

IODP EXP 358 Daily Geomechanics Report

Report #022 20181201Final 4990

RTG Team

RTG Supervisor(s)	David Castillo / Thomas Finkbeiner / Demian Saffer
RTG Watch Lead (00:00-12:00)	Kan Aoike
RTG Watch Lead (12:00-24:00)	Adam Wspanialy
RTG Office Support	N/A

Well Status (as of 06:00 Dec.2 2018)

Site Name:	C0002	Hole Name:	Q
Water Depth:	1,939.0 m	RT-MSL:	28.5 m
Current Depth:	4,990.0 mBRT (4,988.0) mTVD	Section TD:	4,990 mBRT (4,988.0) mTVD
Section #:	1	CSG Depth / Size:	(4855.0) mBRT 11-3/4 "
Static MW:	1.37 sg	Current ECD:	1.43 sg
FIT/LOT/XLOT:	FIT maximum pressure = 1.45 sg, Possible "LOP" = 1.43 sg @4855 mBRT		
Current formation/ lithology:	Shale		
Sensor Offsets from the Bit:	PDC Bit: 0 m arcVISION 675: (APWD: 3.59 m, Resistivity: 4.30 m, GR: 4.35 m) TeleScope 675: (IWOB: 8.47 m, Direction + Inclination: 11.84 m)		
Other BHA Offsets from the Bit	8-1/4" Stabiliser: 17.463~19.051 m 8-1/2" x 12-1/4" Z-reamer: 28.475~29.823 m Jar: 190.654~200.229 m		
Current Operations:	Continued reaming down with 8-1/2" x 12-1/4" BHA with Z-reamer opened. Experienced some high torques but no stall. Slow and steady reaming was observed. 4970 mBRT as of 06:00 Dec.2		

2Geomechanics Alert

GREEN	<p>Green = Projected model remains accurate White = Unanticipated deviation from model which <i>should not</i> affect drilling Yellow = Unanticipated deviation from model which <i>may</i> affect drilling Red = Imminent requirement to stop drilling</p>
Basis for Alert Level + Recommendations	No issue with 1.37 sg MW for Section 1

Principal Findings

N/A

Observations Summary

Use this space to discuss any observations while drilling, running casing etc.

Fracture Gradient	N/A
Pore Pressure	Total gas < 1%.
Wellbore Breakout	N/A
Tensile Failure	N/A
Drilling Parameters	Steady ECD of 1.43 sg with slight short cycle fluctuation. DTOR ~2~5 kNm while STOR 20~30 kNm. DWOB 10~80 kN while SWOB 80~120 kN. 600gpm.
Other	<i>No seepage losses have been observed in last 24hrs.</i>

IODP EXP 358 Daily Geomechanics Report

Report #022 20181201Final 4990

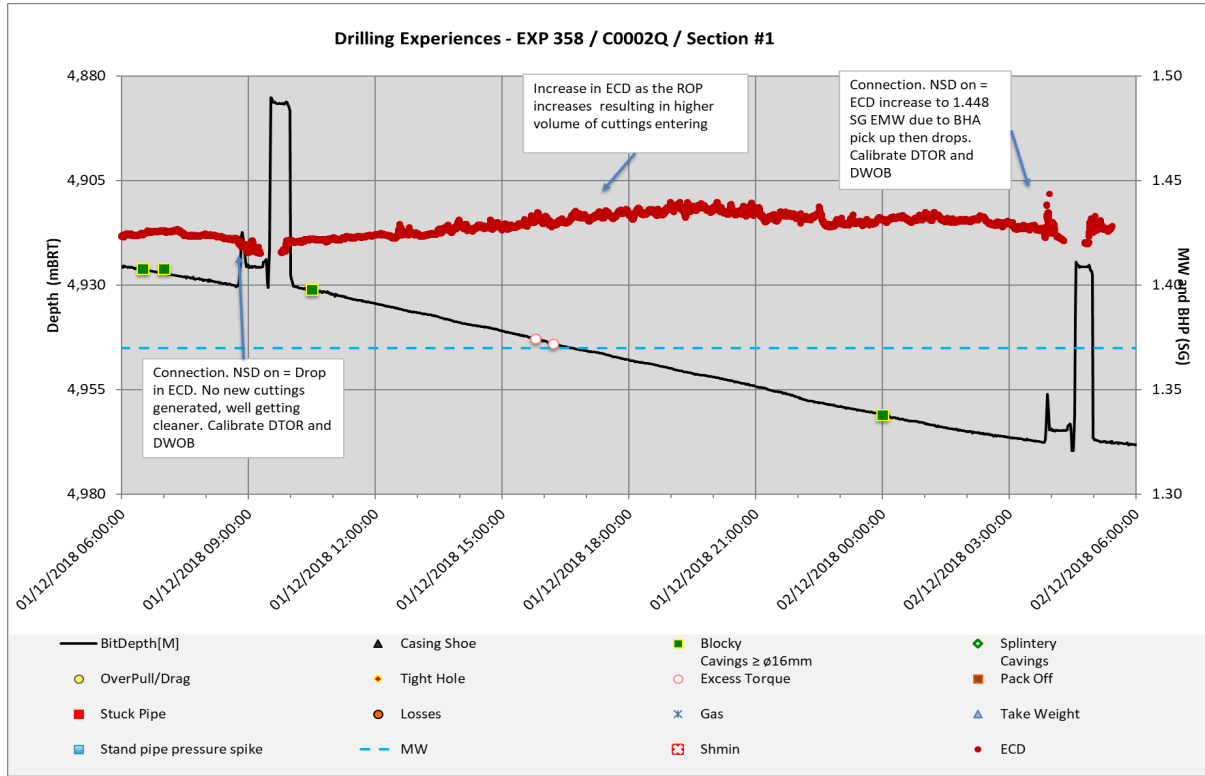


Figure 1. Drilling experiences in Section 1 of the C000Q well between 1st Dec 2018 06:00 and 2nd Dec 2018 06:00.

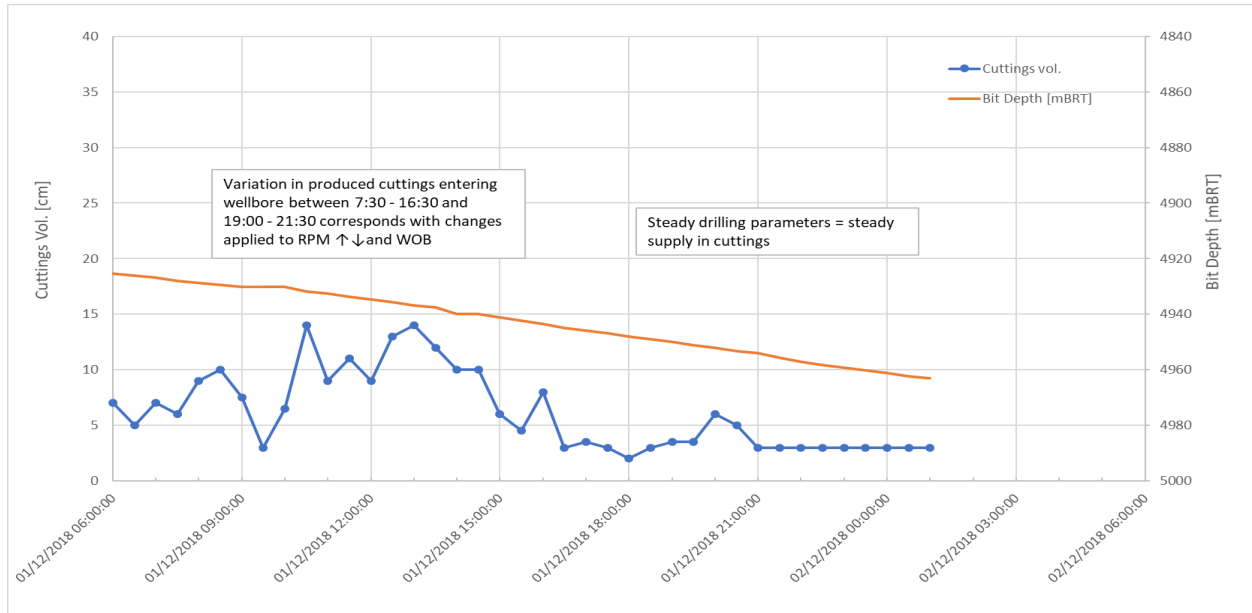


Figure 2. Cuttings/Cavings vs time and drill bit position between 1st Dec 2018 06:00 and 2nd Dec 01:00

IODP EXP 358 Daily Geomechanics Report

Report #022 20181201Final 4990

Analysis

Drilling Experience Analysis

Figure 1. shows under reaming operations during last 24 hrs. Under reaming progressed steadily with occasional high surface torque events occurred 4939.7 mBRT, 4942.9 m, 4944BRT and 4946.3 mBRT (bit depth) (white circles with red rim). High surface torque events correlate well with seen vibration (on stickslip indicator). No excessive downhole torque was observed (DTOR 2 – 3 kNm). This suggests that the higher surface torque could likely be associated with parts of BHA (6 3/4" drill collars) passing through the restriction (window). Alternatively, the high torque events relate to under reamer action drilling through harder stringers. Some blocky cavings were also seen. ECD remained between 1.42 and 1.44 SG EMW. When comparing real time ECD with on Figure 1 with the measured amount of arrived cuttings at surface in Figure 2 there is a clear delay. Cuttings and small blocky sub rounded to rounded cavings seem to spent some time in the well. There is no clear evidence as to where this subrounded to rounded cavings came from.

Cuttings Analysis

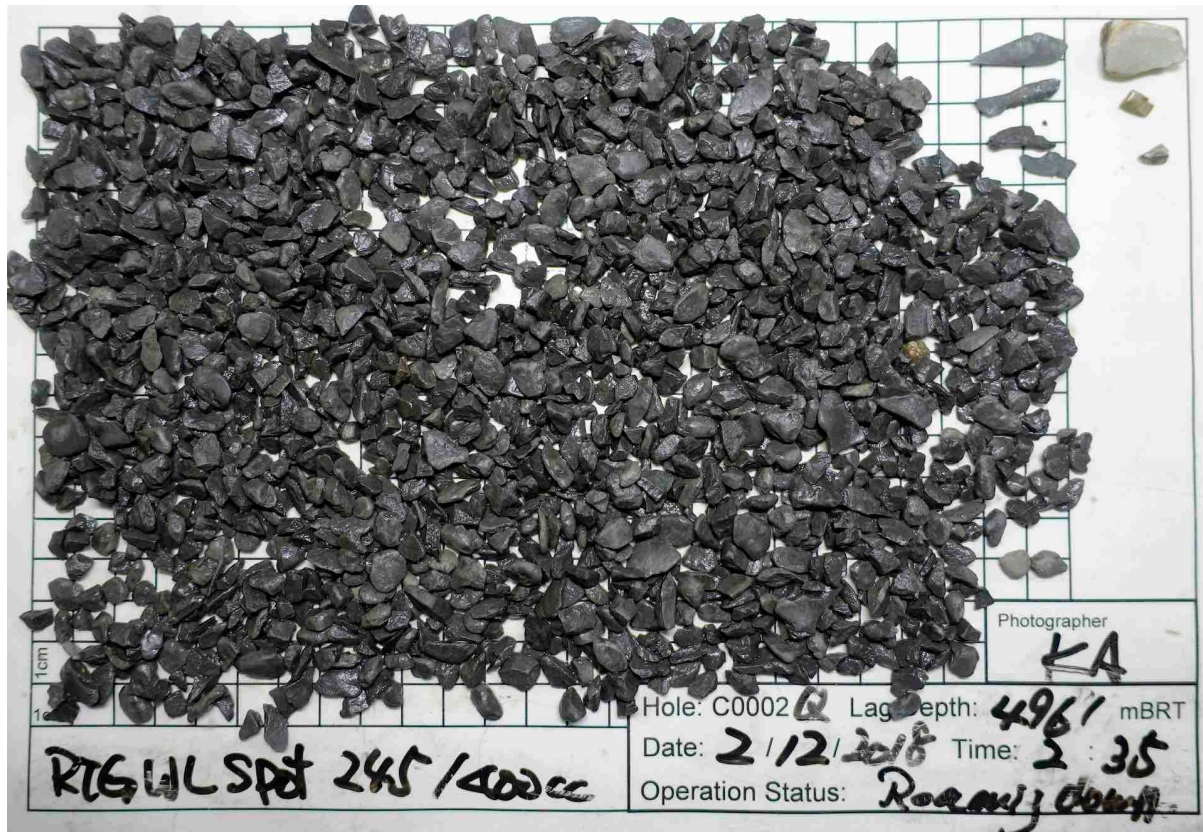
Variations of cuttings volume with time are plotted in Fig.2. The blue dots show cuttings accumulation amounts (cm / 5 min) generally every 30 minutes. The orange line shows the bit depth in mBRT. After 06:00 Dec.1, the cutting volume increased again and peaked at around 12:00. Giving the lag time of 2.5 hours, those cuttings may have left the borehole when the bit and the Z-reamer were located at 4930 mBRT and 4900 mBRT. This may reflect that some large volume of cuttings/cavings were staying in the enlarged interval suggested from the arcVISION resistivities. Cuttings are associated with soft clayey cuttings aggregates 5~10%, suggesting that the bit or the Z-reamer is cutting the formation somehow.

Cavings Analysis

Amounts of cuttings/cavings >ø4mm per unit volume of all solids varied 10~60 % in the last 24 hours (06:00 Dec.1 ~ 06:00 Dec.2). Within the solids >ø4mm, populations of cuttings/cavings with sharp edges and those with rounded edges varied with time. Grains < ø1cm made up 90~100 % of cuttings/cavings >ø 4mm. Cement fragments were rare in general, however, increase of cement fragments ~10 % was observed in some intervals. Some of the observed cuttings show scratches on their surface. These are most likely mechanically derived from either bit/under reamer impact during under reaming operations or other parts of rotating BHA.

IODP EXP 358 Daily Geomechanics Report

Report #022 20181201Final 4990



Residues of a 400-cc cuttings sample after washing with 4-mm mesh sieve. Sample consists mainly of rounded blocky/angular cavings/cuttings < ϕ 1cm around this sampling time. A few splintery cavings or cuttings associated with mechanical origin rather than pressure one. Brownish gray blocky grains in the right side are cement fragments.

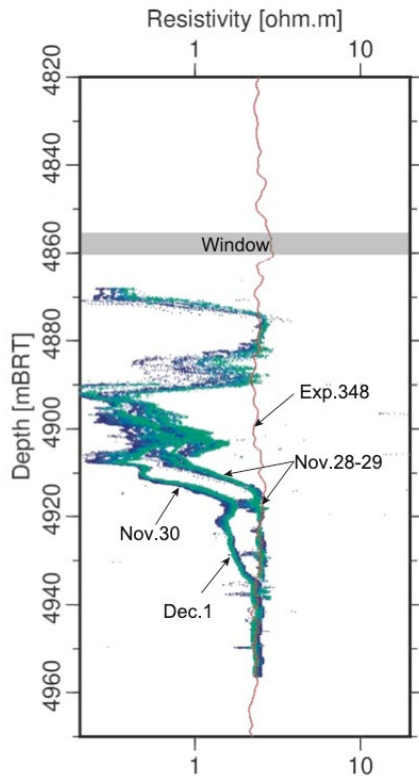
The OPG report also provides information regarding some (up to 10 %) heavily reworked serrated cuttings (PDC it type cuttings) and clumps of finely ground cuttings or formation. It is very difficult to recognise them with a naked eye. Once looked under the microscope it is still possible to detect PDC structure. This suggests that they spent long time in the annulus.

LWD Data Analysis (updated from DGEM #020)

The figure below is showing LWD resistivity comparisons between (arcVISION) collected on Nov 28th, 29th, 30th and Dec 1st in this hole (blue to green dots) and that resistivity collected in 2013 during Exp.348 (red line) (after Yabe, Logging Scientist). Resistivities between 4875~4880 mBRT and below 4915 mBRT in the current expedition indicate similar resistivities as observed during Exp.348, which may imply reasonably good hole conditions in C2Q, at least on the 29th of November 2018. In contrast, the resistivities between 4910 and 4890 mBRT indicate low values and appears to have become less resistive on Nov 30th compared to the Nov 28th-29th. This significant reduction in resistivity suggests that hole enlargement has occurred over this 3-day period. During underreaming operations on Dec 1st, a less significant decrease in resistivities over the interval between 4915~4935 mBRT. Below 4935 mBRT, the LWD resistivity data is markedly comparable to the Exp 348 data, suggesting (at least on Dec 1st) that little to no hole enlargement has occurred.

IODP EXP 358 Daily Geomechanics Report

Report #022 20181201Final 4990



SFIB Analysis

N/A

Geomechanical Model Review (a review of the FIT results)

Potentially no changes to the pre-drill geomechanical model because FIT (Formation Integrity Test) does not directly contribute sufficient information for constraining or refining subsurface earth stresses. By design, FIT is intended to determine whether the planned mud weight can be supported by the formation.

The planned mud weight of 1.37 sg with an operational safety upper margin of +0.06 sg (surge pressure), required a formation pressure integrity up to 1.43 sg. The FIT in the C0002Q rat-hole achieved that objective. It is possible that a leak-off pressure of 1.43 sg may have occurred, but a maximum pressure of 1.45 sg was achieved before the pumps were shut-in. If a leak-off pressure of 1.43 sg did occur, this implies a leak-off-test (LOT) had occurred (no longer a FIT). A leak-off-pressure of 1.43 sg may be interpreted as a possible approximation of S_3 or S_{hmin} stress magnitudes.

This interpretation would require a pass of the LWD image log across the rat-hole section to identify whether a new tensile was created, or drilling fluids leaked into a pre-existing bedding plane or natural fracture. The former would have direct implications of S_3 , while the latter would require further information such as bedding plane orientation.

However, since no LWD data acquisition is planned for the rat hole section, we will have no chance to confirm which case occurred. Therefore, we continue to call this test a FIT.

IODP EXP 358 Daily Geomechanics Report

Report #022 20181201Final 4990

