SUPPLEMENT No. 503

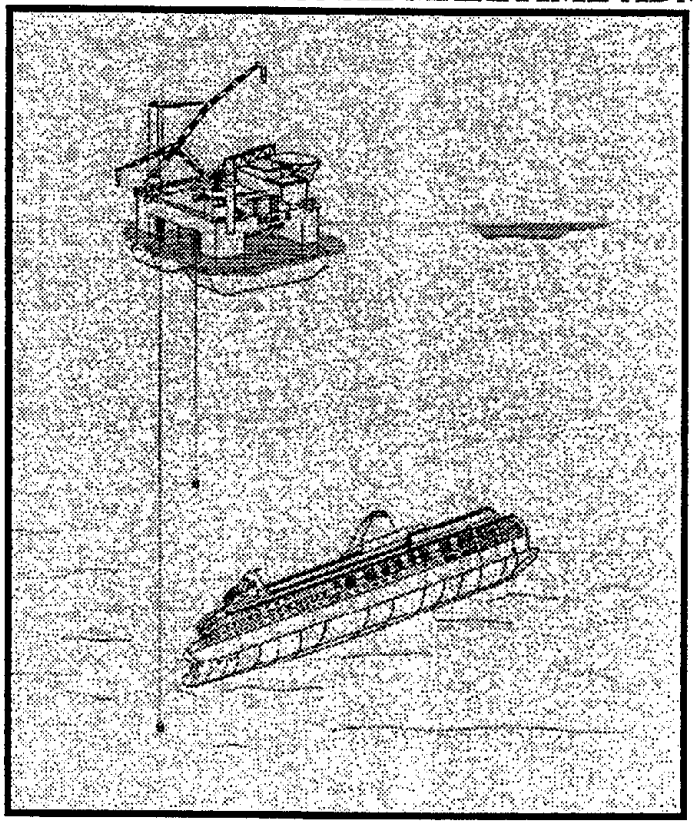
Rockwater A/S:

Condition Survey of the Vessel "Estonia" for the Swedish National Maritime Administration.

Survey Report.

SJÖFARTSVERKET

ROCKWATER A/S
CONDITION SURVEY OF THE VESSEL "ESTONIA"
FOR THE
SWEDISH NATIONAL MARITIME ADMINISTRATION



Survey Report

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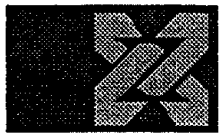


1.0 INTRODUCTION

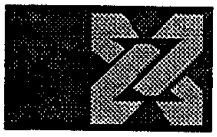
Rockwater A/S were contracted by the Swedish National Maritime Administration (NMA) to perform a condition survey of the stricken ferry "Estonia" in the Baltic Sea.

The purpose of the survey was to provide information to assist the Swedish Government in their consideration of any further action in respect of the Estonia after the tragic sinking of the vessel in September 1994. In order to ensure that the survey provided sufficient information to assist the Swedish Government in their consideration of all possibilities, Rockwater and Smit Tak established a consortium to make best use of the combined experience of both companies in the disciplines of deep water survey, saturation diving inspection and salvage operations. All disciplines were represented in all phases of the work from the initial planning to the issue of this report.

By necessity, the operation was a fast track project. The NMA were to report yerbally to the Swedish Government on the 7th of December 1994 with a written report on the 12th. The contract was awarded on the 24th of November. The schedule for the work is presented in Section 3.0.

This report, together with the video tapes (19 in number), copies of the dive plans and marked-up drawings handed over to the Representatives of the NMA and the Swedish Police onboard, constitute the final report for the survey work.

This report comprises not only the results of the survey, but a description of the means by which those results were obtained in order to assist the Swedish Government in their consideration of the form of any future intervention in respect of the Estonia.



2.0 TECHNICAL SOLUTION

2.1 General

The condition survey of the ferry Estonia was performed generally in accordance with the as tendered work scope as follows:

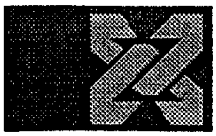
- Approximate geological sea bed survey over a 4km^2 block around the Estonia
- Vibrocore sea bed sampling in the immediate vicinity of the Estonia
- Saturation diver inspection of the inside of selected areas within the Estonia
- ROV survey of the hull and superstructure of the Estonia (including a mudline survey)
- Diver and ROV investigation of the bow visor area and bridge of the Estonia

The marine spread utilised for the work comprised the semi-submersible vessel "Rockwater Semi 1" from which all diving, ROV and sea bed sampling work was performed; and the "Sira Supporter" which was used to perform the approximate geological sea bed survey.

The operation was overseen and directed by Representatives of the NMA, the Swedish Police and the Swedish Accident Investigation Authorities. During the mobilisation and prior to the commencement of the survey work, the objectives of the survey were discussed onboard the vessel and certain areas of the Estonia were targeted for inspection by the saturation divers. A dive plan was established for each deck of the vessel comprising a scope of work, drawings indicating the planned point of entry and the target area and a checklist for the findings of the survey.

The conditions on site required that the dive plans serve as a basis for the work with supplementary instructions being issued by the Representatives of the Swedish Authorities throughout the operation.

Both ROV and diving operations were continuously recorded on VHS video cassettes.



2.2 Safety & Risk Analysis

The offshore operation was conducted in accordance with standard Rockwater procedures which provide a framework for the safe performance of all aspects of the work, including diving.

During the mobilisation and prior to commencement of the offshore operation, a crude risk analysis was performed generally in accordance with Rockwater procedures. The purpose of the analysis was to identify any activities entailed in the Estonia works which were outwith Rockwater's normal operations together with any associated risks.

The analysis took the form of a meeting, attended by representatives of all disciplines involved in the operation, at which the planned steps in the operation were discussed and the associated risks identified.

Having identified the risks, the assembled team then identified actions to be undertaken in order to reduce or eliminate the risks. These items were summarised in the following table which was made known to the crew and displayed in dive control throughout the duration of the work.

Discussion of the hazards and risks actually encountered in the performance of the work is incorporated in the survey results in Section 4.0 of this report.

2.3 Humane Issues & Confidentiality

The tragic circumstances under which the Estonia sank and the number of victims involved in the disaster represented a huge public relations challenge to the Authorities and a threat to the sensibilities of the relatives of the victims and to the offshore work force, particularly the divers.

Rockwater were acutely aware of the risks both in terms of the release of unauthorised information or material to the public and the risk of trauma to those required to view or handle victims of the disaster.

2.3.1 Confidentiality

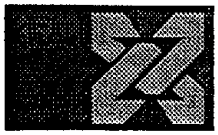
All communications to and from the vessel were controlled by the OIM and the Project Superintendent and were between the vessel, the company's offices and the Authorities. Several calls were received by the vessel from personnel seeking information regarding the operation though no information was released.

Prior to arriving on location, all personnel onboard the vessel were required to sign a statement of confidentiality. These statements were retained.

All video materials for the recording of the survey work were controlled throughout the operation. The video cassettes of the survey work (19 in number) were handed over to the NMA Representative at demobilisation. The remaining video cassettes (used as a method of continuous monitoring for safety purposes) have been removed from the vessel and will be retained in safe storage at Rockwater's Stavanger office for a period of 1 week after the divers have completed their decompression. The tapes will then be destroyed.

Note: The Representatives of the Swedish Police made their own edited tape of the survey work during the course of the operation and will be responsible for the control of this tape.

This report shall be issued directly to the NMA only and the survey findings shall not be divulged to any other than those directly involved in the works.



2.3.2 Welfare Of The Offshore Work force

The offshore team chosen to perform the condition survey of the Estonia included a large proportion who had undertaken similar work in the past. This included the divers, diving supervisory personnel and project engineers.

Prior to travelling offshore, the divers were screened to ensure that each diver was suitable for the work and that their personal circumstances were unlikely to add to the trauma derived from contact with the victims of the disaster.

During the mobilisation, the entire offshore team were briefed as to what they could expect in terms of the conditions at the site and their emotional reactions to the work. The briefing was given by a qualified Psychologist with considerable experience of similar work.

Throughout the diving section of the survey, contact with victims of the disaster was frequent though due consideration was given to the divers and contact was kept to a minimum. Manual handling of the bodies of the victims was occasionally required in order to gain access to targeted areas. The divers were able to gently move bodies within the vessel in order to clear access without causing any further deterioration in the condition of the bodies.

Whilst the work undertaken by the diving team inside the vessel was unpleasant and memorable, the problems associated with this work were not insurmountable and, at the time of writing, no psychological problems had been reported. Rockwater will continue to monitor those involved.

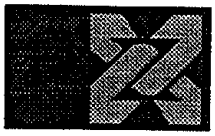
2.4 Approximate Geological Sea bed Survey

The geological sea bed survey was performed from the vessel "Sira Supporter" in tandem with the diving and ROV operations conducted from the Rockwater Semi 1.

The methodology and results are presented in a separate report. (See Section 4.2).

2.5 ROV Mudline Survey

The mudline survey was undertaken by the UFO 350c ROV deployed from Semi 1. The survey comprised a video survey and bathimetry at intervals along the length of the Estonia. The results are presented in Section 4.5.



2.6 Saturation Diving Internal Survey

The conditions actually encountered on site vindicated the choice of divers as the primary means of intervention inside the vessel. It is quite clear from the operation that ROV or ADS alone would have failed to gain access.

The diving operation was conducted from the Rockwater Semi 1 using the vessel's twin bell saturation diving system. Storage depths varied through the operation from 42 metres to 65 metres.

The agreed diving work scope was achieved in 9 bell runs.

The diving operation was carried out with three man bell runs and divers working inside the vessel were wet tended at all times from the point of entry.

Dive plans were developed for each deck which indicated the point of entry and the area of that deck which was to be surveyed. The dive plan also contained a check list which was completed by the Project Engineer in dive control as the work progressed. Due to the conditions on site, the plans were used as a basis only and actual points of entry and areas surveyed varied as a result of safety considerations and accessibility due to debris.

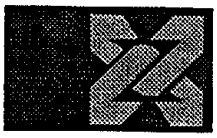
Whilst many of the ports and windows on the Estonia had been opened, broken or removed during the sinking, providing unimpeded access to some areas of the vessel, it was necessary to force entry at a number of locations. Two means of forced entry were utilised as follows:

Breaking Through Windows

The windows aft on Decks 4, 5 and 6 (E, F and G respectively) were large enough to allow safe access for divers to enter the vessel when broken. This was achieved by hammering a large marlin spike into the corner of the selected window in order to shatter the glass. The glass could then be removed using a hammer. Care was taken to remove fragments of glass from the frame in order to preserve the diver's umbilicals.

Oxy-Arc Cutting

Access to Deck 4 (C-Deck), amidships and to the Tween Deck required hatches to be cut using oxy-arc equipment (Broco rods). In addition, the forward windows on Decks 4, 5 and 6 (E, F and G respectively) had to be smashed and extended by oxy-arc cutting to allow diver access.



Resealing Access Points

In instances where there was a risk that buoyant material inside the vessel may be lost through access points made by the divers, the access points were resealed once the survey work at that location had been completed. Due to the attitude of the vessel, the accesses could be sealed using oversized plates or grills held in position by gravity only. Beams were welded to the backs of the plates in order to ensure that they did not slide off the hatches.

Generally, access to the vessel from the port side presented no problems for divers though, due to the attitude of the vessel , the starboard side was, for the most part inaccessible due to debris.

Conditions inside the vessel were intrinsically hazardous to the diver and constant vigilance was required in respect of the possibility of entrapment due to poor visibility and falling debris.

The operation was performed safely and with no incidents reported in association with the diving work. Divers accessed as far as it was safe to do so and did not remove debris in order to gain further access. Due to the unpleasant nature of the work inside the vessel, duration's spent in the vessel were kept short.

Details of the points of access, the extent of the areas surveyed and the location of victims are contained in Section 4.0.

2.7 Vibrocore Sea bed Sampling

A total of 6 bore holes were made at pre-determined locations to the north and south of the vessel. The results are presented in a saperate report. (See Section 4.3.)

The Vibrocore equipment was deployed using the vessel crane and no problems were encountered in connection with this element of the survey.

2.8 Investigation Of The Bow And Bridge

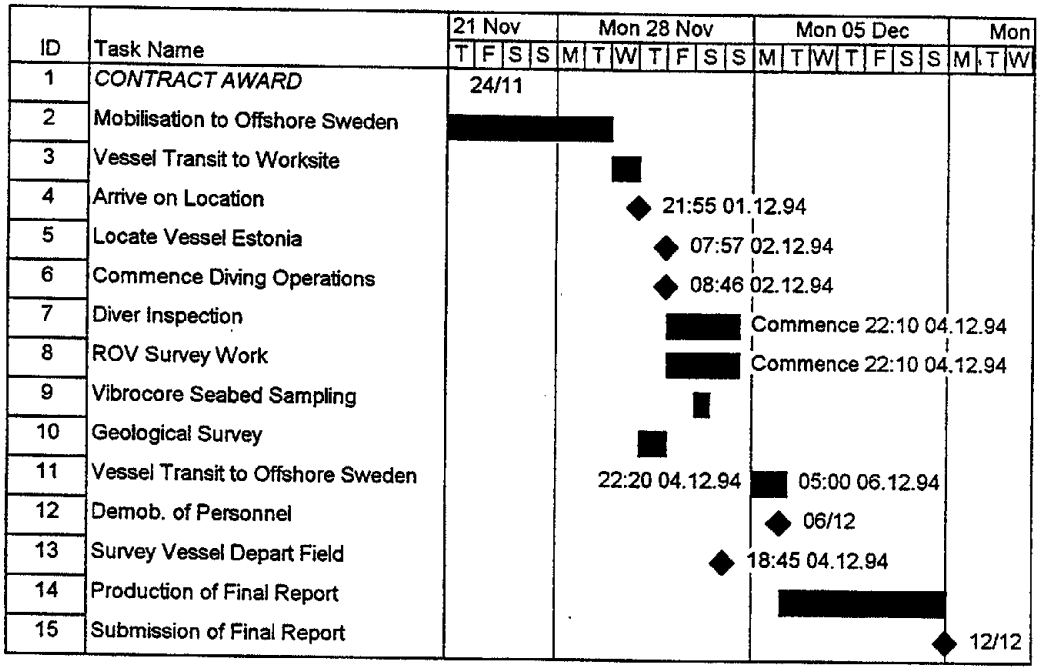
Under the direction of the Representatives of the Swedish Accident Investigation Authorities, divers carried out a survey of the bow of the vessel, paying particular attention to the points of attachment of the bow visor and car loading ramp. Certain attachments were recovered to surface and handed over to the Authorities onboard. In addition, the bulbous bow was inspected both by ROV and Diver.

Also under the direction of the Authorities, divers accessed the Bridge of the vessel and retrieved a number of navigational aids, a man-overboard beacon and the hydrostatic release mechanism for one of the vessel's EPIRB beacons. The bodies of 3 of the victims of the disaster were found on the Bridge.

As agreed with the Representatives of the Authorities onboard, no reporting is made of the results of this investigation work though the performance of the work is recorded on the video cassettes which have already been delivered to the client.

3.0 SCHEDULE

The following schedule reflects the sequence of events and the time frame within which the survey was performed:



4.0 SURVEY RESULTS

The means by which the following results were obtained are described in Section 2.0 of this report.

4.1 Location Of The Vessel

The original co-ordinates for the location of the Estonia provided by the Finnish Authorities were found to be incorrect after visual and sonar surveys carried out by ROV had failed to find the vessel.

The Sira Supporter then undertook a survey of the area using the ORE Side scan Sonar Towfish, running survey lines to the east and west of the original location. The operator onboard the Sira Supporter identified a hard sonar target and calculated the offset distance by reviewing the images recorded on the Thermal Linescan Recorder and the lay-back of the Towfish.

Original Location:	Latitude:	59°23'54.60"
	Longitude:	21°42'10.20"
As-Found Location:	Latitude:	59°22'56.13"
	Longitude:	21°41'00.98"
Offset Distance:	2112 metres	
Bearing:	211.1°	

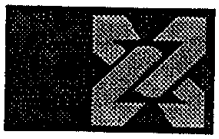
The position was derived by UDI-Wimpol Seastar Differential GPS with an accuracy of 5 metres. This was confirmed by repeating the process on a different sonar line.

The Semi 1 moved to the new location and confirmed the target as the wreck of the Estonia using the ROV.

4.2 Approximate Geological Sea bed Survey

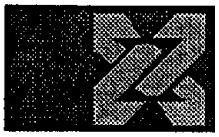
The geological sea bed survey was performed over a 4 km^2 block centred on the location of the Estonia.

The whole area surveyed is crossed by a series of generally east/west valleys which have cut into the underlying stiff clays. The valleys are generally less than 30 metres deep, but 2 in the southern side of the site are much deeper. The infilling of these valleys comprises well laminated, very soft silts and clays. These 2 deep valleys contain gas, biogenic in origin which is within 2 to 3 metres of the sea bed.



The bathymetry is quite complex and varies considerably from line to line and along lines. Some of the valleys, particularly those towards the eastern side of the site are divided by high ridges of outcropping clays up to 50 metres high.

The weather deteriorated towards the end of the survey scope and prevented us from removing the relevant personnel from the Sira Supporter, they ultimately disembarked in Aberdeen some five days later. As a direct result of this the preparation of the Geological input was delayed. In order to allow us to satisfy our Clients requirements with regard to the delivery of this report, the details of the methodology and results of the Geological survey will be presented under a separate cover.



4.3 Vibrocore Sea bed Sampling

A total of 6 bore holes were made at pre-determined locations to the north and south of the vessel. The results will be presented under a separate cover (see note above.)

4.4 Saturation Diver Inspection Of Selected Areas

The survey work inside the vessel was controlled by work packs developed onboard during the mobilisation and was essentially broken down by deck. The results are also presented by deck. The progress of the diver inside the vessel and the ports through which the diver was able to look into the vessel are recorded in the fold-out plans in this section and are marked in green. The location of victims found by the diver are marked in pink. Other items are numbered and marked in yellow.

4.4.1 General Summary

Access to any part of the port side of the vessel is possible by the means described in Section 2.6 with the exception of the shopping area amidships on Deck 5 (D-Deck) where the collapse of the partitions which formed the main shopping area and the accumulation of debris against these partitions prevent all but the most limited access to the whole area.

In general, access to most of the starboard side of the vessel was not possible within the scope of this survey and would require a protracted programme of debris removal at each point of entry in order to make the area safe for divers with the ship in its current attitude.

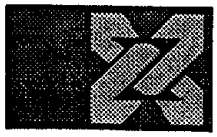
Visibility within the vessel was variable but tended to deteriorate as the divers entered the vessel due to the re-suspension of silt caused by the movement of the divers.

Although a light covering of silt was found throughout the vessel, the overall volume of silt which had penetrated the accessible sections of the vessel was not significant.

Despite initial safety concerns regarding floating debris, the soft furnishings, clothing, sales goods and personal effects did not present a danger to the divers but were an inconvenience when accessing cabins and enclosed spaces generally.

Internal doors, especially those to cabins, were predominantly locked or jammed. Where necessary, they were forced with a crow bar and were easily opened. Once forced, many of the doors fell from their hinges. In the case of those cabins where the doors opened to starboard, debris lying on the door made safe access impossible. Some of the doors from the main stairwell amidships to companionways aft were locked electronically and were not forced.

The bodies of a total of 125 of the victims of the Estonia disaster were individually sighted by the divers during the course of the internal survey though certain areas, especially the port side forward stairwell and the central stairwell, undoubtedly contain many more.



With the exception of those bodies found on the bridge and some of those found in the central stairwell on level 5, the bodies were intact and firm with the sex of the victim being easily identifiable. The bodies on the bridge were more badly decomposed though were also intact. Some of the bodies on Deck 5 at the central stairwell were bloated and buoyant; the remainder were effectively neutral. Many of the bodies exhibited evidence of crush injuries.

4.4.2 Deck 8 (G-Deck)

Refer to attached fold-out plan of Deck 8.

Video references:	RW/SEMI 1/EST/D/001	0:00 to 2:50
	RW/SEMI 1/EST/R/001	1:44 to 1:53

Prior to entry, the divers inspected through the ports to each of the port side cabins at the aft end of Deck 8. Poor visibility inside revealed little detail.

Access was made to Deck 8 only once, through the port side door on the aft bulkhead, at the stairs (the door itself was missing). The diver followed the aft and port side bulkheads around the periphery of the officer's day room to access cabins 835 to 843.

The stern/port quarter of the vessel sustained structural damage of the upper levels of the superstructure during the sinking and the targeted cabins had been all but destroyed. The partitions between the cabins had collapsed, as had the partitions which formed the toilets in each cabin. Plumbing, wiring and the fixtures had spilled from the cabins and into the now collapsed companionway running forward.

The diver reached the end of his umbilical adjacent to cabin 837 which was more intact than those cabins further aft.

No victims were found in the surveyed section of Deck 8.

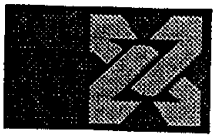
The following features were noted by the diver and are marked up on the attached drawing:

#1. All liferafts and lifeboats on the port side were missing, presumably released during the sinking.

#2. Door 848 and the surrounding bulkhead were found to be intact.

#3. The window to cabin 835 was found to be open, as was the window furthest to port on the aft bulkhead. The remainder were intact and closed.

#4. The aft bulkhead and deck head to Deck 8 were buckled in the area of the port side external aft stairs.



#5. The deck itself appeared buckled adjacent to cabin 841.

4.4.3 Deck 7 (F-Deck)

Refer to attached fold-out plan of Deck 7.
Video references: RW/SEMI 1/EST/D/002 0:00 to 1:42

The divers viewed the amidships port side cabins 747 to 757 from outside the vessel through the ports. Visibility was limited and the view partially obscured by floating debris however, a total of 12 victims were seen in these cabins as indicated on the attached drawing in cabins 748, 749, 750 and 757.

The diver then entered the vessel as planned through the amidships saloon doors 739C to the main stairwell area. The diver attempted to gain access to the aft port side companionway through door 738A (ref. item #1 below). Failing to gain access to the companionway, the diver surveyed the stairwell. The port side stairwell was relatively clear of debris and was accessible. The starboard stairwell was only accessible near the centre line of the vessel as the starboard side of the stairs were blocked by collapsed deck head linings and debris. A further victim was found in the starboard stairwell.

The bulkheads themselves in the stairwells were intact.

Visibility in the stairwells was fair, up to 2 metres.

The diver was able to access the aft companionway on the starboard side of the vessel through door 738B as far as cabin 760. Access was made to cabin 758 which was found to be intact with all main partitions in place.

The following features were noted by the diver and are marked up on the attached drawing:

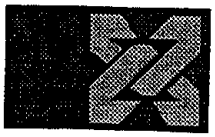
#1. Door 738A fitted with an electronic lock. The door was locked and the diver was unable to access using a crowbar.

#2. Cabins 747 to 751 were viewed from the outside of the vessel through the ports. Though the main partitions were intact, the deck head linings and fixtures had collapsed in most of the cabins obscuring the view. Visibility within the cabins was generally poor.

#3. The windows to cabins 752, 754 and 757 were open and/or broken.

#4. The identification of a victim in cabin 749 is suspect due to poor visibility.

#5. Doors 746 to the lift shaft in the starboard companionway were missing.



#6. The combined door frame for cabins 759 and 760 had collapsed into the companionway.

4.4.4 Deck 6 (E-Deck)

Refer to attached fold-out plan of Deck 6.

Video references:		
	RW/SEMI 1/EST/D/002	1:53 to 2:36
	RW/SEMI 1/EST/D/003	0:00 to 1:22
	RW/SEMI 1/EST/D/017	0:00 to 3:01
	RW/SEMI 1/EST/D/018	0:00 to 1:24
	RW/SEMI 1/EST/D/019	0:00 to 1:42

A total of 4 entries were made to Deck 6 as indicated in the attached plan. All were effected by entering through windows though, due to the small size of the windows to forward on this deck, the window port had to be extended by means of oxy-arc cutting.

In the large public dance bar area amidships, a total of 11 victims were found. The starboard side of this area was not accessed due to the accumulation of debris and it would seem likely that considerably more victims would be found among the debris.

In the port side forward companionway, a further 8 victims were found. The cabins in this part of the vessel were intact and access was made to cabins 6118, 6124, 6130, 6132, 6134 and 6230. Almost all cabins in this area were locked though those accessed were all empty.

The inner glass door to the port side forward stairwell (601) had broken from its mountings (as was the case on Deck 5) and blocked the forward transverse companionway adjacent to the door to cabin 6229.

The lack of furnishings in the lounge at the stern stairwell on the port side made it difficult for the diver to move around with the vessel in its current attitude though the accessed areas contained a further 8 victims.

The following features were noted by the diver and are marked up on the attached drawing:

#1. Many of the hard furnishings throughout the dance bar area were bolted to the deck.

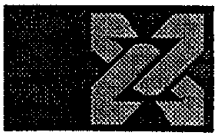
#2. The bar/pantry itself was not accessible due to the accumulation of debris. The recovery of cash boxes or tills would require the removal of a considerable volume of furniture debris.

#3. The window to cabin 617 was open/broken.

#4. The entire starboard stairwell was blocked by debris. The deck head linings had collapsed.

#5. The 4 victims identified adjacent to the men's WC in the port side lounge were surrounded by debris and it is suspected that more victims are present beneath the debris.

#6. It is suspected that access to the port side forward stairwell was blocked by the number of victims present in the stairwell behind door 601.



4.4.5 Deck 5 (D-Deck)

Refer to attached fold-out plan of Deck 5.

Video references:		
	RW/SEMI 1/EST/D/003	1:22 to 3:03
	RW/SEMI 1/EST/D/004	0:00 to 2:31
	RW/SEMI 1/EST/D/016	0:00 to 2:11
	RW/SEMI 1/EST/D/018	1:24 to 2:21

A total of 5 entries were made to Deck 5 as marked on the attached plan, all were through existing access via windows or doors though, due to the small size of the windows to forward on this deck, the window port had to be extended by means of oxy-arc cutting.

In the large public shopping area amidships, access was severely impeded by the collapse of the display arrangements and by the accumulation of sales goods. The bodies of 2 victims were identified in the very limited area which was accessible with a third being seen through one of the port side windows during the course of the work.

In the port side cabin area to forward, access was through cabin 5129 into the companionway. A total of 8 victims were found in the accessible length of this companionway.

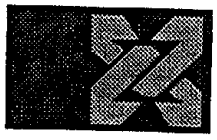
Cabins 5119 to 5135 were intact though access was largely impeded by locked doors, debris or the bodies of victims. Only cabins 5129 and 5131 were accessed.

As on Deck 6, the glass door (503) to the port side forward stairwell had been removed and was blocking the forward transverse companionway and trapping 2 bodies. The stairwell on this level was accessible through the second of the doors at 503 and it was found to be congested with a minimum of 6 bodies.

The starboard forward stairwell was accessed through door 501 to the companionway beyond. Surprisingly, this area was found to be clear of victims though access along the companionway was blocked due to the collapse of the companionway deck head linings.

Access was made to the stern cafeteria through door 578 on the port side. Once again, the accumulation of debris to starboard made safe access impossible and only the port side was inspected. The bodies of 2 victims were discovered in this limited area though it would seem likely that more would be found amongst the debris to starboard.

Two further victims were identified in the hall containing the stern stairwell on the port side though, once again, only a limited area of the hall was accessible.



The following features were noted by the diver and are marked up on the attached drawing:

#1. The deck head linings to the companionway on the port side running forward from the amidships stairwell had collapsed at door 506 refusing access to the diver.

#2. Cabin 523 had collapsed.

#3. Port side stern doors 578 were missing.

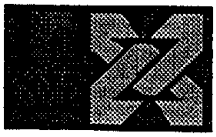
#4. Forward starboard door 501 was open.

#5. The stern of the vessel was partly buried denying access to the stern starboard side doors.

#6. Virtually the entire deck head linings in the port side stern hall containing the stairwell had collapsed allowing very little access for diver survey.

#7. The doors 510A and 510B from the shopping area to the main stairwell could not be identified by the diver due to accumulation of debris.

#8. The glass door (503) to the port side forward stairwell had been removed and was blocking the forward transverse companionway and trapping 2 bodies.



4.4.6 Deck 4 (C-Deck)

Refer to attached fold-out plan of Deck 4.

Video references:	RW/SEMI 1/EST/D/005	0.00 to 3:02
	RW/SEMI 1/EST/D/006	0:00 to 2:25
	RW/SEMI 1/EST/D/007	0:00 to 2:58
	RW/SEMI 1/EST/D/008	0:00 to 2:46

Two entry points were made to Deck 4, one through the gangway hatch amidships on the port side, the other through the window of cabin 4121 on the port forward quarter. Both entries required the use of oxy-arc cutting taking approximately 90 minutes each.

The stairwell area to amidships was relatively clear of major debris but many victims were located in this area. The diver counted 35 bodies in the stairwell area (indicated on the attached drawing by the large pink rectangle). Access aft through door 499 to the stern port side cabins was blocked by bodies as was access forward through door 422. More victims blocked the access to the data room through door 436.

One victim was seen through the window of the office (cabin 434) and a further victim was seen through the windows of the bar area towards the stern on the port side.

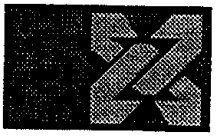
The diver was able to gain access through door 445 to the companionway leading aft along the centre line of the vessel though access to cabins 4501 to 4503 was blocked by debris.

The ports to all cabins on the port side were inspected and the cabins appeared to be intact though visibility was poor and partially obscured by floating debris. The bodies of 2 victims were seen in cabin 4131 and 1 in 4129.

Access through cabin 4121 to the companionway revealed a further 4 victims, 3 of which were clustered around the door 402 preventing access to the stairwell in the port forward quarter. Access was made to cabin 4126 where a further 2 bodies were found.

Access to most of the cabins was not made as the doors were mostly locked, jammed or held closed by debris.

Companionway door 419 was jammed preventing further access along the companionway.



4.4.7 Tween Deck

Refer to attached fold-out plan of the Tween Deck.

Video references:	RW/SEMI 1/EST/D/009	0.00 to 3:00
	RW/SEMI 1/EST/D/010	0:00 to 2:42
	RW/SEMI 1/EST/D/011	0:00 to 3:00
	RW/SEMI 1/EST/D/012	0:00 to 2:16
	RW/SEMI 1/EST/D/013	0:00 to 0:16

After metrology on the hull to identify the points of entry, 2 access hatches were made at the Tween Deck. The first access was made through cabin 1086, having miscalculated in the metrology and having missed the adjacent companionway. The second access was measured from the first and was in the correct position, bringing the divers into the Tween Deck in the companionway adjacent to cabin 1012.

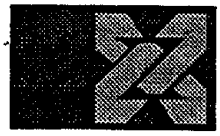
Both access hatches were made with the use of oxy-arc cutting through the hull. Once the steel hull was breached, the internal lagging and panelling was removed easily with a crowbar though this activity was time consuming. A ram suspended on the crane of the Semi 1 was used to speed the process up.

Once access had been achieved, visibility on this deck was good, up to 3 metres.

Most cabins surveyed on the Tween Deck were intact, the exceptions being cabins 1005 and 1006 amidships.

Cabins 1078 to 1086 to forward were all empty and appeared not to have been used on the night of the disaster. Cabins 1005 to 1012 were used and a total of 4 victims were found in these cabins. Two further victims were found in the aft companionway.

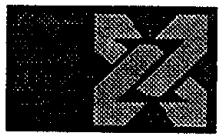
Access along the companionways towards the centre line of the vessel was clear though debris obstructed the divers in their attempts to access the main passages running fore and aft along the centre line of the vessel. Doors 114, 121 and 128A in the water-tight bulkheads on this Deck were not accessible. Door 107 was inspected and found to be closed. Access to the spiral staircase 110 was not possible due to accumulated debris.



4.5 ROV Survey Of The Hull & Superstructure (including mudline survey)

Video references:	RW/SEMI 1/EST/R/001	0:00 to 1:53
	RW/SPRINT/94/ESTONIA/001	0:00 to 2:55

The ROV survey of the hull and superstructure was undertaken by the Sprint vehicle whilst the mudline survey was performed by the UFO 350c. The survey was directed by personnel from Smit Tak and the results are the presented in the following report.



5.0 CONCLUSIONS

Rockwater's brief in performing the condition survey of the ferry "Estonia" was to provide information to assist the Swedish Government in their consideration of any further action in respect of the stricken vessel and/or in the handling of the bodies of the victims of this tragic event.

The 3 day survey comprising geological survey, sea bed sampling, ROV inspection and diver intervention into the vessel has enabled the Rockwater and Smit Tak personnel, and the onboard Representatives of the various Authorities to gain a clear understanding of the condition of the vessel itself, the surrounding environment and the conditions which prevail inside the vessel.

Ultimately, the Authorities charged with bringing the Estonia affair to a satisfactory conclusion are faced with many difficult decisions and it would be inappropriate for Rockwater/Smit Tak to advise on the course of action to be followed. The following points however are the conclusions drawn from the survey work after due consideration of the results of the survey by the combined expertise of Rockwater and Smit Tak. This information may indicate the options available from a purely operational view.

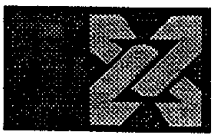
5.1 Salvageability Of The Vessel

The Estonia is salvageable though the consideration of a salvage operation is complicated by the considerations with respect to the handling of the bodies of victims of the disaster. The issues are discussed in part 6 of the Smit Tak report contained in Section 4.5 of this document.

5.2 Internal Intervention

It is quite clear from the experience gained during the survey work that the use of divers is the only means by which useful work can be undertaken inside the vessel. The chaotic nature of the furnishings and fittings would simply not allow an ROV to operate, with fouling being a constant problem. The width of the access points, companionways, internal doors etc. would preclude the use of any ADS currently available.

The survey work demonstrated that the recovery of individual targeted items was only possible within the bridge and not in the public areas due to the chaotic arrangement of debris. The recovery of targeted valuables to reduce the risk of plunder is not practical with the vessel in its current attitude.



The ROVs proved to be quite capable of accessing all parts of the exterior of the hull and superstructure and their sonar and bathymetric equipment proved useful in establishing the location and attitude of the vessel.

5.3 Condition & Location Of Victims

All of the victims found during the survey were inside the vessel.

Although not all areas of the vessel were surveyed internally, those areas to which access was achieved could be considered a representative sample. The relatively small proportion of victims actually pinpointed by the divers (some 125 bodies) would suggest that the remainder would be concentrated in those areas of the vessel which were not accessed, namely, the starboard side.

It was established during the survey that most loose items accumulated on the starboard side when the vessel overturned and sank and it would be reasonable to assume that the bodies of many of the victims would have been carried with the debris to the starboard side.

Any efforts to recover these trapped bodies would have to involve the methodical removal of debris from the point of entry to the full extent of the incursion in order to maintain diver safety. This would not be a quick process and would be hampered by poor visibility as the silt inside the vessel was disturbed by the actions of the divers.

At the time of the survey, the condition of the bodies of the victims was, in general, surprisingly good though some showed obvious signs that deterioration had commenced. It would be reasonable to assume that, once deterioration becomes widespread, the process will accelerate.

The condition of the bodies at the time of the survey would allow them to be handled and recovered in the traditional manner though this condition will not be maintained indefinitely. Any recovery of the vessel to surface would further accelerate the deterioration and the logistics of such an operation would need to be carefully considered.

With the vessel in its current attitude, the same means of intervention used to perform the survey work could be utilised to recover a significant percentage of the victims in a relatively short operation by targeting those areas which are accessible and which are known to contain large numbers of bodies. The efficiency of any such recovery operation would decrease with time and the optimum cut-off would have to be established as the work progressed.