Drilling Program

IODP Expedition 343
Japan Trench Fast Earthquake Drilling Project (JFAST)

JAMSTEC

CDEX Technical Report

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(JFAST)

February, 2011

CDEX, JAMSTEC

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Table of Contents

Health, Safety and Environment (HSE)

All CDEX operations shall be conducted with detailed consideration of Health, Safety and Environment (HSE) aspects. Along with the CDEX HSE Policy, the CDEX HSE Management System (HSE-MS) will be adopted for the entire period of this expedition including its' planning and follow-up stages.

Day-to-day marine and drilling operations, and science operations will be carried out by Mantle Quest Japan Co. Ltd. (MQJ), and by Marine Works Japan (MWJ) Co. Ltd., respectively. CDEX will ensure by means of regular communication and reporting that their HSE-MS maintain CDEX HSE standards.

1. Emergency Response Plan

CDEX will manage emergency situations based on the JAMSTEC Incident /Trouble Response Guidelines document. CDEX will also develop a detailed expedition-specific Emergency Response Plan (HSE-MP-001 Emergency Response Plan), which specifies the functions and responsibilities of the Emergency Response Team.

2. Expedition-specific HSE concerns

- Ultra-deepwater drilling

IODP Expedition 343 will be drilling in 7,000 m of water, a first experience for D/V Chikyu. Moreover, globally, there are very few comparable examples of such ultra-deepwater drilling. We are conducting a full risk-assessment in regard to ultra-deepwater operations and will take all necessary measures to mitigate the risk.

- Radiation exposure from Fukushima-I Power Plant

The Fukushima-I Nuclear Power Plant (Tokyo Electric Power Company) accident in March 2011 released a large amount of radioactive materials over a large area of eastern Japan. The drilling site and the logistic base for Expedition 343 are located about 150 km northeast and 100 km north of the power plant, respectively. A risk assessment conducted in regard to radiation exposure from the Fukushima-I Power Plant concluded that as the sites are at a large enough distance from the reactor site, and that the nuclear reactors themselves are relatively stable, the risk of radiation exposure is generally low. However, there may still be some increased risk during the disaster recovery processes, with associated increases in mental stress for personnel on board Chikyu. To closely monitor this situation, we will conduct the following measures: 1) information collection and distribution, 2) dose monitoring (on board and logistic base), 3) establishment of emergency escape procedures, and 4) education about radiation and how to protect yourself from it.

3. HSE performance monitoring

CDEX will review the Contractor's HSE performance during the expedition in reference to the below lead and lag indicators.

Lead indicators:

- Number of HUNS submitted,
- Number of safety meetings and its participation rate,
- Drills and trainings performed,
- Newly introduced or improved safety systems (e.g. rules, procedures, and equipments).

Lag indicators:

- Number of incidents.

In addition to the above indicators, on board scientists' review will be utilized to evaluate HSE performance of CDEX and the Contractors.

4. HSE audit

CDEX will conduct an audit to verify the effectiveness of the HSE-MS, as well as HSE management of critical activities when necessary. The scope of audit covers the Contractor's office and a logistic base as well as on board facilities.

HSE-MS

JAMSTEC

Health, Safety & Environment Policy

The Center for Deep Earth Exploration (CDEX) is committed to preventing injuries and protecting the environment for safe and efficient operations by our Deep Sea Drilling Vessel, Chikyu. It is our aim to comply with and, where practicable, exceed the requirements of applicable HSE legislation, Standards, Guidelines and Codes.

CDEX's management will define and document HSE policies and strategic objectives.

This will be done for:

- **Safety and health goals for CDEX and contractor personnel;**
- **Ensuring environmental goals for marine, drilling and science services activities;**
- **Operating and maintaining Facilities so that the risk to personnel is as low as reasonably practicable;**
- **Training to meet project, operational and regulatory requirements.**

CDEX believes that this can be achieved while meeting its quality objectives and goals with the cooperation of contracting parties.

To do this, we will:

- **Provide HSE Leadership & Commitment throughout our operations;**
- **Seek out and evaluate best practice HSE Planning strategies;**
- **Develop effective HSE Implementation processes.**

To measure and evaluate our success in achieving these goals, we will:

- **Clarify and develop comprehensive Auditing and Review systems;**
- **Set targets that encourage us to continuously measure, evaluate and improve our HSE performance;**
- **Include HSE performance in performance appraisals;**
- **Communicate the requirements of this policy throughout all levels of the organization.**

It is our commitment to achieve all stated goals and objectives by seeking out, evaluating and, where practicable, implementing best HSE Management practices.

W. Azuma

Dr. Wataru Azuma
Director General of Center for Deep Earth Exploration
August 2011

Version. 5 (The date of the first issue : April 2003)

Figure 1. HSE Policy signed by Director General of CDEX.

2. Scientific Objectives

The science objectives are closely aligned with the overall goals of IODP. In the IODP Initial Science Plan, research concerning solid earth cycles and geodynamics high- lights the seismogenic zone initiative, which advocates subduction zone studies that include investigating the behavior of rocks and sediments to better understand the fault zone and integration with studies of earthquake mechanics. Deformation micro- structures and physical rock properties at in situ conditions, along with observatory monitoring of temperature, pore pressure, and stress, are also emphasized in the plan. These are all key components of the Japan Trench Fast Earthquake Drilling Project (JFAST). Furthermore, JFAST directly addresses Challenge 12 of the IODP Science Plan for 2013–2023: “What mechanisms control the occurrence of destructive earth- quakes, landslides, and tsunami?”

The prioritization of science objectives reflects the unique possibilities provided by rapid response drilling into a slipped fault following an earthquake. The shallow distribution of large slip for the Tohoku earthquake provides an unprecedented ability to directly access a fault that has recently moved tens of meters. As outlined in the report from the International Continental Scientific Drilling Program/Southern California Earthquake Center international workshop on rapid response drilling (Brodsky et al., 2009), fundamental questions regarding stress, faulting-related fluid flow, and the structural and mechanical characteristics of the earthquake rupture zone can be addressed uniquely through rapid response drilling.

Specifically, the science objectives and strategies for achieving them are as follows:

What was the stress state on the fault that controls rupture during the earth- quake and was the stress completely released?

- Dynamic friction during the rupture: potentially the most significant result of this project will be a value for the dynamic frictional stress. Time decaying temperature measurements will be used to estimate the frictional heat produced at the time of the earthquake, which can be used to infer the level of dynamic friction.
- Rupture to the toe of the accretionary wedge: past thinking was that sediments in this region are weak and rate strengthening, so earthquake instability should not nucleate or easily propagate through this region. Measurements of current stress and stress during the earthquake can be used to explore different models to explain how dynamic slip occurred. Hydrogeological measurements can constrain the healing of the fault.

What are the characteristics of large earthquakes in the fault zone, and how can we distinguish present and past events in fault zone cores?

- Core analyses: detailed analyses of textures and small-scale structures of core samples of the fault zone will be used to infer the role of fluids and pressurization during rupture. We will look for evidence of melting and other processes that contribute to dynamic strength reduction. Trace elements will be used to estimate the thermal history of the recent and past events.
- Laboratory experiments: high-speed friction and petrophysical experiments on fault material can be used to characterize the frictional behavior of the fault.

Secondary science objectives include carrying out other geological, geochemical, and microbiological observations to the greatest extent possible during drilling in accordance with the IODP Measurements document (www.iodp.org/program-policies/). As a specific example, there is some evidence that great amounts of hydrogen may be released at the time of large faulting (e.g., Kita et al., 1982). The massive amounts of hydrogen may greatly stimulate microbiological activity; thus, samples of the fault may contain records of biogeochemical and microbiological processes.

3. Drill Site and Geology

3.1. Location

The primary and alternate drill sites of IODP Expedition 343, JFAST-3 and JFAST-4, are located on the lower landward slope of the Japan Trench, 7000 m water depth, 250 km off the Pacific Coast of Sendai City and 100 km ESE from the epicenter of the 2011 Tohoku Earthquake (11 March 2011) to the east-southeast (Fig. 2). These sites are targeted for reaching the décollement along which the huge seismic slip up to 50 m in horizontal displacement is presumably yielded at the main slip of the earthquake. In order to get hold of the décollement at an operationally feasible water depth and a reasonable penetration depth, the primary and the alternate drill sites were chosen from locations satisfying the following requirements: the water depth is 7000 m or less, the décollement depth is less than 1000 m, and multi-channel seismic (MCS) profiles of crossed lines are available. Besides the two sites, four additional contingency operation sites (JFAST-5, JFAST-6, JFAST-7 and JFAST-8) are available, chosen from the upper landward trench slope near ODP Site 1151, middle landward trench slope, lower landward trench slope and the upper seaward trench slope, respectively. Each site is summarized in Table 1.

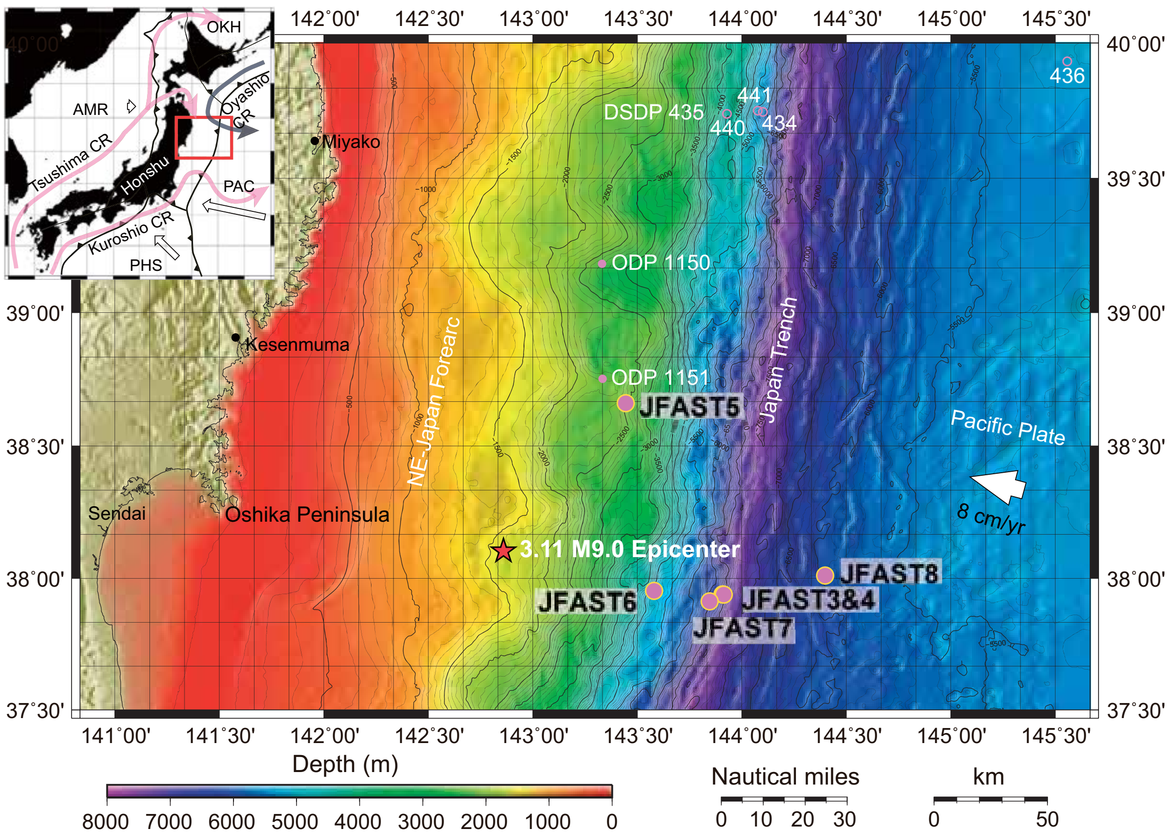


Figure 2. Regional bathymetry map showing the IODP Expedition 343 drill sites. The JFAST drill sites and ODP and DSDP drill sites are shown with large pink circles and small pink circles, respectively. The red star indicates the epicenter of the 2011 Tohoku Earthquake. The inset figure shows the general tectonic background of the Japanese island arc and major sea currents.

Table 1. Summary of the primary and alternate drill sites.

Expedition Number	343			
Expedition Name	Japan Trench Fast Drilling Project			
Site	JFAST3		JFAST4	
Hole	A	B	A	B
Coordinates	37°56.3022'N 143°54.8405'E		37°56.3528'N 143°54.5075'E	
Water Depth	6910 m		6830 m	
Proposed Total Depth	1000 mbsf 7938.5 mBRT		1100 mbsf 7958.5 mBRT	
Main Operations	MWD-LWD, CSG and Observatory	Drilling, Coring, CSG and Observatory	MWD-LWD, CSG and Observatory	Drilling, Coring, CSG and Observatory
Geological Setting	Lower landward trench slope			
Remarks	Primary site		Alternate site	

Table 2. Summary of contingency drill sites.

Expedition Number	343			
Expedition Name	Japan Trench Fast Drilling Project			
Site	JFAST5	JFAST6	JFAST7	JFAST8
Hole	-	-	-	-
Coordinates	38°39.6664'N 143°26.7087'E	37°57.1644'N 143°34.8404'E	37°54.7748'N 143°50.8337'E	37°00.6244'N 144°23.9456'E
Water Depth	2450 m	5240 m	6500 m	5940 m
Proposed Total Depth	1000 mbsf 3478.5 mBRT	750 mbsf 6018.5 mBRT	1000 mbsf 7528,5 mBRT	350 mbsf 6318.5 mBRT
Main Operations	MWD-LWD, CSG and Observatory	Drilling, Coring, CSG and Observatory	MWD-LWD, CSG and Observatory	Drilling, Coring, CSG and Observatory
Geological Setting	Upper landward trench slope (near ODP site 1151)	Middle landward trench slope	Lower landward trench slope (near JFAST1)	Upper seaward trench slope (Pacific Plate)
Remarks	Contingency site			

3.2. Geological Background

The subduction zone along the Japan Trench is where the Pacific plate (early Cretaceous) is subducting under Japan at about 8 cm/year (National Geographical Data Center, 1996) (Fig. 2). The Northeast Japan forearc along this subduction zone is a typical forearc dominated by tectonic erosion compared to the Nankai Trough, which is a typical accretionary subduction zone (ex. von Huene et al. 1994). The accretionary belt along the Japan Trench is only developed near the trench axis on a small scale.

The present Northeast Japan forearc basin has been developed since the regional subsidence that began from the latest Oligocene and ended in the Pliocene, associated with tectonic erosion of the preexisting accretionary complex and the igneous basement. Prior to development of the present forearc, the preexisting formations of the Mesozoic to the early Paleogene uplifted and emerged above the sea in the past forearc region during the early Paleogene. A broad regional unconformity developed in the Northeast Japan forearc during this period. The forearc then began to subside in the latest Oligocene coincident with the resumption of the Pacific Plate subduction and was submerged by the late Miocene. In the late Pliocene regional uplift began, possibly in association with a change from extensional to compressional tectonics (von Huene et al., 1982).

3.3. Geological Prognosis

3.3.1. Overview of seismic profiles and lithological correlation

A MCS profile of pre-stack time migration with depth conversion perpendicular to and across the trench axis is shown in Fig. 3, with interpretation in the light of the tectonic background for geological prognosis of the drill sites. A local bathymetry map with indicating MCS survey lines is shown in Fig. 4.

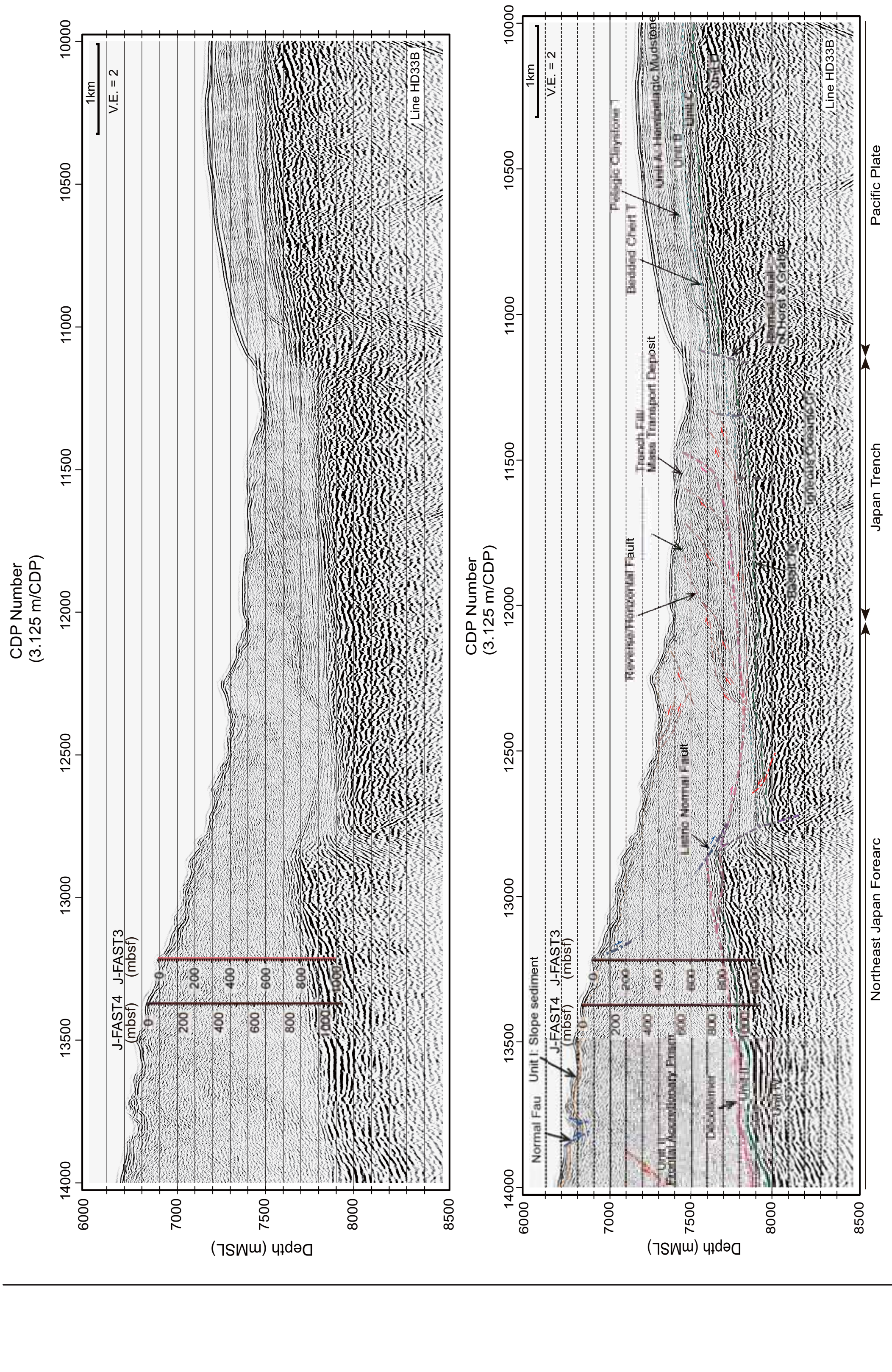


Figure 3. A MCS of Line HD33B A) without, and B) with, geological interpretation. Profile Processing was performed by IFREE, JAMSTEC. The décollement presumably moved up to 50 m in horizontal displacement at the main slip of the 3.11 great earthquake. Following the main slip, a listric normal fault, which drops the trench side and is merged into the décollement, was possibly activated at the edge of the landward trench slope associated with a kind of circular slip and then formed consequently a prominent zone along the trench axis. Unit names are given independently to the pre-subduction Pacific Plate and the forearc side.
The subducting Pacific Plate is clearly represented by strong reflectors with horst and graben structures inclined landward. On the other hand, the overlying forearc crust of the Honshu arc exhibits a wedge shape with incoherent strong reflectors of the shallow formation and a broad structureless zone below. Proposed Sites JFAST-3 and -4 are situated above a graben of the subducting Pacific Plate.

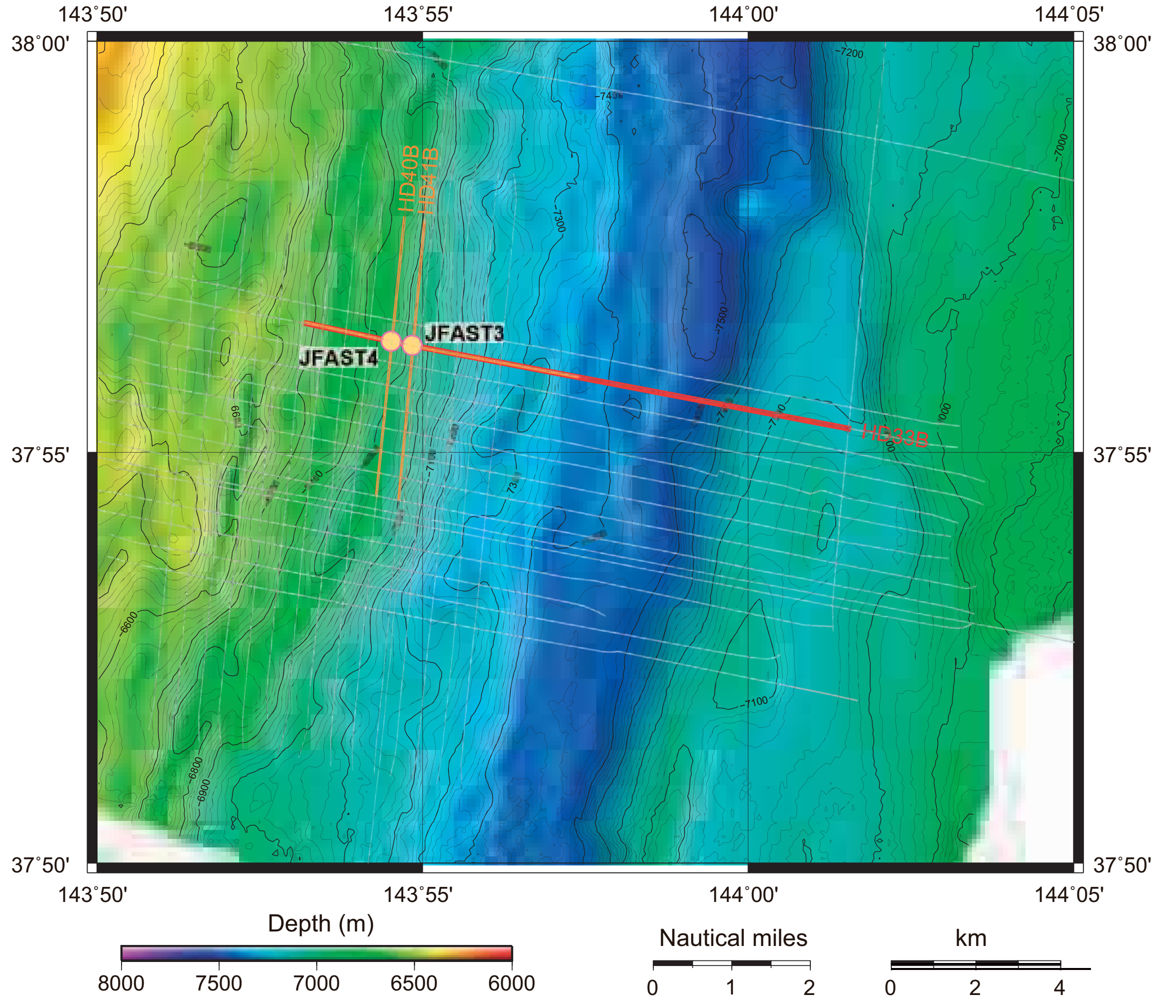


Figure 4. A close-up bathymetry map of Proposed Sites JFAST-3 and -4. Yellow circles represent the drill sites, and white lines show the MCS survey lines. The extent of the line corresponding to Fig. 3 is indicated by a thick red line and those corresponding to Figs. 5, 6 and 7 are indicated by thick orange lines.

1) Pacific Plate

In the strong reflector zone with horst and graben structure of the Pacific Plate, the strongest reflector is situated in the upper middle of the zone (upper Unit D) while the upper reflectors above it show stratification with relatively finer frequency (Unit C). Besides, a stratified weak reflector zone (Unit B) overlies the strong reflector zone. The upper part of the Pacific Plate is comprised of well-stratified low amplitude layers (Unit A). Accordingly four major units can be recognized in the pre-subduction Pacific Plate: Units A, B, C, and D, in descending order. To correlate the seismic interpretation with lithology, data from DSDP Hole 436 (Shipboard Scientific Party, 1980a), drilled on the Pacific Plate off Sanriku coast (280 km to the northeast of the JFAST site), and a representative lithostratigraphy of an accreted oceanic crust on land (e.g. Taira et al., 1988) were used to give a referential lithostratigraphy of the subducting plate. Unit C probably corresponds to bedded chert and consequently the middle strongest reflector, the top of Unit D, can be correlated with the top of the basaltic crust. Major components of Unit B and A are probably pelagic claystone and hemipelagic mudstone to mud, respectively. The boundary between Unit B and C must correspond to the top of opal-CT zone.

In the subducting Pacific Plate below the forearc wedge, Unit III and IV correspond to Unit C and D, respectively. In other words, the forearc wedge formation contacts the subducting bedded chert through the décollement and the formations above (Unit A and B) are scraped off at the trench.

2) Forearc wedge

The overlying forearc wedge, contrastingly, has no obvious structure except the uppermost formation (Unit I). Referable offset well data is available from DSDP Holes 434 and 441 (Shipboard Scientific Party, 1980b, 1980c), which were drilled in a similar setting, the lower landward trench slope, 210 km to the north of the proposed JFAST Sites, in about 6000 m and 5250 m water depth, down to about 640 mbsf and 400 mbsf, respectively. From the results of these holes, it is possible that the forearc wedge formations (upper Unit II) are mainly composed of diatomaceous clay to claystone with intercalations of volcanic ash to tuff and tuffaceous mudstone, with locally contained, isolated pebbles. Biostratigraphic data of Hole 434, however, shows that there is repetition of formations which indicate similar ranges of age, at least in the upper 300 m, suggesting that reworked blocks from landslides or displaced blocks from faulting constitute the upper part of the forearc wedge. Lower Unit II may be composed of accreted diatomaceous and radiolarian mudstones which used to be sediments on the Pacific Plate, even though there is no direct lithological evidence. In addition, the structureless feature of the forearc wedge implies the overall fragileness of the formation.

3) Décollement and related fault systems

The décollement in the forearc wedge is not clearly seen in the seismic profile; however, we assume that it's situated immediately above a horst of the subducting oceanic crust (including bedded chert) where an abrupt physical property change is expected. On the other hand, a very clear reflector definitely corresponding to a part of the décollement is recognizable to the east of the Proposed Drill sites, appearing from the edge of the horst then extending across the wedge above the graben. Furthermore, a listric normal fault appears to drop along the trench side before being merged into the décollement is also likely to exist in the immediate east of the drill sites. This fault apparently cuts a branch of the décollement. The listric normal fault was possibly activated at the edge of the landward trench slope associated with a kind of circular slip shortly subsequent to the main slip of the décollement. In the trench axis area, a reverse fault system with a kind of piggy-back structure similar to that of typical accretionary prisms like the Nankai Trough area is developed, cutting the sedimentary formations above the basaltic crust.

3.3.2. Lithological Prognosis for Proposed Sites JFAST-3 and -4

Close-ups of the MCS profiles around Proposed Sites JFAST-3 and -4 are shown in Figs. 5, 6, and 7. In accordance with the lithological correlation and the identification of the décollement as described above, proposed lithology columns for JFAST-3 and -4 are described (Figs. 8, 9). The uppermost part, Unit I, 20 – 60 m thick, is slope sediment consisting of diatomaceous clay, possibly landslide derived. Unit II, the main part of the forearc wedge, is the frontal accretionary prism, likely composed of diatomaceous and radiolarian clays to claystones, Pleistocene to early Miocene in age, with possibly interbeds of landslide deposits. Thickness of the unit is estimated at 740 to 880 m. The décollement is conceivably situated at 800 mbsf and 900 mbsf in Proposed Sites JFAST-3 and -4, respectively. However, there is no reliable information to determine the fracture zone thickness. Unit III below the décollement, might be a bedded chert formation 50 m thick consisting of alternating chert and porcellanite layers, early Miocene to early Cretaceous. Unit IV is identified as basaltic basement, comprised of pillow lava with subordinate hyaloclasite of the early Cretaceous.

Based on the velocity model made by IFREE, slowness estimation by JAMSTEC shows that the formations get harder abruptly at the décollement and below (Figs. 10, 11). However, the velocity model is necessarily uncertain, especially in the forearc wedge, due to the lack of seismic features to improve the velocity structure in the wedge. Therefore, the depth for each boundary shown here might considerably deviate from the actual situation.

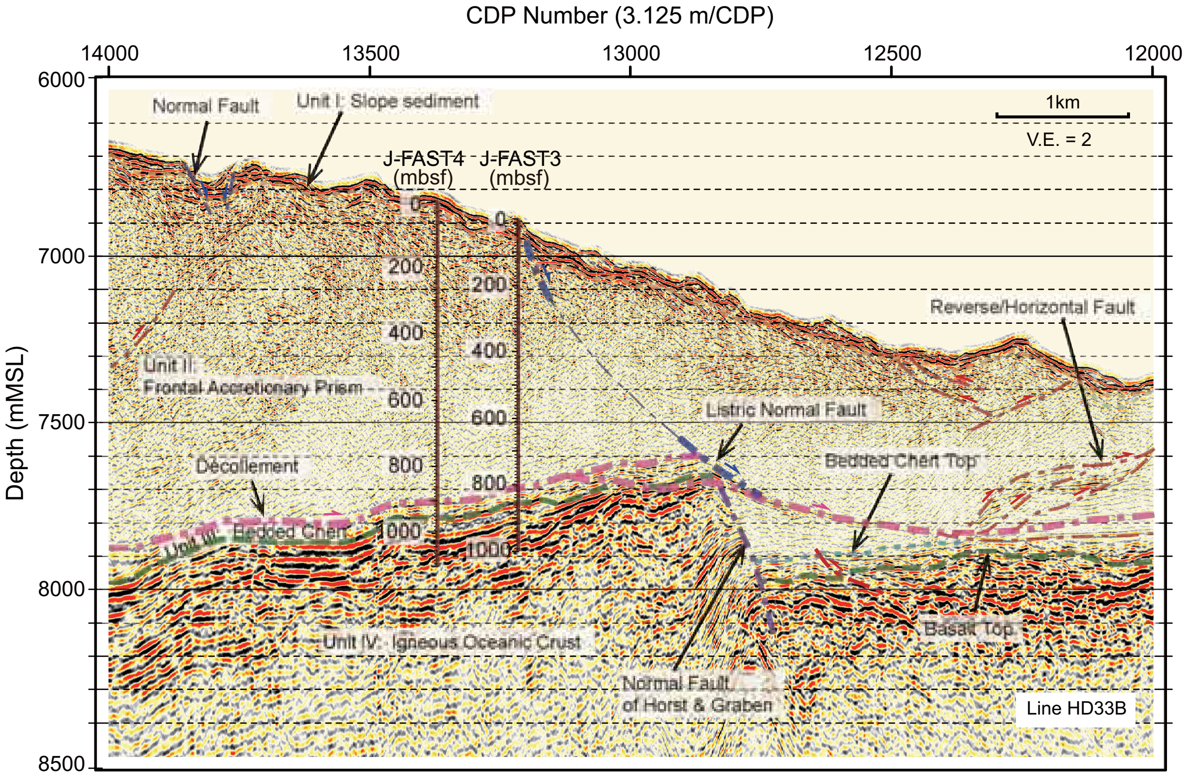


Figure 5. MCS profile of Seismic Line HD33B with a geological interpretation. The extent of the line of this figure is shown in Fig. F3.3.

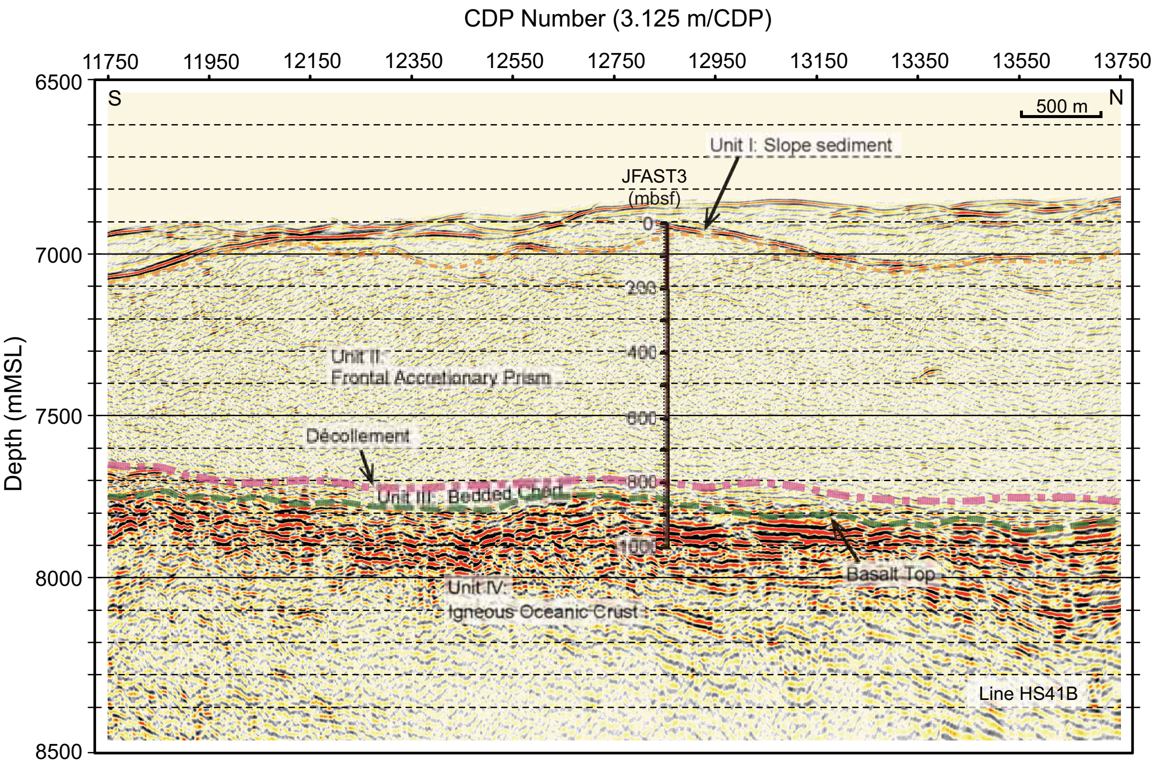


Figure 6. MCS profile of Seismic Line HS41B with a geological interpretation. The extent of the line of this figure is show in Fig. F3.3.

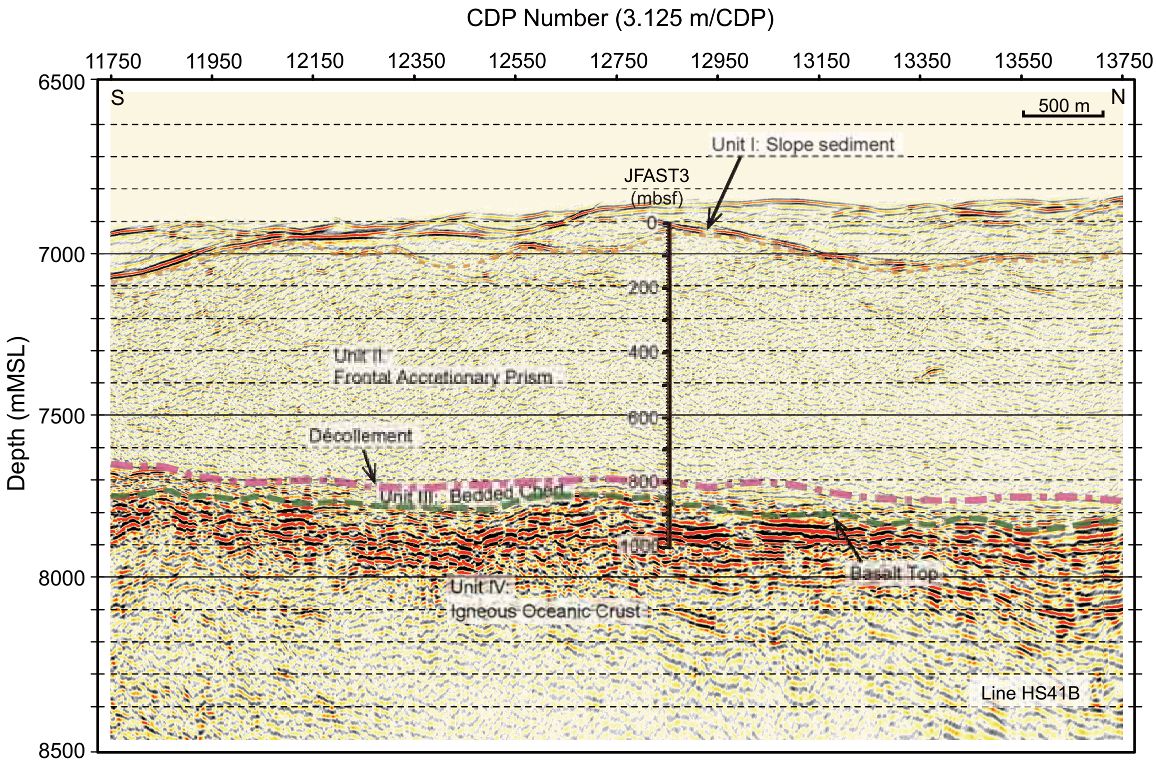


Figure 7. MCS profile of Seismic Line HS40B with a geological interpretation. The extent of the line of this figure is shown in Fig. F3.3. Horizons correlated to the décollement and basalt top are apparently 20-30 m deeper than those identified on the profile of Line HD33B.

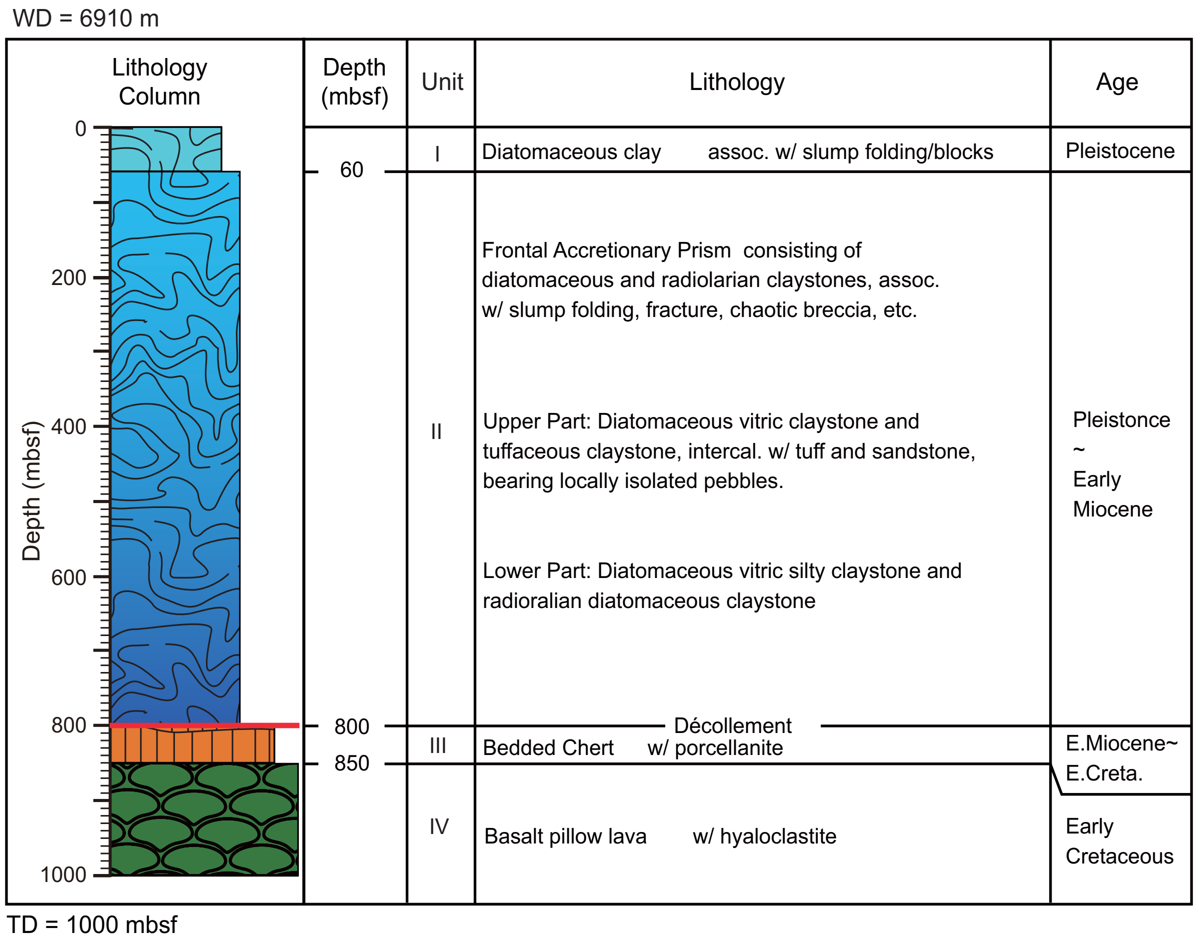


Figure 8. Lithological prognosis for Proposed Site JFAST-3. The depth scale is based on the latest velocity analysis done by IFREE, JAMSTEC. The velocity estimation, however, has a measure of uncertainty due to lack of obvious structure in the forearc wedge.

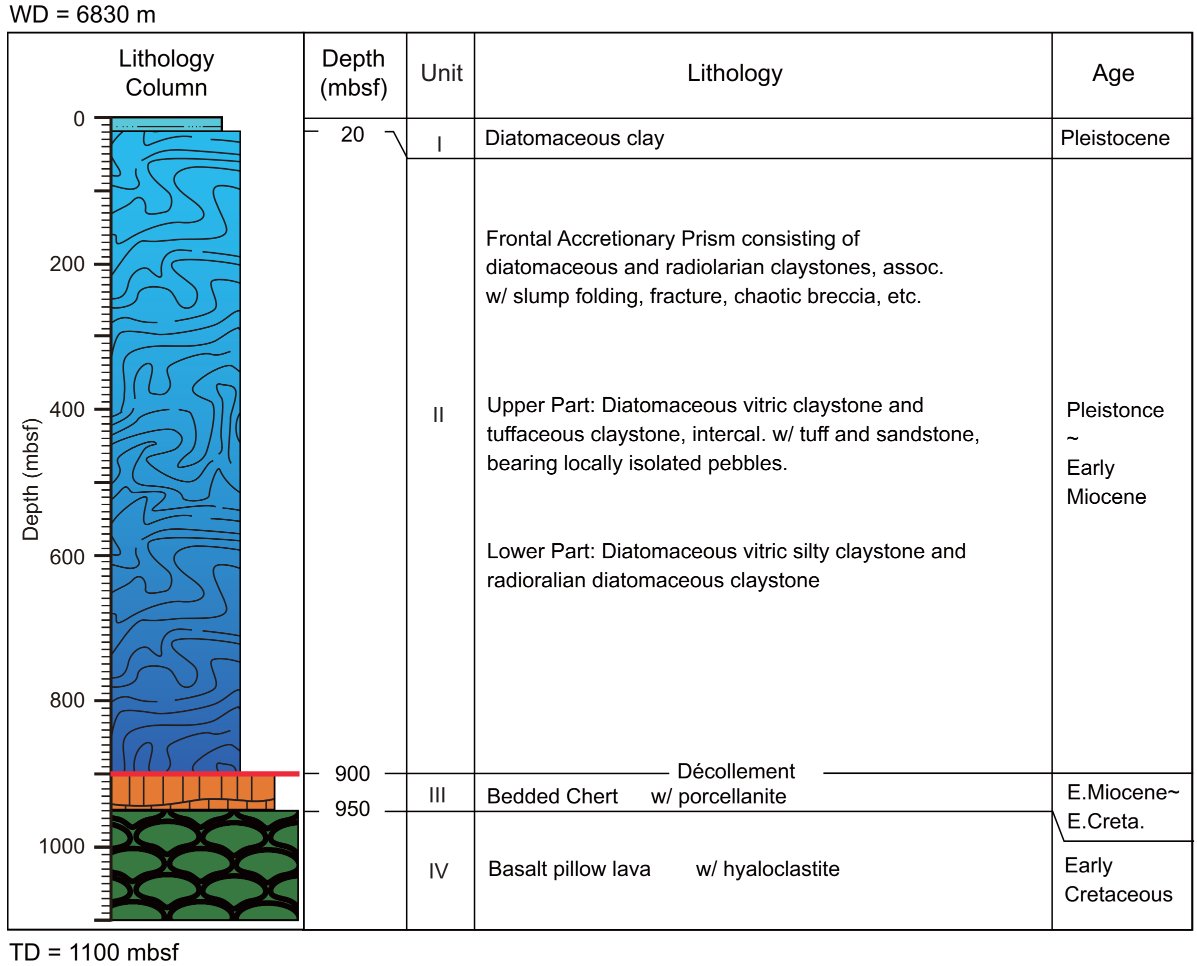
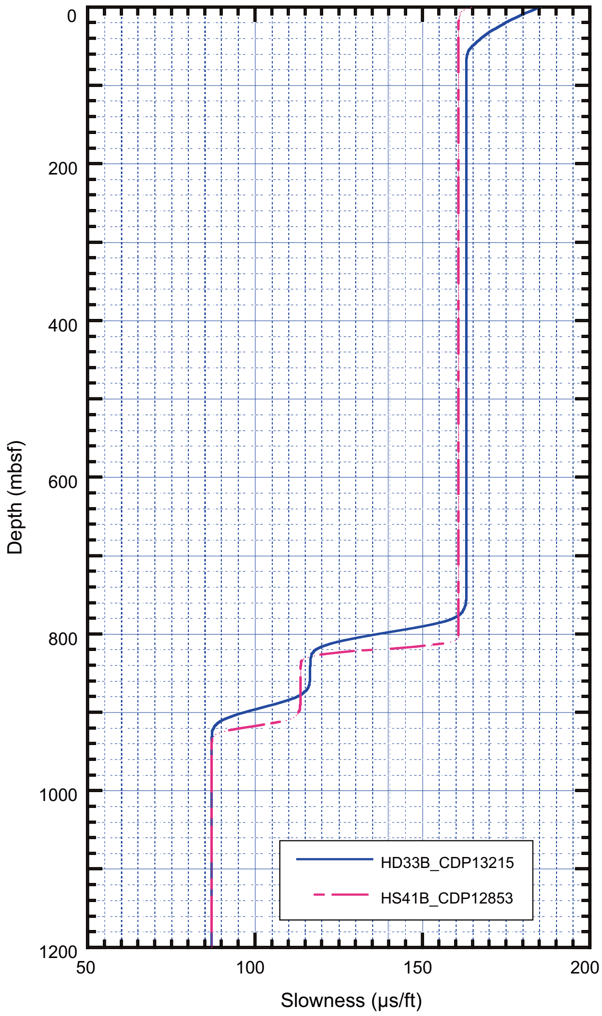


Figure 9. Lithological prognosis for Proposed Site JFAST-4. See the caption of Fig. 5.



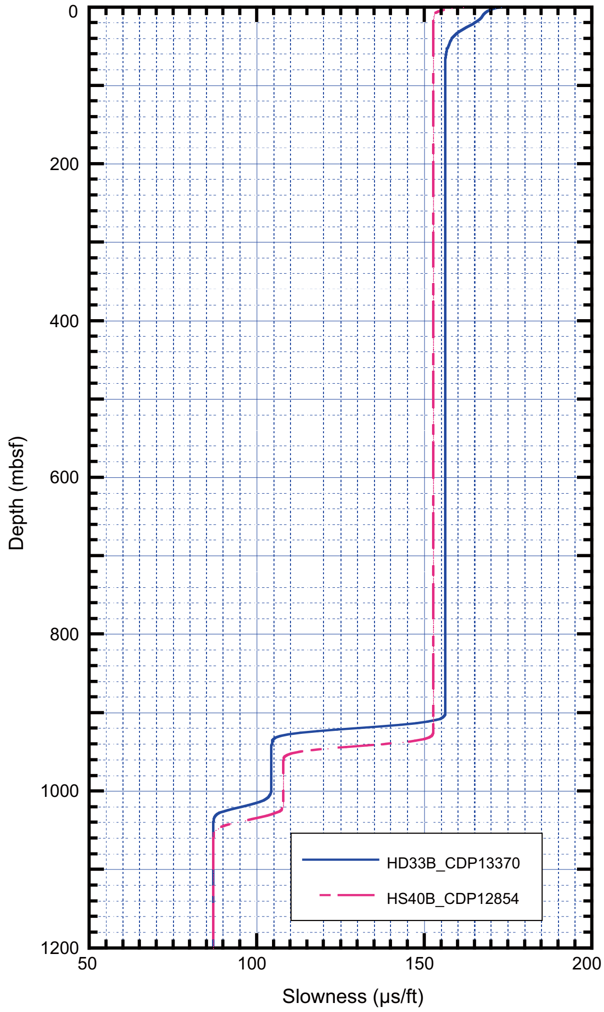


Figure 10. (Left) A plot of slowness vs. depth for Proposed Site JFAST-3. See the caption of Fig. 5.

Figure 11. (Right) A plot of slowness vs. depth for Proposed Site JFAST-4. See the caption of Fig. 5

3.3.3. Potential Geological Hazards of Proposed Sites JFAST-3 and -4

Shallow Hazard

Shallow hazardous features that potentially affect wellhead installation and subsequent stability of the wellhead and safety drilling include free gas (hydrocarbon gases) and water flow in the shallow formation, extremely soft or hard seafloor, and rough topography.

The seismic profiles around the drill sites show no obvious structures in the formations above the expected décollement besides the shallowest portion immediately below the seafloor (Figs. 3, 5, and 6). There are, thus, no features that suggest potential free gas, water flow, hydrocarbon trap or hydrate zones, such as high-amplitude reflectors or those with reversal polarity.

On the other hand, we have great uncertainty about the seafloor condition, since no detailed topographic data, backscattering data nor core samples around the sites are available. As modestly suggestive information about the seafloor hardness, the shallowest formation is relatively firm at DSDP Site 434, indicated by the shear strength and bulk density data. Nevertheless there is no data to deny presence of thick squashy mud lying on the seafloor. In addition, rough topography and/or boulders of mudstone yielded by landslide are of potential concerns.

Deep Hazard

The seismic profiles which image no obvious structure in the most part of the forearc wedge are suggestive of friable properties of the formations due to extensive shearing and fracturing yielded by the last and historical earthquakes (Figs. 3, 5, and 6). In addition, lower degree of compaction of the formations and a compressional regional stress field that may have been already restored result in lower foundation strength of the formations. Operational problems were experienced at DSDP Hole 434B. They left BHA and about 150 m of drill pipes in the hole after retrieving efforts for 16 hours.

Below the décollement, harder formations (bedded chert and the basaltic crust) are expected to underlie. They are conceivably much more abrasive than the formations above, even though being friable due to horizontal shearing.

No obvious features implying abnormally pressurized fluid are observed along either the décollement or the branch faults at least on the seismic profiles. The décollement, however, is possibly still active, having a potential to cause afterslip in some measure (up to 35 cm at a worst estimation).

The drill site area has low potential in large accumulation of hydrocarbon in view of its tectonic setting. Indeed no seismic features suggesting occurrence of hydrocarbon are observed in the deeper part.

3.3.4. Contingency Sites

The locations of the contingency sites are shown in Fig. F3.1. MCS lines and profiles passing each site perpendicular to the trench axis are shown in Figs. F12, F13, F14, and F15.

JFAST-5

This location is close to the ODP Site 1151 (Sacks et al., 2000), on a gentle smooth slope of the lower trench slope. The seismic profiles show that the formations to be drilled have clear stratification, cut by some normal faults, correlating with the formations of ODP Site 1151 (Fig.12). No operational problem owing to any shallow hazardous factors was experienced during the ODP operations.

JFAST-6

This location is on a gentle smooth slope of the middle trench slope. The formations to be drilled are expected to be of younger forearc sediments overlying unconformably the pre-Oligocene systems, showing vague stratification, probably correlated with the formations of ODP Site 1151 (Fig. 13 No shallow hazardous features are noticeable.

JFAST-7

This site is situated at the almost same setting to JFAST-3 and -4. Similar lithologies and hazards are expected (Fig. 14).

JFAST-8

This location is on a flat plain of the Pacific Plate where hemipelagic to pelagic sediments, characterized by finely well-stratified seismic reflectors, are accumulated on the basaltic crust (Fig. 15). No shallow hazardous features are noticeable.

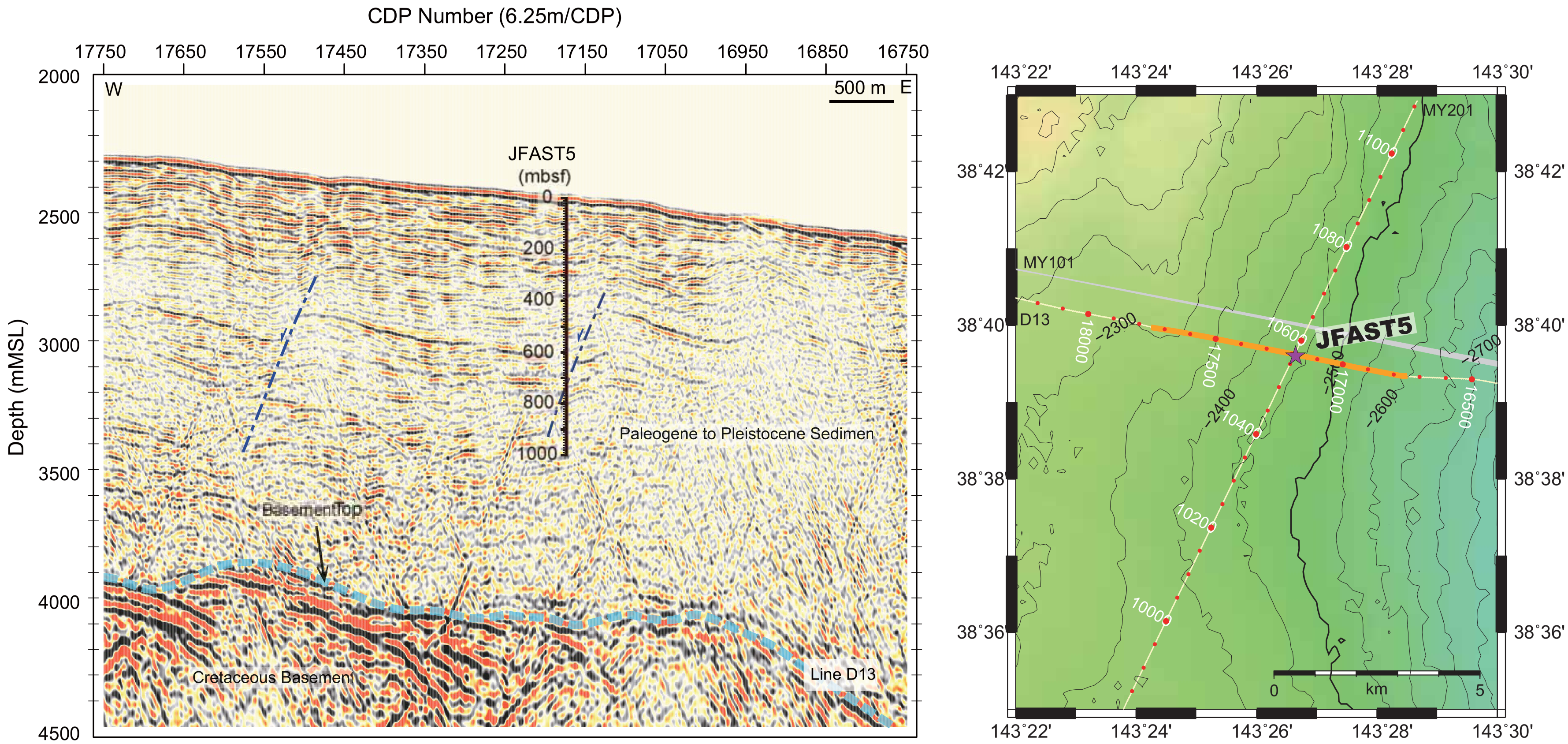


Figure 12. MCS profile with geological interpretation and map showing the corresponding line passing Proposed Site JFAST-5. An orange line indicates the extent of the MCS profile.

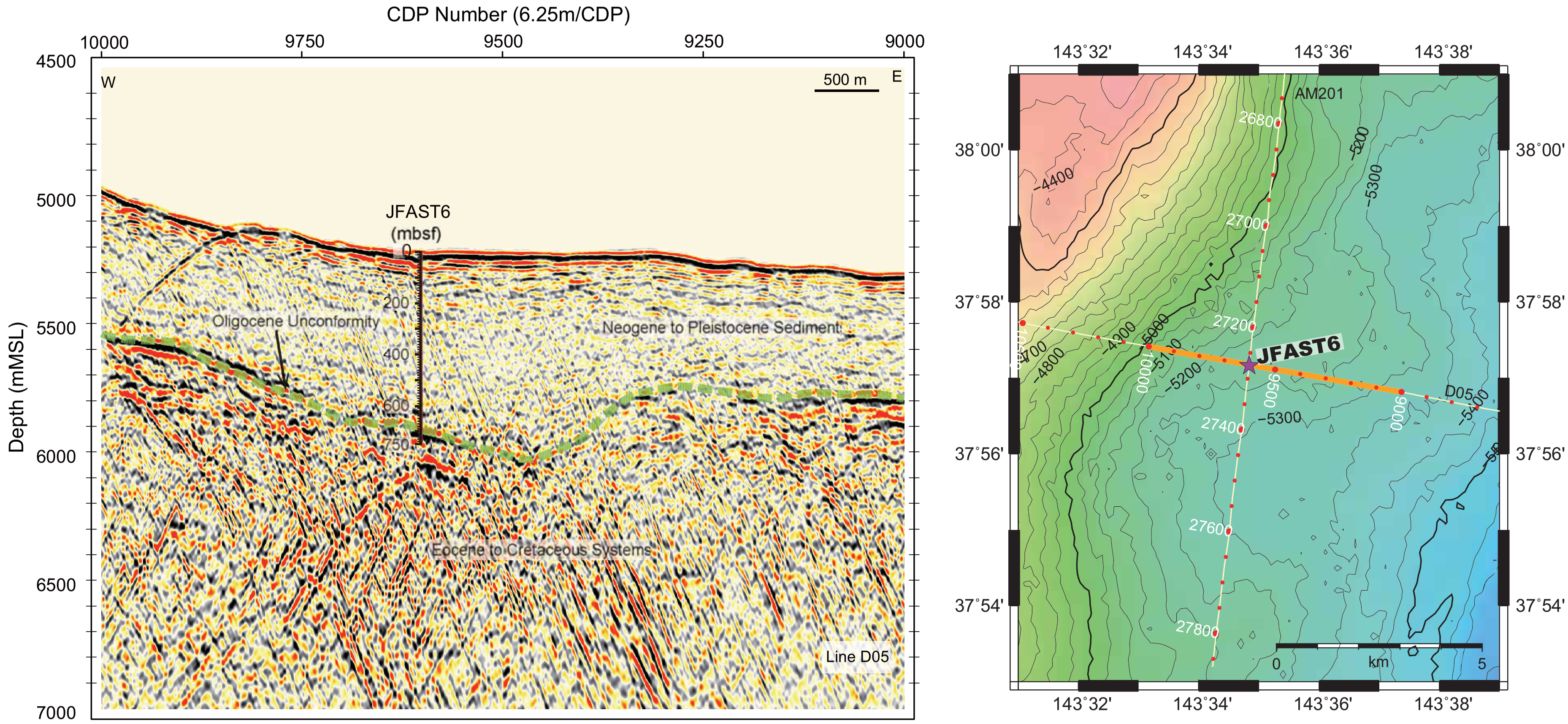


Figure 13. MCS profile with geological interpretation and map showing the corresponding line passing Proposed Site JFAST-6. An orange line indicates the extent of the MCS profile.

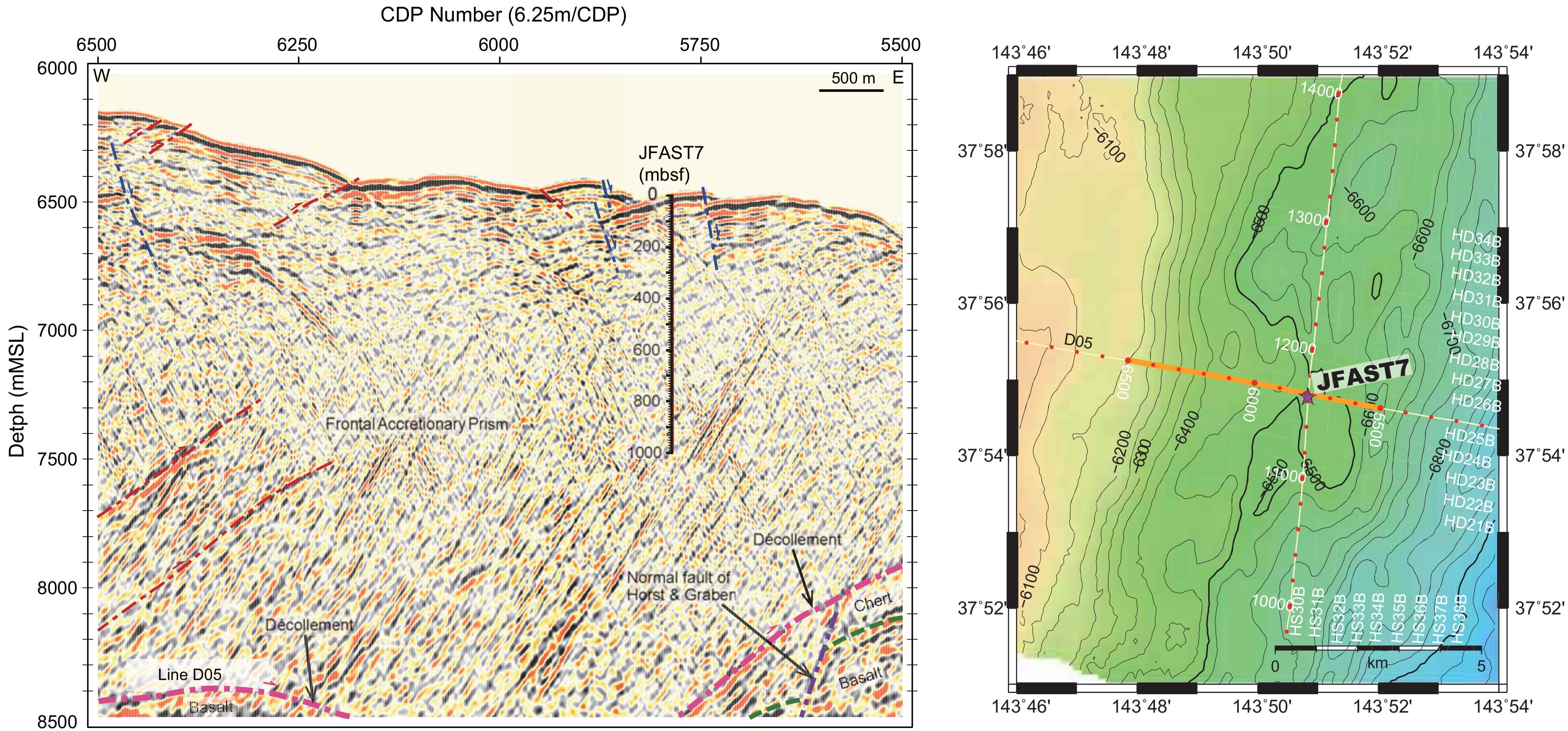


Figure 14. MCS profile with geological interpretation and map showing the corresponding line passing Proposed Site JFAST-7. An orange line indicates the extent of the MCS profile.

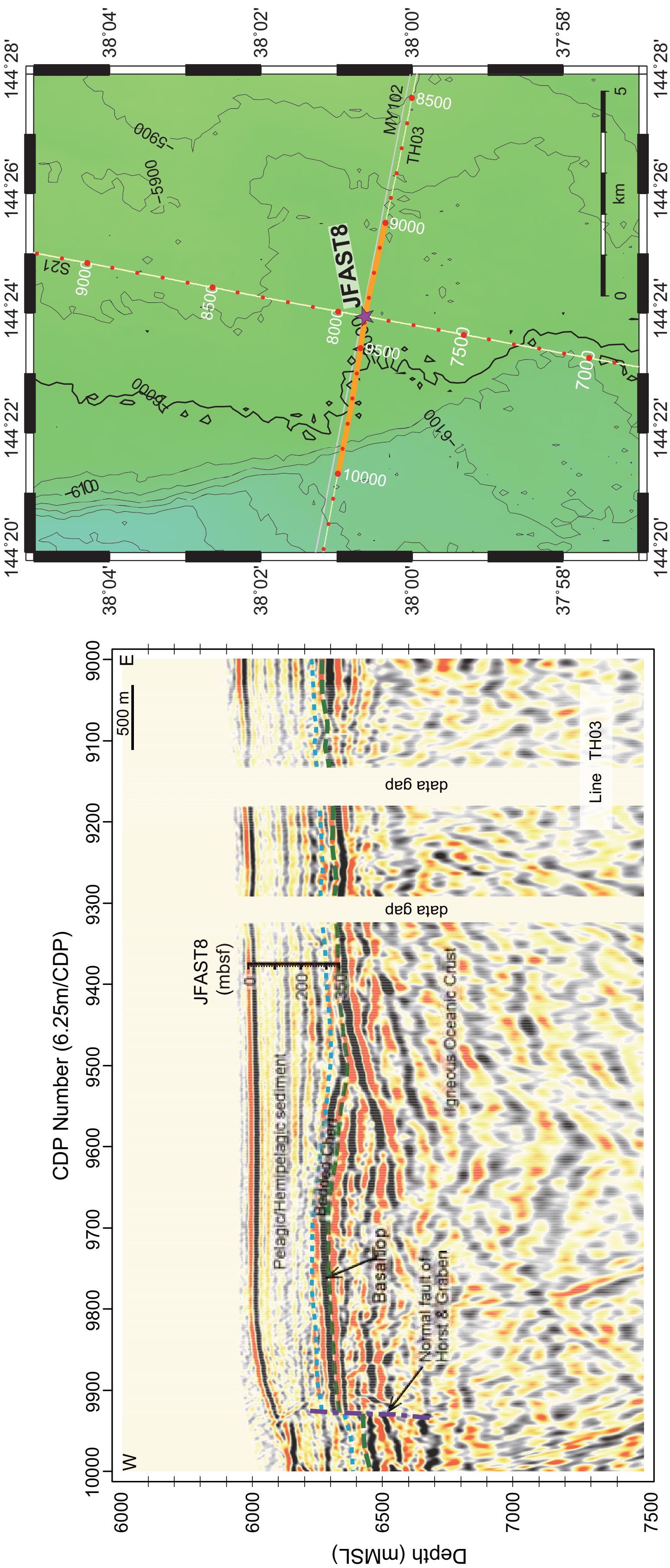


Figure 15. MCS profile with geological interpretation and map showing the corresponding line passing Proposed Site JFAST-8. An orange line indicates the extent of the MCS profile.

4. Operation Summary and Schedule

4.1 Expedition Summary (Expedition 343)

Table 3. Expedition summary table.

Hole Name	Operation	Water Depth (m)	Target Depth (mbsf)	CSG Depth (mbsf)	Ope. days	
Loading Materials at Shimizu						
Move to JFAST3					3	4/1/2012
JFAST3 Hole A	Riserless LWD Hole	6910	1000	4-1/2”	19	4/4 ~ 4/22
	Observatory Hole			1000m		
JFAST# Hole B	Riserless Core Hole RCB	6910	1000	3-1/2”	29	4/23~ 5/21
				1000m		
	Contingency				0	
Sail back to Shimizu					3	5/22~ 5/24

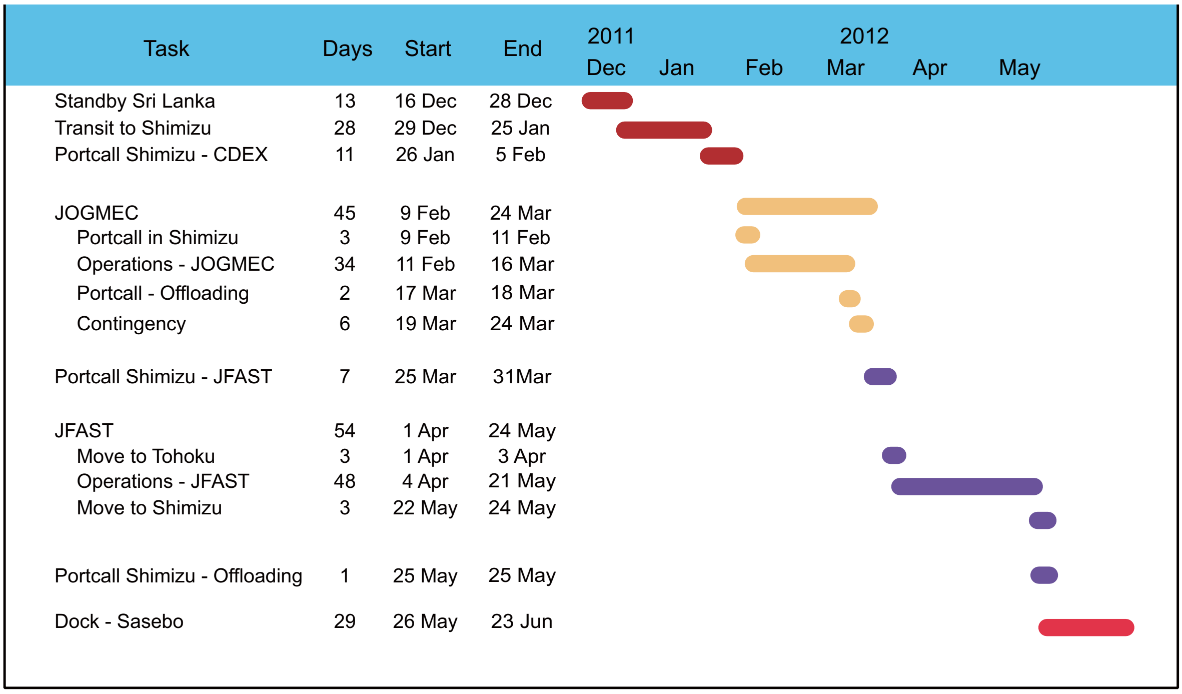
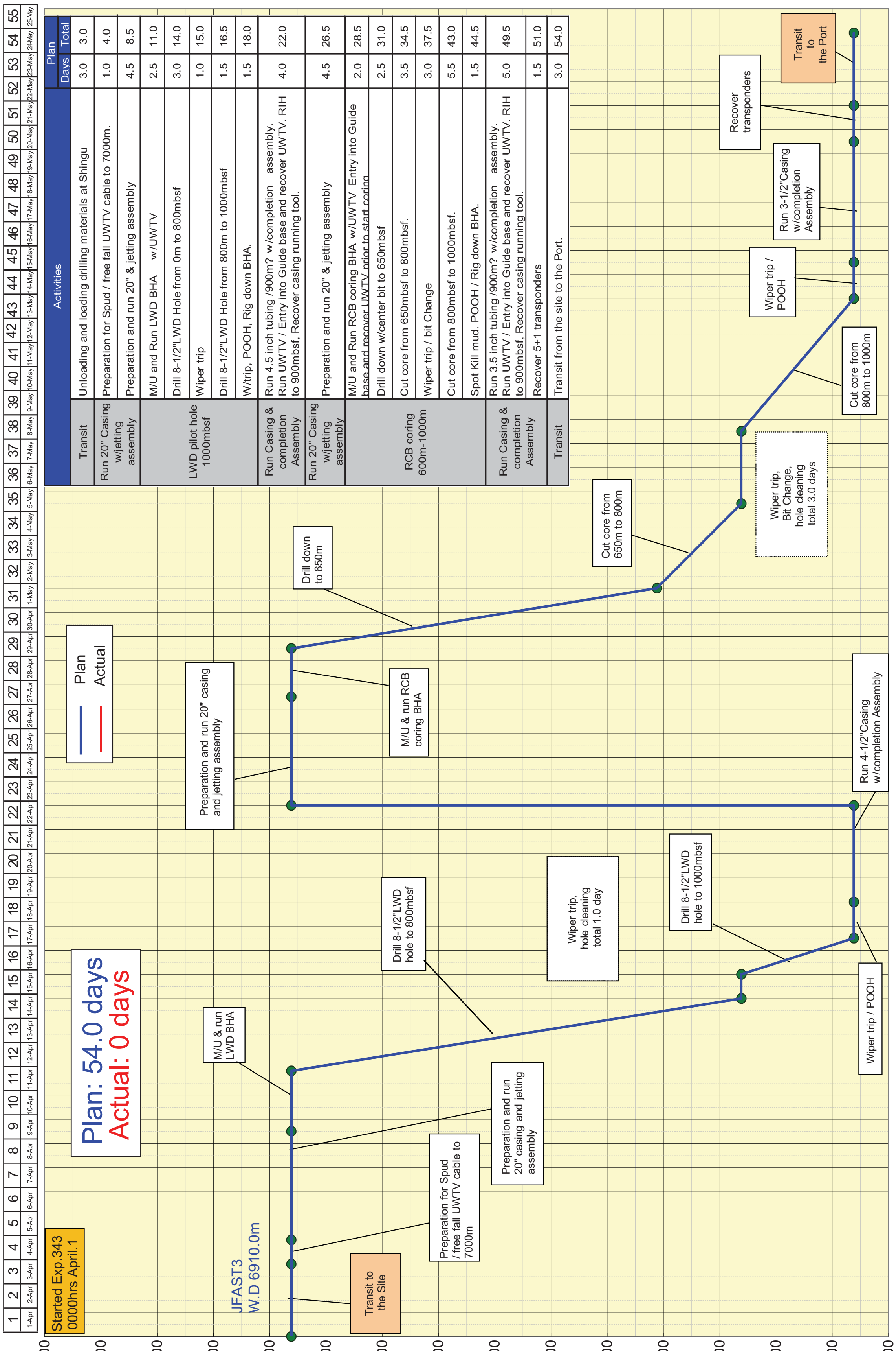


Figure 16. Expedition schedule.

4.3 Drilling time depth chart



Activities		Plan Days	Plan Total
Transit	Unloading and loading drilling materials at Shingu	3.0	3.0
Run 20" Casing w/jetting assembly	Preparation for Spud / free fall UWTV cable to 7000m.	1.0	4.0
	Preparation and run 20" & jetting assembly	4.5	8.5
LWD pilot hole 1000mbsf	M/U and Run LWD BHA w/UWTV	2.5	11.0
	Drill 8-1/2"LWD Hole from 0m to 800mbsf	3.0	14.0
	Wiper trip	1.0	15.0
	Drill 8-1/2"LWD Hole from 800m to 1000mbsf	1.5	16.5
	W/trip, POOH, Rig down BHA.	1.5	18.0
Run Casing & completion Assembly	Run 4.5 inch tubing /900m? w/completion assembly. Run UWTV / Entry into Guide base and recover UWTV. RIH to 900mbsf, Recover casing running tool.	4.0	22.0
Run 20" Casing w/jetting assembly	Preparation and run 20" & jetting assembly	4.5	26.5
RCB coring 600m-1000m	M/U and Run RCB coring BHA w/UWTV Entry into Guide base and recover UWTV prior to start coring	2.0	28.5
	Drill down w/center bit to 650mbsf	2.5	31.0
	Cut core from 650mbsf to 800mbsf.	3.5	34.5
	Wiper trip / bit Change	3.0	37.5
	Cut core from 800mbsf to 1000mbsf.	5.5	43.0
	Spot Kill mud. POOH / Rig down BHA.	1.5	44.5
Run Casing & completion Assembly	Run 3.5 inch tubing /900m? w/completion assembly. Run UWTV / Entry into Guide base and recover UWTV. RIH to 900mbsf, Recover casing running tool.	5.0	49.5
	Recover 5+1 transponders	1.5	51.0
Transit	Transit from the site to the Port.	3.0	54.0

Figure 17. Time depth chart.

4.4 Hole summary

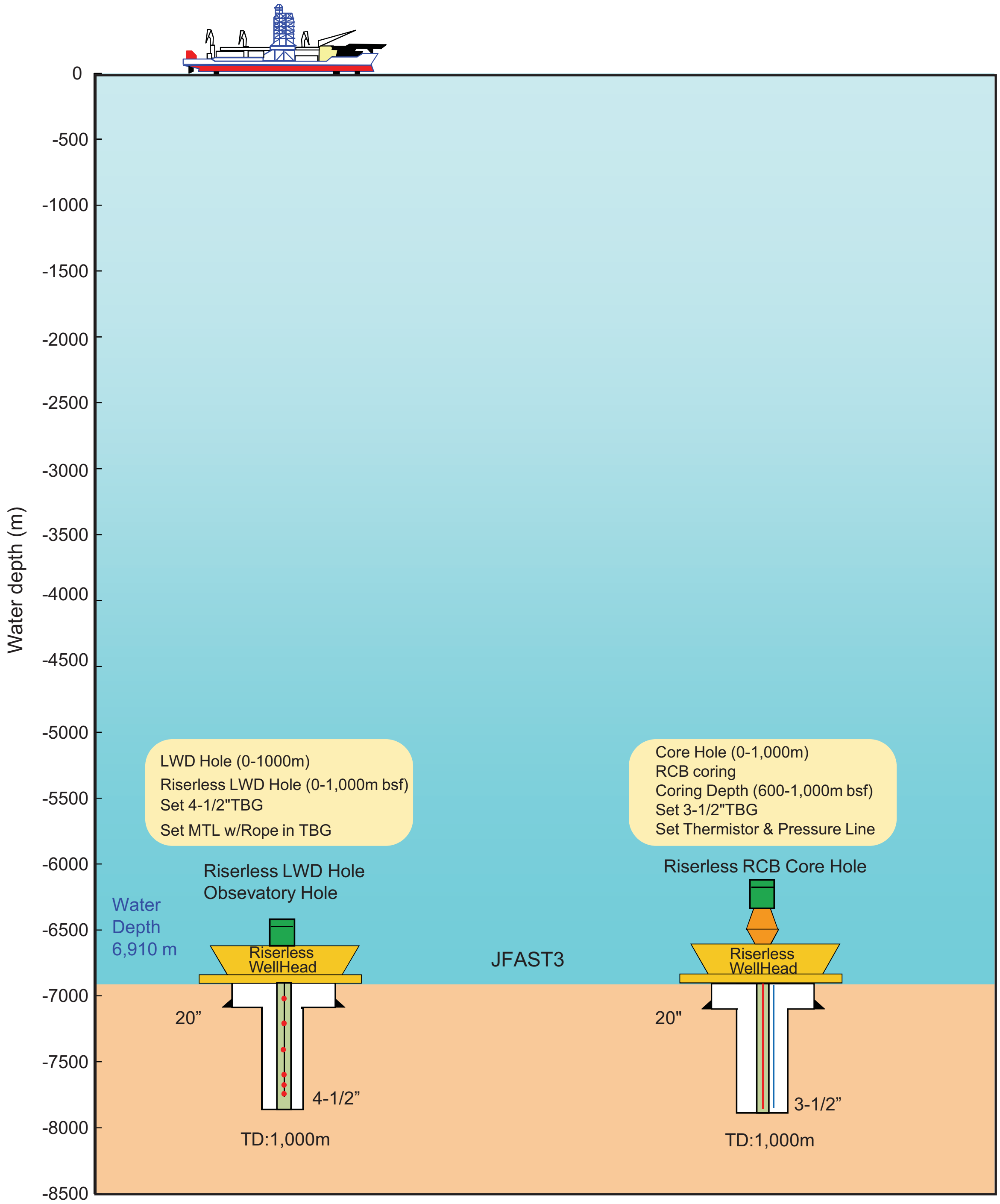


Figure 18. Hole summary for Exp.343

5. Pressure and Temperature Prediction

5.1 Pressure Prediction

The below diagram (Fig.19) was made using IFREE's velocity model from October 2011. The seismic data used is near the Proposed JFAST Sites. Constant velocity in the forearc wedge indicates a normal pressure gradient. The drastic increase of seismic velocity at the boundary between the forearc wedge and the subducting Pacific Plate seen may indicate a lithological change, rather than an increase in formation pressure.

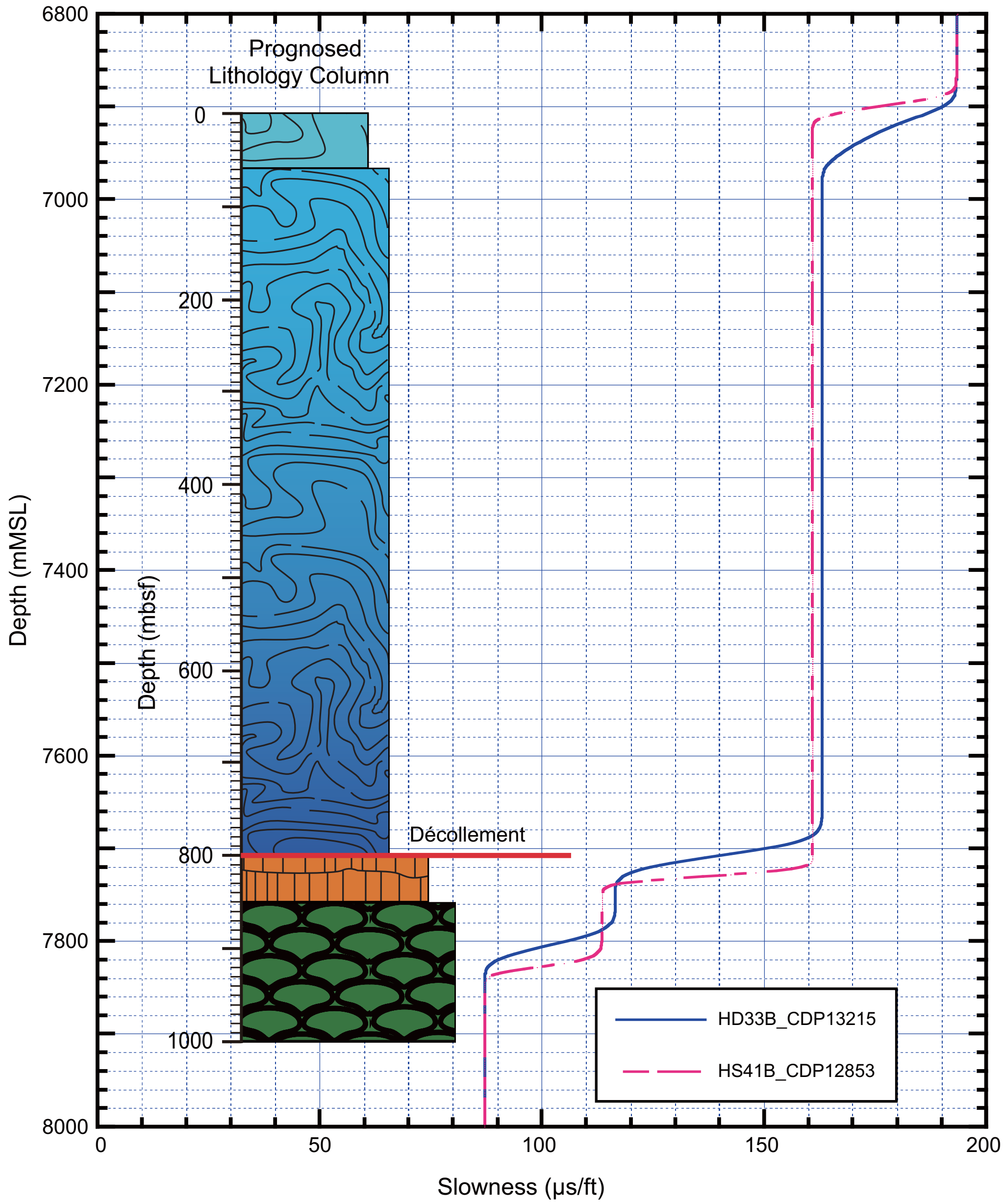


Figure 19. Pressure prediction.

5.2 Temperature Prediction

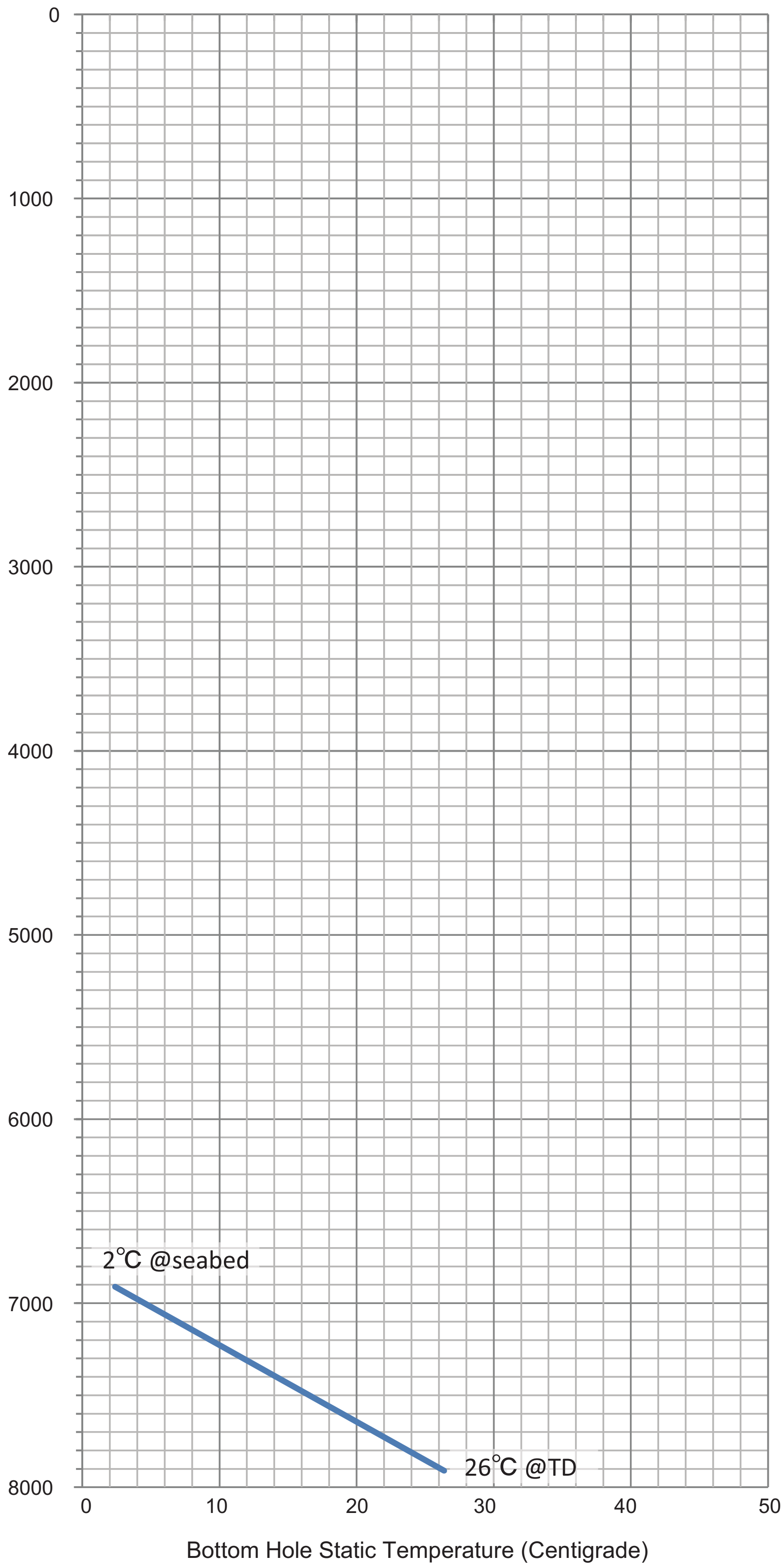


Figure 20. Temperature prediction

6. Drilling Summary

6.1 Well Plan Check List

Table 4. Well plan check list.

Date: 2/February/2012

CDEX Drilling Operation Gr.

Site Name	JFAST3 (C0019)	Nick Name	JFAST	Expedition No.	343	Riser / Riserless	Riserless	Location :	Off Miyagi

Scientific Target: Primary Objectives	Scientific Target: Secondary Objectives	Proposed Total Depth (mbsf)	Geological Prognosis: Formation	Depth (mbsf)	Expected Lithology	Location Geographical	Deviated Well Information	Offset Well
		1000				Well Head	TVD (m)	DSDP Leg 56-57 (434, 435, 440, 441, 436) ODP Leg 186 (1151, 1152)
		Water Depth (m)	I	0-60	Diatomaceous clay to claystone	Lat= 37°56.3022'N	N/A	
		6,910 (ROV not Available)				Lon= 143°54.8405'E	Dev (m)	
		RT Elevation (m)	II	60-800	Diatomaceous and radiolarian claystones	X= 4202982.744	N/A	
		28.5				Y= 756083.27	KOP (m)	
		Proposed Period (days)		800	Décollement	UTM Zone : 54 N	N/A	
		19(LWD Hole), 29(Coring Hole)				Well Bottom	Tangent Angle (deg)	Mud Logging
		AFE Cost	III	800-850	Bedded chert w/ porcellanite	Lat= 37°56.3022'N Lon= 143°54.8405'E	N/A	No
		Vertical or Deviated	IV	850~	Basalt pillow lava w/ hyaloclastite	X= 4202982.744	Direction	
		Vertical				Y= 756083.27	MN	
		Suspension				UTM Zone : 54 N	TN	
		Yes / No				Allowable Radius (m)	Mag. Declination (deg)	
1 st Target	2 nd Target	Long Term Monitoring				100 m (to be approved by EPSP)		
Lat= 37°56.3022'N	Lat =	**Yes** / No						
Lon= 143°54.8405'E	Lon =							
X= 4202982.744	X=							
Y= 756083.27	Y=							
TVD (m) = 1000	TVD (m) =							
Dev (m) = 0	Dev (m) =							
Allowable Radius (m)	Allowable Radius (m)							
100 m (to be approved by EPSP)								

Site Survey

- [x] Deep Seismic
- [ ] Shallow Seismic
- [ ] Side Scan Sonar
- [ ] Sub-bottom Profiler
- [ ] Bathymetry (Seafloor topography)
- [x] Wellhead/Conductor Stress Analysis
- [ ] Others ( )
- [ ] Piston Core
- [ ] Sea Current Survey
- [x] MetOcean Data
- [ ] Riser Analysis

Potential Drilling Hazard

- [ ] Shallow Gas
- [ ] Hydrocarbon
- [ ] Shallow Water Flow
- [ ] Abnormal Pressure
- [ ] Man-made Objects
- [ ] CO2
- [ ] H2S
- [ ] Others (Tyhoon)
- [x] Complicated Seabed Condition
- [x] Soft Seabed
- [ ] Current
- [x] Fractured Zone
- [x] Fault
- [ ] High Dip Angle
- [ ] Hydrothermal Activity
- [x] Landslide & Turbidity Current
- [ ] Methane Hydrate
- [ ] Diapir & Mud Volcano
- [ ] High Temperature
- [ ] Ice Condition

TBG (in)	Depth (mbsf)	Hole Size (Open Hole)	Mud: Type	Mud: MW	Mud: Viscosity	Potential Drilling Problems	Coring Type	DIA Bit D/H Motor	LWD/MWD	Wireline Logging: Hole Size (in)	Wireline Logging: Item	Cementing: Type of Cementing	Cementing: Slurry Type	Cementing: CMTG Interval	Cementing: Caliper Log	Cementing: BHST/BHCT	Temp. & Pressure Survey
LWD Hole (to be Hole A)						* Unstable hole conditions due to fractured rock. * Unstable sands beneath the frontal thrust * Overpressure in fracture zones											
4-1/2"	0-1000	8-1/2"	* Seawater * Bentonite Hi-vis Pill for hole cleaning	1.03			N/A	8-1/2"	6-5/8" TeleScope-APWD 6-5/8" geoVISION 6-5/8" proVISION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Coring Hole (to be Hole B)																	
3-1/2"	0-1000	10-5/8"	* Seawater * Bentonite Hi-vis Pill for hole cleaning	1.03			RCB	10-5/8"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Date: 2/February/2012

CDEX Drilling Operation Gr.

Site Name	JFAST4	Nick Name	JFAST	Expedition No.	343	Riser / Riserless	Riserless	Location :	Off Miyagi

Scientific Target: Primary Objectives	Scientific Target: Secondary Objectives	Proposed Total Depth (mbsf)	Geological Prognosis: Formation	Depth (mbsf)	Expected Lithology	Location Geographical	Deviated Well Information	Offset Well
		1100 (+100)				Well Head	TVD (m)	DSDP Leg 56-57 (434, 435, 440, 441, 436) ODP Leg 186 (1151, 1152)
		Water Depth (m)	I	0-20	Diatomaceous clay to claystone	Lat= 37°56.3528'N	N/A	
		6,830 (ROV not Available)				Lon= 143°54.5075'E	Dev (m)	
		RT Elevation (m)	II	20-900	Diatomaceous and radiolarian claystones	X= 4,203061.09	N/A	
		28.5				Y= 755592.538	KOP (m)	
		Proposed Period (days)		900	Décollement	UTM Zone : 54 N	N/A	
		19(LWD Hole), 29(Coring Hole)				Well Bottom	Tangent Angle (deg)	Mud Logging
		AFE Cost	III	900-950	Bedded chert w/ porcellanite	Lat= 37°56.3533'N Lon= 143°54.5183'E	N/A	No
		Vertical or Deviated	IV	950~	Basalt pillow lava w/ hyaloclastite	X= 4,203061.09	Direction	
		Vertical				Y= 755592.538	MN	
		Suspension				UTM Zone : 54 N	TN	
		Yes / No				Allowable Radius (m)	Mag. Declination (deg)	
1 st Target	2 nd Target	Long Term Monitoring				100 m (to be approved by EPSP)		
Lat= 37°56.3528'N	Lat =	**Yes** / No						
Lon= 143°54.5075'E	Lon =							
X= 4,203061.09	X=							
Y= 755592.538	Y=							
TVD (m) = 1000 (+100: to be approved by EPSP	TVD (m) =							
Dev (m) = 0	Dev (m) =							
Allowable Radius (m)	Allowable Radius (m)							
100 m (to be approved by EPSP)								

Site Survey

- [x] Deep Seismic
- [ ] Shallow Seismic
- [ ] Side Scan Sonar
- [ ] Sub-bottom Profiler
- [ ] Bathymetry (Seafloor topography)
- [ ] Wellhead/Conductor Stress Analysis
- [ ] Others ( )
- [ ] Piston Core
- [ ] Sea Current Survey
- [x] MetOcean Data
- [ ] Riser Analysis

Potential Drilling Hazard

- [ ] Shallow Gas
- [ ] Hydrocarbon
- [ ] Shallow Water Flow
- [ ] Abnormal Pressure
- [ ] Man-made Objects
- [ ] CO2
- [ ] H2S
- [ ] Others (Tyhoon)
- [x] Complicated Seabed Condition
- [x] Soft Seabed
- [ ] Current
- [x] Fractured Zone
- [x] Fault
- [ ] High Dip Angle
- [ ] Hydrothermal Activity
- [x] Landslide & Turbidity Current
- [ ] Methane Hydrate
- [ ] Diapir & Mud Volcano
- [ ] High Temperature
- [ ] Ice Condition

TBG (in)	Depth (mbsf)	Hole Size (Open Hole)	Mud: Type	Mud: MW	Mud: Viscosity	Potential Drilling Problems	Coring Type	DIA Bit D/H Motor	LWD/MWD	Wireline Logging: Hole Size (in)	Wireline Logging: Item	Cementing: Type of Cementing	Cementing: Slurry Type	Cementing: CMTG Interval	Cementing: Caliper Log	Cementing: BHST/BHCT	Temp. & Pressure Survey
LWD Hole (to be Hole A)						* Unstable hole conditions due to fractured rock. * Unstable sands beneath the frontal thrust * Overpressure in fracture zones											
4-1/2"	0-1100	8-1/2"	* Seawater * Bentonite Hi-vis Pill for hole cleaning	1.03			N/A	8-1/2"	6-5/8" TeleScope-APWD 6-5/8" geoVISION 6-5/8" proVISION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Coring Hole (to be Hole B)																	
3-1/2"	0-1100	10-5/8"	* Seawater * Bentonite Hi-vis Pill for hole cleaning	1.03			RCB	10-5/8"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

6.2 Drilling Chronology

Table 5. Drilling Chronology

Exp.343 JFAST3 (Rapid response drilling) Water depth 6909mMSL		Water Depth (mMSL)	Hole Size (inch)	Depth (mMSL)	Depth (mbsf)	Section Length (m)	Daily Progress (m/day)	Days (days)	Sub Total (days)	Total (days)
Transit		6,910								
1	Transit from Shingu (Shimizu) to the site.							3.00	**3.00**	**3.00**
Run 20"casing w/jetting assembly		6,910								
1	Preparation for Spud Free fall UWTV cable to 7000m. Deploy 5+1transponders / DP calibration.							1.00	1.00	
2	Preparation and Run 20" & jetting assembly Rig up guide horn and 20" casing equipment Run 20"casing w/UWTV. Jet in 20" casing Recover UWTV. POOH Running Tool							4.50	**5.50**	**8.50**
LWD pilot hole 1,000mbsf		6,910								
1	M/U and Run LWD BHA w/UWTV Tag the seabed and recover UWTV prior to start drilling.							2.50	2.50	
2	Drill 8-1/2"LWD Hole from 0m to 800mbsf		8-1/2"	7,710	800	800	270	3.00	5.50	
3	Wiper trip							1.00	6.50	
4	Drill 8-1/2"LWD Hole from 800m to 1000mbsf		8-1/2"	7,910	1,000	200	150	1.50	8.00	
5	W/trip, POOH, Rig down BHA.							1.50	**9.50**	**18.00**
Run tubing & completion Assembly (MTL)		6,910								
1	Run 4.5 inch tubing /1000m? w/completion assembly Run UWTV / Entry into Guide base and recover UWTV. RIH to 800mbsf, Recover casing running tool.							4.00	**4.00**	**22.00**
Run 20"casing w/jetting assembly		6,910								
1	Preparation and Run 20" & jetting assembly Rig up guide horn and 20" casing equipment Run 20"casing w/UWTV. Jet in 20" casing Recover UWTV. POOH Running Tool							4.50	**4.50**	**26.50**
RCB coring 650m-1,000m		6,910								
1	M/U and Run RCB coring BHA w/UWTV Entry into Guide base and recover UWTV prior to start coring							2.00	2.00	
2	Drill down w/center bit to 650mbsf			7,560	650	650	300	2.50	4.50	
3	Cut core from 650mbsf to 800mbsf.		10-5/8"	7,710	800	150	42	3.50	8.00	
4	Wiper trip / bit Change							3.00	11.00	
5	Cut core from 800mbsf to 1000mbsf.		10-5/8"	7,910	1,000	200	35	5.50	16.50	
6	Spot Kill mud. POOH / Rig down BHA.							1.50	**18.00**	**44.50**
Run tubing & completion Assembly		6,910								
1	Run 3.5 inch tubing /1000m? w/completion assembly Run UWTV / Entry into Guide base and recover UWTV. RIH to 800mbsf, Recover tubing running tool.							5.00	5.00	
2	Recover 5+1 transponders							1.50	**6.50**	**51.00**
Transit										
1	Transit from the site to the Port.							3.00	**3.00**	**54.00**
							Grand Total			**54.00**

6.3 Drilling Sequence

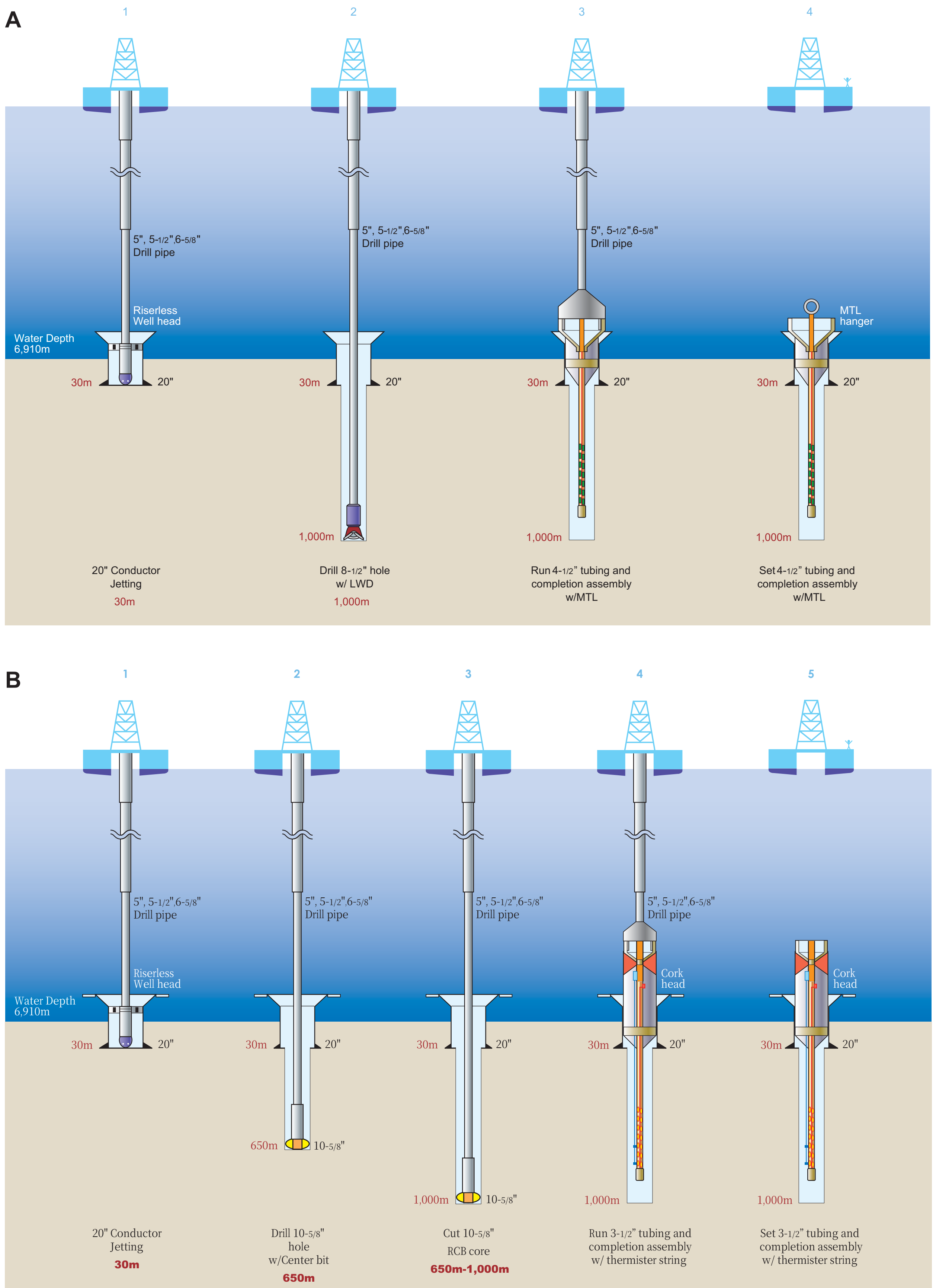


Figure 21. (A) Drilling sequence A, LWD hole. (B) 6.3. Drilling sequence B core hole

6.4 Drilling Program Summary

Table 6. Drilling program summary

Expediton Number	343	**Nick Name**	JFAST
Hole Number	2	**Hole Name**	C0019A, C0019B
Riser/Riserless	Riserless	**ROV**	N/A
Underwater TV	Deployed	**Transponder**	Deployed
Primary Expedition Site		**Secondary Expedition Site**	
Latitude		**Latitude**	
Longitude		**Longitude**	
Water Depth	6,910m	**Water Depth**	6,830m
TD	1,000mbsf	**TD**	1,100m
C0019A	8-1/2”LWD Hole		
C0019B	10-5/8”Coring Hole		
Shallow Gas	Not expected		
Abnormal Pressure	Not expected		
Wellhead	20”CSG by Jetting (In case jetting is not success, Tripod wellhead is set at seabed)		
Mud	Seawater and SW Gel Slurry		
Formation Pressure	Normal		
Vertical/Deviation	Vertical		
Deviation Survey	C0019A: MWD		
	C0019B: No plan		
Motor	No plan		
LWD	C0019A: Power Pulse/Telescope/geo VISION/pro VISION/APWD		
	C0019B: N/A		
W/L Logging	No plan. Prepare back-off tool (tool down to a maximum distance of approximately 7,422mrkb)		
Mud Logging	No plan		
Jar	C0019A: Rent		
	C0019B: JAMSTEC Coring Jar		
Coring	C0019A: No plan		
	C0019B: 650m-1,000m JAMSTEC RCB Wireline Coring		
CMTG	No plan		
Completion	C0019A: 4-1/2”TBG in openhole, Temperature sensors along rope inside TBG		
	C0019B: 3-1/2”TBG in openhole, Thermistor string inside TBG & pressure sensors outside TBG, Data Logger at CORK head		
Total Days	54days		
Transit	3days		
C0019A	19days		
C0019B	29days		
Transit	3days		
Helicopter	Superpuma	**Heli Port**	Sendai airport
Supply Boat	No (On-Call Base)		
Watch Boat	Yes		
Bulk Plant	No plan		

6.5 Contingency Tree

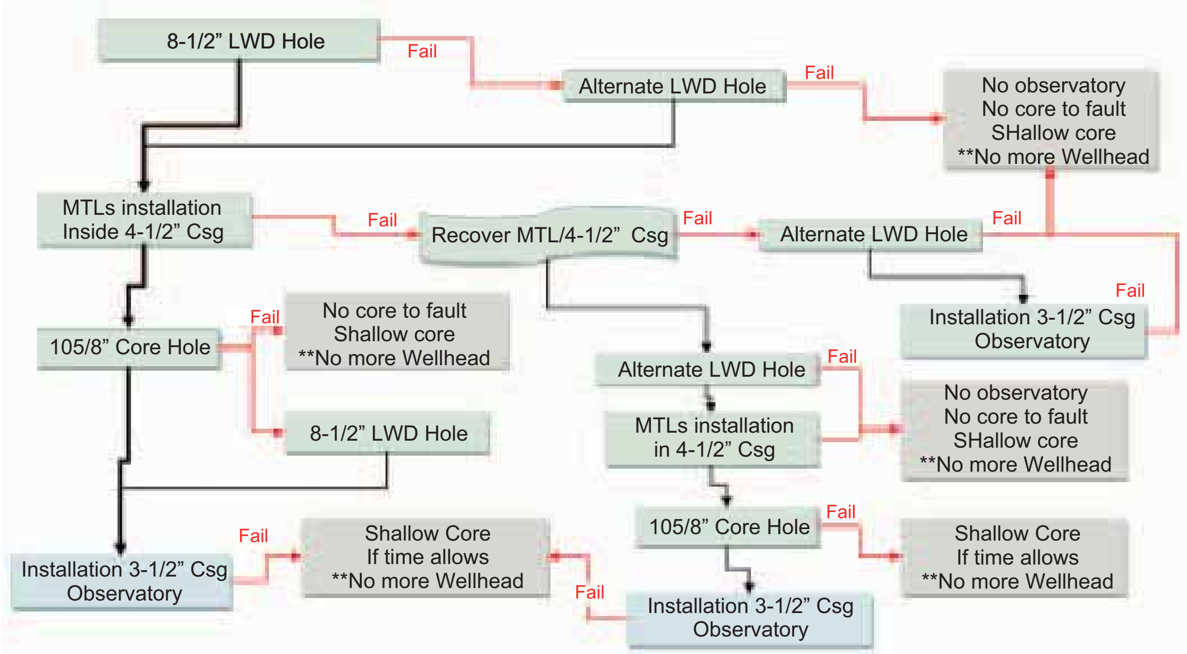


Figure 22. Contingency tree.

6.6 Hazard Assessment

Table 7. Hazard assessment

Potential Hazard /Concern		Impacts on Operations	Initial Risk Level	CDEX's Deep Hazard Control (Hazard Identification ⇒ Risk Assessment ⇒ Risk Mitigation)	Risk Level aft Initial Mitigation
(1) Rig & Equipment Failure	(a) DPS Drive off/Drift off	* Break Drill string * Loss of BHA * Loss of the hole	Low	• Have detail metocean data • Have weather forecast frequently. • Follow WSOG(well Specific Operation Guideline)	Low
	(b) Broken Guide Horn	* Lose drill string while drilling under sever current/weather	Low	• Inspect before installation. • Enough parts shall be on board.(MQJ)	Low
	(c) LWD/MWD failure	* Miss LWD/MWD real time data	Low	• Shallow test shall be conducted. • Back-up Tool shall be on board. • Battery shall be checked prior to running. • Consider battery life while operation.	Low
	(d) Coreline Winch Failure	* Kink the coreline * Impossible to pull out the core tool. * Increase operation period	Low	• PM coreline winch. • Both reels (FWD/AFT) shall be available anytime	Low
	(e) Coreline Wiper Failure	* Leakage of seawater/mud. * Increase wireline operation time.	Low	• Remove sinker bar assembly from the HPS while laying down the inner barrel if necessary for circulation. • Prepare enough spare parts for coreline wiper • Use New type of coreline	Low
	(f) UWTV Failure	* Impossible to re-entry in the same hole. * Abandon the hole	Low	• Untwist the cable prior to commencement of the operation. • PM shall be done. • Prepare enough spare parts on board. • An engineer shall be onboard.	Low
(2) Coring	(a) Unconsolidated formation	* Low recovery * Wash out core * More core operation.	Low	• Consult with coring engineer/geologist • Selection of core bit properly. • Half core process instead of full length core	Low
	(b) Inner Barrel Stuck	* Increase operation period. (POOH a whole BHA in worst	Low	• Drift inside drill pipe prior to commencing the • Circulate well prior to coring. • Release sinker bar ass'y and recover. POOH with	Low
	(c) Unable to unlatch	* Increase operation period	Low	• Circulate hi-vis mud. • Release sinker bar ass'y and recover. POOH with	Low
	(d) Outer barrel stuck	* Loss of BHA in hole * Abandon the hole	Low	• Sufficient hole cleaning. • Prepare enough hi-vis mud to clean the hole • Use lubrication additive in mud if necessary	Low
	(e) Improper core bit	* Decrease ROP * Increase operation period * Low recovery *	Low	• Consult with coring engineer and geologist. • Prepare different kinds of bits on board.	Low
	(f) Improper core system selection	* Decrease ROP * Low core recovery	Low	• Consult with core engineer and geologist • Change coring parameter(WOB/RPM/SPM//) • POOH and change the core system (from RCB to	Low
	(g) Improper core system selection	* Decrease ROP * Low core recovery	Low	• Consult with core engineer and geologist • Change coring parameter(WOB/RPM/SPM//)	Low
(3) Drilling Hazard	(a) Critical Drill Pipe Strength	* Limited Over-pull margin * Limited Operation Criteria * Increase waiting on weather * Longer operation period * Shear Drill Pipe * Loss of LWD Tool * Impossible to reach target depth.	Med	• Conduct a dynamic simulation study • Follow WSOG. • Sophisticated Drill string design must be considered. • Carefully handle drill pipe.(Use Dual Elevator) • Carefully watch weather forecast.	Low

	(b) Stuck on drill string	* Lose BHA in hole * Increase operation period * Abandon the hole	Low	• Sufficient hole cleaning. • Prepare enough mud • Use lubrication additive in mud if necessary	Low
	(c) Twist off drill string	* Lose BHA in hole * Increase operation period * Abandon the hole	Low	• Make up BHA with proper torque. • Do not apply excessive torque. • Set the proper torque limit on DCIS	Low
	(d) Crooked hole	* Stuck pipe * Lose BHA in hole * Sidetrack * Increase operation period	Low	• Proper BHA. • Use MWD for survey.	Low
	(e) Poor hole cleaning	* Stuck pipe * Lose BHA in hole	Low	• Prepare enough mud. • Increase frequency of sweeping hole. • Consider change of drilling parameter. • Conduct Wiper/Short trip.	Low
	(f) Bit failure	* Low ROP * Impossible to drill ahead * Increase operation period	Low	• Select tough bit. • Use PDC bit. • Consult w/bit company	Low
	(g) Pump Failure	* Capacity of cutting transportation is reduced. * Accumulation of cutting around BHA/Stabilizer * Stuck Pipe	Low	• PM pump	Low
(4) Geological uncertainty	(a) Caving / Sloughing	* Decrease drilling rate * Increase operation period * Fill on bottom * Hole Pack-off * Lose BHA in hole * Abandon the hole	Low	• Observe cutting on shaker carefully. • Carry on hole cleaning with hi-vis sweep. • Prepare enough mud chemical on board. • Minimize connection time. • Consider wiper trip. • Consider change of mud property. • Increase mud weight.	Low
	(b) Lost circulation	* Decrease drilling rate * Increase operation period * Accumulate cutting in hole * Stuck pipe, Lose BHA in hole * Abandon the hole	Low	• Prepare enough mud chemical (LCM). • Consider change of mud property(Mud weight). • Control drilling parameters.	Low
	(c) Swelling	* Decrease drilling rate * Increased operation period * Hole pack-off * Lose BHA in hole * Abandon the hole	Low	• Prepare enough chemical on board. • Consider change of mud property. • Consider change of casing setting depth. • Increase mud weight.	Low

Likelihood			Consequence (Monetary/ Reputation)		
			High	**Medium**	**Low**
			Reputation ; International Impact Greater than $1.0M Cost Worse than Lost Time	Reputation ; National Impact Less than $1.0M Cost Lost Time	Reputation ; Limited Impact Less than $100K Cost First Aid
Frequency	**High**	High potential occurrence; known to have happened more than once on other project			
	Medium	Likely to occur, has happened at least once on other projects			
	Low	Not likely to occur on this hole			

Risk ranking ;

High; Must be assessed and managed to ALAP

Medium ; review to ensure appropriate barriers and controls are in place

Low ; Manage by operational documentation

7. Deviation Survey Program

The MWD bottom hole assembly (BHA) will be used for drilling at Proposed Site JFAST-3, Hole A, whereas the coring assembly will be used for all drilling at Proposed Hole B. Hence, no deviation survey is planned for the Proposed Hole A.

8. Bit Program

Table 8. Bit program.

<table>
<tr><th>Section</th><th>Hole Size</th><th>Interval (mMSL)</th><th>Penetration (m)</th><th>Bit / Hole Opener (MFR, IADC Code)</th><th>Back up Bit / Hole Opener (MFR, IADC</th></tr>
<tr><td rowspan="5">6,909m
7,909m
(0- 1,000mbsf)</td><td rowspan="3">8-1/2" LWD hole</td><td rowspan="3">6,910-7,910 m
(0-1,00mbsf)</td><td rowspan="3">1,000</td><td>MDSi713UBPX
SMITH
7blades
7nozzles</td><td rowspan="2">Insert bit
GF40UYOD1RD SMITH / (IADC 617)
GF45YOD1RD SMITH / (IADC 627)
X30GSJ-G TIX / (IADC 537)
X60GJ TIX / (IADC 617)</td></tr>
<tr><td>PDC
MSi516HBPX
SMITH
5blades
7nozzles
16mm cutter</td></tr>
<tr><td>Kymera
HP522FX
BHI
2blades & 2 cones
2nozzles
16mm cutter</td><td>Milled tooth
XR+PS SMITH / (IADC 117)
MH TIX / (IADC 231)</td></tr>
<tr><td rowspan="2">10-5/8"
RCB Core hole</td><td rowspan="2">6,910-7,910m
(0-1,000mbsf)</td><td rowspan="2">1,000</td><td>10-5/8" Core bit
BHC408C
(BHI, PDC)</td><td>10-5/8" Core bit BHC405 x 2 (BHI, PDC)
10-5/8" Core bit BHC408 x 1 (BHI, PDC)
9-7/8" Core bit CC3/CC4/CC7 (insert 4 cone)</td></tr>
<tr><td>10-5/8" Core bit
BHC410C
(BHI, PDC)</td><td>10-5/8" Drill bit
MH TIX / (IADC 231)
X30GJ TIX / (IADC 537)
X40GL TIX (IADC 617)</td></tr>
</table>

9. BHA Program

Table 9. BHA program table

3. Run		Pcs	Length (m)	Accum. Length	Accum. Weight in mud (kg)	OD & Jt OD (inch)	min ID (inch)	Connection				
	4-1/2"tubing /completion assembly	110	990	990	16127.938	4.5 / 4.937	3.833(drift)	-			4-1/2"Vam top	P
	tubing hunger	1	0.6	990.6	16137.712	-	-	4-1/2"Vam top	b	x	-	B
	tubing running tool	1	1.8	992.4	16318.308	7	4.125	-	b	x	6-5/8"FH	B
	X/O	1	0.8	993.2	16398.573	7.5	4.125	6-5/8"FH	P	x	5-3/4"DSTJ	B
	5.68"HW DP (premium)	12	112.8	1106	23282.309	5.68(7)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	1106.8	23362.573	7	4.125	5-3/4"DSTJ	P	x	5-1/2"DSTJ	B
	5"DP S-140 (premium)	184	1729.6	2836.4	70962.875	5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	5-1/2"DP S-140 (premium)	140	1316	4152.4	119829.621	5.5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	X/O	1	9.4	4161.8	120772.732	7	4.125	5-1/2"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (premium)	200	1880	6041.8	204413.039	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (new)	100	940	6981.8	246233.193	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	6982.6	246313.458	8.5	4.125	5-3/4"DSTJ	P	x	6-5/8"FH	B
	6-5/8"DP Z-140 (new)	104	977.6	7960.2	318812.174	6.625(8.5)	4.25	6-5/8"FH	P	x	6-5/8"FH	B
			@re-entry	31.1	5-1/2"DP new 23stds							
			@TD	21.7	6-5/8"DP 26stds							

3. Run		Pcs	Length (m)	Accum. Length	Accum. Weight in mud (kg)	OD & Jt OD (inch)	min ID (inch)	Connection				
	4-1/2"tubing /completion assembly	110	990	990	16127.938	4.5 / 4.937	3.833(drift)	-			4-1/2"Vam top	P
	tubing hunger	1	0.6	990.6	16137.712	-	-	4-1/2"Vam top	b	x	-	B
	tubing running tool	1	1.8	992.4	16318.308	7	4.125	-	b	x	6-5/8"FH	B
	X/O	1	0.8	993.2	16398.573	7.5	4.125	6-5/8"FH	P	x	5-3/4"DSTJ	B
	5.68"HW DP (premium)	12	112.8	1106	23282.309	5.68(7)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	1106.8	23362.573	7	4.125	5-3/4"DSTJ	P	x	5-1/2"DSTJ	B
	5"DP S-140 (premium)	184	1729.6	2836.4	70962.875	5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	5-1/2"DP S-140 (premium)	140	1316	4152.4	119829.621	5.5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	X/O	1	9.4	4161.8	120772.732	7	4.125	5-1/2"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (premium)	200	1880	6041.8	204413.039	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (new)	100	940	6981.8	246233.193	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	6982.6	246313.458	8.5	4.125	5-3/4"DSTJ	P	x	6-5/8"FH	B
	6-5/8"DP Z-140 (new)	104	977.6	7960.2	318812.174	6.625(8.5)	4.25	6-5/8"FH	P	x	6-5/8"FH	B
			@re-entry	31.1	5-1/2"DP new 23stds							
			@TD	21.7	6-5/8"DP 26stds							

2.		Pcs	Length (m)	Accum. Length	Accum. Weight in mud (kg)	OD & Jt OD (inch)	min ID (inch)	Connection				
	8-1/2"bit	1	0.3	0.3	38.942	8.5	-	-			4-1/2" Reg	P
	geoVISION675	1	3.085	3.385	520.512	6.75/7.75(stab)	2.25	4-1/2" Reg	B	x	5-1/2"FH	B
	proVISION675	1	11.372	14.757	2057.401	6.75/7.75(stab)	2.25	5-1/2"FH	P	x	5-1/2"FH	B
	Telescope 675	1	7.529	22.285	2881.014	6.725/6.89(max)	2.25	5-1/2"FH	P	x	4"IF	B
	6-3/4" NMDC	1	9.2	31.485	4112.155	6.25	2.25	4"IF	P	x	4"IF	B
	8-1/2" Str Stabilizer	1	1.65	33.135	4326.335	6.725	2.25	4"IF	P	x	4"IF	B
	6-3/4DC(for drilling)	10	94	127.135	16528.088	6.75	2.25	4"IF	P	x	4"IF	B
	6-1/4"Drilling Jar	1	9.2	136.335	17722.302	6.25	2.25	4"IF	P	x	4"IF	B
	6-3/4DC(for drilling)	5	47	183.335	23823.179	6.75	2.25	4"IF	P	x	4"IF	B
	X/O	1	0.6	183.935	23901.062	7	2.25	4"IF	P	x	5-3/4"DSTJ	B
	5.68"HW DP (premium)	12	112.8	296.735	30784.798	5.68(7)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	297.535	30865.063	7	4.125	5-3/4"DSTJ	P	x	5-1/2"DSTJ	B
	Drilft cathcer sub (Churchill)	1	0.914	298.450	30995.381	7.25	3.17	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	5"DP S-140 (premium)	268	2519.2	2817.650	110339.155	5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	5-1/2"DP S-140 (premium)	140	1316	4133.650	159205.901	5.5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	X/O	1	0.8	4134.450	159286.166	7	4.125	5-1/2"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (premium)	200	1880	6014.450	242926.474	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (new)	100	940	6954.450	284746.627	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	6955.250	284826.892	8.5	4.125	5-3/4"DSTJ	P	x	6-5/8"FH	B
	6-5/8"DP Z-140 (new)	106	996.4	7951.650	358719.815	6.625(8.5)	4.25	6-5/8"FH	P	x	6-5/8"FH	B
			@re-entry	23.650	5-1/2"DP new 25stds							
			@TD	13.150	6-5/8"DP 25stds							

5.RCB coring		Pcs	Length (m)	Accum. Length	Accum. Weight in mud (kg)	OD & Jt OD (inch)	min ID (inch)	Connection

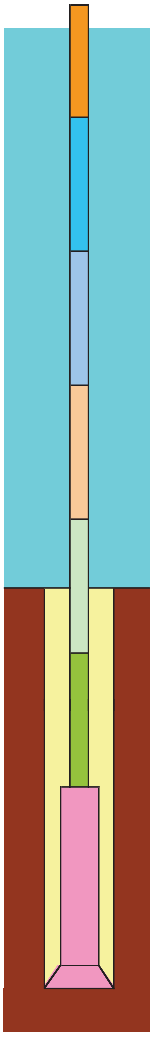
6. Run		Pcs	Length (m)	Accum. Length	Accum. Weight in mud (kg)	OD & Jt OD (inch)	min ID (inch)	Connection				
	3-1/2"tubing /completion assembly	110	990	990	11774.795	3.5 /2.992	2.867(drift)	-			3-1/2"Vam top	P
	tubing hunger	1	0.6	990.6	11781.931	-	-	3-1/2"Vam top	b	x	-	B
	tubing running tool	1	1.8	992.4	11962.527	7	4.125	-	b	x	6-5/8"FH	B
	X/O	1	0.8	993.2	12042.792	7.5	4.125	6-5/8"FH	P	x	5-3/4"DSTJ	B
	5.68"HW DP (premium)	12	112.8	1106	18926.528	5.68(7)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	1106.8	19006.792	7	4.125	5-3/4"DSTJ	P	x	5-1/2"DSTJ	B
	5"DP S-140 (premium)	184	1729.6	2836.4	66607.094	5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	5-1/2"DP S-140 (premium)	140	1316	4152.4	115473.840	5.5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	X/O	1	9.4	4161.8	116416.951	7	4.125	5-1/2"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (premium)	200	1880	6041.8	200057.258	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (new)	100	940	6981.8	241877.412	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	6982.6	241957.677	8.5	4.125	5-3/4"DSTJ	P	x	6-5/8"FH	B
	6-5/8"DP Z-140 (new)	104	977.6	7960.2	314456.393	6.625(8.5)	4.25	6-5/8"FH	P	x	6-5/8"FH	B
			@re-entry	31.1	5-1/2"DP new 23stds							
			@TD	21.7	6-5/8"DP 26stds							

6. Run		Pcs	Length (m)	Accum. Length	Accum. Weight in mud (kg)	OD & Jt OD (inch)	min ID (inch)	Connection				
	3-1/2"tubing /completion assembly	110	990	990	11774.795	3.5 /2.992	2.867(drift)	-			3-1/2"Vam top	P
	tubing hunger	1	0.6	990.6	11781.931	-	-	3-1/2"Vam top	b	x	-	B
	tubing running tool	1	1.8	992.4	11962.527	7	4.125	-	b	x	6-5/8"FH	B
	X/O	1	0.8	993.2	12042.792	7.5	4.125	6-5/8"FH	P	x	5-3/4"DSTJ	B
	5.68"HW DP (premium)	12	112.8	1106	18926.528	5.68(7)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	1106.8	19006.792	7	4.125	5-3/4"DSTJ	P	x	5-1/2"DSTJ	B
	5"DP S-140 (premium)	184	1729.6	2836.4	66607.094	5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	5-1/2"DP S-140 (premium)	140	1316	4152.4	115473.840	5.5(7)	4.125	5-1/2"DSTJ	P	x	5-1/2"DSTJ	B
	X/O	1	9.4	4161.8	116416.951	7	4.125	5-1/2"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (premium)	200	1880	6041.8	200057.258	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	5-1/2"DP S-150 (new)	100	940	6981.8	241877.412	5.5(7.5)	4.125	5-3/4"DSTJ	P	x	5-3/4"DSTJ	B
	X/O	1	0.8	6982.6	241957.677	8.5	4.125	5-3/4"DSTJ	P	x	6-5/8"FH	B
	6-5/8"DP Z-140 (new)	104	977.6	7960.2	314456.393	6.625(8.5)	4.25	6-5/8"FH	P	x	6-5/8"FH	B
			@re-entry	31.1	5-1/2"DP new 23stds							
			@TD	21.7	6-5/8"DP 26stds							

Table 10. typical string weight. (A) RCB Core hole, and (B) 4-1/2" tubing run.

A

Water Depth (mBRT)	6,938.5
Drilling Dept (mbsf)	1,000.0
Total Depth (mBRT)	7,938.5
Bit Depth (mBRT)	7,943.0
Mud weight (SG)	1.03
Buoy. Fact	0.869



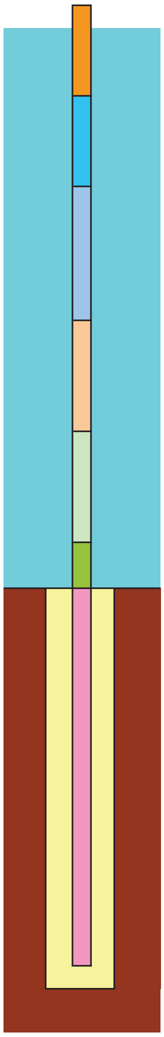
6-5/8"Z-140 new	996.40	m	106jts
Weight	85.36	kg/m	
Buoyed Weight	74.16	kg/m	
Section Weight in water	74	ton	
5-1/2" S-150 new	940.00	m	100jts
Weight	51.21	kg/m	
Buoyed Weight	44.49	kg/m	
Section Weight in water	42	ton	
5-1/2" S-150 premium	1880.00	m	200jts
Weight	51.21	kg/m	
Buoyed Weight	44.49	kg/m	
Section Weight in water	83.64	ton	
5-1/2" S-140 premium	1316.00	m	140jts
Weight	42.74	kg/m	
Buoyed Weight	37.13	kg/m	
Section Weight in water	48.87	ton	
5" S-140 premium	2519.20	m	268jts
Weight	36.31	kg/m	
Buoyed Weight	31.55	kg/m	
Section Weight in water	79.47	ton	
HW drill pipe 5.68"	112.80	m	12jts
Weight	70.24	kg/m	
Section Weight in water	6.88	ton	
8-1/2" DC(core)	178.60	m	19jts
Weight	199.09	kg/m	
Buoyed Weight	172.97	kg/m	
Section Weight in water	30.89	ton	

Drill pipe size & Grade	Depth mBRT top bottom	Section Weight		(a) Cum Weight (top)		(b) tensile capacity	(c) (b) x safety factor	(c) -(a) Load Margin (dynamics & overpull)	
		ton	kN	ton	kN	ton	ton	otN	kN
6-5/8"Z-140 new	-4.50 991.90	73.9	724.2	365.5	3581.6	781	702.90 ((b)x90%)	337.4	3306.8
5-1/2" S-150 new	991.90 1931.90	41.8	409.8	291.6	2857.4	541	486.90 ((b)x90%)	195.3	1914.2
5-1/2" S-150 premium	1931.90 3811.90	83.6	819.7	249.8	2447.6	541	432.80 ((b)x80%)	183.0	1793.8
5-1/2" S-140 premium	3811.90 5127.90	48.9	478.9	166.1	1627.9	421	336.80 ((b)x80%)	170.7	1672.7
5" S-140 premium	5127.90 7647.10	79.5	778.8	117.2	1149.0	335	268.00 ((b)x80%)	150.8	1477.4
HW drill pipe 5.68"	7647.10 7759.90	6.9	67.5	37.8	370.2	541	432.80 ((b)x80%)	1477.4	3871.2
8-1/2" DC(core)	7759.90 7938.50	30.9	302.7	30.9	302.7	989	791.20 ((b)x80%)	760.3	7451.0
Total string weight				365.5	3581.6		Load Margin (dynamics & overpull)	150.8	395.0
								5" S-140 premium	
HPS weight				70.4	690.0				
Total Hook Reading				435.9	4271.6				

cf.		ton	kN
	CMC max compensating Load	518.0	5076.4
	HPS lifting capacity	908.0	8898.4

B

Water Depth (mBRT)	6938.5
Drilling Depth (mbsf)	1000.0
Total Depth (mBRT)	7938.5
Bit Depth (MBRT)	7964.8
Mud weight (SG)	1.03
Buoy. Fact	0.869



6-5/8"Z-140 new	996.40	m	106jts
Weight	85.36	kg/m	
Buoyed Weight	74.16	kg/m	
Section Weight in water	74	ton	
5-1/2" S-150 new	940.00	m	100jts
Weight	51.21	kg/m	
Buoyed Weight	44.49	kg/m	
Section Weight in water	42	ton	
5-1/2" S-150 premium	1880.00	m	200jts
Weight	51.21	kg/m	
Buoyed Weight	44.49	kg/m	
Section Weight in water	83.64	ton	
5-1/2" S-140 premium	1316.00	m	140jts
Weight	42.74	kg/m	
Buoyed Weight	37.13	kg/m	
Section Weight in water	48.87	ton	
5" S-140 premium	1729.60	m	184jts
Weight	36.31	kg/m	
Buoyed Weight	31.55	kg/m	
Section Weight in water	54.56	ton	
HW drill pipe 5.68"	112.80	m	12jts
Weight	70.24	kg/m	
Buoyed Weight	61.03	kg/m	
Section Weight in water	6.88	ton	
4-1/2" tubing	990.00	m	110jts
Weight	18.75	kg/m	
Buoyed Weight	16.29	kg/m	
Section Weight in water	16.13	ton	

Drill pipe size & Grade	Depth mBRT top bottom	Section Weight		(a) Cum Weight (top)		(b) tensile capacity	(c) (b) x safety factor		(c) -(a) Load Margin (dynamics & overpull)	
		ton	kN	ton	kN	ton	ton		otN	kN
6-5/8"Z-140 new	-36.30 960.10	73.9	724.2	325.8	3192.8	781	702.90	((b)x90%)	377.1	3695.6
5-1/2" S-150 new	960.10 1900.10	41.8	409.8	251.9	2468.6	541	486.90	((b)x90%)	235.0	2303.0
5-1/2" S-150 premium	1900.10 3780.10	83.6	819.7	210.1	2058.8	541	432.80	((b)x80%)	222.7	2182.7
5-1/2" S-140 premium	3780.10 5096.10	48.9	478.9	126.4	1239.1	421	336.80	((b)x80%)	210.4	2061.5
5" S-140 premium	5096.10 6825.70	54.6	534.7	77.6	760.2	335	268.00	((b)x80%)	190.4	1866.2
HW drill pipe 5.68"	6825.70 6938.50	6.9	67.5	23.0	225.5	541	432.80	((b)x80%)	409.8	4015.9
4-1/2" tubing	6938.50 7928.50	16.1	158.0	16.1	158.0	989	791.20	((b)x80%)	775.1	7595.7
Total string weight				325.8	3192.8		Load Margin (dynamics & overpull)		190.4	1866.2
									5" S-140 premium	
HPS weight				70.4	690.0					
Total Hook Reading				396.2	3882.8					

cf.		ton	kN
cf.	CMC max compensating Load	518.0	5076.4
	HPS lifting capacity	908.0	8898.4

10. Drilling Fluid (Mud) Program

10.1 Drilling Fluid Summary

Below is the summary of the J-FAST mud program (Table T10):

Table 11. Drilling fluid (mud) table.

Hole Size	Total Depth	Mud Properties	Mud Type / Remarks
JFAST3 Hole A			
8-1/2”	7,938.5mBRT (1,000mbsf) Set 4-1/2” TBG at proper depth	Mud Wt. Unweighted PV n/a , YP n/a API FL No Control	• Sea Water + S/W Gel Slurry • Sweeps : S/W gel Slurry (5-10kl per half stand or 1stand for drilling)
JFAST3 Hole B			

10.2 Potential Hole Problem Summary

Table 12. Drilling fluid (mud) table.

Hole Size	Formation	Potential Hole Problem	Proposed Countermeasure
Riserless Hole	Silty Clay	Hole Instability :	Pump enough sweep per single joint or stand and displace hole to S/W gel at TD.
	Loose Sand Layer	Hole collapse	Pump mud continuously if required.
	Conglomerate		
	Chart	High Pressure	Kill the well and change location.
	Basalt		

11. Casing Program

11.1 Coring program

Table 13. “Casing Program” in casing program table (A) JFAST3 Hole A, and (B) JFAST Hole B.

A

OD	Planned Set Depth	Grade	Weight/WT	Connection	Mud Weight (sg)
20"	29 mbsf	X-56	0.625WT	RL-4S	Sea Water
4.5"	900± mbsf	L-80	12.6 lbs/ft	VAM TOP	1.03

B

OD	Planned Set Depth	Grade	Weight/WT	Connection	Mud Weight (sg)
20"	29 mbsf	X-56	0.625WT	RL-4S	Sea Water
3.5"	900± mbsf	L-80	9.2 lbs/ft	VAM TOP	1.03
3.5"	(Contingency)	SM-95S	12.7 lbs/ft	VAM TOP	

11.2 Specification of Casing

Table 14. Specification of Ccsing and tubing pipes" in casing program table.

Size (inch) (mm)	Nominal weight Grade Connection	Weight (lbs/ft) (kg/m)	I.D. (inch) (mm)	Drift I.D. (inch) (mm)	Coupling OD (inch) (mm)	Coupling ID (inch) (mm)	Tensile Strength (klbs) (ton)	Collapse Resistance (psi) (Mpa)	Internal Yield Press. (psi) (Mpa)	Capacity Vol. (l/m)	Displacement Vol. (l/m)	Make-up Torque (ft-lb) (N-m)	pipe order
20 508	0.625"wall X-56 RL-4S	129.28 192.40	18.75 476.25	18.562 471.47	21.5 546.10	18.63 473.20	2129.6 966.0	1436 9.9	3058 21.1	178.14	24.54	40,000-45,000 54,200-61,000	R- Ⅲ 7 jts WH joint 2 jts jetting shoe joints 2jts
4.5 114.3	12.6lbs/ft L-80 VAM TOP	12.6 18.75	3.958 100.53	3.833 97.36	4.937 125.40	3.913 99.39	288 130.6	7500 51.7	8430 58.1	7.94	2.32	4,000-4,440-4,880 5,400-6,000-6,600	R-2 1000m 1m Pup 4jts 3m Pup 2jts 6m Pup 2jts
3.5 88.9	9.2lbs/ft L-80 VAM TOP	9.2 13.69	2.992 76.00	2.867 72.82	3.907 99.24	2.959 75.16	207 93.9	10540 72.6	10160 70.0	4.54	1.67	2,610-2,900-3,190 3,540-3,930-4,320	R-2 1000m 1m Pup 4jts 3m Pup 2jts 6m Pup 2jts
3.5 88.9	12.7lbs/ft SM-95S VAM TOP	12.7 18.90	2.75 69.85	2.625 66.67	4.043 102.69	2.707 68.76	350 158.8	18170 125.3	17810 122.8	3.83	2.38	4,950-5,500-6,050 6,700-7,500-8,300	R-2 30 jts

12. Hole Evaluation program

12.1 LWD/MWD logging

The logging plan for Expedition 343 is designed to monitor drilling conditions and define lithology and structure changes in real time by use of LWD/MWD. The main aim is to decide the best target depths for installation of the observatory components. LWD/MWD tools are planned to comprise the TeleScope675_MWD, located above the geoVISION675 and ProVISION675_LWD (Figure 23).

The TeleScope_MWD tool transmits APWD (Annular Pressure While Drilling) and MWD real time data and provides information to improve drilling efficiency, and reduce risk. This tool is the highest priority.

The geoVISION can make five resistivity measurements, and has three azimuthally-focused button electrodes for electrical imaging, and also collects azimuthal gamma ray measurements. The resistivity tool is based on RAB (Real-time At-Bit) technology to provide resistivity data and azimuthally focused laterolog measurements for detailed geological imaging on the borehole wall. The geoVISION tool contains a scintillation counter that provides a total gamma ray measurement.

The proVISION tool delivers real-time Nuclear Magnetic Resonance (NMR) data and determinations of mineralogy-independent porosity, permeability and pore size and bound-fluid volume.

The sequence of operations during IODP Expedition 343 is to:

- Drill the primary hole with LWD-MWD to planned total depth (TD) to ~ 1,000 mbsf.
- Run tubing and completion assembly (including long-term temperature monitoring with the autonomous string) in the LWD-MWD hole to a depth of ~1,000 mbsf.
- Drill a second hole with RCB drilling with center bit to ~650 mbsf, and continue with RCB coring to ~1,000 mbsf (bottom).
- Run tubing and completion assembly into the second hole (including long-term temperature monitoring with thermistor string and pressure monitoring via a flatpack) to a depth of ~1,000 mbsf.
- In case of failure at either or both the primary/alternate sites or in case operations finish ahead of schedule, contingency sites are planned to core or to drill with MWD-LWD.

12.2 Decision tree

A decision tree of operations for the various successes and failures of the operational plan is shown in Figure 24.

12.3 Contingency plan

In case of failure at either the primary and alternate sites or in case primary operations finished ahead of schedule, coring or logging with MWD/LWD except NMR logging, are planned at contingency sites upon decision made onboard.

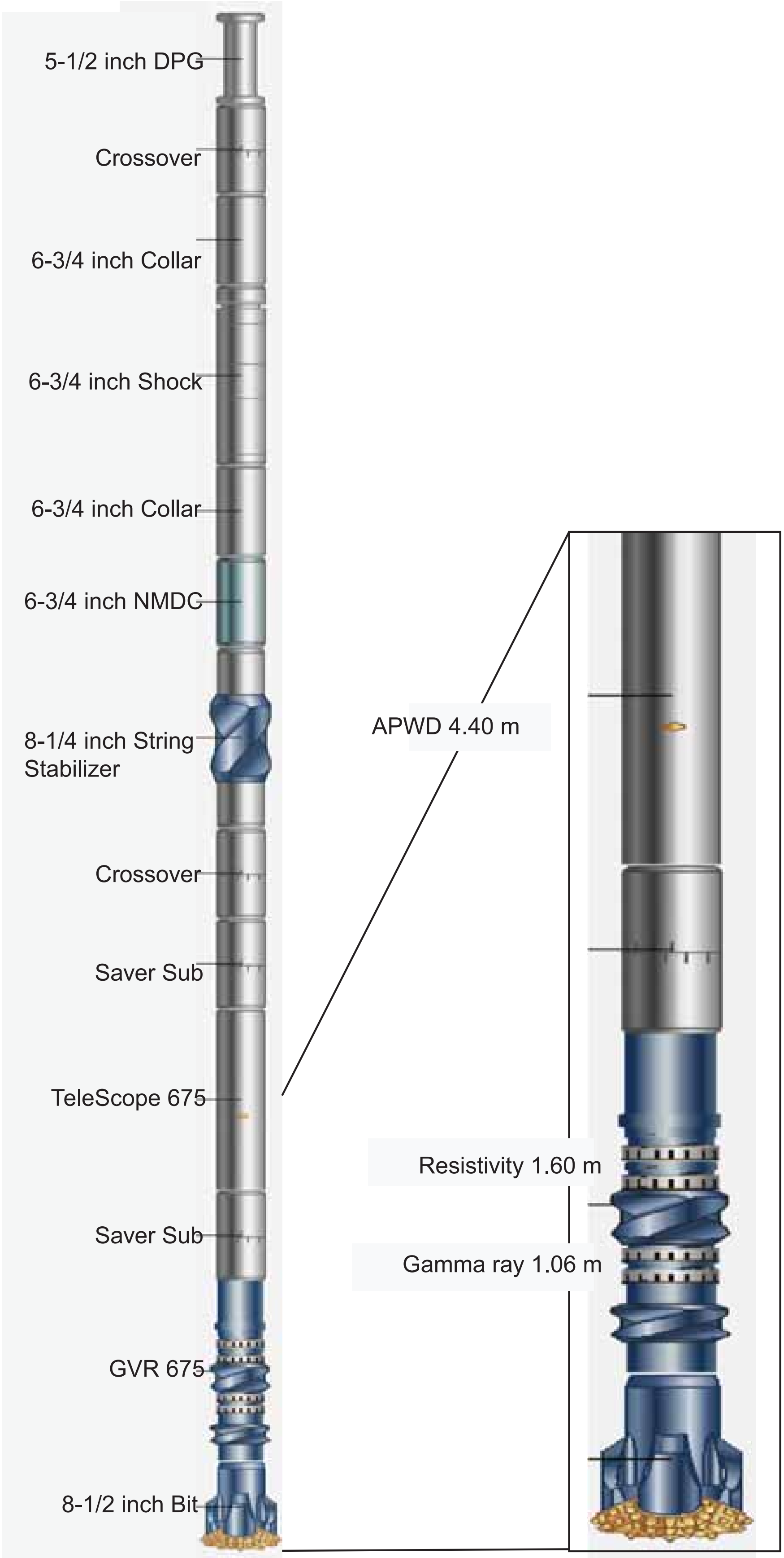
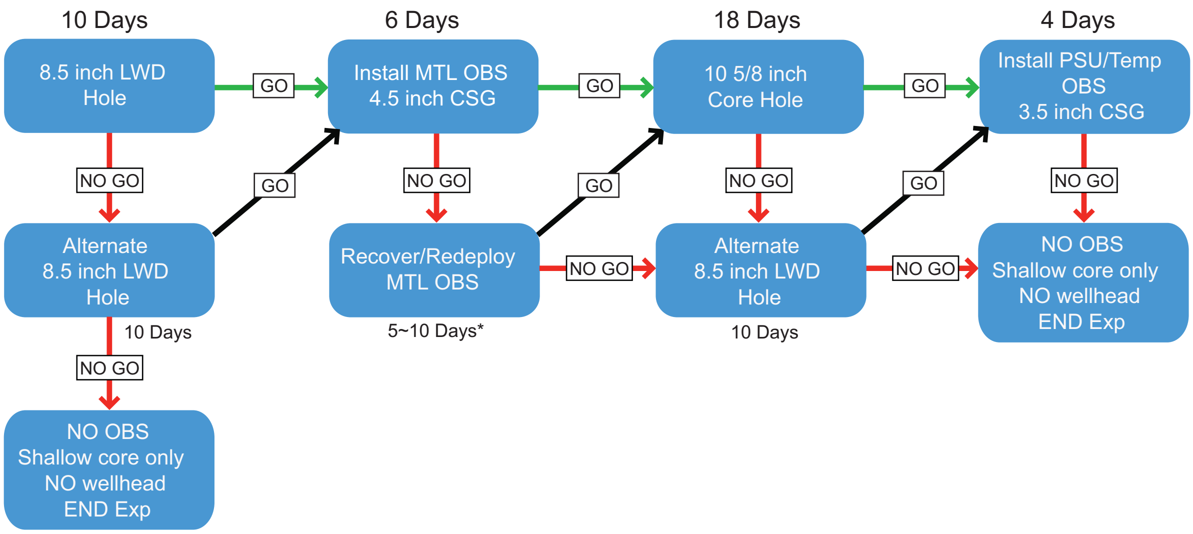


Figure 23. BHA diagrams for LWD/MWD tool.

The entire bore hole assembly is shown on the left (totally 116 m in length), with a close-up of the “proVISION675”, “TeleScope675” and “geoVISION675” tools on the right with measurement points (from the bit face) of the nuclear magnetic resonance sensor, APWD (Annular Pressure While Drilling), gamma and resistivity. XO = Crossover, NMDC = Non Magnetic Drill Collar, Bit size = 8 ½-inch.



*Time estimates depend on whether guidehorn needs to be removed or not.

Figure 24. Operation decision tree.

LWD = Logging While Drilling, OBS = Observatory, MTL = Miniature Temperature Logger, CSG = Casing, PSU = Pressure Sensor Unit.

13. Coring Program

The Rotary Core Barrel coring system (RCB) will be available on Chikyu for IODP Expedition 343 “JFAST”, and plans are in effect to collect RCB core from the Proposed Site JFAST-3 “B” Hole. The RCB coring system in IODP is typically used for harder sediments and rocks in deeper formations. Safety monitoring on Chikyu typically includes continuous ROV monitoring while drilling at sites located in 3000 m of water or less – unfortunately this will be unavailable during IODP Expedition 343 due to the great water depth (~7000 m). During coring operations, geochemical hydrocarbon monitoring on Chikyu will be similar to that of JOIDES Resolution operations.

13.1 Coring summary

Table 15. Coring Table.

Hole Name	Hole Size	Coring Depth	Coring System	Remarks
C0019	10-5/8"	650-1,000 mbsf (TD)	RCB	Drill down to 650mbsf with center bit assembly

13.2 Typical coring system selection

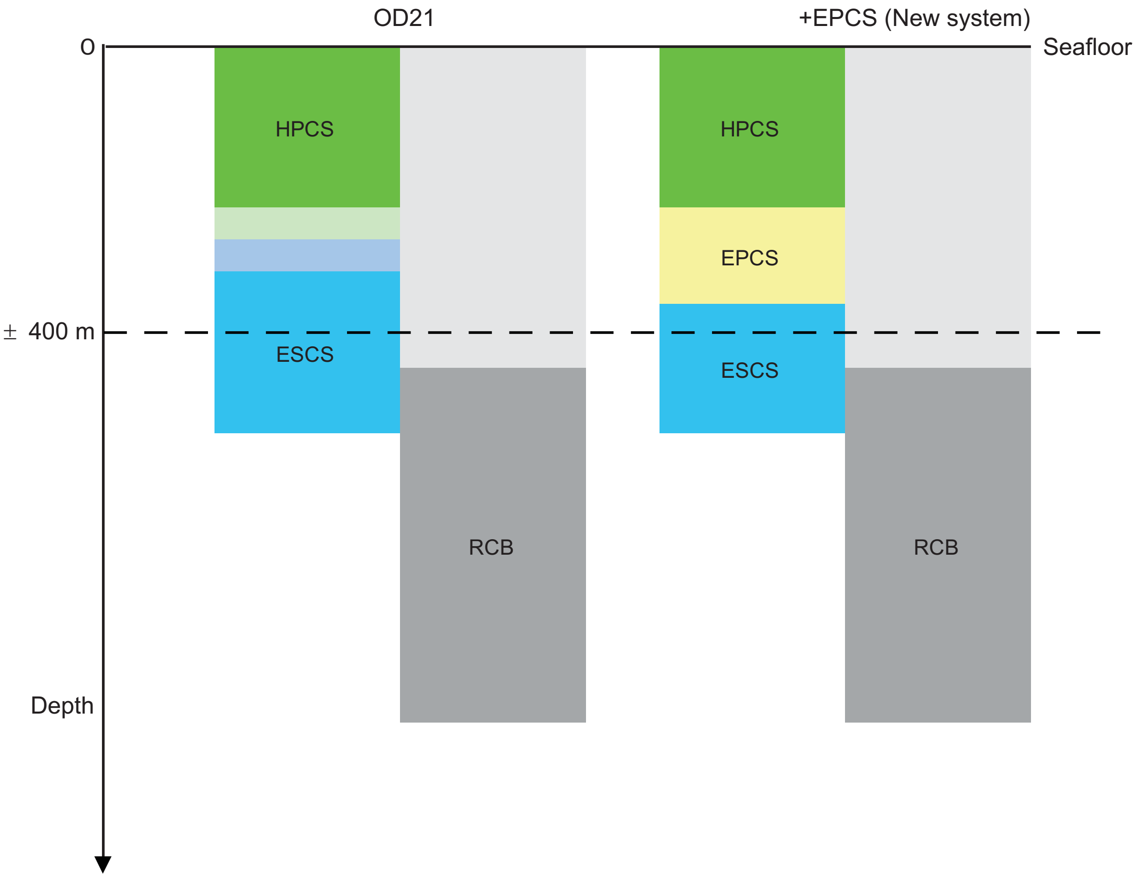


Figure 24.

PDC core bit will be prepared for JFAST coring.

BHC 405 (5 blades PDC core bit)

BHC 408 (8 blades PDC core bit)

BHC 408C (8 blades PDC core bit addition of ware knots / upgrade to cutters)

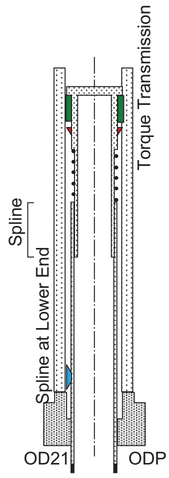
BHC 410C (10 blades PDC core bit addition of ware knots / upgrade to cutters)

13.3 Comparison of ODP with OD-21 Coring Systems

1) The primary objective of the OD21 coring system is to collect high quality cores safely and effectively using both riser and riserless coring (with drilling mud or seawater).
2) Coring Systems between ODP and OD21 are compatible and can be used on "Chikyu" or "JOIDES Resolution" although different Bottom Hole Assemblies are needed.
3) 9-7/8" HPCS, ESCS and RCB coring systems are modifications of the ODP/TAMU APC, XCB and RCB coring systems.
4) 8-1/2" SD-RCB system is similar to the TAMU 7-1/4" ADCB system.

ODP Core Sampling System	Core Trim OD (in)	Core Length (m)	Inner Barrel OD (in)	Outer Barrel OD (in)	OD-21 Core Sampling System	Core Trim OD (in)	Core Length (m)	Inner Barrel Max. OD (in)	Core Liner OD (in)	Core Liner ID (in)	Outer Barrel OD (in)
11-7/16" APC	2.44	9.50	4.00	8.25	HPCS 9-7/8"(PDC/Hibrid Bit) 11-7/16"(Roller Cone)	2.44	9.40	3.50	2.80	2.60	8.44
11-7/16" XCB	2.31	9.50	4.00	8.25	ESCS 9-7/8"(PDC/Hibrid Bit) 11-7/16"(Roller Cone)	2.31	9.40	3.50	2.80	2.60	8.44
9-7/8" RCB	2.31	9.50	4.00	8.25	RCB 9-7/8"(Roller Cone /PDC/Hibrid) 10-5/8"(PDC)	2.31	9.50	3.50	2.80	2.60	8.25
7-1/4" ADCB	3.35	9.50 4.75	3.8	6.75	8-1/2" SD-RCB	3.27 3.35	9.14	3.80	3.50	3.40	6.75
9-7/8" PCS	1.70	0.99	3.75								
9-7/8" MDCB	2.25	4.50									

* OD-21 core size is same as ODP (no change from ODP) on tool dimensions.
* 8-1/2" SD-RCB : 3.27" Core OD is for Tripple Tube System (PQ-3), 3.35" is for Conventional Tube (PQ)
* 9-7/8" PCS : 3.75" is Pressured Sample Chamber OD



ESCS/XCB

OD-21 Improvements

9-7/8"& 11-7/16" HPCS

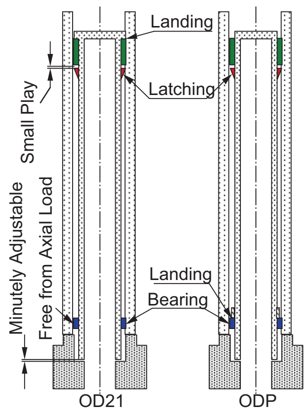
Reduced the strength of Torison Spring to activate Lock Open Dog.
Made "Liner Support Sleeve" thicker with a beveled entrance to reduce failures.
Screw-on "Vent Snubber" on "Male Quick Release"
Added "Piston Head Extender" between Piston Head and Formation
Developed and lab tested "Low Disturbance Cutting Shoes"
Coating Inner Barrel parts to prevent mud flow erosion during riser drilling.
Developed a spreadsheet to better predict HPCS performance.

9-7/8"& 11-7/16" ESCS

"Low End Drive" system to reduce rotary vibrations and prevent core disking.
Hardened Inner Barrel parts to prevent mud flow erosion during riser drilling.
Adopted integral blade WC coated stabilizers for increased wear life.
Optional upper stabilizer on Outer Barrel for PDC and diamond.
Developed spreadsheets to predict venturi and cutting shoe flow performance.
Improved "Venturi Vent System" (20% decrease of back pressure)
Optomized Cutting Shoe flow to improve performance and prevent core washout.
Tool optimized for PDC and diamond bit capability and drilling with mud
Developed PDC and diamond bits compatible with the ESCS.

10-5/8" RCB

Moved the Landing shoulder to top of tool to prevent core jamming.
Add adjustable system for easy and accurate control of Inner Barrel Length.
Developed "Labyrinth Bit Seal"
Hardened Inner Barrel parts to prevent mud flow erosion
Adopted integral blade WC coated stabilizers for increased wear life.
Optional upper stabilizer on Outer Barrel for PDC and diamond
Developed more rugged core catchers.
Tool optimized for PDC and diamond bit capability and drilling with mud.
"Close catch" core catchers minimize gap between bit and catcher.
Developed very effective PDC bit and several diamond bits.



RCB

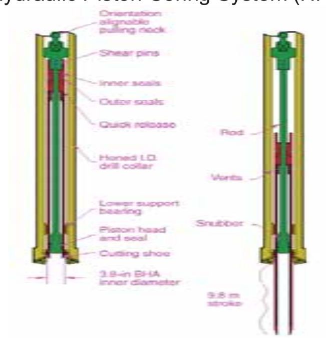
Abbreviations

APC : Advanced Piston Corer
XCB : Extended Core Barrel
RCB : Rotary Core Barrel
ADCB : Advance Diamond Core Barrel
HPCS : Hydraulic Piston Coring System
ESCS : Extended Shoe Coring System
SD-RCB : Small Diameter Rotary Core Barrel
ESCS : Extended Shoe Coring System

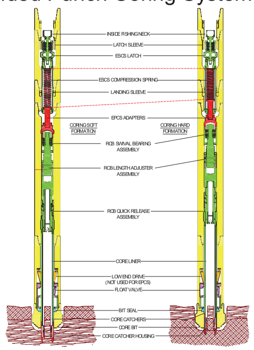
Figure 25.

13.4 Chikyu Coring System

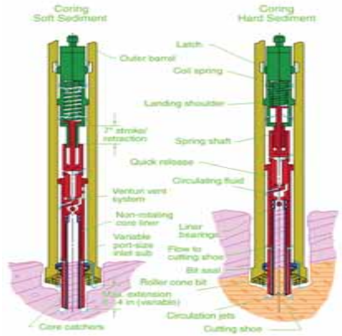
Hydraulic Piston Coring System (HPCS)



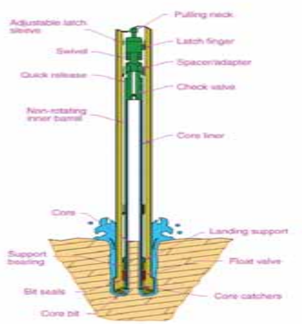
Extended Punch Coring System (EPCS)



Extended Shoe Coring System (ESCS)



Rotary Core Barrel (RCB)



		Hydraulic Piston Coring System (HPCS)	Extended Punch Coring System (EPCS)	Extended Shoe Coring System (ESCS)	Rotary Core Barrel (RCB)
Tool Operations		The HPCS inner core barrel is run to bottom on the coring wireline. Pump pressure is then applied to the drill pipe, which severs the share pins and strokes the inner core barrel 9.5 m into the sediment. The inner core barrel containing the core is then retrieved by wireline. A wireline packoff at the top of the drill string permits rotation of the drill string and continued circulation while the core is retrieved. After core retrieval, the bit and bottom-hole assembly (BHA) are again advanced 9.5 m, repeating the process.	The EPCS was developed to provide a coring system that would yield near insitu core in formations too firm for HPCS, instead of ESCS that is far more disturbed and washed than the core obtained with the HPCS. The EPCS is a hybrid of the other coring systems. It utilizes the ESCS latch and spring loaded inner tube, the bearing, length adjuster and quick release of the RCB and the punch type core catcher housing and core catchers of the HPCS. This unique combination provides a coring system that punches ahead of the bit like the HPCS. However, it only extends 2 to 5 inches ahead of the bit similar to the ESCS but without the disturbance caused by rotary drilling the core like the ESCS.	The ESCS is used to recover 9.5 m long core samples from soft to moderately hard formations. The ESCS is typically deployed when the formation becomes too stiff to piston core (i.e.,upon piston coring "refusal") or when it is not hard enough to permit efficient recovery with the Rotary Core Barrel (RCB). The ESCS cutting shoe extends ahead of the main bit in soft sediments but retracts into the main bit as the weight on bit increases when firm lithologies are encountered. The ESCS relies on rotation of the drill string to advance the hole, and an integral cutting shoe trims the core sample at the same time.	The RCB inner core barrel free falls (and is pumped) through the drill string and latches into the RCB bottom-hole assembly (BHA). The main RCB bit trims the 2.312 in. core. The BHA, including the bit and outer core barrel, is rotated with the drill string while bearings allow the inner core barrel to remain stationary. The inner core barrel can hold a 9.5 m core and is retrieved by wireline. A wireline packoff at the top of the drill string permits rotation and circulation of the drill string to continue while using the wireline to retrieve the core.
Design Features		1) Compatibility The HPCS inner core barrel is deployed in the same BHA as the Extended Punch Coring System (EPCS) and the Extended Shoe Coring System (ESCS); therefore, all tools can be used interchangeably depending on formation lithification. 2) Core Orientation The HPCS core can be oriented with respect to the Earth's magnetic field by running a downhole orientation tool above the core barrel. Benefit: Allows recovery of oriented core for paleomagnetic studies. 3) In Situ Temperature Measurement Special HPCS shoes have a pocket in which a thermistor unit can be run to record the in situ formation temperature after taking a core. Benefit: Provides in situ heat flow measurements for science and hydrocarbon safety.	1) Sharpend Shoe Punches Core The EPCS uses a sharpened shoe to punch the core as HPCS. The cutting shoe is free to extend and retract seven inches while cutting the core. If firmer formations are encountered, the cutting shoe will retract closer to the core bit, allowing for better circulation of the drilling fluid around the face of the cutting shoe. In other formations, the cutting shoe and inner tube extend ahead of the main core for better coring conditions away from the hydraulic and mechanical disturbance of the main bit and core barrel. 2) Movable Cutting Shoe A unique movable device allows the EPCS, which is normally kept the inner tube in the fully extended position, with the cutting shoe protruding seven inches ahead of the main bit. When the formation strength overcomes these hold-down forces, the inner tube retracts until the cutting shoe is flush with the face of the main core bit. 3) Nonrotating Core Liner An inner core barrel swivel allows the core to remain stationary relative to the formation as the bit rotates, thereby reducing the transfer of rotary torque to weakly laminated formations. Benefit: Reduces "biscuiting" (artificial layering), which is a type of core disturbance.	1) Cutting shoe Trims Core The ESCS uses an integral cutting shoe to trim the core. The shoe is positioned ahead of the main core bit, which reduces core "washing" (i.e., core damage caused by water jets from the main drill bit nozzles). Benefit: Improves core recovery and reduces core disturbance in soft to moderate hard formations. 2) Retractable Cutting Shoe A unique retraction device allows the ESCS, which is normally extended ahead of the core bit, to retract inside the BHA until the cutting shoe is flush with the core bit. Benefit: Cutting shoe is retracted to reduce failures when hard formations are encountered. 3) Nonrotating Core Liner An inner core barrel swivel allows the core to remain stationary relative to the formation as the bit rotates, thereby reducing the transfer of rotary torque to weakly laminated formations. Benefit: Reduces "biscuiting" (artificial layering), which is a type of core disturbance caused by transferring rotary torque to the core.	1) Rugged Design The RCB BHA, bit, and inner core barrel assembly have a rugged design for use in abrasive and fractured hard sediments and igneous basement. Benefit: Increases operating time of the bit and improves penetration of hard formations. 2) Drilling with Center Bit A center bit can be used to drill a hole without attempting to recover core. The center bit is used to drill ahead in hard rock and is run on a special inner barrel for rotation. The center-bit assembly is configured to allow circulation through the center bit. Benefit: The center bit can be interchanged with a standard RCB core barrel for "spot" coring. 3) Wireline Logging with Bit Release A Mechanical Bit Release (MBR) can be operated by wireline to drop a bit in the hole or on the seafloor to provide a fully open BHA for logging. Benefit: Wireline logs can be run after coring with the RCB system without making a pipe trip to install a logging bit.
Specifications		Maximum Piston Stroke (Core) Length 9.5 m (31.16 ft) HPCS Shoe Inside Diameter (Core Outer Diameter) 6.2 cm (2.44 in) Piston Force 23,000 to 28,000 lb at 2,300 to 2,800 psi pump pressure	Core Diameter 2.312 in. (60 mm) Maximum Core Length 9.5 m Cutting Shoe Extension 7 in. beyond bit (maximum)	Core Diameter 2.312 in. (60 mm) Maximum Core Length 9.5 m Cutting Shoe Extension 7 in. beyond bit (maximum)	Inner Core Barrel Length 9.5 m (31.16 ft) RCB Bit Throat (Core Diameter) 5.87 cm (2.312 in.)
Typical Operating Range	Formation	Very soft to firm sediments	Soft to medium firm sediments	Soft to medium firm sediments	Firm to very hard sediments and igneous basement
	Depth Range	Seafloor to +300 m below seafloor (mbsf)	Typically from HPCS refusal to ∼400 - 700 m below seafloor (mbsf) in sediments and can core top of igneous basement (destroys shoe).	Typically from HPCS refusal to ∼400 to 700 m below seafloor (mbsf) in sediments and can core top of igneous basement (destroys shoe).	Seafloor through igneous basement
Limitations		Maximum Piston Stroke (Core) Length 9.5 m (31.16 ft) HPCS Shoe Inside Diameter (Core Outer Diameter) 6.2 cm (2.44 in) Piston Force 23,000 to 28,000 lb at 2,300 to 2,800 psi pump pressure	Does not recover ooze of very soft sediments, granular formations (such as sand), fractured rock or rubble, or hard igneous formations.	Does not recover ooze of very soft sediments, granular formations (such as sand), fractured rock or rubble, or hard igneous formations.	Does not recover soft sediments or granular formations (such as sand, fractured rock, or rubble).

Figure 26.

13.5 Wireline Coring System Selection Guide

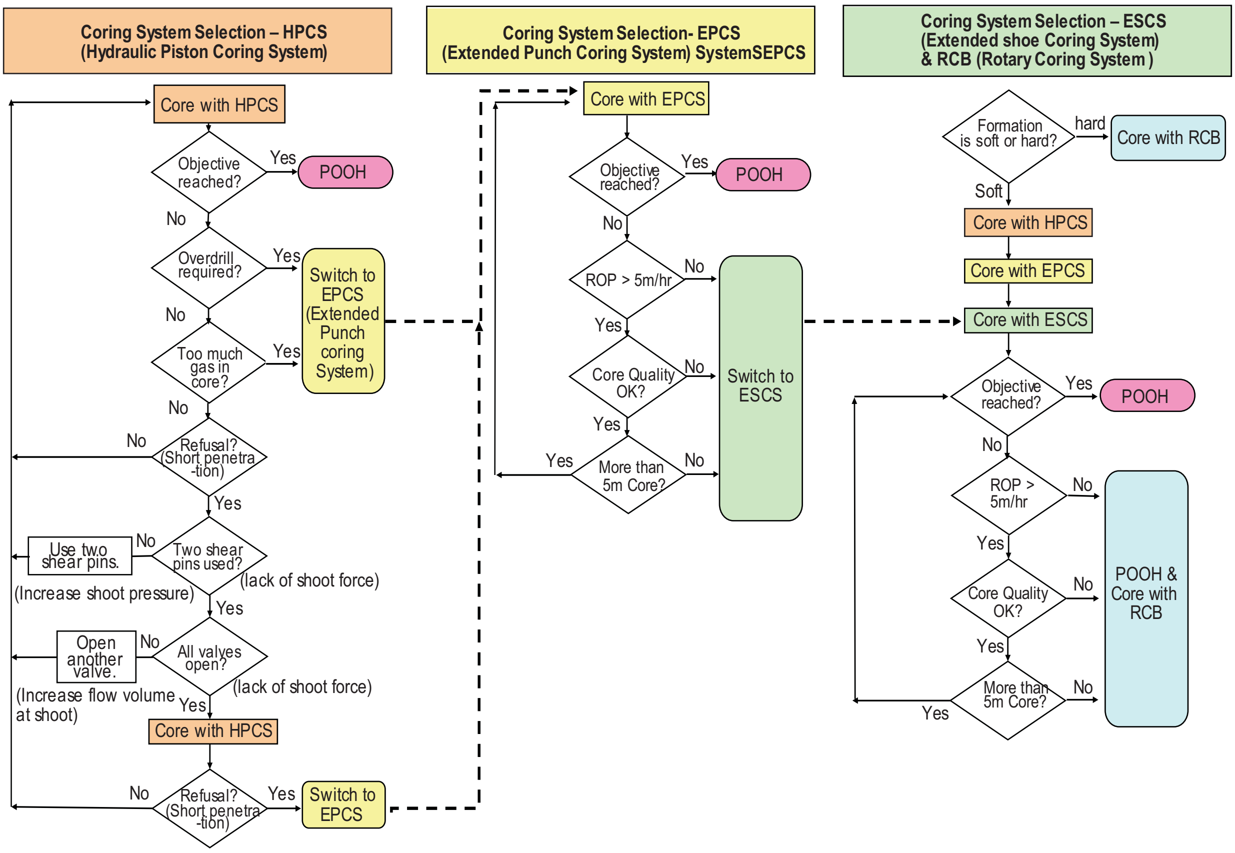


Figure 27.

14. Wellhead and Completion

14.1 Riserless Wellhead

Jetting Wellhead (Fig. 27)

The wellhead for IODP Expedition 343 is a simplified version of a typical riserless wellhead, without a mudmat gimbal profile or BOP H4 profile on the outside. Two 3-inch diameter flowbys have been newly machined to allow jetting flowby. The funnel size for Proposed Hole A was minimized to 30-inch to run down though the rotary and middle guide horn. This minimizes guide horn handling only for upper guide horn and all the operation can be done at drill floor.

The funnel size for Proposed Hole B is 61-inch with a 109-inch ROV platform since the CORK head will require extensive follow-up ROV work. Jetting-in the second wellhead requires the installation of a re-entry funnel at the moonpool, necessitating the separation of the guidehorn between the middle and lower guidehorn.

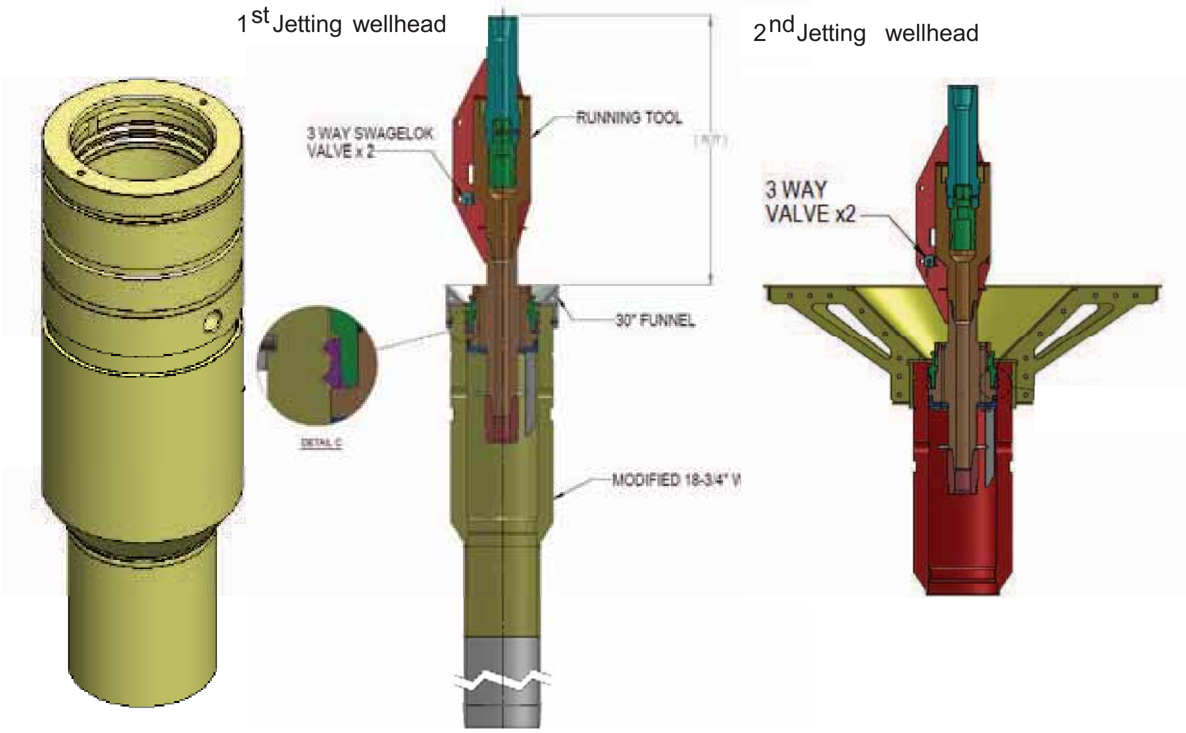


Figure 27. Jetting wellhead.

CART (Fig.28)

IODP Expedition 343 requires the underwater TV system (UWTV) for reentry and jetting due to the extreme water depth (7000 m). While the UWTV is deployed, drill string rotation is prohibited to avoid umbilical cable entanglement. Additionally, the UWTV does not have a pressure supply device; therefore, the CART has been modified so that an internal pressure assist will activate the tool. Tool activation is accomplished by dropping a dart plug (designed to be retrieved by the inner-barrel retrieving tool) into the well and pumping.

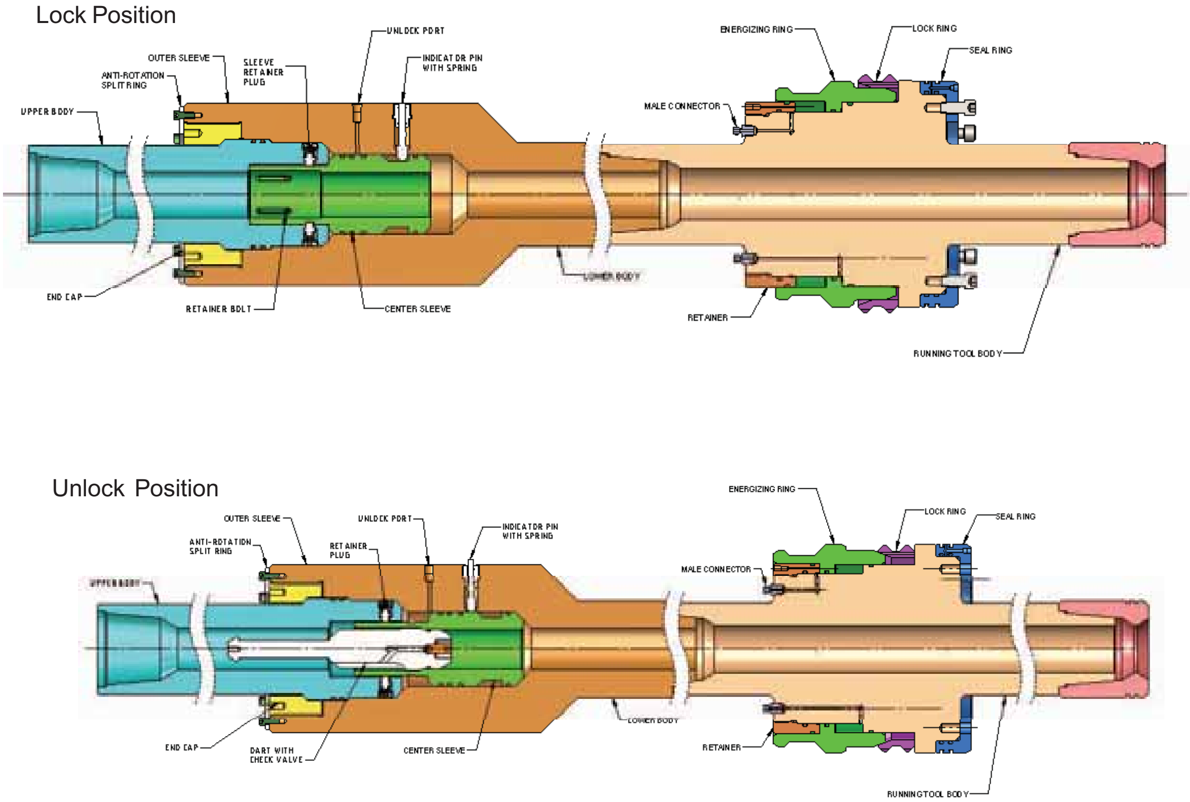


Figure 28. CART (Running Tool)

Tripod Wellhead (Fig. 29)

The tripod wellhead is a secondary wellhead option in case jetting-in operations fail due to encountering a "hard rock" layer in the top 10 – 20 mbsf. This wellhead can be deployed without jetting and the wellhead self-aligns to vertical position via gravity. Originally, it was set to accept seabed angles of 30° but has been modified to accept a maximum of 10° for IODP Expedition 343 to avoid causing complications for reentry operations. This wellhead requires the guide horn to be fully dismantled before the running and full mobilization of the guide horn after running.

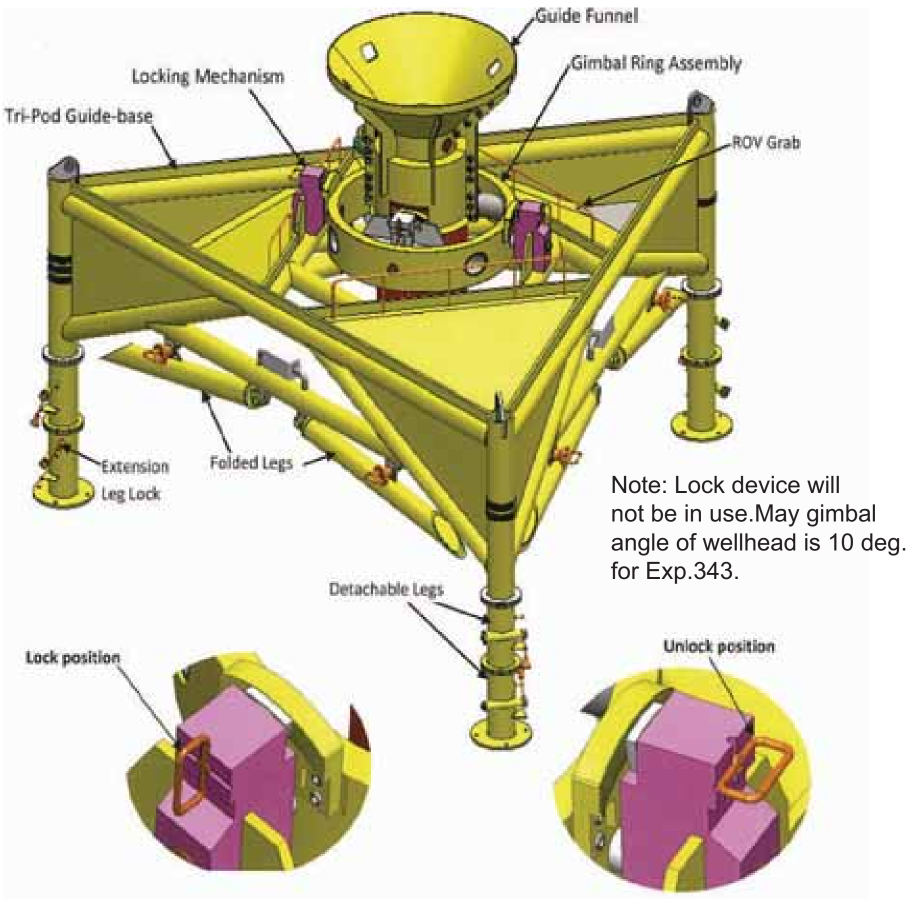
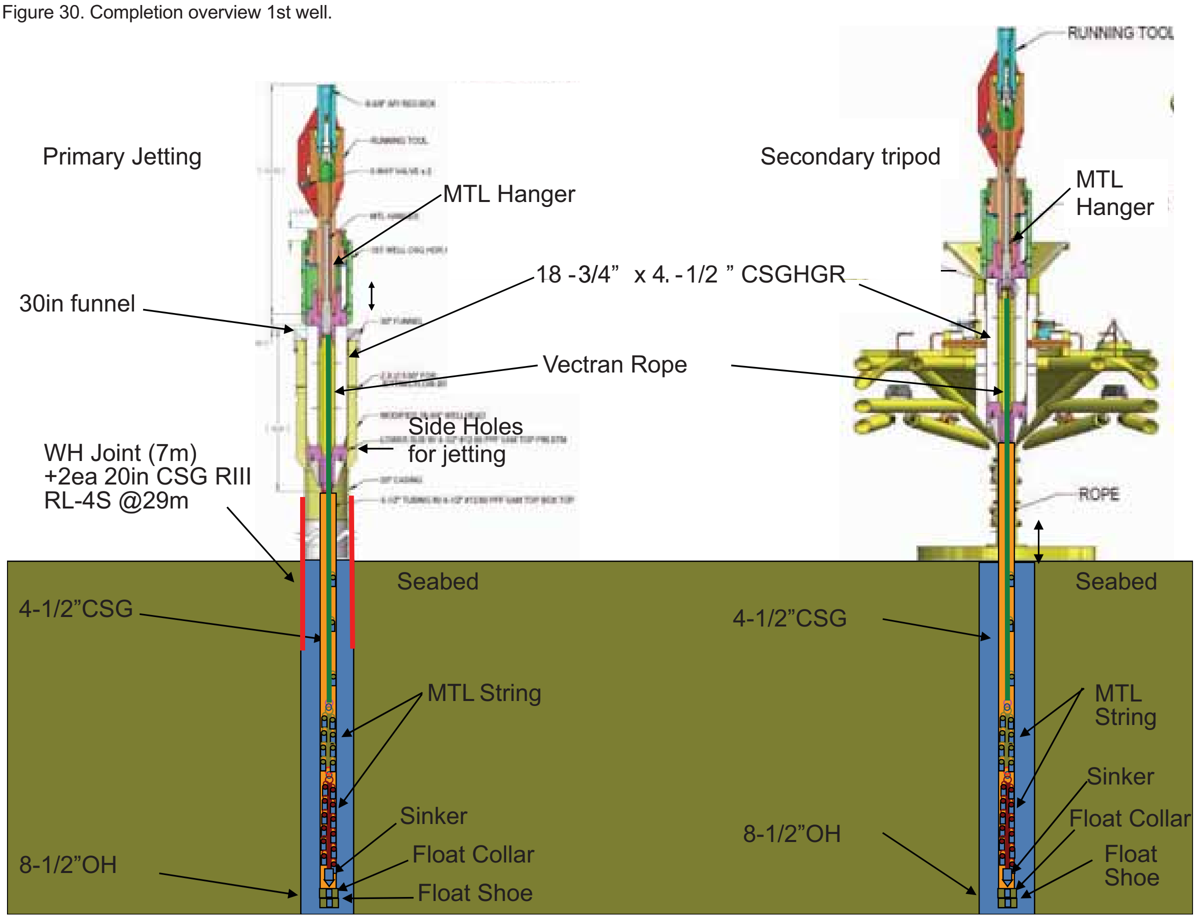


Figure 29. Tripod wellhead.

14.2 Completion for Proposed Hole A.

Casing Hanger Completion (4-1/2-inch TBG) includes internal MTL (miniature temperature loggers) (Fig. 30). Concept of this internal completion is to monitor the temperature profile along the borehole by hanging 50 MTLs from a hanger at the wellhead within the tubing (TBG) with a Vectran rope (low elongation rope). The sensors will be closely spaced near the fault location to focus on the fault section, and more widely spaced away from the fault. The MTL string will be recovered within 6 months via a deep-water ROV rated for 7000 m water depth. The internal rope assemblies (7 sections) are linked with special round shackles, two of which will be replaced with weak links, allowing recovery of some sensors even if the tubing becomes sealed by fault slip after installation.

Figure 30. Completion overview 1st well.



Casing Hanger (Fig. 31)

The Casing Hanger is designed to deploy with the same CART tool as the wellhead described above. It can accommodate the MTL hanger (Inconel 625) from which the internal MTL/Vectran rope assembly can be suspended.

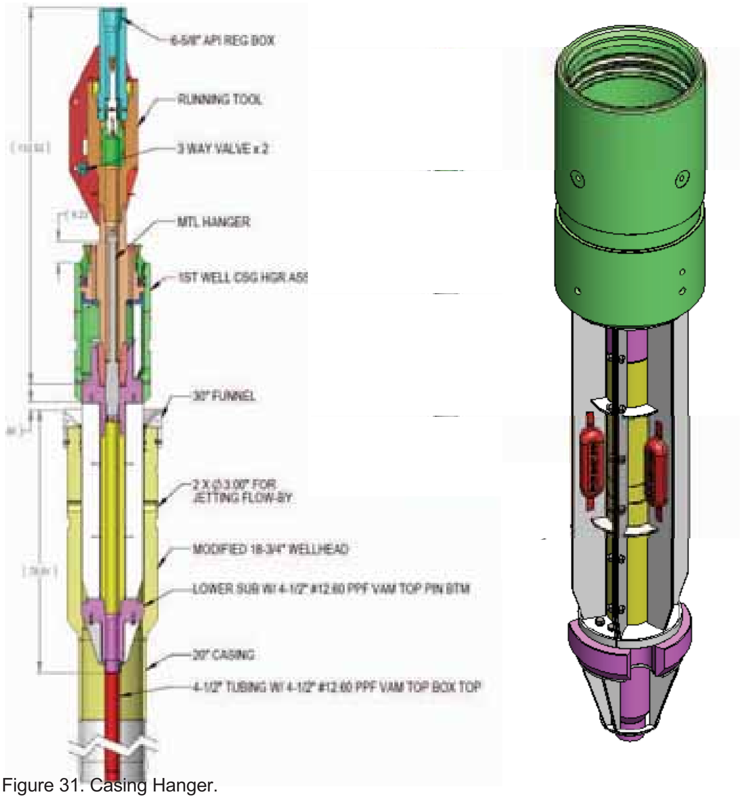


Figure 31. Casing Hanger.

Miniature Temperature Sensor (Fig. 32)

A total of 55 MTL sensors will be installed in Hole A. These are all independent, self-contained, temperature sensors measuring temperature and pressure.

MTL	(a)	(b)
Manufacturer	RBR	ANTARES
PN	TDR-2050 Ti	1859 Deep Water Temperature Data Logger
Quantity	25 (10 of these have pressure sensors as well.)	30
Weighti n air (g)	550	Approx. 200
Weight in water (g)	220	
OD (mm)	38	20
L (mm)	270	190
Housing	Titan	Titan
MAX Pressure (MPa)	Corresponding to 10000 m Depth (About) 101	100
Measuring Range	-5 ℃ to 35 ℃ (Standard Range), -40 ℃ to 50 ℃ (Extended Range)	-5 ℃ to 50 ℃
Resolution	<0.00005 ℃	0.001 ℃
Accuracy	+/- 0.002 ℃	<+/- 0.1℃

Figure 32. Miniature temperature sensor.

Vectran Rope

The rope is being manufactured with pre-spliced eyes from which to hang the MTL sensors. The total assembly will consist of two main components: one widely spaced spliced-eye part, and one closely spaced spliced eye part. The widely spaced section will be comprised of two long sections (500 m each); the closely spaced section will be comprised of five shorter sections, from 12 to ~33 m in length. Vectran rope was selected in part due to its' short "stretch" length (0.325% stretch with 350 kg suspended weight), and in part because of its' light weight-to-strength ratio due to lifting restrictions of the ROV (maximum lifting weight=400 kg).

MTL Hanger and Sinker Bar (Fig. 33)

In the event that the MTL string is not recovered within the scheduled recovery plan, corrosion effects must be mitigated. Therefore, the MTL hanger and Sinker bar are constructed of Inconel 625 (resistant to corrosion for up to 5 years). MTL hanger is equipped with an "eye" on the top for the ROV to attach a hook for recovery.

14.3 Completion for Proposed Hole B.

CORK head Completion (3-1/2-inch TBG) with internal thermistor string.
(Fig. 34, 35)
This completion assembly contains: the downhole (at the fault) and surface external pressure ports, connected by flatpack to the pressure logger unit mounted on the CORK head; the internal temperature thermistor string (20 sensors) running to a data logger (also on CORK head); and a transponder. The data stored inside the loggers can be retrieved in three ways: by ROV communication using wet mate connector, physical retrieval of the logger by ROV and via UWTV acoustic communication (temperature data only).

Figure 33. MTL hanger and sinker bar.

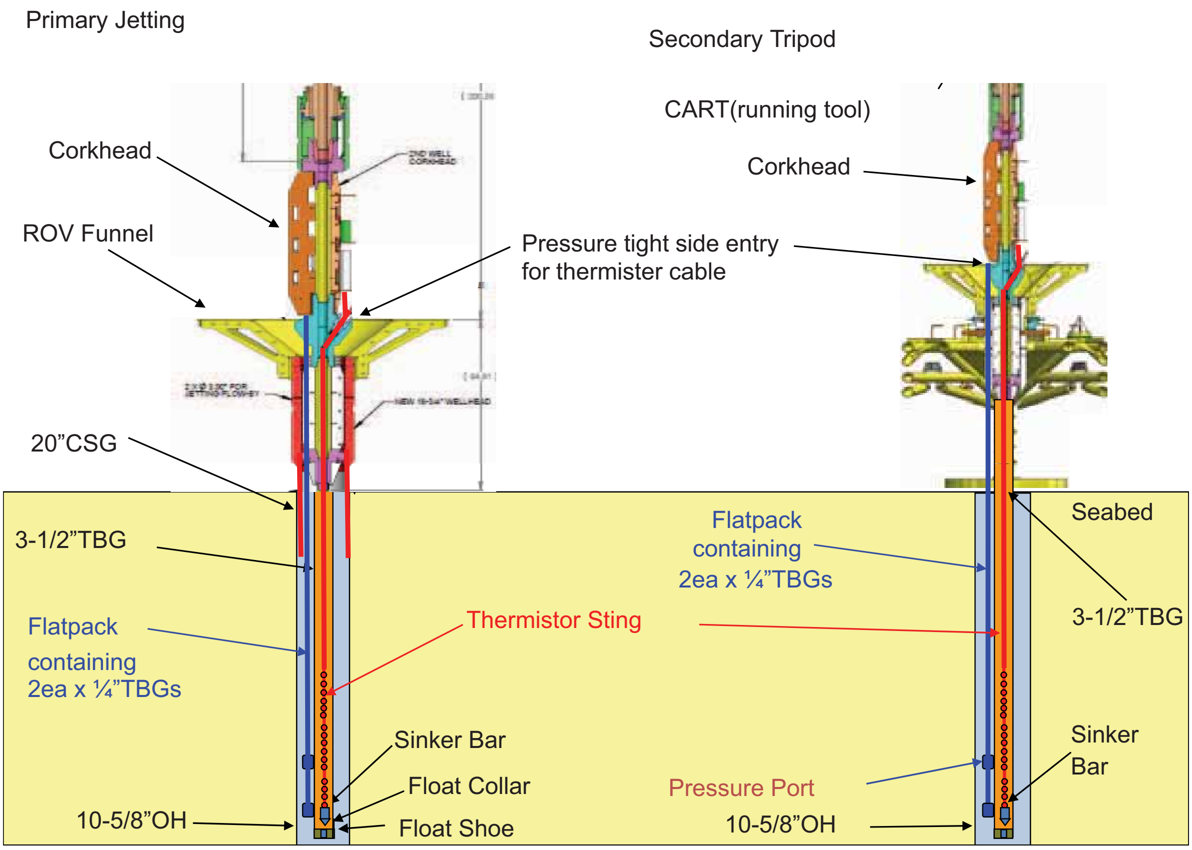


Figure 34. Completion overview for 2nd well.

3.2 Pressure Monitoring System. (External Flat Pack with Pressure Logger)

(Fig. 36)

The flatpack internally accommodates two ¼ -inch TBG lines that communicate between the pressure ports at/near the fault area and the pressure sensor unit (PSU) mounted on the CORK. The PSU data can be retrieved by ROV by wetmate connector communication or by ROV recovery of the entire PSU to the surface. Pressure measurements are through two pressure ports located at, or near, the fault area and one at seafloor (on the PSU) as a reference pressure measurement. Each hydraulic line has 2-way and 3-way valves on the PSU to select measurements from the seafloor or from the bore hole. The flatpack lines are secured on the outside of the tubing with protectors and stainless steel bands during deployment in the moonpool.

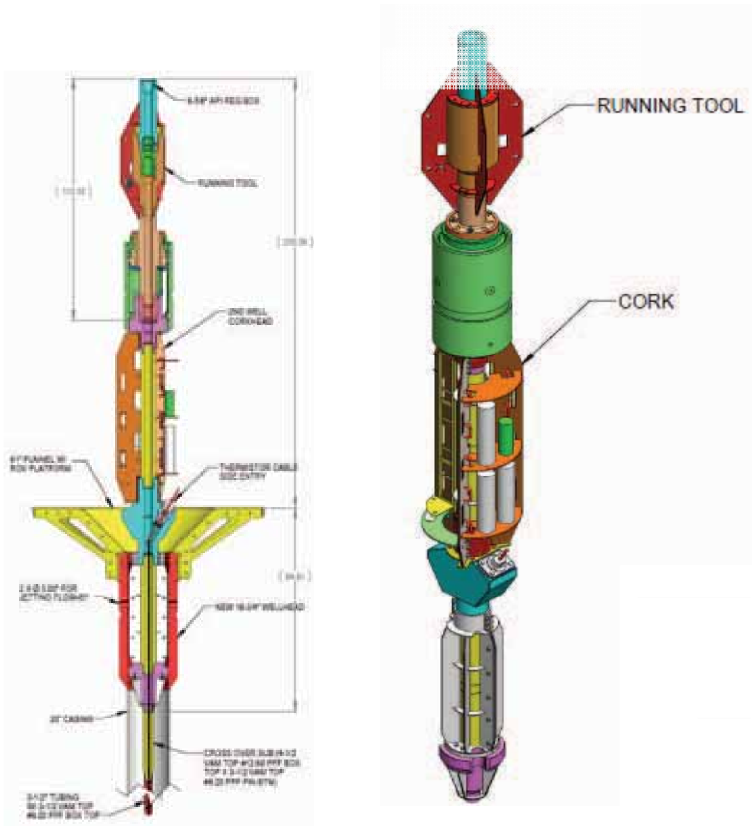


Figure 35. Corkhead.

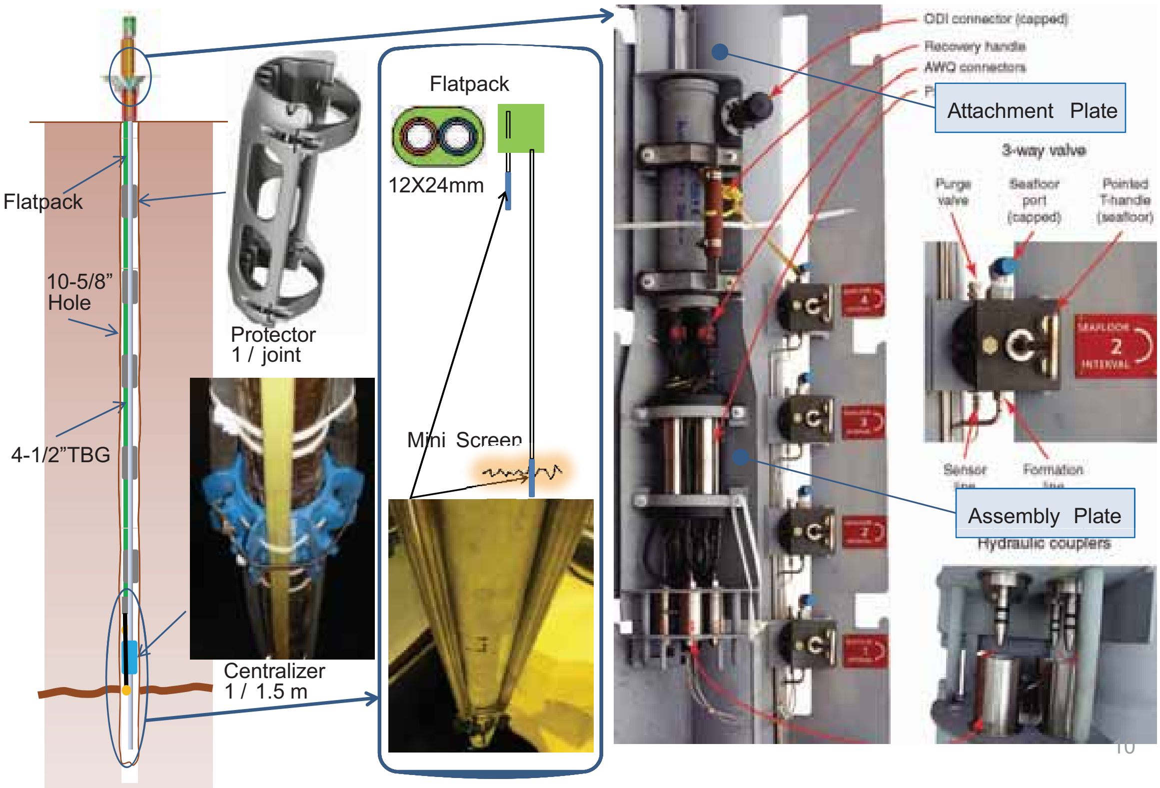
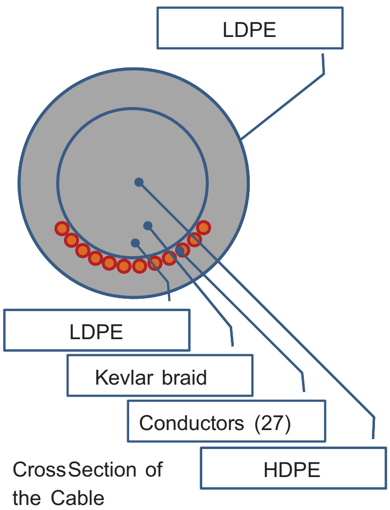


Figure 36. Pressure monitoring system.

Temperature Monitoring System (Internal Thermistor String) (Fig.37-41)

The temperature monitoring system consists of a thermistor string (comprised of 20 temperature sensors), the pressure data logger and the acoustic transponders. Data retrieval options include: physical retrieval of the logger, wet mate connector, and acoustic communication.

The thermistor string will be installed though a side entry port in the CORK head, and run down the inside of the tubing to a flexible sinker bar at the bottom.



	Items (Unit)	Specification
As the whole system	Temperature Range (deg C)	0 to 60
	Resolution (deg C)	0.001
	Accuracy (deg C)	0.01
	Sampling Interval (min)	10 to 60
	Period for Measurement (year)	4 (w/o swapping of batteries)
String itself	OD @ cable (mm)	20
	OD @ thermistor (mm)	About 35
	L @ thermistor (mm)	350
	Weight in air (kg/km)	340
	Weight in water (kg/km)	16.19
	Tensile strength (kgf)	600
	Material of strength support	Kevlar
	Number of conductors	27
	Resistance of conductor (Ω/km)	<100
	Conductor section (mm^2)	0.2
	Total Length (m)	1100
	Minimum bending radius (mm)	400 (200 w/ no-load)

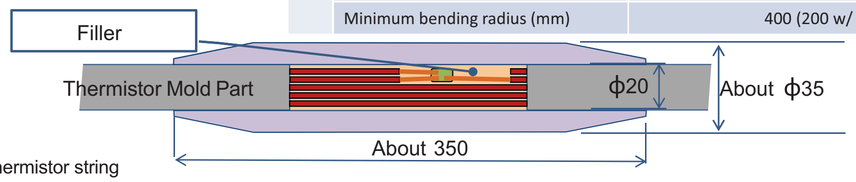


Figure 37. Thermistor string

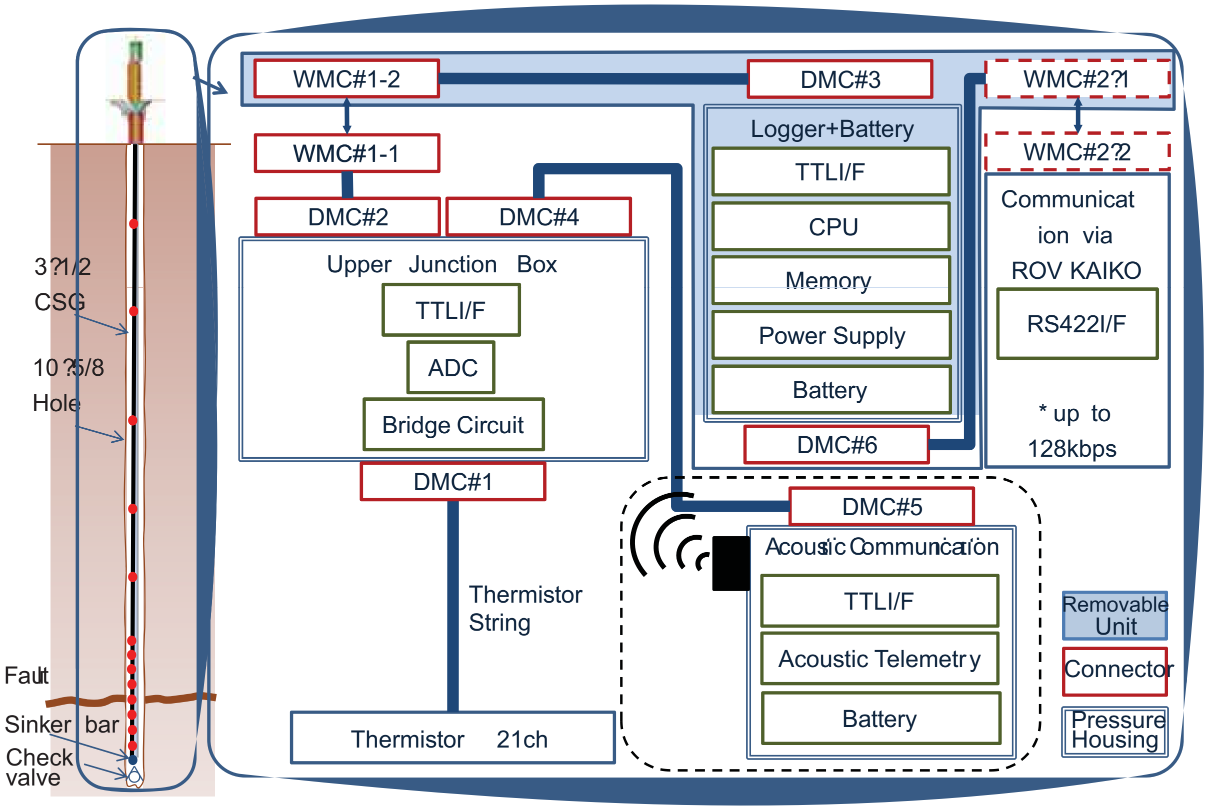


Figure 38. Block diagram for temperature measurement for 2nd well.

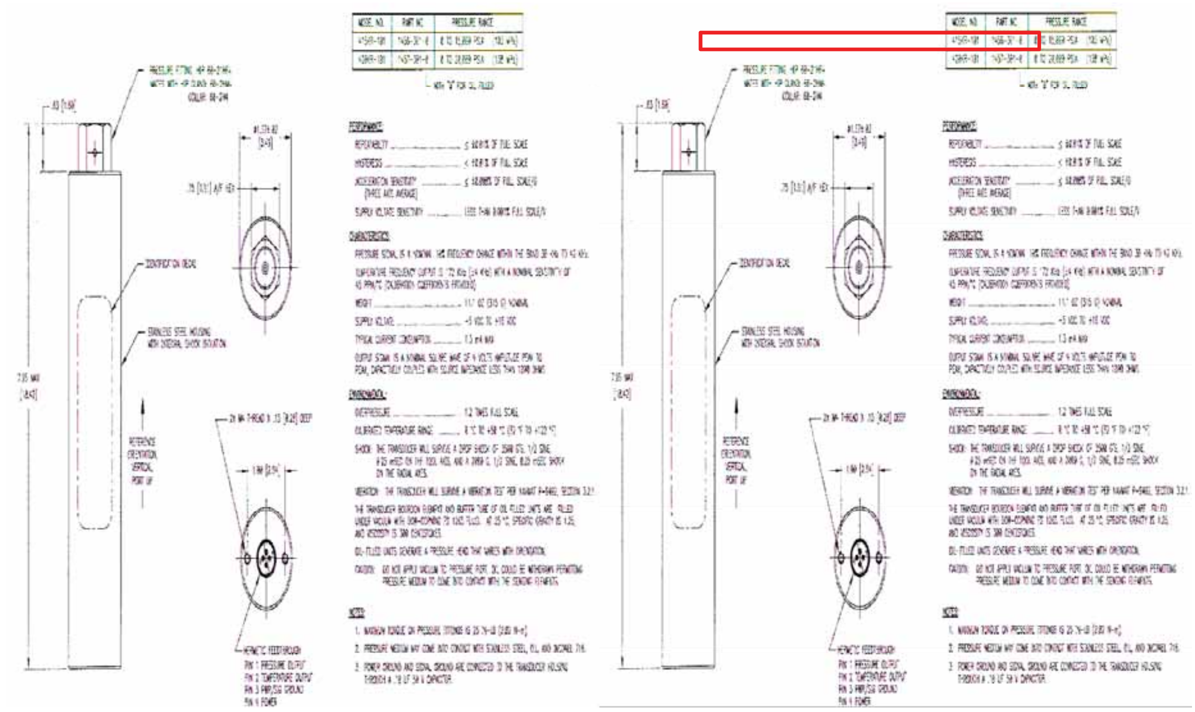


Figure 39. Acoustic transponder.

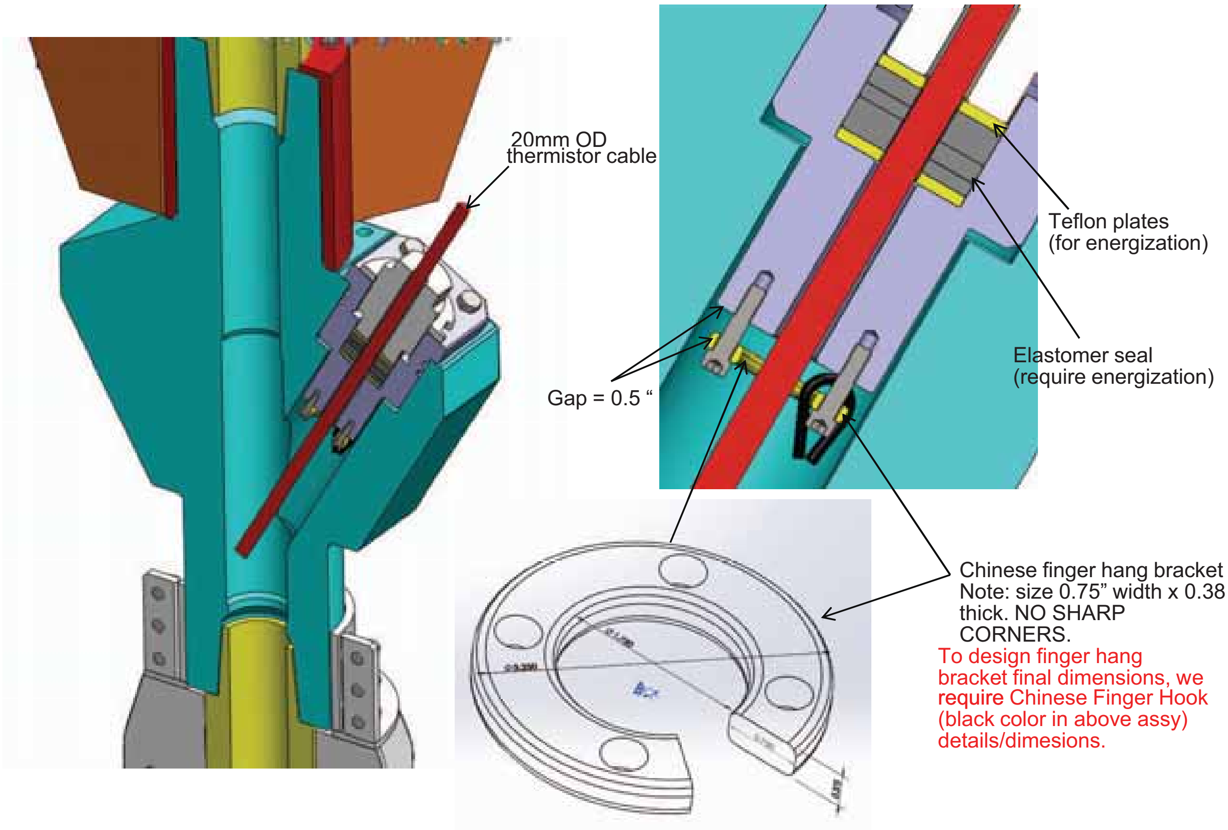


Figure 40. Side entry on corkhead.

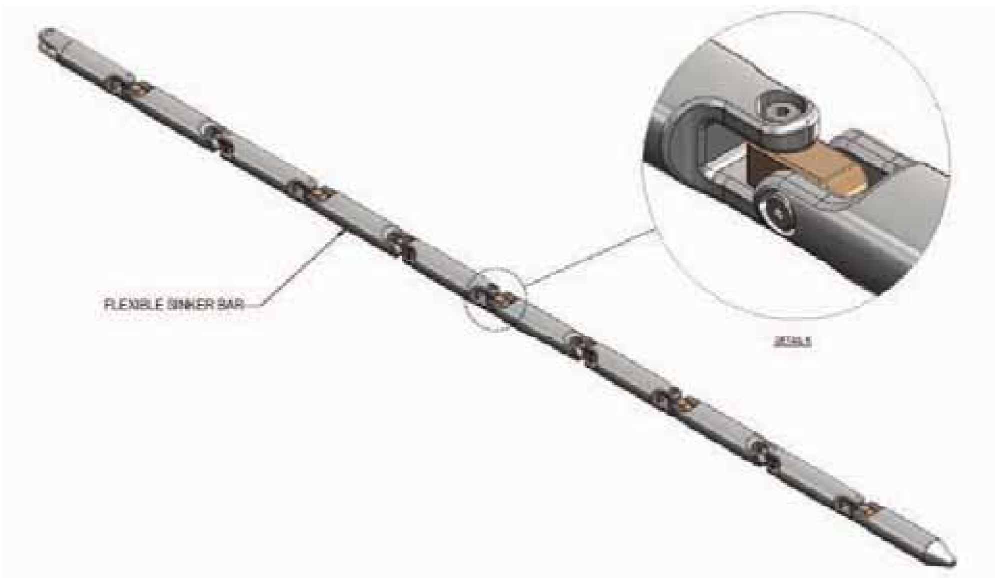


Figure 41. Flexible sinker bar.

15. WSOG JFAST Table

Well Specific Operating Guidelines (WSOG) Unit/vessel: Chikyu Location JFAST off Jpn
JFAST3 (C0019) Operator: CDEX Jamstec

Condition	Green	Advisory	Yellow	RED
1.DP position footprint Unit offset deviation From start point Water depth:…6909mMSL	<5 meters	5 – 15 meters	15 – 90 meters	Immediately when confirmed that situation cannot be controlled. No later than at **90 meters offset.**
2.DP heading footprint	<3°	3° – 5°	5°	If threat to position
3.Power consumption (split switchboard configuration)	Less than 60% load of generators on line.	Have redundancy to meet the power demand in the event of a single worse case failure. And 60% intermittently or generator on line to less than 70% load of full available generator or failure any generator.	Power demand reaches 70% of all full available generator	Blackout,or loss of 1 engine room and not enough power to maintain position within Yellow watch circle
4.Thrust consumption each Online Unit.	<60%	60% or any failure of any thruster	All available thrusters online and insufficient thrust warning activated by forecaster (CA set 13%)	Situation specific Any threat to position
5.Position reference available	2 x DGPS XP Sky Fix 2 x DGPS HP StarFix 2 x Acoustic	Any failure or loss off performance in any system	Single system or not operating in mixed mode	If threat to position
6.DP control system DP controllers	3 All systems Operating	Any failure or loss of performance in any system	Single system	All stations not operating
7.Wind sensors	3	Any failure or loss of performance in any system	Single system	If threat to position
8.Motion sensors (MRU)	2	Single system	Situation Specific	If threat to position
9.Heading sensors (Gyro)	3	Any failure or loss of performance in any system	Single system	Loss of all gyros
10.DP-UPS 1 and 2	2 Both systems operating ok	Any failure or loss of performance in any system	Single system	If threat to position
11. DP-UPS 3 and 4	2 Both systems operating ok	Any failure or loss of performance in any system	Single system	If threat to position
12. IAS System	No controllers Or network alarms	Any component fail	Single network	If threat to position
13. Comms system	Dual systems (DP Driller)	Single system	Situation specific	Situation specific
14. Network Hub / Signal processing units	2 both systems operating	Any failure or loss of performance in any system	Single network or any Network Hub Unit- or Signal process unit alarm in DP	Loss of both systems
15.Riser Limitation Lower flex joint NA	<X°	X°- X°	X°- X°	>X°
16. Riser Twist NA	+/- xxx° from BOP Heading	Situation Specific	Situation specific	Situation specific
17. Vessel Integrity	Vessel in intact condition	Any change in vessel condition	Situation specific	Situation specific
18. Resulting environmental forces direction	Below +/-15° on the bow or <60% load on any online thrusters	Over +/-15 ° On the bow If total environmental force >60% load on online thrusters	Situation specific	Situation specific
19.Wind speed (10m / 10s)	0 – 18 m/s	18 - 22 m/s	Situation Specific	If threat to position
20.N-Line Tensioner vertical stroke NA	<X m	X-Xm	>Xm	Situation Specific
21.**Action required**	**Normal status**	**Advise OIM, driller, Capt, Toolpusher, Company Rep, ROV**	**Issue alarm and Follow procedures**	**Issue alarm and Follow procedures**
22.Notify OIM and Company R immediately (Y/N)	**N**	**Y**	**Y**	**Y**

Well escape route into deeper water is bearing xxx° (t) - To xxx° (t) (Along current to deeper seabed)

Signed on behalf of SO (Rig Manager):……………..……… Signed on behalf of Operator (Drilling Supt.): …………..................

Figure 42. WSOG JFAST Table

Along with the above WSOG JFAST Table, CDEX will make final decisions on operation criteria once the drill string reaches below 4000 mBRT to prevent drill string failure due to string static load, dynamic load, bending stress, and fatigue.

16. Typhoon Evacuation

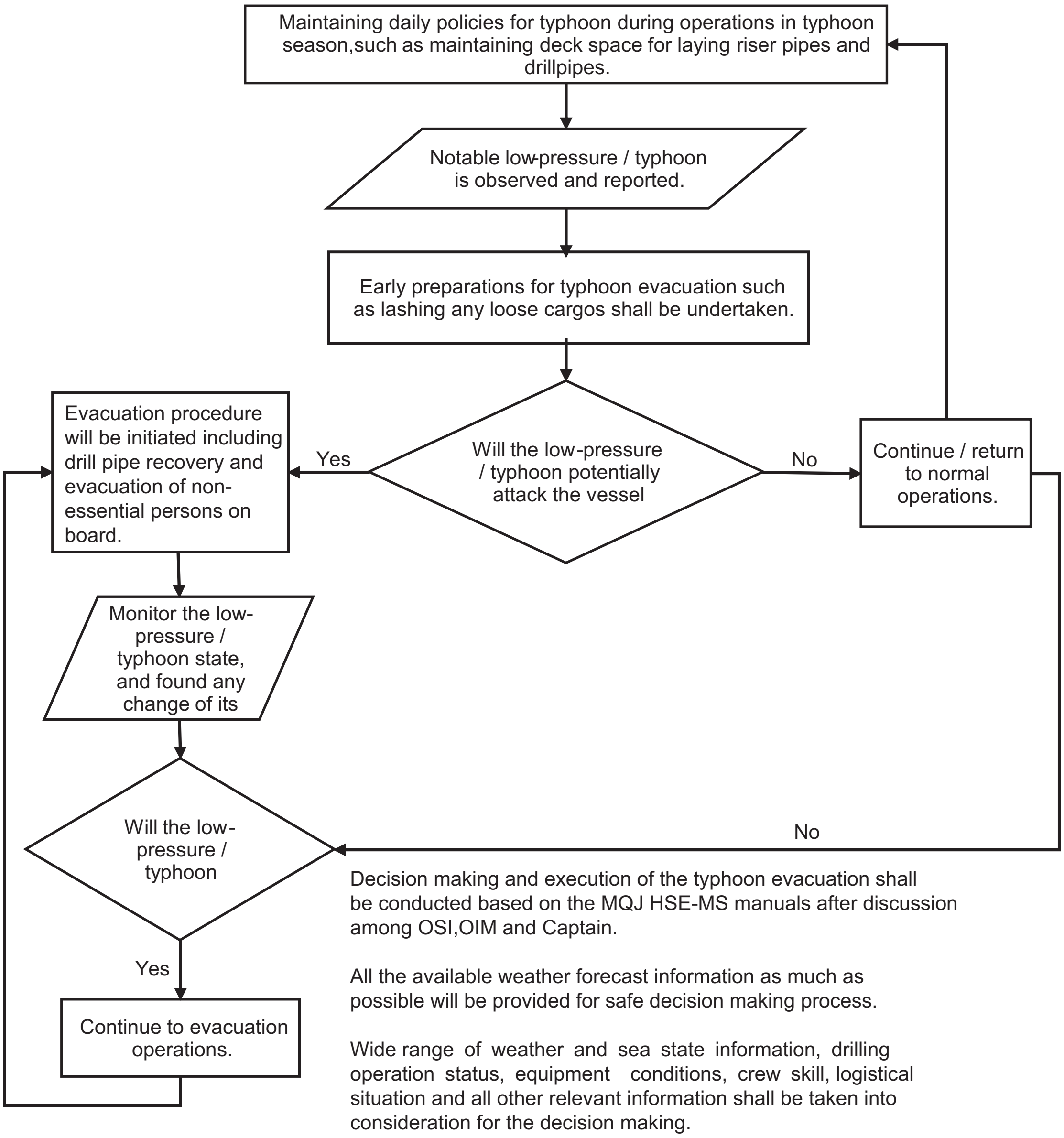


Figure 43. Typhoon and low pressure evacuation

17. Service Subcontractors

Table 16. Subcontractors Table here.

Services & Equipment	Company
A. Services	
Wellhead rental Equipment	Magnum
Mud Engineering Services	Telnite
LWD	Schlumberger
Back off Tool	Schlumberger
Non-Rotating Protector	WWT
Drilling Jar Rental	Weatherford (Dailey)
Tubing Running Services	BJ
Drilling Tools Venders	National Oil Tool, Blohm+Voss etc.
Weather Services	Weather News
Communication Services	Sigtel
Supply Boat	Offshore Operation
Patrol Boat	Undecided
Helicopter Services	Aero Asahi
Scientific Coring Services	Aumann & Associates
Thermistor String	OCC
Temperature Data Logger	Kaiyo-Denshi
B. Purchased Equipment	
Wellhead	Magnum
Tubing (4-1/2", 3-1/2”)	Sumitomo Metal
Tubing Accessories (Shoe, Collar)	Halliburton
Mud Chemicals	Telnite
Cement Additives	Schlumberger
Core Bit, Drill Bit	BHI, Smith, TIX
Underwater TV	OCC
Scientific Coring Equipment	Aumann & Associates
Thermistor String	OCC
Temperature Data Logger	Kaiyo-Denshi
MTL	Antares, RBR
MTL Rope	Tokyo Seiko
Pressure Data Logger	ESS

*Service coordinators will be onboard to control such services during the operation.

Appendix 1. Chikyu Drilling

Table-Appendix 1. Chikyu drill string

Nom. Size		Nom. Wall	Nom. Wt.	Upset Style	Grade	yield strength	Pipe Body OD	Pipe Body ID	CONNECTION OD	CONNECTION ID	CONNECTION Type		Make up Torque (min)	T.J. Torsional Yield Strength	Tensile Capacity	Length Range & Ave. (m)	Calculated Weight	Displacement Volume	Internal Volume
						ksi	in	in	in	in			kN-m	kN-m	ton		kg/m	l/m	l/m
6-5/8"	x	0.75"	47.06	IEU	Z140	140	6.625	5.125	8.5	4.25	6-5/8FH		73.49	146.98	781 (Body)	II (9.55m)	85.36	10.93	12.54
5-1/2"	x	0.506"		IEU	S150	150	5-1/2"	4.488"	7-1/2"	4-1/8"	5-3/4 FH		67.63	112.79	541 (Body)	II (9.55m)	51.21	6.02	9.59
5-1/2"	x	0.415"	24.7 lb/ft	IEU	S140	140	5-1/2"	4.670"	7"	4-1/8"	5-1/2 FH	NKKT-DSTJ	51.37	85.52	421 (Body)	II (9.47m)	42.74	5.02	10.40
5"	x	0.362"	19.5 lb/ft	EUE	S140	140	5"	4.276"	7"	4-1/8"	5-1/2 FH		51.37	85.52	335 (Body)	II (9.43m)	36.31	4.23	8.89
Lower HWDP		for BHA			4145H (M)	120	5.68"	4-1/8"	7"	4-1/8"	5-3/4 FH	NKKT-DSTJ	52.99	75.78	541 (Pin)	II (9.44m)	70.24	8.83	8.52
Upper HWDP		for KNOBBY			ERS425	120	6-5/8"	4-1/8"	8-1/2"	4-1/8"	6-5/8" FH		84.94	141.55	901 (Pin)	II, 9.4m+Pup	133.91	16.64	8.52

			Grade	yield strength	OD	ID	Spiral grooved	Elevator recessed	Slip recessed	CONNECTION Type	Make up Torque	Torsional Yield Strength	Tensile Capacity	Range & Ave. (m)	Calculated Weight	Displacement Volume	Internal Volume
					in	in					kN-m	kN-m	m.ton		kg/m	l/m	l/m
7"	for Coring		4145H (M)	100	8-1/2"	4-1/8"	grooved	recessed	recessed	6-5/8 FH Mod.	91.91	153.18(Pin)	989(Pin)	II (9.31m)	199.12	25.39	8.85
			4145H (M)	100	7"	4-1/8"	grooved	recessed	recessed	5-1/2 FH Mod.	41.73	69.54(Pin)	522(Pin)	II (9.30m)	115.48	14.73	8.74
	for Drilling		4145H (M)	100	9-1/2"	3"	straight	N/A	recessed	7-5/8 REG	140.28	233.80(Pin)	1435(Pin)	II (9.31m)	315.20	40.18	4.93
			4145H (M)	100	8-1/2"	2-1/2"	grooved	recessed	recessed	6-5/8 REG	91.88	153.13(Pin)	1062(Pin)	II (9.31m)	241.68	30.83	3.46
			4145H (M)	110	6-3/4"	2-1/4"	grooved	recessed	recessed	4 IF	44.86	74.76(Pin)	637(Pin)	II (9.31m)	149.41	19.05	2.72
			4145H (M)	110	4-3/4"	2-1/4"	grooved	recessed	recessed	3-1/2 IF	15.60	25.98(Box)	276(Box)	II (9.31m)	63.69	8.12	2.65
	for Drilling		DNM110	100	9-1/2"	3"	straight	N/A	N/A (Slip grooved)	7-5/8 REG	116.90	194.83	1195(Pin)	II (9.32m)	308.20	40.45	4.93
			DNM110	100	8-1/2"	2-1/2"	straight	N/A	N/A (Slip grooved)	6-5/8 REG	76.56	127.61	885(Pin)	II (9.32m)	250.46	32.87	3.46
			DNM110	110	6-3/4"	2-1/4"	straight	N/A	N/A (Slip grooved)	4 IF	41.12	68.53	584(Pin)	II (9.31m)	154.03	20.20	2.72

Appendix 2. Specification and Capability of Chikyu

Table-Appendix 2. Specification and capability of Chikyu。

GENERAL		**MAJOR DRILLING EQUIPMENT**	
Rig Type	Drill Ship	Derrick	Bailey Dual well Derrick
Design	JAMSTEC / Mitsubishi Heavy Industry /		21.95 m(L) X 18.3 m(W) x 70.1m(H)
	Mitsui Engineering and Shipbuilding	Drawworks	National Oilwell Model EH-V-5000, DC Drive
Built Year	2005		Hoisting capacity 1,250MT
Builder	Mitsubishi Heavy Industry /	Motion Compensator	HYDRALIFT Crown Mounted Type
	Mitsui Engineering and Shipbuilding		Max Compensating Load : 518MT
Classification	NK (NS*(Mobile Offshore Drilling Unit		Max Static Load : 1,250MT
	MNS*(M0), DPS B）		Stroke : 25 ft (7.62 m)
Station Keeping	Dynamically Positioned	Top Drive System	HYDRALIFT Model HPS 1000 2E AC, 1,000ST
Accommodation	200 persons	Rotary Table	
Helideck	EH 101 Capable	: Main Hole	Varco BJ Model RST 60-1/2, 1,250MT
Max Drill Depth	10,000m	: Aux. Hole	Varco BJ False Rotary 49-1/2, 680MT
Min/Max Water Depth	*500m/2500m	Dual Elevetor	Blohm+Voss Hydraulic Operated,
(Riser Operation)	* Depend on Metocean Condition	Handling System	Load Capacity : 750 ST, Pipe Range : 2-3/8" - 9-7/8"
Operating Conditions	Wind 23m/s, Wave 4.5m significant	Pipe Handling System	2 X HYDRALIFT, Model : Hydra Racker IV
for Drilling	Current 1.5Knot		Vertical Pipe racker for fourble (Quadruple) stand
		Mud Pumps	3 X National Oilwell 14-P-220, 7500psi, 2260hp
PRINCIPAL DIMENSIONS		Solid Control	Gumbo Separator : 2 x Brandt Single Gumbo Scalper
Length overall	210.0 m		Shale Shaker : 6 x Brandt Double VSM 300
Breadth	38.0 m		Desander : 2 x Swaco, Model 3-12 D-SANDER
Depth	16.2 m		Mud Cleaner : 2 x Swaco, Model 8T4 D-SILTER
Draft (max)	9.2 m		with Adjustable Linear Shaker
Gross Tonnage	56,752 MT		Cenrifuge : 3 x Brandt, Model RT HeviJet 362
Variable load（Operating)	23,500 MT		Degasser : 2 x Burgess Magna-Vac Model 1500
Variable load（Transit)	23,500 MT		
		BOP/RISER	
STORAGE CAPACITY		LMRP	18-3/4" 10,000 psi, Shaffer Dual Spherical BOP
Bulk cement	467 m3 (4 x 4,125 ft3)	BOP	18-3/4" 15,000 psi, Cameron Model 15TL Double
	58 m3 (2 x 1,030 ft3)		18-3/4" 15,000 psi, Cameron Model 15TL Triple
Bulk Mud	701 m3 (6 x 4,125 ft3)	Diverter	ABB Vetco Gray, Model KFDS/CSO
	57 m3 (2 x 1,000 ft3)		60-1/2" suport housing, Working Press. 500 psi,
Sack Storage	500 m^2	BOP Control System	ABB Offshore Systems Inc., MUX Control System
Active Mud Pit	6 x 85m^3 (510 m^3)	Marine Riser	Cameron Load Share Type, 21.75" & 21.375"OD x 90ft jt
Reserve Mud Pit	8 x 212.5m^3 (1,700 m^3)		Connector Type LoadKing 4.0(Load Rating 1,814MT)
Fuel	9,300 m^3		Choke/Kill : 4.25"ID, 15,000 psi, Booster : 4"ID, 7,500 psi
Helifuel	3 X 2,500 lit.	Telescopic Joint	65 ft (19.8m) stroke, Load Rating 1,814MT
Potable water	740 m^3		Working Press. : 500 psi
Drill water	2,550 m^3	Riser Tensioners	HYDRALIFT, Direct Cylinder Tensioner N-line System
Pipe Storage	1,020 m^2		6 cylinders, 52' stroke, 363 ton /ea. capacity
Riser Storage	780 m^2	Riser Management	Fugro/MCS, On-Line Riser Analysis System
		System (RMS)	
MACHINERY		Choke Manifold	Cameron, 3-1/16" 15,000psi / 4-1/16" 5,000psi
Main Engines	Mitsui 12ADD30V, 6 x 5,270kw		2 X Hydraulic remote choke, 2 X Manual choke
Main Generator	Nishishiba, 6 x 5000kw		
Auxiliary Engines	Mitsui 6ADD30V, 2 x 2,640kw	PURPOSE-BUILT TUBULAR	
Auxiliary Generator	Nishishiba, 2 x 2500kw	Drill Pipe	5.5"DP X 0.506" S-150, 5-3/4"FH NK DSTJ 3,250m
Emergency Engines	MHI S12A2-MPTA, 1 x 600kw		5.5"DP X 0.415" S-140, 5-1/2"FH NK DSTJ 1,500m
Emergency Generator	Nishishiba, 560kw		5.0"DP X 0.362" S-140, 5-1/2"FH NK DSTJ 5,000m
DYNAMIC POSITIONING SYSTEM		**OTHERS**	
Model	Mitsui Engineering and Shipbuilding	Deck Crane	Hydralift, Electric-Hydraulic Knuckle Boom Crane
	Triple Redundancy DPS		2 x 85MT, 2 x 45MT
Class	Class B	Laboratories	2,300m2
Position Reference System	2 x DGPS (Skyfix XP)		Various types of laboratories which are Microbiology,
	2 x DGPS(Starfix HP)		Paleomagnetics,Geochemistry, Paleontology/Petrology,
	2 x Acoustic Position Reference System		Geochemistry on board
	(LBL + USBL)	Sewage Treatment Plant	Sasakura Engeering, Super Trident ST-15
		Drill Cuttings/Waste Mud	Sasakura/Telnite/Apollo, IHI MU
PROPULSION/THRUSTERS		Treatment Unit	1) Mud Drain Concentration System
Azimuth Thrusters	2 x Non-Retractable 4,200kw		2) Condesed Water Purifying System
	4 x Retractable 4,200kw		3) Solidify & Dehydration System
Side Thruster	1 x 2,550kw		
Transit Speed	11.5 knots		

Appendix 3. Improved Underwater TV System

The Underwater TV (UWTV) system has been improved for IODP Expedition 343, primarily for:

- Improvement of camera vision quality
- Improvement of operational performance
- Prevention from entanglement on the CORK head

Improvement of camera vision quality

The installation of a new camera on the UWTV frame and improvement of a dimming control system have been completed.

The setting position of the camera in both top and bottom of the frame is selectable. Moreover level of the camera angle is adjustable to a certain extent before descent. The greater portion of the top and bottom edge of the guide sleeve is within the camera frame of view. (Fig.1-Appendix 3)

The improved dimming control system allows for tuning of dimming levels in stepwise increments (8 stages). (Fig.2-Appendix 3,"Lightning control") This control is now available in both the Driller's house and in the Moon pool area via a new control box described below.

Improvement of the operation performance

A new control box and monitor have been installed in the Driller's house to improve UWTV operation performance. (Fig.3-Appendix 3)

The driller can control various UWTV functions via a new control box in the Driller's house and also in Moon pool area. The control box is portable, and can be carried to the Moon pool if needed. The control box can be connected to the UDTV reel via connection port on the UWTV reel. Control functions include: an on/off switch and level controls for Light, sonar and responder, and also to control the winding speed of the UWTV winch.

Prevention from entanglement on the CORK head

During IODP Expedition 343 operations, the UWTV will pass down around the Drill pipe and the outside of the large diameter CORK head. To avoid any hangups on the CORK unit, the UWTV guide sleeve of has been redesigned.

- Rounding off corners as shown in two spheres in figure. (Fig.4-Appendix 3)
- Expanded the diameter to 34 inches. (Fig.4-Appendix 3)
- Installed bungee cords to maintain flexibility between the guide sleeve and the frame. (Refer to Fig.5)

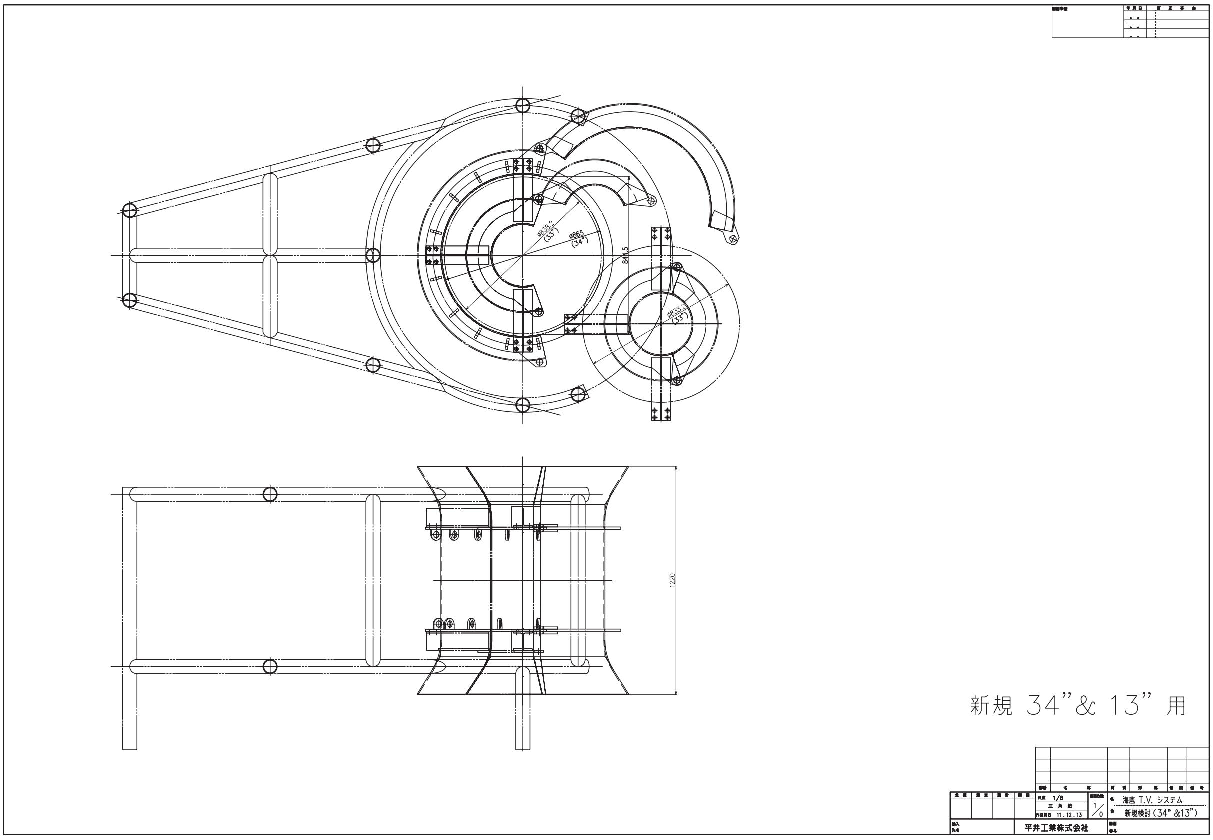


Figure 1-Appendix3.

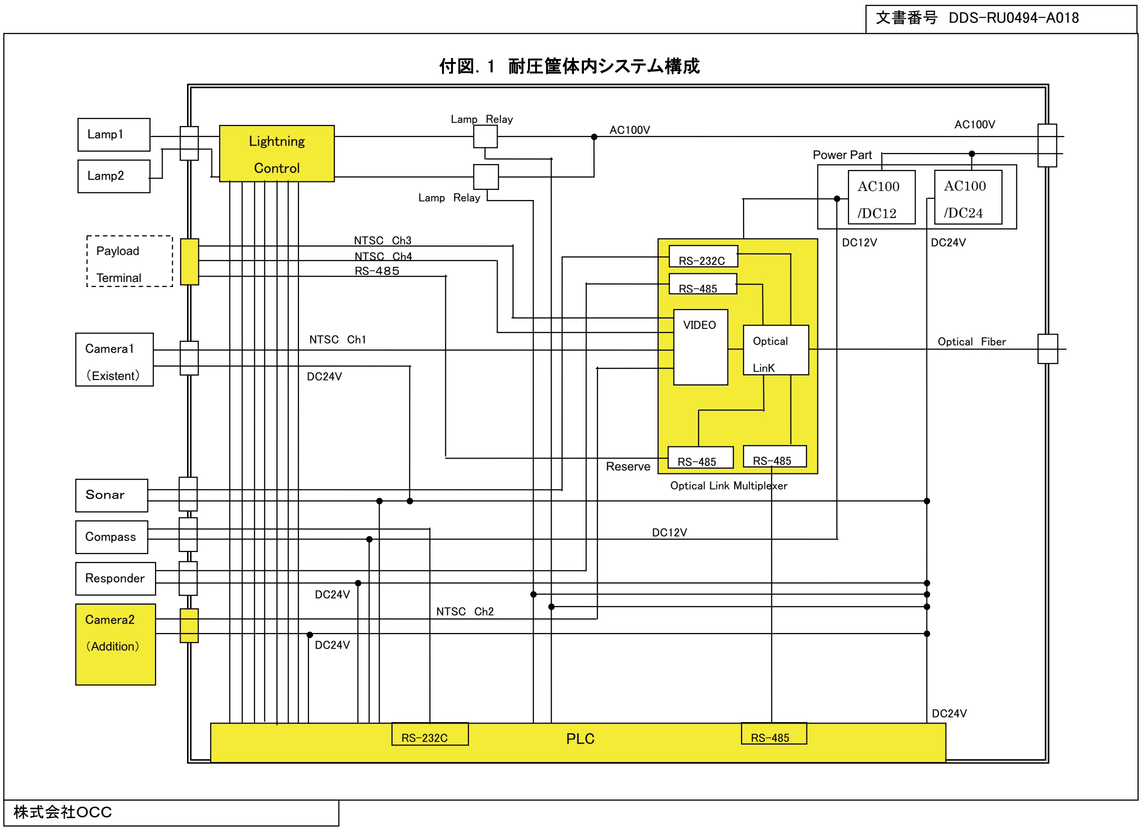


Figure 2-Appendix3.

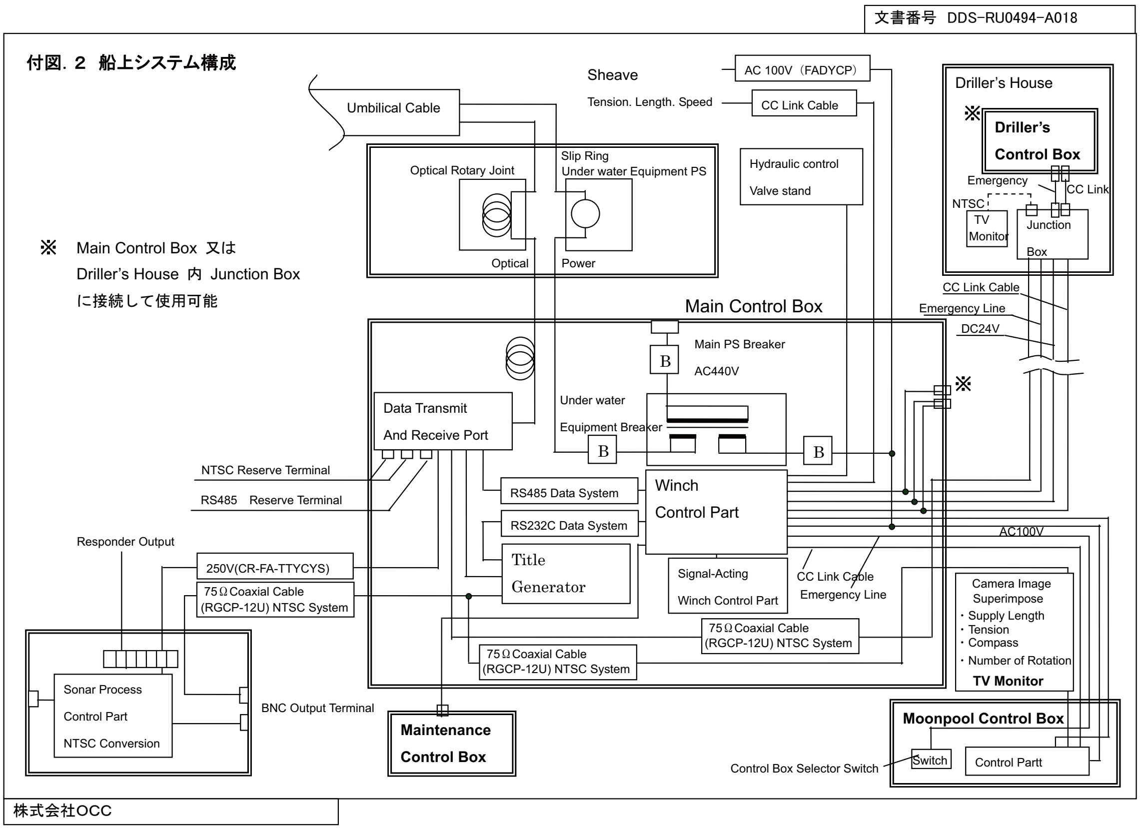


Figure 3-Appendix3.

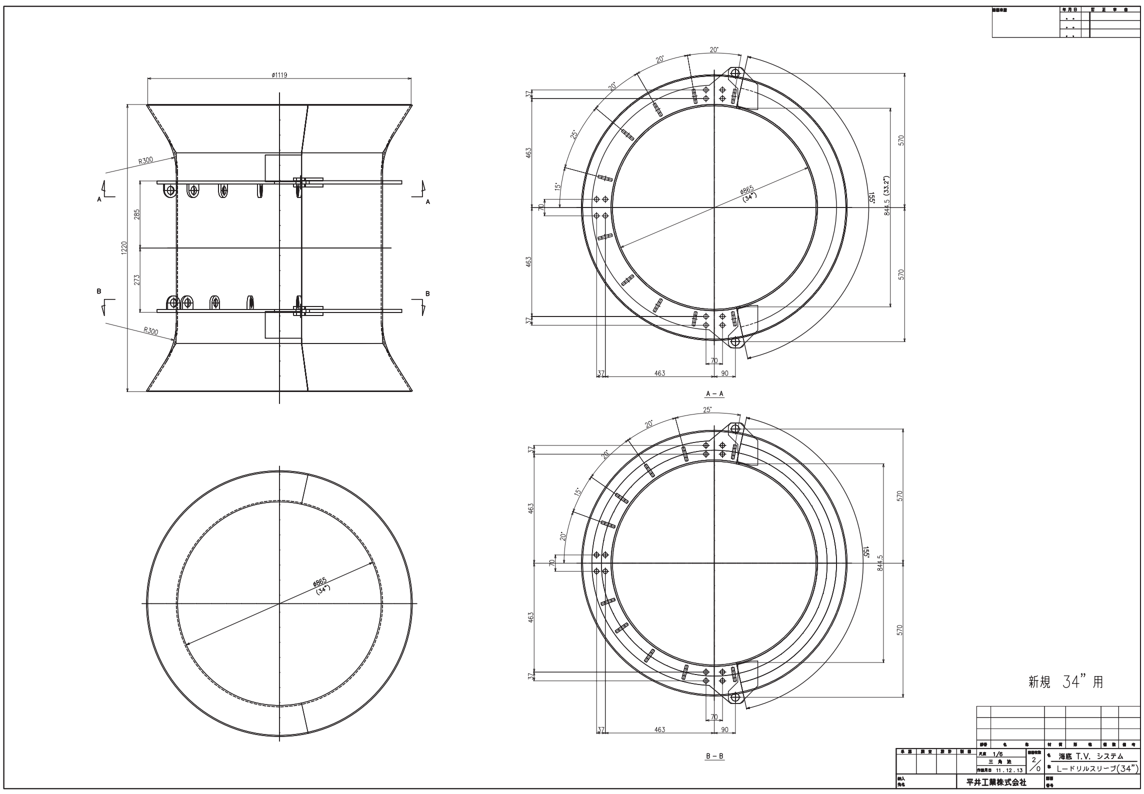


Figure 4-Appendix3.

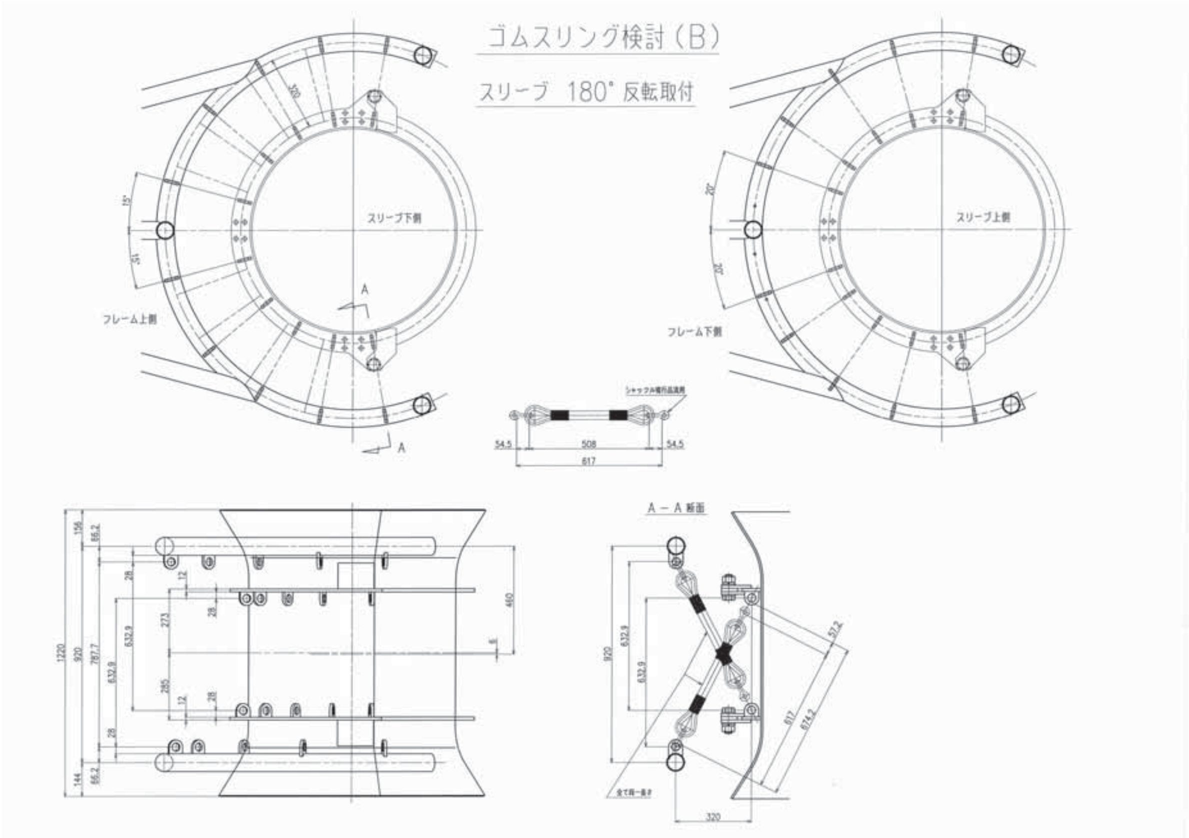


Figure 5-Appendix3.

Appendix 4. Meta-ocean Data

Table1-Appendix 4. Visibility

Monthly Visibility Table (Weathernews) Observation, Sendai Airport, 2006 – 2010

	Jan	Feb	Mar	Apr	May	Jun	Aug	Sep	Oct	Nov	Dec
All	3440	3006	3394	3523	3485	3680	3712	3600	3531	3746	3986
Over 10 km Visibility	3256	2699	3069	2755	2569	2635	2891	3148	3203	3494	3702
	94.9	89.8	90.4	82.0	72.9	75.6	77.9	87.9	90.7	93.3	92.9
Low Visibility (under 3000 m)	30	107	64	114	226	21.5	118	50	37	19	57
	0.9	3.6	1.9	3.4	6.4	6.2	3.2	1.4	1.0	0.5	1.4
Low Visibility (under 1000 m)	2	21	8	24	64	51	22	12	9	5	10
	0.1	0.7	0.2	0.7	1.8	1.5	0.6	0.3	0.3	0.1	0.3

Wave Height Exceedance (Weathernews)

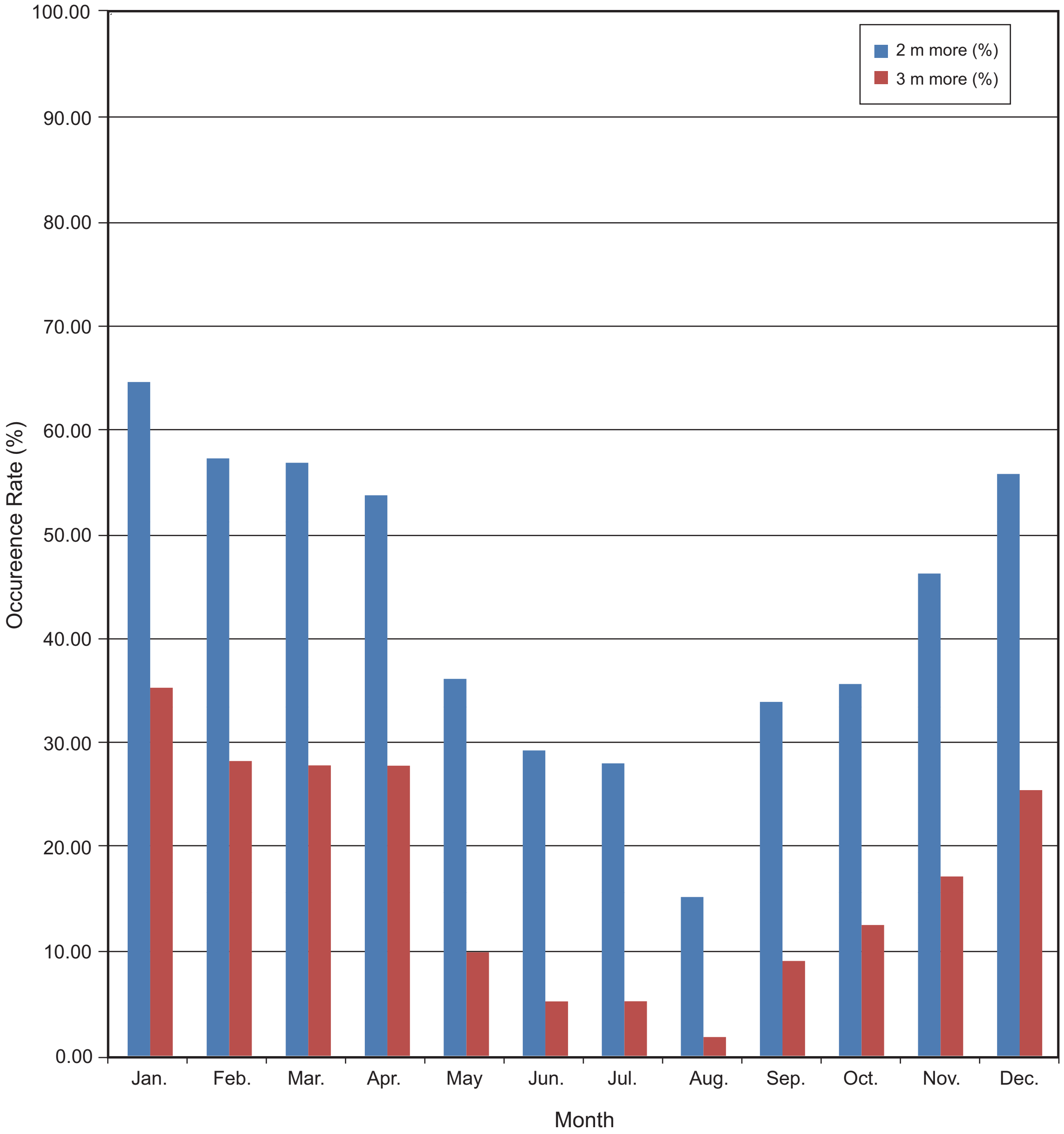


Figure1- Appendix 4. Wind Speed

Wind Speed Records & Its Exceedance (WeathernNews)

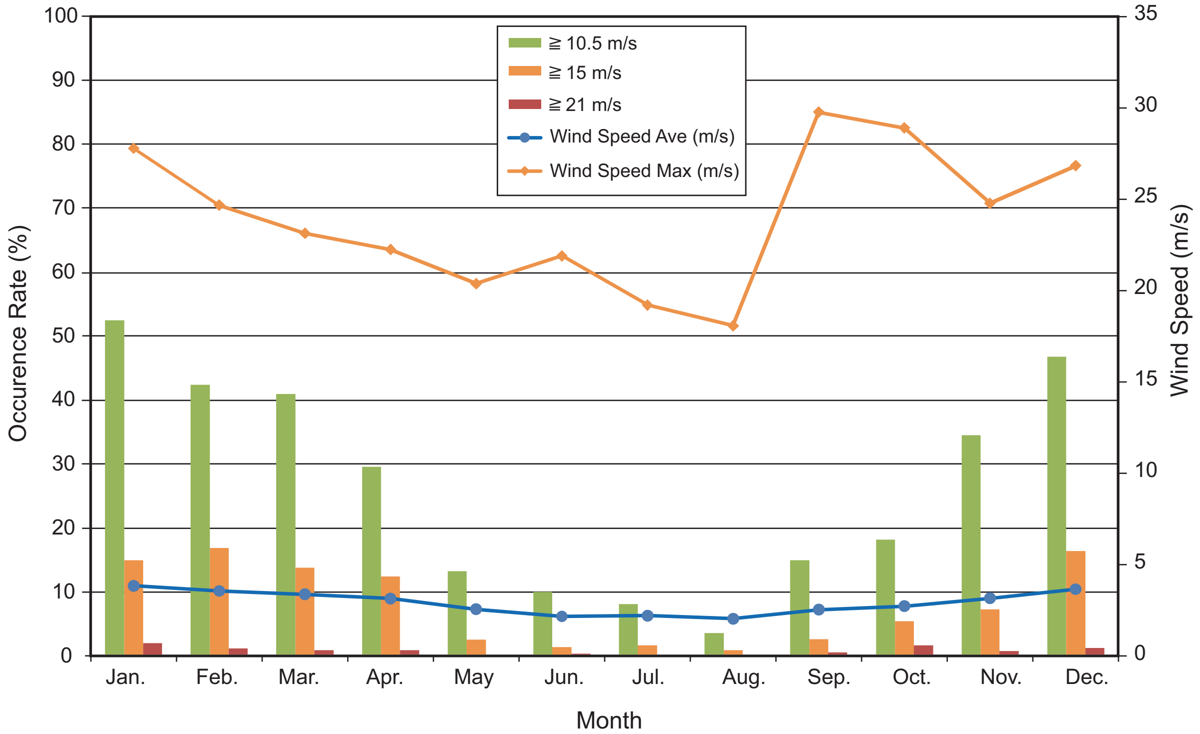


Figure 2-Appendix 4. Tropical Cyclones Left April Right May

Tropical Cyclones Tracks (Weathernews)

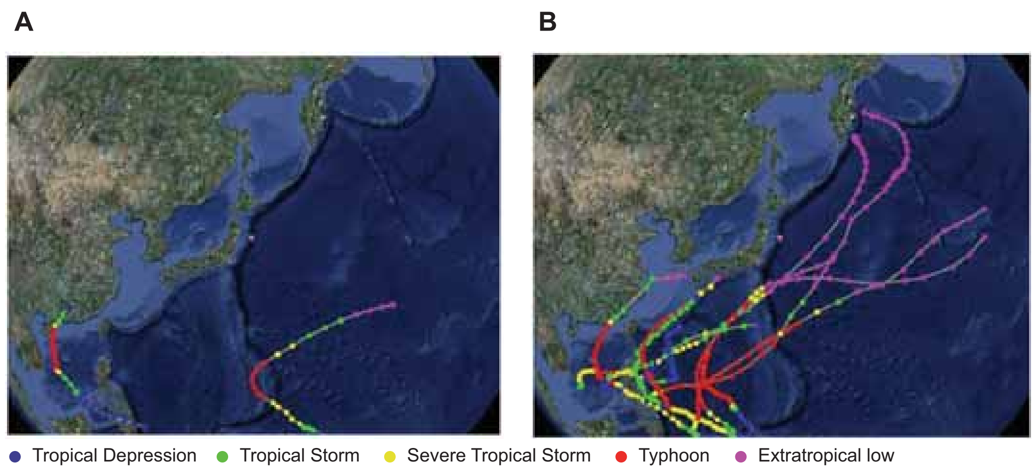
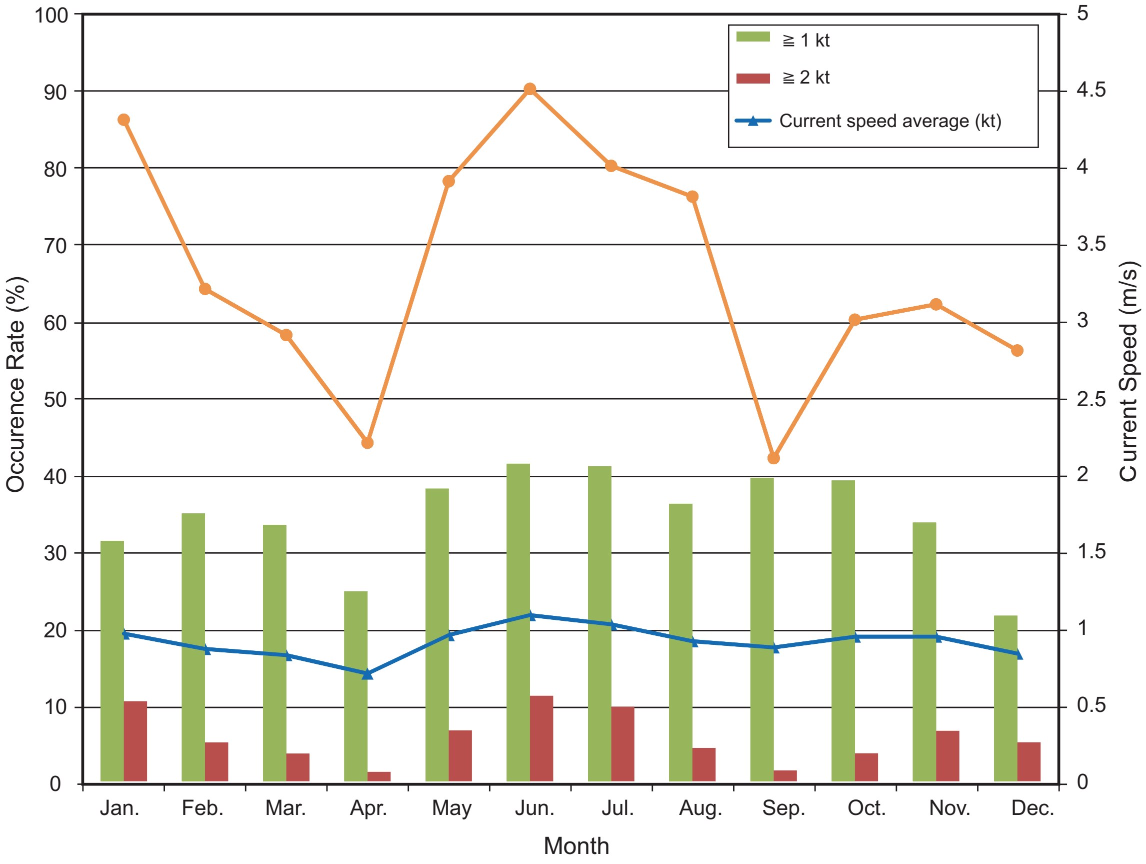


Figure 3-Appendix 4. Current

Sea Current Speed Exceedance (Weathernews)



Appendix 5. Offset well data

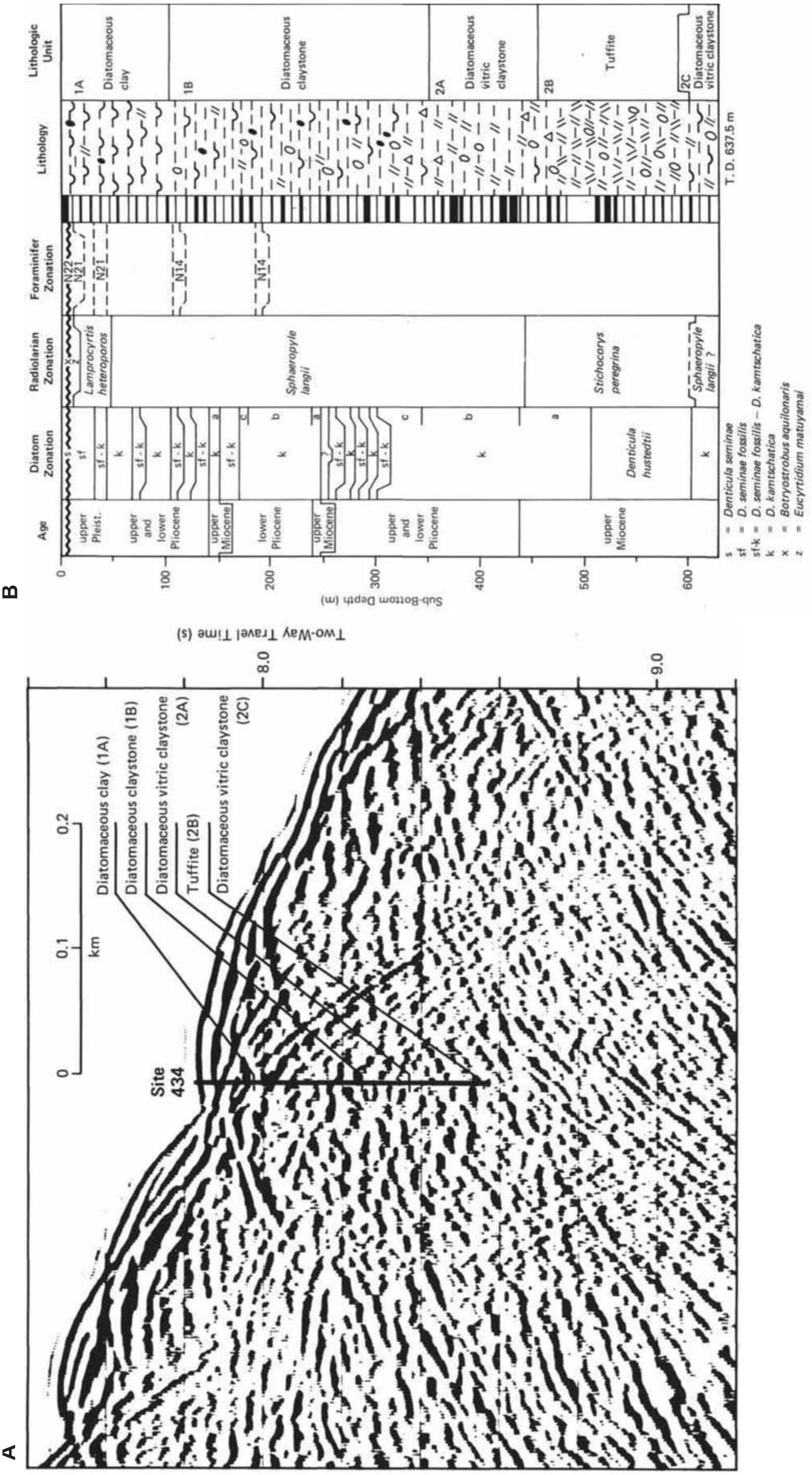


Figure 1-Appendix 5. Lithostratigraphy of DSDP Site 434.

C

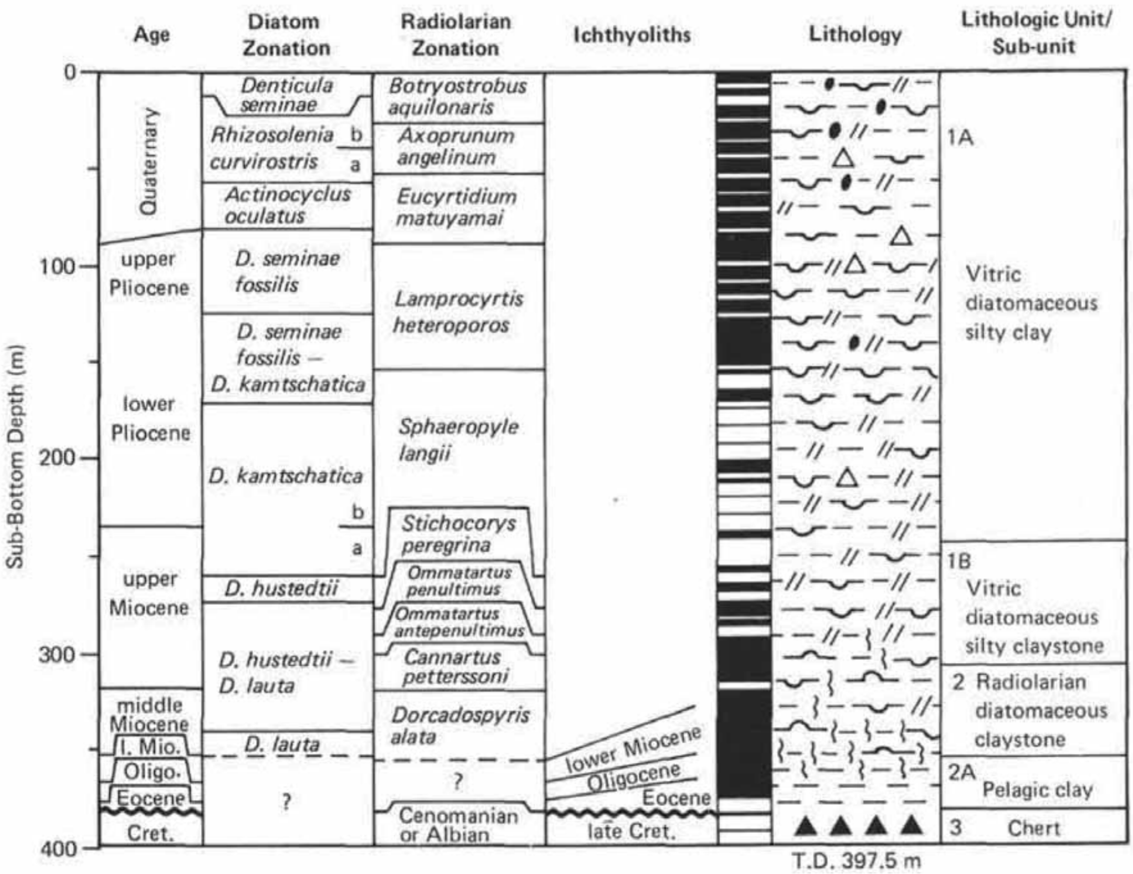


Figure 2-Appendix 5. Lithostratigraphy of DSDP Site 436.

Appendix 6. Helicopter Spec

RRD Helicopter Specifications

Table 1-Appendix 6. RRD Helicopter Specification

ITEM	CONTRACT SHIP	SUBSTITUTE SHIP	SUBSTITUTE SHIP
Manufactured Company	S.N.I.Aerospatial	Bell Helicopter Textron	Bell Helicopter Textron
Type of Helicopter	AS332L	Bell412EP	Bell412SP
Registration No.	2089	36496	33109
Place of Registration	Japan	Japan	Japan
Call Sign	9690	6928	9616
Length	18.70m	17.13m	17.13m
Height	4.94m	4.60m	4.60m
Rotor Diameter	15.60m	14.2m	14.2m
Gross Weight	8,600kg	5,398kg	5,398kg
Self Weight	4,380kg	3,124kg	3,084kg
Loading Weight	4,220kg	2,274kg	2,314kg
Crew	2	2	2
Passenger Seats	18	11	11
Cabin Capacity	13.43m^3	6.23m^3	6.23m^3
Cargo Capacity	Cabin	0.79m^3	0.79m^3
Fuel Capacity	2,059ℓ	1,249ℓ	1,249ℓ
Engine	TURBOMECHA-1A× 2	P&WPT6-3D×2	P&WPT6T-3BE×2
Engine Power	Max1636shp×2	Max900shp×2	Max900shp×2
Max Speed	275km ／ h	259km ／ h	259km ／ h
Cruising Speed	240km ／ h	230km ／ h	230km ／ h
Max Altitude	5,100m	5,025m	5,025m
Endurance	3.00h	3.70h	3.70h
Cruising Range	580km	470km	470km
Fuel Consumption	686L ／ h	337L ／ h	337L ／ h
Year Manufactured	1984	2008	1986
Place of Manufactured	FRANCE	U.S.A	U.S.A
Total Airframe Flying Hour	12,891h49m	243h58m	5,875h21m
No1Engine Total Hours	6,931h00m	243h58m	5,875h21m
No2 Engine Total Hours	1,647h22m	243h58m	964h29m
Certificate of Airworthiness	February,24,2012	December,14,2012	June,6,2012

Helicopter Landing Limitations

Table 2-Appendix 6. Helicopter Landing Limitation

		Day Time	Night Time
Weather	**Max. Wind Speed including Gust**	45knots(23.15m/sec)	
	Min. Visibility	5,000m	5,000m
	Min. Height of cloud	1,000ft (300m)	1,000ft (300m)
Movements	**Max. Pitch/Roll**	+/- Pitch 2deg, Roll 5deg	+/- Pitch 1deg, Roll 3deg
	Max. Heave rate	N/A	N/A
A Significant shift in relative wave		N/A	
Other restriction		*No take off or landing with a tailwind.*	
		No flight when 2VHF AM air-bands are inoperative.	

Helicopter Shutdown on Unstable Helideck

Table 3-Appendix 6. Helicopter Shutdown on Unstable Helideck

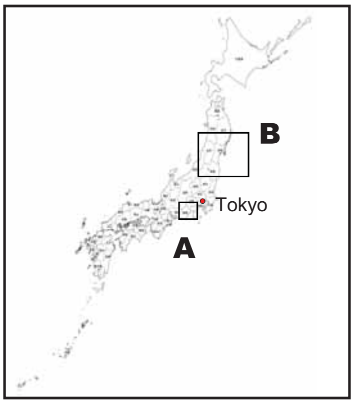
A/C	Max. Wind Speed Including Guest	Max Pitch/Roll	Max. Heave Rate
AS332L	30knot	+/- Pitch 1deg, Roll 3deg	N/A
Bell412EP	20knot	+/- Pitch1deg, Roll 3deg	N/A
Bell412SP	20knot	+/- Pitch 1deg, Roll 3deg	N/A

Appendix 7. Supply Boat Specifications

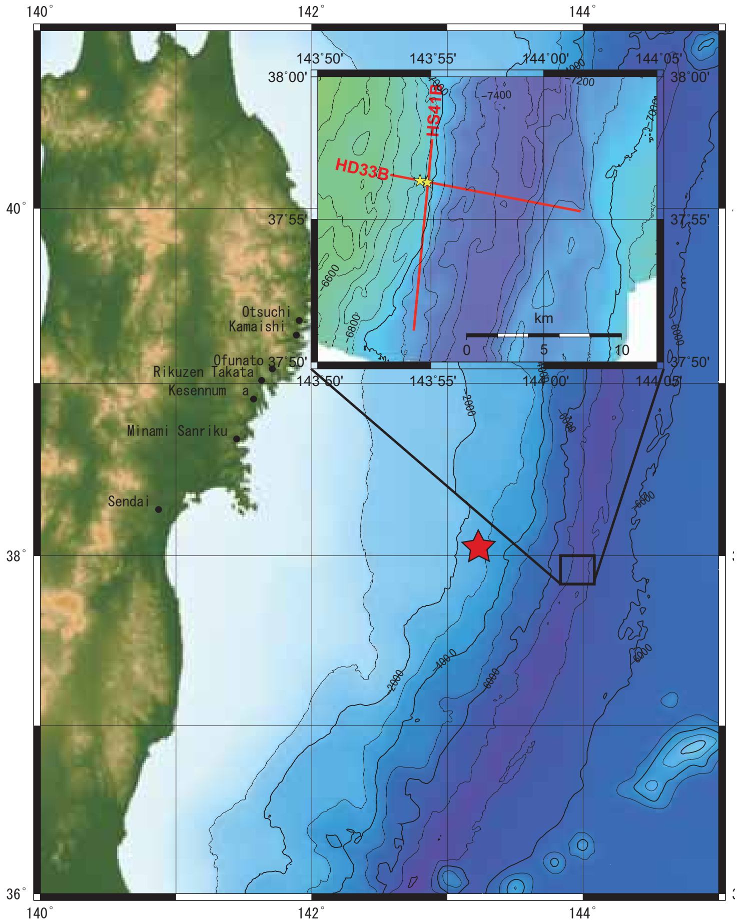
Table 1-Appendix 7. Supply Boat Spec.

RRD		KAIKO	KAIYU
Class	Classification	NK	NK
	Ice Class		
	Navigation Limit	Major Coastal, International(A3)	Major Coastal, International (A3)
	Built Year	1991 October	2005 March
Dimension	Length	65.90m	62.40m
	Breadth Moulded	14.50m	14.00m
	Depth Moulded	7.13m	6.00m
	Draught	5.85m	5.00m
	Gross Tonnage	1,460t	1,292t
	Dead weight		
Capacity	Fuel Oil	761.05m^3	957.38m^3
	Fresh Water	424.92m^3	409.11m^3
	Drill Water	588.17m^3	431.12m^3
	Deck Cargo	800ton	312t
	Deck Space	385.2m^2	310.5m^2
	Bulk Tank	229.20m^3	140m^3
	Crew	15	15
	Passenger	21	25

Appendix 8. IODP Expedition 343 “JFAST” Logistics Map

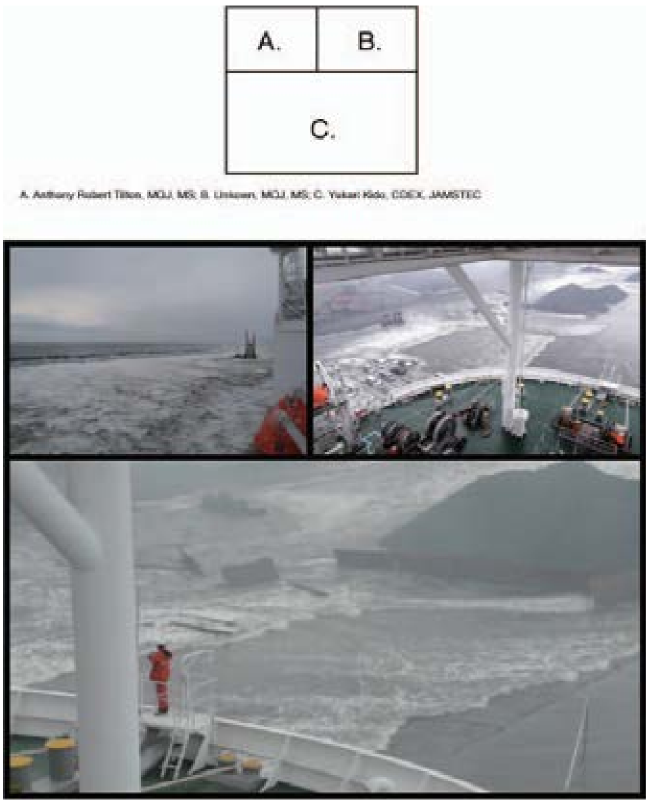


A Shimizu Port
Before Expedition 343, Chikyu will be stand-by and loading material and equipment alongside the Shimizu Port.
And after the expedition finish, Chikyu will be back to the Shimizu Port.



B Tohoku Region and epicenter of Tohoku earthquake along with the servey lines and the proposed drilled sites (modified from Exp.343 Scientific Prospectus).

Figure1-Appendix 8. Logistics map.



CDEX TECHNICAL REPORT Volume 16

Drilling Completion Report

Japan Trench Fast Earthwuake Drilling Project (JFAST)

Expedition 343

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