

**MONITORING REPORT No. 9
DREDGING AND RECLAMATION PROGRAMME IN
KINGSTON HARBOUR**

May 31, 2002

**Prepared for:
The Port Authority of Jamaica**

Prepared by:

1.0 BACKGROUND

The dredging Programme was suspended by NEPA on Friday 4th May and resumed on 11th May. This was due to problems of excessive sedimentation beyond the weir at R1. Dredging resumed when separate licences were subsequently granted for various aspects of the program. The licence for continuation of activities at R1 was withheld pending advice to NEPA the National Works Agency on the hydraulics of the Jew Gully outfall.

In keeping with increased intensity of monitoring operations, as required by NEPA, water quality sampling fieldwork was carried out on May 13th and 17th 2002. Sampling scheduled for Monday May 27th had to be postponed due to inclement weather as flood rains affected the island.

The sampling exercise carried out on May 13th was intended to provide measurement of TSS (total suspended solids)/turbidity in the vicinity of the bund being established in the R2 .reclamation area, west of Gordon Cay On May 17th, sampling was done at the temporary disposal site at two stations to investigate how effective the screen is in minimizing the amount of suspended solids reaching the reef. However, high currents tore sections of the northern part of the screen. Therefore, sampling was confined to southern section of the screen which was secure.

Monitoring flights took place on May 13th and 28th and a selection of the photographs taken is attached.

Inspections of the silt screen at West Middle shoal took place on May 17, shortly after it was installed. The sea was very rough and the installation of the screen proved to be quite challenging for the divers. As mentioned above, the northern end of the screen was torn shortly after installation. Efforts were made to patch the screen when currents subsided. Another dive to inspect the screen, scheduled for the 26th May, was postponed due to inclement weather.

2.0 WATER QUALITY MONITORING

The objectives were:

May 13: To obtain data on TSS (total suspended solids)/turbidity in the vicinity of the bund being established in R2 just south east of the causeway.

May 17: To obtain measurements of TSS/Turbidity in the vicinity of west middle shoal during dredging.

Field Work

On both occasions sites were established for the collection of water samples and field measurements at multiple depths. Sub-surface samples were taken using a Model No. 12.25 Eijkelkamp peristaltic pump provided by Jan De Nul, as well as a Van Dorn water sampler. Samples were denoted T (surface), M (middle depth), and B (bottom depth). Sampling was carried out between 1020 and 1208 hours.

May 13

Six sites were monitored, five of them starting in the vicinity of the screen at R2 and heading south toward the channel (these were identified as KTP 1-5 (Figure 1). A sample was also taken in the shallow area just offshore the bund. All sites were assigned a GPS location (Table 1).

**Table 1: Dredging And Reclamation In Kingston Harbour
Water Quality Sampling Sites - May 13, 2002**

STATION NO	DESCRIPTION	N COORD.	W COORD
1	Just Outside Screen at R2	18° 00.214'	76° 46.196'
2	South of Screen	17° 58.617'	76° 50.344'
3	South of 2	17° 58.562'	76° 50.278'
4	South of 3	17° 58.422'	76° 50.153'
5	Channel	17° 58.166'	76° 49.857'

May 17

Four sets of samples were collected at two sites – at the dredge site west of West Middle Shoal, and outside the southern section of the screen protecting the shoal. (Figure 2). Shallow depth prevented the collection of samples inside the screen.

**Table 2: Dredging And Reclamation In Kingston Harbour
Water Quality Sampling Sites – May 17, 2002**

STATION NO	DESCRIPTION	N COORD.	W COORD.
1	Dredge Site - West Middle Shoal	17° 55.415'	76° 51.216'
2	At Screen (outside)	17° 55.376'	76° 51.000'
3	Dredge Site - Resampled	17° 55.450'	76° 51.288'
4	At Screen - Resampled	17° 55.343'	76° 51.017'

Sample Analysis

Samples were analysed by the Geological Survey Division laboratory. Samples were analysed to determine TSS and turbidity. Analyses were conducted in accordance with Standard Methods for the Analysis of Water and Waste Water.

TSS was determined by filtration of a known sample volume through a dried, pre-weighed filter. After filtration, the filter was dried and re-weighed. TSS in mg/l is obtained through a determination of the weight difference of the filter before and after filtration.

Turbidity was performed using the colorimetric method and reported in FAU (formazin attenuated units). FAU includes a correction for colour and is approximately equivalent to TSS mg/l.

Observation and Results

May 13, 2002

During this sampling exercise heavy-duty equipment was observed assisting in the establishment of the bund at R2. Though progress was obvious, there was significant slippage of material as well as the emergence of small mud waves which created a shallow area extending about 15 M southward from the bund (Appendix - Plate 1). The silt screen was in place though it appeared to be overwhelmed by the choppy seas (Appendix - Plate 2). The screen extended from the southern shore of Gordon Cay but was discontinuous in front of the southern side of the bund closer to the Causeway. This was reported immediately on observation and corrected. On May 14th the bund lineation was adjusted to run closer to Gordon Cay, this to limit the emergence of mud waves.

Results of laboratory and field analyses are presented in Table 3 along with sampling depth and time of sample collection.

Table 3: Dredge Monitoring - R2 Bund near Causeway – May 13, 2002

STATION NO	TIME	DEPTH (M)	LAB. RESULTS		FIELD DATA*
			T (FAU)*	TSS (mg/l)	TSS (mg/l)
1T	1020		21	12.00	50
1Ta			28	17.00	
1M		2.0	31	20.00	200
1Ma			28	18.00	
1B		4.0	2835	2117.00	200
1Ba			4933	23420.00	
2T	1117		18	12.00	50
2Ta			27	25.00	
2B		4.0	23	14.00	50
2Ba			30	41.00	
3T	1125		19	2.00	50
3Ta			20	3.00	
3B		5.0	<14	4.00	350
3Ba			38	32.00	
4T	1200		<14	2	50
4B		6	<14	24	50
5T	1210		<14	<1	50
5B		7.0	<14	13.00	50
KTP R2 Bund		0.5	82	55.00	
T - Surface sample					
B - Depth sample					
(a) - duplicate/replicate samples					
TSS mg/l - Total Suspended Solids					
T (FAU) - Turbidity in Formazin Attenuated Units					

Laboratory results indicate TSS values ranging from <1 - 23,420 mg/l (Figure 3). The highest values, 2117 and 23420mg/l were reported for the bottom samples taken in the vicinity of the screen (KTP 1B, and KTP1Ba respectively). All other samples analysed had a TSS range of <1 – 55mg/l. The highest value in this range was determined for the sample collected at the bund (behind the screen) where depth was around 1M. For samples taken just outside the screen, TSS was determined to be around 15mg/l in surface water. In general TSS in surface water decreased steadily moving from the Bund (R2) towards the channel (Figure 4).

Figure 3: TSS at R2 and Environs - May 13

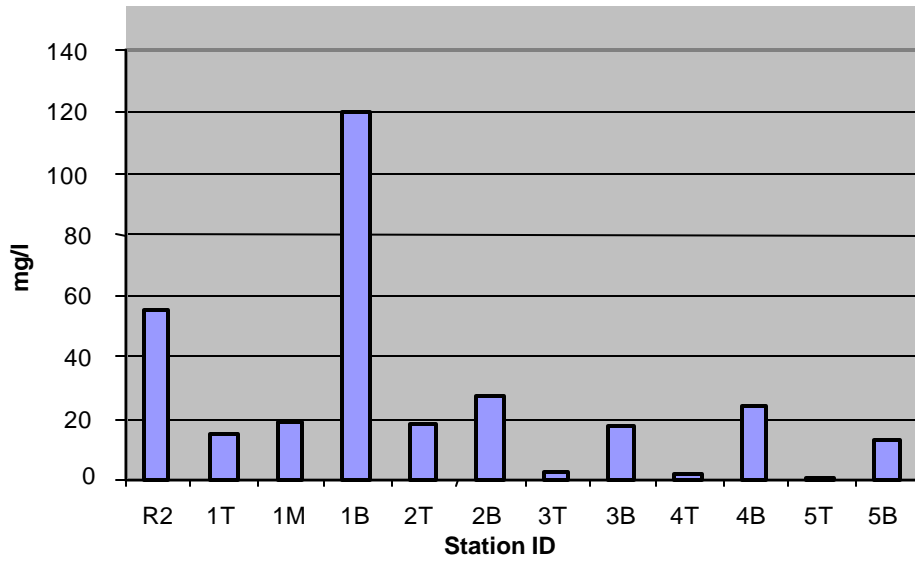
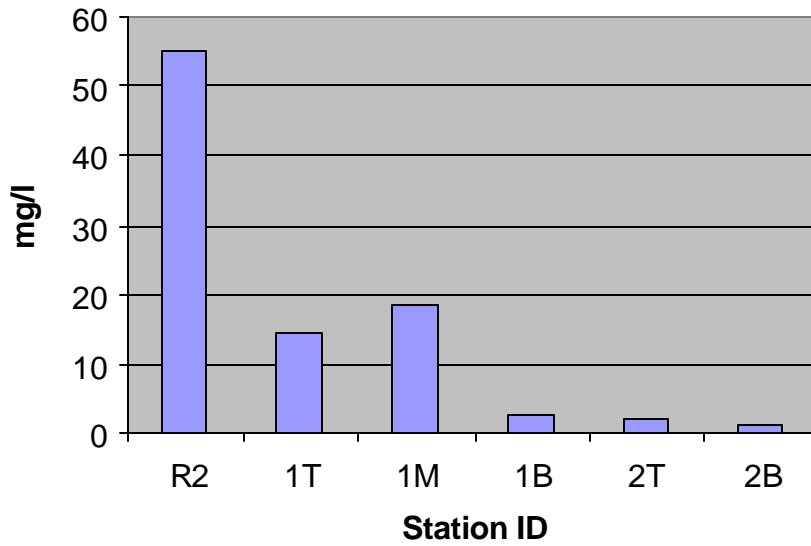


Figure 4: TSS In Surface Water R2 and Environs - May 13



May 17, 2002

During the sampling exercise, seas were choppy to rough. Damage to the northern section of the screen was observed.

Results of laboratory analyses as well as field measurements are presented in Table 4. Laboratory analyses indicated a range of <1 – 81mg/l TSS for all samples. The range determined from field measurements was 13 - 150mg/l.

Table 4: Dredge Monitoring – West Middle Shoal – May 17, 2002

STATION NO	TIME	DEPTH SAMPLED (M)	LAB. RESULTS		FIELD DATA*
			T (FAU)	TSS (mg/l)	TSS (mg/l)
1T	1235		<14	2.0	50
1M		8.5	22	81.0	50
1B		17.0	<14	15.0	150
2T	1302		<14	<1.0	13
2M		8.5	<14	7.0	13
2B		17.0	<14	21.0	13
3T	1329		<14	8.0	20
3M		8.5	<14	<1.0	20
3B		17.0	<14	8.5	20
4T	1342		<14	3.0	20
4M		8.5	<14	<1.0	20
4B		17.0	<14	<1.0	20
T - Surface sample					
M - Middle Depth					
B - Depth sample					

The highest values were determined for the dredge plume (KTP 1) where TSS was determined by lab analysis to be 2mg/l for the surface sample, 81mg/l at middle depth, and 15mg/l in the bottom sample. Analysis of samples taken next at West Middle Shoal (KTP 2) indicated TSS of <1mg/l at the surface, 7mg/l at middle depth, and 21mg/l at the bottom. Re-sampling of the dredge site (KTP 3) 30 minutes later, (after the dredge had gone to the 100m dump site), indicated TSS of 8mg/l at the surface, <1mg/l at middle depth, and 8.5mg/l at bottom depth. Re-sampling of West Middle Shoal (KTP 4), indicated TSS of 3mg/l at the surface, and <1mg/l below the surface.

Conclusion/Environmental Impact

May 13

- Elevated TSS levels were associated with the formation of the bund at R2. These levels appeared to be confined to the immediate vicinity of the bund.
- Slippage of softer material from the bund formed a shallow area in which the floor is composed of very soft material that is readily re-suspended. This is a main contributor to the high TSS level determined in subsurface waters just outside the screen.
- Settling of most of the sediment appeared to take place within approximately 100m of the bund.
- The screen appeared to be helping to promote settling of sediment but it was easily damaged by windy conditions.

May 17

- Dredging appeared to have a negligible impact on TSS at West Middle Shoal at the time of sampling.
- The silt screen was easily torn by rough conditions.

Recommendations/Mitigation

- Strategies for reducing slippage of the bund should be investigated.
- Silt screens require close monitoring and should be repaired as required.

3.0 MONITORING BY AIR

R2 Bund

The aerial examination of the R2 bund on May 13th showed no cause for alarm (Plates 3,4,5). The small mud waves were not visible from the air. The photograph of the Leonardo Da Vinci (Plate 6) showed some plume development although the plume spread was noted at approximately 200 metres from the dredge, in very shallow water.

North of R1

A helicopter flight was made on May 27 to document the effects of heavy rainfall in the area for several days. Unfortunately, poor visibility hampered efforts and affected the quality of the photographs (Plates 7, 8). The area north of R1 was deluged with water and the Jew Gully appeared to be flowing normally. An extensive plume was noted coming from the Rio Cobre and from Sandy Gully, which emerged from the causeway and caused considerable discolouration along the western side of the harbour.

4.0 RACKHAMS CAY

Dredging at the “temporary site” West of West Middle Shoal by the Christofforo Columbo began on Friday 17th May, and was monitored by our water quality team (See section 2.0). The dredging was carried out to remove the mud from the site (to the 1000m offshore dump site) in preparation for the deposition of clean material from Rackham Cay. This dredging was completed on Tuesday 28th May.

Dredging at Rackhams Cay was scheduled to begin on May 26th. This was delayed due bad weather that affected the groundwork for the exercise. The preparation of screens at Rackham and the laying of the pipeline to the temporary site were delayed. Attempts to lay the pipe on May 30th led to a break in the pipe that had to be repaired. Further, the screen at West Middle Shoal was again damaged due to rough seas. The estimated time for dredging to commence in this area is now June 6th or 7th. An inspection of the screen at Rackham carried out by TEMN on the 28th May showed it to be properly located and undamaged.