SYDNEY PORTS
FIRST PORT, FUTURE PORT

SYDNEY PORTS CORPORATION
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8 July 2009

Mr Scott Jeffries
Director
Major Infrastructure Assessments
NSW Department of Planning
GPO Box 39
SYDNEY NSW 2001

Dear Mr Jeffries,

Re: Port Botany Expansion Project
Section 96(1A) Modification
Additional Ship Turning Area Dredging - Revised

Further to a request from Ingrid Ilias on 8 July 2009, this letter provides additional information regarding the proposal to undertake additional dredging within the ship turning area.

Sydney Ports Corporation (Sydney Ports) is seeking a further modification, under Section 96(1A) of the *Environmental Planning & Assessment Act 1979*, to increase the volume of sand permitted to be dredged from within the ship turning area as part of the Port Botany Expansion Project.

Sydney Ports has previously obtained the following modifications, relating to additional dredging south of the main works area:

- modification DA-494-11-2003-i MOD 8, dated 20 May 2009, to allow dredging of an additional 300,000m^3 of sand within the ship turning area; and
- modification DA-494-11-2003-i MOD 9, dated 18 June 2009, to allow dredging of an additional 100,000m^3 of sand at the high spot off Molineux Point.

These modifications are in addition to the dredging of 220,000m^3 of high spots south of the main works area that was assessed and approved as part of the approval of the Port Botany Expansion Project in 2005 (DA-494-11-2003-i).

The total approved volume of dredging south of the main works area is 620,000m^3.

Sydney Ports now seeks to obtain approval to dredge a further 600,000m^3 of sand from within the ship turning area. A trailing suction hopper dredger would also be used for this dredging.

The dredge volume requested by Sydney Ports for approval as part of DA-494-11-2003-i MOD 8 was limited to 300,000m^3 as it was considered likely that this would be the limit of unconsolidated sediments present within the ship turning area. The trailing suction hopper dredger can only dredge unconsolidated sediments therefore the dredge volume is limited by the availability of unconsolidated sediment.

Since that time, dredging within the ship turning area has commenced. Significantly more unconsolidated sediment than was anticipated has been found to be available within the ship turning area

and would be able to be dredged by the trailing suction hopper dredger. This modification application is therefore seeking to increase the dredge volume by a further 600,000m^3 in the ship turning area.

The environmental assessment provided in support of Sydney Ports' application for approval of modification DA-494-11-2003-i MOD 8 remains valid for this application and is attached as Attachment 6 for ease of reference. The assessment for that modification was conducted on the basis of undertaking full dredging to the depths shown in Figure 2 of that application, reproduced as Attachment 1 to this letter. The total volume of material that would be available within ship turning area to achieve the depths in Figure 1 is in excess of 900,000m^3.

With the proposed additional dredging described in this modification, the total volume of material to be dredged from the ship turning area is 900,000m^3. The additional dredging proposed in this modification will therefore not change the depths identified in Attachment 1. As such, the environmental assessment and consultation previously undertaken remain valid.

The total quantity of material required to be dredged for the Port Botany Expansion Project would not change if this application is approved.

Need for Additional Dredging

The dredging of the additional 600,000m^3 of sand from the ship turning area is proposed for the following reasons:

- the dredging of clean sand in the ship turning area that has already been undertaken by the Trailing Suction Hopper Dredger has been successful and has identified the availability of further unconsolidated sands that can be dredged from this area;
- low turbidity levels have been generated by the Trailing Suction Hopper Dredger dredging in this location hence the environmental impact of the additional dredging is minimal;
- the extent and depth of dredging required nearer the third runway, new boat ramp and retained seagrass area would be further reduced, as less material would be required to be sourced from the area between the Parallel Runway and the new terminal;
- the amount of dredging of inter-bedded layers of sands and clays inside the silt curtain would be further reduced, which would mean less interaction with clay layers. This would reduce the amount of clay material needing to be redeposited in the dump pit adjacent to the Parallel Runway.

Environmental Assessment

The environmental assessment undertaken by Sydney Ports in support of DA-494-11-2003-i MOD 8 included an assessment of impacts on turbidity, noise, seagrass, aquatic ecology, hydrodynamics and other projects in Botany Bay.

There is no change to this assessment, as the proposed additional dredging will remain within the depths assessed by that application.

Turbidity Monitoring of Dredging in Ship Turning Area

Extensive water quality monitoring of dredging activities using the Trailing Suction Hopper Dredger 'De Bougainville' in the ship turning area to date has shown turbidity is well below the project water quality criteria (background + 50 mg/L) at fixed monitoring buoys outside the primary silt curtain. This is indicated in Attachment 3 to this letter, which shows turbidity levels over the first week of dredging at

buoys WQ03 and WQ04 compared to the project criteria. A conversion from TSS (mg/l) to turbidity (NTU) was determined by a NATA accredited laboratory using in-situ sediment. It was found that 50mg/l TSS is equivalent to a turbidity level of 32.6 NTU.

Additional turbidity monitoring has been undertaken during dredging within the ship turning area, as required by the monitoring procedure outlined in the approved modification DA-494-11-2003-i MOD 8 (refer to Section 6.1.1 of Attachment 6) and reflected in Environmental Protection Licence 12923. This additional monitoring consists of two samples during each outgoing tide during daylight hours at two locations 50m and 100m downstream of the working area. The locations are dependent on tidal flow. These results are compared to an upstream monitoring location, to allow identification of any differences between turbidity from dredging and local background turbidity levels. Results from this sampling are provided in Table 1 below. All results remain well below the set limit of 'background + 32.6 NTU'.

Table 1: Results of mobile monitoring at downstream and upstream locations during outgoing tides.

number	date	time	location	NTU min	NTU max	NTU average
1	09/06/2009	11:50	upstream	4.4	4.5	4.4
2	09/06/2009	11:44	Downstream_1	5.1	7.1	6.0
3	09/06/2009	11:41	Downstream_2	4.2	4.4	4.3
4	10/06/2009	12:10	upstream	4.4	4.5	4.4
5	10/06/2009	11:56	Downstream_1	10.1	13.1	11.6
6	10/06/2009	11:53	Downstream_2	9.2	14.4	11.8
7	11/06/2009	13:32	upstream	0.8	6.7	2.6
8	11/06/2009	13:17	Downstream_1	1.8	8.6	3.3
9	11/06/2009	13:22	Downstream_2	3.2	16.5	11.2
10	11/06/2009	15:30	upstream	1.2	4.7	2.5
11	11/06/2009	15:46	Downstream_1	2.7	11.1	6.6
12	11/06/2009	15:54	Downstream_2	1.6	10.3	6.1
13	12/06/2009	14:24	upstream	1.5	1.6	1.5
14	12/06/2009	14:12	Downstream_1	1.8	9.3	6.3
15	12/06/2009	14:18	Downstream_2	1.5	4.1	2.2
16	12/06/2009	15:50	upstream	1.1	1.4	1.2
17	12/06/2009	15:43	Downstream_1	1.1	1.7	1.3
18	12/06/2009	15:46	Downstream_2	0.8	1.6	1.2
19	13/06/2009	14:41	upstream	0.7	3.0	2.2
20	13/06/2009	14:10	Downstream_1	1.6	4.0	2.1
21	13/06/2009	14:15	Downstream_2	0.4	1.3	1.1
22	13/06/2009	15:48	upstream	2.6	4.4	3.7
23	13/06/2009	15:54	Downstream_1	2.9	7.8	4.7
24	13/06/2009	15:59	Downstream_2	2.1	2.4	2.2
25	14/06/2009	14:19	upstream	1.9	4.3	2.4
26	14/06/2009	14:11	Downstream_1	1.5	1.7	1.6
27	14/06/2009	14:16	Downstream_2	1.2	1.4	1.3
28	14/06/2009	15:52	upstream	1.9	2.2	2.1
29	14/06/2009	15:23	Downstream_1	4.1	9.6	5.6
30	14/06/2009	15:33	Downstream_2	0.8	4.8	2.0
31	15/06/2009	16:14	upstream	2.4	3.7	2.6
32	15/06/2009	15:57	Downstream_1	1.8	5.2	3.8
33	15/06/2009	16:05	Downstream_2	2.1	4.8	2.7
34	15/06/2009	17:03	upstream	2.7	3.1	2.9
35	15/06/2009	16:48	Downstream_1	9.5	14.3	12.2
36	15/06/2009	16:56	Downstream_2	3.8	4.8	4.2

Turbidity monitoring will continue during the dredging of the additional 600,000 m3 in the same manner as outlined above and in accordance with approval Condition B2.9.

Noise

The noise assessment conducted for modification DA-494-11-2003-i MOD 8 (refer to Section 6.1.2 of Attachment 6) remains valid for the proposed additional swing basin area dredging covered in this application. The dredging is sufficiently remote from the nearest residences that it would not result in an increase in construction noise impacts at those residences.

Seagrasses

The seagrass impact assessment conducted for modification DA-494-11-2003-i MOD 8 remains valid for the proposed additional swing basin area dredging covered in this application (refer to Section 6.1.3 of Attachment 6).

Aquatic Ecology

There is no change to the aquatic ecology assessment conducted for modification DA-494-11-2003-i MOD 8 (refer to Section 6.1.4 of Attachment 6) as a result of the proposed additional swing basin area dredging covered in this application, as the dredging is to occur within the area covered by the aquatic ecology assessment report. This has been confirmed by Cardno Ecology Lab in Attachment 2 to this letter.

Hydrodynamics

The hydrodynamic assessment provided as part of modification DA-494-11-2003-i MOD 8 (refer to Section 6.2.1) is valid for the additional swing basin area dredging proposed in this application as it assessed removal of material in the swing basin to the depths identified in Attachment 1. This has been confirmed by Cardno Lawson Treloar in Attachment 2 to this letter.

Consultation

Stakeholder consultation was undertaken by Sydney Ports for this modification application with the following organisations:

- Community Consultative Committee (CCC) at its meeting on 17 June 2009 – no issues were raised by the CCC. A Botany Council representative was present at the meeting. No issues of concern were raised by Council.
- NSW Maritime – an email confirming that NSW Maritime has no objection to the additional dredging is provided in Attachment 4.
- Harbour Master – a letter giving Harbour Master Approval for the additional dredging is provided in Attachment 4.
- DPI Fisheries – an email confirming that DPI Fisheries have no objections to the proposed modification is provided in Attachment 4.
- DECC – an email from DECC confirming that the proposal is authorised by the current Environment Protection Licence 12923 (EPL) issued to Jan De Nul is provided in Attachment 5.

Conclusion

There would be no increased impact arising from the additional ship turning area dredging as assessed in this application. It is considered that the proposed modification is substantially the same as the approved development and would have minimal environmental impact. Therefore an application under Section 96(1A) is appropriate.

Approval for dredging an additional 600,000m^3 of sandy material in the ship turning area using a Trailing Suction Hopper Dredge should be granted.

The mitigation measures to be implemented as part of the modification are:

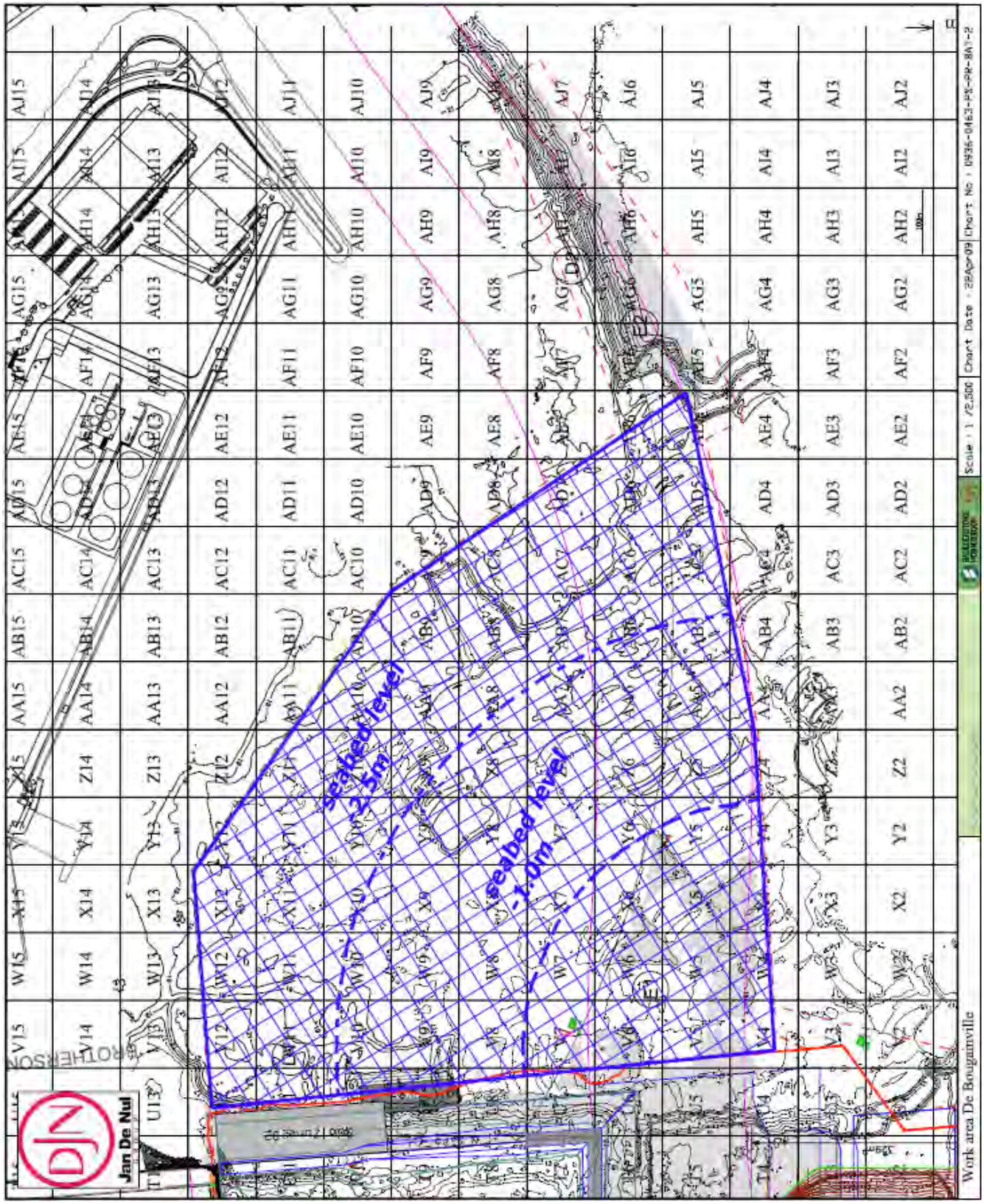
- Turbidity monitoring would continue to be undertaken.
- Visual surveillance for turbidity plumes would be conducted at all times during dredging and reclamation.
- Operational controls as specified in modification DA-494-11-2003-i MOD 8 (refer to Table 4 would continue to be implemented in response to increasing turbidity levels.

Your prompt assessment of this modification would be appreciated. Should you require further information please do not hesitate to contact me on 9296 4908.

Yours sincerely

Marika Calfas
Manager Planning & Environment
Port Botany Expansion

Attachment 1: Proposed Dredging Within the Ship Turning Basin



Attachment 2: Letter from Cardno Lawson Treloar & Cardno Ecology Lab

Cardno Lawson Treloar

Our Ref LJ2548/L1905 :sgr

Contact P.D. Treloar

16 June 2009

Sydney Ports Corporation
Port Botany Expansion Project
PO Box 25
MILLERS POINT NSW 2000

Attention: Mr Tony Navaratne

Dear Sir,

WAVE CLIMATE INVESTIGATIONS - PORT BOTANY EXPANSION
PROPOSED JDN DREDGING IN PORT BOTANY – TURNING CIRCLE AREA

Preamble

Following our telephone discussion on 16 June 2009, we confirm that the numerical modelling studies reported in our letter L1866 dated 11 May 2009 was based on the bed level/depth information presented in Annexure A of that letter.

Yours faithfully,

P.D. Treloar
Manager - Coastal, Ocean & Estuarine Studies
for **Cardno Lawson Treloar**

Cardno Lawson Treloar Pty Ltd
ABN 55 001 082 673

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Gold Coast
Gosford
Baulkham Hills
Wollongong
Busselton

Papua New Guinea
Indonesia
Vietnam
China
Kenya
United Arab Emirates
United Kingdom
United States

Our Ref EL0708073

Contact Dr Marcus Lincoln Smith (Marcus.lincolnsmith@cardno.com.au)

Cardno Ecology Lab

Shaping the Future

8 July 2009

Ms Marika Calfas
Senior Manager - Planning
Sydney Ports Corporation
Level 8, 207 Kent Street
Sydney NSW 2000

Dear Marika,

Re: Further Dredging in Ship Turning Area

As advised by you, Sydney Ports is seeking further modification, under Section 96(1A) of the Environmental Planning and Assessment Act 1979, to increase the volume of unconsolidated sediment to be dredged from the ship turning area as part of the Port Botany Expansion Project. Approval is being sought to dredge a further 600,000 m^3. In correspondence to Sydney Ports on 12 May 2009 I provided an assessment of the likely effects on aquatic ecology of dredging 300,000 m^3.

Key elements of the revised dredging include the following:

- The dredging would be confined to the turning area
- All the dredged material would be placed within the reclamation area
- Slopes to the adjacent shipping channel would be 1:3 and 1:5 and would be connected to the adjacent shipping berth and channel. Hence there would not be creation of areas of water that would be isolated from Botany Bay (and hence with a potential for reduced water quality).

I have previously provided advice to Sydney Ports (correspondence 12 May 2009) on the likely effects of dredging in the turning basin that was in addition to that proposed in the original Environmental Impact Statement (URS 2003). It was predicted in both the EIS and my recent correspondence that the dredging in the turning basin would cause a temporary loss of benthic productivity. Moreover, I noted that dredging plan would avoid the creation of a deep, isolated hole potentially subject to poor water quality. Based on the three elements listed above, my assessment of impacts to aquatic ecology does not change.

Yours faithfully

Dr Marcus Lincoln Smith

Business Unit Manager

Cardno Ecology Lab

Cardno Ecology Lab Pty Ltd
ABN 73 002 379 473

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Brookvale
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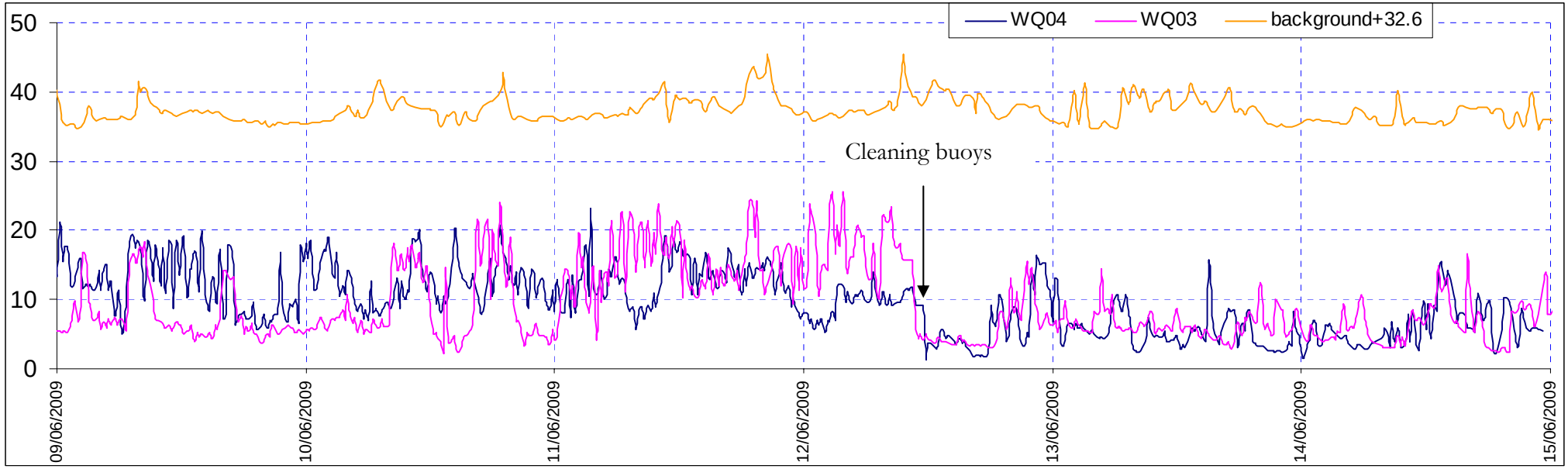
Springfield
Gold Coast
Canberra
Victoria
Melbourne
Bendigo
Dandenong
Western Australia
Perth
Kalgoorlie
Busselton
Northern Territory
Darwin

Attachment 3: **Turbidity readings at the fixed buoys outside the silt curtain (WQ03 and WQ04) compared to the set limit of background + 32.6 NTU.**



Attachment 4: Stakeholder Correspondence

Email from NSW Maritime

-----Original Message-----
From: Graeme Dunlavie [mailto:Graeme.Dunlavie@maritime.nsw.gov.au]
Sent: Friday, 19 June 2009 4:01 PM
To: Graeme Alley
Subject: RE: Additional Dredging of the Swing Basin off Brotherson Dock

Good Afternoon Graeme

Please be advised that NSW Maritime has no navigational objection to the proposed additional dredging woorks to be undertaken in the Swing Basin off Brotherson Dock.

Regards
Graeme Dunlavie
Operations Manager Botany Bay/Port Hacking
Recreational Boating & Regional Services
NSW Maritime

Serving our Boating Community - Safe Waterways and Support for the Maritime Community

T: 02 9545 4422 | F: 02 9545 3648 | M: 0418 417 032
PO Box 456 | SUTHERLAND NSW 1499
www.maritime.nsw.gov.au

-----Original Message-----
From: Graeme Alley [mailto:galley@sydneyports.com.au]
Sent: Thursday, 18 June 2009 3:36 PM
To: Graeme Dunlavie
Subject: FW: Additional Dredging of the Swing Basin off Brotherson Dock

The De Bougainville dredge is currently dredging the Swing Basin off Brotherson Dock down to a declared depth of -15.5m CD. The productivity of the trailer suction split hopper dredge will allow 600,000 cum of additional sand removal from the Swing Basin. Cardno Lawson Treloar advised on 16 June 2009 that modelling of the proposed additional dredging of 600,000 cum from the Swing Basin has no impact.
As discussed please provide a response confirming that you have no issues with the proposed additional dredging.

Graeme Alley
Senior Manager, Botany Projects

Sydney Ports Corporation
Penrhyn Road | Banksmeadow NSW 2019 Australia
PO Box 25, Millers Point | NSW 2000 Australia

E: galley@sydneyports.com.au
T: +61 2 9392 3344 | **F:** + 61 2 9392 3350
M: 0417 272 941
www.sydneyports.com.au

Email from DPI Fisheries

From: carla.ganassin@dpi.nsw.gov.au [mailto:carla.ganassin@dpi.nsw.gov.au]
Sent: Thursday, 9 July 2009 11:04 AM
To: Marika Calfas
Cc: Scott Carter
Subject: Re: Dredging at Port Botany

Hi Marika,

Thank you for giving NSW Department of Primary Industries (DPI) the opportunity to comment on this proposal.

NSW DPI has noted that the proposed dredging modification does not change the previously approved dredging configuration. Considering this and that significant impacts on aquatic habitats are not indicated in the information provided, NSW DPI has no objections to this proposed modification.

Regards,

Carla Ganassin
NSW Department of Primary Industries (DPI)
Conservation Manager - Sydney Region
PO Box 21, Cronulla 2230
202 Nicholson Pde, Cronulla
Ph: (02) 9527-8552; Fax: (02) 9527-8576

Email from DECC

From: Jennifer Sage <Jennifer.Sage@environment.nsw.gov.au>
To: Quentin Pitts <QPitts@baulderstone.com.au>
Cc: Laura Wythes <Laura.Wythes@environment.nsw.gov.au>, Jacinta de Jong <Jacinta.deJong@environment.nsw.gov.au>
Date: 08/07/2009 03:08 PM
Subject: RE: DECC--Notification of Additional Dredging in Ship Turning Basin

---

Hi Quentin,

DECC has reviewed the information provided in Sydney Ports' application to the Department of Planning to modify the Port Botany Expansion Project to increase the volume of sand dredged from within the ship turning area.

DECC considers that the proposed additional dredging of 600,000m^3 outside the silt curtain for the Port Botany Expansion Project is authorised by the current Environment Protection Licence 12923, on the basis that the dredging will be carried out –

- in the same locations and to the depths considered in the original environmental assessment for the project; and
- using the methods, equipment and monitoring procedures as that outlined in Jan de Nul's licence variation application dated 7 May 2009.

As discussed earlier today, Condition E2.1 of JDN's EPL allows for dredging outside the silt curtain for a period of 60 days, with a contingency for unforeseeable events.

Please contact me if you have any further queries.

Regards,
Jen

Jennifer Sage

Metropolitan Infrastructure

Environment Protection & Regulation Group

Department of Environment and Climate Change

Tel: 02 9995 6856 | Fax: 02 9995 6902

Email: jennifer.sage@environment.nsw.gov.au

Attachment 5: Approval from Harbour Master

SYDNEY PORTS
FIRST PORT, FUTURE PORT

18th June 2009

Jan De Nul
PO Box 641
Botany 1455
New South Wales

Dear Sir

Permission for Disturbance of the Bed of a Special Port Area

I, the Harbour Master for the Ports of Sydney Harbour and Botany Bay, grant permission to Jan De Nul under Clause 67 of the *Management of Waters and Waterside Lands Regulations* for works disturbing the bed of a Special Port Area.

This permission applies to the dredging of an additional 600,000m3 from the additional swing basin area shown on plan BPD227A dated 5.05.2009.

The permission is valid for the period of 6 months to 18-12-2009 and is issued subject to the Conditions attached at Schedule 1.

This Permission does not imply that any other permission, approval or consent required under any state or federal legislation has been granted, and works are not to commence until all such permissions, approvals or consents are issued by the relevant authorities.

Richard Lorraine
Harbour Master

18th June 2009

Schedule 1 – Conditions of Permission

1. The Applicant is to implement a marine traffic management plan which is to be approved by Sydney Ports Corporation.

2. The works are not to interfere with the movement of trading vessels unless agreed in advance with Sydney Ports Corporation.

3. Buoys are not to be laid in or adjacent to the shipping channels unless agreed in advance with Sydney Ports Corporation.

4. All buoys are to be fitted with lights.

5. All vessels associated with the works are to have response plans for emergencies and spills.

6. All hours contact numbers are to be provided to Sydney Ports Corporation.

7. All operations to be undertaken in accordance with the current version of port operating protocol.

Attachment 6 – DA-494-11-2003-i MOD 8

PORT BOTANY EXPANSION

SHIP TURNING AREA DREDGING

SECTION 96 (1A) MODIFICATION

May 2009

TABLE OF CONTENTS

1. INTRODUCTION

Sydney Ports Corporation (Sydney Ports) has obtained planning approval from the Minister for Planning for the construction and operation of a new container terminal, referred to as the Port Botany Expansion (DA-494-11-2003i approved on 13 October 2005 and 22 August 2006).

The approved dredging and reclamation methodology during construction is described in Chapter 8 of the Environmental Impact Statement (EIS) (URS, 2003). The approved development provides for:

- dredging and reclamation within the primary silt curtain between Brotherson Dock and the Parallel Runway; and
- dredging of approximately 220,000m^3 of high spots outside the primary silt curtain.

Chapter 8 of the EIS (page 8-10) states that:

> "*Several high spots currently exist in the ship turning area to the south of the main dredge area as shown in Figure 8.4. It would be necessary to remove these navigation hazards as shipping traffic increases in these areas and ships become larger. Dredging of these minor obstructions would be conducted as part of the contract for the berth and reclamation area to avoid having to remobilise dredging equipment at a later date.*
>
> *It is expected that approximately 220,000 m^3 of material would need to be removed from these areas. The cutter suction dredging method would be used. Where possible, dredged material would be pumped directly to the reclamation area, however, pumping may not prove practical for the most distant locations, in which case, the dredged material would be loaded into barges for transportation to the reclamation site*."

Recently, investigations into potential changes to dredging and reclamation methodology have been undertaken. These investigations have identified an opportunity to use a Trailing Suction Hopper Dredger to undertake some of the dredging. This opportunity presents a number of advantages over the dredging methodology presented in the EIS.

While the proposed dredging using a Trailing Suction Hopper Dredger for removal of high spots in the ship turning area is consistent with the EIS, it is proposed to dredge an additional 300,000m^3 of sand from the ship turning area. This would result in a total of 520,000m^3 of dredging in the ship turning area.

This modification application seeks planning approval for additional dredging in the ship turning area, to maximise positive outcomes during construction.

2. MODIFICATION DESCRIPTION

2.1. EIS Approved Dredging Configuration

The approved dredging and reclamation methodology is described in detail in Section 8.2.3 of the EIS. It includes the following principal dredging and reclamation activities:

- dredging of an access channel to the new berths and removal of high spots within the ship turning area to allow ships to manoeuvre and berth at the new terminal;
- reclamation of land for additional container terminal capacity using the dredged material;
- progressive construction of counterfort walls to contain the outer edges of the reclaimed land; and
- reclamation of land for a new boat ramp and car park with direct access to Foreshore Road.

Figure 8.4 of the EIS, reproduced below as Figure 1, identifies the approved dredging configuration.

2.2. Proposed Changes to Dredging Configuration

The proposed dredging would not change the principal dredging and reclamation activities described in the EIS. In particular, there would be no change to the dredging of 220,000m^3 of sand to remove high spots outside the primary silt curtain.

The only change that would occur due to the proposed dredging would be deeper levels in the ship turning area in some areas by the dredging of an additional 300,000m^3 compared to that indicated in the EIS. These areas are shown in Figure 2 below. Levels would be up to 1 and 2.5 metres below the current seabed in parts of the ship turning area, as indicated in Figure 2, though it is likely that not all sand would be removed to these levels.

The edge of the dredged areas would have a slope of 1:3 to the adjacent undisturbed areas in the ship turning area.

All dredged material would all be placed within the reclamation area. This dredging would reduce the amount of dredging required within the main dredged area between the Parallel Runway and the new terminal, as the total amount required to be dredged for the Port Botany Expansion would not change.

Therefore the only change would be an increased volume of dredged material, from approximately 220,000m^3 in the EIS to approximately 520,000m^3, and deepening of parts of the ship turning area by 1 to 2.5 metres. There would be no widening or re-orientation of the existing ship turning area.

As there would be no changes to the total dredged quantity required for the development, or the type, nature, or scale of operations that would take place on the terminal as a result of approval of the modification, the modification is substantially the same development as the approved development.

2.3. Dredging Method for Proposed Changes

A Trailing Suction Hopper Dredger would be used by Jan de Nul (JDN) for the additional dredging. This method is consistent with the EIS. Dredging of this additional material would take around two weeks.

Trailing Suction Hopper Dredgers are sometimes referred to as ‘vacuum cleaner dredgers’. When arriving on location the dredger is set in position and a suction pipe is lowered overboard

until drag heads reach the seabed (**Figure 1**, Number 1). The depth of the drag heads is controlled continuously to ensure correct depths are achieved.

While the vessel moves forward, the loosened seabed material is drawn up the pipe (**Figure 1**, Number 2). The material is pumped into the dredger's hopper where it settles to the bottom, while the excess water drains through a variable overflow system (**Figure 1**, Number 3).

When the hopper is full, the dredger sails to the reclamation area via the 50 metre gate in the silt curtain, where the material is placed underwater in a controlled manner by splitting the hull over the complete length. All reclamation for the Port Botany Expansion Project is inside the primary silt curtain. The gate in the silt curtain would be kept open while dredging is undertaken in the ship turning area, including when the material is deposited at the reclamation area. The gate will be kept closed while the dredger is working entirely within the area between the Parallel Runway and the new terminal.

The Trailing Suction Hopper Dredger would only be used to dredge sands, and not clays, as the suction is only strong enough to loosen unconsolidated sediments.

Figure 1 - Working principle of Trailing Suction Hopper Dredge

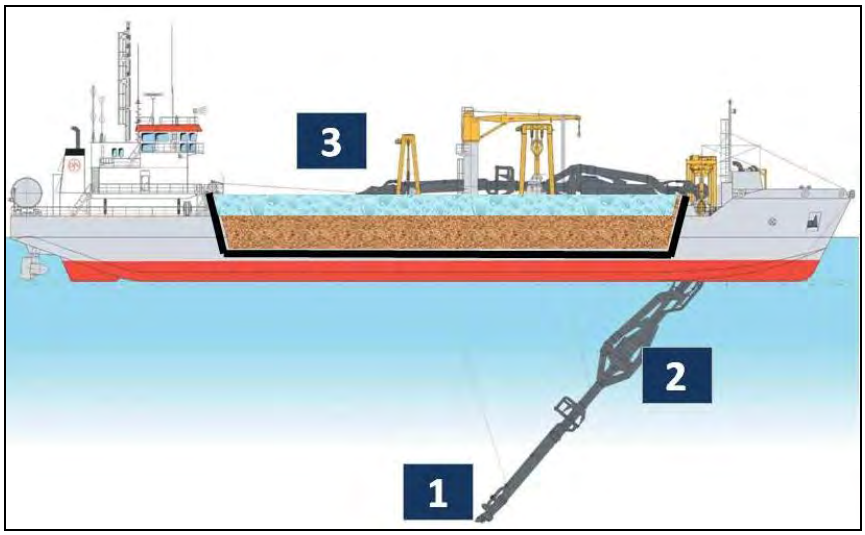


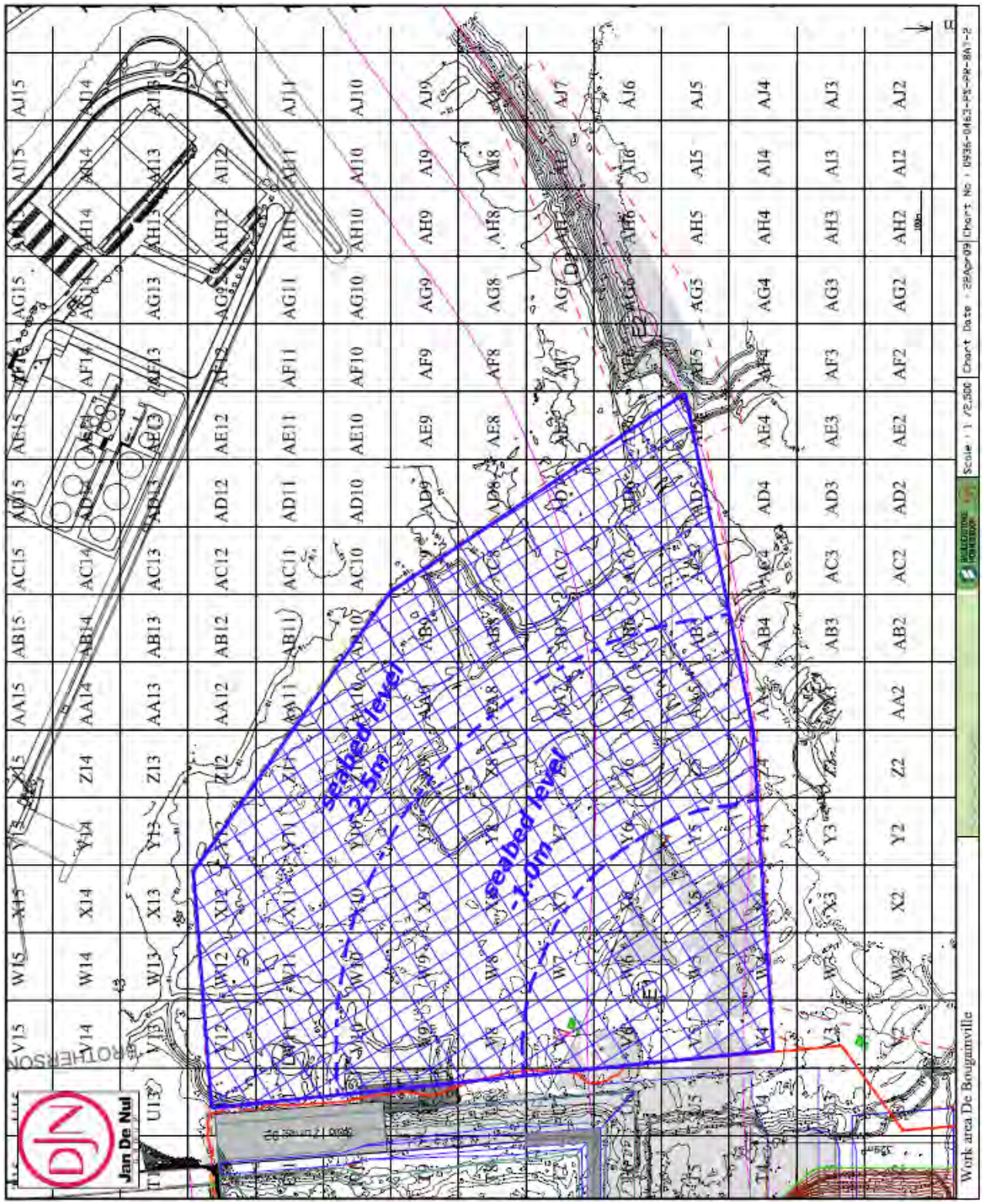
Table 1 below outlines bulk dredging methods to be used throughout the project.

Table 1 – Dredge locations and methods

Dredge Location	Additional to EIS?	Dredging method
Counterfort trench, inside primary silt curtain	No	Cutter Suction Dredge, Trailing Suction Hopper Dredge
Bulk dredging within primary silt curtain	No	Cutter Suction Dredge, Trailing Suction Hopper Dredge
High spots outside primary silt curtain	No	Trailing Suction Hopper Dredge
Additional bulk dredging outside primary silt curtain	Yes	Trailing Suction Hopper Dredge

Figure 1: Approved Dredging and Reclamation (From URS, 2003)

Figure 2: Proposed Dredging Outside Primary Silt Curtain



3. NEED FOR THE ALTERNATE DREDGING CONFIGURATION

For technical reasons, a Trailing Suction Hopper Dredge is the most appropriate type of plant to dredge certain areas inside the primary silt curtain.

This type of dredging was not previously considered, and is preferred for operational reasons for dredging areas outside the primary silt curtain in the ship turning area. This preference is due to the dredgers ability to move and dredge independently, as opposed to Cutter Suction Dredgers which require anchoring, tug boats, spud poles, and pipe connections to operate and move. Whereas mobilisation of a Cutter Suction Dredger and pipeline to a particular area would take 6-8 hours, Trailer Suction Hopper Dredgers are very manoeuvrable, and can vacate an area within minutes. This would mean no restrictions to cargo vessels coming into, and out of, Brotherson Dock. It also reduces issues with SACL restrictions on the Obstacle Limitation Surface.

The proposed dredging would have the following advantages:

- deepening the ship turning area, reducing the possibility of future maintenance dredging;
- reducing the extent and depth of dredging required nearer the third runway, new boat ramp and retained seagrass area, as less material is required to be sourced from the area between the Parallel runway and the new terminal;
- reducing the amount of dredging of inter-bedded layers of sands and clays inside the silt curtain, which would mean less interaction with clay layers. This would reduce the amount of clay material needing to be redeposited in the dump pit adjacent to the Parallel Runway.

It should be noted that the total quantity of material required to be dredged for the Port Botany Expansion Project would not change if this application is approved.

4. RELEVANT STATUTORY REQUIREMENTS AND APPROVAL PROCESSES

4.1. Environment Protection & Biodiversity Conservation Act 1999 [Commonwealth]

The then Commonwealth Minister for the Environment and Heritage accredited the NSW environmental impact assessment process for the proposed Port Botany Expansion. The assessment was undertaken in accordance with provision of Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act), with the single EIS for the project satisfying the assessment requirements of both the Commonwealth and NSW Legislation.

This application will be sent to the Commonwealth Department of Environment, Heritage, Water and the Arts (DEWHA) by Sydney Ports at the same time as it is lodged with the NSW Department of Planning (DoP) to seek advice as to whether this modification requires assessment and determination by the Department under this Act. Should a determination be required under the Act then the DoP would refer the application to DEWHA following approval.

There would be no impact on Commonwealth land and no change is required to the Penrhyn Estuary Habitat Enhancement Plan as a result of the modification.

4.2. Airports Act 1996 [Commonwealth]

The modification is not a 'controlled activity' as defined under the *Airports Act*. There would be no intrusion into prescribed airspace and no change to the level of lighting or sunlight reflectivity arising from the modification.

4.3. Environmental Planning & Assessment Act 1979 [NSW]

Section 96 (1A) of the EP&A Act states that a consent authority may modify a development consent if:

"

(a) it is satisfied that the proposed modification is of minimal environmental impact, and

(b) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all), and

(c) it has notified the application in accordance with:

(i) the regulations, if the regulations so require, or

(ii) a development control plan, if the consent authority is a council that has made a development control plan under section 72 that requires the notification or advertising of applications for modification of a development consent, and

(d) *it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be. "*

Table 2 sets out the sections in this document that relate to each of the above requirements.

Table 2: Section 96(1A) Requirements

Requirement under Section 96(1A)	Location in document where addressed
(a) Proposed modification is of minimal environmental impact	Section 6
(b) Modified consent would be substantially the same development	Section 2.2
(c) Notification of the application	Notification is not required under the Regulations or under any Development Control Plan applying to the site. The modification has been discussed with: § the Port Botany Expansion Community Consultative Committee, which includes representatives of the City of Botany Bay Council and Randwick Council; § NSW Department of Environmental and Climate Change; § NSW Department of Primary Industries Fisheries; § the Harbour Master; § NSW Maritime; § Sydney Airports Corporation Limited; and § adjacent dredging projects in Botany Bay. Further details are provided in Section 5.
(d) Consideration of submissions	Responses to the comments and issues raised by relevant stakeholders are summarised in Section 5, Table 3.

5. CONSULTATION

5.1. Port Botany Expansion Community Consultative Committee

Sydney Ports has a commitment to the Community Consultative Committee (CCC) to advise them of proposed project modifications in advance of seeking approval from the NSW Department of Planning. Accordingly, this modification was raised with the CCC at the meeting of 6 May 2009. Questions raised by the CCC, and Sydney Ports' response, are provided in **Table 3**.

5.2. Botany and Randwick Councils

Representatives of Botany Bay and Randwick Councils are members of the CCC. Questions raised by Council representatives at the CCC meeting of 6 May 2009, and Sydney Ports' response, are provided in **Table 3**.

5.3. Harbour Master

There is a weekly co-ordination meeting between BHJDN and the Harbour Master. The proposed dredging in the ship turning basin has been discussed with the Harbour Master, and the Harbour Master has subsequently granted permission under Clause 67 of the *Management of Waters and Waterside Lands Regulation*, subject to conditions which are acceptable. A copy of the Harbour Master approval is provided in Appendix A.

5.4. Department of Environment and Climate Change

Baulderstone Jan De Nul Port Botany Consortium (BHJDN) met with DECC on 17 April 2009 in relation to the proposed dredging. DECC required a licence variation be prepared, covering information on the dredging methods and turbidity monitoring. This variation was submitted to DECC on 4 May 2009.

5.5. Department of Primary Industries (Fisheries)

Information relating to the proposed dredging, including the hydrodynamic modelling presented in Appendix C, was forwarded to DPI Fisheries for comment. Feedback from DPI Fisheries is that there is no objection to the proposed additional dredging (pers. comms. Scott Carter 14 May 2009). A letter confirming this has been sent to Sydney Ports. Once it has been received it will be forwarded to DOP.

5.6. Other Dredging Projects in Botany Bay

Representatives of Sydney Water (Water Delivery Alliance) and Energy Australia were consulted regarding the potential dredging changes at a meeting on 30 April 2009, as the Sydney Ports Port Botany Expansion, Sydney Water Desalination Pipeline and Energy Australia cable works are all occurring within Botany Bay at the same time. There were no comments on the proposed dredging or concerns raised from Sydney Water or Energy Australia.

Note that the hydrodynamic modelling presented in Section 6.2.1 and Appendix C includes impacts from the Sydney Water and Energy Australia projects as a cumulative impact assessment.

5.7. NSW Maritime

Approval from NSW Maritime for the project is given in the Dredging Agreement between NSW Maritime and Sydney Ports dated 27 March 2007. This Agreement includes the area in the ship turning area. Information relating to the proposed dredging has been forwarded to NSW Maritime for comment. If comments or feedback from NSW Maritime is received, it will be forwarded to DOP.

5.8. Sydney Airports Corporation Limited (SACL)

Comments from SACL for the operation of the Trailing Suction Hopper Dredger to be used have been received on 8 May 2009. A copy of the SACL comments is provided in Appendix A.

5.9. Summary

A summary of the issues raised or comments made by relevant stakeholders, and Sydney Ports and BHJDN's response to these comments are provided in **Table 3**. Any submissions received from these stakeholders are attached in Appendix A.

Table 3: Stakeholder Comments / Issues & Responses

Stakeholder Issue / Comment	Sydney Ports / BHJDN Response
CCC Community Members Will studies on changes to wave action be done as part of the modification and who will do the study?	Hydrodynamic assessment is being done as part of the modification by Cardno Lawson Treloar – the same organisation that has done all the wave modelling work for the project for Sydney Ports. This assessment is provided in Appendix C to this report.
Botany Council Representative on CCC No comments made at CCC meeting.	-
Randwick Council Representative on CCC Would all dredged material associated with the modification be placed in the reclamation?	Yes. All dredged material would be sand that would be placed in the reclamation.
Harbour Master Approved subject to conditions (refer Appendix A).	These conditions are acceptable.
NSW Department of Environment & Climate Change An application to vary the licence covering dredging and reclamation will be required.	BHJDN have prepared and submitted an application to vary the Environmental Protection Licence 12923.
NSW Department of Primary Industries Fisheries No objection.	-
Sydney Water (Water Delivery Alliance) No objection.	-
Energy Australia No objection.	-
SACL Acceptable subject to conditions (refer Appendix A).	These conditions are acceptable.
NSW Maritime No formal response received to date.	-

6. ENVIRONMENTAL ASSESSMENT

6.1. Construction Impacts

Construction impacts are not expected to increase from EIS predictions as a result of the proposed modification.

6.1.1. Turbidity

Turbidity could be generated while using the Trailing Suction Hopper Dredger from the following sources:

- at the suction head, though sediment losses are usually small as the economics of dredging is greatly affected by losses near the drag heads;
- discharge of water from the variable overflow system onboard the Trailing Suction Hopper Dredger; and
- when placing dredged material from the hopper on to the reclamation area.

The material to be dredged would be sand, as the Trailing Suction Hopper Dredger to be used cannot dredge stiff clays, as the suction is only strong enough to loosen unconsolidated sediments. Sands produce less turbidity than clays.

Monitoring of dredging and reclamation in sands and clays to date on the Port Botany Expansion project has shown minimal turbidity that is well below the project water quality criteria.

Additional turbidity monitoring would be undertaken during any dredging operations within the ship turning area, in accordance with a DECC licence variation. Turbidity monitoring would consist of:

- Monitoring twice during each outgoing tide during daylight hours at at least two locations 50m downstream of the working area. The locations would be dependent on tidal flows.
- Comparison of monitoring results to an upstream monitoring location, to allow identification of any differences between turbidity from dredging and local background turbidity levels.
- Monitoring on each outgoing tide during daylight hours at the gate in the silt curtain during the first week of dredging in the ship turning area, and comparison with turbidity measurements at the continuous monitoring buoys outside the silt curtain. This would confirm that turbidity levels remain below water quality criteria.
- Visual surveillance for turbidity plumes at all times during dredging and reclamation by a responsible person who can identify turbidity plumes.

Turbidity monitoring would be undertaken with a calibrated handheld probe and recorded with an onboard data logger. All samples would be taken at one metre depth in the water column.

A correlation between Total Suspended Solids (TSS) and turbidity for the specific area to be dredged would be established prior to start of the dredging activities. This correlation would indicate the NTU-equivalent of 50 mg/L that would be used as the field equivalent for TSS.

Dredging would stop if turbidity levels at downstream monitoring locations are greater than the equivalent of 50mg/L above the upstream monitoring locations, and would not recommence until NTU levels return below this threshold. TSS confirmation sampling and laboratory analysis would be undertaken if downstream NTU value exceeds upstream turbidity by the equivalent of 50mg/L.

Operational controls that would be used in response to increasing turbidity levels are described in **Table 4** below. These may be used to control turbidity as needed. Controls would also be used if turbidity is observed outside the silt curtain when the silt curtain gate is open.

Table 4: Operational Controls for Trailing Suction Hopper Dredge

Mitigation Measure Description	Possible Immediate Measures
Adjust overflow height	✓
Sail dredge away from area	✓
Use turbidity-reducing valve in overflow	✓
Reduce or augment trailing speed	✓
Adjust dredging depth	✓
Limit cycle time	✓

Regular turbidity and water quality monitoring would continue weekly as per the *Soil & Water Management Sub-Plan*. This includes two continuous turbidity monitoring buoys immediately outside the primary silt curtain.

Turbidity monitoring and exceedance response procedures are the subject of a licence variation application that was submitted to DECC on 4 May 2009.

6.1.2. Noise

There would be no increased noise impacts, as the Trailing Suction Hopper Dredger would be operating between 500m and two kilometres from the nearest residents. This is further than the scenarios modelled in the *Construction Noise & Vibration Management Sub-Plan* which met noise criteria set for the project. There may be reduced impact due to less dredging inside the primary silt curtain, which is closest to the noise-sensitive receivers identified for the project.

Regular noise monitoring would continue monthly as per the *Construction Noise & Vibration Management Sub-Plan*.

6.1.3. Seagrasses

There may be reduced impact on the retained seagrass along Foreshore Beach as there would be less dredging between the Parallel Runway and the new terminal adjacent to the retained seagrass area.

Regular seagrass monitoring would continue weekly as per the *Seagrass Management Sub-Plan*.

6.1.4. Aquatic Ecology

A review of the aquatic ecology issues relating to additional dredging in the ship turning area was undertaken by Cardno Ecology Lab. A copy of the review is provided in Appendix B.

Cardno Ecology Lab's assessment states that the proposed dredging configuration does not change the impacts described in the EIS, on the basis that:

- there are no seagrasses, algal beds or reefs in the ship turning basin;
- there would be limited opportunity for colonisation of seagrasses or algae in the area;
- temporary losses of benthos would be recolonised following the completion of dredging;

- water exchange is not likely to change as a result of the proposed dredging; and
- any *Caulerpa taxifolia* that may have colonised the area would be deposited and buried within the reclamation.

Therefore the impacts on aquatic ecology are minimal and as per the EIS conclusions.

6.1.5. Other Projects / Services

Consultation with nearby Sydney Water and Energy Australia dredging projects has indicated that there would be no effect on other services, or other current projects in Botany Bay.

6.2. Operational Impacts

Operation impacts are not expected to increase from EIS predictions as a result of the proposed modification.

6.2.1. Hydrodynamics

An investigation of hydrodynamics effects of additional dredging in the ship turning area was undertaken by Cardno Lawson Treloar. A copy of the investigation is provided in Appendix C.

Cardno Lawson Treloar did not predict any change to sea wave climate, as the depths in the ship turning basin are already sufficiently deep to have no effect on local sea waves.

Cardno Lawson Treloar undertook additional current and swell wave modelling to assess the impact of the proposed dredging on shipping operations, the Parallel Runway, and shoreline areas of Botany Bay. Wave modelling was undertaken for the following three scenarios:

- *existing* as at EIS approval, which is before any dredging commenced;
- *approved development*, which includes all subsequent approvals since EIS approval up to May 2009; and
- *additional ship turning area dredging* as per this Section 96 application.

The results of this modelling were:

- Effective wave heights from the *additional ship turning area dredging* would be similar to those for the *approved development*.
- Wave directions with the *additional ship turning area dredging* would be generally unchanged when compared with the *approved development* dredging at beaches around Botany Bay. Any changes are less than 0.05 degrees which amounts to no identifiable change.
- As the *additional ship turning area dredging* shows no change in wave conditions on any beaches around Botany Bay, they would not contribute to any potential impacts in a cumulative way that might arise from other works in Botany Bay.
- Wave heights along the Third Runway with the *additional ship turning area dredging* would remain significantly smaller than the wave heights for the *existing* bathymetry.
- Small changes in current direction and magnitude near Port Botany are mainly due to the increase in depth with the *additional ship turning area dredging* and would not affect shipping operations at the port.

The outcome of the modelling by Cardno Lawson Treloar is that the *additional ship turning area dredging* would not cause any deleterious changes in wave heights and directions within Botany Bay. Changes in the current patterns within Port Botany would be minimal and generally a small reduction in the current magnitude would be expected.

7. CONCLUSION & RECOMMENDATION

There would be no increased impact from the additional ship turning area dredging as assessed in this application. It is considered that the proposed modification is substantially the same development as the approved development and would have minimal environmental impact. Therefore an application under Section 96(1A) is appropriate.

Approval for increasing the volume of sandy material dredged in the ship turning area should be granted to allow the use of the Trailing Suction Hopper Dredge.

The mitigation measures to be implemented as part of the modification are summarised below:

- Turbidity monitoring would be undertaken as outlined in Section 6.1.1.
- Visual surveillance for turbidity plumes would be conducted at all times during dredging and reclamation.
- Operational controls as outlined in Section 6.1.1 would be implemented in response to increasing turbidity levels.

8. REFERENCES

URS (2003) *Port Botany Expansion Environmental Impact Statement,* prepared for Sydney Ports Corporation

APPENDIX A

SUBMISSIONS FROM STAKEHOLDERS

MAY 2009

SYDNEY PORTS
FIRST PORT, FUTURE PORT

SYDNEY PORTS CORPORATION
ABN 95 784 452 933
Level 8, 207 Kent Street
Sydney NSW 2000 Australia
PO Box 25 Millers Point
NSW 2000 Australia
Telephone +61 2 9296 4999
Facsimile +61 2 9296 4742
www.sydneyports.com.au

7th May 2009

Jan De Nul
PO Box 641
Botany 1455
New South Wales

Dear Sir

Permission for Disturbance of the Bed of a Special Port Area

I, the Harbour Master for the Ports of Sydney Harbour and Botany Bay, grant permission to Jan De Nul under Clause 67 of the *Management of Waters and Waterside Lands Regulations* for works disturbing the bed of a Special Port Area.

This permission applies to the works described as additional swing basin dredging within the area shown at Plans Numbered BPDP227A and dated 5-05-2009.

The permission is valid for the period of 6 months to 6-11-2009 and is issued subject to the Conditions attached at Schedule 1.

This Permission does not imply that any other permission, approval or consent required under any state or federal legislation has been granted, and works are not to commence until all such permissions, approvals or consents are issued by the relevant authorities.

Richard Lorraine
Harbour Master

7th May 2009

Schedule 1 – Conditions of Permission

1. The Applicant is to implement a marine traffic management plan which is to be approved by Sydney Ports Corporation.

2. The works are not to interfere with the movement of trading vessels unless agreed in advance with Sydney Ports Corporation.

3. Buoys are not to be laid in or adjacent to the shipping channels unless agreed in advance with Sydney Ports Corporation.

4. All buoys are to be fitted with lights.

5. All vessels associated with the works are to have response plans for emergencies and spills.

6. All hours contact numbers are to be provided to Sydney Ports Corporation.

7. All operations to be undertaken in accordance with the current version of port operating protocol.

File No.: 09/00016
Reg No: 09/0226 area a
Your Ref.:

8 May, 2009

Attn: Mr John Taylor
BH-JDN Port Botany Consortium
PO Box 281
BOTANY NSW 1455

Sydney Airport Corporation Limited
ABN 62 082 578 809

Locked Bag 5000
Sydney International Airport NSW 2020

The Ulm Building
1 Link Road
Sydney International Airport NSW 2020
Australia

Telephone:
61 2 9667 9111
www.sydneyairport.com

Dear John,

SPLIT HOPPER DREDGE OPERATION - AREA A: PORT BOTANY EXPANSION PROJECT

I refer to your email of 20 April 2009.

The Sydney Airport Corporation Ltd (SACL) has no objection to the split hopper dredge operation at PORT BOTANY EXPANSION PROJECT, subject to the following conditions:

- the maximum height of the dredge is not to exceed a height of 24.0 metres above Australian Height Datum (AHD).
- the dredge may be operated within the area bounded by Positions 3 to 12 only (as indicated on Attachment "A"),
- the dredge may be operated 24 hours a day on 18 May to 9 August 2009 only.
- **the dredge operator/site manager is to contact the Airfield Operations Co-ordinator, telephone 0419-278-208 or (02) 9667-9824, prior to and again after completion of a daily crane operation.**
- during hours of darkness, the dredge is to be **obstruction lit** *(low intensity steady red lights)* in accordance with Part 139 of the Manual of Standards issued by the Civil Aviation Safety Authority. The obstruction lights must operate and be maintained in working order at all times by the proponent.
- during daylight hours & in lieu of obstruction marking, the dredge is to be **obstruction lit** *(medium intensity flashing white lights)* in accordance with Part 139 of the Manual of Standards issued by the Civil Aviation Safety Authority. The obstruction lights must operate and be maintained in working order at all times by the proponent.
- **the dredge operator/site manager is to confirm a permanent line of communication with the Airfield Operations Co-ordinator (0419-278-208 or (02) 9667-9824) which will enable the dredge to be moved if required.**
- **in the case of emergency, or when instructed by the Airfield Operations Co-ordinator, the dredge must be moved within 15 minutes.**
- **the Senior Tower Controller/Airfield Operations Co-ordinator will retain the overriding authority to require the moving of the dredge at any time and for any reason deemed necessary.**

Please advise this Corporation of any variation to your schedule at least five working days in advance so that we may fulfil our legal obligation to the Civil Aviation Safety Authority (CASA) under Civil Aviation Regulation 89.

I again stress the importance of your co-operation in compliance with the approval conditions as set out above as they are critical to the safe operation of Sydney Airport.

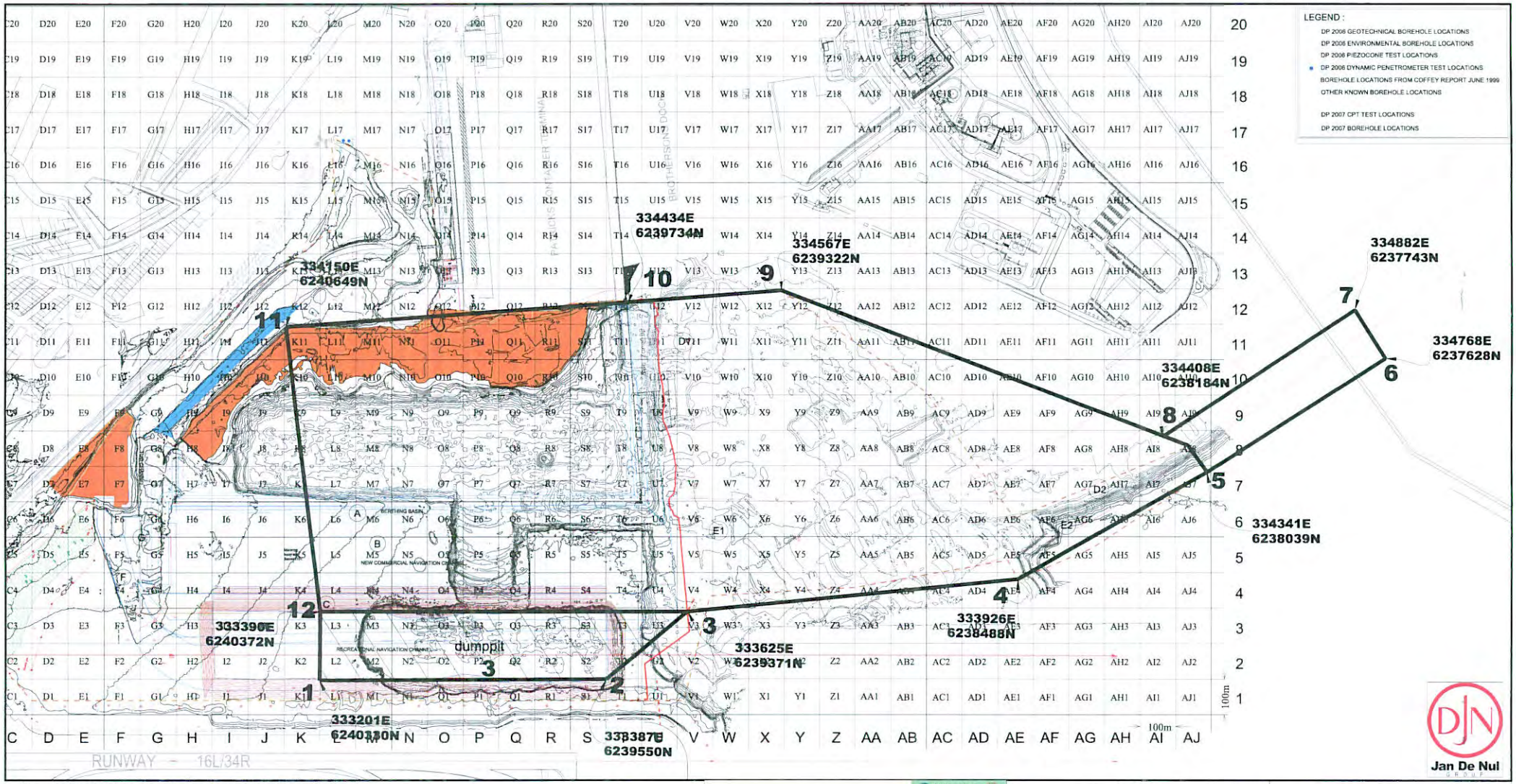
Carrying out a controlled activity otherwise than in accordance with a condition of the approval is an offence punishable by a fine of up to 250 penalty units.

For further information on aviation impacts please contact Ms Lynne Barrington on (02) 9667-9217.

Yours faithfully

Peter Bleasdale
Airfield Design Manager
Sydney Airport

ATTACHMENT 'A'



Presentation Working Area Hopper Dredger De Bougainville

APPENDIX B

AQUATIC ECOLOGICAL ASSESSMENT BY CARDNO ECOLOGY LAB

12 MAY 2009

Cardno Ecology Lab Pty Ltd
ABN 73 002 379 473

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Brookvale New South Wales 2100
Australia
Phone 02 9907 4440
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Marcus.LincolnSmith@cardno.com.au
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12 May 2009

Ms Marika Calfas
Senior Manager – Planning
Sydney Ports Corporation
Level 8, 207 Kent Street Sydney NSW 2000 Australia

Email: Mcalfas@sydneyports.com.au

Dear Marika,

Re: Proposal for change to dredging configuration, Port Botany Expansion – aquatic ecology issues

In response to your enquiry regarding the potential effects on aquatic ecology of changes to the dredging configuration for the Port Botany Expansion, I provide the following advice.

Background and description of proposed changes

Background in the proposed changes was provided by Sydney Ports (email correspondence M. Calfas: 4-5-2009) and is summarised here.

Investigations into potential changes to dredging and reclamation methodology identified an opportunity to use a Trailing Suction Hopper Dredger to undertake some of the dredging. This opportunity presents a number of advantages over the dredging methodology presented in the EIS (URS 2003). The proposed dredging would not change the principal dredging and reclamation activities described in the EIS.

The changes would include the following:

1. Deeper levels in the ship turning basin in some areas by the dredging of an additional 300,000 m^3, compared to that indicated in the EIS. Levels within the ship turning basin would be 1 to 2.5 metres below the current seabed in parts of the ship turning basin, though it is likely that not all sand would be removed to these levels. There would be no widening or re-orientation of the ship turning basin.
2. Additional dredging of the high spot off Molineux Point of 100,000 m^3, compared to that indicated in the EIS.

The edge of these dredged areas would have a slope of between 1:1.5 and 1:3 to the adjacent undisturbed areas.

All dredged material would be placed within the reclamation area. This dredging would reduce the amount of dredging required within the main dredge area between the Parallel Runway and the new

terminal, as the total amount to be dredged as part of the Port Botany Expansion Project would not change.

As there would be no changes to the total dredged quantity for the development, or the type, nature, or scale of operations that would take place on the terminal as a result of approval of the modification, the modification is substantially the same development as the approved development.

Implications for Aquatic Ecology

Staff from The Ecology Lab Pty Ltd inspected the proposed turning basin and high spot by diving in July 2002 as part of the original EIS (Appendix N in URS 2003). No seagrasses, algal beds or reefs were found and observations indicated sandy sediments inhabited by a variety of benthic invertebrates. Given the relatively deep water within the turning basin and hot spots, it is most unlikely that these areas would be colonised by seagrasses and there would be limited opportunity for colonisation by algae.

It was concluded in the original EIS that the dredging would cause a temporary loss of benthic productivity. Additionally, the dredged areas would be connected to the main navigation channel and hence to the bay and adjacent coastal environment. This would avoid the creation of deep, isolated holes potentially subject to poor water quality and ensure water exchange and a potential supply of invertebrate propagules for colonisation of sediments following the dredging operation.

Advice from Cardno Lawson & Treloar indicates that water exchange is not likely to change as result of the dredging now proposed (email correspondence: M. Calfas 11-5-2009). Based on the revised dredging configuration my assessment of impacts in relation to aquatic ecology does not change substantially.

There is a very small risk that the shallower sections of the high spot may have become colonised by the noxious alga *Caulerpa taxifolia* following the inspection in 2002. It is noted, however, that the sediment would be dredged by trailing suction hopper dredge which would transport sediment to the reclamation and hence any *Caulerpa taxifolia* present on the hot spots also would be removed to the reclamation. Therefore, it is considered that the risk of dispersing fragments of *Caulerpa taxifolia* elsewhere in Botany Bay as a result of the dredging is virtually negligible.

Reference

URS (2003). *Port Botany Expansion Environmental Impact Statement.* Prepared for Sydney Ports Corporation.

Dr Marcus Lincoln Smith
Manager
Cardno Ecology Lab Pty Ltd

APPENDIX C

HYDRODYNAMIC ASSESSMENT BY CARDNO LAWSON TRELOAR

11 MAY 2009

Our Ref LJ2548/L1866 :sge

Contact P.D. Treloar/ A. Berthot

11 May 2009

Sydney Ports Corporation
Port Botany Expansion Project
PO Box 25
MILLERS POINT NSW 2000

Attention: Mr Tony Navaratne

Dear Sir,

WAVE CLIMATE INVESTIGATIONS - PORT BOTANY EXPANSION
PROPOSED JDN DREDGING IN PORT BOTANY – TURNING CIRCLE AREA

Preamble

We understand that the Port Works contractor for the Port Botany Expansion project is looking to extract more sand of suitable quality from the turning circle area than proposed as part of the approved EIS works – dredging. The details of the proposed additional dredging are presented in Annexure A.

Cardno Lawson Treloar have been engaged by Sydney Ports Corporation to investigate the hydrodynamic effects of this additional Ship Turning Basin Dredging (ASTBD) proposal on: shipping operations; the Sydney Airport parallel runway structure; and shoreline areas of Botany Bay.. This letter describes wave and current modelling outcomes. Two main aspects of potential wave climate change were addressed using the SWAN and MIKE-21 BW wave models - the same systems as those used for EIS investigations.

It is important to note that, as wave models of Botany Bay have evolved, the grid size of the bay-wide SWAN model has reduced to provide better resolution; and model output locations along the shorelines and at structures such as the parallel runway of Sydney Kingsford Smith airport have changed slightly. Hence, in order to maintain a consistent basis for case-by-case comparison, the scenarios modelled in the EIS have been re-run using the new models. Note that the Approved Development case includes the approved modification to the EIS for construction of vertical quay walls on the new terminal, and the new rock protection works along the perimeter of the parallel runway. The Existing case refers to the bay bathymetry as it was in 2003 before port expansion works (currently in progress), Sydney Desalination project (Water Delivery Alliance (WDA)) (currently in progress), and Energy Australia Cable Laying (EA) project commenced.

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United States

Wave Modelling Investigations

Wave modelling was undertaken for the following bathymetries:-

- *Existing as at EIS Approval:* that is, bathymetry as it was at the time of the EIS approval and before any dredging work started, (referred to as Existing in this letter).

- *Approved Development (AD-EIS)*: that is, port development works approved to date May 2009, (referred as AD-EIS in this letter).

- *Additional Ship Turning Basin Dredging (ASTBD)*: that is, the Approved Development model bathymetry + the proposed additional ship turning basin dredging, (referred as ASTBD in this letter).

Because several major projects are occurring simultaneously within Botany Bay, it was understood that the potential cumulative impacts on coastal processes due to the EA, WDA and Port Botany Expansion projects (Figure 1) were to be considered. Figure 2 describes the location of the EA cable and WDA project works.

The majority of the EA cable will be jetted directly into the seabed and will have no effect on wave propagation. One section of the cable route, on the southern side of the Port Botany shipping channel, requires pre-dreding before cable-laying. If this location is not backfilled then changes to wave propagation are predicted (Cardno Lawson Treloar 2009, Rep2527v2).

Because the Desalination Project dredged trench will be backfilled and the Silver Beach and Kyeemagh Beach work-sites will be demobilized and returned to their previous states, it is anticipated that there will be no long-term cumulative impacts arising from those works in conjunction with the Port Botany Expansion and EA cable works. In addition, we understand that the spoil from the EA dredged trench and WDA pipeline trench may be removed from the existing dredged basin west of the main north-south runway of Sydney airport at the completion of those projects. In this context only the EA dredged trench and Port Botany Expansion ASTBD dredging will remain with potential cumulative impacts and is addressed below. The placement of dredged spoil by EA and WDA in the existing dredged hole would only cause minor effects within the region of Lady Robinsons Beach protected by groynes; should it not be removed as we understand it will - pers. Comm. WDA and EA - Cardno Lawson Treloar.

Shoreline Wave Climate - SWAN Wave Modelling

It was not expected that deepening of the port area shown in Annexure A would affect local sea generation and propagation and so only swell wave modelling was undertaken. Water depths within the ASTDB area are already sufficiently deep to have no effect on local sea and this additional deepening would have no effect. The longest local sea wave periods may be about 3 seconds and those waves are not affected by depths greater than about 10m. Additionally, the proposed ASTBD does not affect local sea fetches. Hence Foreshore Beach and the seagrass areas nearby, which are affected mainly by local sea, would not be affected by the proposed ASTBD.

The general procedure of modelling a range of offshore wave directions and wave periods, see Lawson and Treloar, 2003, was followed, in order to prepare matrices of inshore wave coefficients, wave periods and wave directions at the model output locations shown on Figure 1. Those offshore to inshore transfer coefficients were used to transfer about 15 years of offshore directional wave data recorded by the Long Reef directional Waverider Buoy (1992-2007) operated by the Manly Hydraulics Laboratory. This procedure provided time series of transferred wave parameters at each of the locations shown on Figure 1. Those time series were analysed to provide estimates of the effective significant wave height H_e and weighted mean wave direction Φ_m parameters at those locations - procedures described in Lawson and Treloar, 2003.

The outcomes are presented in tabular form in Annexure B.

Figures 3 and 4 present the changes in terms of the effective wave height (H_e) and the weighted mean wave (Φ_m) direction at shoreline locations for the Existing, AD-EIS and ASTBD bathymetric cases. Each figure presents the effective wave height and the weighted mean wave direction (top two graphs) and the difference in effective wave height and weighted mean wave direction for the AD-EIS and ASTBD bathymetry cases compared to the existing bathymetry (bottom two graphs).

The results show that the effective wave heights H_e that would occur with the new proposed ASTBD bathymetry are similar to those from the AD-EIS bathymetric case previously investigated (Lawson and Treloar 2003).

The very small changes in the wave direction that occurred with the AD-EIS bathymetric case when compared to the Existing bathymetry would be generally unchanged for the proposed ASTBD case from the previous results near Silver Beach (Locations 1 to 29, Figure 3) and slightly reduced near Towra Beach (Locations 30 to 53, Figure 3). These changes are too small to be evident in the Annexure B table and amount to no identifiable change.

Near Lady Robinsons Beach (Figure 4) changes in wave direction were generally very small with the AD-EIS proposed dredging and this is still the case with the inclusion of the proposed ASTBD work (change in direction is less than 0.05 degrees). Near Locations 67 to 77, the wave directions become generally more northward (from) when the proposed ASTBD is considered, which may potentially lead to a minimal, but positive decrease in the existing northward transport along the beach just north of the northern-most groyne near Solander Street - about Location 69. There is currently a net northward transport in this region of Lady Robinsons Beach and any reduction would marginally reduce the future need for sand re-nourishment of this beach area - as currently planned from time-to-time, though not required at this moment. These changes are too small to be evident in the Annexure B table and amount to no identifiable change.

Based on recent SPC surveys (2008) of the beach area immediately north of the northern-most groyne, the beach there is known to be receding - as expected from the groyne design investigations SPA et al (1996). The change in wave direction arising from the proposed ASTBD works would slightly reduce the northward transport locally - from the northernmost groyne to a little north of President Avenue.

The presence of groynes south of President Avenue (Location 70) tends to prevent longshore transport and potential shoreline changes in that region. The change in wave parameters there, and therefore sediment transport, are expected to have no identifiable effect.

Cumulative Impacts

Because these investigations of the proposed ASTBD works show no change in wave conditions on any shorelines of Botany Bay, they would not contribute to any potential impacts in a cumulative way that might arise from other works in Botany Bay.

Wave Propagation Changes – Port Botany and Airport Third Runway

Near Port Botany and the Airport parallel runway seawall there are minimal changes in effective wave height between the AD-EIS and the proposed ASTBD works cases. These changes are too small to be evident in the Annexure B table and amount to no identifiable change. However, although these areas are represented in the SWAN model, SWAN cannot resolve phase dependant diffraction which occurs around Molineux Point and the partial and full wave reflections that occur from the port works and runways. A calibrated MIKE-21 Boussinesq wave model was used to investigate these processes in the three bathymetric cases; that is, the Existing, Approved Development EIS and proposed ASTBD. Figure 5 presents the MIKE-21 output locations for the Third Runway and new container berths. This is the same model system and these are the same output locations as those used in the EIS investigations, Lawson and Treloar (2003).
Tables 1 and 2 present wave climate results for model output locations along the parallel Runway and at the new container berths for the each bathymetric case. The EIS case investigated in this study is consistent with the Approved Development (AD-EIS). There is only a very small increase in wave

heights along the Third Runway with the proposed ASTBD works compared to those for the AD-EIS case. However, the overall variations between the AD-EIS and the ASTBD option investigated in this study are smaller than could be detected with present instrumentation. It should be noted that the wave heights with the proposed ASTBD works would remain significantly smaller than the wave heights for the Existing bathymetry.

Table 1: Wave Heights Along the Parallel Runway

Probability of Exceedance	Location	Existing as at EIS Approval	Approved Development	Additional Ship Turning Basin Dredging
1day/year	RW1	0.50	0.34	0.35
	RW2	0.45	0.18	0.20
	RW3	0.35	0.08	0.08
0.01%	RW1	0.79	0.52	0.55
	RW2	0.73	0.28	0.31
	RW3	0.55	0.13	0.12
10%	RW1	0.22	0.15	0.16
	RW2	0.21	0.08	0.09
	RW3	0.16	0.04	0.03

Table 2: Wave Heights Along the New Container Berth

Probability of Exceedance	Location	Existing as at EIS Approval	Approved Development	Additional Ship Turning Basin Dredging
1day/year	CT1	-	0.18	0.16
	CT2	-	0.15	0.14
	CT3	-	0.15	0.13
	CT4	-	0.16	0.14
0.01%	CT1	-	0.27	0.25
	CT2	-	0.23	0.22
	CT3	-	0.24	0.21
	CT4	-	0.24	0.23
10%	CT1	-	0.08	0.07
	CT2	-	0.07	0.06
	CT3	-	0.07	0.06
	CT4	-	0.07	0.06

Current Modelling Investigations

Current modelling was undertaken for the following bathymetries:-

- *Approved Development (AD-EIS)*: that is port development works approved to date May 2009, (referred to as AD-EIS in this letter).

- *Additional Ship Turning Basin Dredging (ASTBD)*: that is, the Approved Development model bathymetry + the proposed additional ship turning basin dredging", (referred to as ASTBD in this letter).

The Delft3D FLOW model set up used in Lawson and Treloar 2003 was applied here. The model was run for a spring tide for each bathymetric case. Current maps for times of peak flood and peak ebb, spring tide, are presented on Figures 6 and 7. Blue vector arrows represent the depth averaged current for the AD-EIS bathymetry and the red vector arrows represent the depth-averaged

currents for the ASTBD bathymetry. Note that where a red vector only is visible, this is because the blue vectors are plotted first and when the red and blue vectors are the same then only the red vector will be visible.

Time series of the water level, current magnitude and direction at location C1, (located within the turning basin) are presented in Figure 8. Note that these time series were extracted from the current map files and therefore are only on an hourly time step, a shorter time step would provide a smoother signal.

Results show that generally the changes in currents near Port Botany are minimal.

Small changes in direction and magnitude presented in Figure 8 are mainly due to the increase in depth at location C1 with the proposed additional dredging. A small reduction in current magnitude in the order of few centimetres per second is expected there due to the increase in the water depth.

The outcome of these analyses is that the proposed ASTBD work would not cause any deleterious changes in wave heights and directions within Botany Bay. Changes in the current patterns within Port Botany will be minimal and generally a small reduction in the current magnitude is expected.

Should you have any questions please contact me on 02 9499 3000.

Yours faithfully,

P.D. Treloar/A.A. Berthot
Manager - Coastal, Ocean & Estuarine Studies and Senior Oceanographer
for **Cardno Lawson Treloar**

References

Lawson and Treloar (2003): Proposed Expansion of Container Port Facilities in Botany Bay, NSW. Coastal Process and Water Resources Issues. Volume 3: Waves, Currents and Coastal Process Investigations. Report (J2076/R1999/Vol. 3) Prepared for Sydney Ports Corporation.

Sydney Ports Authority, Lawson and Treloar and Sinclair Knight Merz (1996): Lady Robinsons Beach, Botany Bay. Beach Management Options, Florence Street to the Cooks River.

Cardno Lawson Treloar (2009) Energy Australia's Botany Bay Cable Project, Dredging Adjacent to the Port Botany Shipping Channel – Coastal Processes and Sediment Plume Investigations. Rep2527v2.

Enc.

Annexure A – JDN Dredging Proposal
Annexure B – Swell Wave Parameters at Botany Bay Output Locations

Cardno Lawson Treloar

Annexure A

JDN Dredging Proposal

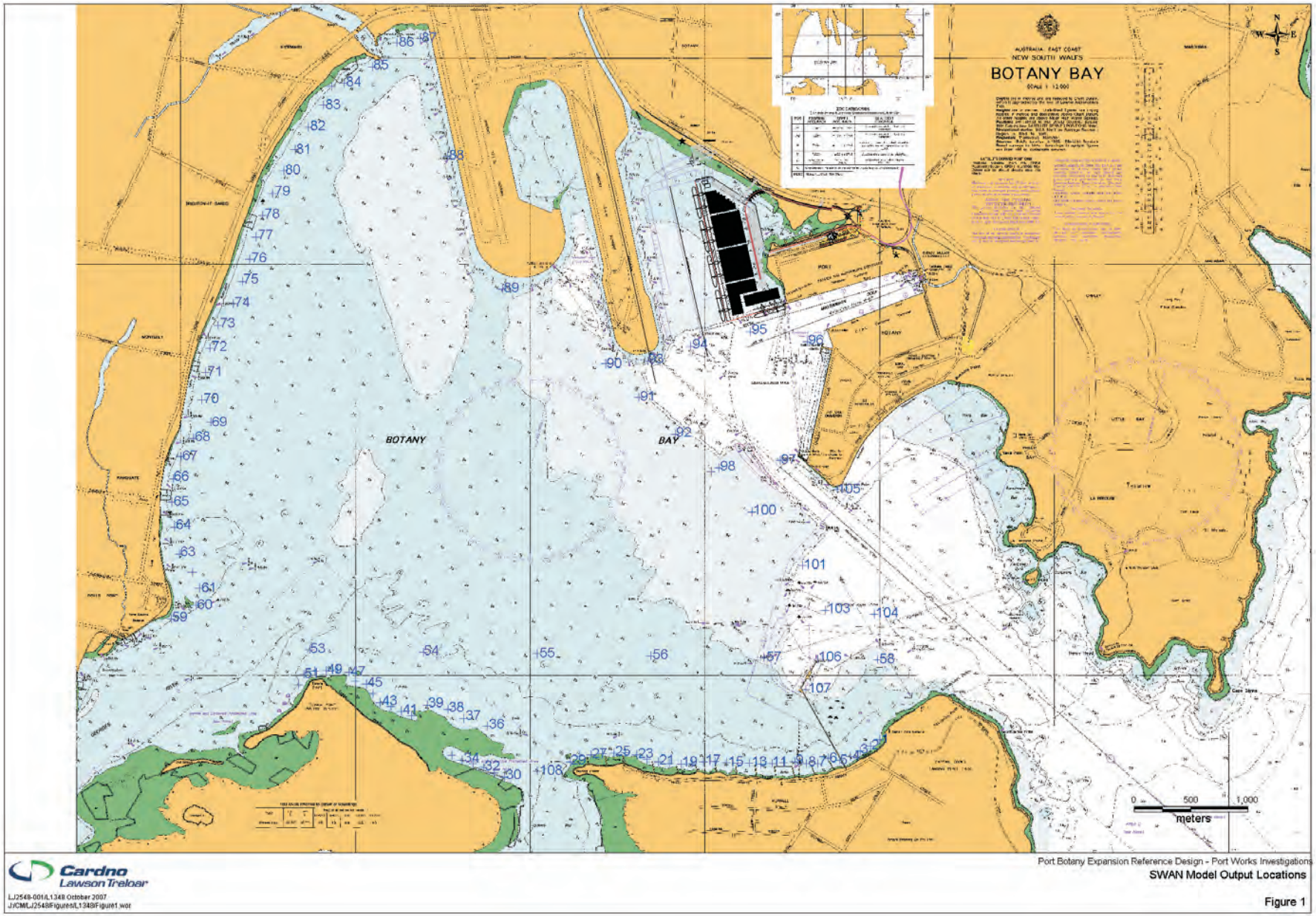

Work area De Bougainville
-1.0m seabed level
-2.5m seabed level
BROTHERSON
Scale : 1 /2,500
Chart Date : 22Apr09
Chart No : 0936-0463-PS-PR-BAT-2

Annexure B

SWELL WAVE PARAMETERS AT BOTANY BAY OUTPUT LOCATIONS

Location	Existing as at EIS Approval		Approved Development (Difference from Existing)		Additional Ship Turning Basin Dredging (Difference from Existing)	
	He (m)	φm (°TN)	ΔHe (m)	Δφm (°TN)	ΔHe (m)	Δφm (°TN)
1	0.10	331.8	0.00	0.0	0.00	0.0
2	0.12	340.7	0.00	0.0	0.00	0.0
3	0.17	344.2	0.00	0.0	0.00	0.0
4	0.20	341.6	0.00	0.0	0.00	0.0
5	0.20	351.1	0.00	0.0	0.00	0.0
6	0.24	4.6	0.00	0.0	0.00	0.0
7	0.26	3.5	0.00	0.0	0.00	0.0
8	0.23	10.1	0.00	0.0	0.00	0.0
9	0.18	18.7	0.00	0.0	0.00	0.0
10	0.17	24.1	0.00	0.0	0.00	0.0
11	0.16	23.4	0.00	0.0	0.00	0.0
12	0.16	30.9	0.00	0.0	0.00	0.0
13	0.17	34.3	0.00	0.0	0.00	0.0
14	0.18	33.8	0.00	0.0	0.00	0.0
15	0.16	34.9	0.00	0.0	0.00	0.0
16	0.16	38.6	0.00	0.0	0.00	0.0
17	0.16	36.3	0.00	0.0	0.00	0.0
18	0.16	31.1	0.00	0.0	0.00	0.0
19	0.15	28.8	0.00	0.0	0.00	0.0
20	0.15	27.3	0.00	0.0	0.00	0.0
21	0.16	34.9	0.00	0.0	0.00	0.0
22	0.16	41.0	0.00	0.0	0.00	0.0
23	0.17	39.9	0.00	0.1	0.00	0.1
24	0.16	38.0	0.00	0.1	0.00	0.1
25	0.17	31.9	0.00	0.0	0.00	0.0
26	0.16	34.2	0.00	0.0	0.00	0.0
27	0.16	35.6	0.00	0.0	0.00	0.0
28	0.18	30.5	0.00	0.0	0.00	0.0
29	0.17	15.9	0.00	0.0	0.00	0.0
30	-10.30	261.0	0.00	0.0	0.00	0.0
31	0.16	62.2	0.00	0.0	0.00	0.0
32	0.14	55.4	0.00	0.0	0.00	0.0
33	0.16	69.3	0.00	0.0	0.00	0.0
34	0.16	52.8	0.00	0.0	0.00	0.0
35	0.16	56.8	0.00	0.0	0.00	0.0
36	0.17	51.0	0.00	0.0	0.00	0.0
37	0.17	56.9	0.00	0.0	0.00	0.0
38	0.19	56.2	0.00	0.0	0.00	0.0
39	0.15	45.2	0.00	0.0	0.00	0.0
40	0.12	38.6	0.00	0.0	0.00	0.0
41	0.14	39.9	0.00	0.0	0.00	0.0
42	0.18	41.9	0.00	0.0	0.00	0.0
43	0.18	46.0	0.00	0.0	0.00	0.0
44	0.18	50.7	0.00	0.0	0.00	0.0

Location	Existing as at EIS Approval		Approved Development (Difference from Existing)		Additional Ship Turning Basin Dredging (Difference from Existing)	
	He (m)	φm (°TN)	ΔHe (m)	Δφm (°TN)	ΔHe (m)	Δφm (°TN)
45	0.16	46.4	0.00	0.0	0.00	0.0
46	0.16	41.1	0.00	0.0	0.00	0.0
47	0.14	43.9	0.00	0.0	0.00	0.0
48	0.13	40.9	0.00	0.0	0.00	0.0
49	0.16	36.2	0.00	0.0	0.00	0.0
50	0.20	29.5	0.00	0.0	0.00	0.0
51	0.20	10.3	0.00	0.0	0.00	0.0
52	0.15	1.0	0.00	0.0	0.00	0.0
53	0.24	52.5	0.00	0.0	0.00	0.0
54	0.24	80.7	0.00	0.0	0.00	0.0
55	0.25	79.6	0.00	0.0	0.00	0.0
56	0.31	83.6	0.00	0.0	0.00	0.0
57	0.29	80.8	0.00	0.0	0.00	0.0
58	0.41	84.0	0.00	0.0	0.00	0.0
59	0.12	102.5	0.00	0.0	0.00	0.0
60	0.15	97.6	0.00	0.0	0.00	0.0
61	0.22	82.8	0.00	0.0	0.00	0.0
62	0.23	74.2	0.00	0.0	0.00	0.0
63	0.20	70.1	0.00	0.0	0.00	0.0
64	0.13	83.1	0.00	0.0	0.00	0.0
65	0.11	81.8	0.00	0.0	0.00	0.0
66	0.13	98.0	0.00	0.0	0.00	0.0
67	0.16	100.3	0.00	0.0	0.00	0.0
68	0.17	110.9	0.00	0.0	0.00	0.0
69	0.22	102.5	0.00	0.0	0.00	0.0
70	0.23	97.3	0.00	0.0	0.00	0.0
71	0.21	98.3	0.00	0.0	0.00	0.0
72	0.21	99.9	0.00	0.0	0.00	0.0
73	0.18	110.6	0.00	0.0	0.00	0.0
74	0.22	118.6	0.00	0.0	0.00	0.0
75	0.18	115.4	0.00	0.0	0.00	0.0
76	0.16	113.9	0.00	0.0	0.00	0.0
77	0.14	110.5	0.00	0.0	0.00	0.0
78	0.14	110.9	0.00	0.0	0.00	0.0
79	0.12	115.3	0.00	0.0	0.00	0.0
80	0.10	119.8	0.00	0.0	0.00	0.0
81	0.08	123.5	0.00	0.0	0.00	0.0
82	0.06	127.9	0.00	0.0	0.00	0.0
83	0.04	133.8	0.00	0.0	0.00	0.0
84	0.02	139.0	0.00	0.0	0.00	0.0
85	0.02	147.5	0.00	0.0	0.00	0.0
86	0.01	168.6	0.00	0.0	0.00	0.0
87	0.01	191.8	0.00	0.0	0.00	0.0
88	0.02	198.3	0.00	0.0	0.00	0.0
89	0.14	132.1	0.00	0.0	0.00	0.0



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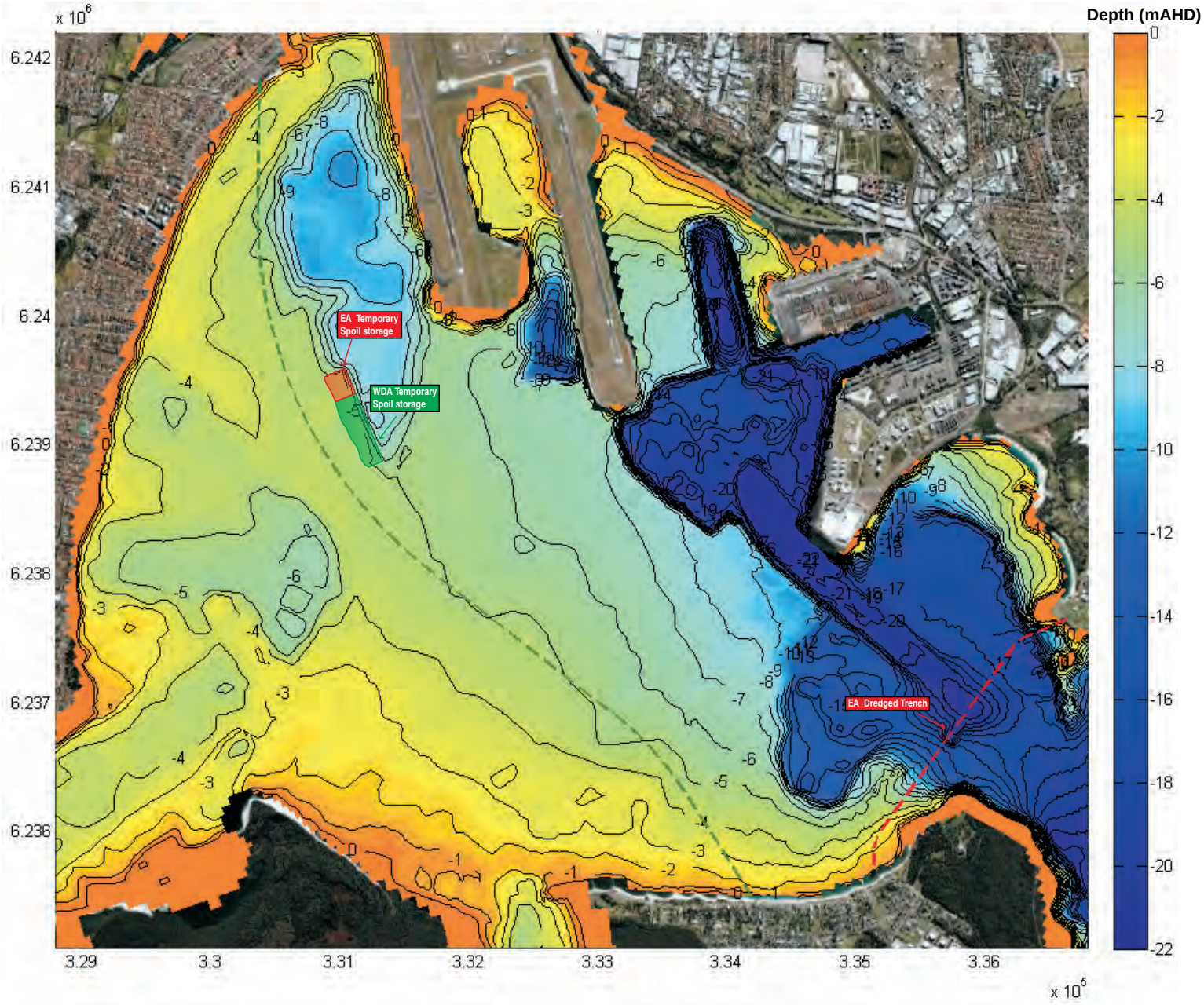
Port Botany Expansion - Dredging Matters
SWAN MODEL OUTPUT LOCATIONS

Figure 1



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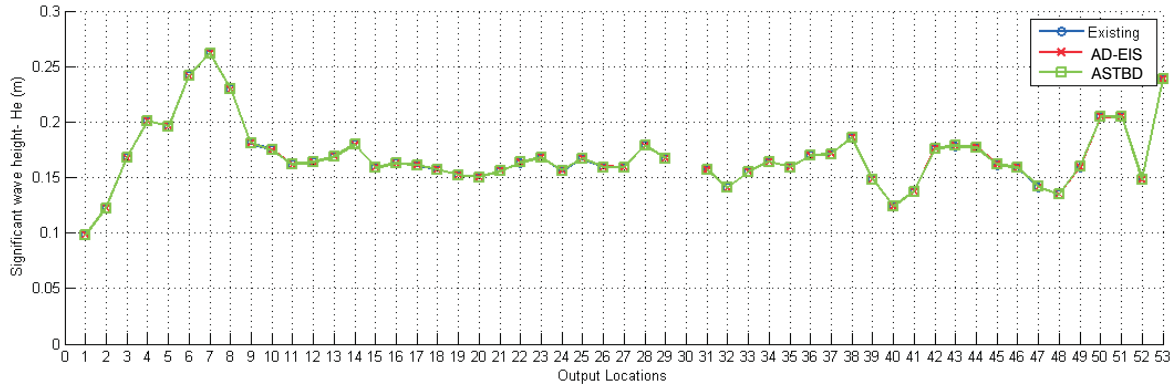
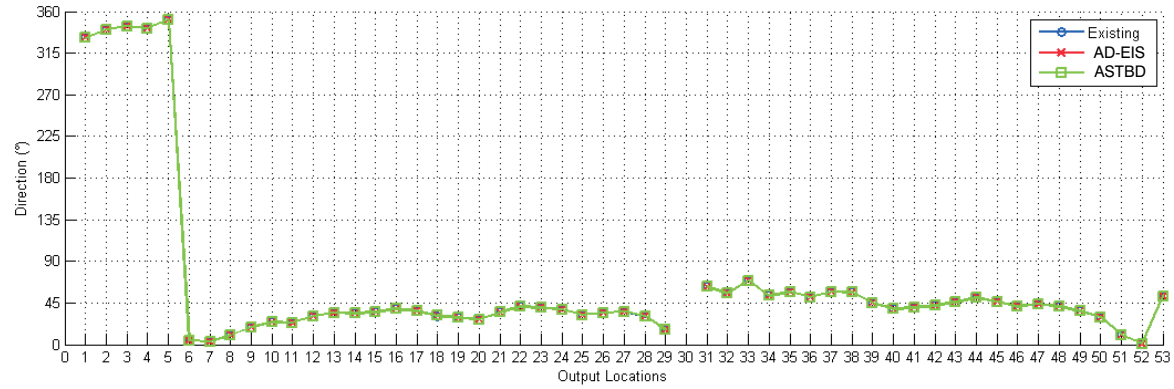
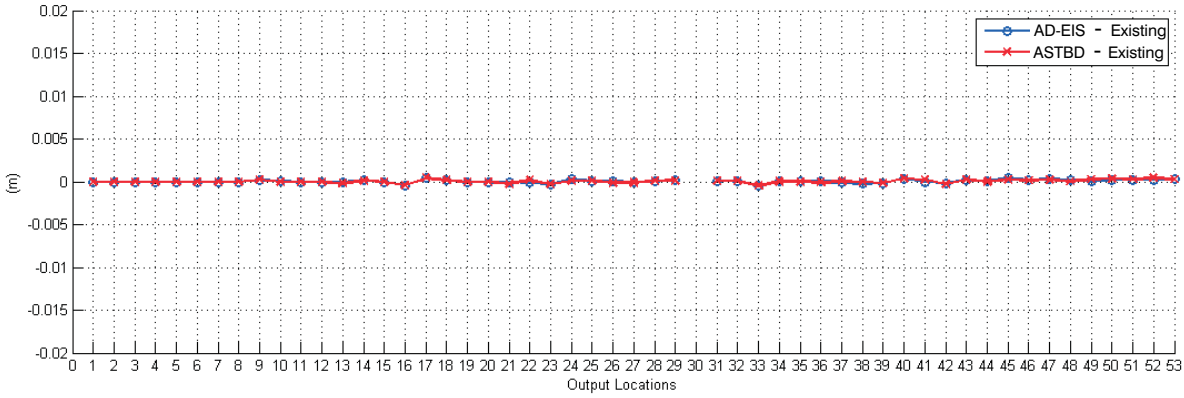
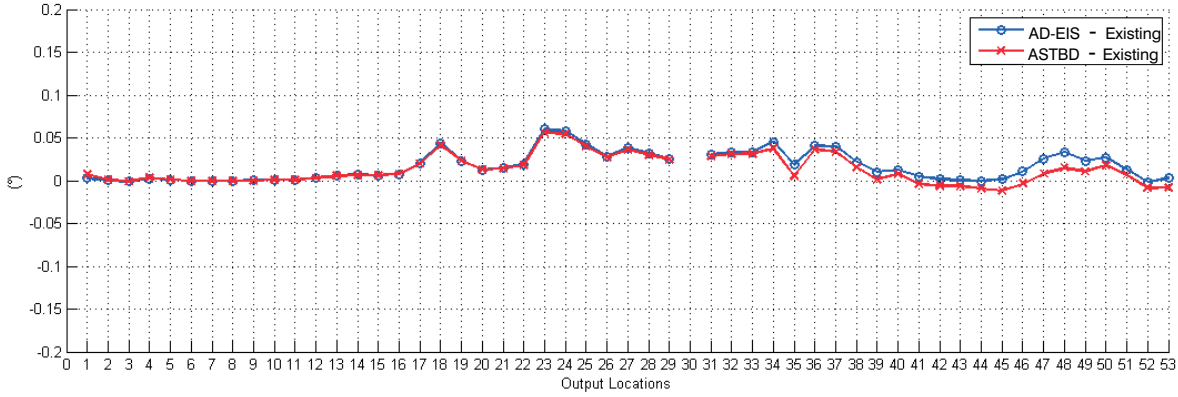
Port Botany Expansion - Dredging Matters
WATER DELIVERY ALLIANCE (WDA) AND ENERGY AUSTRALIA (EA) PROJECTS IN BOTANY BAY

Figure 2









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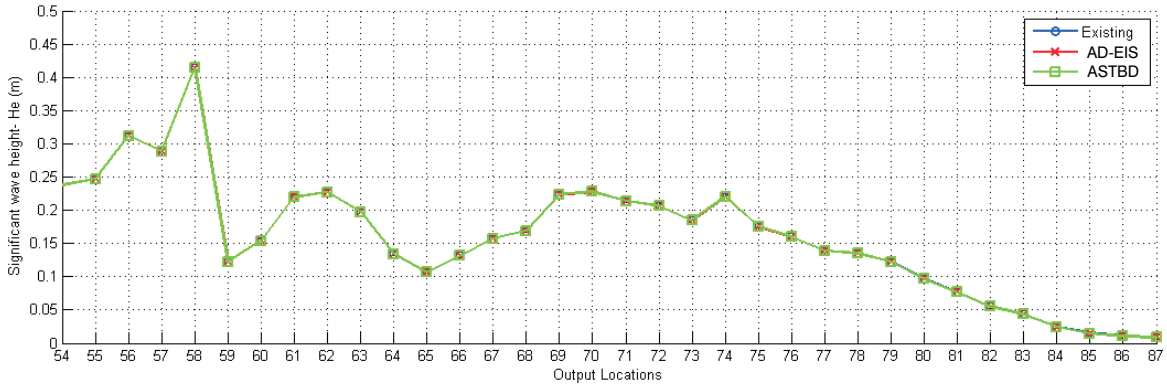
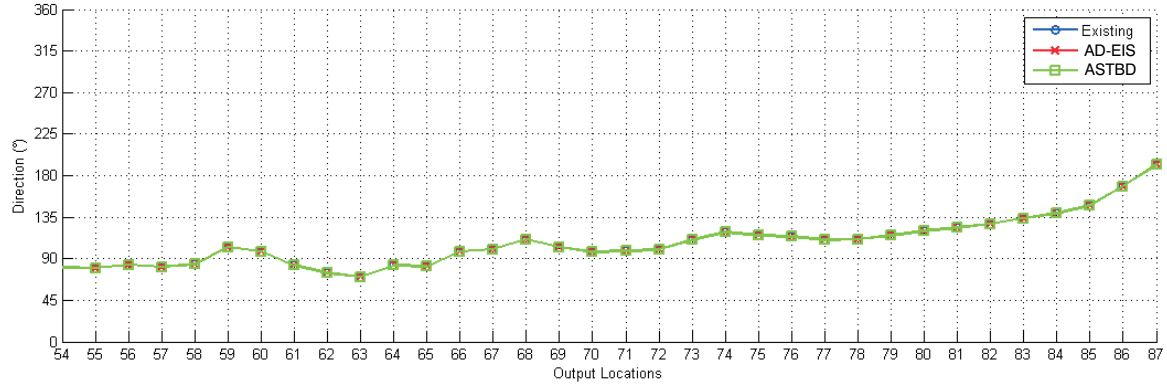
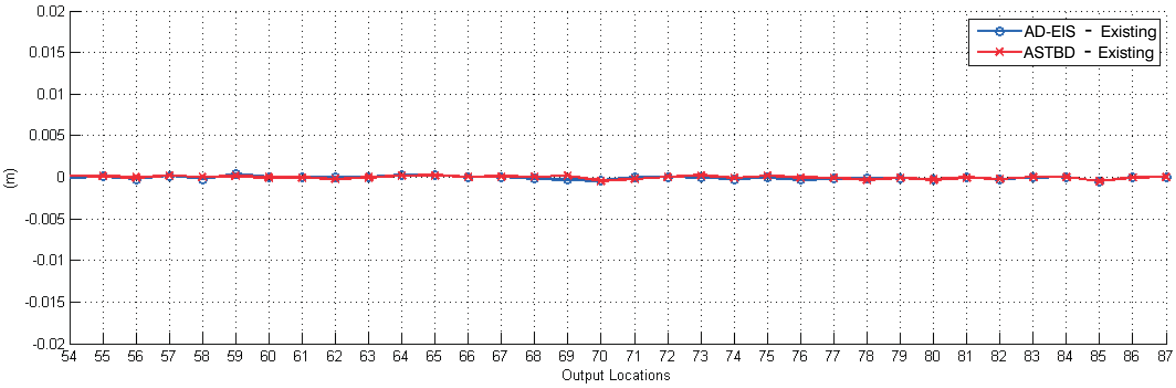
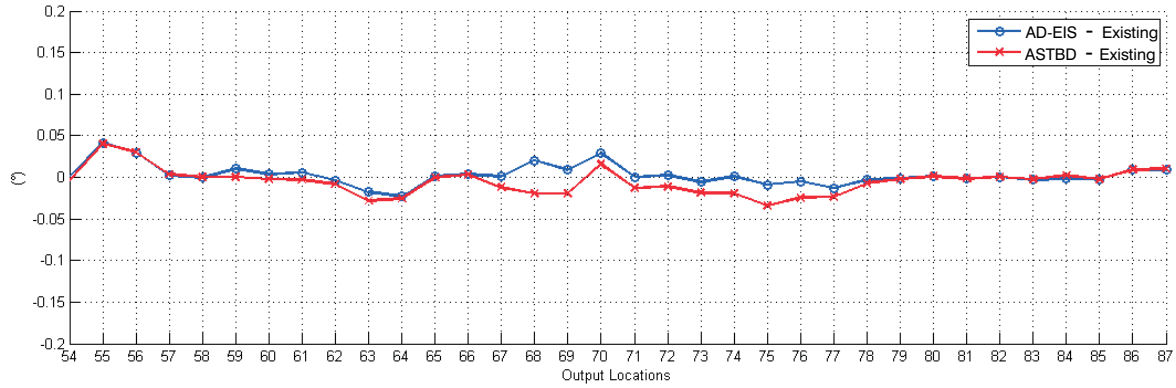
Port Botany Expansion - Dredging Matters
EFFECTIVE WAVE HEIGHT AND MEAN DIRECTION - SILVER AND TOWRA BEACH
Existing, AD-EIS, ASTBD Bathymetries
Figure 3









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Port Botany Expansion - Dredging Matters
EFFECTIVE WAVE HEIGHT AND MEAN DIRECTION - LADY ROBINSON BEACH
Existing, AD-EIS, ASTBDBathymetries
Figure 4

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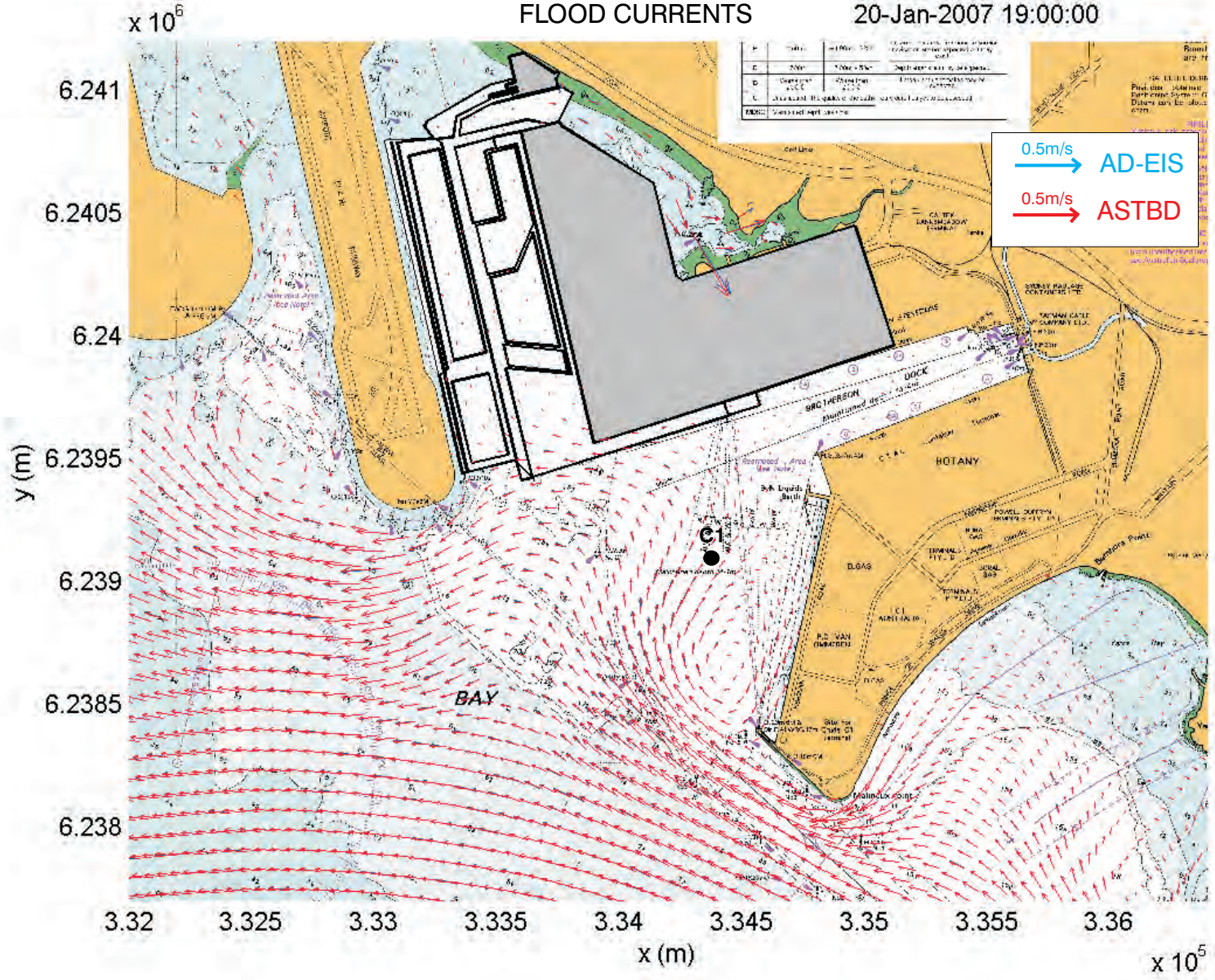
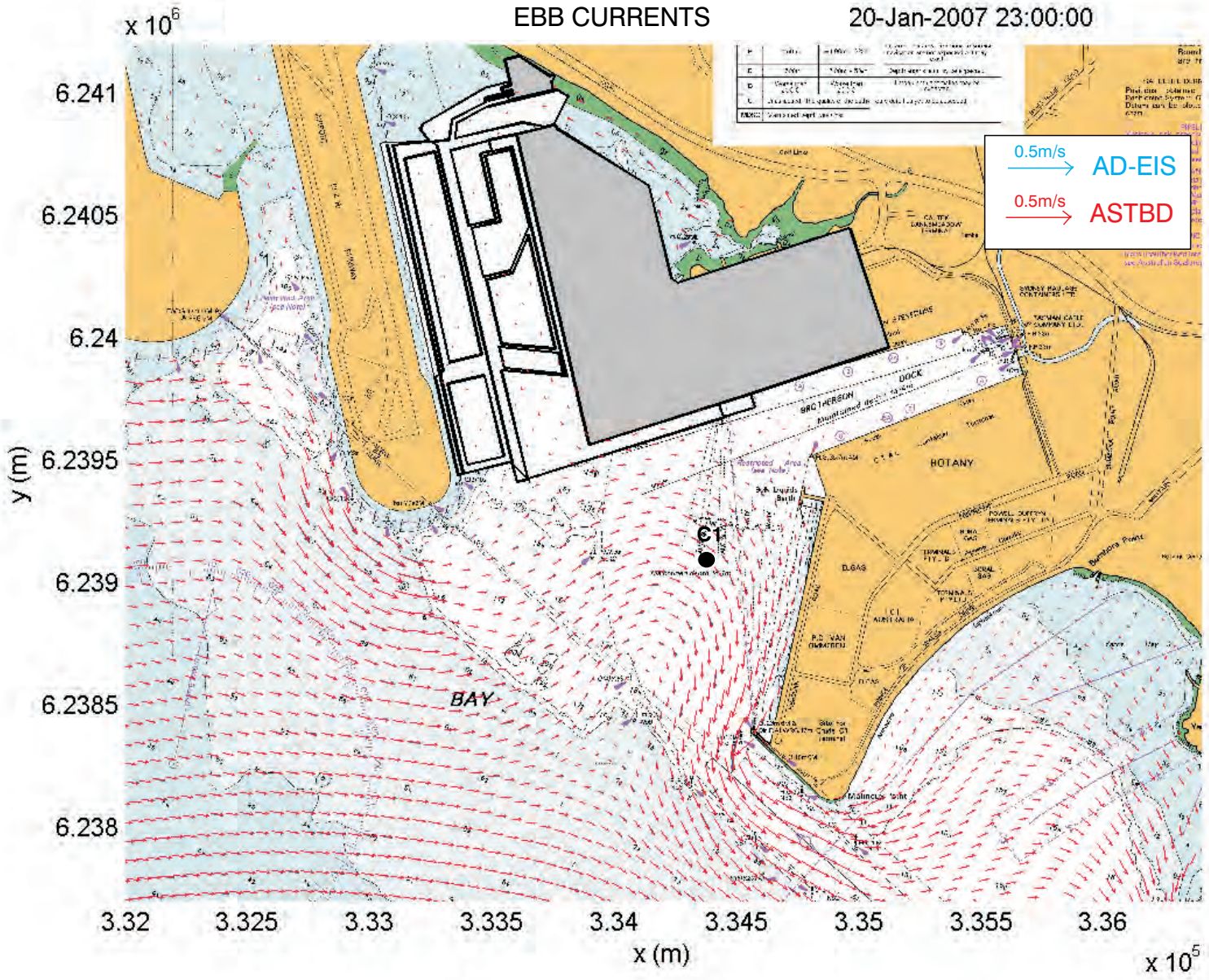
Port Botany Expansion - Dredging Matters
PORT BOTANY AND AIRPORT THIRD RUNWAY OUTPUT LOCATIONS
MIKE 21
Figure 5



Cardno Lawson Treloar

LJ2548/L1866 06/05/2009
File: J/CM/LJ2548/Docs/LJ2548_L1866.cdr

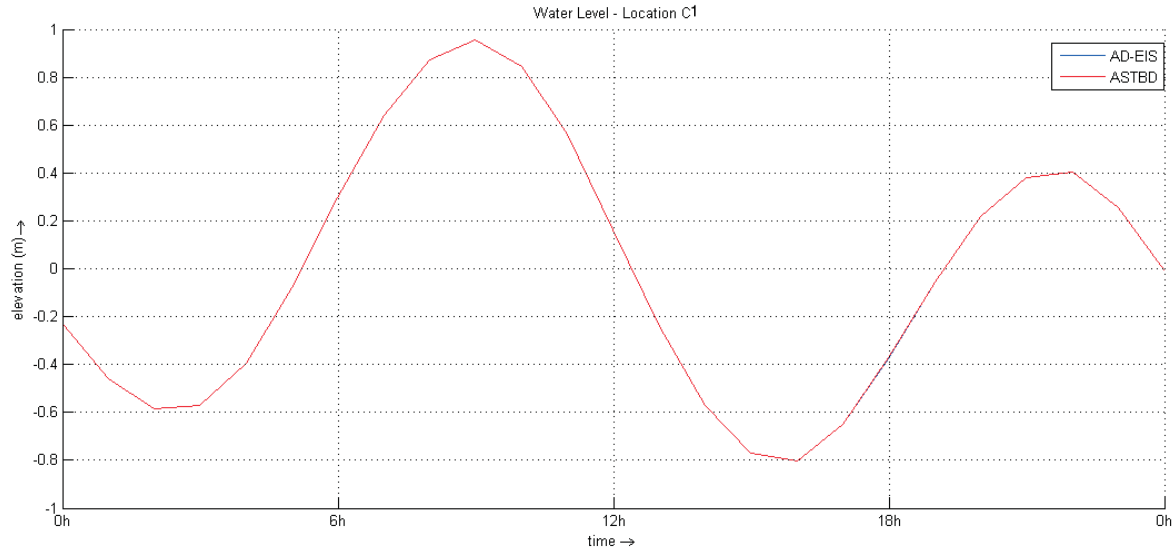
Port Botany Expansion - Dredging Matters
DEPTH AVERAGED CURRENT DURING FLOOD - PORT BOTANY
AD-EIS, ASTBD Bathymetries
Figure 6

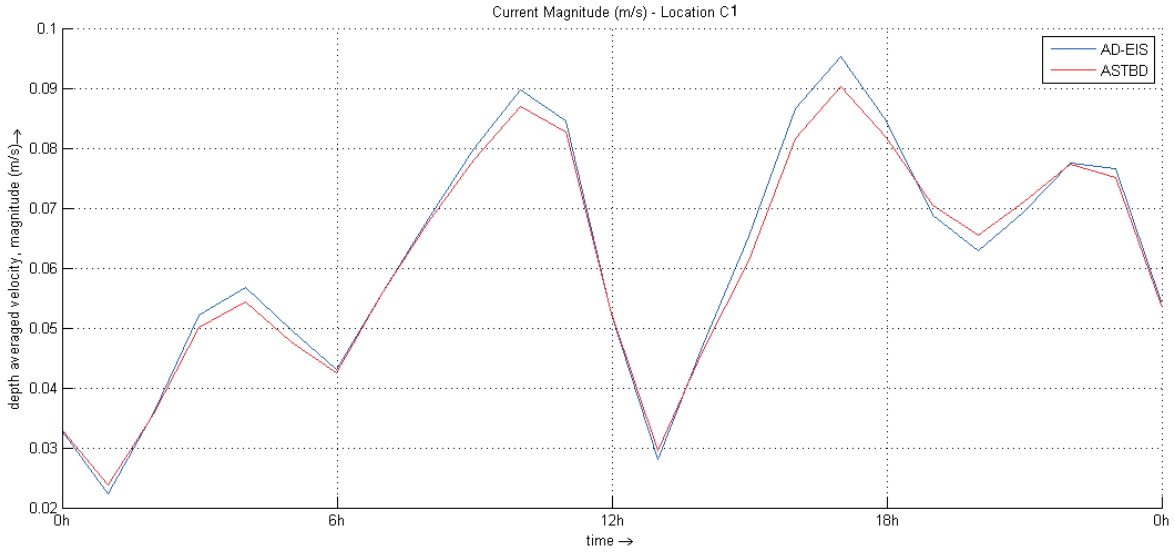


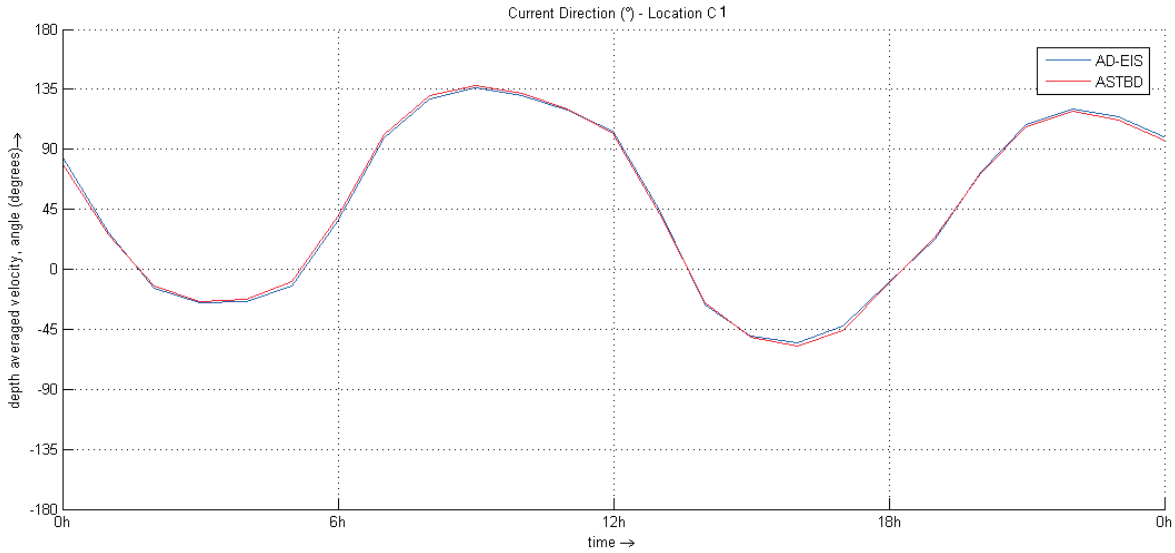
Cardno Lawson Treloar

LJ2548/L1866 06/05/2009
File: J/CM/LJ2548/Docs/LJ2548_L1866.cdr

Port Botany Expansion - Dredging Matters
DEPTH AVERAGED CURRENT DURING EBB - PORT BOTANY
AD-EIS, ASTBD Bathymetries
Figure 7







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LJ2548/L1866 06/05/2009
File: J/CM/LJ2548/Docs/LJ2548_L1866.cdr

Port Botany Expansion - Dredging Matters
WATER LEVEL, DEPTH AVERAGED CURRENTMAGNITUDE AND DIRECTION
LOCATION C1 - AD-EIS, ASTBD Bathymetries
Figure 8