report

ERMS

Environmental Risk Management System

Program participants: - Agip - Conoco Phillips - Exxon Mobil - Hydro - Petrobras - Shell - Statoil - Total

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ERMS Report no. 2

ERMS Field Trial during production drilling at Sleipner Vest Alfa Nord. September 2003. Cruice report.

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SINTEF

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SINTEF REPORT

TITLE

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ERMS Field Trials during production drilling At Sleipner Vest Alfa Nord, September 2003

Cruise report

AUTHOR(S)

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CLIENT(S)

ConocoPhillips, Eni, ExxonMobil, Hydro, Petrobras, Shell, Statoil, Total

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ABSTRACT

A field trial has been carried out as a part of the ERMS project (ERMS = Environment Risk and Management System). The purpose of the ERMS project is to develop tools for evaluating impacts from discharges of drill cuttings and mud. It will be achieved through a process including review of literature, establishing criteria for impacts (PNEC's) and finally to develop modules for simulating processes in the sediment deposited (and below).

This report contains the log from the ERMS Field Survey performed in September 2003, with the following objectives:

- To measure the concentrations of particulate matter in the water column from the release of drill cuttings with mud from the drilling rig.
- To measure deposits of drill cuttings/mud on the seabed.

KEYWORDS	ENGLISH	NORWEGIAN
GROUP 1	Environment	Miljø
GROUP 2	Drilling discharges	Utslipp boring
SELECTED BY AUTHOR	Monitoring	Monitorering
	Experiment	Eksperiment

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1 INTRODUCTION

A field trial has been carried out as a part of the ERMS project (*ERMS = Environment Risk and Management System*). The purpose of the ERMS project is to develop tools for evaluating impacts from discharges of drill cuttings and mud. It will be achieved through a process including review of literature, establishing criteria for impacts (PNEC's) and finally to develop modules for simulating processes in the sediment deposited (and below).

This report contains the log from the field activity in 2003. Further reports from this field activity will contain (may be revised):

- a review of the collected field data
- results from the comparison between the data and the model simulations.

2 OBJECTIVES OF FIELD ACTIVITIES

The main objectives of the "ERMS Field Activities 2003 – 2004" project are to provide the field data that are required to

1. Tune the *ParTrack* numerical model with respect to release of cuttings and mud from drilling activities. To accomplish this, a field experiment will be conducted during the summer 2003, comprising monitoring and sampling of drill cuttings and mud from the drilling of production wells at the Sleipner Vest Alfa Nord gas/condensate field in the North Sea, see Figure 2.1.
2. Evaluate the influence from cuttings and mud on benthic communities. This will be done by comparing samples to be taken in 2004 with samples obtained on the same location in 2002 and 2003.

The specific objectives of the ERMS Field Survey performed in September 2003 were

- To measure the concentrations of particulate matter in the water column from the release of drill cuttings with mud from the drilling rig.
- To measure deposits of drill cuttings/mud on the seabed.

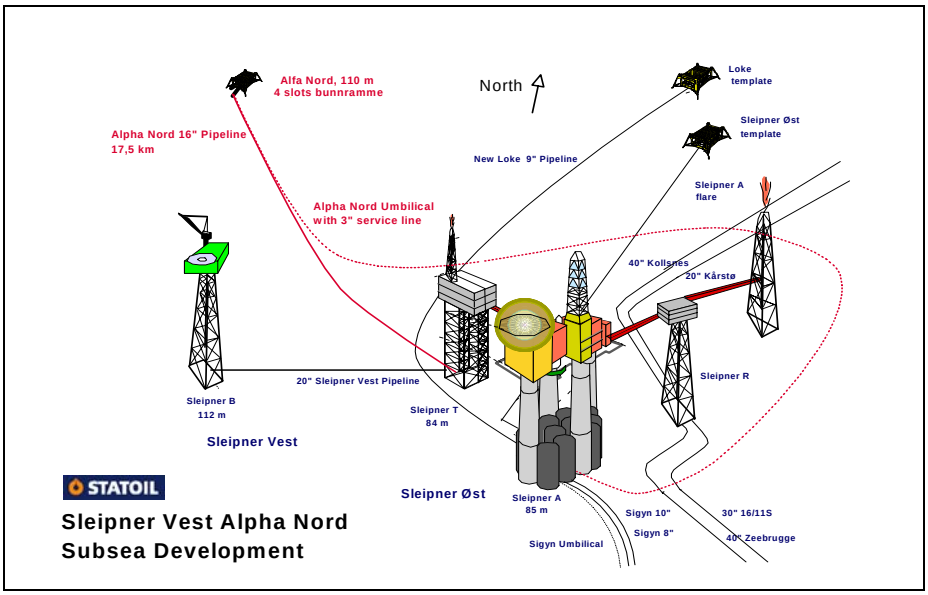


Figure 2.1 Experiment area for the ERMS field activity at Alfa Nord in upper left corner.

3 OPERATIONS SUMMARY

Originally the field survey was expected to last for 5 days, including transit to the site and back to harbour after ended operations. Some problems during the preparations prior to drilling of the 17" section lead to some delays, and the POLARBAS hence used 7 days from mobilization in Bergen until it was back again.

An overview of the timeline for the field activities is given in Table 3.1 below. For details regarding the different activities we refer to the log entries from the drilling rig and the vessel, Appendices A and B, respectively.

Table 3.1 ERMS Field activities, September 2003 on the Sleipner Vest Alfa Nord

September 2003	**Thurs**	**Fri**	**Satur**	**Sun**	**Mon**	**Tues**	**Wedn.**	**Thurs**
Activity	**Sept. 4**	**Sept. 5**	**Sept. 6**	**Sept. 7**	**Sept. 8**	**Sept. 9**	**Sept. 10**	**Sept. 11**
Mob. (POLARBAS, Transocean Searcher)	x x							
Deploy rigs (current, shell)		x						
Baseline activities		xxx	xxxxxxxxxx					
Rhodamin releases				xx	xx			
Discharges drill cuttings, mud						xxxxxxx	xxxxxxxxxx	xxxxxxxxxx
ROV monitoring				xx	xx	xx		
Sampling in water column						xxxxxxxx	xxxxxxxx	
Sediment samples		xx	xxxxxxx				xxx	
Turbidity measurements						xxxxxxxx	xx x x	
Left Sleipner Vest Alfa Nord							x	
Demob Bergen								x

4 FIELD ACTIVITIES

4.1 Decision to start field activity

When the decision was made to coordinate the ERMS field survey with the production drilling program on the Sleipner Vest Alfa Nord, the expected time for the survey was prior to July 2003. After rearranging the time schedule for the drilling rig, Transocean Searcher arrived on site early August. Soon after this, SINTEF received updates of the activities on the rig day by day.

The nature of the drilling program is that all the activities are included, and the most optimistic time schedule for each activity is prepared. Since the time schedule is worked out without any slack, all delays will directly influence on the overall time schedule. This implies that the time schedule changes all the time, which made the planning of the survey and charter of the expedition vessel more complicated.

After close communications with (and advice from) the Statoil production drilling division in Stavanger, the decision was made to mobilize the vessel in Bergen on Tuesday, September 2. Due to further changes of the drilling program, the survey started in Bergen two days later, on Thursday, September 4.

4.2 Mobilization

Vessel (POLARBAS)
Two SINTEF representatives, Alf G. Melbye and Lasse Darell, in addition to Oddmund Isaksen (Akvaplan-niva) and Harald Berland (Akvamiljø) mobilized on board POLARBAS at Tollboden in Bergen harbor. During mobilization, all equipment necessary for sampling and monitoring was loaded on board, and necessary storage conditions for live shells were initiated. A safety exercise was performed immediately after departure.

Drilling rig Transocean Searcher
Two SINTEF representatives, Henrik Rye and Hans V. Jensen, were to operate from the drilling rig. They mobilized on the same day as POLARBAS, by one of the regular helicopter flights to the rig. This gave time on board the drilling rig to inform about the sampling and monitoring program before POLARBAS arrived, and to get the necessary approvals for operations inside the safety area 500 m around the bottom template. The template is indicated in Figure 4.1.

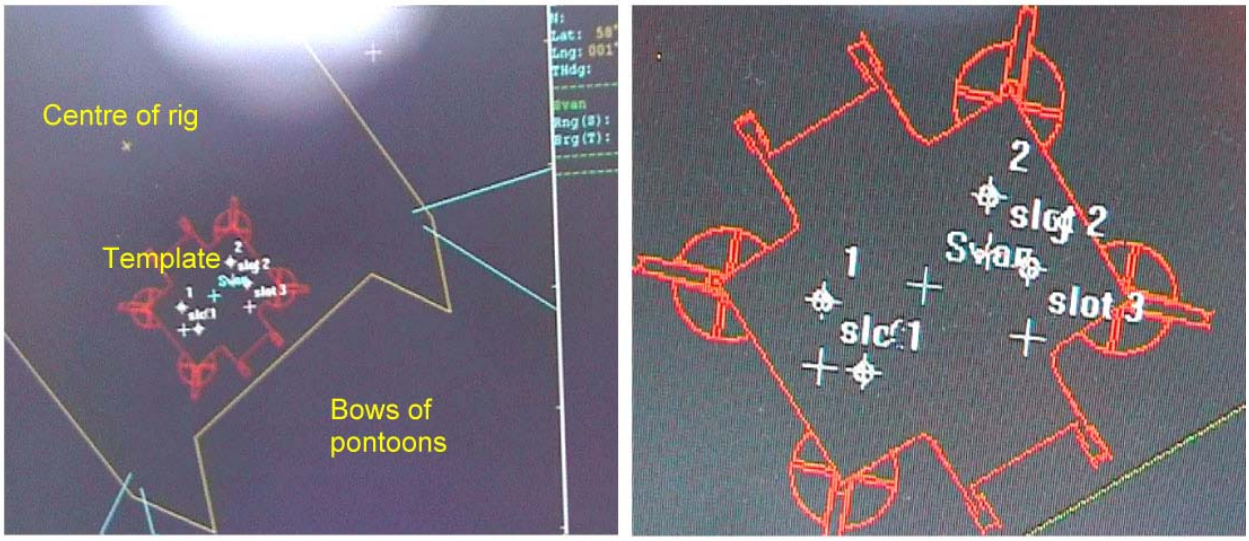


Figure 4.1 *The bottom template seen on the navigation monitor on Transocean Searcher. At left we see the rig is moved off centre to avoid potential template damage in case a heavy object should fall from the moon pool area. At right the slots for the 4 wells are marked.*

4.3 Monitoring rigs deployed from vessel

Rigs for current measurements and exposure of live mussels and sea scallops were deployed near the drilling rig (see Figure 4.2) and at a reference station approx 6 km away from the rig. The rigs were all deployed on Friday, September 5:

<u>Current rig close to TRANSOCEAN SEARCHER</u>

- Current meters at 10, 20 and 60 m depths. Current meter at 10 m online, connected to radio transmitter on buoy. Based on the temperature profiles of the water column, the current meter at 20 m depth was moved to 35 m depth two days later.
- Sediment traps at two upper current meters.
- Turbidity sensors incorporated in the two upper current meters.

Current rig (backup) at reference station
This current rig was a pure backup rig in case there was no data catch from the main current rig. Data from the backup rig has not been analysed.

Biology rigs close to TRANSOCEAN SEARCHER

Rig 1 (outer rig)
- Shell cages at 20, 35 and 100 m

Rig 2 (inner rig)
- Shell cages at 10, 20 and 40 m

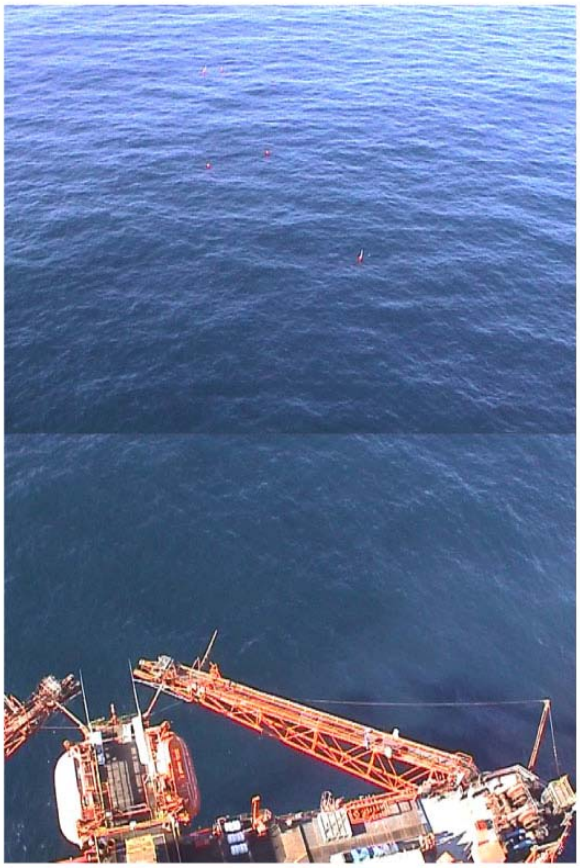


Figure 4.2
Current rig closest, shell rigs behind, all fairly close behind the drilling rig.
Photos from top of derrick.

Regarding positions
When comparing positions from the GPS on board POLARBAS with positions referred by Statoil for the bottom template, there was clearly a discrepancy, probably in the order of 200 – 300 m, which is not acceptable. One of the main sources for this problem is probably the use of coordinates from different geodetic references like for instance
- European Datum 1954 (old Norwegian sea maps)
- WGS 84 (World Geodetic System 1984)
- ETRS89 (European geodetic datum)

without transforming the coordinates. This has to be sorted out, especially before the field activity in 2004.

4.4 Baseline study

The baseline study was conducted by sampling of sediment for chemical and biological analysis. Sampling of sediment was performed using two different sediment samplers: long-armed van Veen grab and a multicorer, see figure in Section 4.10. The van Veen grab is ideal for sampling of sediment for biological samples, however, is burdened by disturbance of the micro layer of fines on top of the bottom sediment during sampling. The multi-corer is not suitable for sampling for biological analysis (small-volume samples), but gives non-disturbed sediment samples.

Sampling of sediment using long-armed van Veen grab was conducted both prior to and after discharge of drilling mud. Sampling of sediment using multicorer was conducted only prior to discharge of drilling mud. It must be noted that drilling mud has been discharged in this area before this cruise, and that the bottom sediments already was affected by the discharges at our arrival.

Samples for biology, represented by the whole content of the van Veen grab, were obtained through 5 replicates, sifted, conserved and bottled for shipment. Samples for chemical analysis were taken out from a separate grab (one replicate of upper 5 cm for analysis of metals, grain size distribution and organic chemical analysis, respectively).

Samples for chemical analysis from multicorer samples were taken out as the upper 1 cm cross-section, for analysis of metals. In addition to the upper 1 cm cross-section, the 10 cm water-column above sediment in the core-sample was collected, to include the fines distributed from the sediment to the water column during sampling and sample handling. The samples for chemical analysis were labeled and stored in a deep-freezer on board POLARBAS.

4.5 Monitoring of turbidity during drilling releases

In situ monitoring of the particulate matter dispersed in the water column was conducted from POLARBAS using a turbidity sensor, interfaced to a CTD (conductivity/temperature/depth) instrument. Turbidity, measured as FTU, was logged in transects at various distances from the discharge point, both in close proximity to the rig (see Figure 4.3), and at various distances from 90 to 1000 meters away from the discharge point.

The limitation for on-line turbidity measurements in transects, was approx. 20 m, due to limited cable length. It was however, possible to measure depth profiles off-line down to the seafloor.

Figure 4.3 POLARBAS close to drilling rig during release of drill cuttings/mud, observing increased turbidity both from on board instrument and from turbidity sensor on current rig (float in upper left corner).

4.6 Rhodamin releases

Included in the planned preparations on site was a Rhodamin release to rehearse the sampling and monitoring activities prior to the discharges of drill cuttings with mud attached.

Due to delays in the drilling activities, two Rhodamin releases could be performed. The Rhodamin was released in the shaker room, in the same pit as the drill cuttings are guided from the shakers. During the releases, water was flushed into the pit to assure a fairly steady flow of Rhodamin to the discharge point, which was located 5 m below the sea surface, see Figure 4.4.

Figure 4.4 Rhodamin released through thinner pipe 5 m below surface(left), Rhodamin plume seen from Deck 11(Upper Deck) all the way to POLARBAS (right).

The Rhodamin (see MSDS in Appendix D) had too high a viscosity for the metering pump brought on board for this purpose. As a replacement, a fixed volume of Rhodamin was prepared for each release, and one cup was released per full minute. The average flow rates for the two releases were as follows:

Rhodamin release 1: September 7, start 1516, stop 1554. Average flow rate 0,240 l/min.
Rhodamin release 2: September 8, start 0905, stop 0959. Average flow rate 0,234 l/min.

During both releases, turbidity was measured and water samples were taken from POLARBAS. The vessel was partially guided by a person observing the plume visually from the top of the drilling rig derrick 80 m above sea level. An ROV from the drilling rig was also used to perform underwater observations at the release point close to the riser.

In situ monitoring of the Rhodamin concentrations in the water masses was conducted from POLARBAS using a UV Fluorometer, interfaced to a CTD (conductivity/temperature/depth) instrument. Concentration of Rhodamin was logged in transects at various distances from the discharge point:

- Release 1: 170 m, 200 m, 335 m, 540 m, 575 m, 700 m and 1100 m
- Release 2: 320 m, 750 m, 1000 – 2130 m.

Due to limited cable length, the limitation for on-line Rhodamin measurements in transects was approximately 20 m water depth . It was however, possible to measure depth profiles off-line down to the seafloor.

4.7 Discharges of drill cuttings/mud, sampling and monitoring

In total three (possibly four) wells were to be drilled from the same bottom template. During the measurement period, four sections were drilled with water based mud (WBM). The discharges from the drilling rig took place at:

- 1st well, 17 ½" section: 9. Sept. 0930 – 12. Sept. 0900
- 1st well, 12/ ¼" section: 16. Sept. 0400 – 18. Sept. 0600
- 2nd well, 17 ½" section: 26 Sept. 0900 – 1. Oct. 0145
- 2nd well, 12 ¼" section: 6. Oct. 0300 – 13. Oct. 1100.

Due to some leakage problems when pressure testing the first drilling well, it was decided to start drilling the next well instead. Similar problems occurred when pressure testing this well too, and during a few hectic hours it was very uncertain whether the drilling of the 17 ½" sections could start at all.

The decision was made to continue, and the discharges of drill cuttings started in the morning on Tuesday, September 9. The ROV was in place and could record video from the start of the releases. POLARBAS was partly guided from the top of the derrick, based on visual observations, see Figure 4.5.

Samples of the drill cuttings were taken at the shaker, while samples of newly mixed mud were taken before it was blended with used mud.

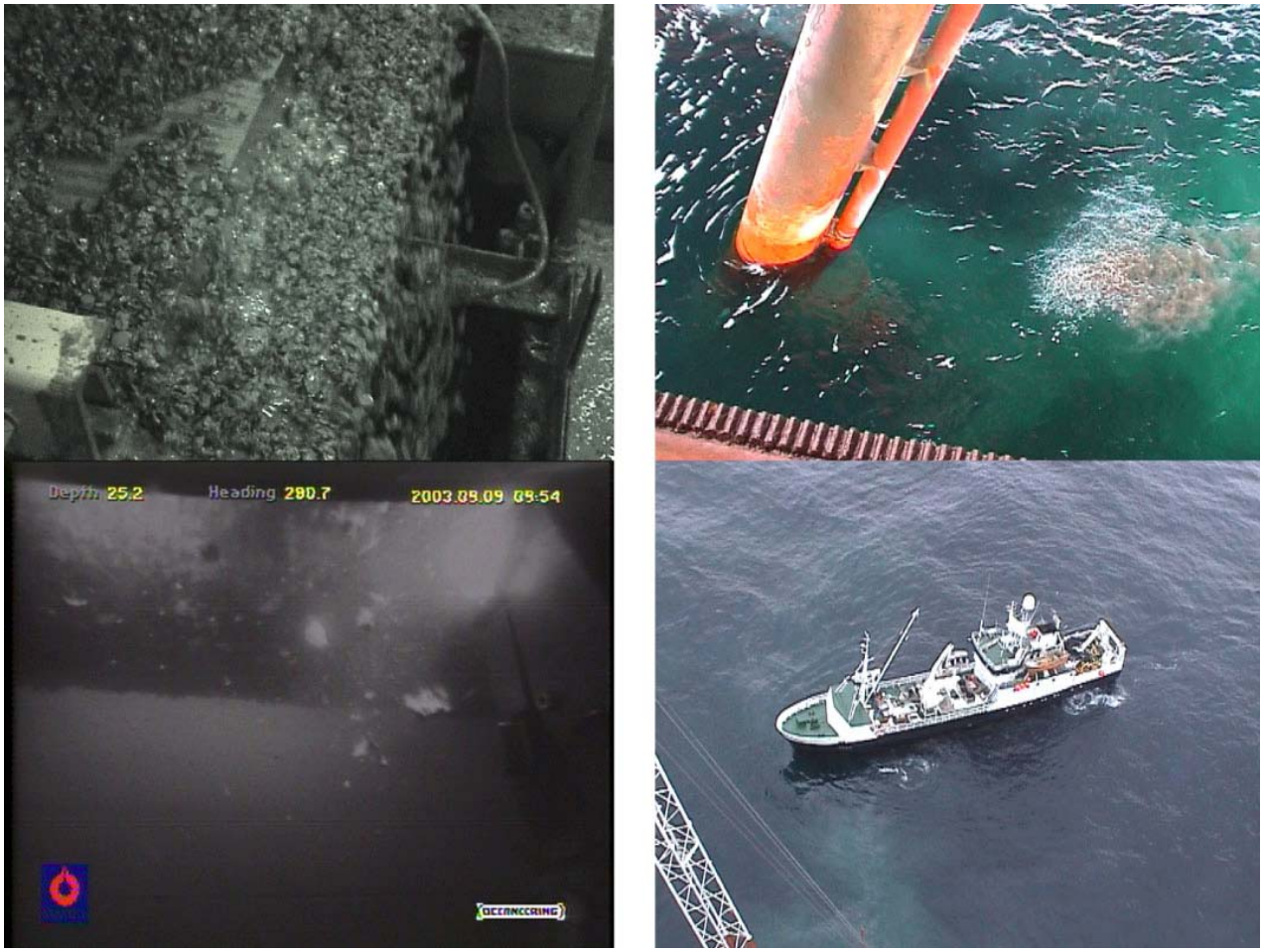


Figure 4.5 Photo from shaker (upper left), discharge seen from moon pool (upper right), ROV at the start of releases from drilling the 17.5" section (lower left), POLARBAS guided into the plume close to the drilling rig (lower right).

4.8 Demobilization

After finalizing the monitoring program in the afternoon on Wednesday, September 10, the two SINTEF representatives were transferred to POLARBAS by basket to the standby vessel, and then with a MOB boat to POLARBAS. Immediately after this, the vessel sailed back to Bergen for demob. In the evening a debrief was held on the POLARBAS.

4.9 Recovery of current rigs

All the deployed rigs were left on site when the sampling and monitoring was ended on Wednesday September 10. The drilling progress updates were closely followed day by day to find out when the right time would be to recover the sensors. A combination of bad weather forecast, activities on the drilling rig, and some damage on the surface current meter at the drilling rig made the decision easy to recover the current rigs after approximately 4 weeks of operation. This was performed by another, smaller vessel during excellent weather conditions, and the operation was performed without any problems.

The shell rigs from Akvamiljø were recovered about a week later by a supply vessel. Akvamiljø reported that also this operation was performed without any problems.

4.10 Equipment used for sampling and monitoring

Sediment sampling

Sediment samples were collected using two different samplers; A multicorer and a van Veen grab (Figure 4.6). The samplers were operated by winch, and samples retrieved were transferred to dedicated sample storage containers and stored in deep freezer until demobilization and transport to the laboratory.

Figure 4.6. Multicorer (left) and van Veen grab (right) used for sediment sampling

Water sampling
Water samples were collected using a submerged pump. Whole water samples were pumped directly into pre-washed 10-L containers. Samples for filtering were collected in a retention vessel prior to filtering.

Water samples were filtered using a two-step filtering approach. First the seawater was pre-filtered through a semi-course paper-filter and then through a 0.2 µm filter cartridge. Suction through the system was maintained by a vacuum pump. Figure 4.7 shows the filter rig.

Figure 4.7. The filter rig. Sea water in the retention tank was filtered through a pre-filter (filter holder seen on the left) and then through a fine filter (0.2 µm) cartridge seen as a white cartridge on deck (behind the blue hose).

CTD-profiling of the water column
Profiling the water column with respect to salinity, temperature and turbidity was performed using a CTD from SAIV (model SD204), equipped with a turbidity sensor from Seapoint Sensors Inc. Figure 4.8 shows the CTD sensor.

Figure 4.8. SAIV CTD with turbidity sensor.

Monitoring Rhodamin concentrations in the water column

Rhodamin in the water column was monitored using the SAIV CTD equipped with a Rhodamin fluorometer from Seapoint Sensors Inc. Monitoring was performed by towing the real-time sensor at low speed in transects through the plume at different distances from the discharge point.

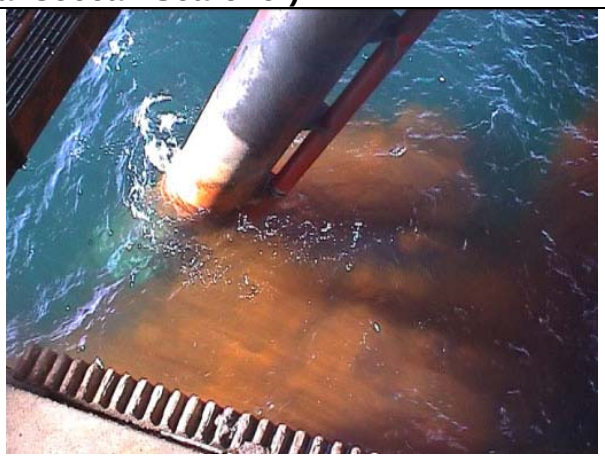
APPENDIX A – LOG DRILLING RIG TRANSOCEAN SEARCHER

This log is partly based on the notes from the SINTEF representatives on board the Transocean Searcher (Henrik Rye and Hans V. Jensen)

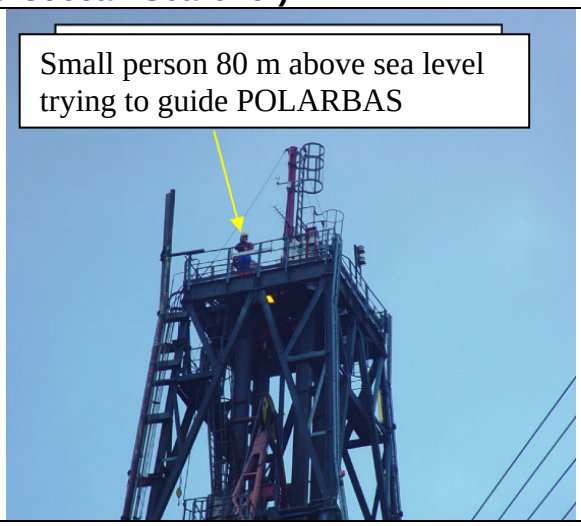
Date, hhmm	Comment (Transocean Searcher)
Thursday 4 Sept.	
1600	At Sola heliport, waiting for transportation to TO Searcher.
2100	Arrived on rig. Short intro on the bridge by chief of staff Eliassen, safety video and safety instructions at the lifeboat station.
Friday 5 Sept.	
0730	Safety exercise/drill for all personnel, audit from land. Nice weather conditions.
0830	Sat. phone from Alf at POLARBAS. On its way out, ETA around lunchtime.
0850	Short visit to the Statoil representative Nilo Erdal, busy. Advised to contact platform manager Kjell Engen.
1040	After waiting for some time, meeting with Kjell Engen and Nilo Erdal. SINTEF personnel inform about our activities, and asking for information and permissions we need to perform our objectives. We want to deploy current rigs and rigs with muscles very close to the rig, hopefully to register seawater contaminated by drilling mud. Totally 8 anchor chains are distributed around the rig, all some 1500 m out from the template. These anchor chains have a high tension, and touchdown at the seabed is 300 – 400 m out. The rigs for current and biology will have to be deployed in between the anchor chains, and we have to keep in mind that the TO Searcher will be pulled more than 50 m backwards during the operations.
1115	Visit at the TO Searcher control room. Various information both ways. We will need new work permit every day for the using video camera outdoors, and also fro using a metering pump for release of Rhodamin.
1130	New contact from POLARBAS, they are now some 6 nm. from the site.
1245	VHF contact with POLARBAS, they are on site. They will start at ALFA N. Ref. 14 station with deployment of backup current rig and biology rig.
1340	Contacted toolpusher (boresjef), Lorentsen, regarding the planned release of Rhodamin.
1500	Faxed figure of anchor chain distribution to POLARBAS. Later discussed positioning of rigs over radio with the cruise leader (Alf).
1520	Moved TO Searcher 25 m aft “off position”.
1545	POLARBAS has got the “go” to deploy rigs close to TO Searcher.
1605	POLARBAS 1000 m from TO Searcher. Preparing deployment. Will deploy rigs and then tow them into pre determined position.
1624	POLARBAS requested permission to enter 500 m zone, ok from “Searcher control”.
1735	Deployed biology rig No. 2.
1800	Deployed biology rig No. 3.
1826	Discussing baseline activities with POLARBAS. It takes more time than expected, chemistry samples will have priority. Some uncertainties

Date, hhmm	Comment (Transocean Searcher)
	about accurate positions. Can we on board TO Searcher convert from UTM coordinates into lat/long?
1940	Transferred Rhodamin from vessel to rig.
2200	Contact POLARBAS. The crew has only one shift, and they have called it a day without finishing the first sampling station. Will start 0800 tomorrow.
Saturday 6 Sept.	
0745	Contact POLARBAS. Last night got very fine layer on top of the core sampler. Would have been lost if sampling with a grab. Did not take bio samples. Agreed to sample the 8 closest stations first (125 and 250 m). Rhodamin release is at the moment 2. priority.
0920	Transferred by VHF positions for 125 and 250 m stations.
1045	Discussions about positions. Apparently something is incorrect when POLARBAS tries to use positions worked out from positions on the TO Searcher. Different map conventions?
1227	Back on bridge after visiting Geo-services and control room. At Geoservices requesting following samples: 1. New mud prepared to supplement existing batch. 2. a) Drill cuttings with mud attached, b) mud after shaker. First set of samples 1-2 hrs. after start drilling the 17" section. Second set of samples 12 – 24 hrs, after the first one. Important to label and conserve samples to assume correct analysis at SINTEF lab.
1228	POLARBAS has finished 6 out of 8 stations, good progress.
1315	POLARBAS finished chemical sampling. Requesting CTD transect.
1558	POLARBAS has been very close (125 m) in position towards S, bio sampling seabed. Transocean Searcher (TOS) soon to be moved 25 m to the rear (NW-ly) to relocate to new well (No. 3 instead of 1) due to leakage at testing when pressure testing the well. Implies delay, possibly 12 hrs.
1945	Guided tour with the toolpusher, Bjørn Lorentzen. He was very helpful, explaining about the drilling operations, flowlines for mud, drill cuttings and so on, and to show where the release of cuttings would hit the sea. The release point turned out to be some 5 m below water level, at a diagonal column or cross brace (skråstag), diameter approximately 16". Outlet opening directed vertically downwards. Potential batch releses from 1-2 m^3 sump, from which hatches can be open to each shaker individually. Batch releases whenever shaker capacity cannot cope with cuttings/mud flowrate, or rather when the product does not flow properly. Estimated rate when drilling the 17 ½" section is about 30 m/hour penetrating downwards.
2058	TOS moved to well No. 3.
2056	Turbidity sensor at POLARBAS works online down to 25 m, will be used to locate consentrations of particulate matter close to the surface. Recordings from current meter at the surface is communicated over VHF from POLARBAS, during the last tide the maximum curretn speed was < 20 cm/s.
2100	CTD profile was taken. It turned out that the water stratification was weak close to the surface. In fact, the water was approximately

Date, hhmm	Comment (Transocean Searcher)
	homogeneous down to at least 30 m. Combined with the new information that the discharge did NOT took place from the derrick level of the drilling rig, but rather from 5 m depth, it was decided to run the *ParTrack* model (which was brought along on a laptop) to estimate the expected layer of trapping for the expected discharge of drill cuttings and mud. Such a calculation gave a layer of trapping between 30 and 40 m depth, rather than the depth interval within the upper 10 m which was anticipated prior to the field trial. It was therefore decided to change the depths of the recording instruments for the locations closest to the drilling rig.
Sunday 7. Sept.	
0400	Request from rig to use some Rhodamin to check potential leakage during pressure testing of well No. 3.
0745	Contact POLARBAS. Current meters at 10, 20 and 60 m depth. Turbidity sensor at 10 and 20 m. Sediment traps at 10 and 60 m. Radio transmission of surface current and turbidity to POLARBAS.
0810	SINTEF personnel attending safety meeting: results from safety audit, new system for chemicals on board, fracturing tests planned by Statoil, info from SINTEF about our sampling program.
0921	Lasse: Relocating current meters includes risk to damage cable to transmitter at surface.
1030	POLARBAS changing current meter depths, from 10, 20 and 60 m, to be at 10, 35 and 60 m. The reason is due to the position of the thermocline, which is located deeper than expected beforehand. In addition, the discharge is taken place at 5 m depth instead of from the derrick above the sea surface.
1200	Permission to operate metering pump for Rhodamin in shaker room. Moved Rhodamin and pump to shaker room. Also permission from Ivar Singsaas to extend the measurement period beyond the time allowed for the field trial according to the budgets. The reason for the delay is unexpected delays in the drilling program on Transocean Searcher.
1400	Henrik enters the ROV room for ROV recordings during Rhodamin release.
1516-1554	Rhodamin release from shaker room. Difficult to make the metering pump work, has poured a cup of Rhodamin in the shaker trench per minute. ROV at discharge point. Recordings of the Rhodamin plume at the riser. Observe Rhodamin down to 20 m depth. At 1527 ocean currents are observed to be 3- 4 cm/s at 10 m depth, which are weak currents (Direction is 10 deg, NNE).

Date, hhmm	Comment (Transocean Searcher)
	 Photo from moon pool right after Rhodamin release finished, outlet from the thinner pipe 5 m below surface.  From main deck level right after Rhodamin release. Rhodamin should be seen all the way to the POLARBAS.
	Hans climbed to top of derrick to video and guide POLARBAS visually, down again at 1745.  Photo from top of derrick, the Rhodamin should be seen all the way to the POLARBAS.
2100	Stops for the day after communications with POLARBAS.
Monday 8 Sept.	
0800	Communication with POLARBAS. Planning a second release of Rhodamin. Info from Statoil indicates serious trouble with the drilling program. We decide to carry out a second Rhodamin trial while we

Date, hhmm	Comment (Transocean Searcher)
	await the situation.
0905-0959	Second release of Rhodamin. Henrik goes to Oceaneering container at 0820 to prepare for the ROV recordings. Observe leakage from effluent pipe. This results into two plumes, one for the leakage (at the sea surface) and one for the discharge through the outlet opening.
	Hans in derrick: Wind in other direction than current, this makes tracking the drift visually more difficult. Drift towards SE direction, cannot see Rhodamin very far, drift pattern and sun makes visual observations difficult. Henrik talks with mud ingeniør (Tom Nordby). Explains details of the shaker arrangement and amounts/rates typically discharged. Attachments to cuttings are typically 20 %.
1347	POLARBAS finished sampling Rhodamin release. Discussing sampling program during the drilling coming up. TOS personnel expects starting of drilling tonight.
1924	POLARBAS has taken a new CTD sample, thermocline at same depth as yesterday, 35 – 40 m. Will not sample until tomorrow morning.
Tuesday 9 Sept.	
0700	Contact POLARBAS, drilling not started yet.
0800	TOS expecting start drilling around 0900. Henrik will be in the Oceaneering container to observe release from ROV. Winds observed to be very low (2.3 m/s).
0842	Henrik can see release of cement (concrete). Will be a new leakage test before starting to drill.
0939	Release expected in some 15 min. Currents in 10 m depth observed to be weak (5.8 cm/s, direction 64 deg).
0959	ROV camera shows a cloud from the release at 15 – 30 m depth at riser.
1010	ROV at 60 m depth, Henrik wants a CTD measurement. Some traces of discharges observed down to 40 – 50 m depth ?
1024	Hans has brief phone call to inform ERMS coordinator about start release from drilling.
1033	ROV gets lost in the discharge. No sight. ROV runs aground at some columns of the drilling rig. Lost position. Takes time to get loose again. No new ROV observations before at about 1400. Further, restrictions were imposed not to run the ROV inside cloud area.
1131	Hans waiting for permit to climb in derrick (3- 4 signatures are needed). POLARBAS reports turbidity is very high close to TOS.
1220	No drilling is reported.
1300	Hans on top of derrick, trying to guide POLARBAS visually. Drilling is reported to take place at 1310. Currents are strong, of order 20 cm/s, direction 211 deg.

Date, hhmm	Comment (Transocean Searcher)
1324	
1345	POLARBAS sampling water. Henrik in contact with Ivar Singsaas. He encouraged us to continue the measurements due to the opportunity there and then. Extra costs would be covered, either by changes in existing budgets or by other means ? He had received accept for this (and even recommendations ?) from the oil companies.
1349	POLARBAS about 580 m from TOS.
1359	The drilling is starting and stopping as the next length of drill string is connected and drilled. The plume seems to be 1-2 boat lengths (50 – 100 m) wide.
1420	Hans climbs down from derrick for lunch. New ROV recordings, but these are now restricted to outside the cloudy areas only. At riser 1410. Try to catch pictures from below the cloud area. Presence of flocculated matter ?? Good pictures catched at 1500 – 1515.
1522	Hans in derrick again. POLARBAS 250 m out, takes water samples, thereafter out to 1000 m station. Cannot see anything visually further out than POLARBAS due to sun.
1553	POLARBAS moves further out.
1652	More mud plume out from port side of TOS and rearwards (towards NE). Lasse reports increased turbidity on sensor positioned on current rig to N of TOS.
1729	Plume drifting slowly towards NNE, can see plume visually some 150 m out.
1900	Hans down from derrick, video from changing drill string length, shaker room etc. Henrik observes a lot of leakages from the discharge arrangement (producing two plumes).
2100	Contact POLARBAS regarding plan for tomorrow. Mud engineer claims that there has been no batch releases from the shaker area today.
Wednes-day 10 Sept.	
0700	Contact POLARBAS. Suggesting to map turbidity. Also plans for ROV measurements down on the sea floor. In addition, some sampling of bottom sediment towards S and N (prevailing ocean current directions).
0825	Henrik receives sample of cuttings that has remained on the top of the ROV structure (apparently dried during the night). ROV leaves cage. At riser. Trouble with maneuvring due to strong currents. Down to the sea

Date, hhmm	Comment (Transocean Searcher)
	floor. Attempts to record deposition on the sea floor. A lot of fish (which are attracted by the light from the ROV). Difficult to get good pictures.
0930	Hans in derrick again for visual observations. ROV recordings terminated at about 1000. Receives copies of the ROV recordings from Oceaneering.
1130	Down again from derrick. Hans guided POLARBAS at the NE side of TOS, POLARBAS just moved to position 125 m out from helicopter platform (E or SE of rig).
1300	Visiting mud engineer. He confirms that he will send us the samples from the shaker (mud, cuttings) and also samples of the mixture of the unused chemicals.
1330	Visiting Geo-services. They demonstrate that the cuttings collected from the top of the ROV contains a white/gray layer outside the cuttings particles. This layer remains from the mud used and has not been washed away by the sea water.
1415	Last wind observation performed on the drilling rig: 2.7 m/s (nice, sunny weather with almost no wind). – Very nice condition for Hans and Henrik to be moved with a basket over to POLARBAS.
1430	Visit to Statoil representative, platform manager, toolpusher to thank for the hospitality and good help. Since the weather was excellent, Hans and Henrik got the permission to be transferred to POLARBAS.
1600-1700	Transfer by basket via standby vessel to POLARBAS. POLARBAS heading for Bergen.
2120	Debrief on POLARBAS. - Henrik informs about the ROV work - Lasse Darell explains about the deployment of current rigs. Positions are a mess as always. i) Often UTM coordinates are used, ii) <old Norwegian sea maps are referring to European Datum 1954, and iii) there is WGS 84. The problem we had was that the positions referred by Statoil for the template very clearly did not match the coordinates on the POLARBAS GPS. The differences seemed to be in the order of 200 – 300 m, which is of course far from acceptable. - Oddmund Isaksen referred that the multi-corer worked very well. He had obtained 12 x 5 = 60 bio samples (8 before drilling discharges, 4 after). Probably a good idea to analyze some of the samples. - Harald Berland mentioned that it was a lot of work to deploy the rigs with biosensors (blue mussels and sea scallops). On the two rigs close to TOS the shells were located at 10, 20 and 40 m depth, and at 10, 35 and 100 m, respectively. At the reference station 5 km out, the shells were deployed at 10, 20 and 100 m depth. Totally about 560 specimen (blue mussels and sea scallops) each. Each net has 18 compartments, of which 15 were used. The sizes of the specimen were 80 – 120 mm. - Alf was glad we had POLARBAS and not a supply vessel. The vessel is better suite for this kind of work, and the crew has been very helpful and competent. All the crew and the expedition members have contributed, and everything has work well. There was some stress associated with the shells, to keep them alive, to measure all etc… The shell rigs were prepared for the RSW (Refrigerated Sea Water) tanks, then the deployment was quick and easy. These tanks are used for storing catches (herring, mackerel …) for human

Date, hhmm	Comment (Transocean Searcher)
	consumption, and a supply vessel will not have such facilities. The multi-corer is heavy, but functioned well (4 plexiglass cylinders provide one sample each). Most times 3 out of 4 samples were ok. CTD profiles were taken when requested by Henrik. The thermocline was down about 10 m today by the way. The Rhodamin release was sampled out to approximately 2300 m from TOS. The reference for the various measurements and samples is the time, which is noted for all measurements and samples. Water samples were taken at pre-decided positions. Water was also sampled when measuring turbidity. The sediment traps are at 10 and 60 m depth, respectively. - Finally there was some discussion about the recovery of current rigs and shell rigs, when and how, which vessel, personnel. This will be organized by SINTEF Fisheries/Aquaculture division.
Thursday 11 Sept.	
0930	POLARBAS arrives Bergen harbour. Henrik and Hans leave for the airport right away, while the others are unloading and preparing their gear for transportation.
~1100	POLARBAS unloaded, and expedition members disembarked the vessel. End of charter.

APPENDIX B – LOG CHARTERED VESSEL POLARBAS

Date, hhmm	Comment (POLARBAS)
Thursday 4 Sept.	
1200 -1600	Mobilisation on board POLARBAS at Tollboden in Bergen Loading of equipment
1600	Departure from Tollboden: The following scientific personnel joined the cruise: Alf G. Melbye, SINTEF Applied Chemistry – cruise leader Lasse Darell, SINTEF Fisheries and Aquaculture Oddmund Isaksen, Akvaplan-niva Harald Berland, Akvamiljø
1630-1700	Safety exercise/drill for all scientific personnel
1700-2000	Preparation of seawater tanks on board POLARBAS to accommodate living shells Placement of shells in dedicated shell cages and initial measure of lengths of individual shells Storage of shell cages in seawater tanks, with continuous water flow
Friday 5 Sept.	
0830	Sat. phone with Hans at TRANSOCEAN SEARCHER. Status information and co-ordinates exchanged
1215	New sat. phone with Hans at TRANSOCEAN SEARCHER. Was informed: • VHF channel 9 is cleared for communication between scientific personnel on POLARBAS and TRANSOCEAN SEARCHER • Standby vessel STRIL HVAL is informed about our planned activities • We are cleared to enter the safety zone, but have to wait until minor movement of TRANSOCEAN SEARCHER is complete • Location of anchor chains (accompanied by a map sent by telefax) • Drilling start planned at 1400 Saturday 6. September • We are cleared to hoist a can of Rhodamin from POLARBAS to TRANSOCEAN SEARCHER by the rig crane
1300-1330	Deployment of reference shell rig at position 58°29’392’’N 01°49’361’’E

Date, hhmm	Comment (POLARBAS)
1335	
1330-1410	Deployment of reference current rig at position 58°29’789’’N 01°49’481’’E
Approx. 1430	Communication with Hans on TRANSOCEAN SEARCHER ; Sediment sampling planned to be performed at distances 125, 250 and 1000 m in four directions from TRANSOCEAN SEARCHER
1615-1650	Current rig deployed 100 m from drilling point at position 58°29’872’’N 01°43’261’’ (between anchor chains 4 and 5)
1710-1730	Unsuccessful deployment of shell rig at 120 m from drilling point. The rope was not of correct length, and the rig was retrieved and rope length adjusted.
1730-1740	Successful deployment of shell rig at 120 m from drilling point at position 58°29’893’’N 01°43’132’’ (between anchor chains 4 and 5)
1740-1800	Deployment of shell rig at 190 m from drilling point at position 58°29’899’’N 01°43’111’’
1813	 Floats for all three rigs close to Transocean Searcher, just after deployment.
1900-2000	Preparation of multicorer and winch arrangement for sediment sampling
2000-2030	Sediment sampling at reference station using multicorer First sampling: 2 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°30’345’’N 01°43’550’’E

Date, hhmm	Comment (POLARBAS)
	Second sampling. 2 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Samples taken out of one of the cores. Position 58°30'350''N 01°43'539''E
Saturday 6 Sept.	
0835-0900	Sediment sampling at station Alfa 1 (250 m) using multicorer. First sampling: 2 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°29'945''N 01°43'420''E Second sampling. 2 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Samples taken out of one of the cores. Position 58°29'937''N 01°43'422''E
0930-0925	Sediment sampling at station Alfa 1 - 125 m using multicorer. First sampling: 2 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°29'873''N 01°43'380''E Second sampling. 2 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Samples taken out of one of the cores. Position 58°29'869''N 01°43'381''E
0927	  Interesting sample from the multi-corer.
0930	
0945-1000	Sediment sampling at station Alfa 8 (250 m) using multicorer. 3 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken

Date, hhmm	Comment (POLARBAS)
	as a one-centimeter layer of the top. Position 58°29'682''N 01°43'319''E
1010-1030	Sediment sampling at station Alfa 8 -125 m using multicorer. 3 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°29'719''N 01°43'320''E
1045-1100	Sediment sampling at station Alfa 5 (250 m) using multicorer. 3 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°29'799''N 01°43'611''E
1130-1150	Sediment sampling at station Alfa 5 - 125 m using multicorer. 3 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°29'804''N 01°43'485''E
1245-1305	Sediment sampling at station Alfa 11 (250 m) using multicorer. 3 of 4 cores successfully retrieved. Identified a white/gray fluffy substance on the sediment surface. The headspace water containing particulate matter was sampled individually. Sediment samples taken as a one-centimeter layer of the top. Position 58°29'835''N 01°43'112''E
-	Sediment sampling at station Alfa 11- 125 m was not performed due to conflict with the anchor chains at this position
1400-2000	Sediment sampling using a long-armed van Veen grab. Grab sampling at the following stations: Alfa 11 (250 m) Alfa 5 (125 m) Alfa 8 (125 m) Alfa 1 (125 m) Reference station All stations sampled by taking 5 grab samples for biological analysis and one grab sample for chemical analysis (one sub sample for grain size distribution and one sub sample for chemical analysis)
2100	CTD profile. Main conclusion on stratification at 35-40 m depth communicated to Henrik on board TRANSOCEAN SEARCHER
Sunday 7 Sept.	
0730-0800	CTD profile. Main conclusion on stratification at 35-40 m depth communicated to Henrik on board TRANSOCEAN SEARCHER Communication with Hans reveals that the discharge is taken place at 5 m depth, in contrast to earlier information about the discharge to take place over deck onboard TRANSOCEAN SEARCHER, also that drilling resulting in discharge is delayed.

Date, hhmm	Comment (POLARBAS)
	The following actions were planned for Sunday 7 September: • Evaluate the need for re-rigging the current rig for lowering the turbidity sensor and sediment traps down to 30-40 m depth • Evaluate corresponding re-rigging on the shell cage rigs • Evaluate the possibility for discharge and monitoring of Rhodamin It was decided that the cruise was to be called off if the discharges was not starting until Tuesday. Henrik and Hans is checking the possibility for postponing the measurements one month
1000-1100	Re-rigging current rig. Current sensors are now at 10, 35 and 60 m depth. The sensor on 10 m depth is giving data in real time New position of current rig. 58°29'846N 01°43'214''E Re-rigging shell cage rig nr. 2 (at approx. 190 m from drilling point) Cages are now at 20, 25 and 100 m depth. New position of shell cage rig: 58°29'914N 01°43'108''E (The shell cages on shell cage rig nr. 2 are positioned at 10, 20 and 40 m depth)
1516-1830	Discharge and monitoring of Rhodamin Direction of plume was predicted by real-time current measurements, and the discharge plume was visually followed by Hans on board TRANSOCEAN SEARCHER. In-situ measurements were performed using a Rhodamin fluorimeter capable of measurements down to approx. 20 m. The measurements were performed by traversing the plume at fixed depths, to obtain good measurements over cross sections of the plume.
Monday 8 Sept.	
0800	Communication with TRANSOCEAN SEARCHER. Planning a second release of Rhodamin. Decided to carry out a second Rhodamin trial while we await the situation.
0905-1350	Discharge and monitoring of Rhodamin Direction of plume was predicted by real-time current measurements, and the discharge plume was visually followed by Hans on board TRANSOCEAN SEARCHER. In-situ measurements were performed using a Rhodamin fluorometer capable of measurements down to approx. 20 m. The measurements were performed by traversing the plume at fixed depths, to obtain good measurements over cross sections of the plume.

Date, hhmm	Comment (POLARBAS)
0938	 Rhodamin plume drifting from drilling rig.
1925	CTD profile taken close to TRANSOCEAN SEARCHER
Tuesday 9 Sept.	
0700	Communication with TRANSOCEAN SEARCHER. Drilling planned started this morning
0950-1230	Initial turbidity measurements in close proximity to the drilling rig
1257	Water sampling (whole water samples and *in situ* filtering of water) Sample 1a taken at 15 m depth. Position 58°29'657''N 01°43'222''E
1303	Water sampling (whole water samples and *in situ* filtering of water) Sample 1b taken at 30 m depth. Position 58°29'647''N 01°43'192''E Radar distance to TRANSOCEAN SEARCHER approx. 200 m
1335	Turbidity measurement Position 58°29'418''N 01°42'839''E
1349	Turbidity measurement Position 58°29'476''N 01°42'992''E
1400	Water sampling (whole water samples and *in situ* filtering of water) Sample 2a taken at 20 m depth. Position 58°29'448''N 01°43'001''E Radar distance to TRANSOCEAN SEARCHER approx. 630 m
1405	Water sampling (whole water samples and *in situ* filtering of water) Sample 2b taken at 30 m depth. Position 58°29'430''N 01°42'928''E Radar distance to TRANSOCEAN SEARCHER approx. 680 m
1512	Turbidity measurement Position 58°29'657''N 01°43'120''E Radar distance to TRANSOCEAN SEARCHER approx. 235 m
1523	Water sampling (whole water samples and *in situ* filtering of water) Sample 3a taken at 15 m depth. Position 58°29'644''N 01°43'087''E Radar distance to TRANSOCEAN SEARCHER approx. 250 m
1529	Water sampling (whole water sample) Sample 3b taken at 10 m depth. Position 58°29'680''N 01°43'113''E Radar distance to TRANSOCEAN SEARCHER approx. 260 m
1534	Water sampling (whole water sample) Sample 3c taken at 30 m depth.

Date, hhmm	Comment (POLARBAS)
	Position 58°29'646''N 01°43'119''E Radar distance to TRANSOCEAN SEARCHER approx. 250 m
1547	Water sampling (*in situ* filtering of water) Sample 3d taken at 30 m depth. Position 58°29'658''N 01°43'122''E Radar distance to TRANSOCEAN SEARCHER approx. 240 m
1625	Water sampling (whole water samples and *in situ* filtering of water) Sample 4a taken at 30 m depth. Position 58°29'328''N 01°42'765''E Radar distance to TRANSOCEAN SEARCHER approx. 1010 m
1630	Water sampling (whole water sample) Sample 4a taken at 20 m depth. Position 58°29'380''N 01°42'795''E Radar distance to TRANSOCEAN SEARCHER approx. 990 m
1638	Water sampling (whole water samples and *in situ* filtering of water) Sample 4a taken at 15 m depth. Position 58°29'337''N 01°42'778''E Radar distance to TRANSOCEAN SEARCHER approx. 990 m
1750	Turbidity measurement Position 58°29'841''N 01°43'350''E Radar distance to TRANSOCEAN SEARCHER approx. 90 m
1800	Water sampling (whole water sample) Sample 5a taken at 30 m depth. Position 58°29'842''N 01°43'356''E Radar distance to TRANSOCEAN SEARCHER approx. 90 m
1805	Water sampling (whole water sample and *in situ* filtering of water) Samples 5b taken at 20 m depth. Position 58°29'845''N 01°43'348''E Radar distance to TRANSOCEAN SEARCHER approx. 90 m
1810	Water sampling (whole water sample) Sample 5c taken at 15 m depth. Position 58°29'831''N 01°43'356''E Radar distance to TRANSOCEAN SEARCHER approx. 90 m
1827	Turbidity measurement Position 58°30'010''N 01°42'657''E Radar distance to TRANSOCEAN SEARCHER approx. 500 m
1835	Water sampling (whole water sample) Sample 6a taken at 30 m depth. Position 58°30'001''N 01°42'699''E Radar distance to TRANSOCEAN SEARCHER approx. 540 m
1840	Water sampling (whole water sample and *in situ* filtering of water) Samples 6b taken at 20 m depth. Position 58°30'014''N 01°42'673''E Radar distance to TRANSOCEAN SEARCHER approx. 540 m
1846	Water sampling (whole water sample and *in situ* filtering of water) Samples 6c taken at 15 m depth. Position 58°30'000''N 01°42'759''E Radar distance to TRANSOCEAN SEARCHER approx. 500 m
1915	Turbidity measurement Position 58°30'246''N 01°43'951''E Radar distance to TRANSOCEAN SEARCHER approx. 1000 m

Date, hhmm	Comment (POLARBAS)
1924	Water sampling (whole water sample) Sample 7a taken at 30 m depth. Position 58°30'257''N 01°43'935''E Radar distance to TRANSOCEAN SEARCHER approx. 1050 m
1931	Water sampling (whole water sample and *in situ* filtering of water) Samples 7b taken at 20 m depth. Position 58°30'263''N 01°43'928''E Radar distance to TRANSOCEAN SEARCHER approx. 1050 m
1936	Water sampling (whole water sample) Sample 7c taken at 15 m depth. Position 58°30'254''N 01°43'938''E Radar distance to TRANSOCEAN SEARCHER approx. 1050 m
Wednesday 10 Sept.	
0849-0921	Tracking turbidity - real time measurement at fixed depths. Circling around the discharge point at different distances
1045	Turbidity measurement Position 58°29'978''N 01°43'705''E Radar distance to TRANSOCEAN SEARCHER approx. 500 m
1102	Water sampling (whole water sample / filter? CHECK!) Sample 8 taken at 15 m depth. Position 58°29'943''N 01°43'704''E Radar distance to TRANSOCEAN SEARCHER approx. 500 m
1125	Water sampling (whole water sample / filter? CHECK!) Sample 9 taken at 15 m depth. Position 58°29'770''N 01°43'461''E Radar distance to TRANSOCEAN SEARCHER approx. 125 m
1143	Water sampling (whole water sample / filter? CHECK!) Sample 10 taken at 15 m depth. Position 58°29'755''N 01°43'597''E Radar distance to TRANSOCEAN SEARCHER approx. 250 m
1116	Turbidity measurement Position 58°29'797''N 01°43'444''E Radar distance to TRANSOCEAN SEARCHER approx. 125 m
1129	Turbidity measurement Position 58°29'767''N 01°43'601''E Radar distance to TRANSOCEAN SEARCHER approx. 250 m
1156-1201	Turbidity measurement reference station Position 58°29'862''N 01°43'170''E
1600-1700	Transfer of Hans and Henrik by basket from TRANSOCEAN SEARCHER

Date, hhmm	Comment (POLARBAS)
	 
1727	Water sampling (whole water sample) Reference station at 15 m depth. Position 58°33'459''N 01°51'117''E
1732	Water sampling (whole water sample) Reference station at 25 m depth. Position 58°33'457''N 01°50'923''E
1800-2100	Sediment sampling using long-armed van Veen grab on stations: Alfa 1 – 125 m Alfa 1 (250 m) Alfa 8 – 125 m Alfa 8 (250 m) All stations sampled by taking 5 grab samples for biological analysis and one grab sample for chemical analysis (one sub sample for grain size distribution and one sub sample for chemical analysis)
Thursday 11 Sept.	
0930	POLARBAS arriving Bergen harbour
~1100	POLARBAS unloaded, and expedition members disembarked the vessel. End of charter.

APPENDIX C – PERSONNEL IN THE FIELD

On board Transocean Searcher (TOS)

Representative	Company	Position/duties
Henrik Rye	SINTEF	Responsible for scientific content of the field trial. Guidance of the ROV recordings. Calculations of discharge with the *ParTrack* model (on Laptop).
Hans V. Jensen	SINTEF	Coordinating logistics, Rhodamin release, visual guiding from derrick

On board POLARBAS

Representative	Company	Position/duties
Alf G. Melbye	SINTEF	Cruise leader POLARBAS, samples chemical analyses, CTD measurements , turbidity profiles
Lasse Darrell	SINTEF	Current measurements, field engineer
Harald Berland	Akvamiljø	Responsible shell rigs.
Oddmund Isaksen	Akvaplan-niva	Responsible multi-corer, bio sampling.

Contact persons on board Transocean Searcher

Representative	Company	Position/duties
Kjell Engen	Transocean	Platform manager
Eliassen	Transocean	Chief of staff
Bjørn G. Lorentzen	Transocean	Toolpusher
Nilo Erdal	Statoil	Statoil representative
Bjørn Kåre Løland	Oceaneering	
Odd Geir Fagerli	Geoservices	-/sampling cuttings, mud
Tom Nordby	Transocean	Mud engineer

APPENDIX D – RHODAMIN MATERIALS SAFETY DATA SHEET (MSDS)

BASF AS

BASF

HMS-datablad

i henhold til 91/155/EØF

BASF HMS-datablad EP 00189 (N/N)
Dato / oppdatert: 27.08.2001 utgave 5.00
Produkt: BASONYL* ROT 545 FLUESSIG

(Trykkingsdato: 06.06.2003)

1. Handelsnavn og ansvarlig firma

BASONYL* ROT 545 FLUESSIG

Firma:
BASF AS - NO-1372 Asker
Norway

Kontaktadresse
BASF A/S
Ved Stadsgraven 15
2300 K|benhavn S
Telefon: 32 66 07 00
E-mail adresse: responsible-care(a)nordic.basf.org

Opplysninger i nødstilfelle:
BASF Health & Nutrition A/S
Telefon: 87 58 43 33
Telefaks-nummer: 87 58 44 45

2. Opplysninger om kjemisk sammensetning

Kjemisk karakterisering
Xantenfargestoff i vann/eddiksyre
C.I. Basic Violet 10

! Fareutløsere

C.I. Basic Violet 10	Innhold: 40-45 wt.%
CAS-No. 64381-99-3	Faresymbol: Xi
EINECS-Nr. 264-859-5	R-setninger: 37/38-41
Eddiksyre	Innhold: 35-40 wt.%
CAS-No. 64-19-7	Faresymbol: C
EINECS-Nr. 200-580-7	R-setninger: 10-35

3. Viktigste faremomenter

Spesielle opplysninger vedrørende fare for menneske og miljø:
Irriterer luftveiene og huden.
Fare for alvorlig øyeskade.

4. Førstehjelpstiltak

Generelle opplysninger:
Tilsølte klær fjernes.

Ved innånding:
Ved ubehag etter innånding av damp/sprøytetåke: friskluft, legehjelp.

Ved hudkontakt:
Vask grundig med såpe og vann.

Tilstandsendring			
Kokepunkt/kokepunktsområde:		99-152 °C	
Størkningstemperatur:		< -5 °C	
Flammepunkt:		> 100 °C	(DIN 51758)
Antenningstemperatur:		> 200 °C	(DIN 51794)
Eksplosjonsfare:		ingen eksplosjonsfare	
Damptrykk:	(50 °C)	71 mbar	
Tetthet:	(20 °C)	ca. 1.11 g/cm3	(DIN 53193)
Løs vekt:		i.r.	
Løselighet i vann: blandbar			
Løselighet i andre løsemidler: blandbar med flere organiske løsemidler.			
pH-verdi:	(ved 20 g/l, 20°C)	ca. 2.5	etanol 90 %
Viskositet:	(20 °C)	50-100 mPa.s	Brookfield 20/min

10. Stabilitet og reaktivitet

Forhold som må unngåes:
Unngå temperaturer over 60 °C.

Farlige reaksjoner: ingen

Helsefarlige spaltningsprodukter: ingen eksisterende data

11. Helsefaropplysninger

Akutt toksisitet

LD50/oral/rotte: 2500 mg/kg

Akutt inhalasjonsrisiko (rotte; testresultat avhengig av toksisitet og flyktighet): Ingen dødelighet etter 8 h eksponering i en ved 20°C høyt anriket hhv. mettet atmosfære.

Primær hudirritasjon/kanin/: irriterende; BASF-test
Primær slimhinneirritasjon/kaninøye/: irriterende; BASF-test

Fare for alvorlig øyeskade.

Andre opplysninger:
Inneholder: C.I. Basic Violet 10.
I forsøk med langtidsføring av rotter og mus ble det observert økt tumorforekomst i forskjellige målorganer.

12. Miljøopplysninger

Eliminerbarhet
Forsøksmetode: statisk metode
Analysemetode: fotometri
Eliminasjonsgrad: 50-100%

Tilstandsendring			
Kokepunkt/kokepunktsområde:		98-152 °C	
Størkningstemperatur:		< -5 °C	
Flammepunkt:		> 100 °C	(DIN 51758)
Antenningstemperatur:		> 200 °C	(DIN 51794)
Eksplosjonsfare:		ingen eksplosjonsfare	
Damptrykk:	(50 °C)	71 mbar	
Tetthet:	(20 °C)	ca. 1.11 g/cm3	(DIN 53193)
Løs vekt:		i.r.	

Løselighet i vann: blandbar
Løselighet i andre løsemidler: blandbar med flere organiske løsemidler.

pH-verdi:	(ved 20 g/l, 20°C)	ca. 2.5	etanol 90 %
Viskositet:	(20 °C)	50-100 mPa.s	Brookfield 20/min

10. Stabilitet og reaktivitet

Forhold som må unngåes:
Unngå temperaturer over 60 °C.

Farlige reaksjoner: ingen

Helsefarlige spaltningsprodukter: ingen eksisterende data

11. Helsefaropplysninger

Akutt toksisitet

LD50/oral/rotte: 2500 mg/kg

Akutt inhalasjonsrisiko (rotte; testresultat avhengig av toksisitet og flyktighet): Ingen dødelighet etter 8 h eksponering i en ved 20°C høyt anriket hhv. mettet atmosfære.

Primær hudirritasjon/kanin/: irriterende; BASF-test
Primær slimhinneirritasjon/kaninøye/: irriterende; BASF-test

Fare for alvorlig øyeskade.

Andre opplysninger:
Inneholder: C.I. Basic Violet 10.
I forsøk med langtidsføring av rotter og mus ble det observert økt tumorforekomst i forskjellige målorganer.

12. Miljøopplysninger

Eliminerbarhet
Forsøksmetode: statisk metode
Analysemetode: fotometri
Eliminasjonsgrad: 50-100%

Økotoksiske virkninger

Bakterietoksisitet: IC50: > 100 mg/l (modifisert Zahrungstest)

Fisketoksisitet: EC/LC50(96 h): > 100 mg/l Poecilia reticulata

13. Fjerning av rester og avfall

Produkt:
Må avfallshåndteres i hht. de lokale bestemmelser, f.eks. i egnet deponi eller egnet forbrenningsanlegg.

Leveres til godkjent mottak for spesialavfall (Norge).

Forurenset emballasje:
Ikke kontaminert emballasje kan gå til gjenbruk.
Emballasje som ikke kan rengjøres, må avfallshåndteres som stoffet.

14. Opplysninger om transport

Ikke farlig gods i henhold til transportforskriftene.

15. Opplysninger om lover og forskrifter

Merking ifølge EU-direktiv

Xi - Irriterende

R37/38 - Irriterer luftveiene og huden.
R41 - Fare for alvorlig øyeskade.

S39 - Bruk vernebriller/ansiktsskjerm.
S26 - Får man stoffet i øynene, skyll straks grundig med store mengder vann og kontakt lege.

Nasjonale forskrifter
Norge

Xi - Irriterende

R37/38 - Irriterer luftveiene og huden.
R41 - Fare for alvorlig øyeskade.

S26 - Får man stoffet i øynene, skyll straks grundig med store mengder vann og kontakt lege.
S39 - Bruk vernebriller/ansiktsskjerm.

Opplysninger om lover og forskrifter:
Forskrifter om klassifisering og merking m.v. av farlige kjemikalier, med utfyllende forskrifter (1998).
Forskrift om utarbeidelse og distribusjon av helse-, miljø- og sikkerhetsdatablad for farlige kjemikalier (1998).
Forskrift om spesialavfall (1994, sist endret 1999).
Administrative normer for forurensning i arbeidsatmosfære (2001).
Norsk stoffliste (1998)

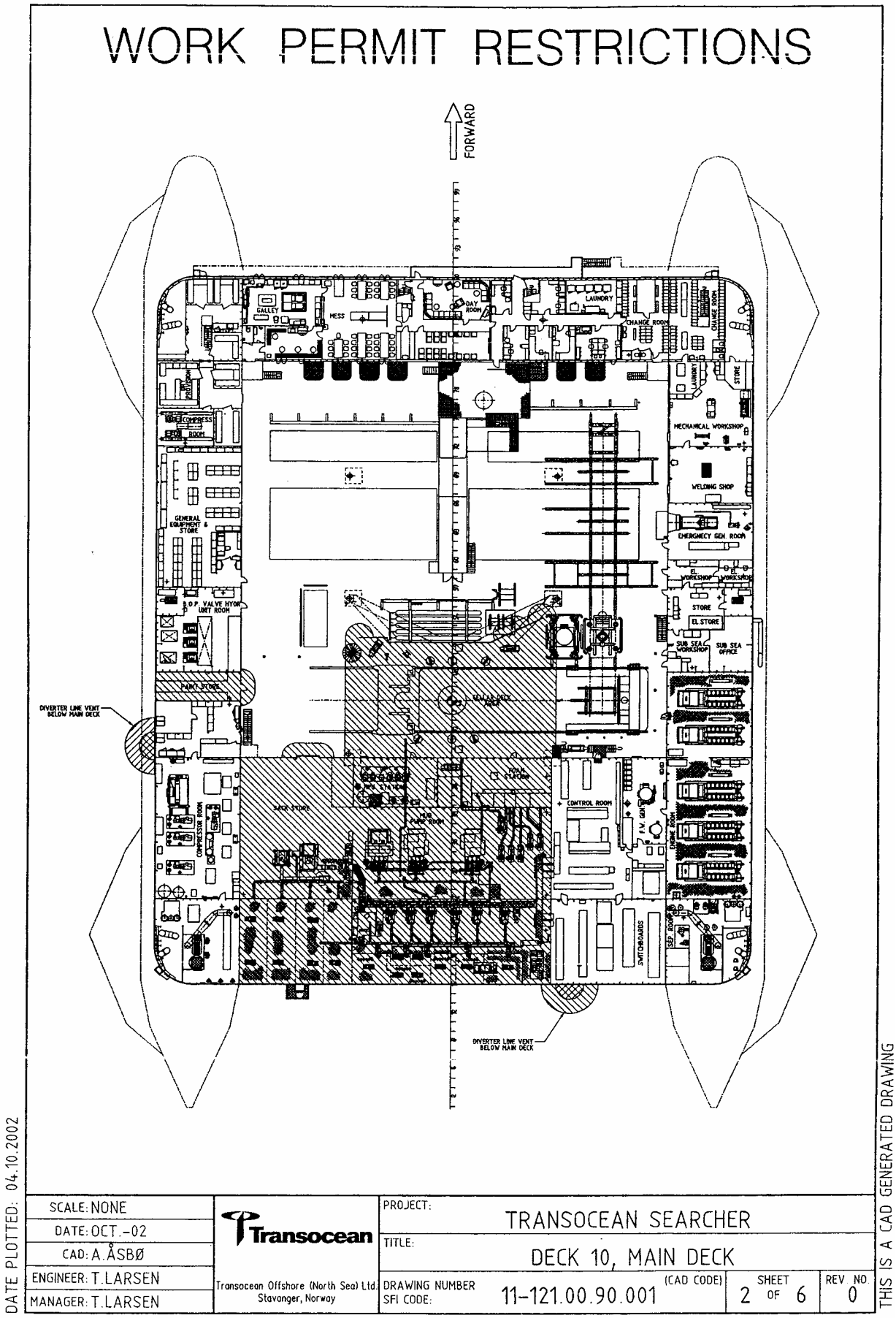
16. Andre opplysninger av betydning for brukerens helse og sikkerhet

i.r. = ikke relevant
i.d.t. = ingen data tilgjengelig

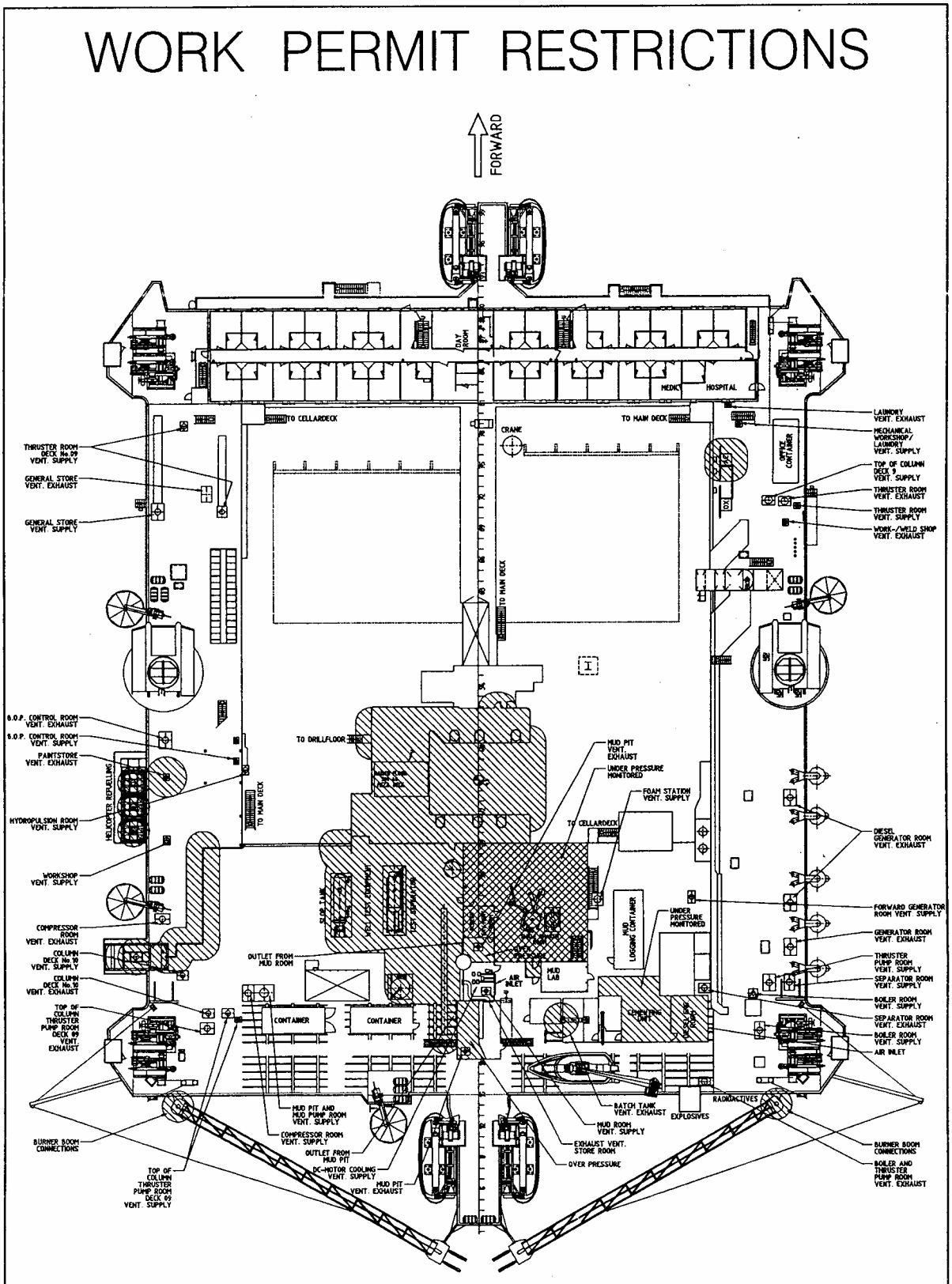
Loddrette streker i venstre marg henviser til endringer i forhold til foregående versjon.

Informasjonene baseres på vår nåværende kunnskap og er derfor ingen garanti for spesielle egenskaper. Det er opp til mottaker av vårt produkt selv å iaktta gjeldende lover og forskrifter.

APPENDIX E – LAYOUT OF DECKS 10 AND 11, TRANSOCEAN SEARCHER



WORK PERMIT RESTRICTIONS



SCALE: NONE	Transocean	PROJECT: TRANSOCEAN SEARCHER			
DATE: OCT.-02		TITLE: DECK 11, UPPER DECK			
CAD: A.ÅSBØ					
ENGINEER: T.LARSEN	Transocean Offshore (North Sea) Ltd. Stavanger, Norway	DRAWING NUMBER / SFI CODE: 11-121.00.90.001 (CAD CODE)	SHEET 3 OF 6	REV. NO. 1	
MANAGER: T.LARSEN					

DATE PLOTTED: 20.03.2003

THIS IS A CAD GENERATED DRAWING

APPENDIX F CURRENT RIG CLOSE TO TRANSOCEAN SEARCHER

Instrumentation, positions and data recovery

Aanderaa RCM-9 current meters have been used for the current and turbidity measurements. These meters measure the current speed and direction by a Doppler Current Sensor that sends out 600 pings during each recording interval of 10 min. The sensor measures the horizontal current in an area from 0.4 to 2.2 m from the instrument. The measurements are compensated for tilt, and referred to magnetic north by means of an internal compass. The 10-minute vector averaged current velocity (speed and direction) is then calculated and recorded. The meters were equipped with a thermistor and a turbidity sensor. The turbidity sensor measures scattered light, which is known to have a good correlation to the amount of suspended matter in the water. One of the meters was also equipped with a pressure sensor and a conductivity sensor (for subsequent calculation of salinity).

The mooring was a traditional I-moorings equipped with a surface buoy. For monitoring purposes the buoy transmitted the recorded data in real time to a nearby vessel by a VHF-radio connection. The measurement position was 58^{o} 29' 49.17'' N 01^{o} 43' 21.85'' E. The water depth was 108 m, and the measurement depths were 10, 35 and 60 m. (In the period 5 – 7 September the meter in the middle was deployed at 20 m depth.) The data recovery is summarised in Table F.1.

Table F.1 Data recovery[1]

Measurement depth	Current speed	Current direction	Temperature	Turbidity
10 m	78 %	78 %	78 %	78 %
35 m	100 %	100 %	100 %	100 %
60 m	100 %	100 %	100 %	0 %

[1] The data recovery percentage is the total amount of controlled and accepted data relative to the maximum attainable data during the measurement period.

The mooring was accidentally cut after 20 days releasing the upper meter and the surface buoy. The equipment was picked up by a stand-by vessel. The reduced data recovery at 10 m depth was due to this event. The other two meters were in operation from deployment (5 September) till they were picked up 1 October 2002.