



**Savannah River
Remediation**

AECOM | BECHTEL | CH2M | B&W | AREVA

Saltstone Disposal Facility SDU Cell 2A Core Drill Summary

We do the right thing.

SRR-CWDA-2015-00087

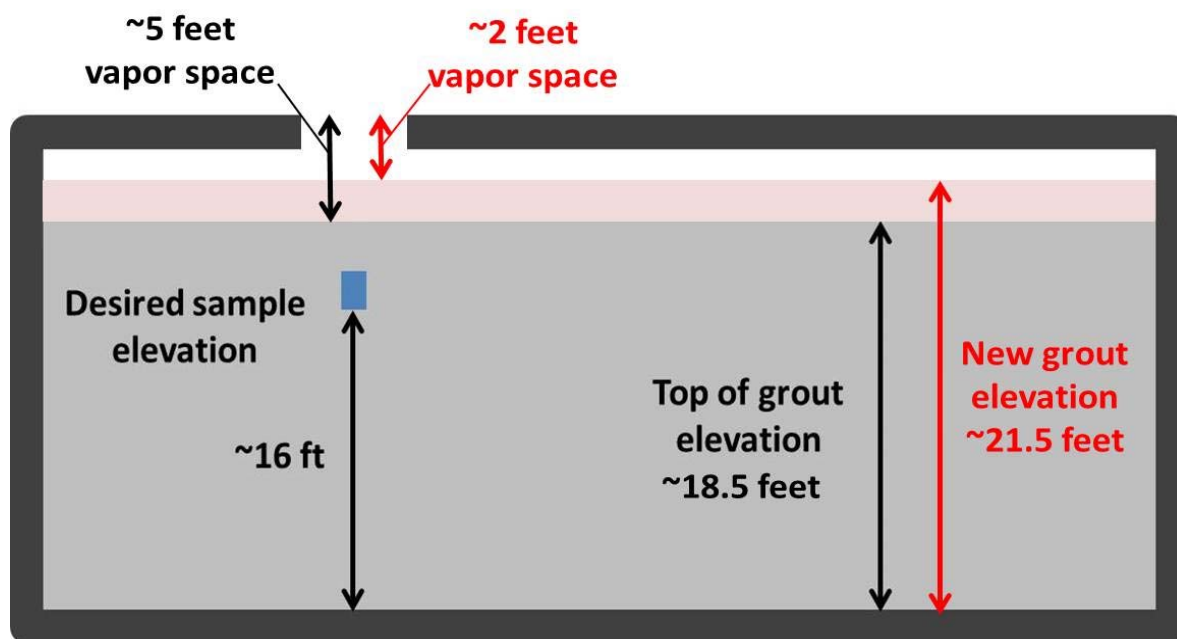


- **TASK**: Compare the key properties of the following field and laboratory-prepared saltstone:
 - A. Actual saltstone (*radioactive*) mixed in SPF and emplaced/cured in SDU Cell 2A
 - B. Simulant saltstone (*non-radioactive*) mixed and cured in the laboratory.
- **PURPOSE**: Demonstrate that the properties of laboratory-prepared saltstone are representative of the properties of “actual” saltstone emplaced and cured in the SDU.

Objectives

We do the right thing.

- Intent is to core drill grout samples of 2-inch diameter at three separate locations (two samples per location) in SDU Cell 2A.
- Necessary to core drill through overlying grout to reach desired sample elevation (previously 3 feet but now up to 6 feet of overlying grout).



Max. fill height
in SDU increased
from 18.5 to
21.5 feet.

Planned Analyses

We do the right thing.

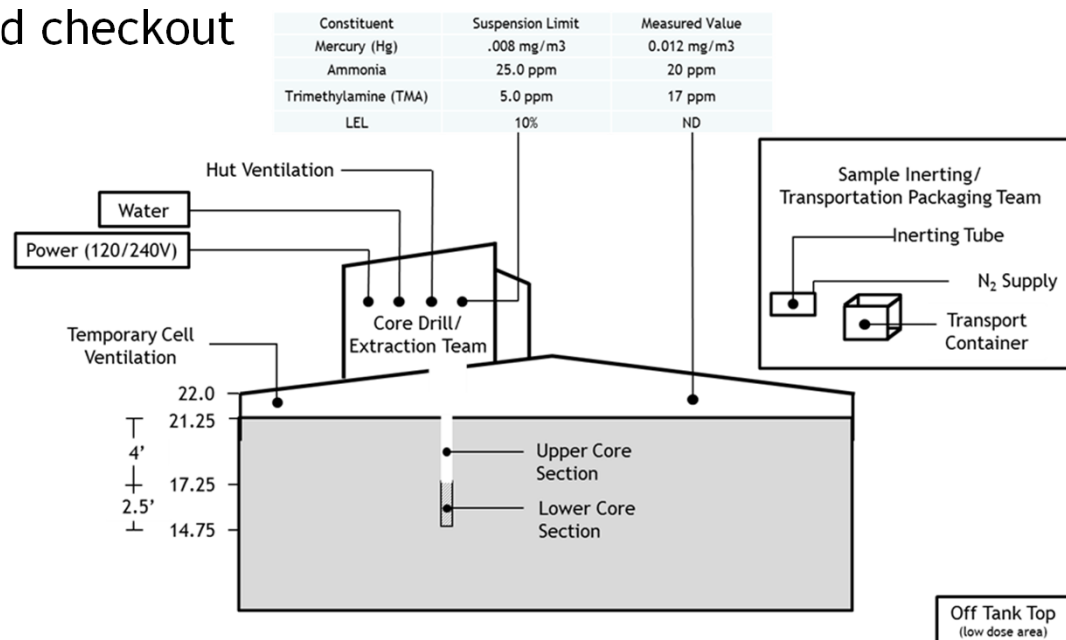
Sample Analysis	Sample Configuration	Required Sample Mass or Dimensions
Saturated Hydraulic Conductivity	Cylindrical sample with little or no observable surface damage	2 inch x 2 inch (Diameter x Height)
Density, Porosity, Moisture Content	Fractured samples – exposure to oxygen will not affect data	≈10 grams
Total Activity (Tc-99, Sr-90, Se-79, I-129, Ra-226)	Fractured samples – exposure to oxygen will not affect data	≈10 grams for each isotope
Distribution Coefficient (K_d) (Tc, Sr, Se, I, Ra)	Sub-sample removed from intact sample interior to ensure minimal oxygen exposure – sub-sample ground for measurement	≈10 grams for all elements – leachate separated for individual element measurements
Tc(VII) / Tc(Total) Ratio	Sub-sample removed from intact sample interior to ensure minimal oxygen exposure – sub-sample ground for measurement	≈10 grams
pH / Eh	Fractured samples ground for measurement	≈10 grams
Toxicity Characteristic Leaching Procedure (TCLP) (reduced sample)	Sub-sample removed from intact sample interior to ensure minimal oxygen exposure – sub-sample crushed for measurement but must be maintained in an anoxic environment for transfer and measurement	≈50 grams
TCLP (oxidized sample)	Fractured samples – sample should be proximately located to reduced TCLP sample – sample should be crushed and exposed to air during transfer and measurement	≈50 grams

SDU Cell 2A Core Drill Baseline Conditions & Preparatory Work

We do the right thing.

- Core Drill Preparation Work
 - Baseline vapor space chemical concentrations
 - Used to evaluate potential personnel exposure concerns and develop mitigating strategies.
 - Fabrication of anaerobic chamber for SRNL
 - Fabrication of inerting tubes for transport
 - Installation of containment huts over each camera port
 - Installation of supplemental active cell ventilation
 - Drill equipment installation and checkout
 - Staging support equipment
 - Temporary power
 - Water buffalo
 - Nitrogen
 - Waste handling

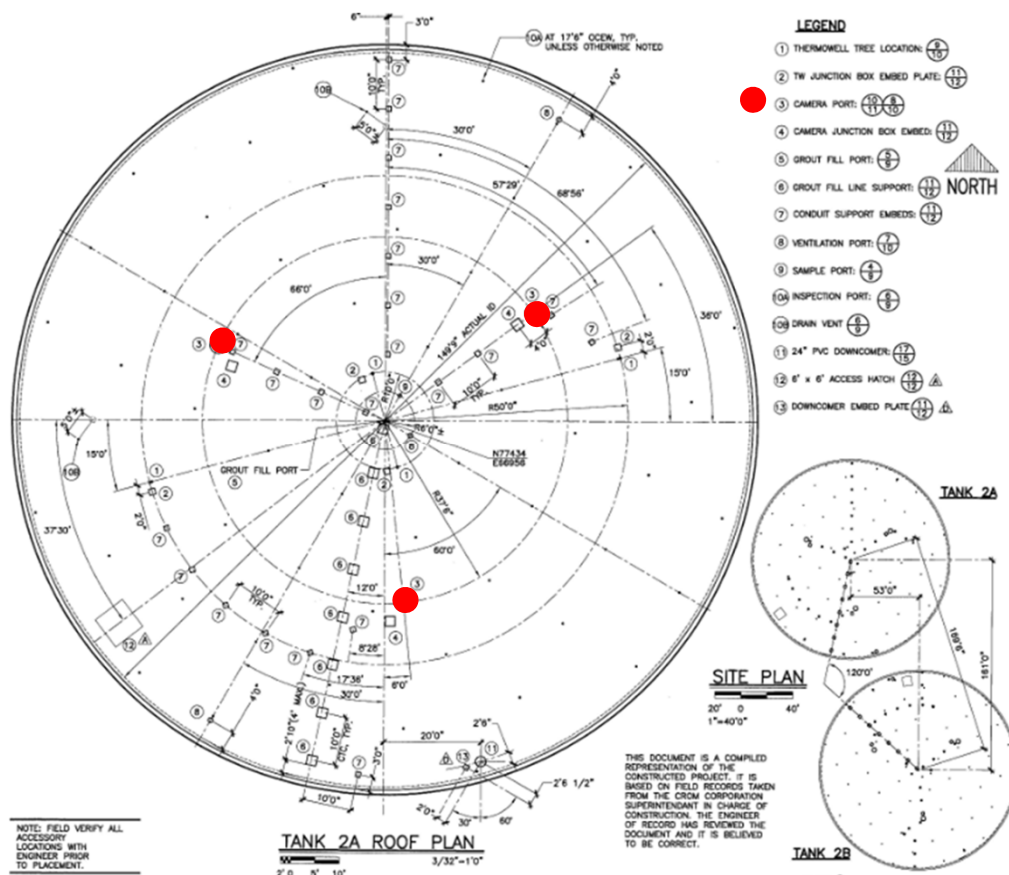
Total Dose
Received: 822 person-mrem



Cell Access: Camera Port Locations

We do the right thing.

Use existing camera ports, 120° apart to access cell



Cell Access: Containment Huts

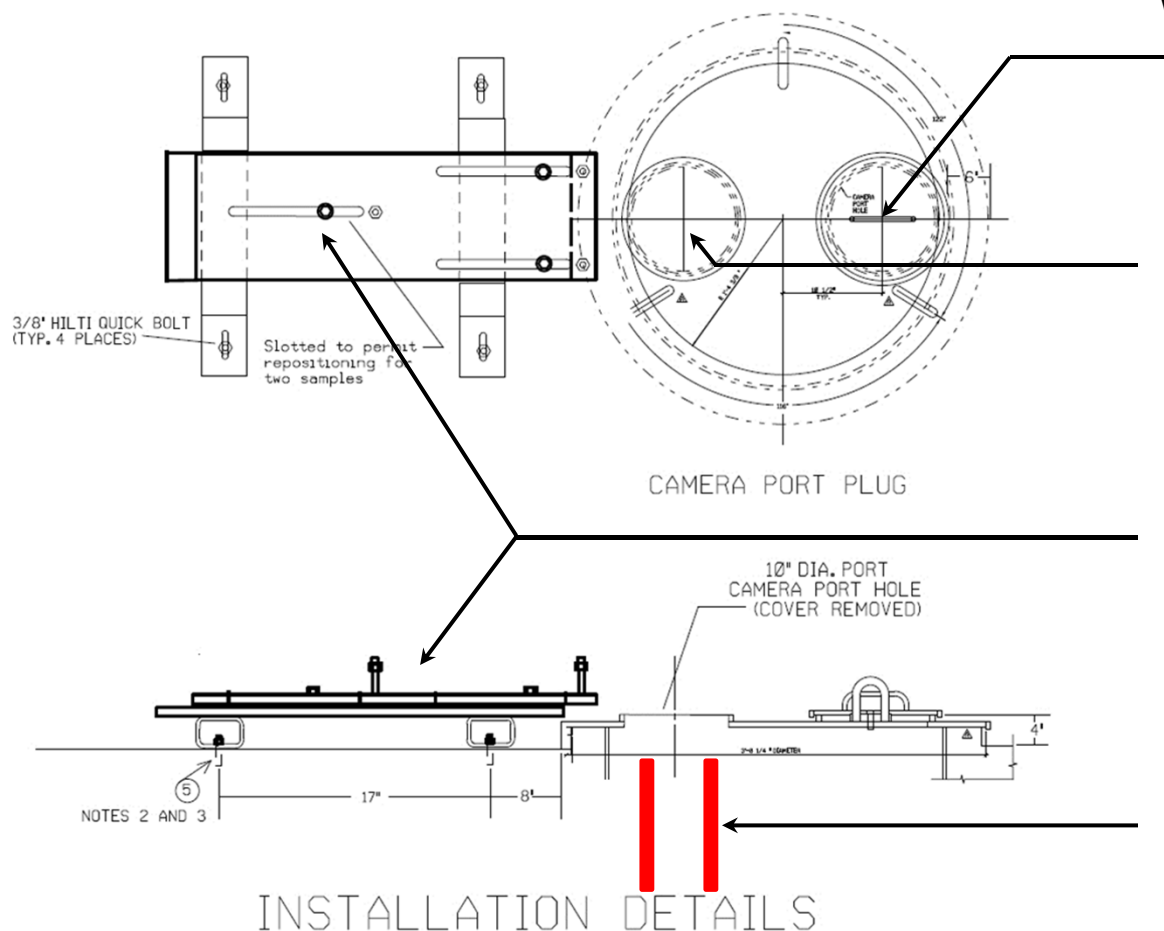
We do the right thing.



Main hut: 12'w x 15'l x 12'h

Air lock: 12'w x 5'l x 12'h

Cell Access: Equipment and Cell Modifications



- Each location is equipped with two access ports
- One used to install micro-camera
- One used for drilling operations
- Slotted mounting plate mounted to SDU Cell 2A roof and used to slide drill to two different locations within the camera port
- Two drill attempts per camera port hole desired

Core Drill / Extraction Equipment

Slotted Mounting Plate



Drill String Shield Plate



Cell Micro Camera and Shield Plate



Equipment Staging and Checkout



Core Drill Process

We do the right thing.



Sample Extraction Process

We do the right thing.



Extraction Process

We do the right thing.



Inerting Equipment / Operation

Inerting Tube
Undergoing Inerting
Process Using N₂ Gas



Inerted Tubes Packed In
Shipping Container

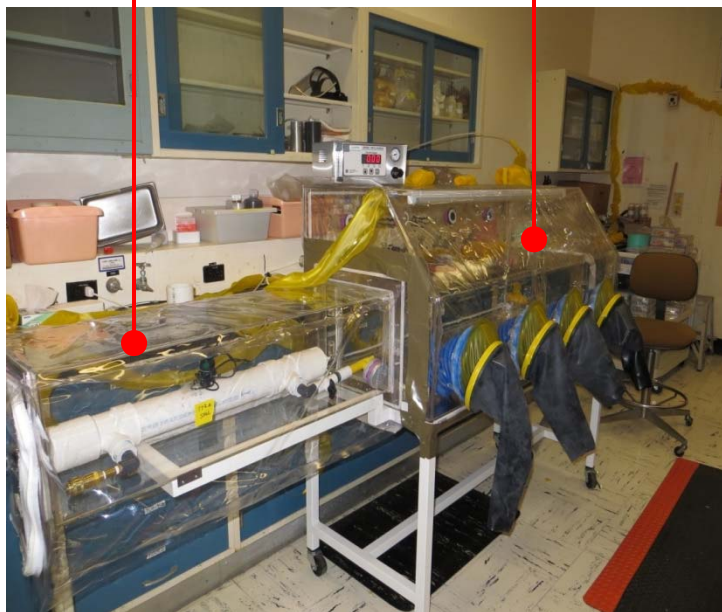


Laboratory Anaerobic Chamber

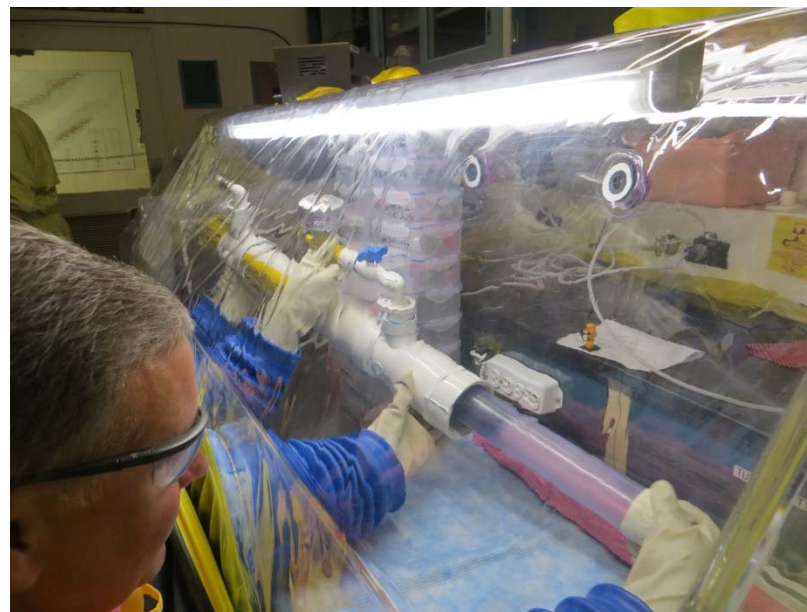
Anaerobic Chamber

Transfer Chamber

Main Chamber

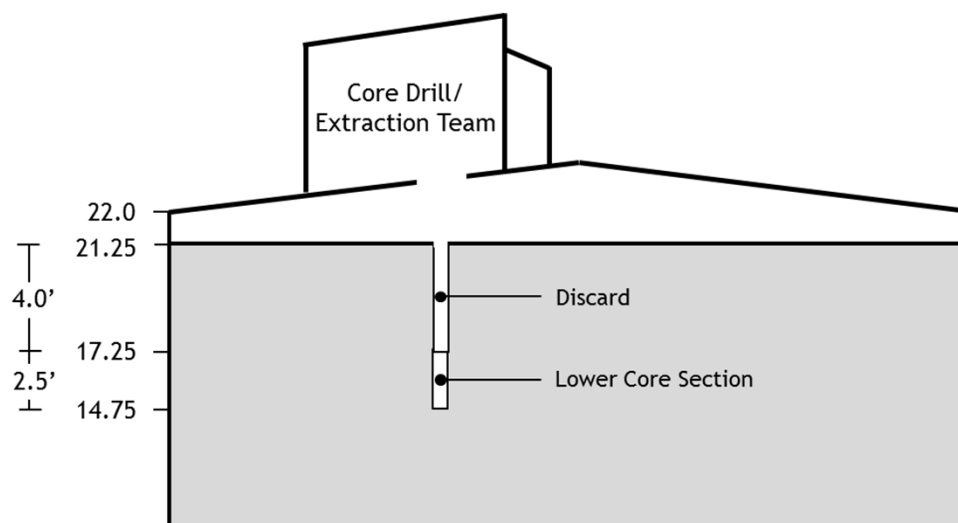


Unpackaging Samples Inside the Anaerobic Chamber



Initial Conceptual Approach

- Initial approach based on TNX mock-up experience
- Drill approximately 6.5 feet
- Reset drill to second location, drill approximately 6.5 feet
 - Remove upper 4 feet
 - Remove remaining 2.5 feet as sample
 - Inert for transport
 - Discard upper 4 feet back in cell
 - Repeat for second hole



Camera Port B Summary

We do the right thing.

Core drill activities were conducted in camera port B 4/16/2015 and 4/22/2015

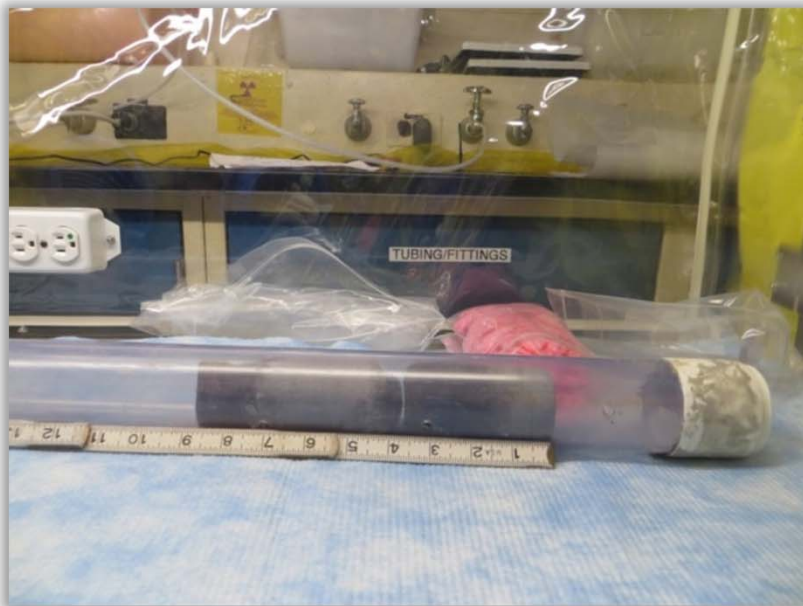
	Date	Depth (feet)	Drill Operation	Observations	Core Material Extracted (approximate) [inches]
Hole 1	16-Apr	0-2	As anticipated		0
	16-Apr	2-4	Noticable decrease in drill traverse speed	Considerably more time than required compared to mock-up experience	0
	16-Apr	4-6.5	Additional decrease in drill traverse speed, drill motor laboring then "popping" and resumption of normal drill operation	Popping was not observed during the mock-up. Approximately 24 inches of core material observed in the drill bit but no other solid material remained in the hole	0
Hole 2	16-Apr	0-2	As anticipated	Based on the original plan the upper 4 feet was discarded back into the cell	0
	16-Apr	2-4	Noticable decrease in drill traverse speed. Work suspended due to extended job duration	Considerably more time than required compared to mock-up experience. Based on the original plan the upper 4 feet was discarded back into the cell	0
	22-Apr	4-6.5	Intentionally decreased drill traverse speed, drill motor laboring then "popping" and resumption of normal drill operation	Extraction tube encountered considerable resistance. Operators described the feel as "gravelly"	9

Total Dose Received (person-mrem) = 587

Camera Port B Summary

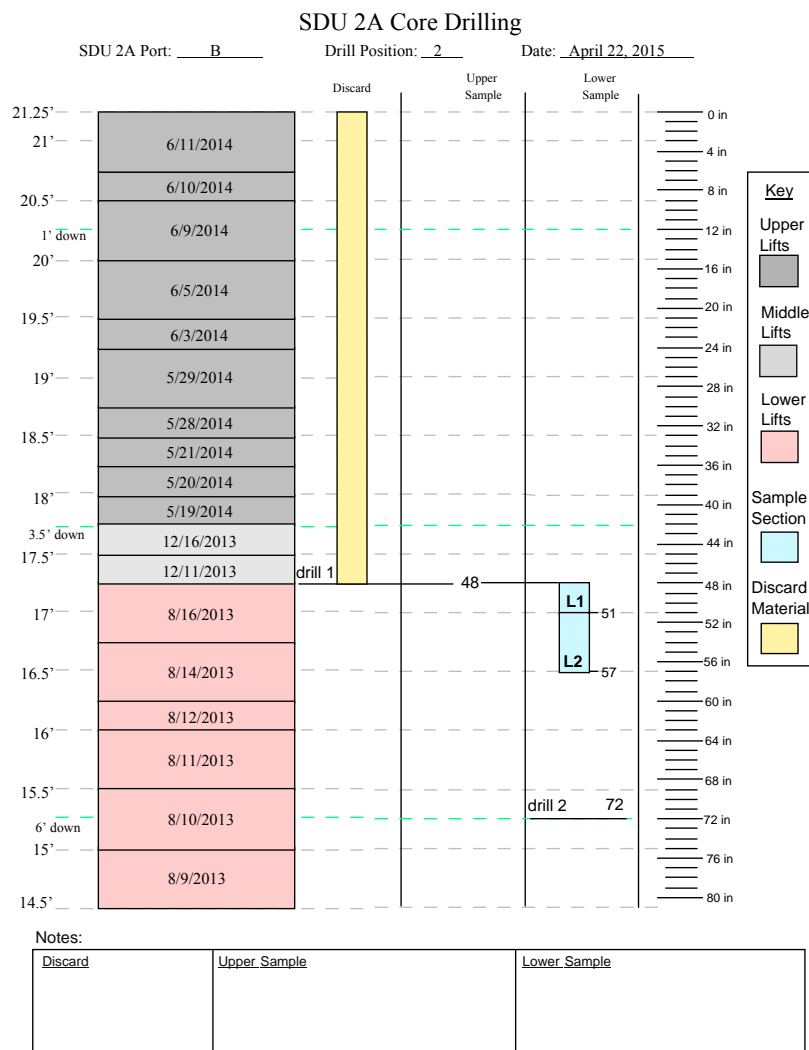
Port B, Hole #2

- Core Material Extracted from Hole # 2
 - Approximately 16.5' - 17.25' elevation



Camera Port B Operator Aid Hole #2

We do the right thing.



Camera Port B Lessons Learned

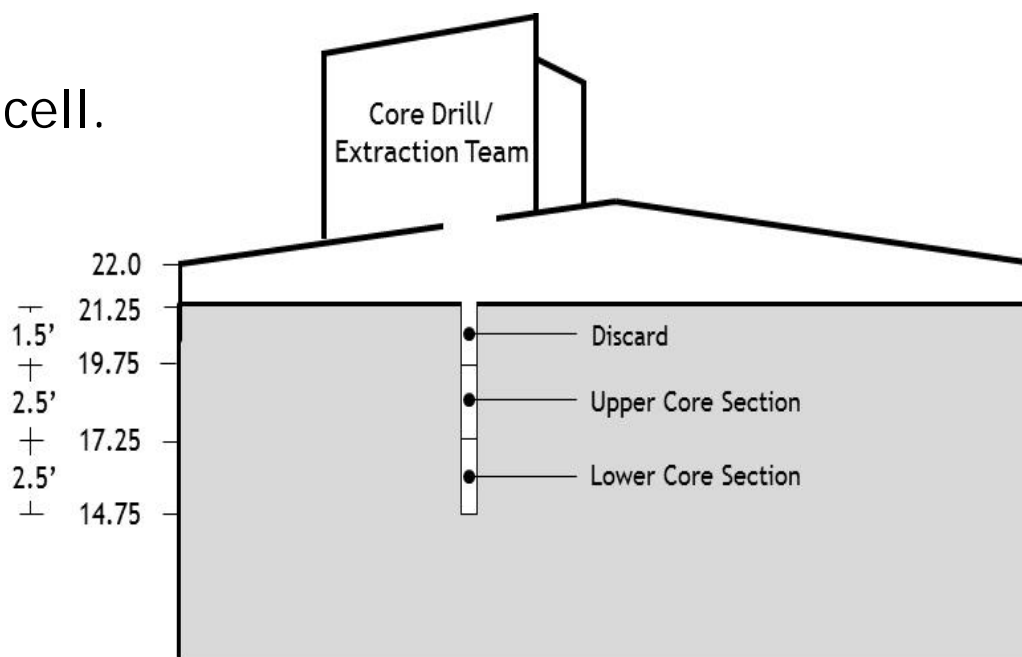
We do the right thing.

- Lessons learned from Camera Port B operations were incorporated into the approach for Ports C and A to increase the probability of retrieving usable sample material:
 - Revised core drill procedure to allow flexibility to drill or remove core material as needed to ensure material did not bind in the bit.
 - Revised approach to drill in discrete segments, remove material, and thoroughly flush hole prior to re-setting the drill bit.
 - Added “upper” core sample to original “target” sample areas to increase probability of retrieving viable sample material.
 - Used larger DD 350 drill motor to overcome motor laboring.
 - Limited Drill / Extraction process to a single hole per day due to slower drill traverse speed and increased duration per hole.
 - RCO revised support personnel arrangement to minimize dose given increased job duration.

Revised Approach Incorporating Lessons Learned

We do the right thing.

- Drill / Remove upper 1-2 feet; measure hole depth
- Drill / Remove upper core sample section (~ 2.5 feet) ; measure hole depth
- Inert for transport
- Drill / Remove lower core sample section (~ 2.5 feet)
- Inert for transport
- Discard upper 1-2 feet back in cell.



Camera Port C Summary

We do the right thing.

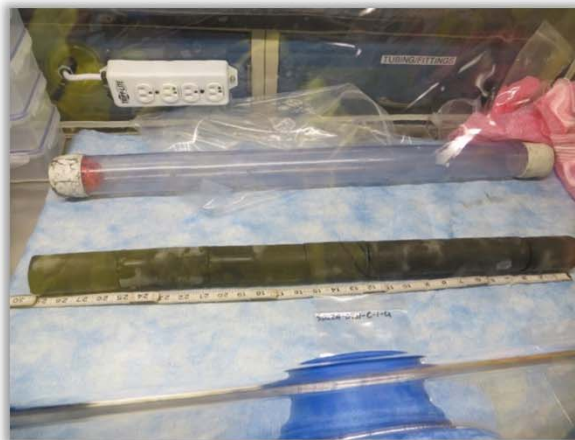
Core drill activities were conducted in camera port C 4/28/2015 and 4/30/2015

	Date	Depth (feet)	Drill Operation	Core Material Extracted (approximate) [inches]
Hole 1	28-Apr	0-1	As anticipated	0
	28-Apr	1-3.5	Noticable decrease in drill traverse speed	29
	28-Apr	3.5-6	Drill motor did not exhibit laboring but "popping" followed by normal drill operation observed	20
Hole 2	30-Apr	0-1.75	As anticipated	0
	30-Apr	1.75-4	Noticable decrease in drill traverse speed	24
	30-Apr	4-6.5	Drill motor did not exhibit laboring but "popping" followed by normal drill operation observed	29

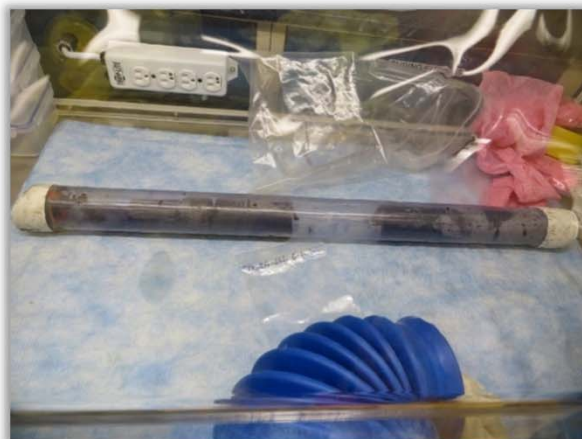
Total Dose Received (person-mrem) = 589

Camera Port C Hole #1

Upper Sample

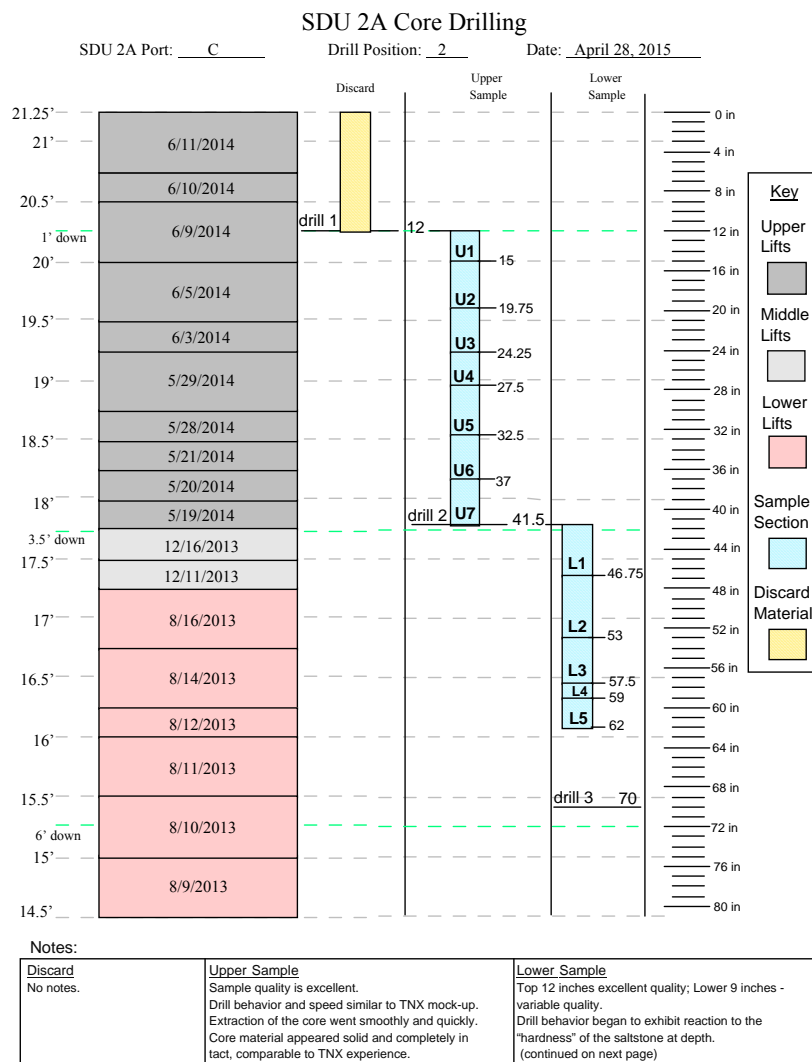


Lower Sample



Camera Port C Operator Aide Hole #1

We do the right thing.

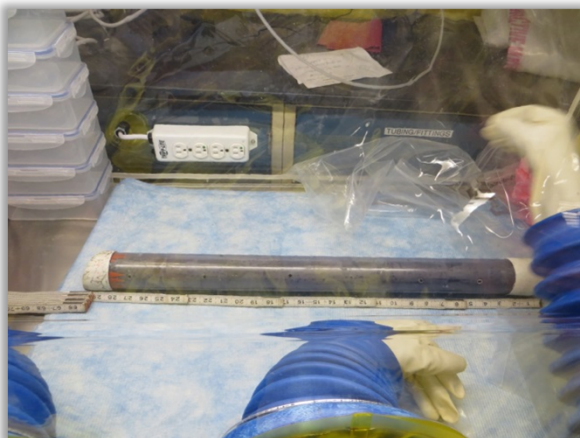


Camera Port C Hole #2

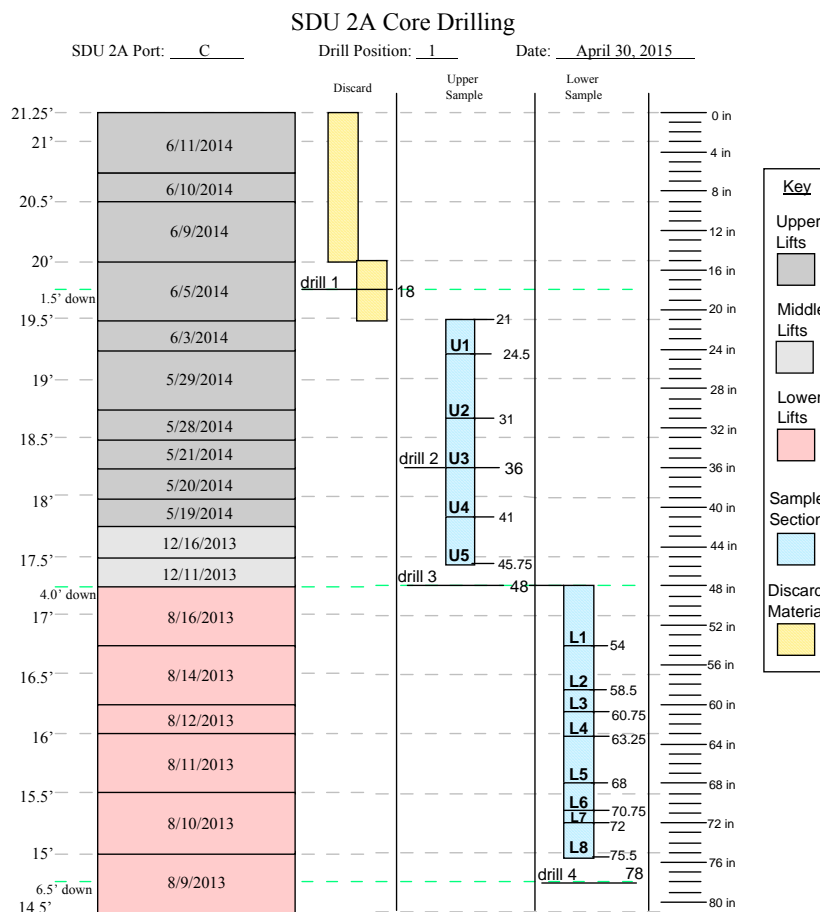
Upper Sample



Lower Sample



Camera Port C Operator Aide Hole #2



Notes:

Discard First sample section length is 17 inches, hole depth 15 inches. Material has chips (some chips are suspected to have turned in the extraction tube).	Upper Sample Retrieved and discarded additional 6 inches off the top. Upper sample section 24 inches, hole depth 48 inches.	Lower Sample Lower core section length 28.5 inches. Excellent quality. Much like the upper section and clearly better than drill position 1.
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Camera Port A Summary

We do the right thing.

Core drill activities were conducted in camera port A 5/5/2015 and 5/6/2015

	Date	Depth (feet)	Drill Operation	Core Material Extracted (approximate) [inches]
Hole 1	5-May	0-2	As anticipated	0
	5-May	2-4	Noticable decrease in drill traverse speed	22
	5-May	4-6	Drill motor did not exhibit laboring but "popping" followed by normal drill operation observed	17
Hole 2	6-May	0-2	As anticipated	0
	6-May	2-4	Noticable decrease in drill traverse speed	24
	6-May	4-6	Drill motor did not exhibit laboring but "popping" followed by normal drill operation observed	17

Total Dose received (person-mrem) = 716

Camera Port A Hole #1

Upper Sample

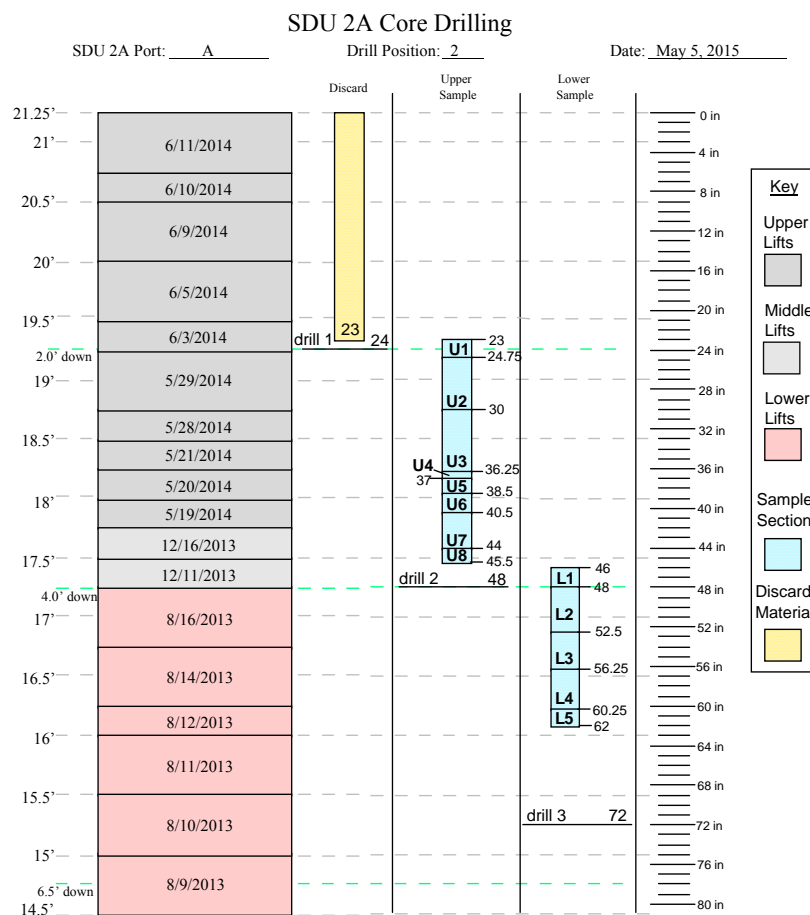


Lower Sample



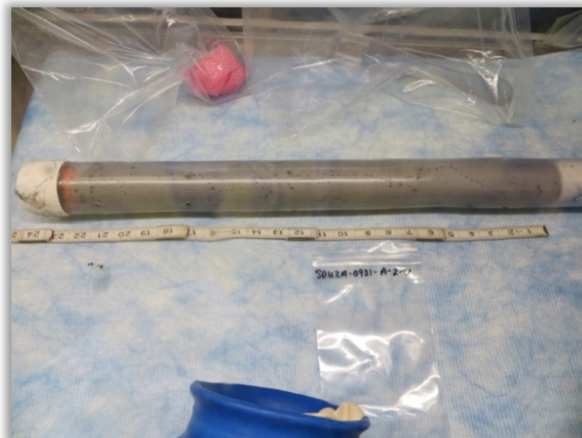
Camera Port A Operator Aid Hole #1

We do the right thing.

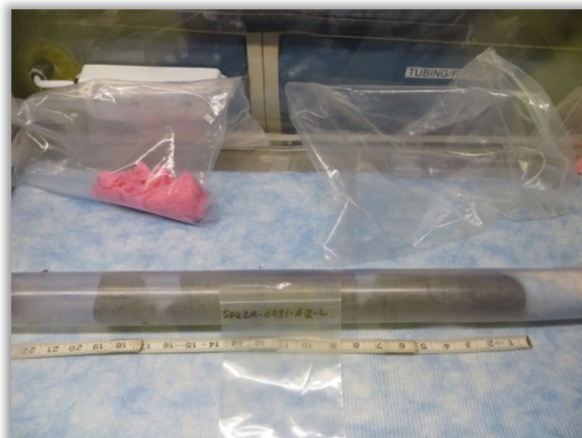


Camera Port A Hole #2

Upper Sample

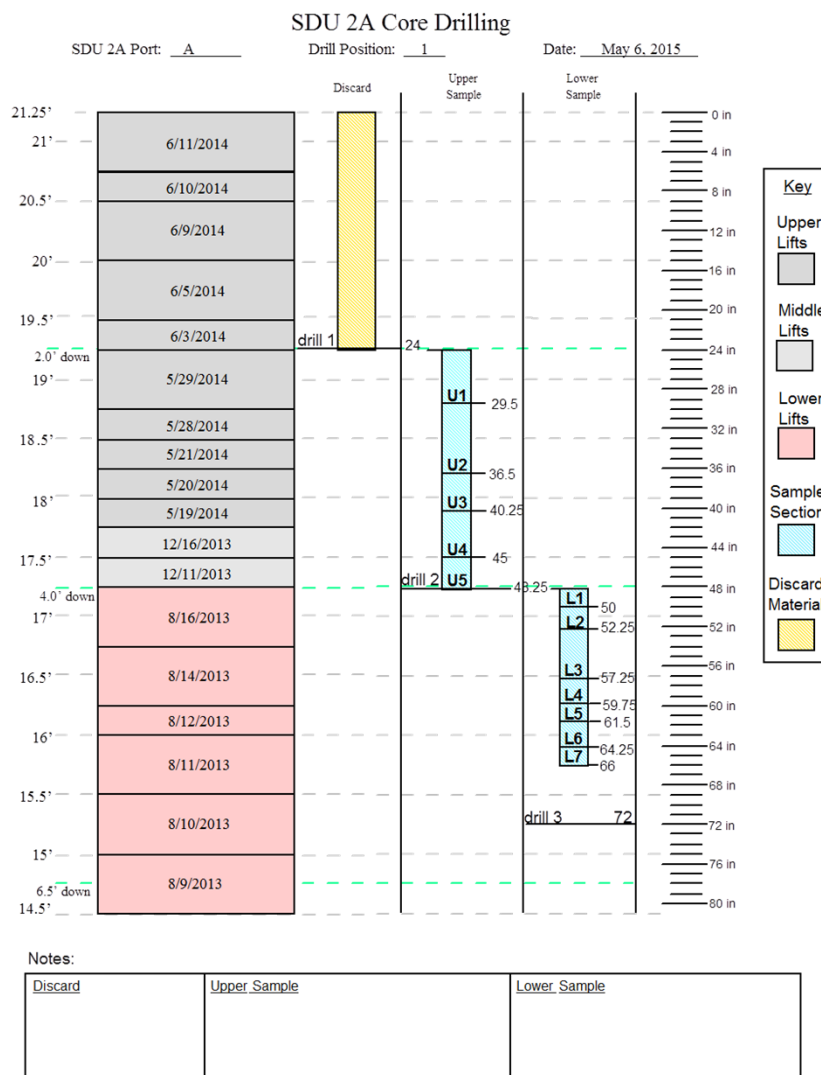


Lower Sample



Camera Port A Operator Aid Hole #2

We do the right thing.



Summary of Samples Collected

We do the right thing.

Date	Port	Hole #	Drill Position	Approximate Sample Length (in)	Sample Region	Sample Condition	Notes
16-Apr	B	1	1	N/A	N/A	Undefined	Material found bound in drill bit. Drill activities suspended prior to core extraction
22-Apr	B	2	2	9	Lower	Degraded	Drilled to approximately 78 inches. Extraction tube could only be inserted into top 9 inches of the target region. Hole possibly obstructed with grout fragments
28-Apr	C	1	2	29	Upper	Excellent	
28-Apr	C	1	2	20	Lower	Good	
30-Apr	C	2	1	24	Upper	Excellent	
30-Apr	C	2	1	29	Lower	Excellent	
5-May	A	1	2	22	Upper	Average	
5-May	A	1	2	17	Lower	Marginal	
6-May	A	2	1	24	Upper	Excellent	
6-May	A	2	1	17	Lower	Average	

NOTE: Sample Condition was a subjective assessment of core conditions in the field when removed from the cell.

Summary of Dose Received

We do the right thing.

Camera Port	Dose (person-mrem)
Preparation and Support	822
A	716
B	587
C	589
Total	2,714

Highest Individual Dose

- Core Drill 253 mrem
- Preparation & Support 144 mrem

NOTE: Doses do not include demobilization

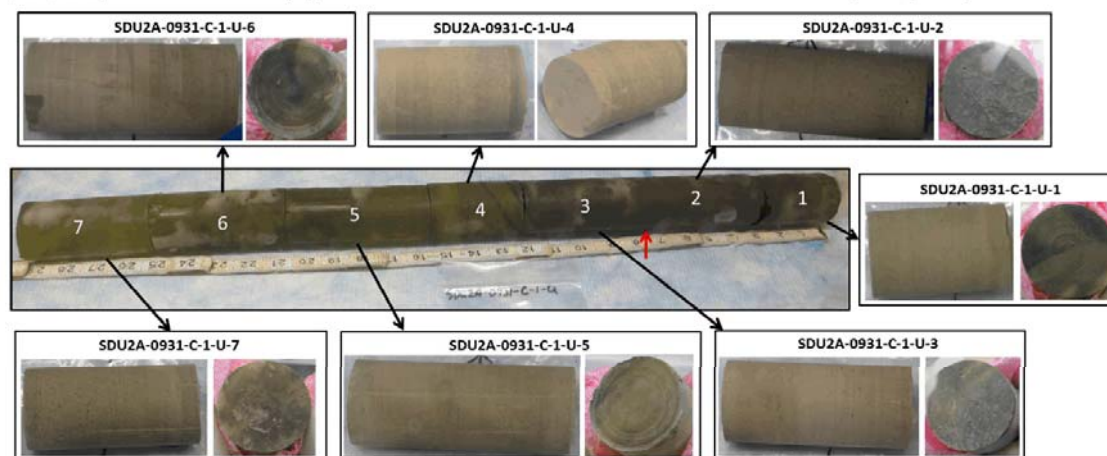
Current Status

- All core material is currently stored in the anaerobic chamber at SRNL
- Each core section has been evaluated for quality
- Technical Task Request (TTR) issued to SRNL for testing
- Technical Task Quality Assurance Plan (TTQAP) issued by SRNL
- Experimental Plan issued by SRNL

We do the right thing.

- Core Sample Test Designation Plan issued to address testing planned for each core section as well as cores to be used as spares

Sample ID: SDU2A-0931-C-1-U (Upper Core Portion Extracted from Port C – Drill Position 1 on April 28, 2015)



#	Approx. Pour Date	Physical Appearance	Possible Test(s)
1	6/9/14	• Intact	• Spare
2	6/5/14	• Intact – sample broken at cold joint to produce samples 2 & 3	• Spare
3	6/3/14 & 6/5/14		• Spare
4	5/29/14	• Intact	• Spare
5	5/28/14 & 5/29/14	• Intact	• Tc total activity, Tc K _d , & Tc(VII) conc. – for K _d and Tc(VII) conc. material must be removed from sample interior
6	5/20/14 & 5/21/14	• Intact	• Total activity and K _d (except Tc) – for K _d material must be removed from sample interior
7	5/19/14 & 5/20/14	• Intact	• SHC – ensure 2" sample sectioned for SHC does not include a cold joint • Density, porosity, & moisture content on one end section removed during SHC sample cutting • pH / E _s – for E _s material must be removed from sample interior

- Testing scheduled for FY 2016 (pending available funding)