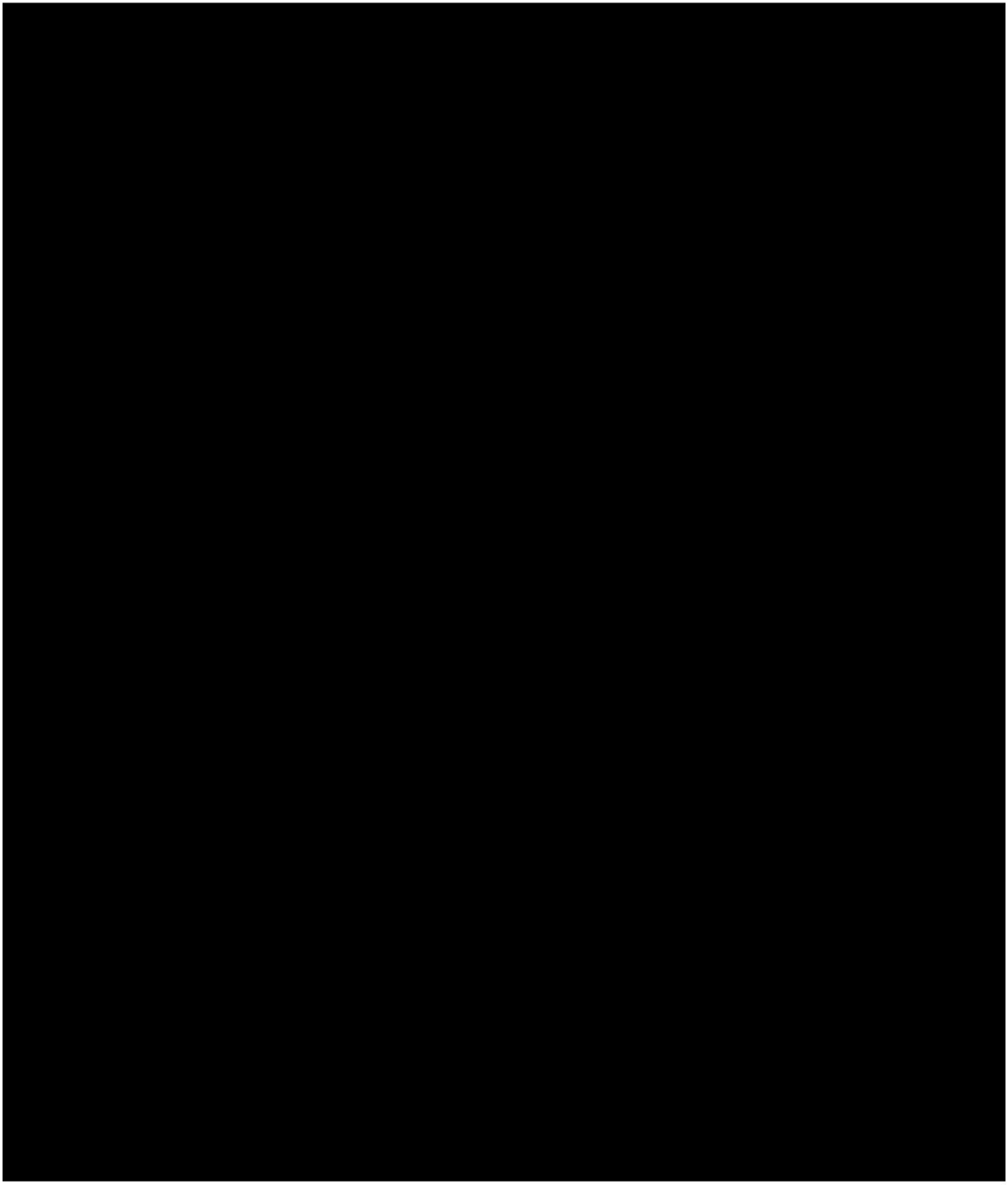
8.0 NEAR-SURFACE GROUNDWATER AND SOIL GAS SAMPLING AND MONITORING

[redacted]



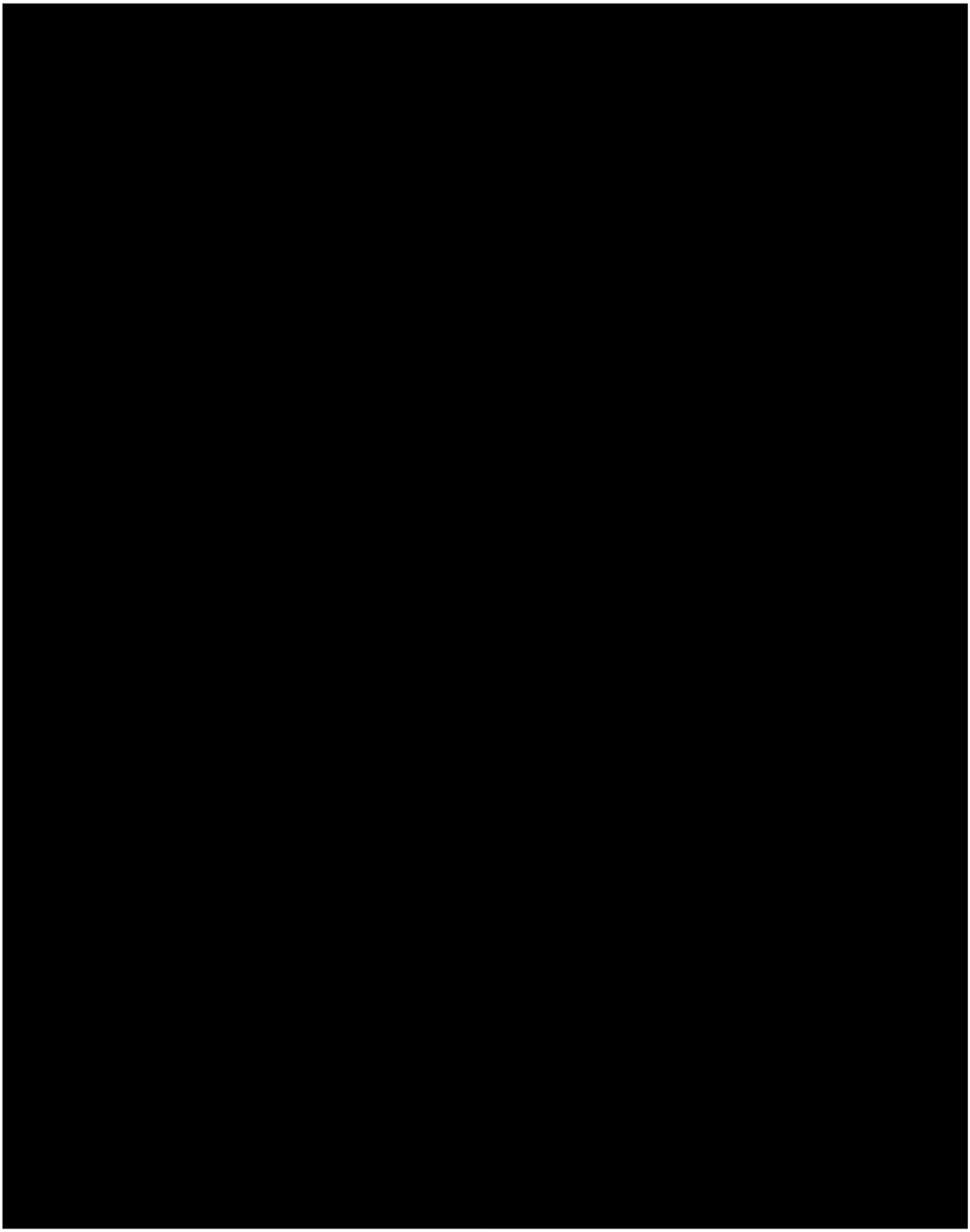


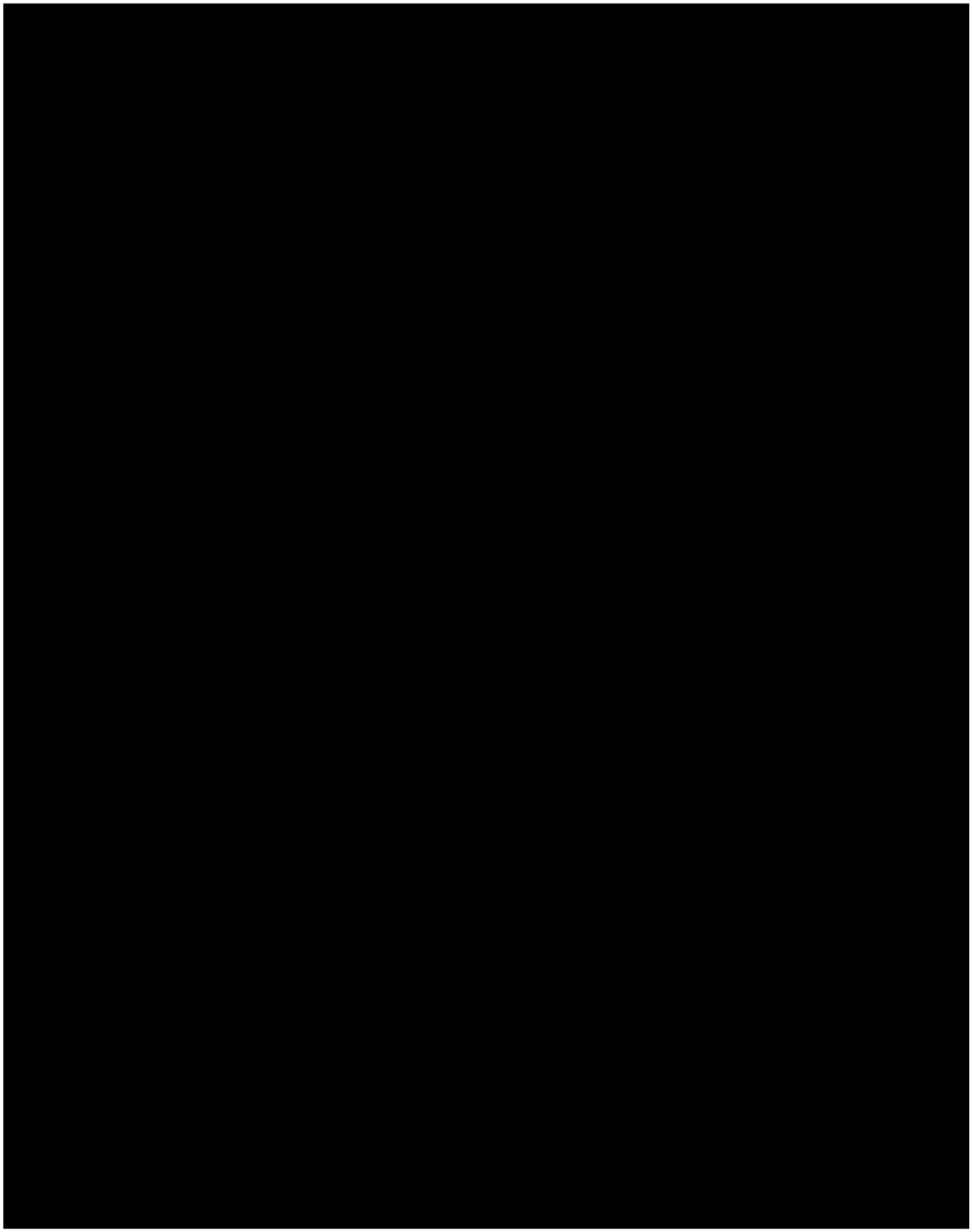


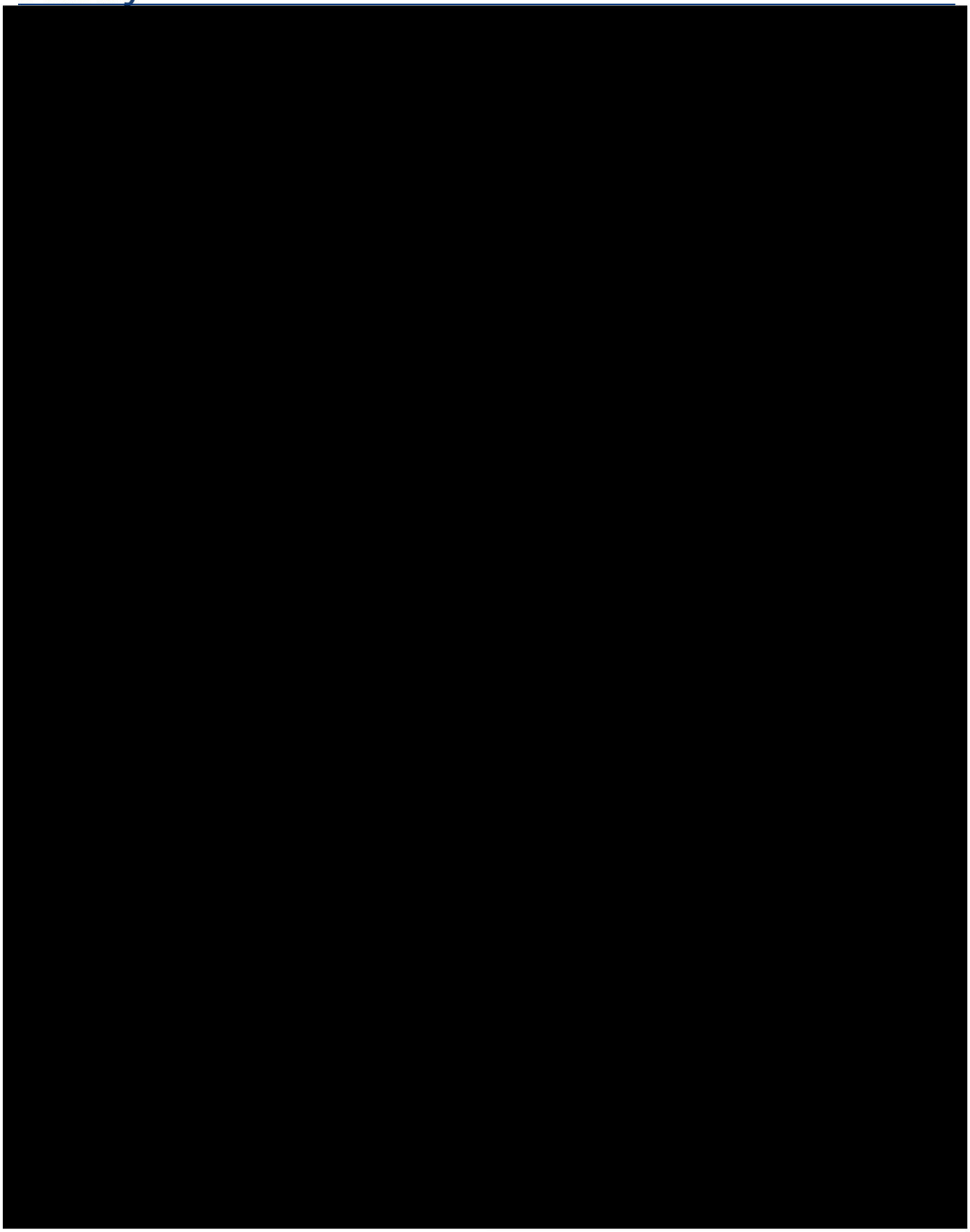


9.0 BASELINE MONITORING PLAN

The purpose of the Baseline Monitoring Plan is to establish pre-operational site conditions (e.g., soil-gas composition, vegetation type and density, groundwater geochemical properties, and induced seismicity) prior to CO_2 injection. [redacted]







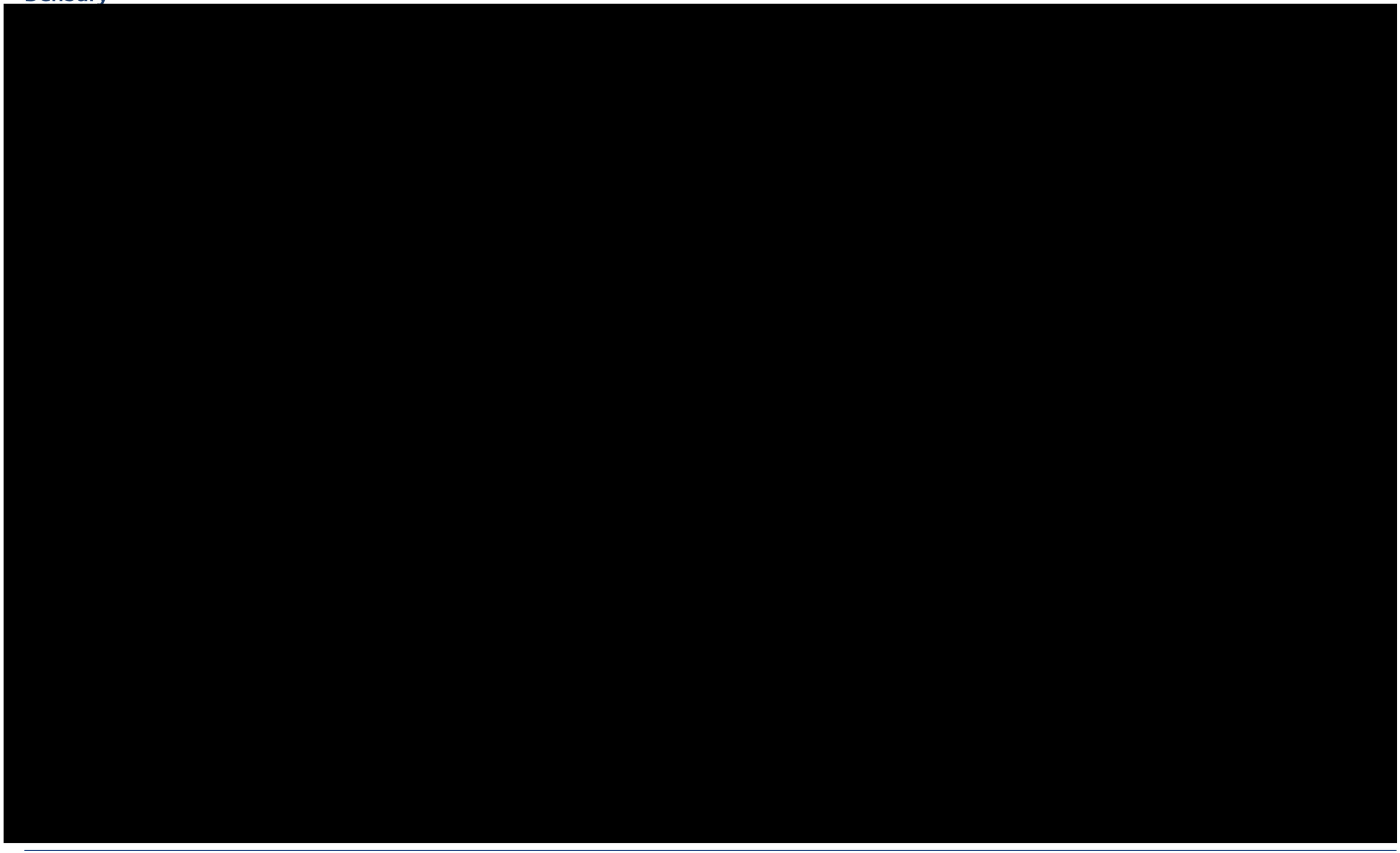
[redacted]

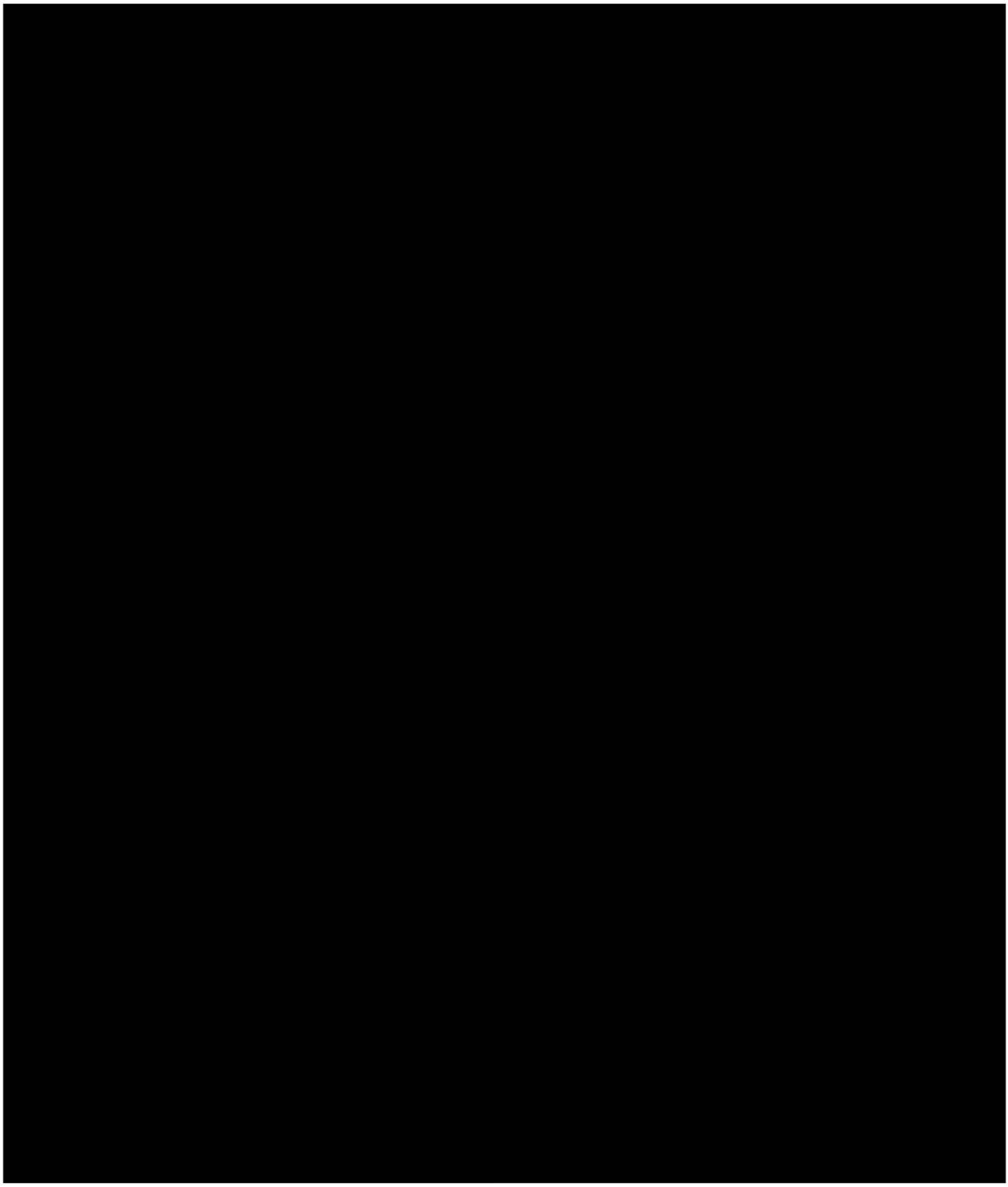
10.0 DEEP SUBSURFACE MONITORING OF FREE-PHASE CO_2 PLUME AND PRESSURE FRONT

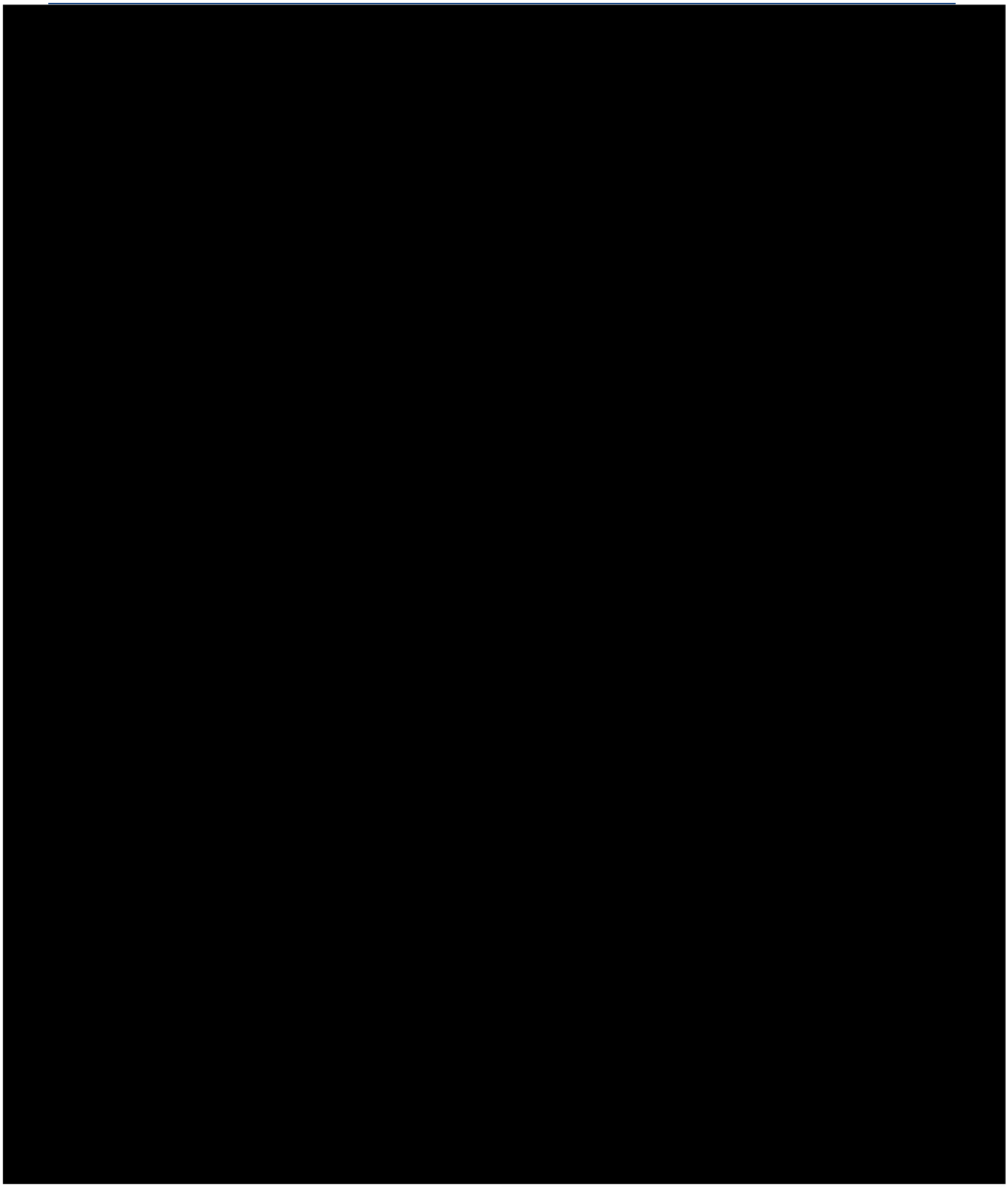
Denbury will implement direct and indirect methods to monitor the location, thickness, and distribution of the free-phase CO_2 plume (plume) and associated pressure (pressure) relative to the permitted storage reservoir.

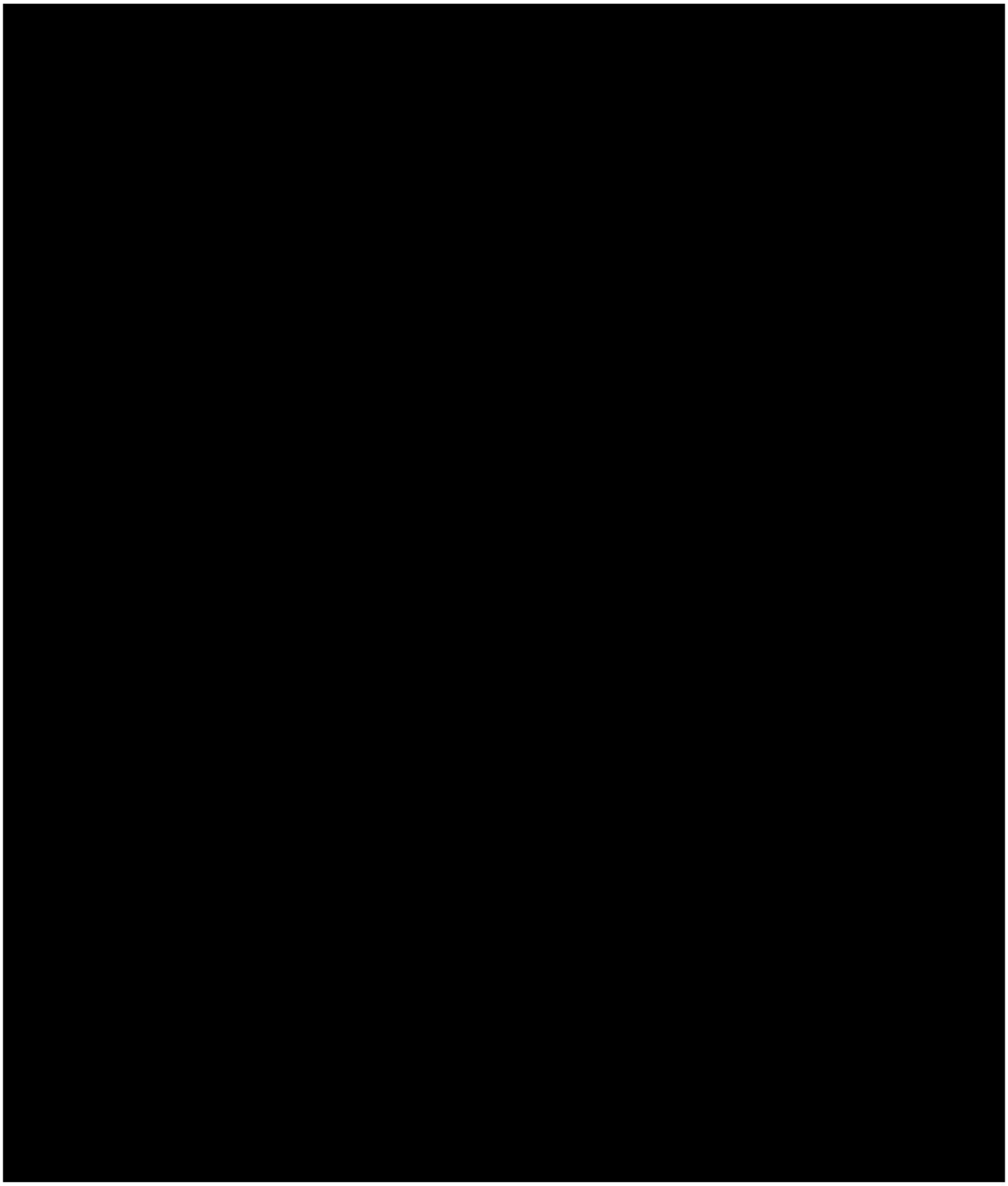
[redacted]

[redacted]









APPENDIX A: QUALITY ASSURANCE AND SURVEILLANCE PLAN