DOE Award No.: DE-FE0023919

Quarterly Research Performance Progress Report

(Period Ending 03/31/23)

Deepwater Methane Hydrate Characterization & Scientific Assessment

Project Period 5: 10/01/20 - 09/30/23

Submitted by:

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Signature

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DISCLAIMER

1 ACCOMPLISHMENTS

This report outlines the progress of the second quarter of the ninth fiscal year of the project, Jan. 1 – Mar. 31, 2023 (Budget Period 5, Year 3). Highlights from this period include:

- **UT-GOM2-2 Drilling Program Funded**
  - The U.S. Federal omnibus spending package for fiscal year 2023 was passed on Dec. 23. The bill provides "*up to $20,000,000 for University research and field investigations in the Gulf of Mexico to confirm the nature, regional context, and hydrocarbon system behavior of gas hydrate deposits.*"
  - UT Austin was subsequently informed that the UT Austin "GOM2" project would receive $19,000,000 from the omnibus spending package. The $19,000,000 allocation will have the following impacts for the UT-GOM2-2 operational/science program:
    - Drill second hole at H-location
    - Expanded conventional coring program to understand microbial methane factory
    - Full FY23 and FY24 funding for Subawards

- **UT-GOM2-2 Science Meeting / Workshop**
  - On Feb. 3, 2022, UT Austin hosted a UT-GOM2-2 science and planning workshop in Houston, Texas. Attendees included members of US DOE, USGS, BOEM, The Ohio State University, University of Oregon, University of Washington, University of New Hampshire, Tufts University, Colorado School of Mines, LDEO-Columbia University, Geotek, Pettigrew Engineering, and TR Consulting.

- **T-HUET Training for UT-GOM2-2 Science Party**
  - During the week of Jan. 30, 2022, UT Austin and members of the UT-GOM2-2 Science Party completed T-HUET training in Houston, TX, required for helicopter transport to and from the Helix Q4000 MSV.

- **UT-GOM2-2 hydrates drilling program permitting**
  - UT Austin completed a BSEE *Application for Permit to Drill* (APD) for each proposed well (WR313 H002 and WR313 H003).

- **New Publication in Marine and Petroleum Geology**
  - Gabrielle Varona (a U.T. graduate student) and colleagues published a paper in Marine and Petroleum Geology titled 'Hydrate-bearing sands in the Terrebonne Basin record the transition from ponded deposition to bypass in the deep-water Gulf of Mexico' (https://doi.org/10.1016/j.marpetgeo.2023.106172). This paper suggests the Orange sand, the primary drilling target, is a regionally connected sand body that extends throughout the Terrebonne minibasin.

1.1 Major Project Goals

The primary objective of this project is to gain insight into the nature, formation, occurrence and physical properties of methane hydrate-bearing sediments for the purpose of methane hydrate resource appraisal. This will be accomplished through the planning and execution of a state-of-the-art drilling, coring, logging, testing and analytical program that assess the geologic occurrence, regional context, and characteristics of marine methane hydrate deposits in the Gulf of Mexico Continental Shelf. Project Milestones are listed in Table 1-1, Table 1-2, and Table 1-3.

Table 1-1: Previous Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
1	M1A	Project Management Plan	Mar-15	Mar-15	Project Management Plan
	M1B	Project Kick-off Meeting	Jan-15	Dec-14	Presentation
	M1C	Site Location and Ranking Report	Sep-15	Sep-15	Phase 1 Report
	M1D	Preliminary Field Program Operational Plan Report	Sep-15	Sep-15	Phase 1 Report
	M1E	Updated CPP Proposal Submitted	May-15	Oct-15	Phase 1 Report
	M1F	Demonstration of a Viable Pressure Coring Tool: Lab Test	Sep-15	Sep-15	Phase 1 Report
2	M2A	Document Results of BP1/Phase 1 Activities	Dec-15	Jan-16	Phase 1 Report
	M2B	Complete Updated CPP Proposal Submitted	Nov-15	Nov-15	QRPPR
	M2C	Scheduling of Hydrate Drilling Leg by IODP	May-16	May-17	Report directly to DOE PM
	M2D	Demonstration of a Viable Pressure Coring Tool: Land Test	Dec-15	Dec-15	PCTB Land Test Report, in QRPPR
	M2E	Demonstration of a Viable Pressure Coring Tool: Marine Test	Jan-17	May-17	QRPPR
	M2F	Update UT-GOM2-2 Operational Plan	Feb-18	Apr-18	Phase 2 Report
3	M3A	Document results of BP2 Activities	Apr-18	Apr-18	Phase 2 Report
	M3B	Update UT-GOM2-2 Operational Plan	Sep-19	Jan-19	Phase 3 Report
4	M4A	Document results of BP3 Activities	Jan-20	Apr-20	Phase 3 Report
	M4B	Demonstration of a Viable Pressure Coring Tool: Lab Test	Feb-20	Jan-20	PCTB Lab Test Report, in QRPPR
	M4C	Demonstration of a Viable Pressure Coring Tool: Land Test	Mar-20	Mar-20	PCTB Land Test Report, in QRPPR

Table 1-2: Current Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
5	M5A	Document Results of BP4 Activities	Dec-20	Mar-21	Phase 4 Report
	M5B	Complete Contracting of UT-GOM2-2 with Drilling Vessel	May-21	Feb-22	QRPPR
	M5C	Complete Project Sample and Data Distribution Plan	Jul-22	Oct-21	Report directly to DOE PM
	M5D	Complete Pre-Expedition Permitting Requirements for UT-GOM2-2	Mar-23	-	QRPPR
	M5E	Complete UT-GOM2-2 Operational Plan Report	May-21	Sep-21	QRPPR
	M5F	Complete UT-GOM2-2 Field Operations	Jul-23	-	QRPPR

Table 1-3: Future Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
6	M6A	Document Results of BP5 Activities	Dec-23	-	Phase 5 Report
	M6B	Complete Preliminary Expedition Summary	Dec-23	-	Report directly to DOE PM
	M6C	Initiate comprehensive Scientific Results Volume	Jun-24	-	Report directly to DOE PM
	M6D	Submit set of manuscripts for comprehensive Scientific Results Volume	Sep-25	-	Report directly to DOE PM

1.2 What Was Accomplishments Under These Goals

1.2.1 Previous Project Periods

Tasks accomplished in previous project periods (Phase 1, 2, 3, and 4) are summarized in Table 1-4, Table 1-5, Table 1-6, and Table 1-7.

Table 1-4: Tasks Accomplished in Phase 1

PHASE 1/BUDGET PERIOD 1	
Task 1.0	**Project Management and Planning**
Task 2.0	**Site Analysis and Selection**
Subtask 2.1	*Site Analysis*
Subtask 2.2	*Site Ranking / Recommendation*
Task 3.0	**Develop Operational Plan for UT-GOM2-2 Scientific Drilling Program**
Task 4.0	**Complete IODP Complimentary Project Proposal**
Task 5.0	**Pressure Coring and Core Analysis System Modifications and Testing**
Subtask 5.1	*PCTB Scientific Planning Workshop*
Subtask 5.2	*PCTB Lab Test*
Subtask 5.3	*PCTB Land Test Prep*

Table 1-5: Tasks Accomplished in Phase 2

PHASE 2/BUDGET PERIOD 2	
Task 1.0	**Project Management and Planning**
Task 6.0	**Technical and Operational Support of Complimentary Project Proposal**
Task 7.0	**Continued Pressure Coring and Core Analysis System Modifications and Testing**
Subtask 7.1	*Review and Complete NEPA Requirements for PCTB Land Test*
Subtask 7.2	*PCTB Land Test*
Subtask 7.3	*PCTB Land Test Report*
Subtask 7.4	*PCTB Modification*
Task 8.0	**UT-GOM2-1 Marine Field Test**
Subtask 8.1	*Review and Complete NEPA Requirements for UT-GOM2-1*
Subtask 8.2	*UT-GOM2-1 Operational Plan*
Subtask 8.3	*UT-GOM2-1 Documentation and Permitting*
Subtask 8.4	*UT-GOM2-1 Marine Field Test of Pressure Coring System*
Subtask 8.5	*UT-GOM2-1 Marine Field Test Report*
Task 9.0	**Develop Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 9.1	*Review and Complete NEPA Requirements for Core Storage and Manipulation*
Subtask 9.2	*Hydrate Core Transport*
Subtask 9.3	*Storage of Hydrate Pressure Cores*
Subtask 9.4	*Refrigerated Container for Storage of Hydrate Pressure Cores*

Subtask 9.5	*Hydrate Core Manipulator and Cutter Tool*
Subtask 9.6	*Hydrate Core Effective Stress Chamber*
Subtask 9.7	*Hydrate Core Depressurization Chamber*
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.1	*Routine Core Analysis (UT-GOM2-1)*
Subtask 10.2	*Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.3	*Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**

Table 1-6: Tasks Accomplished in Phase 3

PHASE 3/BUDGET PERIOD 3	
Task 1.0	**Project Management and Planning**
Task 6.0	**Technical and Operational Support of CPP Proposal**
Task 9.0	**Develop Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 9.8	*X-ray Computed Tomography*
Subtask 9.9	*Pre-Consolidation System*
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter Tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.1	*PCTB Lab Test*
Subtask 14.2	*PCTB Modifications/Upgrades*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.1	*Assemble and Contract Pressure Coring Team Leads for UT-GOM2-2 Scientific Drilling Program*
Subtask 15.2	*Contract Project Scientists and Establish Project Science Team for UT-GOM2-2 Scientific Drilling Program*

Table 1-7: Tasks Accomplished in Phase 4

PHASE 4/BUDGET PERIOD 4	
Task 1.0	**Project Management and Planning**
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Subtask 10.7	*Hydrate Modeling*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter Tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Subtask 13.7	*X-ray Computed Tomography*
Subtask 13.8	*Pre-Consolidation System*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.1	*PCTB Lab Test*
Subtask 14.2	*PCTB Modifications/Upgrades*
Subtask 14.3	*PCTB Land Test*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.3	*Permitting for UT-GOM2-2 Scientific Drilling Program*

1.2.2 Current Project Period

Current project period tasks are shown in Table 1-8.

Table 1-8: Current Project Tasks

PHASE 5/BUDGET PERIOD 5	
Task 1.0	**Project Management and Planning**
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Subtask 10.7	*Hydrate Modeling*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Maintenance and Storage of Hydrate Pressure Cores from UT-GOM2-1*
Subtask 13.7	*Maintain X-ray CT*
Subtask 13.8	*Maintain Preconsolidation System*
Subtask 13.9	*Transportation of Hydrate Core from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.10	*Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.11	*Hydrate Core Distribution*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.4	*PCTB Modifications/Upgrades*
Subtask 14.5	*PCTB Land Test III*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.3	*Permitting for UT-GOM2-2 Scientific Drilling Program*
Subtask 15.4	*Review and Complete NEPA Requirements*
Subtask 15.5	*Finalize Operational Plan for UT-GOM2-2 Scientific Drilling Program*
Task 16.0	**UT-GOM2-2 Scientific Drilling Program Field Operations**
Subtask 16.1	*Execute UT-GOM2-2 Field Program*
Optional Subtask 16.2	*Add Conventional Coring*
Optional Subtask 16.3	*Add Spot Pressure Coring*
Optional Subtask 16.4	*Add Second Hole at H-Location*
Optional Subtask 16.5	*Add Additional Cores and Measurements*
Task 17.0	**UT-GOM2-2 Core Analysis**
Subtask 17.1	*Routine UT-GOM2-2 Core Analysis*
Optional Subtask 17.2	*UT-GOM2-2 Expanded Core Analysis*

1.2.2.1 Task 1.0 – Project Management & Planning

Status: Ongoing

- **Coordinate the overall scientific progress, administration and finances of the project:**
  - UT continued to monitor and control the project budget, scope, and schedule.
  - The U.S. Federal omnibus spending package for fiscal year 2023 was passed on Dec. 23. The bill provides "*up to $20,000,000 for University research and field investigations in the Gulf of Mexico to confirm the nature, regional context, and hydrocarbon system behavior of gas hydrate deposits.*" UT Austin was subsequently informed that the UT Austin "GOM2" project would receive $19,000,000 from the omnibus spending package. As a result, UT prepared a formal request for US DOE to authorize "Phase 5B" and specific Phase 5B "Optional Subtasks" that could be funded with the FY23 funding of $19,000,000:
    - Optional Subtask 16.2: Add Conventional Coring
    - Optional Subtask 16.3: Add Spot-Pressure Coring
    - Optional Subtask 16.4: Add Second Hole at H-Location
    - Optional Subtask 17.2: UT-GOM2-2 Expanded Core Analysis
  - UT initiated weekly planning meetings with members of UT Austin, Geotek, and others as required to coordinate all aspects of the UT-GOM2-2 premobilization operational, science, and logistical tasks.
  - UT initiated weekly planning meetings with members of the UT-GOM2-2 Science Party, including UT, USGS, Subaward Universities, and Geotek, to coordinate and prepare for all aspects of the UT-GOM2-2 science program.

- **Communicate with project team and sponsors:**
  - Organized sponsor and stakeholder meetings.
  - Organized task-specific working meetings to plan and execute project tasks per the Project Management Plan and Statement of Project Objectives.
  - Managed SharePoint sites, email lists, and archive/website.

- **Coordinate and supervise service agreements:**
  - UT executed a final Subaward contract with Dr. Brandon Dugan of Colorado School of Mines (Mines). Mines will fill the role of the in situ temperature and pressure measurement lead.

- **Coordinate subcontractors:**
  - UT continued to monitor and control subaward and contractor efforts.
  - UT continued to hold recurring technical/science meetings with Geotek to identify and address science and engineering challenges pertaining to UT Pressure Core Center and field science program for the UT-GOM2-2 Scientific Drilling Program.

- UT continued to hold recurring technical meetings with Helix to plan the 2023 UT-GOM2-2 field program, and refine requirements for third party subcontracts covering drill pipe-make up, wireline operations, Drilling Fluid, supply boats, Dock services, Well certification, Deck layouts, etc.

1.2.2.2 Task 10.0 – UT-GOM2-1 Core Analysis

Status: Ongoing

1.2.2.2.1 *Subtask 10.4 – Continued Pressure Core Analysis (UT-GOM2-1)*

A. Pressurized Core Analysis

A1. Geomechanical behavior

- The geomechanical behavior of hydrate-bearing sediments has impacts on the in-situ stress state, well integrity, production response of hydrate reservoirs, and seafloor stability. In the previous quarter, we explored the geomechanical properties of sample 8FB3-3 to gain a further understanding of the geomechanical response. We showed this sample behaves as visco-plastic material.
- In this quarter, we conducted a similar geomechanical testing program in sample 8FB1-2 to assess if this visco-plastic behavior is present in other sandy-silt samples from GC 955.
- Figure 1-1 shows evidence of this viscoplastic behavior for sample 8FB3-3 (Figure 1-1a) and 8FB1-2 (Figure 1-1b). The axial stress is held constant while allowing samples to deform only in the axial direction (i.e., uniaxial strain compression). The deformation and lateral to axial effective stress ratio (K_0) is monitored with time. During these stress holds, the void ratio (or porosity) decreases (blue line, Figure 1-1), and K_0 increases with time (red line, Figure 1-1), converging to isotropic conditions. These two observations are characteristic of visco-plastic materials.

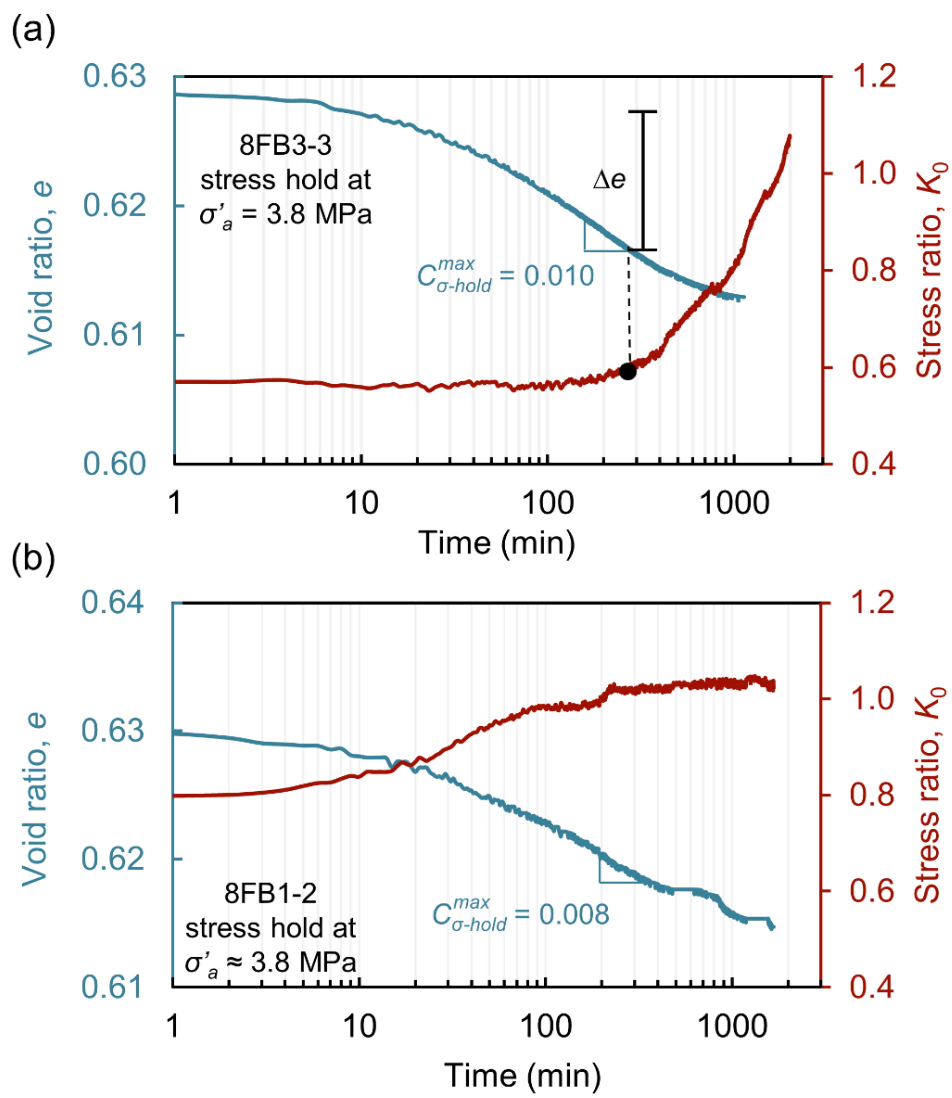

Figure 1-1: Time-dependent evolution of the void ratio e shown in blue (porosity n = e/(1+e)) and stress ratio K0 shown as red curves during the stress holds at σ'_a = 3.8 MPa for (a) sample 8FB3-3 and (b) sample 8FB1-2. The initial time corresponds to the beginning to the stress hold.

- We present a spring and dashpot model to explore the mechanical behavior of hydrate-bearing sediments. We consider two elements in parallel: the elastic element representing the soil skeleton, and the viscoelastic element representing the hydrate skeleton (Figure *1-2*a). This lumped-element model captures both the K_0 increase and void ratio decrease with time.
- We use the 8FB3-3 data to illustrate the model capabilities. The model clearly captures the sigmoidal shape of the compression curve whereas the modeled strain of the hydrate-free material does not change with time (Figure *1-2*b). Similarly, the modeled K_0 increases with time while the K_0 modeled without hydrate remains constant during the stress hold (Figure *1-2*c).

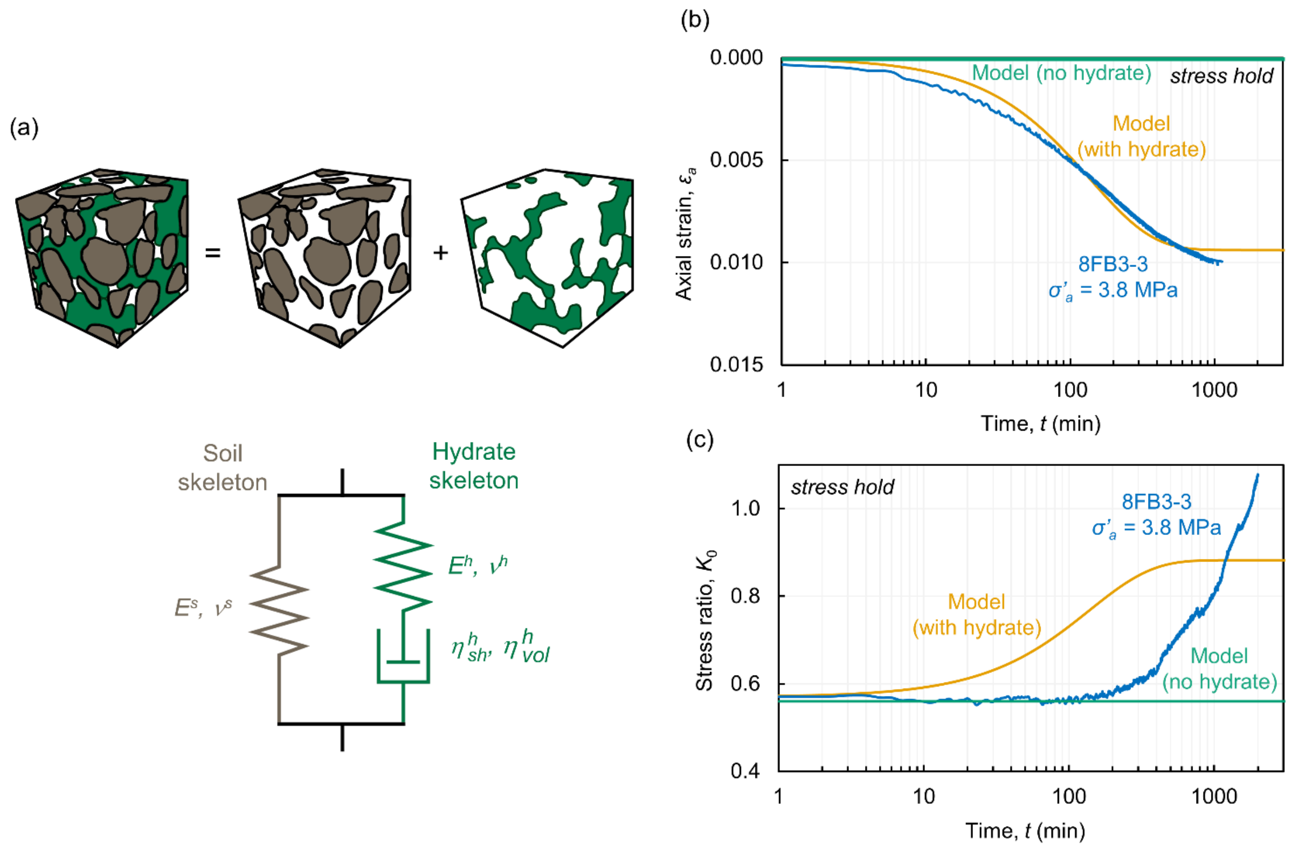

Figure 1-2: (a) The hydrate-bearing sediment is represented as composite made of the soil and hydrate skeletons. The spring-dashpot model involves an elastic soil (Young modulus E^s; Poisson ratio ν^s) and a Maxwell viscoelastic hydrate skeleton (Young modulus E^h; Poisson ratio ν^h; shear viscosity η^h_{sh}; volumetric viscosity η^h_{vol}). The modeled (b) axial strain and (c) K_0 during the stress hold at σ'_a = 3.8 MPa (yellow lines) capture the experimental data (blue lines). The model without hydrate is superimposed (green lines).

1.2.2.2.2 *Subtask 10.5 – Continued Core-Log-Seismic Synthesis (UT-GOM2-1)*

- No updates.

1.2.2.2.3 *Subtask 10.6 – Additional Core Analysis Capabilities*

- No updates

1.2.2.2.4 *Subtask 10.7 – Hydrate Modeling*

- No update

1.2.2.3 Task 11.0 – Update Science and Operations Plans for UT-GOM2-2 Scientific Drilling Program

Status: Complete (Milestones 5C, 5E)

- See notes in Section 1.2.2.7.6 Subtask 15.5 – Finalize Operational Plan for UT-GOM2-2 Scientific Drilling Program for additional information.

1.2.2.4 Task 12.0 – UT-GOM2-2 Scientific Drilling Program Vessel Access

Status: Complete (Milestone 5B)

1.2.2.5 Task 13.0 – Maintenance & Refinement of Pressure Core Transport, Storage, & Manipulation Capability

Status: Ongoing

1.2.2.5.1 *Long-Term Pressure Core Storage Optimization*

- UT continues to explore a potential remedial action to mitigate methane hydrate dissolution by saturating the pressure core storage system water with dissolved methane.
- UT has assembled all the components to create methane-saturated water in a pressurized vessel. UT constructed a mobile operations stand to contain the methane-saturation system. UT will pursue pressurized testing of the system to quantify and stop system leaks once the stand has been assembled and the components installed.
  (Flemings, 2021a, b)

1.2.2.5.2 *Subtask 13.1 – Hydrate Core Manipulator and Cutter Tool*

- The mini-PCATS system underwent a full pressure test after the full maintenance teardown in the previous quarter. The X-ray system underwent quarterly calibration.

1.2.2.5.3 *Subtask 13.2 – Hydrate Core Effective Stress Chamber*

- The Effective Stress Chamber underwent a general cleaning and sediment flush between pressure core samples.
- We have refined our experimental approach to studying permeability and geomechanical behavior under uniaxial strain over the last year. These improvements resulted in successful measurements in sample 8FB3-3 and 8FB1-2. To continue developing our experimental pressure core analysis capabilities, we addressed several issues during this quarter as summarized below:
  - We focused on methane-saturated water to have reliable pressure core storage and flow tests. In previous quarters, we have identified that hydrate dissolution occurs in pressure cores due to interaction with non-methane-saturated water, either during core storage or permeability measurements. To address this issue, we have acquired a high-pressure methane-water mixer to have methane-saturated water as storage fluid or as effluent during flow measurements. UT successfully tested the hydraulic seals of this mixer during this quarter.

    - We focused on making a ‘production test’ on a hydrate-bearing sample, where we monitor the geomechanical behavior during hydrate dissociation. A key variable for our effort is the temperature of the sample. In previous performance periods, we successfully tested the custom-made temperature monitoring system and sensors from Geotek to measure the temperature directly in the sample and confining fluid. However, we found that the sensors break after prolonged tests. UT modified the temperature monitoring system to make it more robust to continuous operation.
    - UT tested the new pump mode that corrects for equipment compressibility effects during uniaxial strain tests. This new version removes the deformation associated to the equipment, and thus, it uses a more accurate measurement of the sample length.
- We rely on data communication between the pump software and Geotek software to conduct our uniaxial strain tests. However, the data stream is interrupted when it transfers large data sets (e.g., during compressibility effects correction). UT, Geotek, and the pump company are working to resolve this issue.
    - A recent attempt to resolve this problem was made by Geotek by the development of a new DDE data exchange app. However, this has not improved the situation. Figure 1-3 shows a loss of communication in two different tests we conducted.
    - Geotek and the Pump company have narrowed the problem to the interaction between the pump software and the Geotek software. Particularly, the Dynamic Data Exchange (DDE) app from Geotek stops sending requests/commands to the DDE server in the pump software.
    - The Pump company has replicated the loss of communication between the Geotek DDE app and the pump software. The company was able to create a secure DDE communication by conducting an analogous test with another DDE app that they use. The pump company has now provided a list of suggestions to Geotek to try to correct they communications loss by the Geotek DDE app. The communications loss appears to be the result of a failure on the Geotek or client side of things, not anything related to the pump software.
    - We have identified that restarting the software "resolves" this issue; however, this is not a viable long-term solution, given that our tests run for extended periods.
    - UT, Geotek, and the pump company are continuing efforts to resolve this issue.

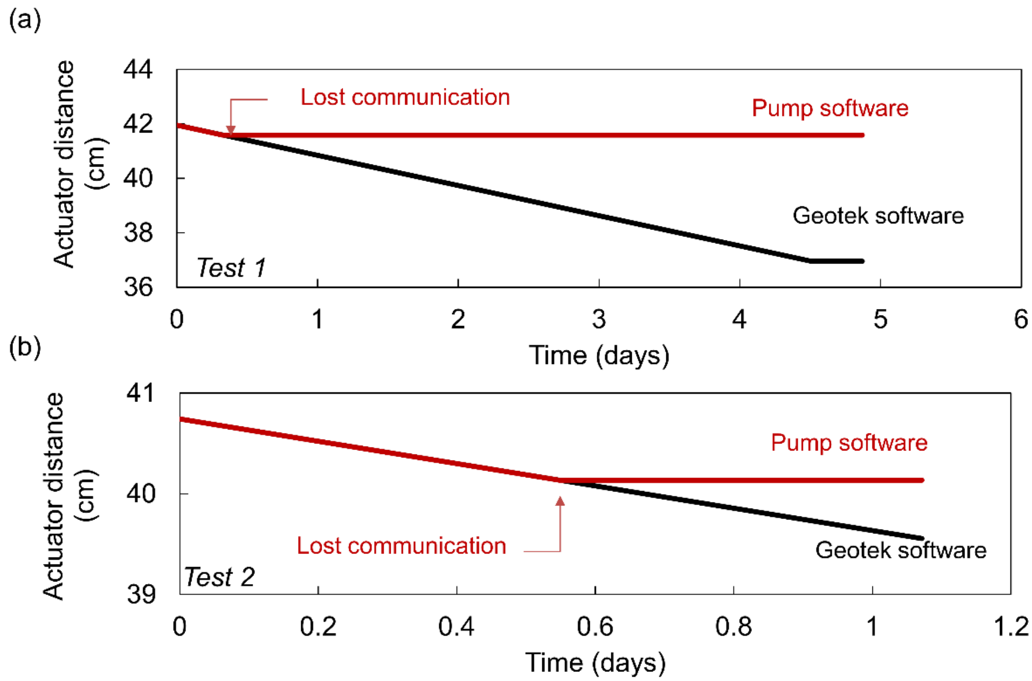

Figure 1-3: Geotek-pump software communication test. The actuator was moved at the slowest speed (1.25×10^{-5} cm/s) and the actuator distance was recorded in both Geotek and pump software. (a) Long-term communication test for 5 days and (b) short-term 1-day test both show the loss of communication.

1.2.2.5.4 *Subtask 13.3 – Hydrate Core Depressurization Chamber*

- The system is in standby mode and ready to be used as needed.

1.2.2.5.5 *Subtask 13.4 – Develop Hydrate Core Transport Capability for UT-GOM2-2*

Status: Complete

1.2.2.5.6 *Subtask 13.5 – Expansion of Pressure Core Storage Capability for UT-GOM2-2*

- UT has purchased 10 enlarged core storage bases. The bases will be manufactured and delivered to UT in the next quarter.
- Expansion of pressure maintenance system is required to increase storage capability sufficient to receive UT-GOM2-2 cores. UT has purchased the components to assemble the pressure manifolds that will allow for the expansion of the pressure maintenance system. The components will be received and installed in the next quarter.
- Evaluation and maintenance testing of methane monitoring system and possible expansion is being assessed.

1.2.2.5.7 *Subtask 13.6 – Continued Storage of Hydrate Cores from UT-GOM2-1*

- Core storage expansion in the PCC is anticipated to accommodate any remaining pressure cores acquired from UT-GOM2-1, even when additional cores are collected during UT-GOM2-2 and transferred to the PCC.

1.2.2.5.8 *Subtask 13.7 – Maintain X-ray Computed Tomography*

- The X-Ray CT continues to operate as designed.
- The Dell Image Reconstruction computer continues to operate properly.

1.2.2.5.9 *Subtask 13.8 – Maintain Pre-Consolidation System*

The system will continue to be evaluated to ensure proper pressure maintenance to generate effective stresses in pressure cores.

1.2.2.5.10 *Subtask 13.9 – Transportation of Hydrate Core from UT-GOM2-2 Scientific Drilling Program*

Future Task.

1.2.2.5.11 *Subtask 13.10 – Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*

Future Task.

1.2.2.5.12 *Subtask 13.11 – Hydrate Core Distribution*

Future Task.

1.2.2.6 Task 14.0 – Performance Assessment, Modifications, And Testing of PCTB

Status: Complete

1.2.2.7 Task 15.0 – UT-GOM2-2 Scientific Drilling Program Preparations

Status: In Progress

1.2.2.7.1 *UT-GOM2-2 Science Meeting/Workshop*

On Feb. 3, 2022, UT Austin hosted a UT-GOM2-2 science workshop in Houston, Texas (Figure 1-4). In-person attendees included members of USGS, The Ohio State University, University of Oregon, University of Washington, University of New Hampshire, Tufts University, Colorado School of Mines, Geotek, and TR Consulting. Virtual attendees included members of US DOE, BOEM, USGS, Tufts University, LDEO-Columbia University. The objective of the workshop was to introduce and review science motivations and challenges, engage and train new students, discuss the Walker Ridge 313 structural basin, WR313 H001 LWD interpretation, UT-GOM2-2 Coring Tools, UT-GOM2-2 Coring Plan, and the UT-GOM2-2 Sampling Plan. A workshop agenda is provided in Table 1-9.

All participants left the workshop engaged and ready for final preparations leading up to the expedition start. The students left motivated to tackle many of the scientific challenges discussed. Actions items were captured and disseminated. Weekly science meetings will continue to track and close these items.

Figure 1-4: UT-GOM2-2 Science Meeting/Workshop

Table 1-9: UT-GOM2-2 Science Meeting/Workshop schedule, held on Feb 3, 2023 at Springhill Suites in Houston, TX.

7:45-8:00 AM	Welcome, Introductions *Peter B Flemings, UT, Jackson School of Geosciences*
8:00-8:30 AM	Talk 1: UT-GOM2-2 The Overall Plan and Challenges *Peter B Flemings, UT, Jackson School of Geosciences*
8:30-9:00 AM	Talk 2: Walker Ridge 313 Terrebonne Basin *Alexey Portnov, Jackson School of Geosciences*
9:00-9:30 AM	Talk 3: Log Interpretation with a focus on WR313-H001 *Ann Cook, Ohio State University*
9:30-9:45 AM	Talk 4: Review Hypotheses and Testing *Peter B Flemings, UT, Jackson School of Geosciences*
9:45-10:10 AM	Talk 5: Coring Tools, T&P measurement *Carla Thomas, University of Texas; Brandon Dugan, Colorado School of Mines*
10:10-10:35 AM	Talk 6: Coring Plan & Timeline *Carla Thomas, University of Texas*
10:50-11:15 PM	Talk 7: Science Party, Expedition Reporting -Report Outline, report timing *Carla Thomas, University of Texas*
11:15 AM -12:00 PM	Talk 8: Curation, Sampling Plan *Carla Thomas, University of Texas*

1.2.2.7.2 *Strater Preparation*

The science team developed sample layouts in Strater software to achieve efficient core data integration and display while onboard. Two separate sample layouts are designed: one for the conventional cores, and one for the pressure cores. The sample layout projects include a set of data tables containing information on core and sampling depths, sample types, labels, core images, core logs, etc., which control core displays. New data for each core (e.g., logs, images, whole-round sample depths) will be populated into the tables and instantly displayed.

A sample layout for an APC core (as an example, WR313-H003-07H) is provided in Figure 1-5. Each sample layout contains the following tracks: depth references (MD, measured depth; TVDSF, depth below seafloor; depth in core); logging-while drilling data; core scans; core logs; sample types and distribution. Additional logs such as lithology, or quick-look measurements can be added to certain cores by necessity. These databases can be used to quickly access information for every sample in a core.

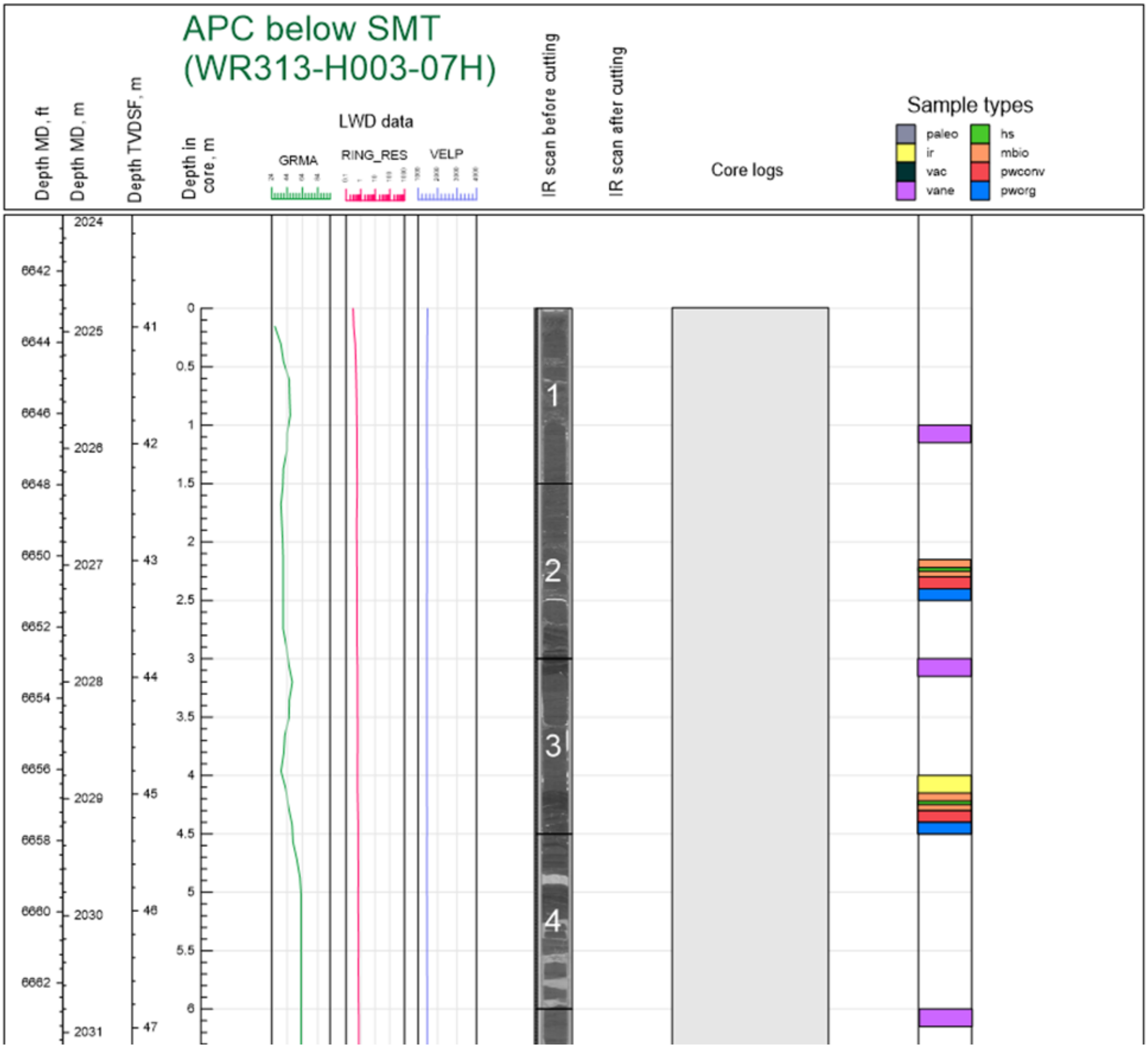

Figure 1-5: Sample layout for a conventional core (as an example, WR313-H003-07H). The layout contains essential tracks including references, logs, images, and sampling locations. Note: shown core image is a placeholder, as well as gray rectangle for core logs.

1.2.2.7.3 *Borehole-scale layouts*

Borehole-scale layouts provide general information including petrophysical data, gas hydrate saturation, planned core depths, density and distribution of planned sampling along the entire well. For example (Figure 1-6) shows a H003 well section including LWD logs from H001, pore fluid, hydrate saturation, types and density of samples (red symbols) in each core. The borehole-scale layouts will be updated to reflect any changes in the coring plan.

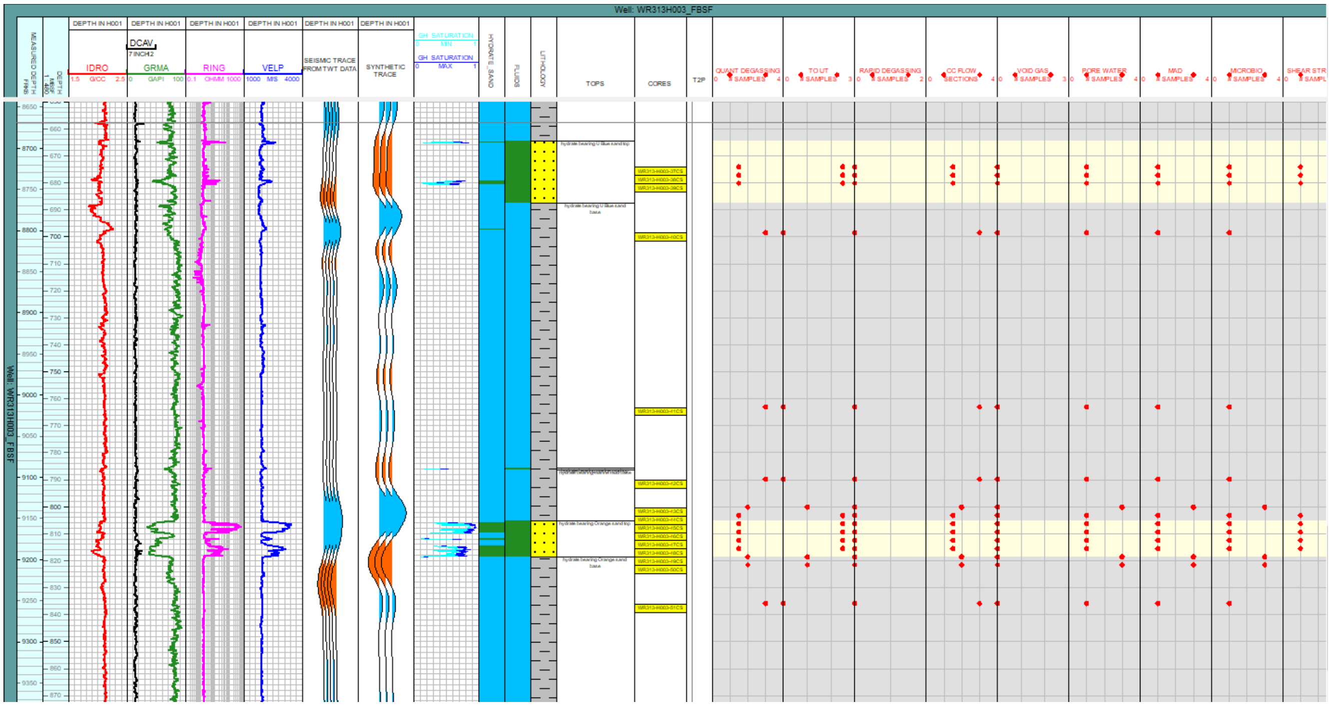

Figure 1-6: Segment of the WR313 H003 borehole-scale layout showing LWD logs, seismic and synthetic traces, predicted lithology, cores, sampling plan distribution and density near the Orange and Blue sands.

1.2.2.7.4 *Subtask 15.3 – Permitting for UT-GOM2-2 Scientific Drilling Program*

- **BSEE APD**:
  UT Austin prepared a BSEE Application for Permit to Drill (APD) for WR313-H002 and WR313 H003. UT sent the APDs to J. Connor Consulting (JCC) for technical review on Jan. 26, 2023. UT set up an organizational account for UT Austin in BSEE's permit submittal web interface (*eWell*). JCC attempted to submit the APDs through eWell on behalf of UT in March 6, 2023. However, eWell rejected all permit submission attempts. After numerous discussions with BSEE and JCC, UT was informed that eWell was only capable of accepting permit applications were an active bottom lease is present and that eWell and that eWell could not be modified to accept a permit application where only a RUE is present. At BSEE's request, UT and JCC are now preparing to submit 'hardcopy' APDs for WR313 H002 and WR313 H003.

- **EPA NPDES OCS General Discharge Permit (GMG290000)**:
  UT Austin successfully set up an organizational account for UT Austin in the US EPA's permit submittal web interface (*CDX*). Upon attempting to submit an electronic notice of intent (*eNOI*) for the NPDES OCS General Permit, UT discovered that the US EPA did not reissue the 2017 OCS General permit upon its expiration on September 30, 2022.

UT Austin held a conference call with US EPA Region 6 Section Chief, Brent Larson, and Offshore Specialist and Enforcement Officer, Sharon Angove, on March 1, 2023 to understand the 2022 OCS General permit status and potential options. The 2022 OCS General Permit is currently in US EPA administrative review and NPDES coverage under the permit cannot currently be obtained. UT was informed that our only option is to wait until the permit is reissued, and apply for coverage then. EPA conveyed that the permit would be completed as soon as possible, as the EPA is under significant pressure to do so.

UT Austin and JCC are closely monitoring the NPDES OCS General Permit review process and are staying in close contact with EPA Region 6 on the permit's progress. UT is prepared to submit an eNOI as soon as the permit is reissued. Coverage is typically granted the same day.

- The status of permit submission and approval for the UT-GOM2-2 field program is shown in Table 1-10.

Table 1-10: UT-GOM2-2 Permit Status

AGENCY	PERMIT / REQUIREMENT	STATUS	TRACKING INFO
BOEM	Qualified Operator Certification	Submitted 03/17/17 Approved 03/21/17	No. 3487
BOEM	BOEM Qualification Update (Dr. Daniel Jaffe, VPR)	Submitted 11/10/21 Approved 01/10/22	None
BOEM	Lease Bond	Submitted 07/08/21 Approved 07/19/21	Bond No. ROG000193
BOEM	Right-of-Use and Easement (RUE)	Submitted 04/15/21 Approved 11/12/21	OCS-G 30392
BOEM	Right-of-Use and Easement (RUE) Amendment	Submitted 10/21/22 Approved 12/08/22	OCS-G 30392
BOEM	Initial Exploration Plan	Submitted 04/16/21 Approved 11/12/21	N-10162
BOEM	Revised Exploration Plan	Submitted 10/20/22 Approved 12/08/22	R-7211
BOEM	Permit to Conduct Geological or Geophysical Exploration… (G&G)	Submitted 12/02/22	L22-025
BSEE	Application for Permit to Drill (APD)	*Ready to Submit*	--
BSEE	Application for Permit to Modify (APM)	*In progress*	--
LDNR	CZM Consistency Cert.	Submitted 04/16/21 Approved 11/05/21	C20210156
US CG	Letter of Determination (LOD)	*In progress*	--
US DOE	NEPA Enviromental Questionnaire (EQ) - UT-GOM2-2	Submitted 02/16/22 Approved 03/10/22	--
US EPA	NPDES OCS General Discharge Permit (GMG290000)	*Pending reissuance of OCS General Permit*	--

1.2.2.7.5 *Subtask 15.4 – Review and Complete NEPA Requirements*
Status: In Progress

- A NEPA Categorical Exclusion for the UT-GOM2-2 field program was granted on Mar. 10, 2022.

1.2.2.7.6 *Subtask 15.5 – Finalize Operational Plan for UT-GOM2-2 Scientific Drilling Program*
Status: Complete (Milestones M5C, M5E)

- Updates were started on the operational plan to move conventional and pressure coring from G002 to H003 and align the plan with the proposed level of funding for the BP5B step defined as "Add 2nd Hole". Edits were also made to the coring and sampling plan. Edits are pending on several fronts including plug and abandonment.
- Edits were started to the UT-GOM2-2 Prospectus and Science plan to move conventional and pressure coring from G002 to H003 and align the plan with the proposed level of funding for the BP5B step defined as "Add 2nd Hole". Edits were also made to the coring and sampling plan. Edits are pending on several fronts as we work through creating step-by-step protocols for sample collection, storage, and shipping.

1.2.2.8 Task 16.0 – UT-GOM2-2 Scientific Drilling Program Field Operations

1.2.2.8.1 *Subtask 16.1 – Execute UT-GOM2-2 Field Program*
Future task.

1.2.2.8.2 *Optional Subtask 16.2 – Add Conventional Coring (Phase 5B)*
Future task.

1.2.2.8.3 *Optional Subtask 16.3 – Add Spot Pressure Coring (Phase 5B)*
Future task.

1.2.2.8.4 *Optional Subtask 16.4 – Add Second Hole at H-Location (Phase 5B)*
Future task.

1.2.2.8.5 *Optional Subtask 16.5 – Add Additional Cores and Measurements (Phase 5B)*
Not funded in FY23 budget – will not be performed.

1.2.2.9 Task 17.0 – UT-GOM2-2 Core Analysis

1.2.2.9.1 *Subtask 17. 1 – Routine UT-GOM2-2 Core Analysis*
Future task.

1.2.2.9.2 *Optional Subtask 17.2 – UT-GOM2-2 Expanded Core Analysis*
Future task.

1.3 What Will Be Done In The Next Reporting Period To Accomplish These Goals

1.3.1 Task 1.0 – Project Management & Planning

- UT will continue to execute the project in accordance with the approved Project Management Plan (PMP) and Statement of Project Objectives (SOPO).
- UT will continue to manage and control project activities in accordance with their established processes and procedures to ensure subtasks and tasks are completed within schedule and budget constraints defined by the PMP.

1.3.2 Task 10.0 – Core Analysis

- UT will use the new temperature measurement capabilities in the UT Effective Stress Chamber to conduct a gas production test. We will replicate field conditions, where the pore pressure is decreased, the total vertical stress is maintained constant, and the sample undergoes uniaxial strain deformation (i.e., zero lateral strain). We will measure produced gas, lateral stress, compression and temperature throughout the entire test.
- UT will conduct permeability tests using the new methane-saturated water capabilities. We will assess the impact of hydrate dissolution for permeability measurements.
- UT, Ohio State, UW, UNH, Oregon State, Colorado School of Mines, and Tufts will continue working on UT-GOM2-2 protocols and supply lists.
- UT will continue to work with Geotek and the Pump company to establish a dedicated and stable data communications with the Geotek Effective Stress Chamber software and the pump used to operate the system for compressibility corrections.

1.3.3 Task 11.0 – Update Science and Operations Plan for UT-GOM2-2 Scientific Drilling Program

- Operational and Prospectus Science Plan vs 2.3 will be finalized.

1.3.4 Task 12.0 – UT-GOM2-2 Scientific Drilling Program Vessel Access

- Task Complete

1.3.5 Task 13.0 – Maintenance And Refinement Of Pressure Core Transport, Storage, & Manipulation Capability

- The Mini-PCATS, PMRS, analytical equipment, and storage chambers will undergo continued observation and maintenance at regularly scheduled intervals and on an as-needed basis. Installation of new or replacement parts will continue to ensure operational readiness.
- UT will continue testing the methane-water mixer at high pressures. The system will be tested to ensure the ability to generate high-pressure, methane-saturated water is stable and capable of transfer to other pressurized systems. We will attempt to integrate this new device to the Hydrate Core Effective Stress Chamber in order to perform permeability measurements.
- UT will continue to test and evaluate the sediment trap modification in mPCATS to assist with preventing large quantities of loose sediment being introduced into the Effective Stress Chamber during testing.
- UT will install the dedicated storage bases, pressure maintenance, and methane safety manifolds necessary for the expansion of the pressure core storage capabilities.
- UT will continue to evaluate and refine the temperature measurement capabilities of the Effective Stress Chamber test section.

1.3.6 Task 14.0 – Performance Assessment, Modifications, And Testing Of PCTB

- Task complete.

1.3.7 Task 15.0 – UT-GOM2-2 Scientific Drilling Program Preparations

- UT will submit an *Application for Permit to Drill* (APD) to BSEE
- UT will submit a notice of intent to comply with the NPDES GMG290000 General Discharge Permit.
- Helix will continue to request quotes from various third-party subcontractors and UT will provide specification guidance to Helix regarding required services, materials, equipment, and personnel.
- UT will host a Drill Well on Paper (DWOP) at UT Austin on April 26. Participants will include members of US DOE, Helix, Helix subcontractors, Geotek, Pettigrew Engineering, TR Consulting, and others involved in the UT-GOM2-2 field program. A draft agenda for the DWOP meeting is provided in Table 1-11.

Table 1-11: Draft Drill-Well-On-Paper (DWOP) Agenda

8:30 - 8:50 AM	**Introductory Discussion** – *Peter Flemings* • Project structure, organization, Safety Management System • Project objectives / definition of success • Schedule, location, high-level work scope
8:50 - 9:20 AM	**Geological Prognosis** – *Peter Flemings* • Geologic targets • Geologic hazards review • Pore pressure plot • JIP logs
9:20 – 9:40 AM	**Q-4000 Safety** – *Ben Ringwelski*
9:40 – 10:00 AM	**Location Services and Plat Survey** – *Callum Cook*
10:10 - 10:40 AM	**Activity Forecast, Time Estimate and Mud Program** – *Tom Pettigrew, Thomas (TR) Redd, and Neil Biswas* • Coring • Timeline • Well Cleans • Mud Program

10:40 - 11:10 AM	**Downhole Tools** – *Mike Mimitz*
	• Geotek Coring
	• Inclination Survey
	• T2P
	• Tool Handling
	• Slickline needs/concerns
	  ○ Scope & scale of wireline program
	  ○ Rig Up/down, wireline/drill pipe

11:10 – 11:30 AM	**Personnel** - Lines of communication
12:15 – 12:45 PM	**P&A Program** – *Roma Diarra (virtual) and Tom Pettigrew* • P&A Plan • Cement Equipment • Personnel
12:45 – 1:15 PM	**Contingency Plans** – *Tom Pettigrew, Thomas (TR) Redd, Peter Flemings* • Flow Events • Stuck pipe • Operational risks

1:15 - 1:45 PM	**Geotek and Science Party Deck operations** – *Mike Mimitz and Carla Thomas*
	• Containers, baskets, tools, BHA, buts, fishing
	  ○ Dimensions, weights, lift points
	  ○ Helix/Harvey Gulf lifting requirements
	• Deck Layout
	  ○ Connections, drainage
	• Core Processing
	• Mud Logging Program
	• Personnel

2:00 - 2:30 PM	**Logistics** - *Carla Thomas, Callum Cook* • Mobilization • During Project • Demobilization
2:30 - 3:00 PM	**Permits** – *Jesse Houghton*
3:00 – 3:30 PM	**Lessons learned from UT-GOM2-1 2017 –** *Peter Flemings* • Mobilization • Data collection
3:30 - 4:30 PM	**Closing** – *Peter Flemings, Carla Thomas, Callum Cook* • Action Items • Path Forward

1.3.8 Task 16.0 – UT-GOM2-2 Scientific Drilling Program Field Operations

- Detailed pre-mobilization planning and preparation activities will continue. Equipment and supplies will be packed and shipped to Helix, Geotek, and Prolog as required.
- Protocols will be developed for UT-GOM2-2 core processing, curation, testing, and analysis.

1.3.9 Task 17.0 – UT-GOM2-2 Core Analysis

- Future task.

2 PRODUCTS

Project publications webpage: https://ig.utexas.edu/energy/gom2-methane-hydrates-at-the-university-of-texas/gom2-publications/

2.1 Publications

Boswell, R., Collet, T.C., Cook, A.E., Flemings, P.B., 2020, Introduction to Special Issue: Gas Hydrates in Green Canyon Block 955, deep-water Gulf of Mexico: Part I: AAPG Bulletin, v. 104, no. 9, p. 1844-1846, http://dx.doi.org/10.1306/bltnintro062320.

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Chen, X., and Espinoza, D. N., 2018a, Ostwald ripening changes the pore habit and spatial variability of clathrate hydrate: Fuel, v. 214, p. 614-622. https://doi.org/10.1016/j.fuel.2017.11.065

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Chen, X. Y., and Espinoza, D. N., 2018b, Surface area controls gas hydrate dissociation kinetics in porous media: Fuel, v. 234, p. 358-363. https://doi.org/10.1016/j.fuel.2018.07.030

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Ewton, E., 2019, The effects of X-ray CT scanning on microbial communities in sediment coresHonors]: Oregon State University, 21 p.

Fang, Y., Flemings, P. B., Daigle, H., Phillips, S. C., Meazell, P. K., and You, K., 2020, Petrophysical properties of the Green Canyon block 955 hydrate reservoir inferred from reconstituted sediments: Implications for hydrate formation and production: AAPG Bulletin, v. 104, no. 9, p. 1997–2028, https://doi.org/10.1306/01062019165

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Flemings, P. B., Phillips, S. C., Collett, T., Cook, A., Boswell, R., and Scientists, U.-G.-E., 2018, UT-GOM2-1 Hydrate Pressure Coring Expedition Summary, *in* Flemings, P. B., Phillips, S. C., Collett, T., Cook, A., Boswell, R., and Scientists, U.-G.-E., eds., UT-GOM2-1 Hydrate Pressure Coring Expedition Report: Austin, TX, University of Texas Institute for Geophysics.

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2.3 Proceeding of the UT-GOM2-1 Hydrate Pressure Coring Expedition

Volume contents are published on the UT-GOM2-1 Expedition website and on OSTI.gov.

2.3.1 Volume Reference

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2.3.2 Prospectus

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2.3.3 Expedition Report Chapters

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2.4 Processing of the UT-GOM2-2 Hydrate Coring Expedition

Volume contents will be published on the UT-GOM2-2 Expedition Proceedings website and on OSTI.gov.

2.4.1 Prospectus

Peter Flemings, Carla Thomas, Tim Collett, Fredrick Colwell, Ann Cook, John Germaine, Melanie Holland, Jesse Houghton, Joel Johnson, Alberto Malinverno, Kevin Meazell, Tom Pettigrew, Steve Phillips, Alexey Portnov, Aaron Price, Manasij Santra, Peter Schultheiss, Evan Solomon, Kehua You, UT-GOM2-2 Prospectus: Science and Sample Distribution Plan, Austin, TX (University of Texas Institute for Geophysics, TX). http://dx.doi.org/10.2172/1827729, 141 p.

2.5 Websites

- Project Website:

https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/

- UT-GOM2-2 Expedition Website

https://ig.utexas.edu/energy/gom2-methane-hydrates-at-the-university-of-texas/gom2-2-expedition/

- UT-GOM2-1 Expedition Website:

https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/expedition-ut-gom2-1/

- Project SharePoint:

https://sps.austin.utexas.edu/sites/GEOMech/doehd/teams/

- Methane Hydrate: Fire, Ice, and Huge Quantities of Potential Energy:

https://www.youtube.com/watch?v=f1G302BBX9w

- Fueling the Future: The Search for Methane Hydrate:

https://www.youtube.com/watch?v=z1dFc-fdah4

- Pressure Coring Tool Development Video:

https://www.youtube.com/watch?v=DXseEbKp5Ak&t=154s

2.6 Technologies Or Techniques

Nothing to report.

2.7 Inventions, Patent Applications, and/or Licenses

Nothing to report.

3 CHANGES/PROBLEMS

3.1 Changes In Approach And Reasons For Change

None.

3.2 Actual Or Anticipated Problems Or Delays And Actions Or Plans To Resolve Them

EPA NPDES Permit for the Gulf of Mexico

The US EPA *National Pollutant Discharge Elimination System* (NPDES) OCS General Permit establishes limitations, prohibitions, and reporting requirements for discharges in the Gulf of Mexico. UT Austin and the Helix are required to obtain US EPA coverage prior to drilling operations. However, the EPA did not reissue the previous NPDES OCS General Permit for the Gulf of Mexico when it expired in September, 2022. No new NPDES coverage can be obtained by operators in the Gulf of Mexico under the OCS General Permit until it is reissued by the EPA. If the EPA does not reissue the OCS General permit by the planned mobilization date, the expedition will have to be delayed.

As of March 31, 2023, the OCS General Permit is under review by the US EPA Region 6 Director. Once this review is complete, the permit will be sent to EPA headquarters OMB for a significance determination. We have been informed by the EPA that the significance determination can take as little as two weeks or up to 90 days.

Hydrate Core Effective Stress Chamber

We rely on data communication between the pump software and Geotek software to conduct our uniaxial strain tests. However, the data stream is interrupted when it transfers large data sets (e.g., during compressibility effects correction). UT, Geotek, and the pump company have been trying to resolve this issue.

A recent attempt to resolve this was made by Geotek by the development of a new DDE data exchange app. However, this has not improved the situation. Geotek and the Pump company have narrowed the problem to the interaction between the pump software and the Geotek software. The Pump company has replicated the loss of communication between the Geotek DDE app and the pump software. The pump company has now provided a list of suggestions to Geotek to try to correct they communications loss by the Geotek DDE app. The communications loss appears to be the result of a failure on the Geotek or client side of things, not anything related to the pump software.

We have identified that restarting the software "resolves" this issue; however, this is not a viable long-term solution, given that our tests run for extended periods. UT will continue to work with Geotek and the Pump company to establish a dedicated and stable data communications with the Geotek Effective Stress Chamber software and the pump used to operate the system for compressibility corrections.

3.3 Changes That Have A Significant Impact On Expenditures

The BP5 Budget Period Continuation modified the project cost to reflect UT's best understanding of current offshore drilling costs at this time. Many of UT's service contracts are now locked-in contractually. Unknown variables that are still subject to change include Helix Well Ops third party subcontracts, such as supply vessels, helicopters, mud and drilling fluids, and associated fuel costs.

3.4 Change Of Primary Performance Site Location From That Originally Proposed

None.

4 SPECIAL REPORTING REQUIREMENTS

4.1 Current Project Period

Task 1.0 – Revised Project Management Plan

Subtask 15.5 – Final UT-GOM2-2 Scientific Drilling Program Operations Plan

4.2 Future Project Periods

Task 1.0 – Revised Project Management Plan

Subtask 18.1 – Project Sample and Data Distribution Plan

Subtask 18.3 – UT-GOM2-2 Scientific Drilling Program Scientific Results Volume

5 BUDGETARY INFORMATION

The Budget Period 5 cost summary is provided in Table 5-1.

Table 5-1: Phase 5 / Budget Period 5 Cost Profile

Baseline Reporting Quarter	Budget Period 5							
	Y1Q1		Y1Q2		Y1Q3		Y1Q4	
	10/01/20-12/31/20		01/01/21-03/31/21		04/01/21-06/30/21		07/01/21-09/30/21	
	Y1Q1	Cumulative Total	Y1Q2	Cumulative Total	Y1Q3	Cumulative Total	Y1Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 587,651	$ 31,973,595	$ 581,151	$ 32,554,746	$ 5,466,306	$ 38,021,052	$ 581,151	$ 38,602,203
Non-Federal Share	$ 150,293	$ 23,871,255	$ 148,630	$ 24,019,885	$ 1,398,018	$ 25,417,903	$ 148,630	$ 25,566,533
Total Planned	$ 737,944	$ 55,844,850	$ 729,781	$ 56,574,631	$ 6,864,324	$ 63,438,955	$ 729,781	$ 64,168,736
Actual Incurred Cost								
Federal Share	$ 589,548	$ 29,766,294	$ 426,667	$ 30,192,961	$ 2,072,269	$ 32,265,230	$ 598,900	$ 32,864,131
Non-Federal Share	$ 220,056	$ 23,547,000	$ 374,124	$ 23,921,124	$ 623,736	$ 24,544,860	$ 222,682	$ 24,767,542
Total Incurred Cost	$ 809,604	$ 53,313,294	$ 800,791	$ 54,114,085	$ 2,696,006	$ 56,810,091	$ 821,582	$ 57,631,673
Variance								
Federal Share	$ 1,897	$ (2,207,301)	$ (154,484)	$ (2,361,785)	$ (3,394,037)	$ (5,755,822)	$ 17,750	$ (5,738,072)
Non-Federal Share	$ 69,763	$ (324,255)	$ 225,493	$ (98,761)	$ (774,281)	$ (873,043)	$ 74,052	$ (798,991)
Total Variance	$ 71,661	$ (2,531,556)	$ 71,010	$ (2,460,546)	$ (4,168,318)	$ (6,628,864)	$ 91,801	$ (6,537,063)

Baseline Reporting Quarter	Budget Period 5							
	Y2Q1		Y2Q2		Y2Q3		Y2Q4	
	10/01/21-12/31/21		01/01/22-03/31/22		04/01/22-06/30/22		07/01/22-09/30/22	
	Y2Q1	Cumulative Total	Y2Q2	Cumulative Total	Y2Q3	Cumulative Total	Y2Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 4,433,883	$ 43,036,085	$ 749,973	$ 43,786,058	$ 20,274,089	$ 64,060,147	$ 710,837	$ 64,770,984
Non-Federal Share	$ 700,232	$ 26,266,765	$ 118,441	$ 26,385,206	$ 3,201,835	$ 29,587,040	$ 112,261	$ 29,699,301
Total Planned	$ 5,134,114	$ 69,302,850	$ 868,414	$ 70,171,264	$ 23,475,924	$ 93,647,188	$ 823,097	$ 94,470,285
Actual Incurred Cost								
Federal Share	$ 466,675	$ 33,330,806	$ 617,836	$ 33,948,642	$ 543,438	$ 34,492,080	$ 3,743,308	$ 38,235,387
Non-Federal Share	$ 254,642	$ 25,022,184	$ 281,474	$ 25,303,658	$ 258,413	$ 25,562,071	$ 904,873	$ 26,466,945
Total Incurred Cost	$ 721,317	$ 58,352,990	$ 899,310	$ 59,252,300	$ 801,851	$ 60,054,151	$ 4,648,181	$ 64,702,332
Variance								
Federal Share	$ (3,967,208)	$ (9,705,280)	$ (132,137)	$ (9,837,417)	$ (19,730,651)	$ (29,568,068)	$ 3,032,471	$ (26,535,597)
Non-Federal Share	$ (445,590)	$ (1,244,581)	$ 163,033	$ (1,081,548)	$ (2,943,422)	$ (4,024,969)	$ 792,613	$ (3,232,356)
Total Variance	$ (4,412,798)	$ (10,949,860)	$ 30,896	$ (10,918,964)	$ (22,674,073)	$ (33,593,037)	$ 3,825,084	$ (29,767,953)

Baseline Reporting Quarter	Budget Period 5							
	Y3Q1		Y3Q2		Y3Q3		Y3Q4	
	10/01/22-12/31/22		01/01/23-03/31/23		04/01/23-06/30/23		07/01/23-09/30/23	
	Y3Q1	Cumulative Total	Y3Q2	Cumulative Total	Y3Q3	Cumulative Total	Y3Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 1,038,173	$ 36,505,850	$ 19,419,248	$ 55,925,098	$ 19,297,378	$ 75,222,476	$ 609,291	$ 75,831,767
Non-Federal Share	$ 356,923	$ 25,399,611	$ 4,475,093	$ 29,874,704	$ 4,447,789	$ 34,322,493	$ 260,835	$ 34,583,328
Total Planned	$ 1,395,096	$ 61,905,461	$ 23,894,341	$ 85,799,802	$ 23,745,167	$ 109,544,969	$ 870,126	$ 110,415,095
Actual Incurred Cost								
Federal Share	$ 294,544	$ 38,529,931	$ 319,110	$ 38,849,041				
Non-Federal Share	$ 207,066	$ 26,674,011	$ 269,715	$ 26,943,726				
Total Incurred Cost	$ 501,610	$ 65,203,942	$ 588,825	$ 65,792,767				
Variance								
Federal Share	$ (743,629)	$ 2,024,082	$ (19,100,138)	$ (17,076,057)				
Non-Federal Share	$ (149,857)	$ 1,274,399	$ (4,205,378)	$ (2,930,979)				
Total Variance	$ (893,486)	$ 3,298,481	$ (23,305,516)	$ (20,007,035)				

*Note: BP5 rescoped beginning Y3Q1; cumulatives re-set

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7 ACRONYMS

Table 7-1: List of Acronyms

ACRONYM	DEFINITION
AAPG	American Association of Petroleum Geologists
APD	Application for Permit to Drill
APM	Application for Permit to Modify
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CDX	Central Data Exchange
CHNS	Carbon, Hydrogen, Nitrogen, Sulfur
CPP	Complimentary Project Proposal
DDE	Dynamic Data Exchange
DNA	Deoxyribonucleic Acid
DOE	U.S. Department of Energy
EPA	Environmental Protection Agency
GC	Green Canyon
GHSZ	Gas Hydrate Stability Zone
IODP	International Ocean Discovery Program
JCC	J. Connor Consulting, Inc.
JGR	Journal of Geophysical Research
JIP	Joint Industry Project
LDEO	Lamont-Doherty Earth Observatory
LOD	Letter of Determination
MD	Measured Depth
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NMR	Nuclear Magnetic Resonance
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OCS	Outer Continental Shelf
OSTI	Office of Scientific and Technical Information
PCATS	Pressure Core Analysis and Transfer System
PCC	Pressure Core Center
PCTB	Pressure Core Tool with Ball Valve
PI	Principle Investigator
PM	Project Manager
PMP	Project Management Plan

PMRS	Pressure Maintenance and Relief System
QRPPR	Quarterly Research Performance and Progress Report
RBBC	Resedimented Boston Blue Clay
RPPR	Research Performance and Progress Report
RUE	Right-of-Use-and-Easement
SOPO	Statement of Project Objectives
TVDSF	Total Vertical Depth Below Seafloor
UNH	University of New Hampshire
USCG	United States Coast Guard
USGS	United States Geological Survey
UT	University of Texas at Austin
UW	University of Washington
WR	Walker Ridge
XCT	X-ray Computed Tomography

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