WHITE BAY BERTH 6

PROPOSED MARINE SUPPLY FACILITY

ENVIRONMENTAL ASSESSMENT

Volume 2 – Photos, Figures and Appendices

Prepared for:

GRAHAM BAILEY PTY LTD

T/A Baileys Marine Fuels ABN 13 008 677 370
28 Mews Road, FREMANTLE WA 6160
Telephone 08 9335 7822; Facsimile 08 9430 4618

Prepared by:

KELLOGG BROWN & ROOT PTY LTD
ABN 91 007 660 317
Level 9, 201 Kent Street
SYDNEY NSW 2000
Telephone 02 9911 0000, Facsimile 02 9241 2900

September 2006

SEN547-G-REP-002 Rev 2

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to prepare an Environmental Assessment in accordance with the scope of services set out in the contract between KBR and Baileys Marine Fuels Pty Ltd ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

KBR derived the data in this report primarily from the Client, NSW Government agencies, sub-consultants, visual inspections of the site carreid out by KBR, examination of records in the public domain, interviews with individuals with information about the site. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, KBR has relied upon and presumed accurate certain information (or absence thereof) relative to the project provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, KBR has not attempted to verify the accuracy or completeness of any such information.

No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings, observations and conclusions are based solely upon information in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Revision History

Revision	Date	Comment	Signatures		
			Originated by	Checked by	Authorised by
A	28/04/06	Preliminary Draft Report	AN	PG	JP
B	02/05/06	Amended by Client comments	AN	PG	JP
C	16/05/06	Revised Draft Issue for Client Comment	AN	PG	JP
0	17/05/06	Draft Report for Land Owners Consent. **NOT FOR PUBLIC DISPLAY**	AN	JP	FH
1	01/09/06	Revised Draft for LOC and DA Submission	JP	PG	FH
2	20/09/06	Final Issue	JP	PG	FH

VOLUME 2

APPENDICES

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Appendix A

DIRECTOR-GENERAL'S REQUIREMENTS

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11 September 2006

Bailey's Marine Fuels Australia
C/- KBR Pty Ltd
201 Kent Street
SYDNEY NSW 2000

Attention: Paul Greenhalgh

Dear Mr Greenhalgh

RE: PROPOSED MARINE REFUELING FACILITY – BERTH 6 WHITE BAY, BALMAIN

I refer to your correspondence dated 31 July 2006 in which you seek the reissue of the Director-General's Environmental Assessment Requirements under Part 3A *of the Environmental Planning and Assessment Act 1979* (the Act) due to operational changes for the above proposal, including undertaking boat repair and maintenance activities on site.

These activities were not included in your original proposal but were proposed after the issue of the DGRs on 8 March 2006.

The Sydney Harbour Foreshore Authority, acting under delegation from the Director-General, requested on 2 August 2006, the provision of key issues and assessment requirements from the Department of Primary Industries (NSW Fisheries) and Department of Environment and Conservation (EPA) on your proposal.

However, while these requirements were being sought, you advised the Foreshore Authority on 24 August 2006 that your client was no longer intending to undertake the additional activities.

This advice notwithstanding, the Department of Environment and Conservation have maintained their view that additional assessment requirements are warranted. This is due to their view that the proposal involves activities classified under Schedule 1 of the *Protection of Environment Operations Act 1997*. A copy of their letter is attached.

Based on this information, and in accordance with section 75F(3) of the Act, the Director-General's requirements have been altered. The additional requirements are noted in bold italics and are attached.

Following submission of the draft Environmental Assessment, consultation will occur with the relevant authorities to determine its adequacy. Should the Director-General consider that the EA does not adequately address the environmental assessment requirements, the Director-General may require the proponent to submit a revised EA to address those requirements.

Should you have any questions relating to these requirements, please do not hesitate to contact Cameron Sargent on 9240 8707 or via email to cameron.sargent@shfa.nsw.gov.au

Yours sincerely

Shayne Watson
Acting Planning Assessment Manager

Sydney Harbour Foreshore Authority
Level 6, 66 Harrington Street, The Rocks 2000
PO Box N408, Grosvenor Place NSW 1220
Telephone 02 9240 8500 Facsimile 02 9240 8899
www.shfa.nsw.gov.au ABN 51 437 725 177

ENVIRONMENTAL ASSESSMENT REQUIREMENTS UNDER PART 3A OF THE *ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979*

Project	Construction and operation of a marine refuelling facility, including a commercial refuelling facility, associated fuel storage, office and bulk goods storage building, a roll on and roll off ramp, handling and lay down areas, and temporary facilities.
Site	Berth 6 White Bay, Balmain, being Lot 22 on proposed subdivision – Leichhardt Local Government Area
Proponent	Bailey's Marine Fuels Australia
Date of Issue	8 September 2006
Date of Expiration	8 September 2008
General Requirements	The Environmental Assessment must be prepared to a high technical and scientific standard and must include: • an executive summary; • a description of the proposal, including construction, operation, and staging; • details of the location of the project and environmental planning provisions applicable to the site and project, including the provisions of the Glebe Island and White Bay Ports Master Plan (deemed DCP); • justification for undertaking the project with consideration of the benefits and impacts of the proposal; • consideration of alternatives to the project; • an assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below; • proposed mitigation/management measures of residual environmental impacts; • a draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring for the project; and • certification by the author of the Environment Assessment that the information contained in the Assessment is neither false nor misleading.
Key Assessment Requirements	The Environmental Assessment must include assessment of the following key issues: • **Air Quality** – the Environmental Assessment must include a comprehensive air quality impact assessment prepared in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2001), with particular focus on dust emissions during construction and operation, and the control of odours during the operation of the facility. • **Noise and Vibration** – the Environmental Assessment must include an assessment of the predicted noise impacts resulting from construction and operation of the projects and the measures to manage any noise impacts. The noise assessment must include an assessment of the existing noise impacts at the site and must be undertaken in accordance with *Industrial Noise Policy* (EPA, 1999) and *Environmental Criteria for Road Traffic Noise* (EPA, 1999). Details should be provided of activities and associated noise that may occur outside standard business hours. • **Water Quality** – the Environmental Assessment must include an assessment of the water quality impacts associated with development, taking into account surface water, stormwater, groundwater and impacts on White Bay. Details of the erosion, sediment and stormwater controls to be established at the site must be included, and should consider potential impacts on marine flora and fauna. The Environmental Assessment should particularly focus on mitigation measures required for the construction of the water based features of the proposal, and the prevention and mitigation measures for possible fuel spillage. • **Traffic and Parking** – the Environmental Assessment must include a Traffic Impact Study (TIS) prepared in accordance with the RTA's publication *Guide to Traffic Generating Developments*. The TIS must include details on the nature/mode of traffic generated, transport routes, traffic volumes and the potential impact of this on local and regional roads and intersections. Details on site access, internal

	roadways, and parking must also be provided. The TIS must also address any impacts on water based traffic as a result of the proposed operation of the facility. • **Visual Impact** – the Environmental Assessment must include an assessment of the visual impact of the proposal on the surrounding area, and must address the requirements of the Master Plan, with particular reference to the siting of the proposed building, and urban design principles. The Environmental Assessment must include at least one photomontage of the proposal when viewed across the waterway from Pyrmont Point Park. • **General Environmental Risk Analysis** – notwithstanding the above key assessment requirements, the Environmental Assessment must include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. The prevention and control of potential fire and spillage hazards are of particular importance. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of these additional key environmental impacts must be included in the Environmental Assessment. • ***Additional requirements: the consideration of the requirements of section 45 of the Protection of the Environment Operations Act 1997; detailed assessment of water, air, noise and waste management issues, particularly in relation to bulk fuel storage, vessel refuelling and vessel pre-commissioning facilities, and protection measures to be adopted during construction and operation of the facilities; provision of comprehensive details of the activities involved in the pre-commissioning of vessels; preparation and implementation of detailed Environmental Management Plans for the project; and emergency response plans to be initiated in the event of an environmental incident during the construction and operation of the facilities.***
Consultation Requirements	You must consult with the following parties during the preparation of the Environmental Assessment: • ***Department of Environment and Conservation***; • NSW Workcover Authority; • NSW Maritime Authority; • NSW Roads and Traffic Authority; • Sydney Ports Corporation; • Leichhardt Municipal Council; and • affected residents and relevant community groups. As part of the consultation process the proposal will be referred to the Sydney Harbour Design Review Panel for consideration, and any comments of the Panel should be considered in developing the final design details of the building and should be address in the final Environmental Assessment. To refer the proposal to the Panel please contact Mr Mark Shanahan at the Sydney Harbour Foreshore Authority on 9240 8816.
Deemed refusal period	Pursuant to clause 8E(2) of the *Environmental Planning and Assessment Regulation 2000*, the deemed refusal period for the project will be 60 days.

Our reference: SR969: SRF15742

8 September 2006

Notice No: 1064906

Mr S Watson
Acting Planning Assessment Manager
Sydney Harbour Foreshore Authority
PO Box N408
GROSVENOR PLACE NSW 1220

Dear Mr Watson

**RE: BAILEY'S MARINE FUELS AUSTRALIA
PROPOSED MARINE REFUELLING FACILITY
WHITE BAY BERTH 6**

I refer to your letter dated 2 August 2006 requesting the Department of Environment and Conservation's (DEC) key issues and assessment requirements for the Director-General's Environmental Assessment Requirements (DGRs) for the above proposal. Your subsequent electronic correspondence dated 29 August 2006 containing an attached letter from Kellogg Brown & Root Pty Ltd dated 24 August 2006 also relates.

The DEC has a licensing role for activities listed in Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act), responsibilities for the protection and care of aboriginal objects and places and the protection and care of native flora and fauna under the *National Parks and Wildlife Act* 1974 (NPW Act) and responsibilities under the *Threatened Species Conservation Act 1997* (TSC Act).

The DEC notes that DGRs have been previously issued for this project, but that the proponent amended the proposal to include activities scheduled under the POEO Act. The DEC also notes that the proponent has further amended the proposal to exclude most of those activities, and that, notwithstanding the withdrawal of those parts of the proposal, the Sydney Harbour Foreshore Authority (SHFA) still seeks input from the DEC for reissuing the DGRs.

The SHFA should note that if the activities to be undertaken at the premises were not scheduled, the DEC would not be the appropriate regulatory authority (ARA) under the POEO Act for the development. Unscheduled activities are not required to be licensed under the POEO Act. The ARA for unscheduled private developments on public land is the local council. Irrespective of which authority is ARA, the project must be undertaken so as to comply with the general environment protection provisions of the POEO Act.

PO Box 668, Parramatta NSW 2124
Level 7, 79 George St, Parramatta NSW
Tel: (02) 9995 5000 Fax: (02) 9995 6900
ABN 30 841 387 271
www.environment.nsw.gov.au

The DEC has considered the details of the proposal as provided. Based upon the information currently provided to the DEC, that the premises will be used in part to cater for pre-commissioning of five or more vessels at any one time, it appears that the proponent will still be undertaking activities classified as "Marinas and Boat Repair Facilities" under Schedule 1 of the POEO Act. The proponent will require an environment protection licence to carry out scheduled development work and subsequently carry out scheduled activities, and will need to make a separate application to the DEC to obtain this licence. Any such licence will be issued in the name of the Environment Protection Authority (EPA).

Attachment "A" to this letter contains the detailed requirements of the DEC for this proposal, in relation to the POEO Act, that should be addressed in the final environmental impact assessment (EIA) for the proposal. The EIA must provide sufficient information for the DEC to be able to fully assess the development in so far as impacts relate to the DEC's licensing role. Specifically the requirements of section 45 of the POEO Act must be addressed. Attachment "B" provides guidelines for the assessment of flora and fauna (EP&A Act and TSC Act) and Attachment "C" provides guidelines for the assessment of cultural heritage (NPW Act).

To assist in assessing the EIA the DEC requests that the EIA follow the format of the specific requirements outlined in Attachment "A" and the guidelines provided in Attachments "B" and "C". If the necessary information is not adequately provided in the EIA delays may occur in the development application process.

In summary, the DEC's key information requirements for the proposal are:

1. the consideration of the requirements of section 45 of the POEO Act;
2. a detailed description of the project, including maps and drawings detailing the site location and proposed layout;
3. a detailed assessment of water, air, noise and waste management issues, particularly in relation to the bulk fuel storage, vessel refuelling and vessel pre-commissioning facilities, and the protection measures to be adopted during the construction and operation of the facilities;
4. provision of comprehensive details of the activities involved in the proposed pre-commissioning of vessels;
5. an assessment of the impacts on flora and fauna, including any threatened species, populations and ecological communities, and the protection measures to be adopted during the construction and operation of the facilities;
6. an assessment of impacts on Aboriginal cultural heritage in consultation with relevant Aboriginal communities, and the protection measures to be adopted during construction of the facilities;
7. details of community consultation to be undertaken for the project, including the provision of a complaints handling procedure and a 24-hour telephone contact number;
8. the preparation and implementation of detailed Environmental Management Plans for the project; and
9. emergency response plans to be initiated in the event of an environmental incident during the construction and operation of the facilities.

The proponent should be aware that any commitments made in the EIA may be formalised as requirements of the DEC's general terms of approval. Consequently pollution control or conservation measures should not be proposed if they are impractical, unrealistic or beyond the financial viability of the development.

The DEC requests that the applicant provide three hard copies and one CD-ROM copy, if available, of the DA / EIA when requesting comments on, or seeking General Terms of Approval for, the project from the DEC. These documents should be sent to:

The Manager
Metropolitan Infrastructure
Department of Environment and Conservation
PO Box 668
PARRAMATTA NSW 2124

If you have any queries regarding this matter please contact Mark Villa on 9995 6814.

Yours sincerely

Signed 8 September 2006

NEALE PHILIP
Head Metropolitan Infrastructure Unit
Environment Protection and Regulation

Table A1 Compliance of EA with Director-General's Requirements

Environmental Assessment Requirements	Section in EA
The Environmental Assessment must be prepared to a high technical and scientific standard and must include:	
• an executive summary;	Page 3
• a description of the proposal, including construction, operation, and staging;	Section 1.3; Chapter 5
• details of the location of the project and environmental planning provisions applicable to the site and project, including the provisions of the Glebe Island and White Bay Ports Master Plan (deemed DCP);	Sections 1.1, 1.2, 1.5, and 1.6; Chapter 2 and Appendix D
• justification for undertaking the project with consideration of the benefits and impacts of the proposal;	Chapter 3 and Section 12.1
• consideration of alternatives to the project;	Chapter 4
• an assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below;	Chapters 7, 8 and 9
• proposed mitigation/management measures of residual environmental impacts;	Chapters 7,, 8 and 11
• a draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring for the project; and	11.3
• certification by the author of the Environment Assessment that the information contained in the Assessment is neither false nor misleading.	Limitations Statement (Page 2)
The Environmental Assessment must include assessment of the following key issues:	
• Air Quality – the Environmental Assessment must include a comprehensive air quality impact assessment prepared in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2001), with particular focus on dust emissions during construction and operation, and the control of odours from fuel and sewerage pump-out during the operation of the facility.	Section 7.5 and Appendix K
• Noise and Vibration – the Environmental Assessment must include an assessment of the predicted noise impacts resulting from construction and operation of the projects and the measures to manage any noise impacts. The noise assessment must include an assessment of the existing noise impacts at the site and must be undertaken in accordance with Industrial Noise Policy (EPA, 1999) and Environmental Criteria for Road Traffic Noise (EPA, 1999). Details should be provided of activities and associated noise that may occur outside standard business hours.	Section 8.1 and Appendix L
• Water Quality – the Environmental Assessment must include an assessment of the water quality impacts associated with development, taking into account surface water, stormwater, groundwater and impacts on White Bay. Details of the erosion, sediment and stormwater controls to be established at the site must be included, and should consider potential impacts on marine flora and fauna. The Environmental Assessment should particularly focus on mitigation measures required for the construction of the water based features of the proposal, and the prevention and mitigation measures for possible fuel spillage.	Sections 7.2, 7.3 and 8.7 and Appendix I
• Traffic and Parking – the Environmental Assessment must include a Traffic Impact Study (TIS) prepared in accordance with the RTA's publication Guide to Traffic Generating Developments. The TIS must include details on the nature/mode of traffic generated, transport routes, traffic volumes and the potential impact of this on local and regional roads and intersections. Details on site access, internal roadways, and parking must also be provided. The TIS must also address any impacts on water based traffic as a result of the proposed operation of the facility.	Section 8.6
• Visual Impact – the Environmental Assessment must include an assessment of the visual impact of the proposal on the surrounding area,	Sections 8.4, 8.5 and Appendix M

Environmental Assessment Requirements	Section in EA
and must address the requirements of the Master Plan, with particular reference to the siting of the proposed building, and urban design principles. The Environmental Assessment should detail potential lighting impacts and mitigation measures to control potential light spill. The Environmental Assessment must include at least one photomontage of the proposal when viewed across the waterway from Pyrmont Point Park. • General Environmental Risk Analysis – notwithstanding the above key assessment requirements, the Environmental Assessment must include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. The prevention and control of potential fire and spillage hazards are of particular importance. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of these additional key environmental impacts must be included in the Environmental Assessment.	 Section 8.7 and Appendix N
Additional Requirements:	
The consideration of the requirements of section 45 of the POEO Act.	Appendix D
A detailed assessment of water, air, noise and waste management issues, particularly in relation to the bulk fuel storage, vessel refuelling and vessel pre-commissioning facilities, and the protection measures to be adopted during the construction and operation of the facilities.	Chapters 7 & 8
Provision of comprehensive details of the activities involved in the proposed pre-commissioning of vessels.	Section 5.3.8 of the EA lists activities involved with the pre-commissioning facilities
The preparation and implementation of detailed Environmental Management Plans for the project	To be completed after development consent is given.
Emergency response plans to be initiated in the event of an environmental incident during the construction and operation of the facilities	To be completed after development consent is given.
You must consult with the following parties during the preparation of the Environmental Assessment: • Department of Environment and Conservation; • NSW Workcover Authority; • NSW Maritime Authority; • NSW Roads and Traffic Authority; • Sydney Ports Corporation; • Sydney Water; • Leichhardt Municipal Council; and • affected residents and relevant community groups. As part of the consultation process the proposal will be referred to the Sydney Harbour Design Review Panel for consideration, and any comments of the Panel should be considered in developing the final design details of the building and should be addressed in the final Environmental Assessment.	Chapter 6

Appendix B

EXISTING SPC SERVICES AND UTILITIES DRAWING

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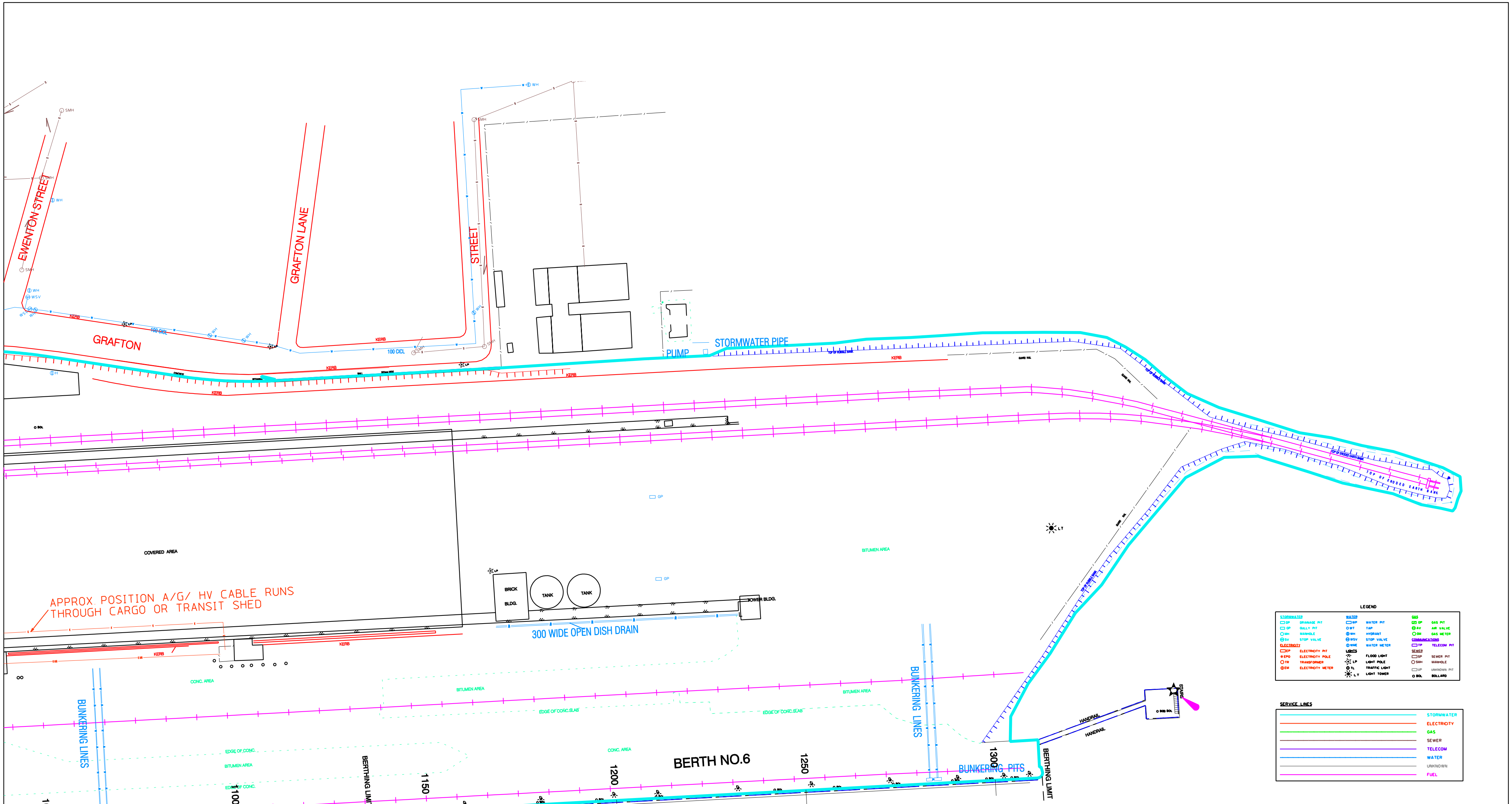

NOTE:
THIS PLAN IS FOR VERIFICATION PURPOSES ONLY AND SHOULD BE USED WITH CAUTION.

SERVICES COMPILED FROM VARIOUS SOURCES INCLUDING INFORMATION SUPPLIED BY SERVICE AUTHORITIES WHICH MAY BE INDICATE AND INCOMPLETE IN AREAS. DETAILS SHOULD BE VERIFIED BY THE RESPECTIVE AUTHORITY COMPLETING AN ASBUILT SURVEY AS REQUIRED.

PLAN LIMITATION STATEMENT

This plan has been prepared in accordance with accepted practice for the use only of Sydney Ports Corporation for a specific purpose. No Warranty or representation, expressed or implied is made to any other party regarding this survey and plan. This plan should not be relied upon for any other purpose or use by any party including Sydney Ports Corporation as the plan may not contain sufficient information for that purpose or use.

THIS NOTE IS AN INTEGRAL PART OF THIS PLAN

NOTE : STATED MEASUREMENTS ARE INDICATIVE ONLY AND SUBJECT TO SURVEY

SPC Boundary

N

0 10 20 30 40 50 60 70 80 90 100m

Scale in Metres

SYDNEY PORTS

FIRST PORT, FUTURE PORT

PLAN PRODUCED ON MGA GRID

WHITE BAY No.6
LOCATION OF SERVICES

DRAFTED BY: J.T.

DATE: 22/03/2006

PLAN SCALE: AS PER SCALE BAR

DWG NO: SWGP296A

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Appendix C

LAND OWNERS CONSENT

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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

15 September 2006

Mr Guy Bailey
Managing Director
Baileys Marine Fuels Australia
28 Mews Road
Fremantle WA 6160

Dear Guy

RE: LANDOWNERS CONSENT FOR WORKS – WHITE BAY 6

Reference is made to the Environmental Assessment for Baileys Marine Fuels Australia (Baileys) for the proposed development works at White Bay 6.

Sydney Ports' consent to the lodgement of the Development Application is hereby granted, subject to the following conditions:

1. Any amendments to the development application or supporting documentation assessed by Sydney Ports in issuing landowner's consent (whether the amendments are made prior to lodgement or following lodgement) require further consent by Sydney Ports prior to submission to the consent authority.

2. All work shall be carried out to the requirements of all relevant codes, acts and statutory requirements having jurisdiction.

3. Completed working drawings and technical specifications for the development shall be submitted to Sydney Ports for review at least two weeks prior to work commencing on site.

4. A copy of the Consent and evidence of approval by the consent authority shall be provided to Sydney Ports at least two weeks prior to work commencing on site. Sydney Ports shall also be provided with a copy of the draft conditions of consent immediately upon receipt by Baileys.

5. All work shall be completed without cost to, and to the reasonable satisfaction of Sydney Ports.

6. Sydney Ports does not warrant the efficacy of the proposed works nor their suitability for the intended purpose, nor does it accept any liability or responsibility for any matter arising from or as a result of the works.
7. Any damage to Sydney Ports' or other parties' assets caused by the building works or installation of services shall be reinstated on completion of work, or at other times as requested, to the reasonable satisfaction of Sydney Ports.
8. Detailed site layout drawings are to be submitted to Sydney Ports for information prior to or when seeking the consent to the Construction Certificate application. In particular, drawings showing the site drainage and the connection to the existing Sydney Ports' drainage are to be provided. If any drainage works are to be undertaken outside the Baileys lease area, then the further approval of Sydney Ports will re required.
9. Baileys is to submit an updated Green Port Guidelines Checklist for Sydney Ports' review during the detailed design stage of the project, which outlines the commitments made for the proposed development which have been included in the detailed design.
10. Detailed proposed pipeline route drawings are to be provided to Sydney Ports for approval prior to any pipeline construction works being committed outside the lease area.
11. The location of all new pipelines outside the lease area are to be surveyed, and the survey information is to be provided to Sydney Ports as soon as practicable after construction. Baileys will enter into a pipeline licence with Sydney Ports for all new pipelines. The licence will commence from the date of commissioning of the first new pipeline. A licence fee will apply.
12. Sydney Ports' attendance at any HAZOP workshop is mandatory. Appropriate notice of the HAZOP date is required for Sydney Ports' personnel to attend.
13. Baileys shall appoint a Principal Contractor for the construction works in accordance with the OH&S Regulation (NSW) 2001. Acceptable risk assessments and safe work method statements shall be prepared and evidence of these provided to Sydney Ports before site works commence.

Please direct any inquiries regarding this matter to Sarah Hartson, Operations Manager Property, on telephone 9296 4797.

Yours sincerely

Greg Martin
Chief Executive Officer

NSW | MARITIME
AUTHORITY

28 August 2006

File No. W06/170
LOC: 381

Mr Guy Bailey
28 Mews Road
Fremantle WA 6160

Dear Mr Bailey

Land Owner's Consent Major Project Application — Proposed Marine Supply Facility, White Bay

I refer to your **Application for Land Owner's Consent to make a Major Project Application** for the proposal above.

As the owner of the land to which the application relates, NSW Maritime has assessed the application against the Land Owner's Consent Manual considering all available information in relation to your application.

NSW Maritime consents to the lodgement of a Major Project Application for the proposal as shown in Drawing Nos. listed below. The consent is subject to the conditions at Attachment A.

- 6356 - SK1D
- 6356 – SK2D
- 6356 – SK3A
- 6356 – SK4A

It is important to note that the NSW Maritime's consent as Land Owner to the making of the Major Project Application:

1. Does not imply that an environmental assessment of the proposal has been completed in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act).
2. Applies only to the drawings specified above. Any modifications will need the approval of the NSW Maritime as Land Owner.

If you have any questions in regard to this letter please do not hesitate to contact Maryanne Campanelli on 9364 2017.

Yours sincerely,

Ivan Patrick
A/Manager Property Planning
cc: Department of Planning
Sydney Harbour Foreshore Authority

NSW MARITIME
James Craig Road Rozelle NSW 2039
Locked Bag 5100 Camperdown NSW 1450
T 02 9563 8511 F 02 9563 8530 www.maritime.nsw.gov.au

Attachment A

General

1. That satisfactory tenancy arrangements are entered into with NSW Maritime for the water based structures.

Environmental

2. All work, being done in such a way that no construction debris etc. or any material of any kind falls, flows or is carried by natural forces to the bed or waters of the Port and any such material entering Port is to be removed immediately.
3. That a Construction Environmental Management Plan (CEMP) and Operational Management Plan (OMP) be submitted to NSW Maritime prior to the commencement of construction works. NSW Maritime is to be provided with a copy of all investigation studies and environmental reports that relate to the project.

Application for Construction and Engineering

4. Drawings, calculations and specifications together with any other documentation fully and clearly describing all the proposed works below Mean High Water Mark being submitted to and approved by NSW Maritime in writing prior to the commencement of construction.
5. The documentation above complying with *NSW Maritime's Engineering Standards and Guidelines for Maritime Structures and NSW Maritime's Guidance Note: Documentation.*
6. In the event the Development Application receives Development Consent, a copy of the Determination, including any conditions or stamped drawings etc being submitted to NSW Maritime.
7. The design of the proposed work being carried out in accordance with *NSW Maritime's Engineering Standards and Guidelines for Maritime Structures* and where appropriate, undertaken by a practising consulting Civil Engineer qualified for Corporate Membership of the Institution of Engineers Australia.
8. The proposed travel lift and all components being designed, detailed, installed and operated and maintained in accordance with relevant Australian or equivalent codes, rules and standards.
9. Drawings/brochures/catalogues for the proposed travel lift being accompanied by a signed statement from the designer/manufacturer or from a practising consulting Mechanical Engineer qualified for Corporate Membership of the Institution of Engineers Australia certifying that the travel lift complies with AS1418 or equivalent.
10. The proposed fuelling facility being designed and detailed in accordance with the requirements of all appropriate Codes, Rules and Standards and the work complying with the requirements of any authority having a statutory jurisdiction over any aspect of the work.

11. A condition survey report for any existing structures to be incorporated into the proposed facility being submitted to and approved by NSW Maritime in writing prior to the commencement of construction. Such a report being prepared by a practising consulting Civil Engineer qualified for Corporate Membership of the Institution of Engineers Australia.

Other

12. All proposed work being carried out at no cost to NSW Maritime.

13. NSW Maritime reserving the right to request further information following the receipt and examination of the foregoing.

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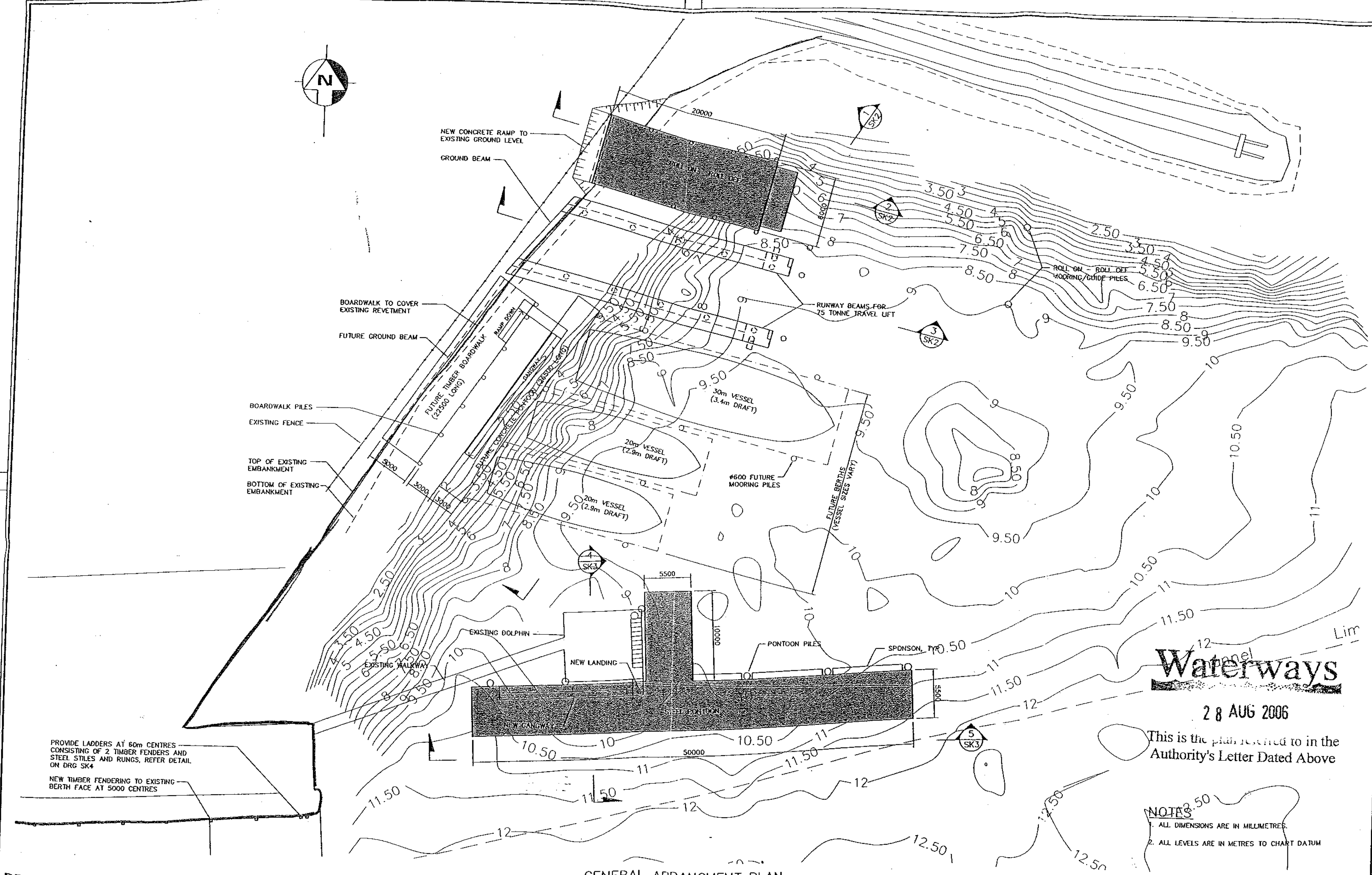

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL LEVELS ARE IN METRES TO CHART DATUM

0 5000 10000 15000 20000mm
1:200 (A1) 1:400 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

GENERAL ARRANGMENT PLAN
1:200

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
D	ISSUED FOR CLIENT COMMENT	AMK	MM	AMK		24.04.06
C	REVISED FOR D.A.	AMK	MM	AMK		23.03.06
B	ISSUED FOR D.A.	AMK	MM	AMK		09.03.06
A	ISSUED FOR INFORMATION	AMK	MM	AMK		15.02.06

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

level 4
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North Sydney 2060
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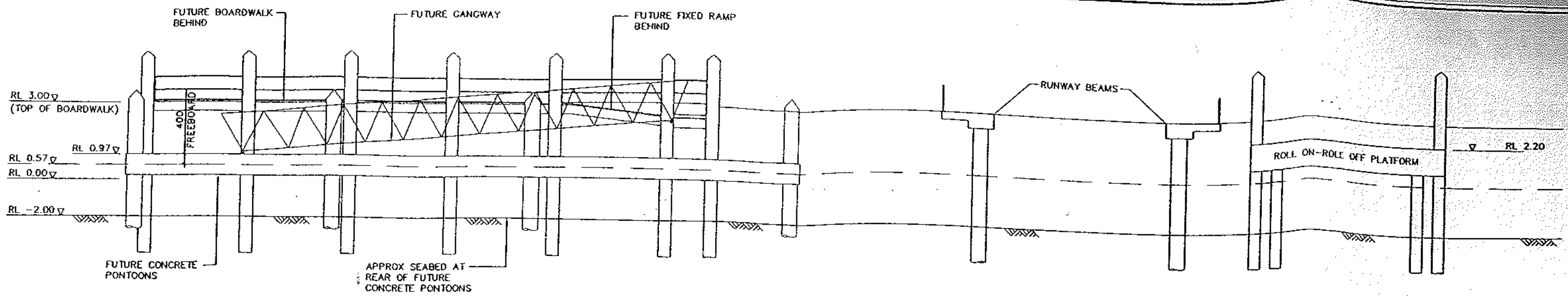
Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: GENERAL ARRANGEMENT PLAN

Drawing No. 6356-SK1
Issue D
Cad File No. 6356-SK1
Xref.(s)

A1



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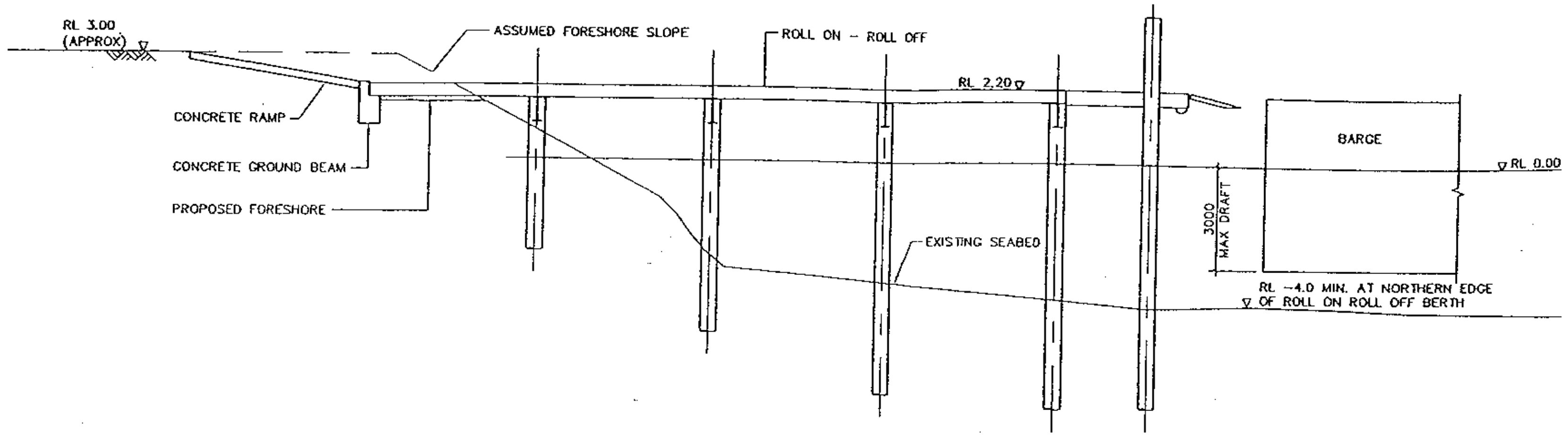

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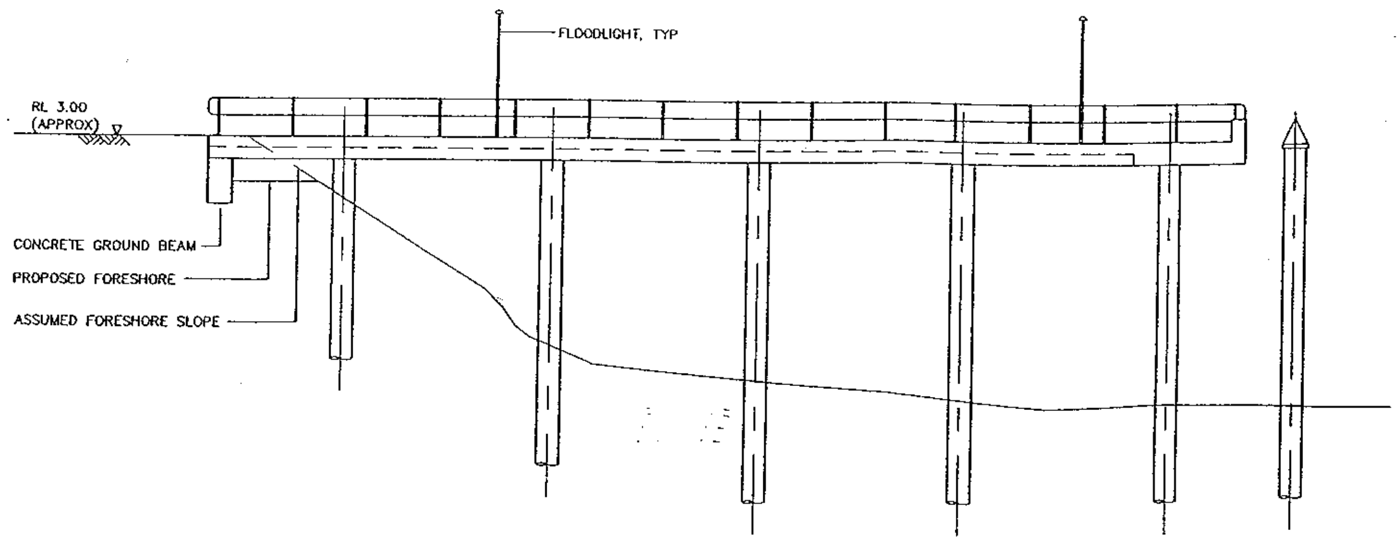

SECTION 3 SK1
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Waterways

2 8 AUG 2006

This is the plan referred to in the Authority's Letter Dated Above

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL LEVELS ARE IN METRES TO CHART DATUM

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1:100 (A1) 1:200 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
D	ISSUED FOR CLIENT COMMENT	AMK	MM	AMK		24.04.06
C	REVISED FOR D.A.	AMK	MM	AMK		24.03.06
B	ISSUED FOR D.A.	AMK	MM	AMK		09.03.06
A	ISSUED FOR INFORMATION	AMK	MM	AMK		15.02.06

A1

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

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Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

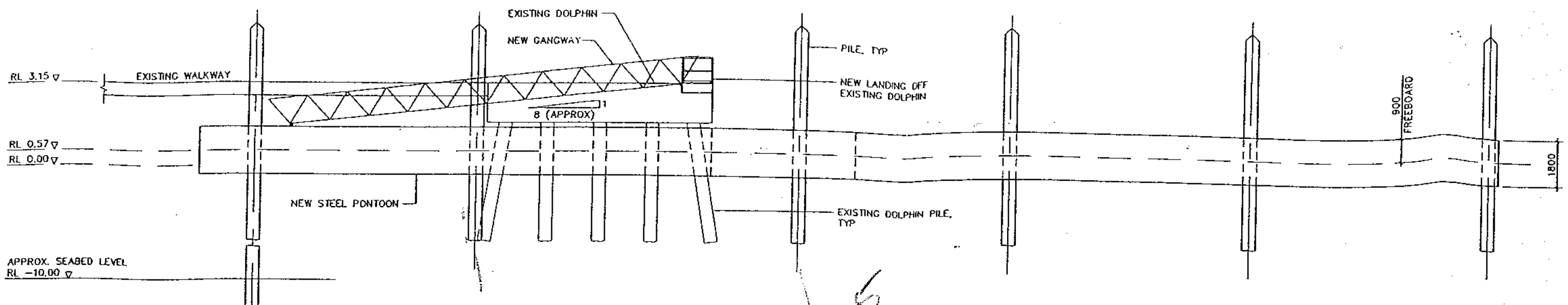
Title: SECTIONS SHEET 1

Drawing No. 6356-SK2

Issue D

Cad File No. 6356-SK2

Xref.(s)



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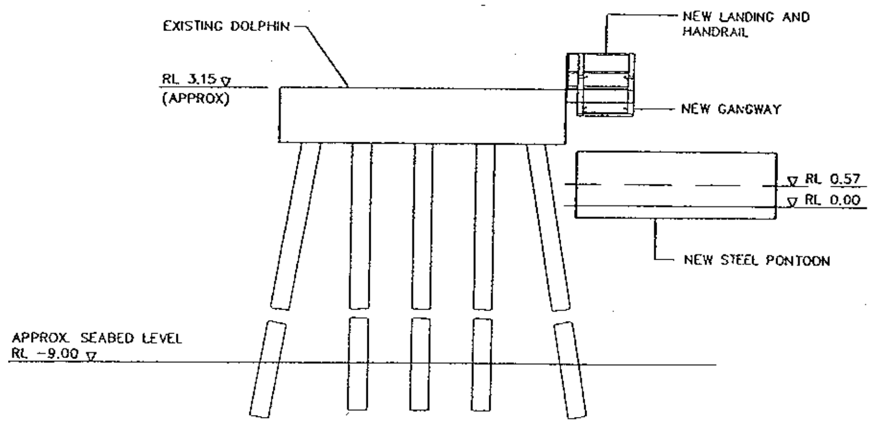

SECTION 4/SK1
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Waterways

28 AUG 2006

This is the plan referred to in the Authority's Letter Dated Above

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL LEVELS ARE IN METRES TO CHART DATUM

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1:100 (A1) 1:200 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR CLIENT COMMENT	AMK	MM	AMK		24.04.06

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Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: SECTIONS SHEET 2

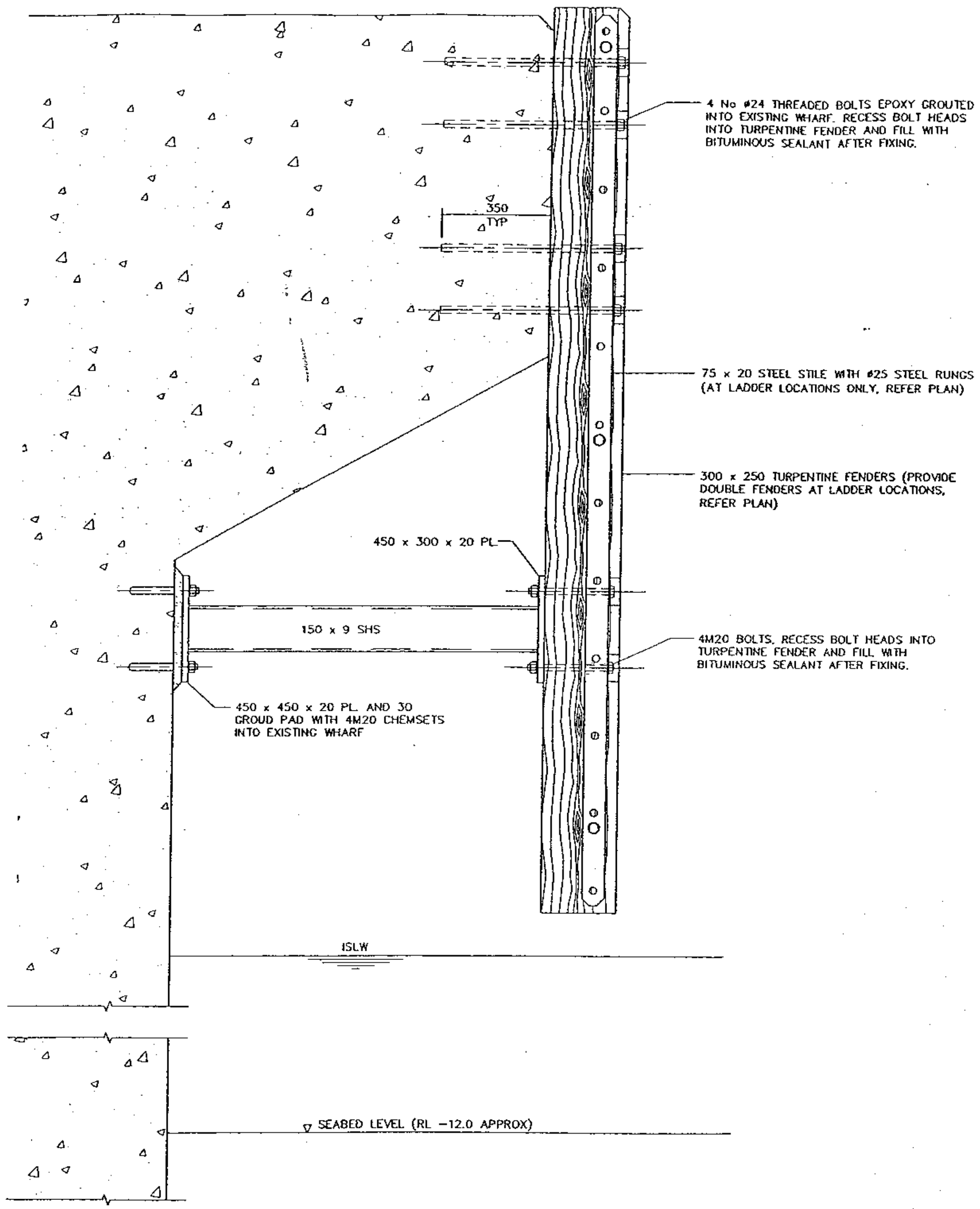
Drawing No. 6356-SK3

Issue A

Cad File No. 6356-SK3

Xref.(s)

A1



TYPICAL FENDER DETAIL
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NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL LEVELS ARE IN METRES TO CHART DATUM

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1:10 (A1) 1:20 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR CLIENT COMMENT	AMK	MM	AMK		24.04.06

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Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: DETAILS

Drawing No. 6356-SK4
Issue: A
Cad File No. 6356-SK4
Xref.(s)

A1

Appendix D

COMPLIANCE OF PROPOSAL WITH STATUTORY REQUIREMENTS

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Table 1 Compliance of Proposal with Sydney Harbour Foreshores and Waterways Area Development Control Plan (DCP) 2005

DCP Performance Criteria	Proposed Development	Compliance (Y/N)
2. Ecological Assessment		
To determine whether a proposal is satisfactory , consideration will need to be given to: – General aims of Section 2.2 – Statement of intent and performance criteria in tables 2-6 – Provisions of section 5A of the EP&A Act 1979	A marine ecology and terrestrial ecology assessment have been undertaken as part of the EA.	Y
3. Landscape Assessment		
To determine whether a proposal is satisfactory, consideration will need to be given to: – Visual impact factors identified in Section 3.1 – General aims of Section 3.2 – Statement of Intent and performance criteria for the relevant landscape character type outlined in Section 3.4	A visual impact assessment has been undertaken as part of the EA.	Y
4. Design Guidelines for Water-Based and Land-Water Interface Developments *4.4 Siting of Buildings and Structures*		
• where there is existing native vegetation, buildings should be set back from this vegetation to avoid disturbance to the vegetation • buildings should address the waterway • buildings should not obstruct views and vistas from public places to the waterway; and • buildings should not obstruct views of landmarks and features identified on the maps accompanying this DCP.	A visual impact assessment has been undertaken as part of the EA.	Y
4.5 Built Form		
• where buildings would be of a contrasting scale or design to existing buildings, care will be needed to ensure that this contrast would enhance the setting • while no shapes are intrinsically unacceptable, rectangular boxy shapes with flat or skillion roofs usually do not harmonise with their surroundings. It is preferable to break up facades and roof lines into smaller elements and to use pitched roofs • bright lighting and especially floodlighting which reflects on the water, can cause	A visual impact assessment has been undertaken as part of the EA.	Y

DCP Performance Criteria	Proposed Development	Compliance (Y/N)
problems with night navigation and should be avoided. External lights should be directed downward, away from the water. Australian Standards (AS4282–1997) Guidelines for Outdoor Lighting and Pedestrian Area (Category P) Lighting (AS/NZ 1158.3 – 1999) should be observed • except where otherwise required for navigation purposes, all lights on structures shall be shielded seawards and positioned to avoid disturbance to neighbouring properties • use of reflective materials is minimised and the relevant provisions of the Building Code of Australia are satisfied • colours should be sympathetic with their surrounds and consistent with the colour criteria, where specified, for particular landscape character types in Part 3 • the cumulative visual impact of a number of built elements on a single lot should be mitigated through bands of vegetation and by articulating walls and using smaller elements • the cumulative impact of development along the shoreline is considered having regard to preserving views of special natural features, landmarks or heritage items.		
4.6 Signage		
The following criteria are designed to reinforce the local requirements and provide guidelines in the absence of any other signage policy. Signs on privately-owned land should meet the following requirements: • their dimensions should be minimal and consistent with the commercial or community identity of the premises; • they should not be brightly illuminated to avoid becoming navigational hazards. Lighting of signs should be directed downward, away from the water; • they should preferably be placed on the facades of buildings, rather than on roofs or free standing; and • signs that intrude on the skyline should be avoided. – State Environmental Planning Policy No. 64 Advertising and Signage (SEPP 64) should also be referred to.	A visual impact assessment has been undertaken as part of the EA.	Y
4.8 Private Landing Facilities (including jetties, ramps and pontoons)		
• to minimise alienation of the public waterway, the total length of structures is restricted to the minimum needed for their function. This is generally 13 metres with a maximum length of 16 metres from the mean high water mark (MHWM). The need for structures to be longer to reach an adequate depth of water is not, in itself, sufficient justification	Chapter 5 of the EA provides a detailed description of the project.	Y, however several pontoons off the mooring dolphin will exceed the

DCP Performance Criteria	Proposed Development	Compliance (Y/N)
for extended structures. Where existing adjoining long structures would prevent access to a new structure of 16 metres, a length compatible with existing structures may be allowable; • pontoons are to be of minimum size and to be as unobtrusive as possible. In general pontoons should be 3.6 metres x 2.4 metres, but, where circumstances demand, pontoons up to but not greater than 6 metres x 3 metres will be considered; • ramps to pontoons shall be of such a length that the slope of the ramp at a zero tide is not steeper than 1 vertical in 2.7 horizontal; • the minimum width of ramps and jetties shall be 1.2 metres and the maximum width 1.8 metres unless there is a demonstrated demand for a greater width; • the depth of water at a pontoon or any associated vessel mooring shall conform with the requirements of the Waterways Authority as construction approval authority; • the surfaces of pontoons, ramps and jetties, including the tops of piles, are to be left untreated or stained or painted in colours compatible with the character of the area, except as required for safety reasons; • ramps should be slatted or mesh to allow light penetration into the intertidal zone; • handrails are not acceptable; and • the decks of jetties shall be 2.5 metres above Zero Fort Denison Tide Gauge (ZFDTG) (1.575 AHD) and their piles shall be cut off at or below deck level. However, those piles necessary as fenders for vessels may extend above deck level in which case such piles, together with any free-standing mooring piles, shall be cut off 3.5 metres above ZFDTG (2.575 AHD).		limits imposed on pontoons.
4.9 Mooring Piles, Single Moorings and mooring pens		
• piles are not to constitute a navigational hazard or obstruction; • mooring and fender piles are to be single piles; • piles of a material other than timber will be considered on merit; • piles are to be cut off at 3.5 metres above ZFDTG (2.575 AHD); • The size of vessels berthed in association with residential development shall not exceed 18 metres in length; • vessels are not be used as a permanent residence; • a mooring pen shall meet an established demand based on vessel ownership of a permanent resident living on the adjoining land; and • no more than one vessel may be permanently berthed in front of a single residence.	Chapter 5 of the EA provides a detailed description of the project.	Y

Table 2 Compliance of Proposal with Glebe Island and White Bay Master Plan

Master Plan Provisions	Proposed Development	Compliance (Y/N)
2.2 Land Use		
• General cargo and containers as well as RORO (Roll On Roll Off for direct access to shipping vessels by trucks and forklifts) to be accommodated at the multipurpose berths at White Bay Berths 3-6. • Allow for up to 3 cranes at White Bay Berths 3-6. • Allow for a maximum of 4 ships at any one time at White Bay Berths 3-6. • Build additional berths at Glebe Island at Berth 5 and Berth 6 to enable expansion of dry bulk facilities and car terminal. • Allow for a car terminal on White Bay Wharves 1 and 2. • Allow for bulk goods unloading by a conveyor mechanism on White Bay Wharves 1 and 2. Allow for storage in new buildings on the back-up land or direct loading to rail. • Permit a maximum of 9 ships serving White Bay and Glebe Island at any one time. • Permit container vessels/multi purpose vessels requiring container cranes (ship to shore) and large straddle/gantry cranes (for truck or train loading) to operate at Glebe Island Wharves. • Prohibit dangerous goods in bulk liquid storage terminals as defined under the ADG code. • Incorporate the existing infrastructure of the former grain terminal into general Port operations for use by dry bulk cargoes/car terminal. • Permit a diverse ship type including motor vehicle carriers, container and container/break bulk ships, dry bulk carriers and self discharging vessels.	The proposal includes provision of a RORO ramp and a building to provide bulky goods storage at White Bay Berth 6. The proposal will not affect the berthing of a maximum number of ships at White Bay and Glebe Island. However, the proposal includes a refuelling facility that will include approximately three 110,000 L diesel and one 45,000 L unleaded petrol tanks.	Y N
2.4 Views, Building Heights and Building Zones		
• Maximum building heights are shown in Figure 10. Heights of buildings are measured from ground level to the uppermost point of the building, excluding: • Silos (Note: Silos are excluded because of their unique built form, historical association with the port. Silos may be located anywhere in the Port subject to assessment of views to and from the Port);	The proposed building is anticipated to comply with the maximum building height in Figure 10 of the Master Plan (i.e. 12m) and will be setback over 20m off the waters edge.	Y

Master Plan Provisions	Proposed Development	Compliance (Y/N)
• Mobile equipment: cranes, gantries etc; • Masts; • Container stacks/cargo (Note: container stacks are excluded because they are not a permanent structure. Maximum container stack heights are noted in Figure 11); • Incidental roof top vents, plant and equipment; and, • Skeletal structures. • Ground level on the wharfs is defined as existing wharf level. Glebe Island 6 and 7 wharfs are 4.2m high and all other wharfs are 3m high. (Note: The height of the wharf is measured from zero at the Fort Denison Tide Gauge. An AHD of 0 is 0.925m above this point.) • Limit container stacks to a maximum of 5 high ie. between 12-13.5m high (note that container stacks generally average 2-3 containers high). Maximum container stack heights are shown in Figure 11. • Limit container stacks to 2 high (between 4.8-5.4m high) at White Bay Berth 2. • No buildings are to occur at White Bay Berth 2 due to the low level of the adjoining land immediately north of Robert Street. • Limit the height of container stacks to protect views from the public realm and to ensure city skyline view is retained. • Setback buildings a minimum of 20m off the waters edge as shown in Figure 10, Figure 12 and Section A-A and Section B-B. • Provide two building zones (Figure 12) for a modern warehouse of up to 10,000sqm in floor area and 12m maximum height. • Provide a zone for a large building for a 6-7 level parking structure of 15,000sqm building up to 25m maximum height generally within the current building envelope of the existing silos (Figure 12).		
2.5 Built Quality		

Master Plan Provisions	Proposed Development	Compliance (Y/N)
• Establish a Port Improvements Program for all facilities through coordination of landscaping, building design and refurbishment, colour schemes for buildings and mobile equipment, road improvements, signage and lighting. As part of this program a set of design guidelines will be prepared. These guidelines will provide standards against which development, including development by port lessees, will be assessed. • Improve the urban amenity by providing opportunities for public viewing of the Port and harbour areas (Figure 13).	The proposed development will be assessed against and is anticipated to comply with the Ports Improvement Programme outlined in Table 3.	Y
2.6 Advertising: Leaseholder Signage		
• Limited to one logo sign for each elevation of the building and of a size that integrates with the form of the buildings as a minor element • The logo sign is to be visible from the water.	The proposed development is anticipated to conform to the provisions of the Master Plan.	Y
2.6 Advertising: Third Party Advertising		
• DUAP or the Minister for Urban Affairs & Planning is the consent authority for advertising • Development consent for advertising is limited to a period of 3 years • Encourage simple advertisements, reduced to a logo or simple image with one or three word phrase • Placement of advertising should consider existing signs on a building/structure or site so as to avoid physical and visual clutter	The proposed development is anticipated to conform to the provisions of the Master Plan.	Y
2.7 Landscaping		
• Detailed landscape provisions are subject to further investigation as set out in the actions below.	The proposed development will incorporate the principles of Ports Improvement Programme including fencing and planting of landscaping species.	Y
2.10 Environment: 2.10.1 Marine Environment and Stormwater		
• Provide for improvements to water quality within the Harbour whenever possible • Investigate new drainage options required by the increased land use of the SRA/Pacific Power sites east of Victoria Road	The proposed development is anticipated to utilise the existing drainage infrastructure. As part of their operational procedures Baileys Marine has specific procedures and methods (including and Environmental Management	Y

Master Plan Provisions	Proposed Development	Compliance (Y/N)
• Provide drainage work associated with new road and rail layouts and any changes to existing facilities.	System) in place in the event of a spill/leak.	
2.10 Environment: 2.10.2 Noise		
• Berth 6, White Bay, to be used for ship handling when other suitable berths are not available • Where practicable, future buildings are to be located and designed to maximise shielding of noise to the surrounding residential area • The acoustic wall in Robert Street may be renewed and extended. This is to be the subject of a separate investigation, particularly with regard to noise performance and design consultations current study • The residents located on the eastern side of Lilyfield Road overlooking the proposed rail access line and on the eastern side of Lilyfield Road extending south from Easton Park are to be approached to determine the suitability of erecting acoustic barriers near their rear boundaries • Future development is to consider the guidelines in the Environmental Protection Authority's NSW Industrial Noise Policy.	The proposed development will maintain access to White Bay Berth 6 for ship handling. The location of the proposed building has been chosen to provide shielding from noise associated with the refuelling facility. Consideration of the EPA's Industrial Noise Policy will be given during the noise impact assessment.	Y
2.10 Environment: 2.10.3 Light Spill		
• Redirect light fittings and fit glare shields to avoid light spill where needed. • Use fittings that enable the light to be thrown forward, while keeping the glass of the fitting horizontal to the ground, for the sections of the terminal furthest from the water. • Install new poles on the residential side of the terminal with lights facing away from the residences and remove the lights facing the residences from the existing poles.	A light spill assessment has been undertaken as part of the EA and is included in Appendix M.	Y
2.10 Environment: 2.10.4 Risk		

Master Plan Provisions	Proposed Development	Compliance (Y/N)
• Ensure any new uses involving dangerous goods satisfy DUAP's risk criteria. • Determine potential mitigation measures to ensure operations are to continue to satisfy applicable risk criteria for increased cargo movements. • Ensure soil testing of the site prior to any development which will require excavation greater than 650mm below the wharf level.	The proposed development includes a refuelling facility that will include approximately three 110,000 L diesel and one 45,000 L unleaded petrol tanks. This facility is proposed to be placed underground and will involve excavation greater than 650mm below the wharf level. The proposed development is anticipated to comply with DUAP (now Department of Planning) risk criteria and will require soil testing.	Y

Table 3 Compliance of Proposal with Ports Improvement Programme Guidelines

Ports Improvement Programme Guidelines	Proposed Development	Compliance (Y/N)
3.1 Buildings: 3.1.1 Fixed and Mobile Equipment		
• Structures that directly service shipping should be strongly identified by colour (see section 3.3).	The proposed development does not include any fixed or mobile equipment associated with shipping.	Y
3.1 Buildings: 3.1.2 Buildings		
• The structure of buildings should be expressed externally wherever possible (Fig 10). • Wall areas should be recessive elements. • Vertical circulation may be expressed externally in order to further articulate the building (Fig 11). • Tonal variation in the colour schemes is to be used to break the mass of the building. • Entry and egress should be defined in the building form further articulating the building. • The night time environment and the appearance of the building should be considered and utilised in providing an interface between new buildings and the surrounding residential area.	The proposed development is anticipated to comply with the guidelines of the Ports Improvement Programme.	Y
3.1 Buildings: 3.1.3 Lighting Elements		
• Lighting stands etc should relate to each other through the use of a coordinated colour scheme and applied to the entire site. (refer colour palette) • Provide for safety lighting • All new wharf structures to have a lighting scheme - existing structures are encouraged to have a lighting scheme. Holistic approach should be made in considering the quality of the night time environment.	The proposed development will utilise the existing lighting elements at White Bay Berth 6 and is anticipated to comply with the guidelines of the Ports Improvement Programme.	Y
3.3 Materials and Colours		
The following colours should be adopted as demonstrated and scheduled below: Fig. 36 Indicative colour schedule. The number refers to Australian Standard 2700 standard colour reference system. Grey-various shades. Lighter shades of grey to be used as recessive wall elements for larger stores and silos. Indicative range AS2700 N11 N12 N22 N42 (See Fig 35, 38, 43	The proposed development is anticipated to comply with the guidelines of the Ports Improvement Programme.	

Ports Improvement Programme Guidelines	Proposed Development	Compliance (Y/N)
and 45)		
Darker grey to highlight structure, and lighting columns N55 N65 (AS2700) or Micaceous iron oxide (See Fig 37, 40,42 and 45)		
Translucent sheet panelling or articulation elements on facades Y33 Y12 Y13 Y15 (AS 2700) (Fig. 35 and 48)		
Movable wharf structures and unloading facilities and accent on light stands R11 R12 R13 (AS 2700) (Fig 38, 39 and 44)		
3.7 Safety and Security		
• Circulation areas and storage areas should be clearly marked	Internal roads, delivery and storage areas will be clearly marked.	Y

Table 4 Compliance of Proposal with Sydney Regional Environmental Plan No.26 - City West (SREP26)

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
Planning principles of regional significance for City West		
Regional Role Development in City West is to promote urban consolidation in the Sydney Region and consequently contribute to Sydney's status as a financial, commercial, residential and tourist city of world standing. Development in City West is to provide benefits to the people of the Sydney Region and New South Wales. The types and intensities of development in City West are to reflect its central location and accessibility to public transport and are to support and to complement development in the city centre. *Land Use Activities* Development in City West is to contribute to an integrated mixed-use development pattern containing a wide range of housing and employment opportunities, and educational, recreation and cultural activities. *Mixed Living and Working Environment* Development in City West is to house an increased population and to provide an increased quantity and range of employment opportunities which are compatible with the achievement of a high-quality mixed living and working environment. Development in City West is to promote and retain close to the city centre a socially diverse residential population representative of all income groups. Development in City West is to provide different kinds of housing, including affordable housing, to ensure that low to moderate income households may continue to be able to live in City West. Development in City West is to provide opportunities for people to live and work at places in close proximity. *Education* Development relating to educational establishments should be based on strategies for their	The proposed development is the construction of a marine supply facility at White Bay 6 to provide a range of services including marine refuelling, sullage / grey water facilities, vessel servicing and marine-related commercial tenancies. The proposed development will provide benefits to the Sydney and NSW region by providing marine services to commercial and recreational vessels.	Y

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
growth and response to technological and other changes, and their integration with surrounding development.		
Leisure and Recreation		
Full advantage is to be taken of the leisure and recreation facilities and the public open space in the city centre and in surrounding areas (particularly in City West) and the use of Sydney Harbour for leisure and recreation.		
Public access to the entire foreshore in City West is to be provided. Opportunities for waterfront and water-based recreation and tourism activities, compatible with adjoining land uses, are to be provided.		
Port Functions		
The operation, concentration and rationalisation of commercial shipping facilities is to be supported to meet the changing needs of Sydney Harbour as a commercial port.		
Social Issues		
The needs of existing and future communities, including needs for social facilities and services are to be accommodated.		
Environmental Issues		
Development in City West is to ensure a high level of environmental quality by addressing issues of air quality, noise levels, wind conditions, access to light and sunshine, privacy, soil conditions and water quality. Development in City West is to have regard to the principles of ecologically sustainable development (namely, the precautionary principle, inter-generational equity, conservation of biological diversity and ecological integrity, and improved valuation, pricing and incentive mechanisms).	The environmental impacts (air quality, noise, light and water quality) associated with the proposed development have been assessed and are addressed in Chapters 7 and 8 in the EA. Chapter 10 addresses the application of the principles of ESD to the development.	Y
Development in City West is to:		
• incorporate measures to minimise waste, including (where practicable) utilising recycled materials and renewable building resources, recycling building and demolition wastes, and providing facilities for recycling and composting, and • implement total water cycle management, including (where practicable) reducing consumption of potable water, treating and recycling waste water for re-use, minimising site run-off and stormwater generation, and reusing stormwater, and	A waste management plan will be prepared prior to the construction of the proposed development. The detailed design stage of the proposed development will incorporate measures to reduce the consumption of water and energy conservation. Landscaping across the northern boundary of the site will also ensure that biological diversity is maintained.	Y

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
• incorporate measures to conserve energy, including (where practicable) reducing energy consumption, and increasing inherent energy efficiency through design and materials selection, and		
• promote biological diversity by measures that include (where practicable) increasing habitat through appropriate retention, planting and maintenance of native flora considered representative of the locality, and		
• complement and reinforce the development and use of the existing and planned integrated public transport, pedestrian and cycling networks in City West.		
Urban Design and the Public Domain		Y
Development in City West is to enhance, complement and contribute to the development of the public domain in order to create a high-quality physical environment for access, enjoyment and recreation for residents and workers.	The proposed development is located on land owned and controlled by SPC and will continue to be controlled by SPC in the future.	
Development in City West is to contribute to a high level of residential amenity and convenience.		
Heritage		Y
The items and areas of heritage significance in City West are to be conserved and enhanced. New development is to respect the character of heritage items and conservation areas. The re-use of heritage buildings through adaptation and modification is to be encouraged.	The proposed development will not impact on any heritage items or areas.	
Movement and Parking		Y
A range of housing and work, leisure and service facilities is to be provided in City West so that the need for travel is minimised.	The proposed development will not provide leisure, housing or service facilities. Walking, cycling and the use of public transport will be encouraged, however the site is located in an area isolated from public transport.	
A high degree of accessibility is to be provided to places in and outside City West for both able and disabled persons. Walking, cycling and use of public transport are to be encouraged as the means of movement.		
Development in City West is to facilitate the provision and operation of a comprehensive regional public transport network.		
Development, particularly that which is employment related, is to be within the capacities of existing and proposed public transport and arterial road systems.		
The provision for vehicular movement is to be consistent with the development of a high-		

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
quality pedestrian environment within the street system. Parking controls are to support public transport strategies of the Government and to reflect road network capacities. *Implementation and Phasing* Development is to contribute towards the efficient use of City West's existing infrastructure and towards the provision of physical and social infrastructure as part of the development process, in accordance with the provisions of the Act.	The proposed development will utilise the existing infrastructure at White Bay 6.	Y
Planning principles for the Bays Precinct		
Role and land use activities Development should reinforce and complement the role of the Precinct as a major inner-harbour port and maritime location. Development should recognise that the port operates for 24 hours of the day and that the generation of noise, lighting and traffic movement is necessarily associated with its operation. Development in the Precinct is to provide for a mixture of commercial port, port-related, employment, waterfront and recreational uses, but is not to include residential development. The existing diversity and maritime character of the Precinct, particularly the mixed use of waterfront areas, should be retained. Development is to take full advantage of the Precinct's location and its infrastructure, particularly rail or light rail facilities, for the port and other employment generating activities. Development is to encourage the environmental rejuvenation of the Precinct. Where possible, future development is to encourage the segregation of port traffic from residential and recreational areas. Development is to make efficient use of surplus government owned land. Development is to encourage the conservation of and adaptation for re-use of existing heritage items and structures for uses compatible with new development. Development is to contribute to improved water quality in Rozelle Bay and Blackwattle Bay. Development on the waterfront and on land adjoining Rozelle Bay and Blackwattle Bay is to enhance the environmental quality of those areas for all users.	The proposed development is the construction of a marine supply facility at White Bay 6 to provide a range of services including marine refuelling, sullage / grey water facilities, vessel servicing and marine-related commercial tenancies. The proposed development will operate on a 24 hour basis with the exception of the refuelling of recreational vessels which will be limited to the hours of 5am to 10pm.	Y

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
Urban design		Y
Design principles to be developed in detailed planning should recognise the working industrial nature of the Precinct in close proximity to residential areas.	The proposed development has been designed to retain the existing industrial components of the site. A visual impact assessment has been prepared for the development and can be seen in Chapter 8 of the EA.	
Development along the Precinct boundary should relate to and not adversely affect the adjoining street systems and built forms.		
The siting and form of development in all areas must consider impacts on views from within the Precinct and to and across the Precinct from surrounding areas.		
Public domain		Y (although public recreation areas will not be provided, the safety and security issues at White Bay 6 have been recognised)
Public recreation areas are to provide for a range of recreational opportunities for those working in and visiting the Precinct.	The proposed development will not provide public recreation areas due to safety and security issues associated with White Bay 6.	
The siting and form of development must consider creating, retaining and enhancing views and vistas from the water and public domain.		
Links for pedestrians, cyclists, and persons with disabilities are to be provided through the Precinct and to link and integrate the Precinct with adjoining areas.		
Links through the Precinct, including public access to the foreshores, should recognise the safety and security issues associated with commercial port and maritime activities.		
Development should help to create a high quality public domain in the Precinct.		
Master plans for all areas should identify opportunities for public recreation, public access through sites and links to adjoining pedestrian and cyclist networks.		
Division 5: Building Height and Floor Space Controls		
(23) Maximum building heights	The proposed development includes a building 11m high which meets the design requirements specified in the Glebe Island White Bay Master Plan.	Y
The height of any building must not exceed the maximum building height shown on Map 3. However, any building on land zoned Public Recreation must not exceed 7 metres in height.		
Before granting consent for any building that will attain the maximum building height, the consent authority must be satisfied that the building will not only meet such of the urban design requirements made by clauses 24, 25, 26 and 26A as are relevant, but will also		

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
meet any relevant design requirements made by a Master Plan or urban development plan.		Y
(24) Application of urban design planning principles Before granting consent to the erection of a building, the consent authority must be satisfied that the building will be consistent with the urban design planning principles for the Precinct in which it will be situated set out in the Table to clause 15.	The proposed development is consistent with the urban planning principles for the Bays Precinct.	Y
(25) Landmark locations Sheet 1 of Map 3 shows specific height limits for development in locations referred to on the map as "landmark locations". The location to which such a limit relates may, with the agreement of the Minister in an adopted master plan, be altered if the consent authority is satisfied that the height of the development in the new location is consistent with the relevant urban design principles.	The proposed development is not located within a landmark location.	Y
(26) Graduated building heights adjacent to heritage items and conservation areas The height of any building adjacent to a heritage item or conservation area must be such as to provide an appropriate transition in height between the building and either the heritage item or the buildings within the conservation area.	The proposed development provides an appropriate transition between heritage buildings in Grafton Street and the new proposed building by utilising the existing infrastructure on site.	Y
(26A) Scale and alignment of building facades Before granting consent to the erection of a building, the consent authority must be satisfied that the scale and alignment of the building facades on the street boundary or boundaries respects the width of the street, adjoining heritage items or other contextual elements, as may be defined in an urban development plan prepared and adopted under Division 7 of this plan, or defined in a Master Plan prepared and adopted under Division 8 of this plan.	The proposed development includes a building which will be constructed within the existing infrastructure on the site. Therefore the building façade of the proposed building will not impact and the existing environment.	NA
(27C) Application of design and height controls for maximum floor space ratios in non-Master Plan areas Before granting consent for any building on land for which a Master Plan is not required that will attain the maximum floor space ratio, the consent authority must be satisfied that the building will not only meet such of the urban design requirements made by clauses 24, 26 and 26A as are relevant, but will also meet any relevant design requirements made by an urban development plan and not exceed any maximum height set by this plan. However, the consent authority may consent to a building that exceeds a maximum floor space ratio or a maximum building height for the site (or both) if an urban development plan containing detailed urban design controls for the block containing the site has been	The proposed development is located within an area which the Glebe Island White Bay Master Plan applies and therefore compliance with this clause is not required.	

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
adopted by the Minister and the building complies with that plan. Before adopting any such urban development plan, the Minister must be satisfied that it will give effect to the relevant urban design requirements made by clauses 24, 26 and 26A.		
Division 6: Heritage Conservation		
(28) Heritage items and conservation areas Heritage items are identified on Map 4 and described in Schedule 4. Conservation areas are identified on Map 4.	The proposed development site located at White Bay 6 does not contain any heritage items as described in Schedule 4.	Y
(29) General considerations Development of or including a heritage item, in the vicinity of a heritage item, or within a conservation area, must be compatible with the conservation of the heritage significance of the item or the character of the conservation area.	The proposed development will not occur within the vicinity of a heritage item or conservation area.	Y
(30) Duty of consent authority Before granting consent to any such development, the consent authority must consider: • the heritage significance of the heritage item or conservation area, and • the impact that the proposed development will have on the heritage significance of the heritage item and its setting or the conservation area, and • the measures proposed to conserve the heritage significance of the heritage item and its setting or the conservation area, and • whether any archaeological site or potential archaeological site would be adversely affected.	The proposed development will not occur within the vicinity of a heritage item or conservation area.	Y
(31) Conservation management plans and heritage impact statements The consent authority must decline to grant consent for development relating to a heritage item or conservation area unless it has taken into consideration a conservation management plan or heritage impact statement which includes an assessment of the matters listed in clause 30.	The proposed development will not occur within the vicinity of a heritage item or conservation area.	Y

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
(32) Demolition of heritage items		Y
Before granting consent to development which includes demolition of a heritage item, the consent authority must seek the views of the Heritage Council of New South Wales and consider any such views received within 28 days of the day on which notice of the proposed development was given to the Heritage Council. The views of the Heritage Council need not be sought if: • the development concerned consists only of a partial demolition of a heritage item, and • in the opinion of the consent authority, the partial demolition will be of a minor nature and will not adversely affect the heritage significance of the item. The consent authority must not grant consent for development which will result in the complete or substantial demolition of a heritage item unless it is satisfied that the item, or so much of the item as is proposed to be demolished, does not have such heritage significance as would warrant its retention. Before granting such a consent, the consent authority must also be satisfied that, after the demolition work has been carried out, redevelopment will be carried out that will: • result in buildings of a higher architectural and urban design quality (in terms of the principles and other provisions of this plan and of any Master Plan or urban development plan applying to the site) than were exhibited by the heritage item before the work was carried out, and • make a positive contribution to the streetscape, and • in the case of partial demolition, enhance the adaptive re-use of the residual part of the heritage item.	The proposed development will not include demolition of a heritage item.	
(33) Potential archaeological sites		Y
Before determining an application for consent to development on land identified in an urban development plan as a potential archaeological site, the consent authority may request a report on the likely impact of the development on any archaeological material.	The proposed development will not occur within a potential archaeological site.	
Division 9: Miscellaneous provisions		
(49) Land decontamination		Y
The consent authority must not consent to development on a site or part of a site unless:	A geotechnical investigation will be undertaken prior to	

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
• it has taken into consideration whether there is any risk to public health or safety from contamination of the site or part by past industrial use, and • where such a risk exists on the site or part, it is satisfied that appropriate remediation measures will be undertaken to remove such a risk before development commences on that site or part.	the construction of the development.	
(49A) Removal of sandstone Removal of sandstone for the provision of car parking or plant or storage associated with future residential or business development is taken to be an ancillary use and not to be extractive industry no matter whether the extracted material is reused or resold.	The proposed development will not remove sandstone from the site.	Y
(50) Services Development must not be carried out on any land until arrangements have been made for the supply of water, sewerage and drainage which are satisfactory to the Water Board.	The proponent has undertaken consultation with Sydney Water and will continue to do so during the detailed design stage.	Y
(51) Advertising of certain development applications Development that is proposed by a development application made after the commencement of Sydney Regional Environmental Plan No 26—City West (Amendment No 9) is advertised development for the purposes of the Act if, in the opinion of the consent authority, the development: • would cause irreversible harm to a heritage item, or • does not conform to a Master Plan, or • would have significant environmental effects. This clause ceases to have effect when a development control plan that provides for notice to be given of the proposed development to which this clause applies is approved by the Director-General.	The proposed development may be considered advertised development as the proposed development does not conform to the Glebe Island White Bay Master Plan (in regards to the storage of 45,000L of unleaded petrol).	Y
(52) Views of other bodies about development in Precincts: Before granting consent to a development application relating to land in the Bays Precinct, the consent authority must, where it considers it appropriate, seek the views of the Leichhardt Council, the City West Development Corporation, the Sydney Ports Corporation, the Office of Marine Administration, the Maritime Authority of NSW, the Rail Access Corporation, the State Rail Authority, the Freight Rail Corporation and the Director-General of the Department of Transport.	The proponent has conducted consultation with Sydney Ports Corporation and NSW Maritime Authority for Land Owners Consent for land based development and Leichhardt Council as part of the community consultation strategy for the Environmental Assessment.	Y

SREP 26 Provisions	Proposed Development	Compliance (Y/N)
The consent authority must consider any views of a body received within 21 days of giving notice of the application to the body.		
(53) Views of other bodies about development within Waterways Zone Before granting consent to a development application relating to land within the Waterways Zone, the consent authority must seek the views of the Maritime Services Board regarding the effect of development on the navigational safety and operations of the Port of Sydney. The consent authority must consider any views of the Board received within 21 days of giving notice of the application to the Board.	The proponent has conducted consultation with NSW Maritime Authority in regards to Land Owners Consent for water based development.	Y
(54) Acquisition of land The owner of the land within the Public Recreation Zone may, by notice in writing, require the City West Development Corporation to acquire the land. This clause does not apply to land owned by a public authority and held by the public authority for public recreation purposes. On receipt of the notice, the City West Development Corporation is to acquire the land. The City West Development Corporation does not, however, have to acquire the land if it might reasonably be required to be dedicated as a condition of development consent.	The owner of the land on which the proposed development will occur is owned by a public authority (Sydney Ports Corporation) and therefore this clause does not apply.	Y

Table 5 Compliance of Proposal with the Protection of the Environment Operations Act 1997 - Section 45

POEO Act Provisions	Proposed Development	Compliance (Y/N)
Section 45		
In exercising its functions under this Chapter, the appropriate regulatory authority is required to take into consideration such of the following matters as are of relevance:		
(a) any protection of the environment policies,	Protection of the Environment Polices are addressed where appropriate in Chapters 7, 8 and 9.	Y
(b) the objectives of the EPA as referred to in section 6 of the Protection of the Environment Administration Act 1991,	Baileys Marine acknowledges the objectives referred to in section 6 of the Act and the proposed development will be designed in order to reduce and minimise pollution to the environment.	Y
(c) the pollution caused or likely to be caused by the carrying out of the activity or work concerned and the likely impact of that pollution on the environment,	Chapter 5 of the EA addresses the work to be carried out by the development and Chapters 7, 8 and 9 addresses the likely pollution impacts of the proposed development.	Y
(d) the practical measures that could be taken: *(i) to prevent, control, abate or mitigate that pollution, and* *(ii) to protect the environment from harm as a result of that pollution,*	Chapter 7, 8, 9 and 12 outline the likely pollution impacts and provide detail of mitigation measures to protect the environment from harm.	Y
(e) any relevant green offset scheme, green offset works or tradeable emission scheme or other scheme involving economic measures, as referred to in Part 9.3,	The proposed development is not part of a green offset scheme, offset works or tradeable emission scheme.	NA
(f) whether the person concerned is a fit and proper person (as referred to in section 83),	Baileys Marine are aware of the factors that the DEC take into consideration regarding fit and proper persons. Baileys Marine have complied with environmental protection legislation within Western Australia and Northern Territory.	Y
(f1) in relation to an activity or work that causes, is likely to cause or has caused water pollution:	The proposed development is situated adjacent to Sydney Harbour and it involves water activities. The potential water pollution impacts from its operations are addressed	Y

POEO Act Provisions	Proposed Development	Compliance (Y/N)
(i) the environmental values of water affected by the activity or work, and *(ii) the practical measures that could be taken to restore or maintain those environmental values,*	in Chapter 7 and appropriate mitigation measures are outlined in Chapter 12 to restore or maintain environmental values.	
(g) in connection with a licence application relating to the control of the carrying out of non-scheduled activities for the purpose of regulating water pollution—whether the applicant is the appropriate person to hold the licence having regard to the role of the applicant in connection with the carrying out of those activities, *(h) in connection with a licence application—any documents accompanying the application,* *(i) in connection with a licence application—any relevant environmental impact statement, or other statement of environmental effects, prepared or obtained by the applicant under the Environmental Planning and Assessment Act 1979,* *(j) in connection with a licence application—any relevant species impact statement prepared or obtained by the applicant under the Threatened Species Conservation Act 1995 or Part 7A of the Fisheries Management Act 1994,* *(k) in connection with a licence application, any waste strategy in force under the Waste Avoidance and Resource Recovery Act 2001,* *(l) in connection with a licence application:* *(i) any public submission in relation to the licence application received by the appropriate regulatory authority under this Act, and* *(ii) any public submission that has been made under the Environmental Planning and Assessment Act 1979, in connection with the activity to which the licence application relates, and that has been received by the appropriate regulatory authority,* *(m) if the appropriate regulatory authority is not the EPA—any guidelines issued by the EPA to the authority relating to the exercise of functions under this Chapter.*	The licence application requirements for this project will be addressed separately.	Y

Appendix E

CONCEPT DESIGN DRAWINGS

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Appendix E1

PROPOSED OFFICE AND STORAGE BUILDINGS

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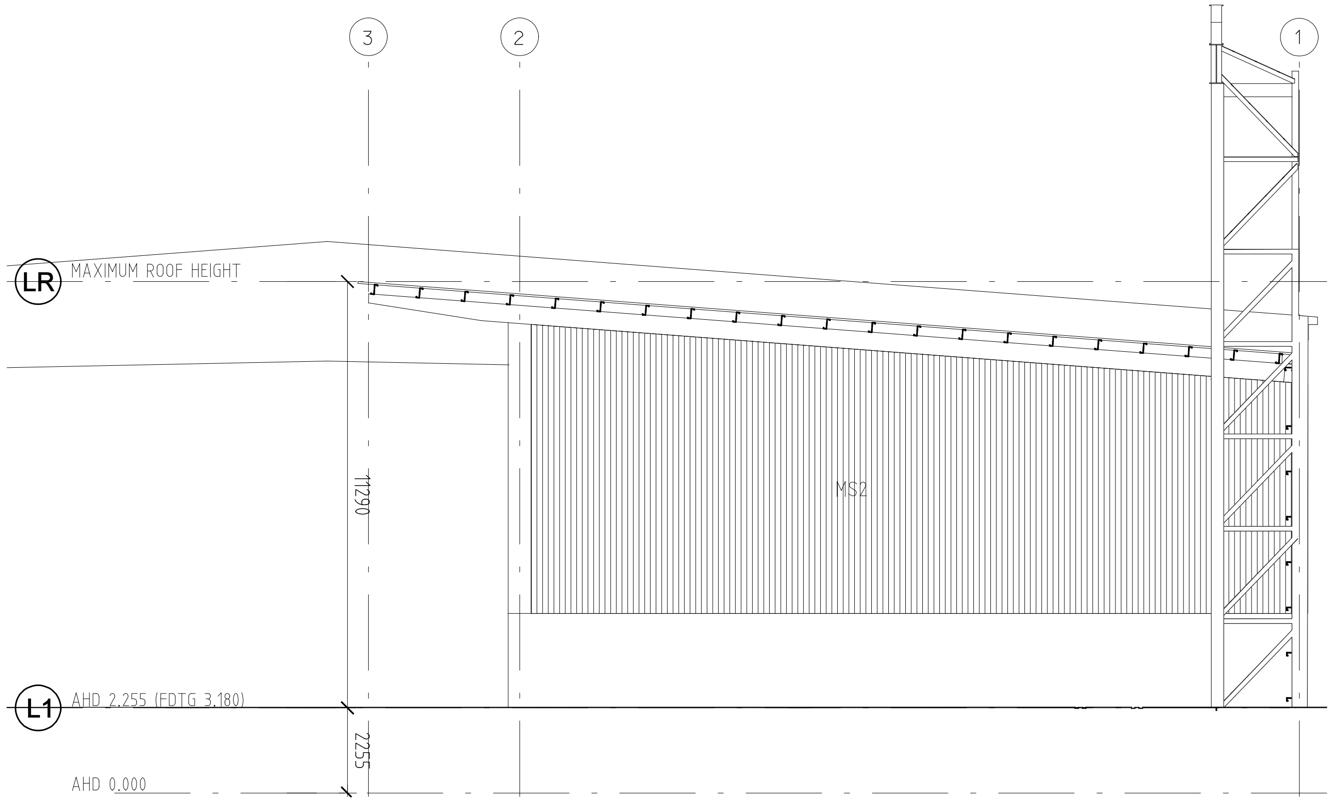

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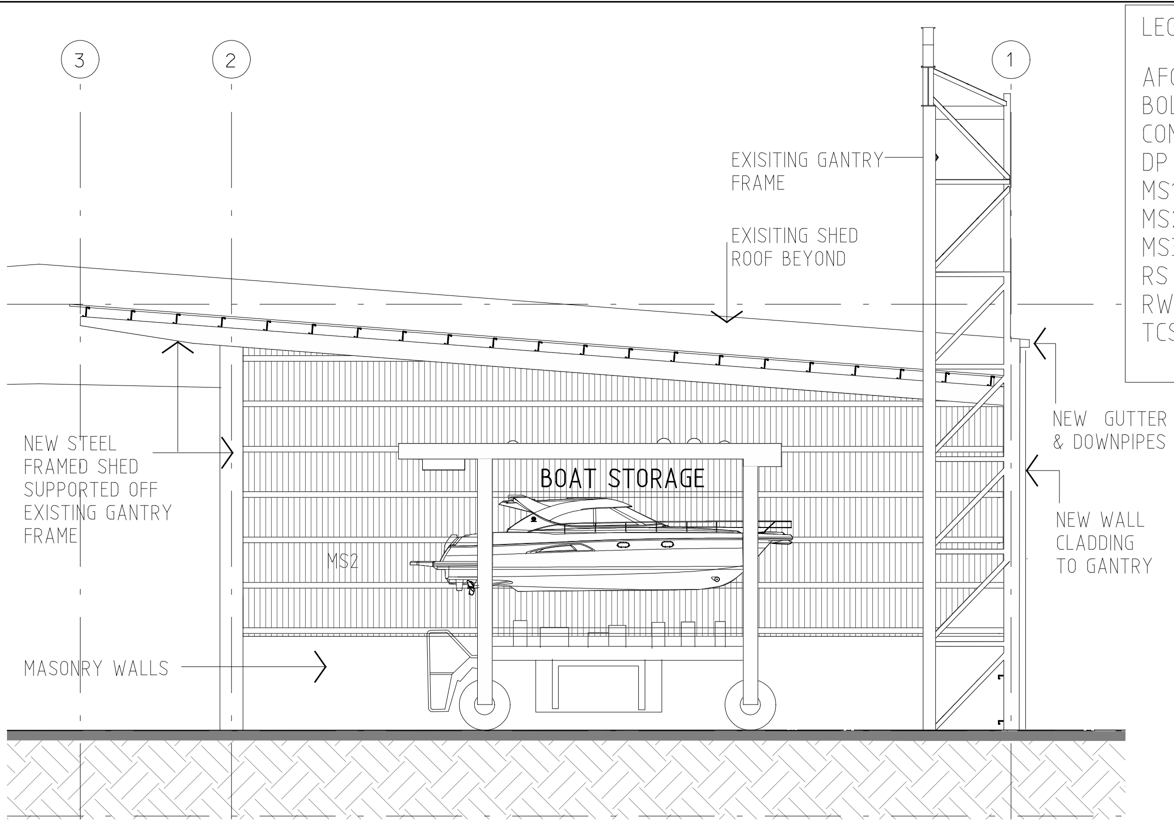
SIMILAR TO WEST ELEVATION 1: 200



2 CROSS SECTION
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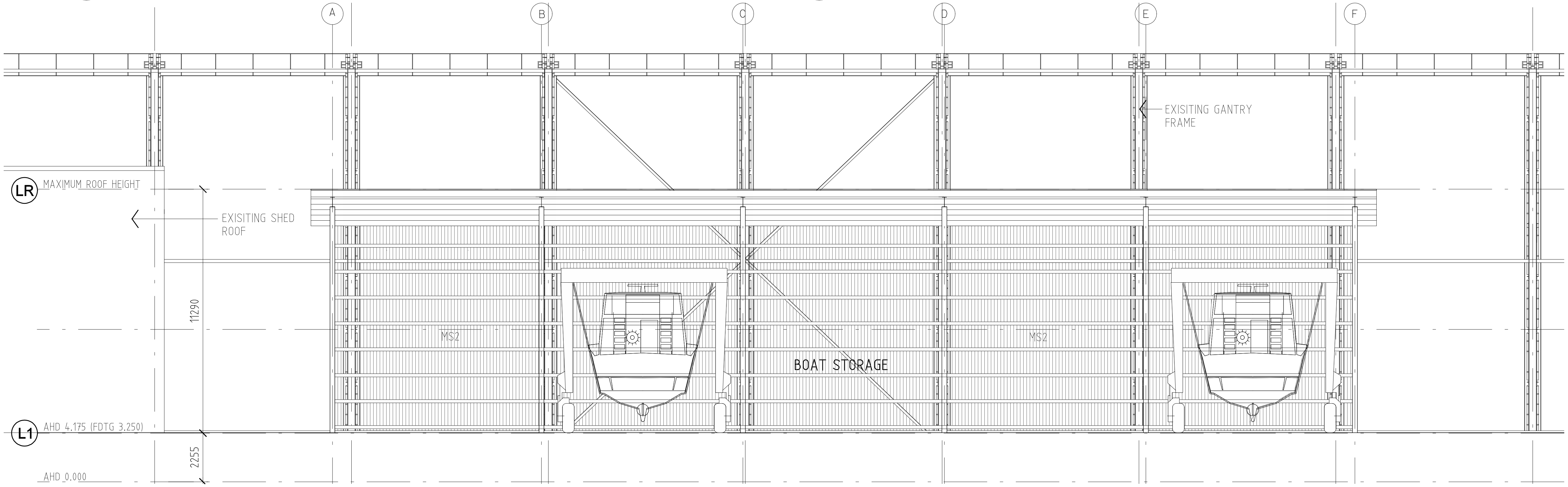
LEGEND

AFG	ALUMINIUM FRAMED GLASS
BOL	BOLLARD
CONC	CONCRETE
DP	DOWNPIPE
MS1	METAL SHEETING TYPE 1
MS2	METAL SHEETING TYPE 2
MS3	METAL SHEETING TYPE 3
RS	ROLLER SHUTTER
RWO	RAIN WATER OUTLET
TCS	TRANSLUSCENT CLADDING SYSTEM



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Revisions				
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01	31.07.06	ISSUED FOR DEVELOPMENT APPROVAL (Formerly issued as A2-3101 & A2-3202)		

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Client
BAILEYS MARINE FUELS
28 Mews Road Fremantle WA 6160

Drawing Status
NOT FOR CONSTRUCTION

Project
BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title
BUILDING 2 - ELEVATIONS & SECTION

Proj No.	Scale at A3	Drawing No	Issue
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PLOTTED & CHECKED BY: WHITTINGHAM PLOT DATE: 31/07/2006 REF:q:\Projects\06_004_Baileys_Marine\Design_files\sheet_files\06004_A3201.dgn
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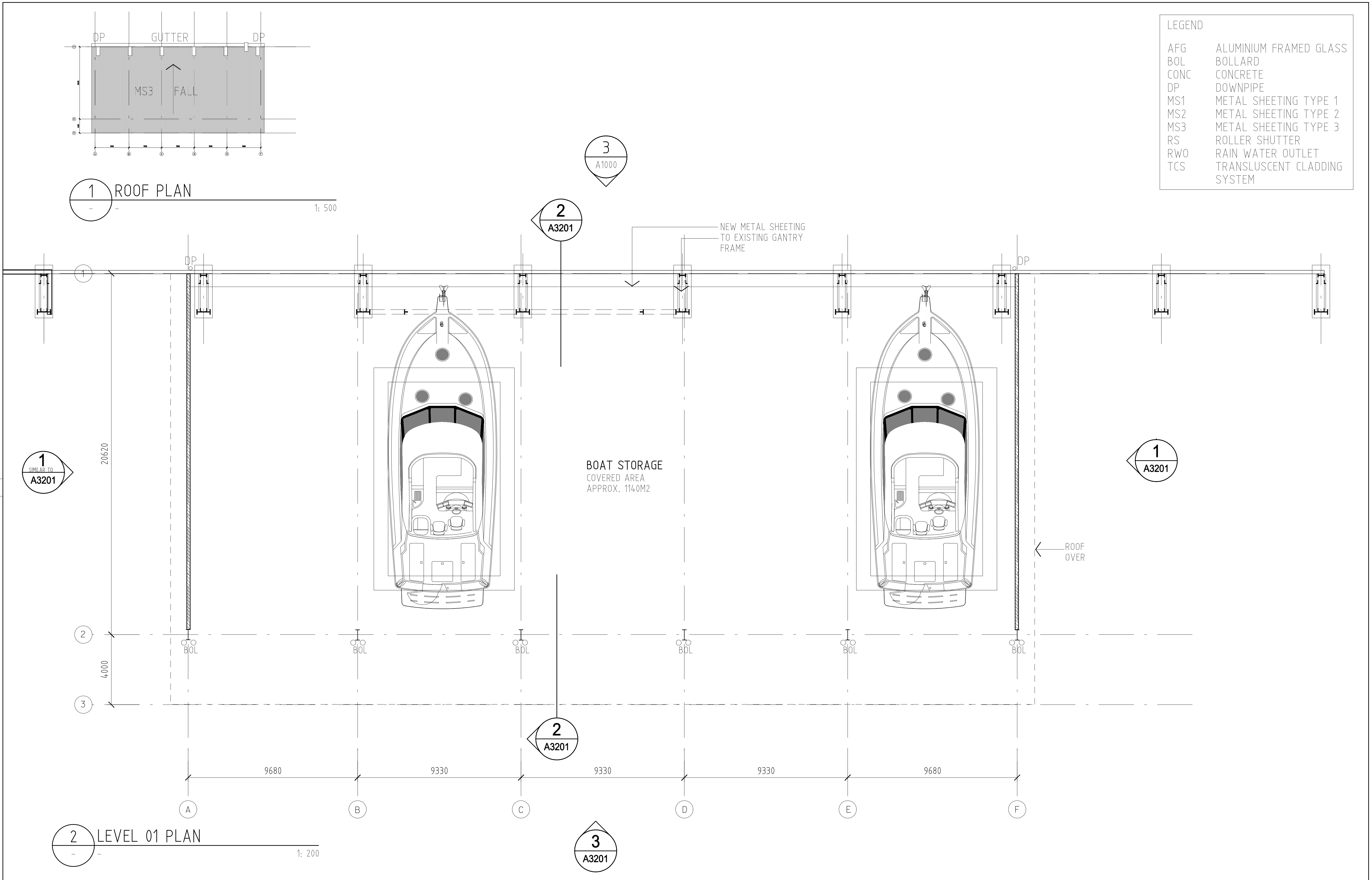

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BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title

BUILDING 2 - LEVEL 1 PLAN

NORTH

Proj No.	Scale at A3	Drawing No	Issue
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PLOTTED & CHECKED BY: Vandenberg PLOT DATE: 31/07/2006 REF:q:\projects\06_004_baileys_marine\design_files\sheet_files\06004_A3101.dgn

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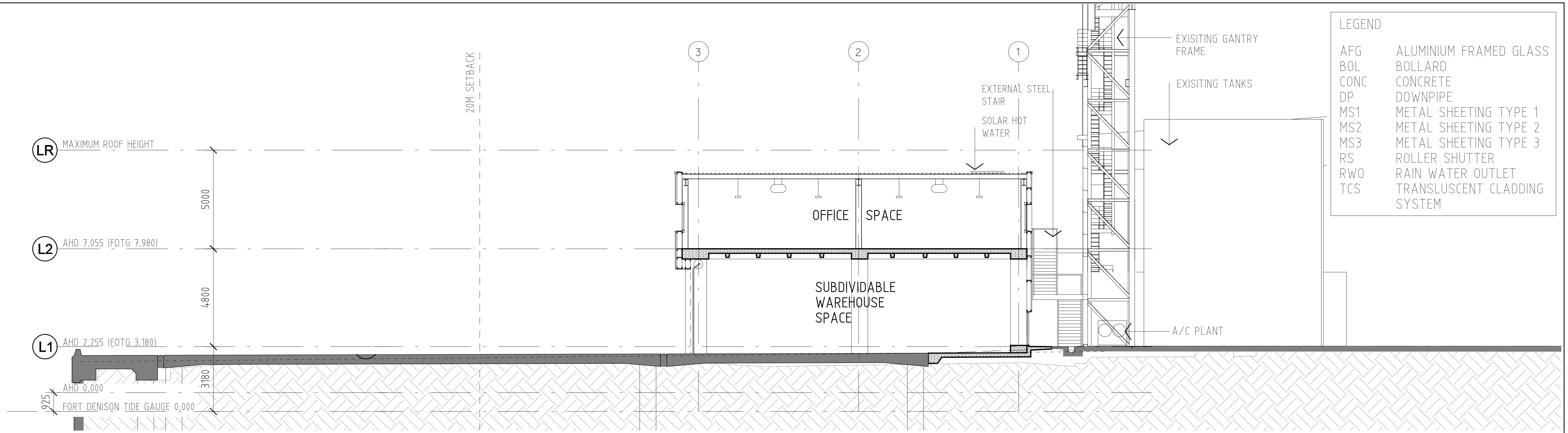

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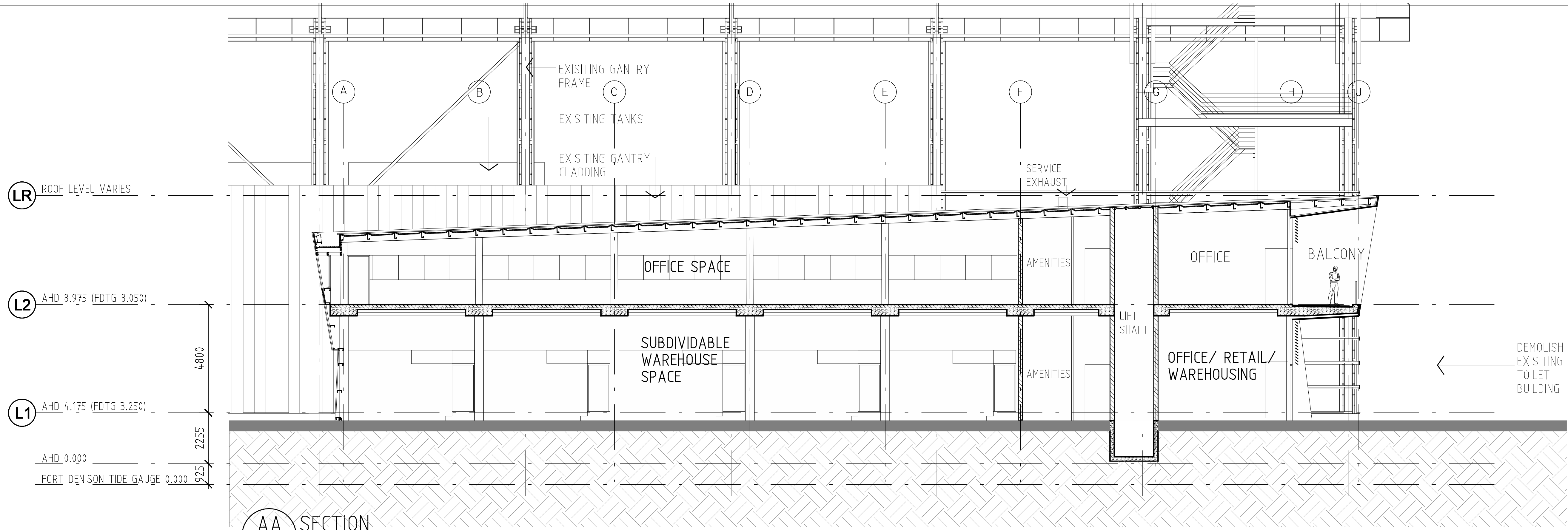
BOL	BOLLARD
CONC	CONCRETE
DP	DOWNPIPE
MS1	METAL SHEETING TYPE 1
MS2	METAL SHEETING TYPE 2
MS3	METAL SHEETING TYPE 3
RS	ROLLER SHUTTER
RWO	RAIN WATER OUTLET
TCS	TRANSLUSCENT CLADDING SYSTEM

BB SECTION
NORTH-SOUTH 1: 200



AA SECTION
EAST-WEST 1: 200

Revisions				
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BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title
BUILDING 1 - SECTIONS

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LEGEND

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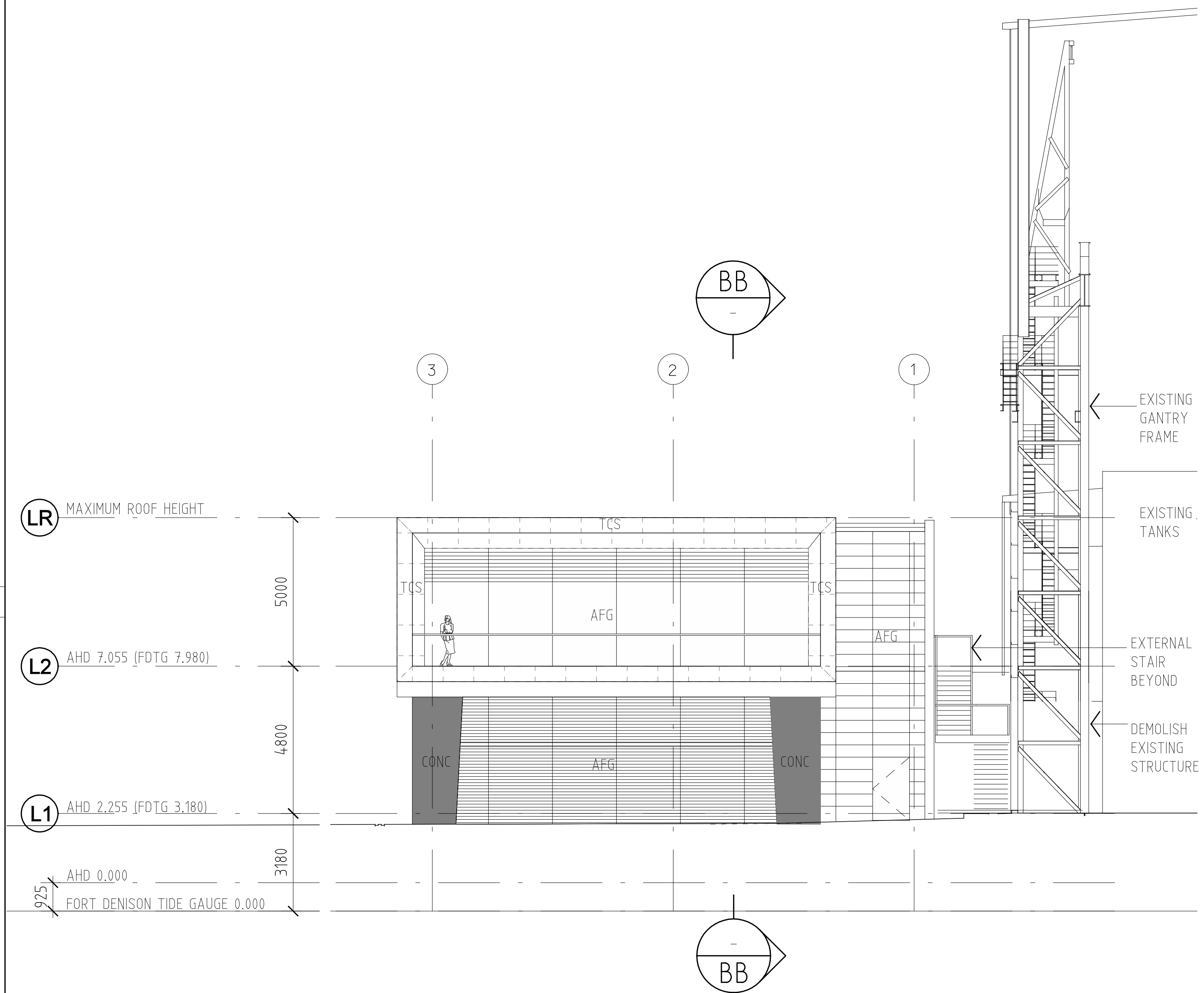
BOL	BOLLARD
CONC	CONCRETE
DP	DOWNPIPE
MS1	METAL SHEETING TYPE 1
MS2	METAL SHEETING TYPE 2
MS3	METAL SHEETING TYPE 3
RS	ROLLER SHUTTER
RWO	RAIN WATER OUTLET
TCS	TRANSLUSCENT CLADDING SYSTEM



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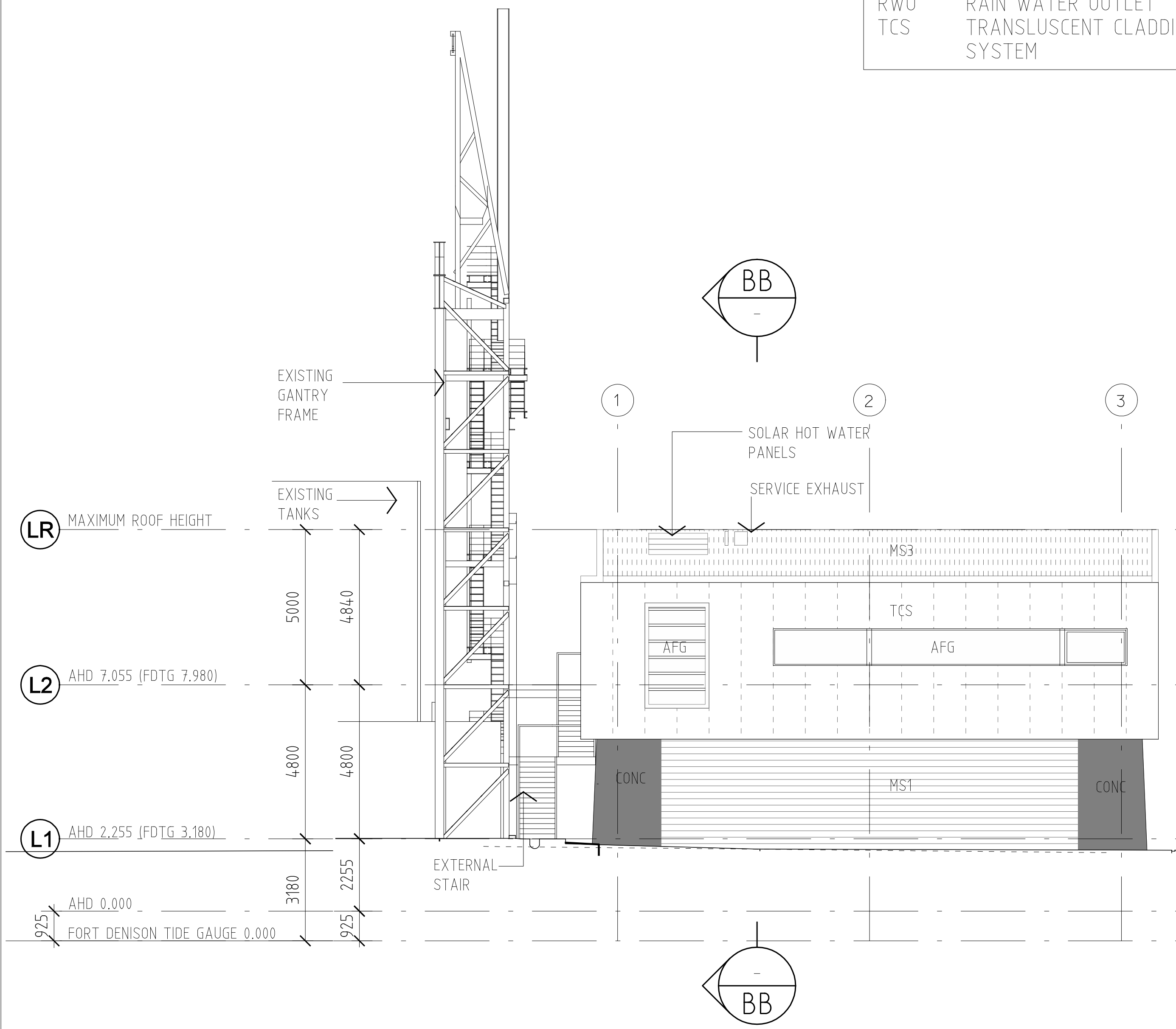

2 WEST ELEVATION

1: 200

Revisions

No	Date	Description	Ver	App'd
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BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY

SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title

BUILDING 1 - ELEVATIONS EAST & WEST

Proj No.	Scale at A3	Drawing No	Issue
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PLOTTED & CHECKED BY: Vandenberg PLOT DATE: 31/07/2006 REF:q:\projects\06_004_baileys_marine\design_files\sheet_files\06004_A2202.dgn

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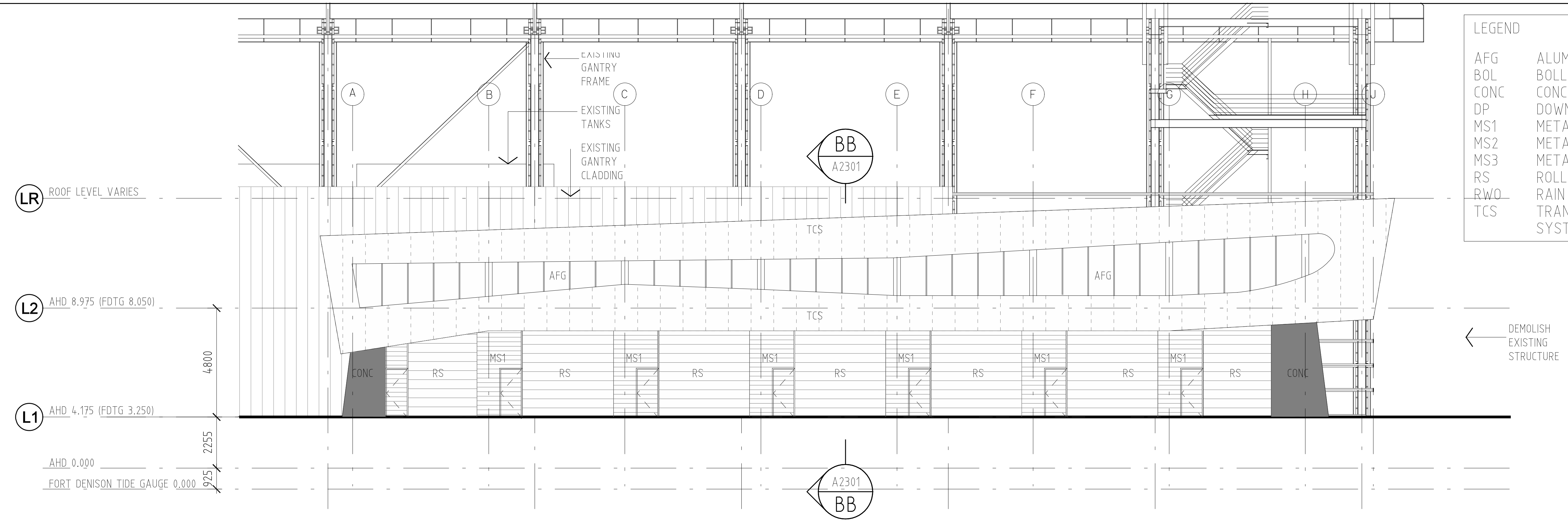

LEGEND	
AFG	ALUMINIUM FRAMED GLASS
BOL	BOLLARD
CONC	CONCRETE
DP	DOWNPIPE
MS1	METAL SHEETING TYPE 1
MS2	METAL SHEETING TYPE 2
MS3	METAL SHEETING TYPE 3
RS	ROLLER SHUTTER
RWO	RAIN WATER OUTLET
TCS	TRANSLUSCENT CLADDING SYSTEM

1 SOUTH ELEVATION
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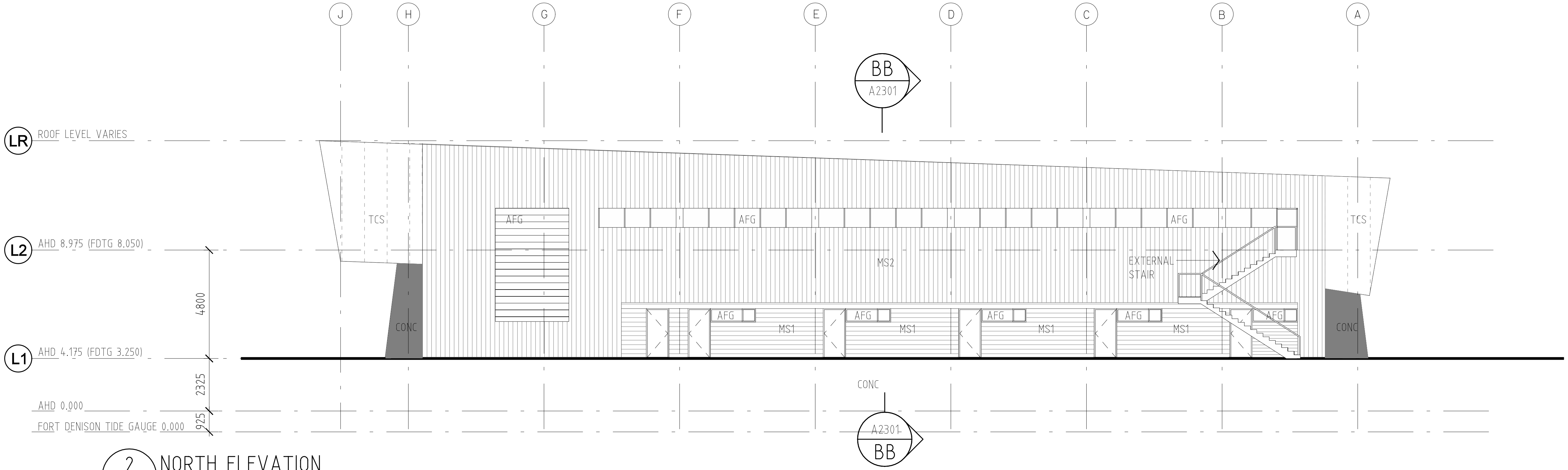

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Revisions				
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Project
BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title
BUILDING 1 - ELEVATIONS NORTH & SOUTH

Proj No.	Scale at A3	Drawing No	Issue
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PLOTTED & CHECKED BY: Vandenberg PLOT DATE: 31/07/2006 REF:q:\projects\06_004_baileys_marine\design_files\sheet_files\06004_A2201.dgn
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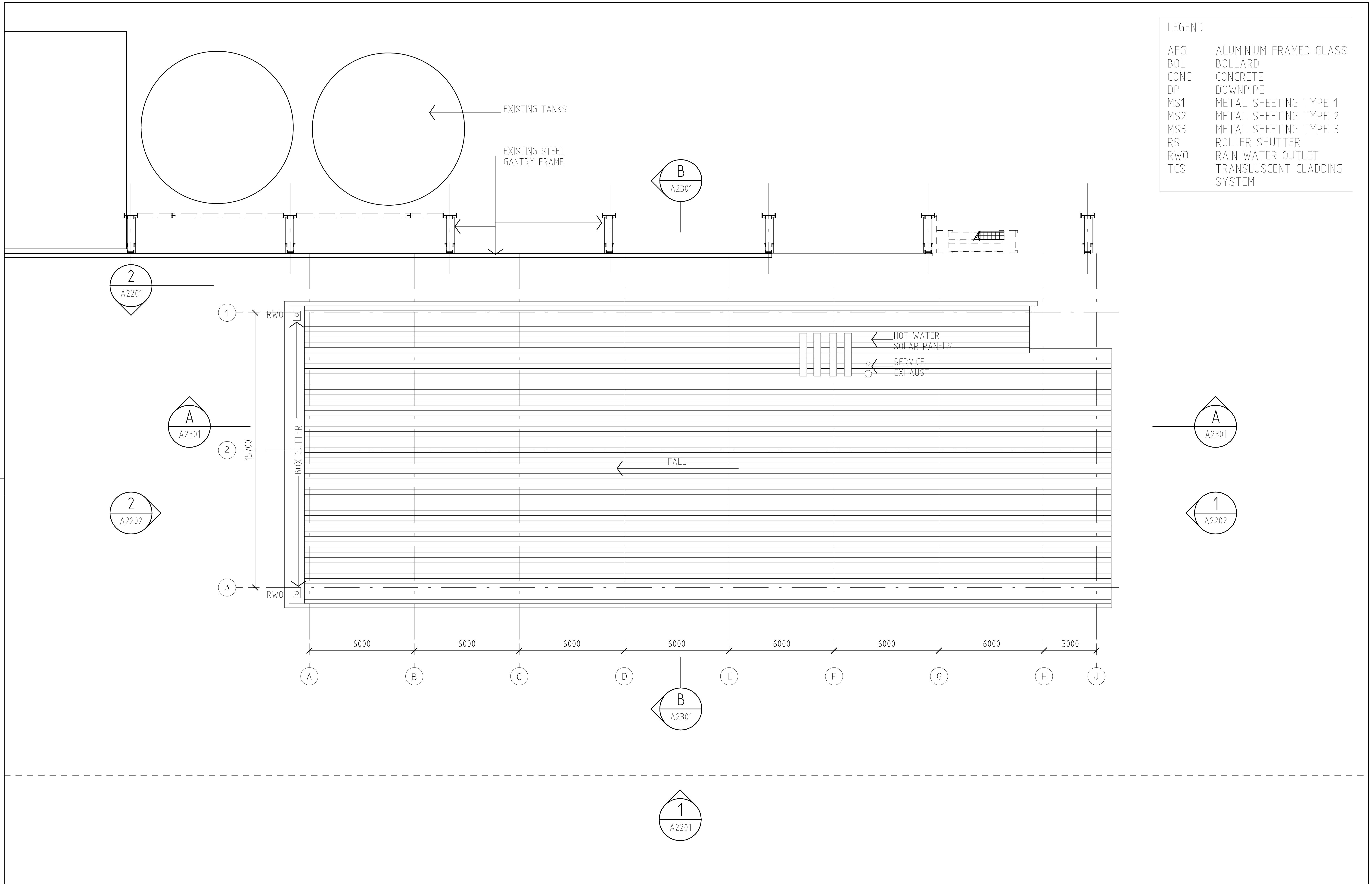

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Drawing Status
NOT FOR CONSTRUCTION

Project
BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title
BUILDING 1 - ROOF PLAN

NORTH

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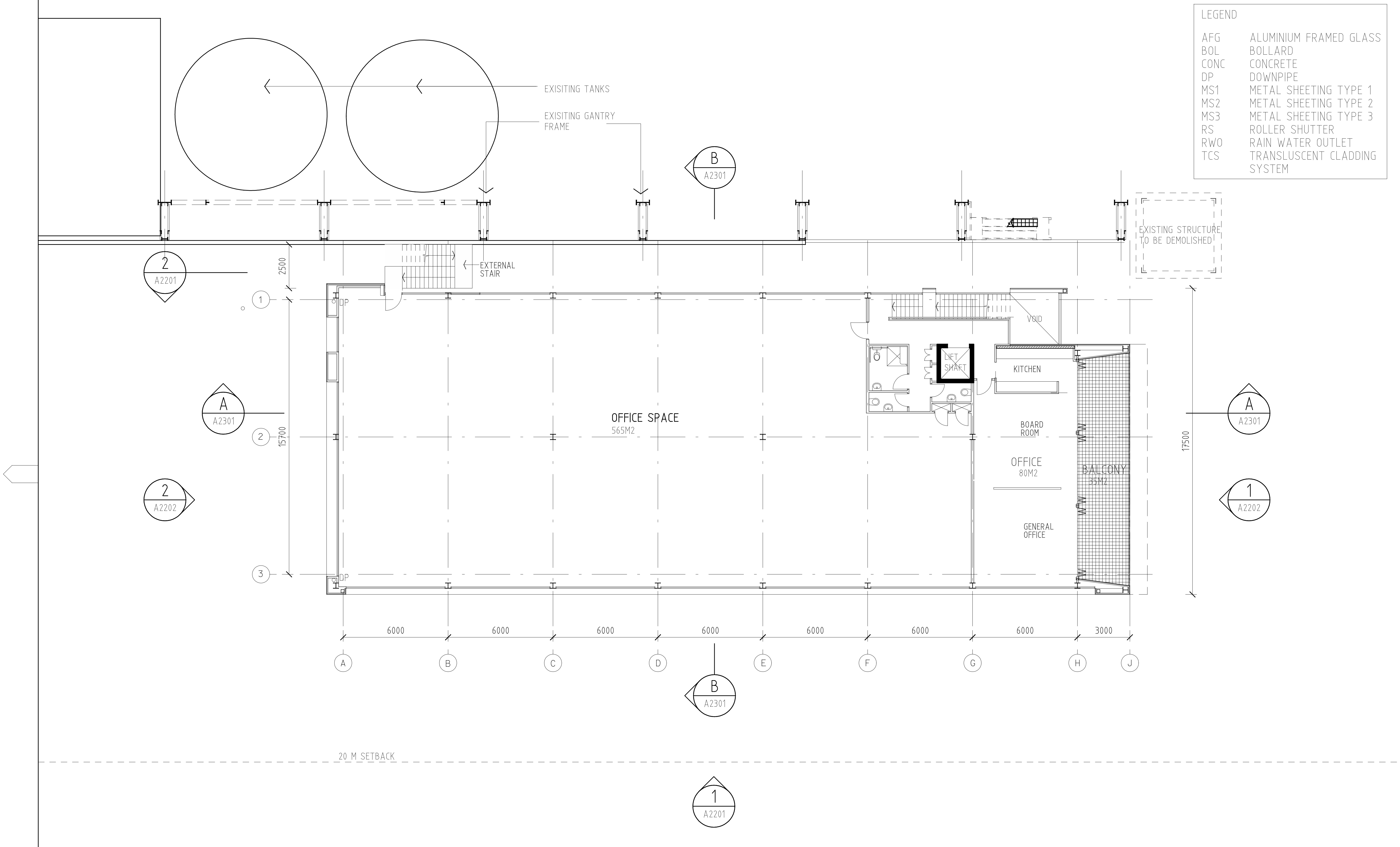

Revisions				
No	Date	Description	Ver	App'd
01	31.07.06.	ISSUED FOR DEVELOPMENT APPROVAL		

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Drawing Status

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Project

BAILEYS MARINE FUELS
SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER
SERVICES PARK WHITE BAY BERTH 6

Drawing Title

BUILDING 1 -
LEVEL 2 PLAN

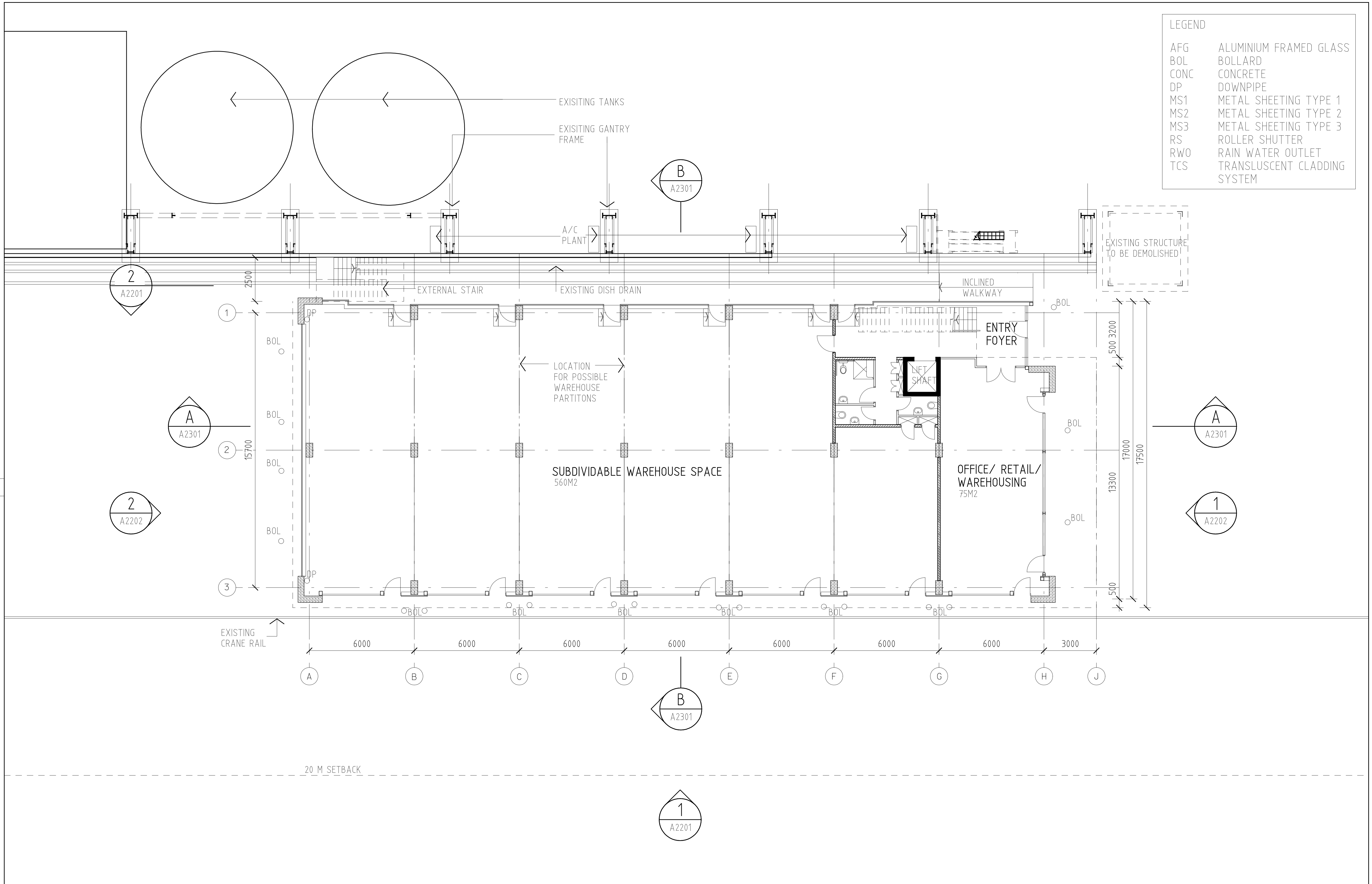
NORTH

Proj No.	Scale at A3	Drawing No	Issue
06004	1:200	A2102	01

0 0.5 1 2 6m

PLOTTED & CHECKED BY: Vandenberg PLOT DATE: 31/07/2006 REF:q:\projects\06_004_baileys_marine\design_files\sheet_files\06004_A2102.dgn

A3



Revisions				
No	Date	Description	Ver	App'd
01	31.07.06.	ISSUED FOR DEVELOPMENT APPROVAL		

Architect
ALLEN JACK+COTTIER
79 Myrtle Street Chippendale NSW 2008 AUSTRALIA
ph +61 2 9311 8222 fx +61 2 9311 8200 ABN 53 003 782 250

Client
BAILEYS MARINE FUELS
28 Mews Road Fremantle WA 6160

Drawing Status
NOT FOR CONSTRUCTION

Project
BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY
SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

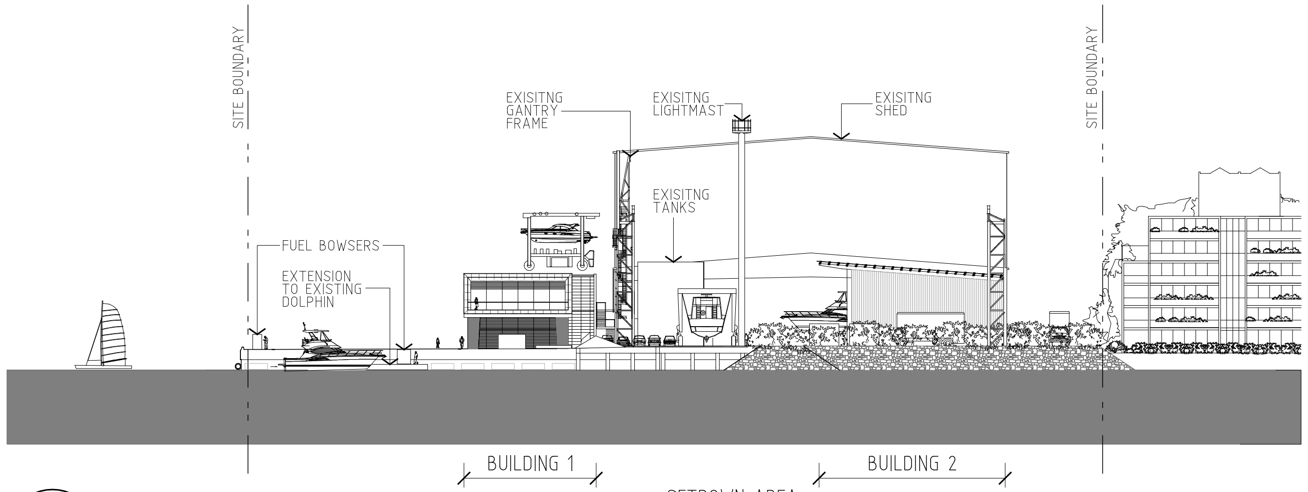
Drawing Title
BUILDING 1 - LEVEL 1 PLAN

NORTH

Proj No.	Scale at A3	Drawing No	Issue
06004	1:200	A2101	01

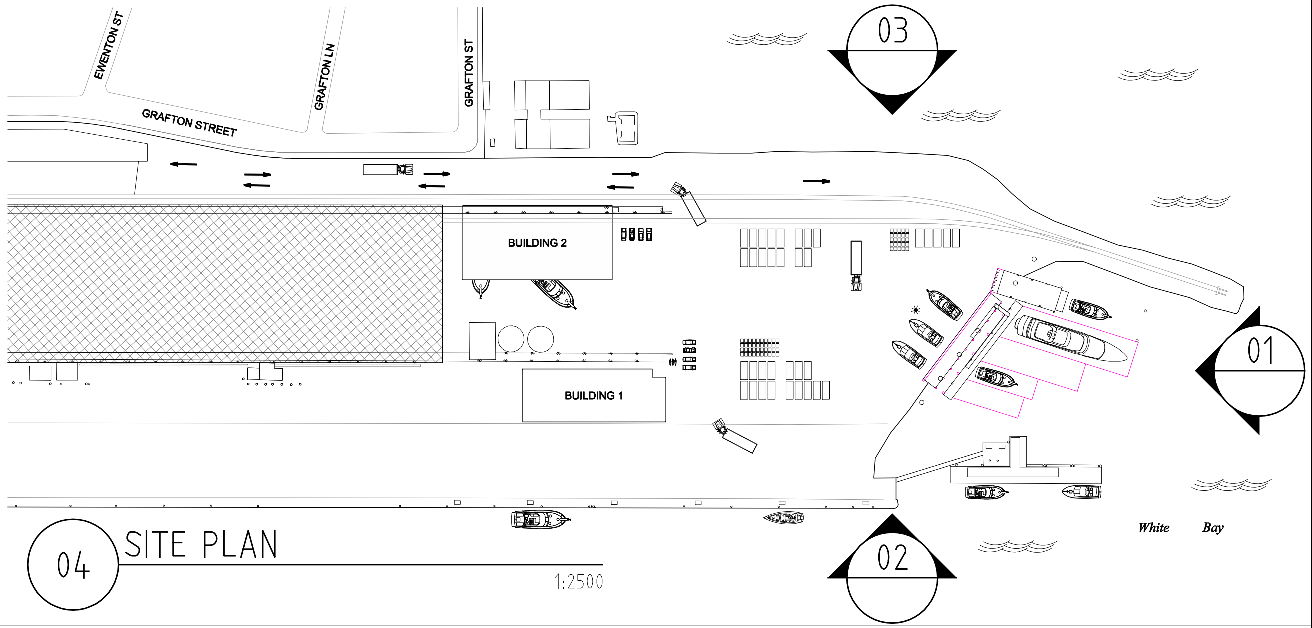
0 0.5 1 2 6m

PLOTTED & CHECKED BY: Vandenberg
PLOT DATE: 31/07/2006 REF:q:\projects\06_004_baileys_marine\design_files\sheet_files\06004_A2101.dgn
A3



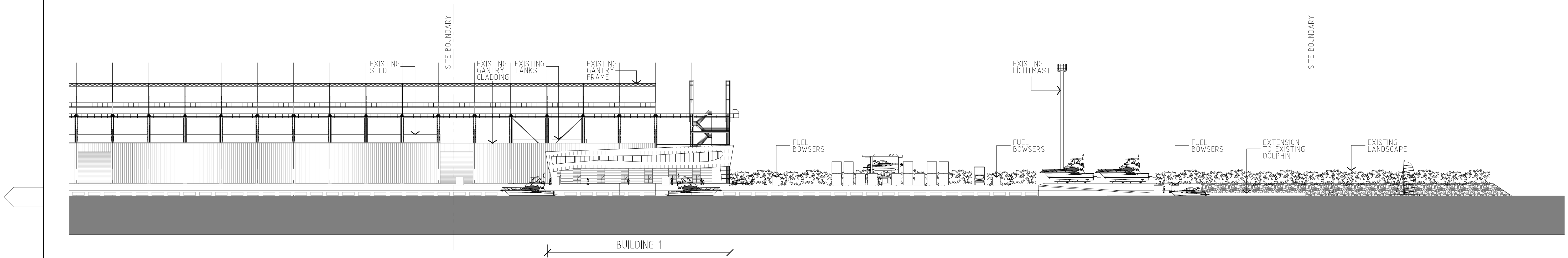
01 EAST ELEVATION

1:1000



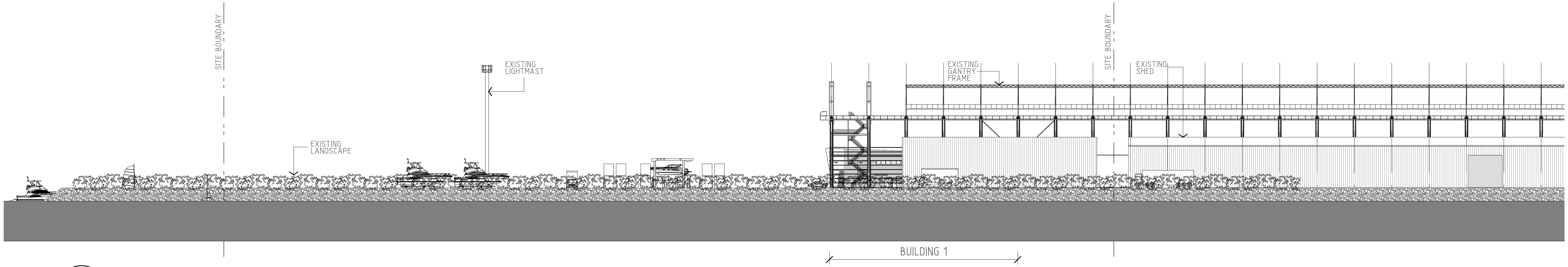
04 SITE PLAN

1:2500



02 SOUTH ELEVATION

1:1000



03 NORTH ELEVATION

1:1000

Revisions

No	Date	Description	Ver	App'd
01	31.07.06	ISSUED FOR DEVELOPMENT APPROVAL (Formerly issued as A3101)		

Architect

ALLEN JACK+COTTIER

79 Myrtle Street Chippendale NSW 2008 AUSTRALIA
ph +61 2 9311 8222 fx +61 2 9311 8200 ABN 53 003 782 250

Client

BAILEYS MARINE FUELS
28 Mews Road Fremantle WA 6160

Drawing Status

NOT FOR CONSTRUCTION

Project

BAILEYS MARINE FUELS SUPPLY BASE, WHITE BAY

SYDNEY HARBOUR COMMON USER SERVICES PARK WHITE BAY BERTH 6

Drawing Title

SITE ELEVATIONS

Proj No.	Scale at A3	Drawing No	Issue
06004	1:1000	A1000	01

0 0.5 1 2 6m

PLOTTED & CHECKED BY: Vandenberg PLOT DATE: 31/07/2006 REF:q:\projects\06_004_baileys_marine\design_files\sheet_files\06004_A1000.dgn

A3

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Appendix E2

PROPOSED MARINE STRUCTURES

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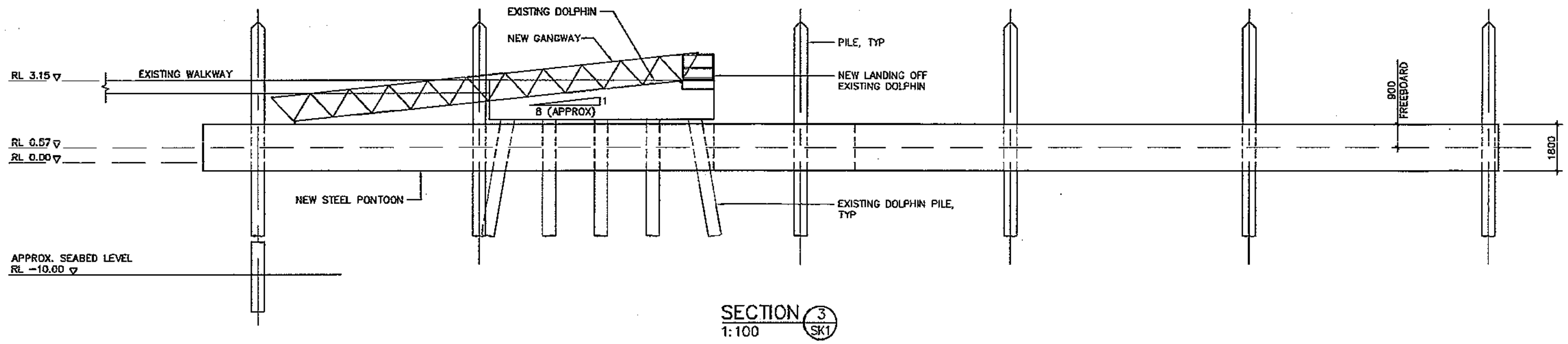
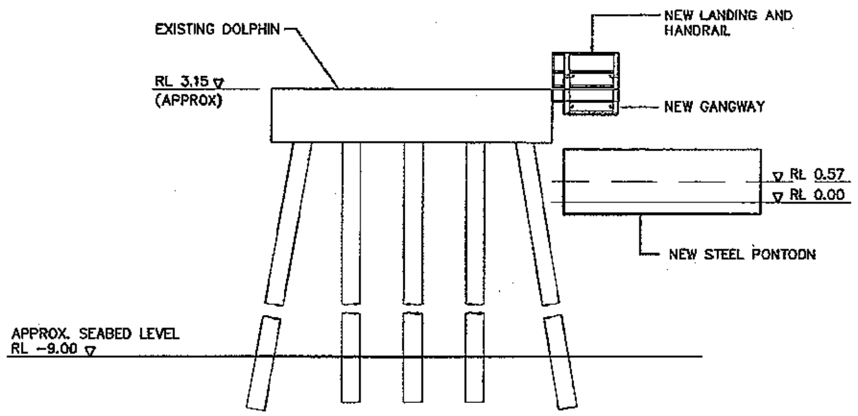


SECTION 3 SK1
1:100



SECTION 4 SK1
1:100

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL LEVELS ARE IN METRES TO CHART DATUM

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1:100 (A1) 1:200 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
A	ISSUED FOR CLIENT COMMENT	AMK	MM	AMK		24.04.06

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

level 4
104 Mount Street
North Sydney 2060
telephone (02) 9957 1619
facsimile (02) 9957 1291
email reception@patbrit.co.au
A.C.N. 003 220 228

Patterson Britton & Partners Pty Ltd
consulting engineers

Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: SECTIONS SHEET 2

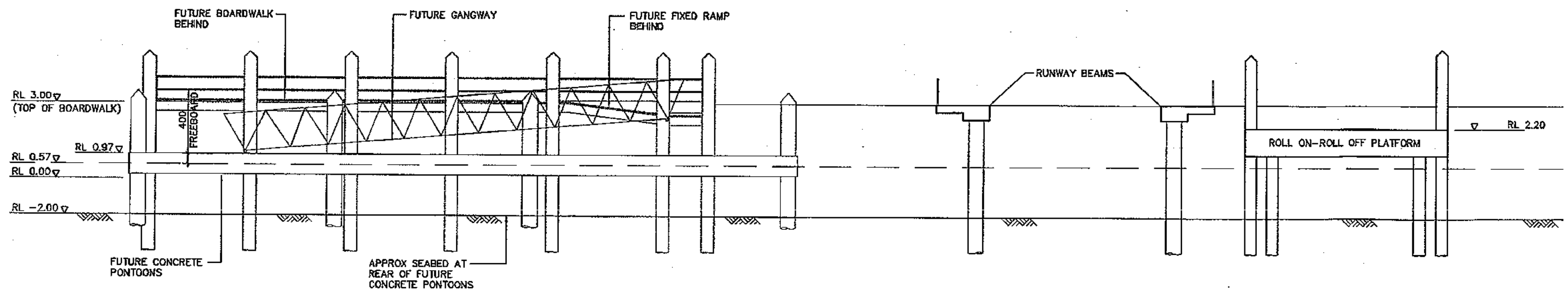
Drawing No. 6356-SK3

Issue A

Cad File No. 6356-SK3

Xref.(s)

A1



SECTION 1/SK1
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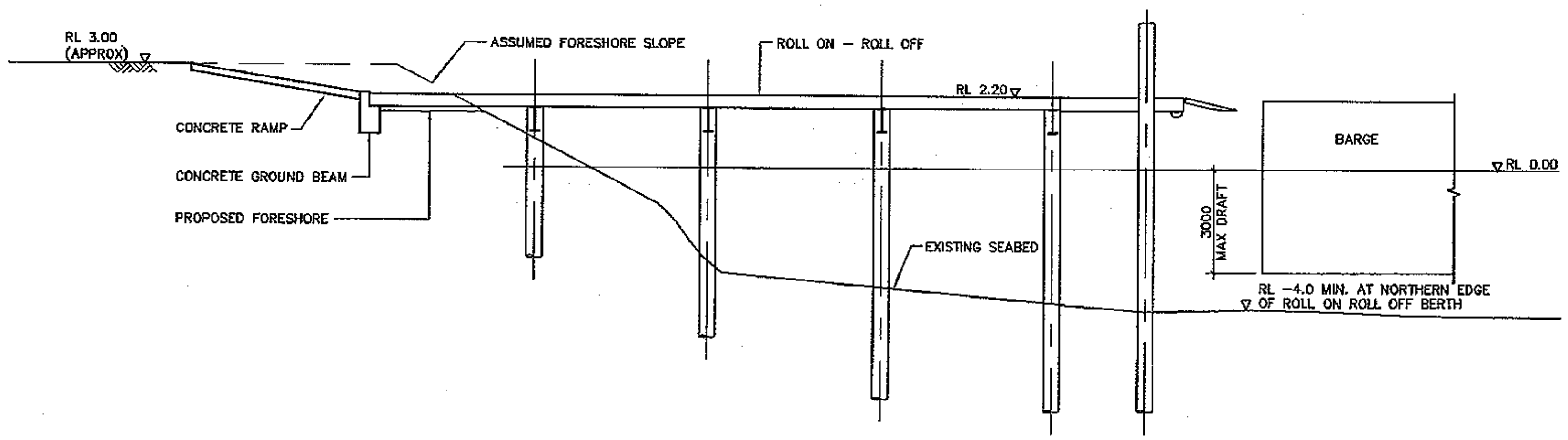

SECTION 2/SK1
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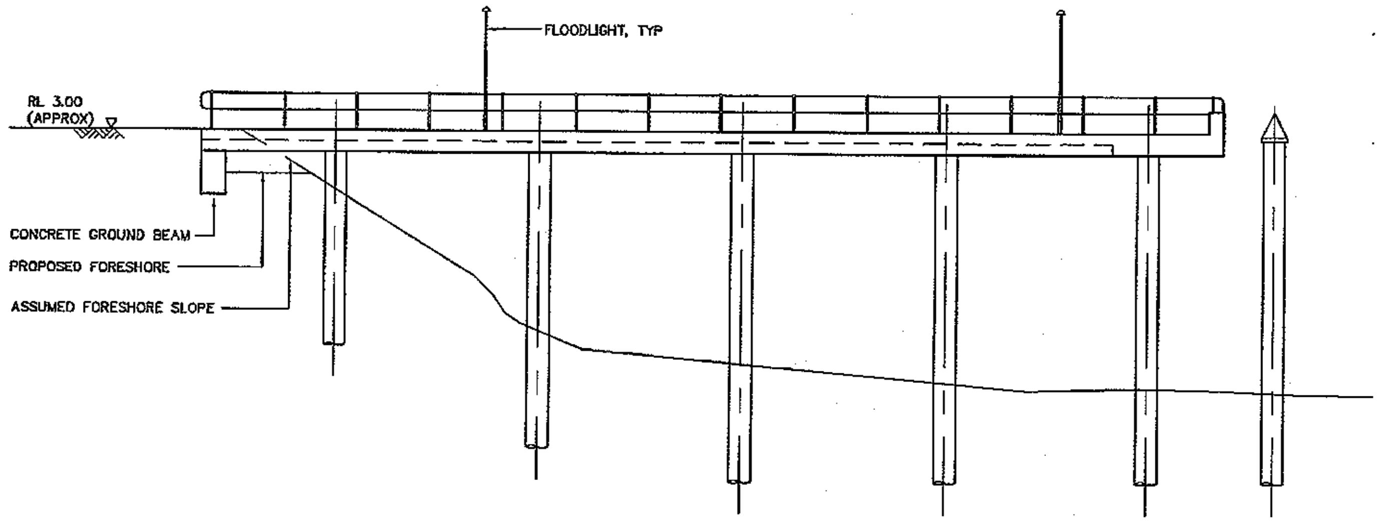

SECTION 3/SK1
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NOTES
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2. ALL LEVELS ARE IN METRES TO CHART DATUM

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DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Dm	Chk'd	Approved	Date
D	ISSUED FOR CLIENT COMMENT	AMK	MM	AMK		24.04.06
C	REVISED FOR D.A.	AMK	MM	AMK		24.03.06
B	ISSUED FOR D.A.	AMK	MM	AMK		09.03.06
A	ISSUED FOR INFORMATION	AMK	MM	AMK		15.02.06

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

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facsimile (02) 9957 1291
email reception@patbrit.com.au
A.C.N. 003 220 228

Patterson Britton & Partners Pty Ltd
consulting engineers

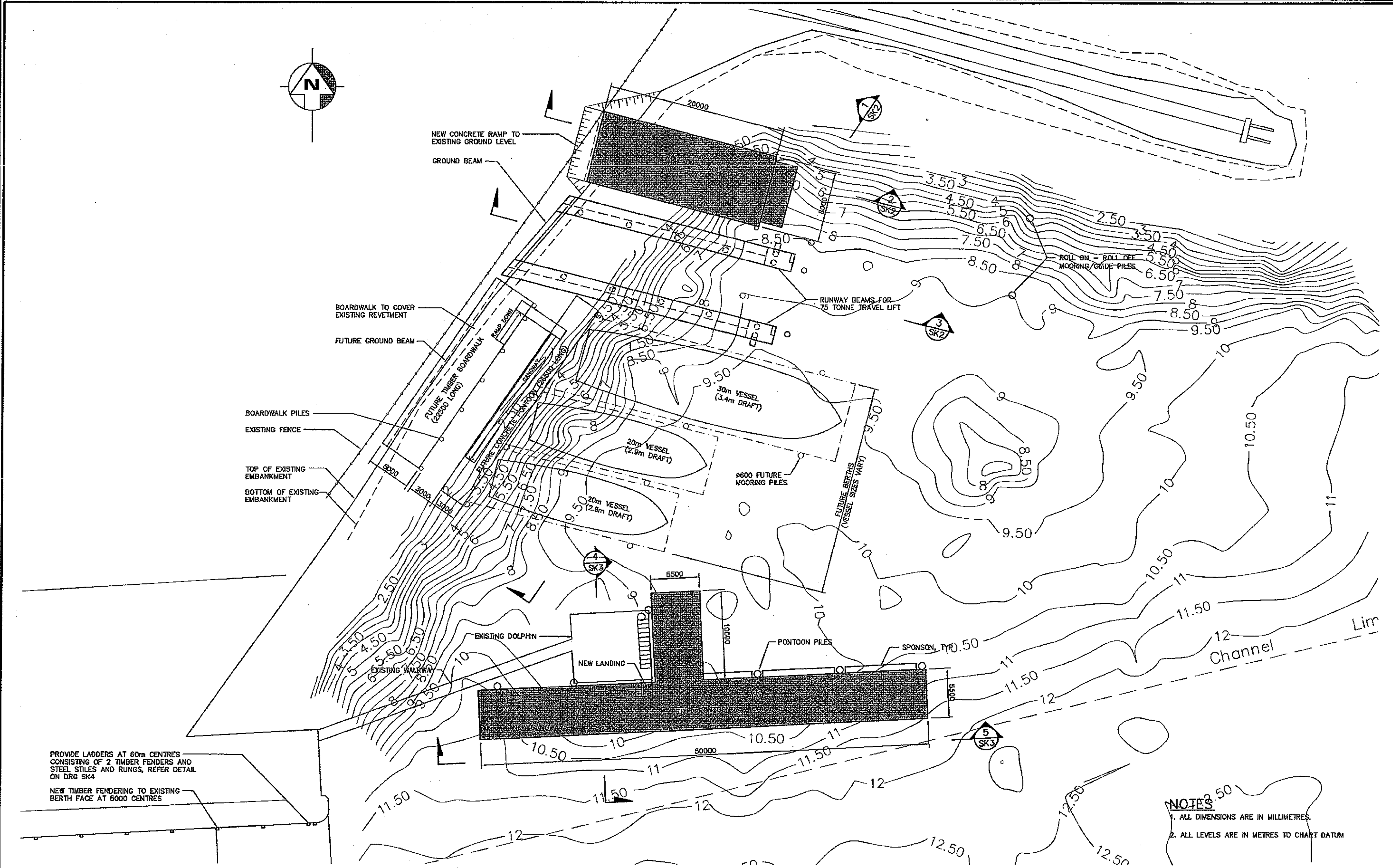
Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: SECTIONS SHEET 1

Drawing No. 6356-SK2
Issue D
Cad File No. 6356-SK2
Xref.(s)

A1



GENERAL ARRANGMENT PLAN
1:200

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
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C	REVISED FOR D.A.	AMK	MM	AMK		23.03.06
B	ISSUED FOR D.A.	AMK	MM	AMK		09.03.06
A	ISSUED FOR INFORMATION	AMK	MM	AMK		15.02.06

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

level 4
104 Mount Street
North Sydney 2060
telephone (02) 9957 1619
facsimile (02) 9957 1291
email reception@patbrit.com.au
A.C.N. 003 220 228

Patterson Britton & Partners Pty Ltd
consulting engineers

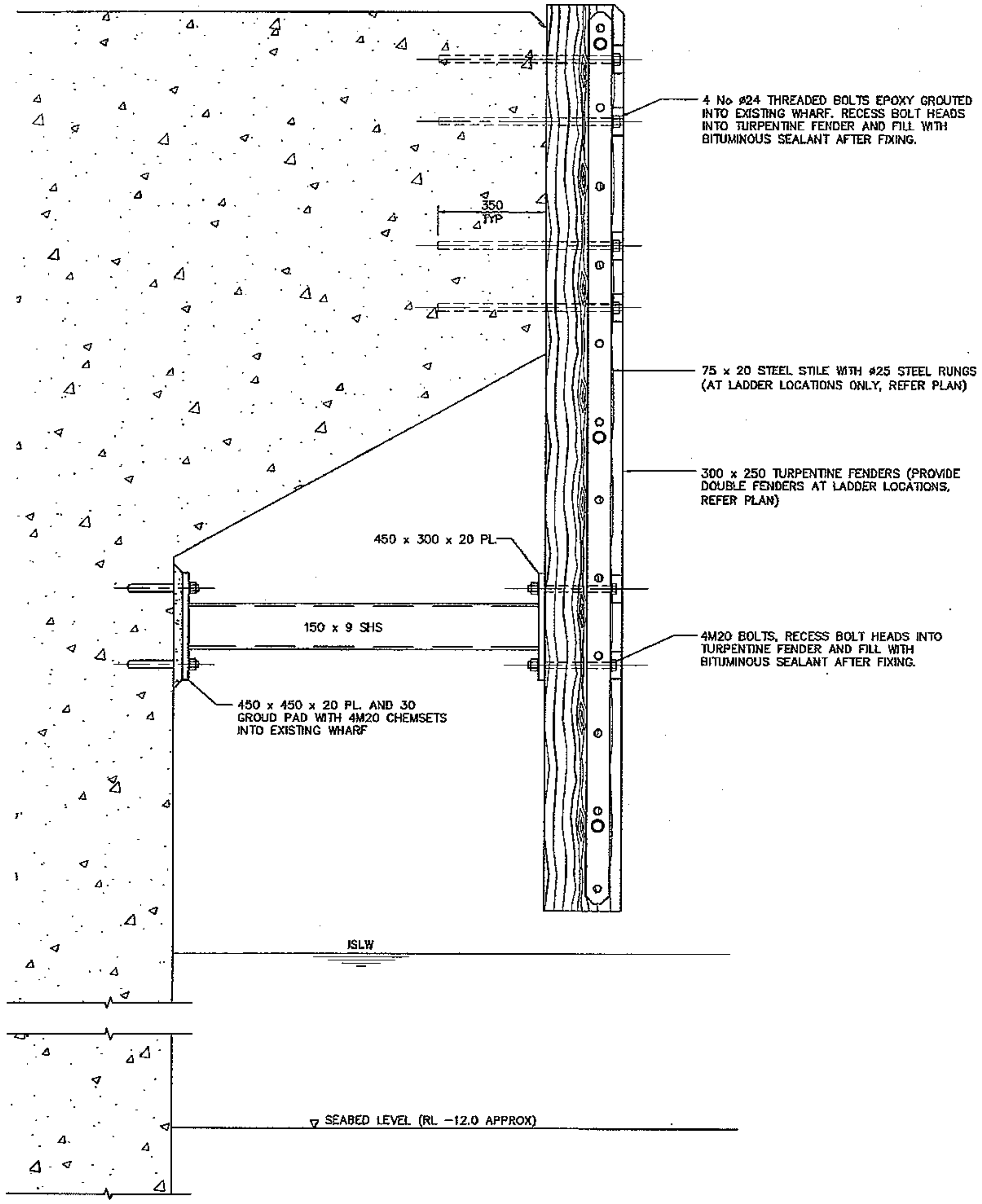
Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: GENERAL ARRANGEMENT PLAN

Drawing No. 6356-SK1
Issue D
Cad File No. 6356-SK1
Xref.(s)

A1



TYPICAL FENDER DETAIL
1:10

NOTES
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2. ALL LEVELS ARE IN METRES TO CHART DATUM

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1:10 (A1) 1:20 (A3)

DRG STATUS : PRELIMINARY, NOT FOR CONSTRUCTION

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
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INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY PATTERSON BRITTON & PARTNERS AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGNAL OF THE DRG REGISTER/TRANSMITTAL FORM No.5.2.2. HELD BY PATTERSON BRITTON & PARTNERS

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email reception @ patbrit.co.au
A.C.N. 003 220 228

Patterson Britton
& Partners Pty Ltd
consulting engineers

Client: WATERWAY CONSTRUCTIONS

Project: WHITE BAY 6 FUELLING FACILITY

Title: DETAILS

Drawing No. 6356-SK4

Issue A

Cad File No. 6356-SK4

Xref.(s)

A1

Appendix E3

FUEL TANKS SCHEMATICS AND ELEVATIONS

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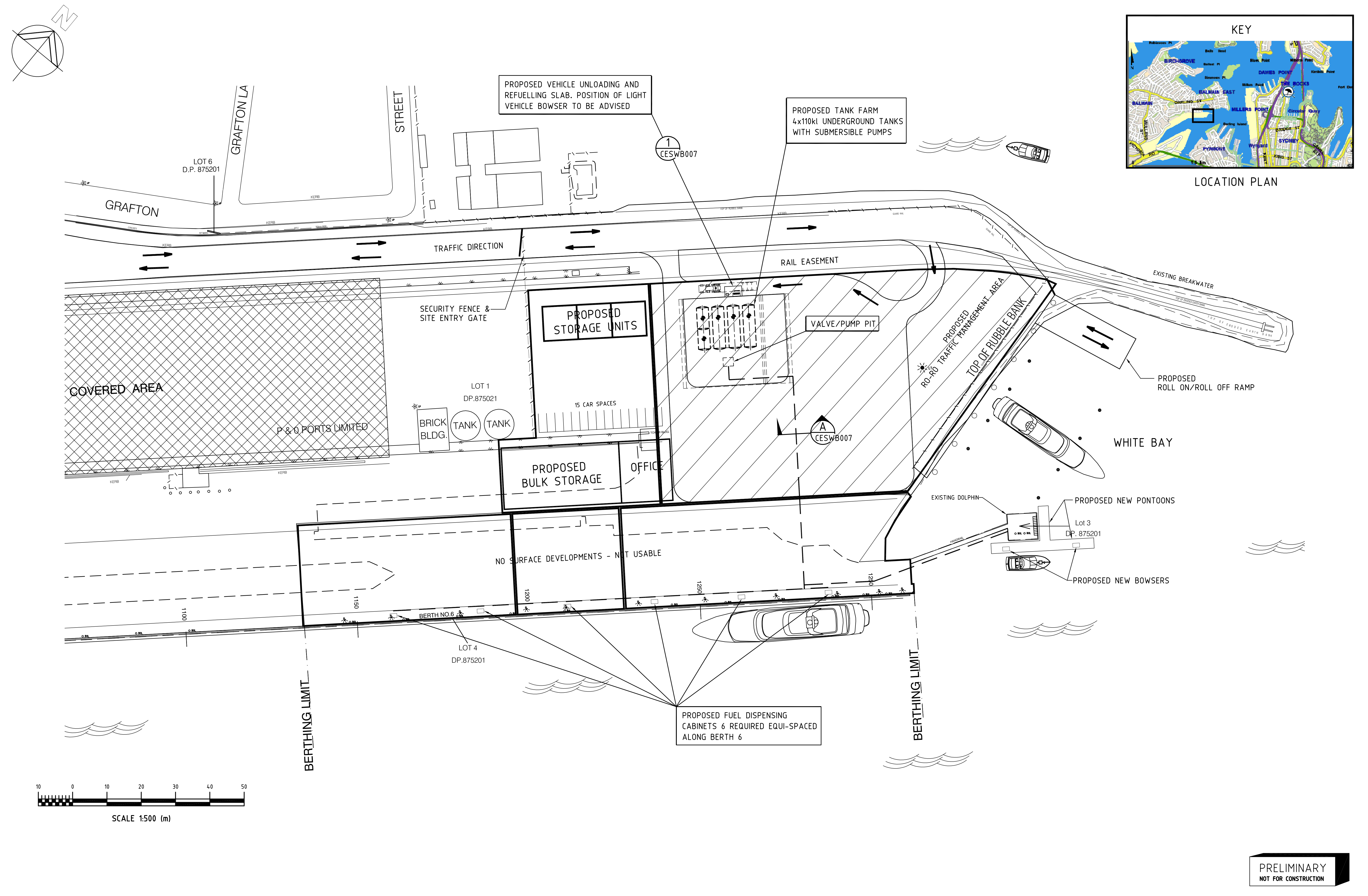


DRAWING PRODUCE FROM KBR DRG No SEN547-C-DWG-905 revA

Kellogg Brown & Root Pty Ltd

KBR

DO NOT SCALE
DIMENSIONS IN MM
DRAWING PRACTICE TO AS1100

NO.	DATE	BY	REVISION	APP'D
2	21-3-06	SAG	SECTION AND DETAIL NOTATION ADDED	
1	31-1-06	SAG	ISSUED FOR COMMENT	

No.	REFERENCE DRAWINGS	DWG. No.
1	CIVIL DETAILS	CESWB007

COOPER ENGINEERING SERVICES Pty Ltd
MOB: 0418 920 104 - FAX (08) 9446 7608 ABN 67 077 151 378
EMAIL:- KGCOOPER@BIGPOND.NET.AU
PROJECT ENGINEERING AND MANAGEMENT

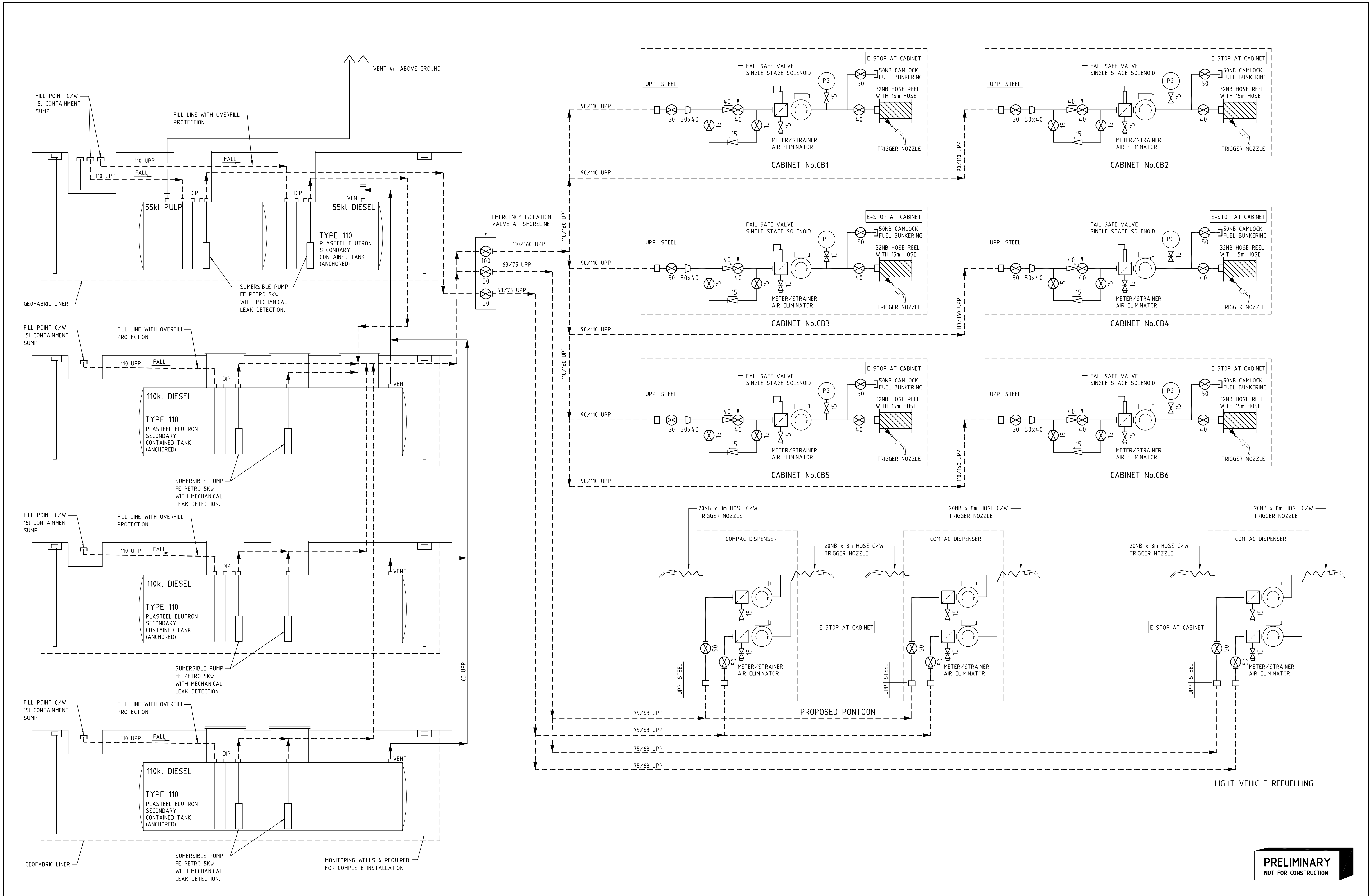
DRAWN DATE	DRAWN BY	SCALE	PLOTTED DATE
31-1-2006	SAG/KBR	1:500	31-1-2006

CAD REF:

BAILEY'S MARINE FUELS AUSTRALIA
BAILEY'S SUPPLY BASE/COMMON USER
WHITE BAY BERTH 6

PROPOSED LAYOUT

DRAWING No.	SIZE	REVISION
CESWB006	A1	2



DO NOT SCALE
DIMENSIONS IN MM
DRAWING PRACTICE TO AS1100

NO.	DATE	BY	REVISION	APP'D
1	30-1-06	SAG	ISSUED FOR COMMENT	

No.	REFERENCE DRAWINGS	DWG. No.

COOPER ENGINEERING SERVICES Pty Ltd
MOB: 0418 920 104 - FAX (08) 9446 7608 ABN 67 077 151 378
EMAIL:- KGCOOPER@BIGPOND.NET.AU
PROJECT ENGINEERING AND MANAGEMENT

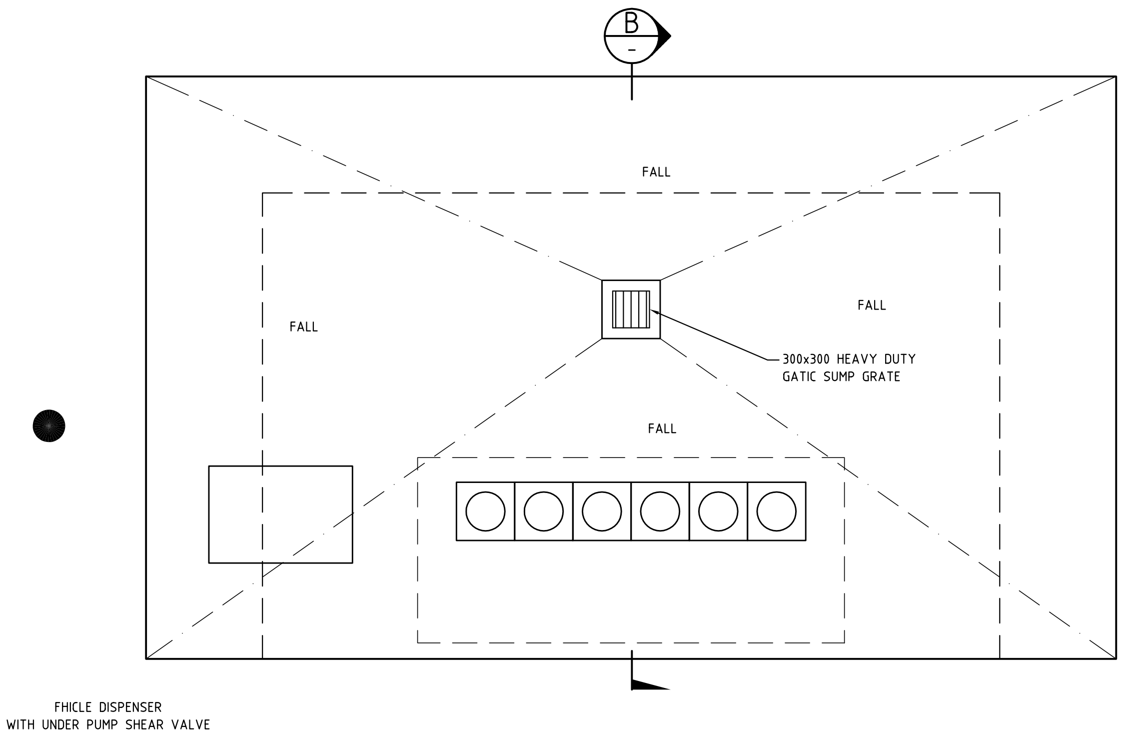
DRAWN DATE	DRAWN BY	SCALE	PLOTTED DATE
30-1-2006	SAG	NONE	30-1-2006

CAD REF:

BAILEY'S MARINE FUELS AUSTRALIA
WHITE BAY FUEL FARM

FUEL P&ID

DRAWING No.	SIZE	REVISION
CESWB005	A1	1



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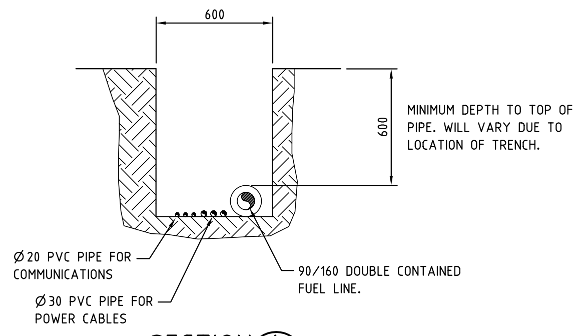
SCALE 1:20 CESWB006



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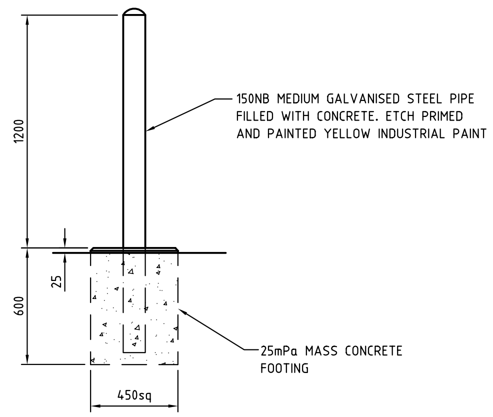
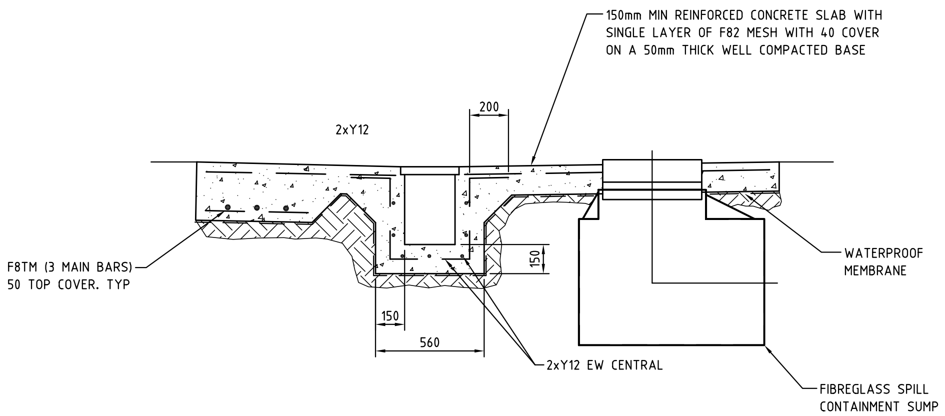
SCALE 1:20 CESWB006
TRENCH DETAIL TYPICAL



DETAIL 2
SCALE 1:20 -



SECTION B
SCALE 1:20 -

PRELIMINARY
NOT FOR CONS

DO NOT SCALE DIMENSIONS IN MM DRAWING PRACTICE TO AS1100	1	17-3-06	SAG	ISSUED FOR COMMENT		1	PROPOSED LAYOUT	CESWB006
	NO.	DATE	BY	REVISION	APP'D	No.	REFERENCE DRAWINGS	DWG. No.

COOPER ENGINEERING SERVICES Pty Ltd
MOB: 0418 920 104 - FAX (08) 9446 7608
ABN 67 077 151 378
EMAIL:- KGCOOPER@BIGPOND.NET.AU
PROJECT ENGINEERING AND MANAGEMENT

DRAWN DATE	DRAWN BY	SCALE	PLOTTED DATE
17-3-06	SAG	1:20	

CAD REF:

BAILEY'S MARINE FUELS AUSTRALIA
BAILEY'S SUPPLY BASE/COMMON USER
WHITE BAY BERTH 6

CIVIL DETAILS

DRAWING No.	SIZE	REVISION
CESWB007	A1	1

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Appendix F

CONSTRUCTION SCHEDULES

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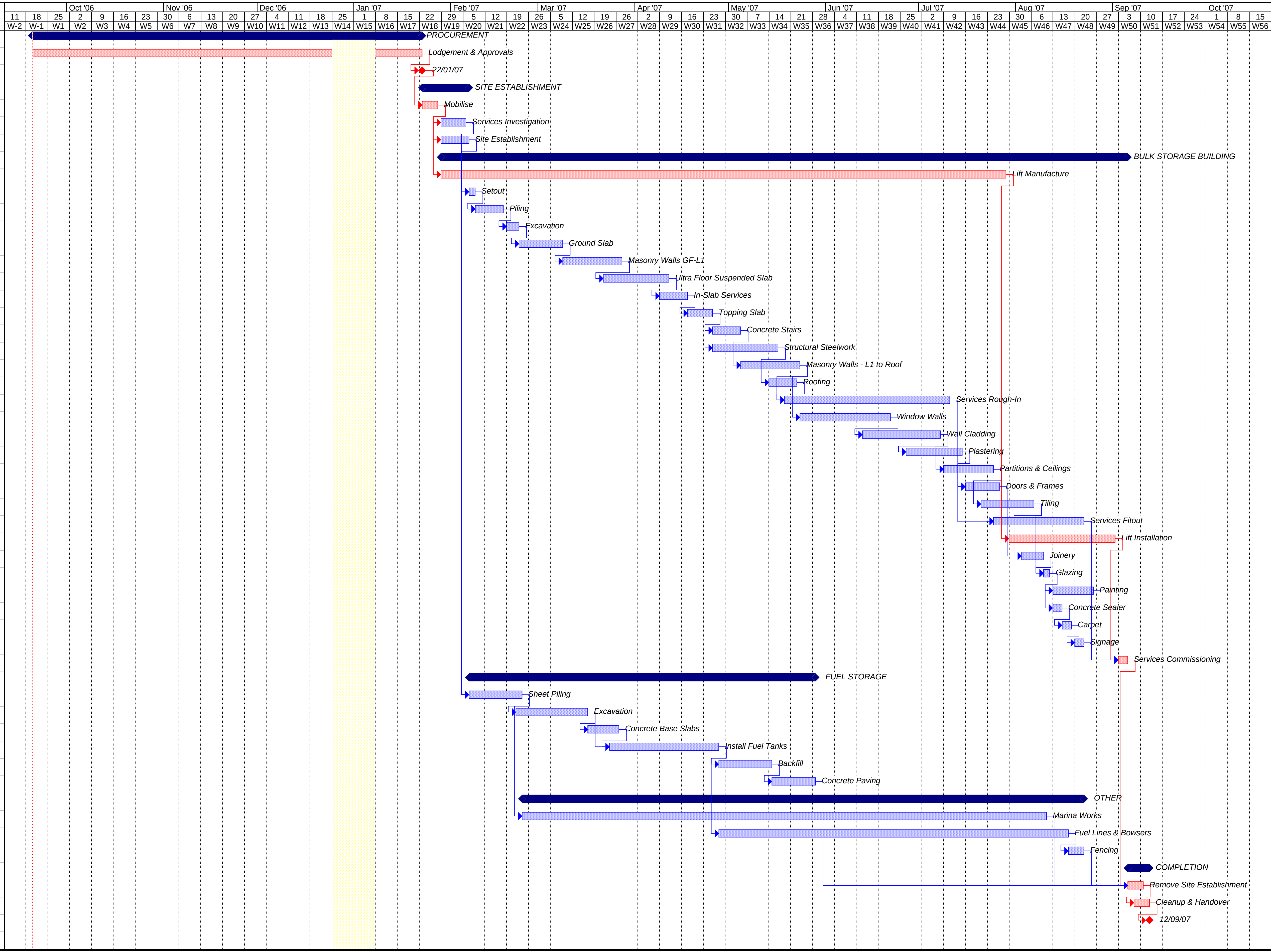
ARENCO

BAILEY'S MARINE - WHITE BAY
PRELIMINARY CONSTRUCTION PROGRAM

ID	Task Name
1	**PROCUREMENT**
2	Lodgement & Approvals
3	Site Possession
4	**SITE ESTABLISHMENT**
5	Mobilise
6	Services Investigation
7	Site Establishment
8	**BULK STORAGE BUILDING**
9	Lift Manufacture
10	Setout
11	Piling
12	Excavation
13	Ground Slab
14	Masonry Walls GF-L1
15	Ultra Floor Suspended Slab
16	In-Slab Services
17	Topping Slab
18	Concrete Stairs
19	Structural Steelwork
20	Masonry Walls - L1 to Roof
21	Roofing
22	Services Rough-In
23	Window Walls
24	Wall Cladding
25	Plastering
26	Partitions & Ceilings
27	Doors & Frames
28	Tiling
29	Services Fitout
30	Lift Installation
31	Joinery
32	Glazing
33	Painting
34	Concrete Sealer
35	Carpet
36	Signage
37	Services Commissioning
38	**FUEL STORAGE**
39	Sheet Piling
40	Excavation
41	Concrete Base Slabs
42	Install Fuel Tanks
43	Backfill
44	Concrete Paving
45	**OTHER**
46	Marina Works
47	Fuel Lines & Bowsers
48	Fencing
49	**COMPLETION**
50	Remove Site Establishment
51	Cleanup & Handover
52	Project Complete
53	



Date: 20/09/06 | Task | Critical Task | Milestone | Split | Task Summary | Critical Task Summary

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Appendix G

GOVERNMENT AGENCY RESPONSES

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Our Reference: 412.5314
Your Reference: SEN547-C2.01-S0004
Contact: Tricia Zapanta
Telephone: 8814 2577
Thursday 11 May 2006

KBR

Project no. SEN547
File code
Register no.
Person responsible

17 MAY 2006

Person	Signed by	Date

Circulate to / Prepare for

Kellogg Brown & Root Pty Ltd

RTA

Kellogg Brown & Root Pty Ltd
GPO Box 1618
Sydney NSW 2001

Attention: Ana Naletilic

Dear Ms Naletilic

CONSTRUCTION OF A MARINE SUPPLY BASE AT WHITE BAY BERTH 6 – ENVIRONMENTAL ASSESSMENT

Further to your letter of 3 May 2006 in relation to the above matter, the following information is submitted for your consideration.

The RTA would like to see the following issues addressed in an environmental assessment for the site:

The preparation of a Traffic Impact Study that addresses but is not limited to the following:

1. The proposed means of vehicular access and vehicular circulation to/from and within the site;

2. Likely daily and peak traffic movements generated by the development and the potential increase in the level and type of traffic associated with the proposal;

3. The impact of development on the surrounding local and arterial road network and the need for upgrading or improvement work on local or arterial roads or intersections;

4. Consideration of the need for the preparation of a local area traffic management plan;

5. An assessment of the likely impact of truck traffic upon nearby residential areas;

6. Details of the anticipated route of trucks through the metropolitan and local road network;

7. An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads and consequently, the preparation of an incident management strategy for accidents, if relevant.

Please refer further queries to Tricia Zapanta on 8814 2577.

Yours faithfully

Salih Suleiman
A/ Landuse Development Manager
Network Planning Unit, Sydney Client Services Branch

PEPPER

Cameron
This is from Department of Fisheries

Our ref: SY6-8-3193A

15 August 2006

RECEIVED SHFA
17 AUG 2006
SCANNED RECORDS

RECEIVED
17 AUG 2006
SYDNEY HARBOUR FORESHORE AUTHORITY

Mr Shayne Watson
Acting Planning Assessment Manager
Sydney Harbour Foreshore Authority
PO Box N408
GROSVENOR PLACE NSW 1220

Dear MR Watson

Re: Request for provision of details of key issues and assessment requirements – Proposed Marine Refuelling Facility at White Bay Berth 6

Thank you for your letter to NSW Department of Primary Industries requesting key issues and assessment requirements for the proposal cited above.

This Department has no objections to the proposal provided:

1. **Treated timber and anti-fouling treatments are not to be used in the construction of the proposed waterway structures.** The use of such materials and/or treatments would prevent aquatic organisms from colonising the hard surfaces of these structures and would negate its value as aquatic habitat. The surfaces of the new structures are being recommended by the applicant as habitat compensation for the loss of marine vegetation due to shading by the proposed structures. Therefore the surfaces of the new structures cannot inhibit colonisation by aquatic organisms.
2. **Environmental safeguards (silt curtains, booms etc) are to be used during construction of the proposed works to ensure there is no escape of turbid plumes into the aquatic environment. Particularly the rocky reef is to be protected from turbid plumes.** Turbid plumes caused by runoff, driving of piles etc have the potential to smother aquatic vegetation and have a deleterious effect on benthic organisms. The whole of Sydney Harbour is an Intertidal Protected Area (IPA).
3. **There is no dredging or reclamation proposed, as defined under the *Fisheries Management Act 1994*.** Details outlining additional works to dredge or reclaim must be forwarded to this Department for assessment.
4. **A Management Plan outlining ongoing monitoring and maintenance of stormwater controls is developed and the implementation of this plan is audited on a regular basis.** Protection of the aquatic environment from the ongoing operation of this facility is required.

Should you require any further information please contact me on 9527 8422.

Yours sincerely

LDiver

LESLEY DIVER
Conservation Manager – Sydney Region

Ana Naletilic

From: Cedric Halforty [chalfort@energy.com.au]
Sent: Tuesday, 9 May 2006 12:06 PM
To: Ana Naletilic
Subject: Construction of a Marine Supply Base at White Bay Berth 6

Dear Ana,

I refer to your letter dated 3 May 2006.

I will be the customer service representative for this project.

There is not much feedback I can give you. I guess your electrical consultant will advise on load requirements and any other requirements in terms of the electricity supply to this development. Until such time there is not much I can do.

Please call if you require any other information

Best regards

Cedric Halforty
Tel: 9585 5663
Mob: 0408 968 133
Fax: 9585 5670

Ana Naletilic

From: ANNIE MANSON [ANNIE.MANSON@sydneywater.com.au]

Sent: Thursday, 11 May 2006 11:32 AM

To: Ana Naletilic

Subject: Re: Trade Waste Licenses

hi Ana,

Under Section 49 of the Sydney Water Act 1994, all customers require the written agreement of Sydney Waterto discharge any substance any substance into a sewer or any work owned by Sydney Water. For customers who are connected to Sydney Water's sewer and who discharge ONLY domestic waste water to that sewer, this written agreement is detailed in the Sydney Water Customer Contract. Wastewater other than domestic water that is discharged from premises connected to Sydney WAter's sewer is defined as trade wastewater. For customers who dischage trade wastewater to sewer, Sydney Water's written agreement is either in the form of a permit issued by Sydney WAter or specific agreement with Sydney WAter.

I have attached some information about our Trade Waste licence policy. I hope this helps.

Regards,

Annie Manson
Strategic Project Officer
Strategic Market Analysis (Urban Growth Centres)
Sydney Water Corporation
115-123 Bathurst Street Sydney NSW 2000
PO Box A53 Sydney South NSW 1232
P: 02 9350 5243
E: annie.manson@sydneywater.com.au

>>> "Ana Naletilic" <Ana.Naletilic@halliburton.com> 11/05/06 10:36 am >>>
Hi Annie,

Just a quick question: under what legislation is a trade waste license required? (Protection of the Environment Operations Act 1991??)

Thanks

Ana

---

5 September, 2006

Ana Natetilic
Environmental Scientist
Kellogg Brown and Root Pty Ltd
GPO Box 1618
SYDNEY NSW 2001

File Ref No: SEN547-C2.01-S0005

Attention: Ana Natetilic, Environmental Scientist

Dear Madam,

Re: Construction of a Marine Supply Base at White Bay Berth 6 Environmental Assessment

We refer to your letter dated 3 May 2006 inviting Sydney Water to provide comments on the proposed marine supply base and outline any specific requirements to be addressed in the Environmental Assessment (EA). Sydney Water has reviewed the information provided for this proposal, and provides the following comments for your consideration.

As redevelopment can intensify water services usage in a given area, any proposed development that results from the rezoning may impact on Sydney Water systems and infrastructure.

Section 73 Compliance Certificate
The developer is required to obtain a Section 73 Compliance Certificate from Sydney Water as a condition of developer consent. Issuing of the Certificate will confirm that the proponent has met Sydney Water's detailed requirements, which include:

- Correctly sized water and wastewater mains; extensions or amplifications to existing water and wastewater systems (if necessary);
- Building over/adjacent to Sydney Water's existing water, sewerage or stormwater infrastructure;
- Payment of Sydney Water charges; and
- The completion of any other requirements.

Developers are advised to engage the services of a Water Servicing Coordinator (WSC) to obtain a Section 73 Certificate and manage the servicing aspects of their projects. Details are available from Sydney Water's Customer Centre on 132092 or Sydney Water's website at www.sydneywater.com.au

Water Supply and Capacity
A 300mm water main runs through the site. The developer will be required to fund the connection of this watermain to the 500mm main located in Lilyfield Road to ensure supply.

Environmental Assessment
Sydney Water requests that the Environmental Assessment for the proposed Marine Supply Base cover the following points and issues.

Water Supply:

- Clearly identify the property

- Specify the quantity of potable water that it requires from Sydney Water.
- Separately specify the quantity of potable water that will be supplied for bunkering purposes. Separate bunkering water meters may be required.
- Specify the water meter(s) serial number
- Confirm that backflow protection AS 3500 is fitted immediately after each Sydney Water meter.

Sewage:

- Specify the quantity of domestic wastewater that will be generated on site
- Specify the quantity of ship to shore toilet waste to be received on the site
- Specify the quantity of galley wastewater to be received on the site
- Specify the quantity of bilge wastewater to be received on the site
- Specify every trade wastewater generating process on the site including quantity, quality and expected rate of discharge.

Rain Water Harvesting

- Specify how the development will harvest rain water for use in the process(es)

Reclaimed Sewage

- Would reclaimed sewage be used on the site if the product were to be available to the site

Site Contamination

- Is the site contaminated and has any clean up notice been issued for the site
- Details of all remediation to be conducted on the site
- Specify what procedures will be in place to ensure that the site, groundwater and surface waters are not polluted

Bunding

- All permanent storage containers for liquids must be suitably bunded. No valves or other penetrations of bund walls are permitted
- All temporary storage for liquids at the ‘supply point’ must be within suitable bunds
- Any storage for liquids on the ‘lay down temporary storage of goods for water transport’ must be within suitable bunds.
- All lead batteries must be stored within a suitably bunded area

Control Point for Harbour Emergencies

- Will any emergency response equipment for port security and emergencies be stored and/or washed on the site?

Fuel

- Details on how bulk fuel deliveries will be managed so that any spillage is contained
- Details on how maritime fuelling operations will be conducted so that any spillage is contained.

Flow Measurement and Sampling Point

- Ship to shore (toilet) waste requires separate electromagnetic flow meter and a separate sampling point
- Galley wastewater requires separate electromagnetic flow meter and a sampling point after the pre-treatment plant
- Other trade wastewaters will require a separate electromagnetic flow meter and a sampling point after the relevant pre-treatment plants.

Prohibited Discharges to Sewer

- Sea Water
- Groundwater
- Stormwater

- Rainwater from any open areas in new developments
- TBT wastes of any kind

Pre-treatment Technology

- Details on all wastewater pre-treatment plants to be used on the site
- Title of person responsible for all trade wastewater discharges from the site
- Details of the quantity, quality and rate of discharge of the pre-treated wastewater
- As residential developments are close to the site any wastewater pre-treatment facilities may have to be fully enclosed to reduce smell and visual complaints.

Sydney Water does not consider the particular firefighting capability of the mains as part of the Section 73 Certificate application process. Assessment of firefighting capability is the responsibility of the applicant and Sydney Water's role is limited to indicating modelled pressures at flows nominated by the applicant.

If you have any queries or require further information, please contact Annie Manson of the Urban Growth Branch on 02 9350 5243 or e-mail Annie.Manson@sydneywater.com.au

Yours sincerely

Andrew Jackson
Manager, Strategic Market Analysis

Appendix H

COMMUNITY BROCHURE

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White Bay Berth No. 6 Proposed Marine Supply Facility

Baileys Marine Fuels

Baileys Marine Fuels Australia is a specialist marine infrastructure developer and fuel service provider. The company operates nationally from headquarters located in Fremantle, Western Australia. Baileys was established in 1986 and is now recognised as one of Australia's leading developers of environmentally friendly marine refuelling infrastructure and related services. The company currently owns 17 marine supply facilities and distributes fuel and oil through a further 36 ports around Australia. Baileys has a proven track record of safely constructing and operating maritime infrastructure.

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Marine Supply Facility at White Bay No. 6

Baileys propose to establish a marine supply facility at White Bay No. 6 as shown in Figure 1. The site, which was formerly a container and general cargo handling facility, is currently used to store new cars. However, in 2005 the NSW Government announced that vehicle storage activities would be relocated to Port Kembla, and that the site would remain as a dedicated maritime precinct. The proposed use of the site as a marine supply facility is consistent with this commitment.

The supply facility will provide a range of services for harbour users including:

- bulk indoor and outdoor storage space for marine equipment like rope, buoys, lifeboats or other marine hardware
- a roll-on/roll-off ramp for land to barge (or similar) to service harbour islands with an associated lay down area for temporary storage of goods for water transport
- marine refuelling facilities, grey water and sullage pump facilities for commercial vessels (such as Matilda and Captain Cook cruisers), professional fishing vessels, tug boats, water taxis, public transport vessels operated by Sydney Ferries and recreational vessels
- a small number of office leases for commercial marine service businesses
- a supply point for commercial vessels to collect pre-ordered supplies
- a dedicated space for port security and emergency services to mobilise and use as a control point in the event of harbour emergencies
- temporary vessel moorings for short term berthing of vessels while repair or maintenance works are undertaken or other services offered through the supply facility are utilised

The average size of vessels utilising services at the marine supply facility will range from between eight metres and 70 metres. The facility will not provide services to commercial cargo vessels.

Benefits of the Project

The project will deliver a number of significant benefits to Sydney and will support the ongoing use of the harbour as a working port.

The project will:

- increase efficiencies and reduce the environmental impacts associated with marine fuel handling, currently operating in Sydney Harbour, through provision of alternative and affordable fuelling practices via a safe, modern, best practice, environmentally controlled delivery platform
- deliver a facility that will service a range of recreational and commercial users
- meet working harbour maritime and port needs in an integrated and planned manner
- provide a secure and staffed facility to augment the harbour's emergency management needs
- provide access to a roll-on/roll-off ramp to support maintenance and redevelopment works to harbour landmarks, including Cockatoo Island and to service special events.

Environmental Planning Issues

Planning for the site will address the objectives and provisions of various planning policies and legislative requirements. The marine supply facility will be designed, constructed and operated to a high standard of environmental performance.

Key issues that will be addressed in the project's design, construction and operation include:

- Noise and vibration - All construction works will be undertaken during daytime hours. Once construction is completed, the supply facility will only generate low levels of operational noise. Night time activities will be limited to 'quiet' activities, such as vessel refuelling, and will be subject to strict operational procedures to minimise noise.
- Traffic generation - During construction, a small number of trucks will be used to transport materials to the site. During operation, traffic movements will be restricted to those associated with staff activities and occasional fuel deliveries. Increases to the predicted daily volumes of traffic may occasionally occur when access to the site for the delivery of materials to support events on the harbour is required. All special event deliveries will be subject to on-site traffic management.
- Visual impact - The supply facility will be visible to harbour users. A detailed visual impact assessment is being undertaken. Baileys is working with professional design specialists Allen Jack & Cottier Architects to ensure new buildings on the site achieve a high standard of urban design. A preliminary concept for the office and indoor storage building is shown in Figure 2.
- Hazard and risk - The storage of fuels on the site will be strictly controlled. Fuel handling practices and storage facilities will be managed to comply with established environmental safeguards and safety measures. Baileys is working with specialist consultants to prepare a hazard and risk assessment as part of the Environmental Assessment process.
- Light spill - Existing lights used for the current car storage operations will be utilised to support 24-hour operation of the supply base. No additional lights will be installed. As such there will be no change from the existing night-time light environment.

These and other environmental aspects of the project, including marine ecology, water quality and air quality will be addressed through detailed technical studies that are being undertaken to assess the potential environmental impacts associated with the proposal.

The Approval Process

The project is classified as a 'Major Project' under NSW State Environmental Planning Policy, and as such will be assessable under Part 3A of the Environmental Planning and Assessment Act (1979). Under this process, Baileys is required to submit an application and Environmental Assessment report to the Department of Planning for the NSW Minister for Planning's determination. The Sydney Ports Corporation and the NSW Maritime Authority are required to give landowners consent for the proposed development.

The following steps are involved in the assessment process for the proposal:

- Department of Planning Director - General's requirements have been issued that set out in detail the matters to be addressed in the Environmental Assessment.
- Planning consultants Kellogg Brown & Root (KBR) and Baileys have appointed specialist consultants to undertake technical studies and prepare an Environmental Assessment report to address the matters raised by the Director - General.
- Baileys propose to lodge an application and Environmental Assessment report with the Department of Planning for consideration by mid 2006.
- Department of Planning will exhibit the application and Environmental Assessment report for a minimum period of 30 days. Interested parties have opportunity to review the application and formally lodge comments to be taken into account during the assessment process.
- Department of Planning considers application including the supporting Environmental Assessment report and any comments received during exhibition. Department of Planning make a recommendation to the Minister for Planning as to whether the proposal should proceed, and if so, what environmental safeguards and management measures will be required.

Figure 2. Proposed Two Storey Office & Indoor Storage Building

Community Consultation

Baileys is committed to informing and consulting a range of community, industry and government stakeholders in order to take into consideration their views prior to submitting an application to Department of Planning. Baileys has been liaising with Sydney Ports Corporation during the development of the proposal and has met with many important user groups including the Boating Industry Association of NSW, the Commercial Vessel Operators Association of NSW and the Professional Fishermans Association of NSW to ensure the supply facility will cater to as wide a range of users as possible. A community information and feedback session will be held to provide local residents with an opportunity to discuss the proposal and the findings of the Environmental Assessment with members of the project team. The session will also enable residents to make suggestions and provide feedback about the proposal.

The community information and feedback session will be held at the Balmain Town Hall on Darling Street on Wednesday 3 May 2006 from 6.00pm to 8.00pm. All members of the community are welcome to attend. Local residents will have further opportunity to provide written feedback in response to the proposal during the statutory exhibition period.

View showing proposed marine supply facility from Pyrmont Point

Contact Details

In the meantime, for enquiries about the project please contact:

Bailey Marine Fuels Australia
Facsimile: 08 9430 4618
Email: whitebay@baileysmarine.com.au
Web: www.baileysmarine.com.au
Post: 28 Mews Road
Fremantle WA 6160

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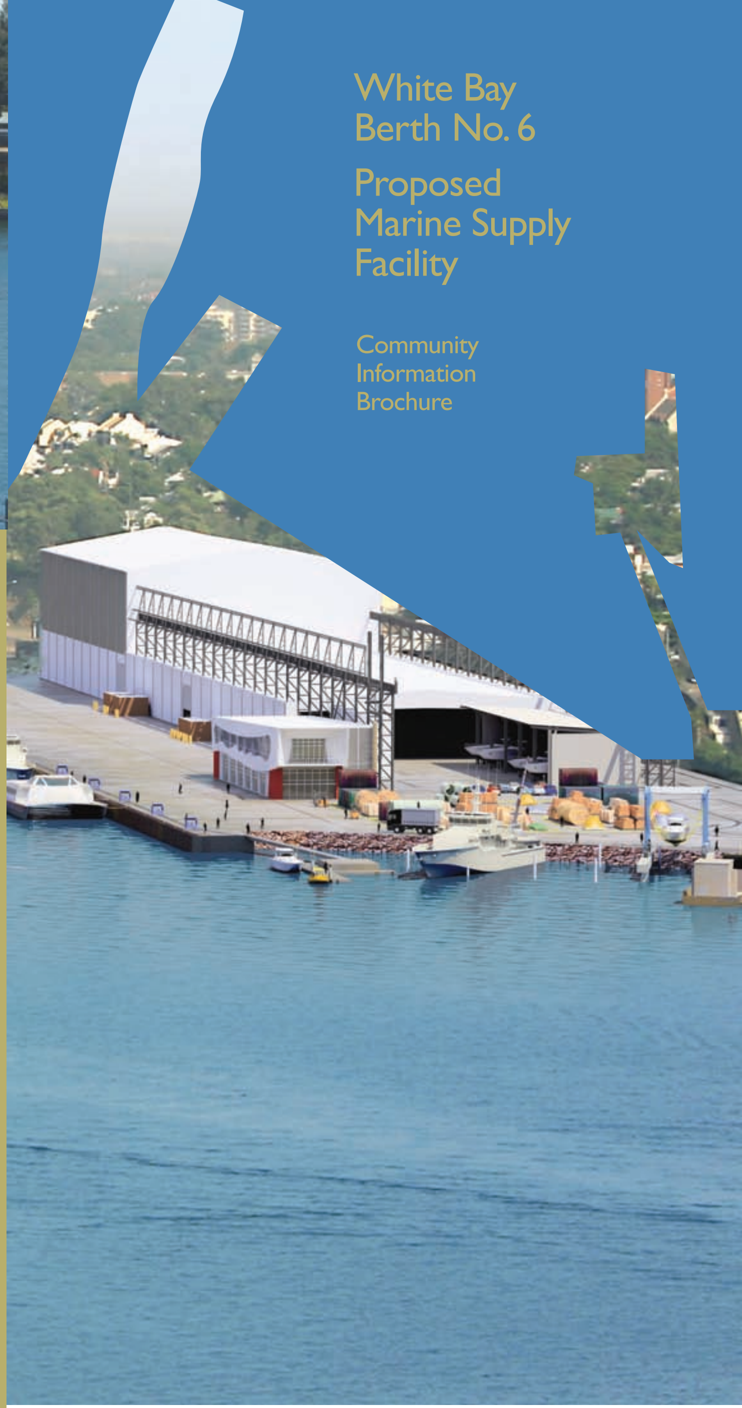
Figure 1. Site Location



White Bay Berth No. 6

Proposed Marine Supply Facility

Community Information Brochure

BAILEY'S MARINE FUELS AUSTRALIA

Appendix I

AQUATIC ECOLOGY REPORT

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MARINE POLLUTION RESEARCH PTY LTD
Marine, Estuarine and Freshwater Ecology, Sediment and Water Quality Dynamics
A.B.N. 64 003 796 576
25 RICHARD ROAD SCOTLAND ISLAND NSW 2105
PO BOX 279 CHURCH POINT NSW 2105
TELEPHONE (02) 9997 6541 FAX (02) 9997 7935 E-MAIL panink@iimetro.com.au

Mr Jeremy Pepper
Kellogg Brown & Root Pty Ltd
Level 9, 201 Kent Street
SYDNEY NSW 2000 11 June 2006

Dear Jeremy,

AQUATIC ECOLOGY SURVEY
PROPOSED BAILEYS MARINE FACILITY, WHITE BAY 6

Please find attached the final aquatic ecology report for the above property with amended considerations made against the amended proposal as shown on SEN547-C-DWG-907. Other than the qualifications contained in the report, I do not see any aquatic ecological basis for withholding land owners consent for the proposed facility at the above address.

Mobilisation of Sediments

Whilst it is not known whether there are any contaminants in the sediments at this site it is concluded that the activities associated with construction can be managed to the extent that there would be no significant mobilisation of sediments from the sea-bed.

Based on the most common vessel draft around 5 m, and the underlying sediment depth of -8 to - 10 m ISLW, there would appear to be sufficient water depth at ISLW to prevent disturbance of bottom sediments arising from propeller wash. However, if this were to be a sticking point with NSW Maritime, you may need to consider tidal restrictions on larger draft vessel movements for the ro-ro or berthing facility.

Shading of Algae

There are additional shading issues arising from the amended layout plan. Based on my recalculations I conclude that some 21 m^2 of algae habitat would be lost to shading (instead of the original 6 m^2) and that about 54 m^2 of additional algae habitat would be created by provision of the pontoons. Accordingly I conclude that there is no significant impact on marine vegetation arising from this development.

SREP (Sydney Harbour Catchment) Wetlands

The revetment and breakwater walls are designated as a wetland under the SREP (Sydney Harbour Catchment). Accordingly I have assessed the impacts on this wetland under Clause 17 of the SREP. I conclude that there would be no net impact on the wetland by virtue of the additional algae habitat provided by the pontoons as compensation for algae habitat lost to provision of the ro-ro facility. Note that this could be considered a 'sleight of hand' in that the habitat to be created is not 'fixed' habitat in the form of rock reef. I would argue that the 'fixed' habitat is equally non natural and thus provision of suitable alternative algae habitat in any form is acceptable. On this basis I also conclude that a permit to "take algae' is unlikely to be required by DPI Fisheries.

Yours Sincerely,

Paul Anink
Aquatic Ecologist

AQUATIC ECOLOGY SURVEY -
BAILEYS MARINE, WHITE BAY 6

1 INTRODUCTION

Marine Pollution Research Pty Ltd (MPR) was commissioned by Kellogg Brown & Root Pty Ltd (KBR) to report on the possible environmental impacts of adaptive re-use proposals at White Bay Berth 6. Baileys Marine are proposing to redevelop White Bay Berth 6 as a common users services park which includes adaptive re-use of the existing dolphin for fuel dispensing, installation of a travel lift, installation of Mediterranean style moorings with associated pontoons plus construction of a roll on/roll off ramp over the existing rock reclamation wall on the eastern side of Berth 6. The proposed development is shown in a Layout Plan prepared by KBR (SEN547-C-DWG-907).

MPR staff undertook an aquatic ecology survey of the shallow in-shore waters, sea bed, dolphin piles and reclamation wall along the eastern side of White Bay Berth 6 on 20 March 2006. The site is located on the western shore of Johnsons Bay, at the eastern end of the White Bay Container terminal.

With respect to possible aquatic ecosystems no marine vegetation is indicated in the vicinity of the proposal on the maps prepared by NSW Fisheries (West et al 1985) and the ecological community is described as 'mixed rocky intertidal and rock platform' on map 8 in the DCP for SREP (Sydney Harbour Catchment) 2004. Mixed rocky intertidal and rock platform habitats are described as 'high conservation value' in the DCP. The wetlands map for the DCP (Sheet 4) for the DCP indicates wetland habitat along the site foreshore and on the existing breakwater at the northern end of the reclamation wall,

2 AQUATIC ECOLOGY

The aquatic ecology survey was made of the rock revetment wall plus the dolphin piles and in-shore waters and sea bed fronting the subject site, from the existing rock breakwater at the north to the existing piled dolphin structure at the south. .

There are three main areas of aquatic habitat in the locality; mixed inert rock rubble intertidal and shallow subtidal habitat on the breakwater and rock revetment along the eastern side of White Bay Berth 6, concrete faced support piles for the existing dolphin and muddy sand grading to mud habitat on the seabed adjacent to the rocky revetments and under the dolphin piles. The breakwater and revetment facing rock is predominantly irregular sandstone with block sizes of around 400 to 600 mm diameter in the intertidal and immediate shallow sub-tidal and progressively larger block sizes in the subtidal to the muddy seabed. Bottom block sizes are up to 2 m diameter. The eastern revetment is steep (slope of around 1 in 1).

There is a distinct depth zonation of aquatic biota on the rock revetment and concrete piles, as shown diagrammatically in Fig 1. The zonation on the rocky revetment is described as follows:

- The upper intertidal comprises bare rock with no aquatic biota.
- The middle intertidal portions of the breakwater and revetment wall support a limited variety of intertidal animals. There are a few littorinid snails *(Bembicium nanum)* plus encrusting barnacles *(Elminius sp.)*.
- The lower intertidal supports a variety of gastropod molluscs; *B. nanum*, *Austrocochlea obtusa*, the Oyster borer, *Morula marginalba* plus several limpet or limpet like species *(Cellana tramoserica* and *Montfortula sp.)*. There is a distinct oyster band from the lower intertidal into the shallow subtidal comprising two species, the native Sydney Rock Oyster plus the introduced declared pest species the Pacific Oyster.
- There were no algae species in the intertidal.
- The shallow sub-tidal fringe of the revetment wall supports a patchy cover of an encrusting red coralline algae plus a limited variety of short frondose brown algae species comprising individual plants of *Dictyota dichotoma* plus a few macro-brown algae plants *(Sargassum sp.)*. Overall cover is patchy at about 20 to 30 % cover.
- Below the coralline algae fringe there is a patchy band of algae including three brown macroalgae species *(Ecklonia radiata, Padina sp., and Sargassum spp.)*, a number of frondose algae, some mussels plus a variety of sponge and tunicate species. Overall cover is very patchy at about 10 to 20 % cover.
- Below the subtidal algae zone the rocks become progressively covered with silt and consequently there are less attached biota. The lower revetment wall to around 5 m above the mud substratum supports a very sparse and patchy sponge and tunicate fauna with no encrusting species such as bryozoa.
- The revetment rocks from 5 m above the seabed to the seabed are covered in silt and support no attached biota.
- The seabed at the toe of the revetment wall is soft silty-sand becoming progressively more muddy with depth away from the wall. There were around 16 burrows per m^2 indicating a relatively stable seabed.
- There was no hard substratum in the form of rubble or shipping

associated detritus found on the seabed along the length of the revetment wall or around the dolphin piles.

- The dolphin piles showed a similar zonation to the rock revetment but with overall less species (Fig 1). There was a very sparse 1 m band of barnacles plus oysters in the lower intertidal plus a 1 m wide band of very sparse (10 % cover) and patchy algae (Kelp and *D. dichotoma),* some mussels and one species of sponge below that. Unlike the rock revetment the lower section of the dolphin support piles were not smothered in silt and consequently supported a patchy distribution of sponges.
- With respect to fish fauna the following species were observed; eastern hula, puffer fish, bream, glassy sprat, black-fish, mullet, oyster blennies and gobies.

With respect to the other specific requirements of NSW Fisheries and of NSW Maritime Authority:

- There were no mangroves, saltmarsh or seagrass along the existing facility foreshore or in the vicinity of the proposed facilities.
- There are no commercial fishing operations or aquacultural activities in the immediate locality of the proposal. Consequently the proposal would not have any impact on commercial fishing operations or aquacultural activities.

The Fisheries Management Act (1994) requires that any proposed activity be assessed with respect to its potential impact on species listed as threatened under the Threatened Species Schedules of the Act which list a number of marine and estuarine shark and teleost fish species as Vulnerable Species under Schedule 5 of the Act. Of the species known from Sydney Harbour only one, the Black Rock Cod *Epinephelus daemelli* could potentially occur in the study area.

The Black Rock Cod *(Epinephelus daemelli)* is described as a common but very secretive NSW coastal and estuarine rocky reef species (Kuiter 1997). It is caught by line fishers but rarely seen by divers because of its secretive habit of lurking in caves and crevices. It is more often seen by divers using torches at night (Kuiter 1997). The rarity of the species may be exemplified by the results of the NSW Fisheries' three year Botany Bay Fish survey (SPCC 1981) where only two specimens were caught (from a total of 229 species and some 78,000 individuals). The two specimens were caught in natural rocky reef habitat towards the entrance of the Bay. The species is considered to be a permanent resident of coastal and outer estuarine rocky reefs although it was noted that there was insufficient information on the species to be precise regarding its residency. It was not, however caught as a juvenile in any of the other estuarine habitats surveyed in Botany Bay (seagrass beds, mangrove forests or deep and shallow soft substratum - muddy and sandy sea beds).

A specific search for Black Rock Cod and Black Rock Cod habitat was made of the sub-tidal revetment wall in the study area and no Black Rock Cod were found. Whilst the rocky revetment sections did not provide suitable cave or rock crevice habitat to support adult Black Rock Cod, there were some suitable small crevice areas which could potentially support juvenile Black Rock Cod. However, no Black Rock Cod were found during the systematic search of the smaller crevices along the revetment wall.

It is concluded that the sub-tidal rocky revetment along the foreshore of the subject site would not provide suitable habitat for adult Black Rock Cod and whilst juvenile Black Rock Cod could utilise the smaller crevices within the rock revetment wall they would only be expected to transit the area and not reside in the area permanently because of the lack of suitable cave and crevice habitat. Accordingly it is considered that an eight part test of significance is not required.

3 IMPACT ASSESSMENT

With respect to possible impacts on aquatic habitat and aquatic biota arising from the proposed construction works, it is understood that dredging would not be required and that the underlying seabed sediments are to be left in place. It is also understood that the hardstand works to be built on-shore would incorporate total stormwater and run-off controls such that there would be no polluted water runoff from the facility. Fuel and pump out facilities to be installed on the dolphin would incorporate best-practise pollution control mechanisms so as to ensure no water pollution.

Actual construction elements which have the potential to impact the aquatic ecology of the locality are indicated on KBR Figure 5.1 (Drawing SEN547-C-DWG-907) and are described as follows:

- Installation of a 10 m wide by 25 m long roll on roll off ramp facility at the northern end of the revetment terminating over the lower portion of the revetment wall with a bottom depth at the outer edge of around 5 to 8 m.
- Installation of a travel lift some 30 m long terminating over the muddy seabed in around 9 m water depth.
- Installation of a floating pontoon system some 28 m long by 4 m wide over the intertidal to shallow sub-tidal portion of the revetment wall (2

to 4 m) to provide access to three short stay Mediterranean style moorings for vessels from 23 to 32 m long. Seabed depths under the vessels would vary from 4 m inshore (over the rock revetment wall) to around 9.5 m deep (over the muddy bottom).

- Installation of a floating pontoon structure around the existing dolphin around 50 m long and about 9 m wide over the bare muddy seabed with depths varying from 10 to 11.5 m).

These structures are shown on the KBR layout plan. The water-based construction works would probably comprise the following actions:

(1) Some excavation of intertidal rock from the upper portion of the rock revetment wall at the location of the proposed roll on-roll off (ro-ro) ramp and at the location of the two travel lift arms.

- As the material to be disturbed is inert rock (mainly sandstone), disturbance of this material would not be expected to result in any significant mobilisation of sediments or pollutants into the water column.
- There would be some minor disturbance of intertidal animals located on the rocks to be removed. However, once the structures are in place the new structures would provide additional intertidal hard substratum which would provide habitat for recolonising species such as oysters. Note that no algae would be lost to this part of the works.

It is concluded that there would not be any significant impact on the intertidal biota arising from this part of the construction works.

(2) Placement of support piles for the ro-ro ramp structure and for the travel lift arms into the rock revetment wall. This work would probably be done from shore and from floating pile driving rigs.

- As the piles are to be driven into the existing subtidal revetment wall, some of the rocks supporting marine biota would be displaced thus potentially damaging some encrusting subtidal fauna.
- The loss of some subtidal rock encrusting fauna to pile driving operations into the revetment wall is considered to be insignificant and in any case any losses to pile driving would be compensated for by the creation of additional sub-tidal hard surfaces which would be available for recolonisation by encrusting organisms including algae.

It is concluded that the loss of subtidal rock revetment habitat fauna to pile driving would be insignificant and would be mitigated by the creation of additional (overall more) sub-tidal hard substratum suitable for re-colonising encrusting species.

(2) Placement of support piles for the ro-ro ramp structure, support piles for the travel lift arms plus fender piles and pontoon locator piles into the deeper bare mud substratum. This work would probably be done from floating pile driving rigs.

- Whilst there could be some mobilisation of sediments (turbidity) arising from pile driving operations it is considered that turbidity plumes from individual pile driving operations would be small, confined to the bottom waters and short-lived, with consequently little or no mobilisation of sediment-bound pollutants to the water column.
- Notwithstanding this conclusion and depending on the extent of these works there may be a need to limit potential sediment plume spread to the adjacent rocky revetment reef by strategic placement of floating boom silt curtain sections.

(3) There is a potential for shading of existing algae habitat on the rock revetment wall and dolphin piles from the placement of fixed and floating structures (mainly ro-ro ramp and pontoons).

- The combined ro-ro ramp, travel lift arms and in-shore pontoon would shade a section of shallow water rock revetment habitat which supports algae, with about 84m^2 of algae habitat affected (out of an estimated total rocky reef algae area of around 500 m^2 around the breakwater and along the revetment wall). As actual algae cover on the rock revetment is very patchy (see above) the actual area of algae affected (at mean 25 % cover) would be no more than 21 m^2.
- The placement of floating pontoons around the dolphin would shade the dolphin support piles. However these structures supported a very sparse algae community and an estimated maximum area of 1 m^2.
- The loss of up to 22 m^2 of actual algae habitat would be compensated for by the creation of about 54 m^2 of floating pontoon algae habitat on the pontoons to be installed around the dolphin (0.5 m draft). The vertical wetted surface areas of floating pontoons have been identified as providing good algae habitat (DPI Fisheries 1999), by virtue of the fact that the wetted areas remain in the surface waters without any intertidal drying periods plus negligible silt build-up. As a

consequence these surfaces generally support a larger diversity and more even cover of algae than adjacent silt and tide impacted rocky revetment walls.

- The proposed pontoons also provide more than 500 m^2 of underside habitat which has also been found to provide very good habitat for encrusting biota (sponges, bryozoa, tunicates and molluscs) - also by virtue of the orientation which excludes silt build-up. The combined algae plus encrusting biota on floating pontoons in turn provide valuable fish habitat, particularly for juvenile fish.

It is concluded that the loss of around 22 m^2 of silt affected algae habitat on the rock revetment walls is insignificant as this loss would be mitigated by the creation of around double that area of good vertical (and thus less silt affected) shallow algae habitat on pontoon wetted surfaces.

(4) With regard to the use of the facilities, there is a potential for mobilisation of bottom sediments via propeller wash by vessels coming to the ro-ro ramp, travel lift and fuelling facilities. I am advised that the 'most normal' large vessel usage envisioned for the facilities would have a draft of up to 5 m. Given that the underlying sediment seabed in the locality of the facilities ranges from -8 to -11 m ISLW there is adequate bottom clearance to prevent significant mobilisation of sediments from the work areas.

3.1 Fisheries Management Act Permit and Habitat Protection Requirements

Part 7 of the Fisheries Management Act 1994 (FMA) sets out the conditions under which permits are required for various construction activities, and the conditions under which a permit may be granted are specified in the NSW Fisheries' Policy and Guidelines (NSW Fisheries 1999). With respect to estuarine activities permits are required for reclamation or dredging works and for the taking or harming of marine vegetation.

The present proposal does not include activities which fall under the definition of dredging or reclamation and the proposed works do not entail a risk of significantly harming intertidal or shallow sub-tidal marine vegetation. Accordingly, the proposal is not likely to require permits from DPI Fisheries.

3.2 SREP Considerations

In this section the potential impact of the proposed works on aquatic ecological biodiversity, ecology and environmental protection are assessed against the Sydney Regional

Environmental Plan (Sydney Harbour Catchment) 2004 and the DCP for SREP (Sydney Harbour Catchment) 2004.

Assessment criteria under Clause 17 of the Draft SREP (Sydney Harbour Catchment) 2004 for biodiversity, ecology and environmental protection are set out in Appendix B of the draft DCP - matters for consideration relevant to Draft DCP Part 2 Tables 1–6:

17(a) *Need for development to have a neutral or beneficial effect on water quality entering the waterway.*
Provided the construction works utilise best management practice for containing water and materials runoff from the site, water quality impacts would be minimal and temporary. Following completion of the works there would be a net benefit for water quality as adjacent site runoff would be contained.

17(b) *Need for development to protect and enhance terrestrial and aquatic ecological communities.*
There would be some loss of aquatic vegetation to shading (21 m^2 or about 4.2 % for the designated wetland in this location) but this would be compensated for by the provision of at least double this much algae habitat on the wetted surface areas of the proposed pontoons. With respect to remaining aquatic ecological communities there is expected to be a net positive benefit in the provision of some 500 m^2 of additional hard substratum wetted surface areas for colonisation by other aquatic biota.

17(c) *Need for development to avoid indirect impacts on aquatic vegetation as a result of increased access.*
The rock revetment and the breakwater are currently fenced off from access and the whole site excludes public access. Given the uneven surfaces of these structures and the consequent danger of injury for persons climbing onto the rocks it is more than likely that, from an OH&S perspective, fencing will be required to exclude access to the rocks. Accordingly the proposed facilities would not result in any significant increased access to aquatic vegetation in the locality thus there would be no indirect impacts on aquatic vegetation.

17(d) *Need for development to protect and reinstate natural inter-tidal foreshore areas, natural landforms and native vegetation.*
The existing shore-line comprises a built rock revetment wall and a concrete decked reclamation (Walsh Bay Container terminal) built out over what was once a deep water (up to 10 m muddy embayment. There is no opportunity to reinstate natural inter-tidal foreshore areas.

Notwithstanding this the rock revetment provides a valuable rocky reef type of intertidal rocky shore and reef which is to be retained.

17(f) *Need for development on land adjoining wetlands to maintain and enhance the ecological integrity of the wetlands and where possible to provide a vegetative buffer to protect wetlands.*

The wetland designation for this site relates to the provision of intertidal to sub-tidal sloping rock revetment habitat which supports algae. As indicated in the impact assessment above, the project would result in a net increase in available hard-substratum area for support of algae. With respect to development on lands adjoining this wetland the development would incorporate stormwater controls which would divert runoff from the rock revetment area and the development would include fencing to exclude public assess to the wetland.

4 CONCLUSIONS

It is concluded that the construction works associated with the proposed Baileys Marine Common User Services Park at White Bay Berth 6, plus the use of the facilities once built can be undertaken in such a way that there would be no significant impacts on water quality and aquatic ecology. Construction and operational impacts can be minimised to insignificance by appropriate construction safeguards, some of which are provided in this report.

In the short term construction impacts will be insignificant with later positive benefits arising from both overall site water quality control and colonisation of the additional hard substratum habitat provided by the facility. Operational impacts can also be minimised to insignificance by appropriate safe work practices to prevent pollution of waters.

Accordingly, the project could meet the aquatic ecology conservation requirements of the DCP under SREP (Sydney Harbour) and could meet the aquatic ecology and fish habitat conservation requirements of the Fisheries Management Act 1994 and the NSW Fisheries guidelines (DPI Fisheries 1999).

With respect to permit requirements under the Fisheries Management Act (1994), it is unlikely that the proposal would require a permit

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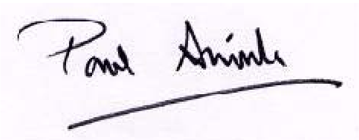

Paul Anink
Aquatic Ecologist
Marine Pollution Research Pty Ltd 11 June 2006

Appendix J

TERRESTRIAL FLORA AND FAUNA RECORDS

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Search Results

Your selection: Fauna, threatened species, recorded since 1980, Selected Area - 151.13861,-33.91250,151.23861,-33.81250 returned a total of 93 records of 16 spe
Report generated on 06/09/2006 - 12:52 (Data valid to 03/09/2006)

view map search again clear selection

Choose up to 3 species to map.

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Hylidae						
	☐	Litoria aurea	Green and Golden Bell Frog	E1	6	
Myobatrachidae						
	☐	Pseudophryne australis	Red-crowned Toadlet	V	7	

Aves	Map	Scientific Name	Common Name	Legal Status	Count	Info
Anseranatidae						
	☐	Anseranas semipalmata	Magpie Goose	V	9	
Burhinidae						
	☐	Burhinus grallarius	Bush Stone-curlew	E1	1	
Columbidae						
	☐	Ptilinopus superbus	Superb Fruit-Dove	V	3	
Diomedeidae						
	☐	Diomedea exulans	Wandering Albatross	E1	1	
Haematopodidae						
	☐	Haematopus longirostris	Pied Oystercatcher	V	1	
Laridae						
	☐	Sterna albifrons	Little Tern	E1	1	
Psittacidae						
	☐	Lathamus discolor	Swift Parrot	E1	3	
Strigidae						
	☐	Ninox connivens	Barking Owl	V	1	
	☐	Ninox strenua	Powerful Owl	V	25	

Mammalia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Balaenidae						
	☐	Eubalaena australis	Southern Right Whale	V	1	

Otariidae					
	Arctocephalus forsteri	New Zealand Fur-seal	V	2	
	Arctocephalus pusillus doriferus	Australian Fur-seal	V	4	
Pteropodidae					
	Pteropus poliocephalus	Grey-headed Flying-fox	V	23	
Vespertilionidae					
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	5	

Choose up to 3 species to map.

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Search Results

Your selection: Fauna, threatened species, Selected Area - 151.13861,-33.91250,151.23861,-33.81250 returned a total of 107 records of 23 species.
Report generated on 06/09/2006 - 12:58 (Data valid to 03/09/2006)

Choose up to 3 species to map.

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Hylidae						
		Litoria aurea	Green and Golden Bell Frog	E1	7	
Myobatrachidae						
		Pseudophryne australis	Red-crowned Toadlet	V	7	

Aves	Map	Scientific Name	Common Name	Legal Status	Count	Info
Accipitridae						
		Erythrotriorchis radiatus	Red Goshawk	E1	1	
Anseranatidae						
		Anseranas semipalmata	Magpie Goose	V	9	
Ardeidae						
		Botaurus poiciloptilus	Australasian Bittern	V	1	
Burhinidae						
		Burhinus grallarius	Bush Stone-curlew	E1	1	
Columbidae						
		Ptilinopus superbus	Superb Fruit-Dove	V	5	
Diomedeidae						
		Diomedea exulans	Wandering Albatross	E1	1	
Estrildidae						
		Stagonopleura guttata	Diamond Firetail	V	1	
Haematopodidae						
		Haematopus longirostris	Pied Oystercatcher	V	1	
Laridae						
		Sterna albifrons	Little Tern	E1	2	
Meliphagidae						
		Xanthomyza phrygia	Regent Honeyeater	E1	2	
Psittacidae						

	Map	Scientific Name	Common Name	Legal Status	Count	Info
		Lathamus discolor	Swift Parrot	E1	3	
Strigidae						
		Ninox connivens	Barking Owl	V	1	
		Ninox strenua	Powerful Owl	V	25	

Mammalia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Balaenidae						
		Eubalaena australis	Southern Right Whale	V	1	
Burramyidae						
		Cercartetus nanus	Eastern Pygmy-possum	V	1	
Dasyuridae						
		Dasyurus maculatus	Spotted-tailed Quoll	V	1	
		Dasyurus viverrinus	Eastern Quoll	E1	1	
Otariidae						
		Arctocephalus forsteri	New Zealand Fur-seal	V	2	
		Arctocephalus pusillus doriferus	Australian Fur-seal	V	4	
Pteropodidae						
		Pteropus poliocephalus	Grey-headed Flying-fox	V	24	
Vespertilionidae						
		Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	6	

Choose up to 3 species to map.

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Search Results

Your selection: Flora, threatened species, recorded since 1980, Selected Area - 151.13861,-33.91250,151.23861,-33.81250 returned a total of 20 records of 13 spe[cies]

view map

Report generated on 06/09/2006 - 12:56 (Data valid to 03/09/2006)

view map search again clear selection search aga[in]

Choose up to 3 species to map.

clear select[ion]

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Epacridaceae						
		Epacris purpurascens var. purpurascens		V	2	
Fabaceae (Mimosoideae)						
		Acacia terminalis subsp. terminalis	Sunshine Wattle	E1	6	
Hygrophoraceae						
		Camarophyllopsis kearneyi		E1	1	
		Hygrocybe anomala var. ianthinomarginata		V	1	
		Hygrocybe aurantipes		V	1	
		Hygrocybe austropratensis		E1	1	
		Hygrocybe collucera		E1	1	
		Hygrocybe griseoramosa		E1	1	
		Hygrocybe lanecovensis		E1	1	
		Hygrocybe reesiae		V	1	
		Hygrocybe rubronivea		V	1	
Myrtaceae						
		Eucalyptus scoparia	Wallangarra White Gum	E1	1	
		Syzygium paniculatum	Magenta Lilly Pilly	V	2	

Choose up to 3 species to map.

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Search Results

Your selection: Flora, threatened species, Selected Area - 151.13861,-33.91250,151.23861,-33.81250 returned a total of 34 records of 21 species.
Report generated on 06/09/2006 - 12:59 (Data valid to 03/09/2006)

view map   search again   clear selection

Choose up to 3 species to map.

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Epacridaceae						
	☐	Epacris purpurascens var. purpurascens		V	2	
Fabaceae (Mimosoideae)						
	☐	Acacia bynoeana	Bynoe's Wattle	E1	2	
	☐	Acacia gordonii		E1	1	
	☐	Acacia terminalis subsp. terminalis	Sunshine Wattle	E1	8	
Hygrophoraceae						
	☐	Camarophyllopsis kearneyi		E1	1	
	☐	Hygrocybe anomala var. ianthinomarginata		V	1	
	☐	Hygrocybe aurantipes		V	1	
	☐	Hygrocybe austropratensis		E1	1	
	☐	Hygrocybe collucera		E1	1	
	☐	Hygrocybe griseoramosa		E1	1	
	☐	Hygrocybe lanecovensis		E1	1	
	☐	Hygrocybe reesiae		V	1	
	☐	Hygrocybe rubronivea		V	1	
Myrtaceae						
	☐	Darwinia biflora		V	1	
	☐	Eucalyptus camfieldii	Heart-leaved Stringybark	V	3	
	☐	Eucalyptus pulverulenta	Silver-leafed Gum	V	1	
	☐	Eucalyptus scoparia	Wallangarra White Gum	E1	1	
	☐	Melaleuca deanei	Deane's Paperbark	V	2	
	☐	Syzygium paniculatum	Magenta Lilly Pilly	V	2	

Santalaceae					
	☐ Thesium australe	Austral Toadflax	V	1	
Tremandraceae					
	☐ Tetratheca juncea	Black-eyed Susan	V	1	

Choose up to 3 species to map.

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Table J1 Key to conservation status symbols used in fauna species inventories

Key to symbols	
*	Introduced species (not native to Australia)
E	Listed under Schedule 1 of the TSC Act as an endangered species
V	Listed under Schedule 2 of the TSC Act as a vulnerable species
E(C)	Endangered (Commonwealth level) - listed as endangered under the EPBC Act
V(C)	Vulnerable (Commonwealth level) - listed as vulnerable under the EPBC Act

Table J2 Fauna species recorded within the study area during the current investigation

Scientific Name	**Common Name**	**Conservation Status**
BIRDS		
Artamidae		
Gymnorhina tibicen	Australian Magpie	
Strepera graculina	Pied Currawong	
Charadriidae		
Vanellus miles	Masked Lapwing	
Columbidae		
Columba livia	Feral Pigeon	*
Ocyphaps lophotes	Crested Pigeon	
Streptopelia chinensis	Spotted Turtle-Dove	*
Corvidae		
Corvus coronoides	Australian Raven	
Dicruridae		
Rhipidura leucophrys	Willie Wagtail	
Grallina cyanoleuca	Magpie Lark	
Halcyonidae		
Dacelo novaeguineae	Laughing Kookaburra	
Laridae		
Larus novaehollandiae	Silver Gull	
Meliphagidae		
Manorina melanocephala	Noisy Miner	
Phalacrocoracidae		
Phalacrocorax carbo	Great Cormorant	
Psittacidae		
Trichoglossus haematodus	Rainbow Lorikeet	
Sturnidae		
Acridotheres tristis	Common Myna	*
Sturnus vulgaris	Common Starling	*

Table J3 Key to conservation status symbols used in flora and fauna species inventories

Key to symbols	
*	Introduced species (not native to Australia)
N (Wx)	Noxious weed listed under the *NSW Noxious Weeds Act 1993* (see Box 1)
P	Planted specimen
Ni	non-indigenous native species (Australian in origin, but not indigenous to this locality)
E	Listed under Schedule 1 of the TSC Act as an endangered species
V	Listed under Schedule 2 of the TSC Act as a vulnerable species
E(C)	Endangered (Commonwealth level) - listed as endangered under the EPBC Act
V(C)	Vulnerable (Commonwealth level) - listed as vulnerable under the EPBC Act

Table J4 Flora species recorded within the study area during the current investigation

Scientific Name	**Common Name**	**Conservation Status**
Adiataceae		
Adiantum aethiopicum	Common Maidenhair Fern	
Amaryllidaceae		
Crinum pendunculatum	Swamp Lily	P
Apiaceae		
Foeniculum vulgare	Fennel	*
Apocynaceae		
Trachelospermum jasminoides	Star Jasmine	* P
Araliaceae		
Hedera helix	English Ivy	* P
Arecaceae		
Phoenix canariensis	Canary Island Date Palm; Phoenix Palm	* P
Asteraceae		
Ageratina adenophora	Crofton Weed	*
Bidens pilosa	Cobbler's Pegs	*
Conyza bonariensis	Flaxleaf Fleabane	*
Sonchus oleraceus	Common Sowthistle	*
Taraxacum officinale	Dandelion	*
Casuarinaceae		
Casuarina glauca	Swamp Oak	P
Davalliaceae		
Nephrolepis cordifolia	Fishbone Fern	Ni
Dennstaedtiaceae		
Hypolepis muelleri	Harsh Ground Fern	
Pteridium esculentum	Bracken	
Ericaceae		

Scientific Name	Common Name	Conservation Status
Rhododendron sp.	Rhododendron	* P
Fabaceae (Caesalpinioideae)		
Senna pendula var. *glabrata*	-	*
Fabaceae (Mimosoideae)		
Acacia longifolia subsp. *sophorae*	Coastal Wattle	P
Goodeniaceae		
Scaevola sp.	-	
Juncaceae		
Juncus usitatus	Common Rush	
Malvaceae		
Hibiscus tiltaceus	Beach Cottonwood	P Ni
Moraceae		
Ficus rubiginosa	Port Jackson Fig	
Myrtaceae		
Callistemon salignus	Willow Bottlebrush	P
Oleaceae		
Olea europaea subsp. *africana*	African Olive	* P
Onagraceae		
Oenothera stricta	Evening Primrose	*
Pittosporaceae		
Pittosporum undulatum	Sweet Pittosporum	Ni
Plantaginaceae		
Plantago lanceolata	Lamb's Tongue	*
Poaceae		
Avena fatua	Wild Oats	*
Chloris gayana	Rhodes Grass	*
Cortaderia selloana	Pampas Grass	* N(W2)
Digitaria sanguinalis	Summer Grass	
Eleusine indica	Crowsfoot Grass	*
Eragrotis curvula	African Lovegrass	*
Paspalum dilatatum	Paspalum	*
Pennisetum clandestinum	Kikuyu	*
Pennisetum alopecuroides	Swamp Foxtail	
Setaria palmifolia	Palm Grass	
Sapindaceae		
Cupaniopsis anacardioides	Tuckeroo	P
Ulmaceae		
Celtis sp.	-	
Urticaceae		

Scientific Name	Common Name	Conservation Status
Parietaria judaica	Pellitory	* N(W3)
Verbenaceae		
Lantana camara	Lantana	* N(W2)
Vitaceae		
Cissus antarctica	Water Vine	

Box 1 Control Categories of the *NSW Noxious Weeds Act 1993*

W1	The presence of the weed on land must be notified to the local control authority and the weed must be fully and continuously suppressed and destroyed.
W2	The weed must be fully and continuously suppressed and destroyed.
W3	The weed must be prevented from spreading and its numbers and distribution reduced.
W4a	The weed must not be sold, propagated or knowingly distributed and any part of the weed must be prevented from growing within 3 metres of the boundary of a property.
W4b	The weed must not be sold, propagated or knowingly distributed and any existing weed must be prevented from flowering and fruiting.
W4c	The weed must not be sold, propagated or knowingly distributed and the weed must be prevented from spreading to an adjoining property.
W4d	The weed: (a) must not be sold, propagated or knowingly distributed; and (b) must be fully and continuously suppressed and destroyed unless it is: · listed on the state heritage register under the Heritage Act 1977; listed for preservation or protection as a heritage item under an Environmental Planning Instrument under the Environmental Planning and Assessment Act 1979; · listed for preservation or protection in a tree preservation order of the council for the Local Government area; included for preservation or protection in a Plan of Management for a local government area under section 40 of the Local Government Act 1993; or ·included for preservation or protection in a noxious weed policy or a noxious weed control program approved by the local control authority for the area for which it is the local control authority.
W4e	The weed must be fully and continuously suppressed and destroyed. All reasonable precautions must be taken to ensure produce, soil, livestock, equipment and vehicles are free of the weed before sale or movement from an infested area of the property.
W4f	The weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by the local control authority must be implemented.
W4g	The weed must not be sold, propagated or knowingly distributed.

Table J5 Habitat requirements of threatened fauna species

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
Anseranas semipalmata	Magpie Goose	Vulnerable (TSC Act)	The Magpie Goose is still relatively common in the Australian northern tropics, but had disappeared from south-east Australia by 1920 due to drainage and overgrazing of reed swamps used for breeding. Since the 1980s there have been an increasing number of records in central and northern NSW. Vagrants can follow food sources to south-eastern NSW. Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. qually at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes.	No	1
Diomedea exulans	Wandering Albatross	Vulnerable (EPBC Act) & Endangered (TSC Act)	The Wandering Albatross visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. It has been recorded along the length of the NSW coast. At other times birds roam the southern oceans and commonly follow fishing vessels for several days. Wandering albatross spend the majority of their time in flight, soaring over the southern oceans. They breed on a number of islands just north of the Antarctic Circle: South Georgia Island (belonging to the UK), Prince Edward and Marion Islands (South Africa), Crozet and Kerguelen Islands (French Southern Territories) and Macquarie Island (Australia).	No	1
Haematopus longirostris	Pied Oystercatcher	Vulnerable (TSC Act)	The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	No	1
Sterna albifrons	Little Tern	Endangered (TSC Act)	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to	No	1

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
			November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. It breeds in spring and summer along the entire east coast from Tasmania to northern Queensland, and is seen until May, with only occasional birds seen in winter months. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.		
Lathamus discolour	Swift Parrot	Endangered (TSC Act)	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include *Eucalyptus robusta, Corymbia maculata, Corymbia gummifera, Eucalyptus sideroxylon*, and *Eucalyptus albens.*	No	1
Ptilinopus superbus	Superb Fruit-dove	Vulnerable (TSC Act)	Distributed along the east coast of Australia. Restricted to subtropical, dry and littoral rainforest, urban areas and sclerophyll forest. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in Eucalypt or Acacia woodland where there are fruit-bearing trees.	No	1, 2
Burhinus grallarius	Bush Stone-curlew	Endangered (TSC Act)	Historical records indicate the species was once widespread along the east coast of NSW including much of the Cumberland Plain. Records in recent years indicate the eastern NSW distribution has contracted to areas within the central and north coast of NSW. Preferred habitat includes dry open grasslands and croplands and habitats associated with woodlands of casuarinas, Eucalypts, Acacia or Epolycarpa.	No	2, 3
Xanthomyza phrygia	Regent Honeyeater	Endangered (TSC Act & EPBC Act)	Species distribution is now patchy and limited to less than 1500 individuals. Most important breeding sites include Warrumbungles NP, Pilliga NR, Barraba district and central coast around Gosford, Hunter Valley and Capertree Valley. Prefers temperate eucalypt woodlands, open forests, box-ironbark eucalypt assocaitions and wet lowland coastal forests dominated by *Eucalyptus robusta, Corymbia maculata* and riverine *Casuarina* woodlands.	No	2, 4

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
Ninox connivens	Barking Owl	Vulnerable (TSC Act)	Found throughout Australia except for the central arid regions and Tasmania. Generally considered uncommon in southern Australia. It has declined across much of its distribution across NSW and now occurs only sparsely. It is most frequently recorded on the western slopes and plains. It is rarely recorded in the far west or in coastal and escarpment forests. Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as *Acacia* and *Casuarina* species, or the dense clumps of canopy leaves in large eucalypts.	No	1, 2
Ninox strenua	Powerful Owl	Vulnerable (TSC Act)	Distributed along the coastal areas of Australia from north eastern Victoria to southern Queensland, from coastal to tableland areas, tall open forest, wet and dry sclerophyll forest, gully rainforest and woodland. Breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. Roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera, Allocasurina littoralis, Angophora floribunda, Exocarpus cupressiformis* and a number of eucalypt species.	No	1, 2
Litoria aurea	Green and Golden Bell Frog	Endangered (TSC Act) & Vulnerable (EPBC Act)	Distributed coastally and within the Greater Sydney Region. Prefers marches, dams and stream sides particularly those containing *Typha* sp. or *Eleocharis* sp. Also requires areas that are unshaded, free from predatory fish *Gambusia holbrooki* and diurnal sheltering, have a grassy area nearby and diurnal sheltering sites available. Species recorded in highly disturbed areas including industrial sites, brick pits, landfill areas and even cleared land.	No	1, 5
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable (TSC & EPBC Act)	Distributed from the central coast of NSW to eastern Victoria across the coast and ranges. It burrows in the banks of small creeks. Found in heath, woodland and open forest with sandy soils. Generally lives in the heath or forest and will travel several hundred metres to creeks to breed.	No	5, 6
Mixophyes balbus	Stuttering Frog	Vulnerable (EPBC Act) & Endangered (TSC Act)	Distributed from northern NSW, east of the Great Dividing Range to Victoria. The species has suffered a marked decline in distribution and abundance, particularly in south-east NSW. It is the only Mixophyes species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	No	1, 5

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
Pseudophryne australis	Red-crowned Toadlet	Vulnerable (TSC Act)	Confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Found in steep escarpments and plateaus and low undulating ranges. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter.	No	1, 5
Hoplocephalus bungaroides	Broad-headed Snake	Vulnerable (EPBC Act) & Endangered (TSC Act)	Distributed along the coast and ranges generally within a 250km radius of Sydney. Confined to Hawkesbury sandstone, under large slabs, in rock crevices or rocky ridges. Shelters under flat sandstone rocks on exposed cliff edges. Habitat is usually associated with woodland, open woodland and/or heath.	No	5, 7
Dasyurus maculatus	Spotted-tailed Quoll	Endangered (EPBC Act) & Threatened (TSC Act)	Recorded within rainforest, open forest, woodland, coastal heathland and inland riparian forest. Distributed on either side of the Great Dividing Range from southern Queensland to South Australia and Tasmania. Uses hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Uses 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces.	No	8, 9
Potorus tridactylus	Long-nosed Potoroo	Vulnerable (TSC Act)	Distributed along the east coast of Australia. Recorded in subtropical rainforest, warm and cool temperate rainforest, wet, dry and swamp sclerophyll forest with a dense lower stratum of grasses, ferns and grass like plants such as sedges or shrubs.	No	8
Arctocephalus forsteri	New Zealand Fur-seal	Vulnerable (TSC Act)	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Prefers rocky parts of islands with jumbled terrain and boulders.	No	1
Arctocephalus pusillus doriferus	Australian Fur-seal	Vulnerable (TSC Act)	Reported to have bred at Seal Rocks, near Port Stephens and Montague Island in southern NSW. Haul outs are observed at isolated places along the NSW coast. Prefers rocky parts of islands with flat, open terrain. They occupy flatter areas than do New Zealand Fur-Seals where they occur together.	No	1
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable (TSC & EPBC Act)	Distributed from central coastal Queensland near Rockhampton to Bungonia in southern NSW. Found mainly in areas with extensive cliffs and caves. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these	No	1, 8

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
			features in dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range.		
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	Vulnerable (TSC Act)	Occurs along the east and north-west coasts of Australia. Associated with a range of habitats across urban areas including caves, mines, bridges, buildings and other man-made structures.	No	1, 8
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable (TSC Act & EPBC Act)	Distributed from Bundaberg in Queensland through NSW and eastern Victoria. Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and *Melaleuca* swamps as well as urban gardens and cultivated fruit crops. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines and within cultivated gardens and fruit crops. Colonies within the Greater Sydney area include: Cabramatta Creek, Gordon, Royal Botanic Gardens and Matchum.	No	8, 10

References:

1. Department of Environment and Conservation (NSW) Threatened species, populations and ecological communities of NSW website: http://www.threatenedspecies.environment.nsw.gov.au/
2. Pizzey, G., and Knight, F. 1997, *A field guide to the birds of Australia*, Angus & Robertson, Sydney.
3. National Parks & Wildlife Service (NSW), 1999. *Threatened Species Information Burhinus grallarius*, NSW National Parks & Wildlife Service, Hurstville.
4. National Parks & Wildlife Service (NSW), 1999. *Threatened Species Information Xanthomyza phrygia*, NSW National Parks & Wildlife Service, Hurstville.
5. Cogger, H.G. 2000, *Reptiles & Amphibians of Australia*, Reed New Holland, Sydney
6. National Parks & Wildlife Service (NSW), 2001. *Threatened Species Information Heleioporus australiacus*, NSW National Parks & Wildlife Service, Hurstville.

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8. Strahan, R. 1995, *The Mammals of Australia*, Reed New Holland, Sydney

9. National Parks & Wildlife Service (NSW), 1999. *Threatened Species Information Dasyurus maculatus*, NSW National Parks & Wildlife Service, Hurstville.

10. National Parks & Wildlife Service (NSW), 2001. *Threatened Species Information Pteropus poliocephalus*, NSW National Parks & Wildlife Service, Hurstville.

Table J6 Habitat requirements of threatened flora species

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
Acacia bynoeana	Bynoe's Wattle	Vulnerable (EPBC Act)	Endemic to central eastern NSW. Occurs in an area from Hunter District (Morisset) south to Berrima and Mittagong, although its stronghold distribution is the Blue Mountains area. Grows mainly in heath and dry sclerophyll forest on sand or sandy clay usually in areas that are very infertile and well drained. Prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds (from grading) and in recently burnt open patches. Associated vegetation often includes *Corymbia gummifera*, *Eucalyptus haemastoma*, *Eucalyptus parramattensis*, *Eucalyptus sclerophylla*, *Banksia serrata*, *Banksia spinulosa*, *Acacia myrtifolia* and *Kunzea* species.	No	1
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	Endangered (EPBC Act)	Very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent collections have only been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsley Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays. Abundant on moist ground in heath and woodlands. Most areas of habitat or potential habitat are small, isolated, highly modified or disturbed due to surrounding urban development.	No	2
Allocasuarina portuensis	Nielsen Park She-oak	Endangered (TSC & EPBC Act)	The original known habitat of the Neilsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House. The original habitat is tall closed woodland. Canopy species include: *Ficus rubiginosa, Angophora costata, Elaeocarpus reticulatus* and *Gloichidion ferdinandi* with a shrub layer of *Pittosporum revolutum, Kunzea ambigua* and *Monotoca elliptica*. The original habitat occurs above a sandstone shelf approximately 20 m above the harbour. The shallow sandy soils are highly siliceous, coarsely textured and devoid of a soil profile. The plantings have occurred on similar soils.	No	2
Caladenia tessellata	Thick Lip Spider Orchid	Endangered (TSC Act), Vulnerable (EPBC Act)	Known to occur south from Swansea at Wyong, Ulladulla and Braidwood. Found in grassy, sclerophyll woodland on clay loam or sandy soils though the population near Braidwood is in low woodland with stony soil.	No	2, 3
Camarophyllopsis kearneyi	-	Endangered (TSC Act)	Its occurrence appears to be limited to the Lane Cove Bushland Park in the Lane Cove local government area in Sydney. Does not produce basidiomes (above-ground fruiting structures) all year, but may be present only as non-reproductive hyphal structures below	No	2

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
			ground.		
Cryptostylis hunteriana	Leafless Tongue-orchid	Vulnerable (TSC & EPBC Act)	Recorded between Batemans Bay and Nowra, Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-ring-gai Chase National Park and Ben Boyd National Park. No well defined habitat preferences and known from a range of communities including swamp, heath on sandy soils and woodland. Larger populations typically occur in woodland dominated by *Eucalyptus sclerophylla, Eucalyptus sieberi, Corymbia gummifera* and *Allocasuarina littoralis*.	No	2, 3
Darwinia biflora	-	Vulnerable (TSC & EPBC Act)	Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include *Eucalyptus haemastoma, Corymbia gummifera* and/or *E. squamosa*. The vegetation structure is usually woodland, open forest or scrub-heath.	No	2
Deyeuxia appressa	-	Endangered (TSC & EPBC Act)	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas.	No	2
Dillwynia tenuifolia	-	Vulnerable (TSC & EPBC Act)	Core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. Other populations have been recorded from Voyager Point, Kemps Creek, Luddenham and South Maroota. Disjunct communities occur at Yengo, Kurrajong Heights and Woodford in the Blue Mountains. May be locally abundant within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	No	2
Epacris purpurascens var. *purpurascens*	-	Vulnerable (TSC Act)	Recorded from Gosford in the north, Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the south. Found in habitat types with a strong shale influence including: ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities e.g. Stringybark and Ironbark Woodlands, various Shale/Sandstone Transition Forest associations including Turpentine Ironbark Margin Forest, Stringybark/Scribbly Gum Woodland and Scribbly Gum/Grey Gum/Red Bloodwood Woodland. Also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium.	No	4

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
Eucalyptus camfieldii	Camfield's Stringybark	Vulnerable (TSC & EPBC Act)	Restricted distribution in a narrow band from Raymond Terrace to Waterfall. Localised distribution includes Norah Head, Peats Ridge, Mt Colah, Elvina Bay Trail, Terrey Hills, Killara, North Head, Menai, Wattamolla and other sites in the Royal National Park. Occurs mostly in small scattered stands near the boundary of tall coastal heaths on exposed sandy ridges and low open woodland of the slightly more fertile inland areas. Occurs on shallow sandy soils overlying Hawkesbury Sandstone often within restricted drainage. Associated species frequently include *Eucalyptus oblonga, Eucalyptus capitellata* and *Eucalyptus haemostoma.*	No	2
Eucalyptus scoparia	Wallangarra White Gum	Endangered (TSC Act), Vulnerable (EPBC Act)	Occurs in Queensland and reaches its southern limit in NSW. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. Found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops.	No	2
Haloragodendron lucasii	-	Endangered (TSC & EPBC Act)	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels.	No	2
Hygrocybe anomala var. ianthinomarginata	-	Vulnerable (TSC Act)	Type locality, Lane Cove Bushland Park, Lane Cove Local Government Area. Other records from Royal and Blue Mountains NPs. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum*. Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2
Hygrocybe aurantipes	-	Vulnerable (TSC Act)	Type locality, Lane cove Bushland Park, Lane Cove Local Government Area. Other records from Blue Mountains National Park (Mt Wilson) and Hazelbrook. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum*. Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2
Hygrocybe austropratensis	-	Endangered (TSC Act)	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum.*	No	2

Scientific Name	Common Name	Conservation Status	Distribution and Habitat	Habitat Available On-site	Reference
			Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.		
Hygrocybe collucera	-	Endangered (TSC Act)	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum.* Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2
Hygrocybe griseoramosa	-	Endangered (TSC Act)	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum.* Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2
Hygrocybe lanecovensis	-	Endangered (TSC Act)	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum.* Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2
Hygrocybe reesiae	-	Vulnerable (TSC Act)	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Also recorded from Blue Mountains National Park in the Hazelbrook area. Also found in Tasmania. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum.* Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2
Hygrocybe rubronivea	-	Vulnerable (TSC Act)	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by *Acmena smithii, Backhousia myrtifolia, Glochidion ferdinandi* and *Pittosporum undulatum.* Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occurs as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	No	2

Scientific Name	**Common Name**	**Conservation Status**	**Distribution and Habitat**	**Habitat Available On-site**	**Reference**
Melaleuca deanei	Deane's Melaleuca	Vulnerable (TSC & EPBC Act)	Occurs in the Ku-ring-gai/Berowa and Holsworthy/Wedderburn areas. Isolated occurrences at Springwood, Wollemi National Park, Yalwal and Central Coast (Hawkesbury River) areas. Grows in wet, marshy heath on coastal sandstone plateaus, open laterite and sandy ridges.	No	5, 6
Syzygium paniculatum	Magenta Lilly Pilly	Vulnerable (TSC & EPBC Act)	Current distribution indicates a narrow, linear coastal distribution between Bulahdelah and Conjola State Forest, within the Local Government Areas of Great Lakes, Dungog, Lake Macquarie, Wyong, Gosford, Canterbury, Sutherland and Shoalhaven. On the central coast, occurs on quaternary gravels, sands, silts and clays in riparian gallery rainforest and remnant littoral rainforest communities. On the south coast, occurs on sandy grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest.	No	7
Tetratheca glandulosa	-	Vulnerable (TSC & EPBC Act)	Populations range from Sampons Pass in the north, West Pymble to the south, Ingleside to the east and East Kurrajong to the west. Strongholds for the species occur at Berowa Valley, Maroota-South Maroota, Marramarra National Park, Dharug National Park, Mangrove Mountain-Central Mangrove and Ourimbah State Forest. Associated with areas of shale-sandstone transition habitat. Occur on ridgetops, upper slops and mid slope sandstone benches. Vegetation structure varies from heaths and scrub to woodlands/open woodlands and open forest including Sydney Sandstone Ridgetop Woodland. Larger populations occur in woodland/open woodland that provide semi-shade.	No	8, 9
Thesium australe	Austral Toadflax	Vulnerable (TSC & EPBC Act)	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland.Often found in damp sites in association with Kangaroo Grass *Themeda australis*. A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	No	4

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1. National Parks & Wildlife Service (NSW), 1999. *Threatened Species Information Acacia bynoeana,* NSW National Parks & Wildlife Service, Hurstville.
2. Department of Environment and Conservation (NSW) Threatened species, populations and ecological communities of NSW website: http://www.threatenedspecies.environment.nsw.gov.au/
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4. National Parks & Wildlife Service (NSW), 2002. *Threatened Species Information Epacris purpurascens var. purpurascens*, NSW National Parks & Wildlife Service, Hurstville.
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9. Harden G.J. (ed). 1992. *Flora of New South Wales. Volume 3*. New South Wales University Press, Kensington.

Appendix K

AIR QUALITY (ODOUR) ASSESSMENT

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REPORT 10-4638-R1

Revision 0

Proposed Common User Marine Facility
White Bay Berth No.6
Air Quality Impact Assessment

PREPARED FOR

Kellogg Brown & Root Pty Ltd
Level 9, 201 Kent Street
SYDNEY NSW 2000

3 MAY 2006

Proposed Common User Marine Facility

White Bay Berth No.6

Air Quality Impact Assessment

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10-4638-R1	Revision 0	3 May 2006			

EXECUTIVE SUMMARY

Heggies Australia Pty Ltd have been commissioned by Kellogg Brown & Root Pty Ltd on behalf of Bailey's Marine Fuels Australia to undertake an air quality impact assessment for the proposed Common User Marine Facility (hereafter, CUMF) to be located at White Bay Berth 6, Balmain East, NSW

The proposed CUMF is planned to comprise of the following components:

- Bulk indoor and outdoor storage space for marine equipment like rope, buoys, lifeboats or other marine hardware;
- Roll-on/roll-off ramp for land to barge (or similar) to service harbour islands with an associated lay down area for temporary storage of goods for water transport;
- Marine refuelling facilities, grey water and sullage pump facilities for commercial vessels, professional fishing vessels, tug boats, water taxis, public transport vessels operated by Sydney Ferries and recreational vessels;
- A small number of office leases for commercial marine service businesses;
- Supply point for commercial vessels to collect pre-ordered supplies;
- Dedicated space for port security and emergency services to mobilise and use as a control point in the event of harbour emergencies;
- Temporary vessel moorings for short term berthing of vessels while repair or maintenance works are undertaken or other services offered through the supply facility are utilised;

Based on the available data, site-specific ambient air quality levels adopted for assessment purposes are as follows.

- Dust Deposition: An annual average deposition rate of the order of 2 g/m^2/month.
- PM_{10}: A daily varying 24-hour average concentration and an annual average of 20 $\mu g/m^3$.

The following project-specific air quality goals have been established for assessment purposes.

- An annual average dust deposition rate of 4 g/m^2/month.
- A 24-hour maximum concentration of PM_{10} of 50 $\mu g/m^3$.
- An annual average concentration of PM_{10} of 30 $\mu g/m^3$.

The Air Pollution Model (TAPM) software was used to simulate the meteorology of the proposed CUMF Site. TAPM is a prognostic model which may be used to predict three-dimensional meteorological data.

To provide concurrent observations with the daily varying background PM_{10} data used in the assessment, TAPM was used to generate a 2004 meteorological data set, using the data assimilation option to incorporate observations from the Bureau of Meteorology's Fort Denison Automatic Weather Station.

Inspection of the 2004 meteorology revealed occurrences of wind directions from all quadrants, with the annual wind rose indicating that winds tend to be experienced from the western quadrant.

A high frequency of conditions typical of Atmospheric Stability Class "D" was predicted throughout the year at the Project Site. This is indicative of neutral atmospheric conditions, which neither enhance nor diminish atmospheric dispersion due to mechanical mixing.

A review has been carried out of the potentially particulate-generating activities expected during the construction phase of the proposed CUMF. For the modelling, the following activities (where applicable) have been included in the particulate emissions inventory.

- Excavation of materials in proposed fuel tank storage area
- Breaking and removal of hard surface material (ie concrete and asphalt) for the establishment of building foundations, new roads etc within proposed project site.
- Wind erosion of open pit areas and material stockpiles.
- Movement of heavy vehicles on roads within the site (truck wheel-generated dust).

Computer predictions of fugitive emissions (PM_{10} and dust deposition) attributable to the construction phase of the proposed CUMF were undertaken using the Ausplume Gaussian Plume Dispersion Model software developed by EPA (Victoria) to determine the resulting air quality impacts of the proposed operation.

All modelling predictions indicate that, provided that specific design and operational safeguards are implemented, particulate matter and dust deposition during the construction of the proposed CUMF are anticipated to be within the current DEC (and NEPM) air quality goals at all surrounding receptors.

Following discussion with the DEC Air Policy Unit, it has been concluded that quantitative assessment (modelling) of the operational phase is not required. However, details of the proposed air pollution abatement technologies intended for use at the proposed CUMF have been provided.

The planned installation of vapour recovery and odour abatement technologies is designed to ensure that the operational phase activities, (including marine vessel refuelling, underground tank loading and sewage transfer) will have a negligible impact on the surrounding area.

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1 INTRODUCTION

Heggies Australia Pty Ltd (Heggies) have been commissioned by Kellogg Brown & Root Pty Ltd (KBR) on behalf of Bailey's Marine Fuels Australia (BMF) to undertake an air quality impact assessment for the proposed Common User Marine Facility (hereafter CUMF) to be located at White Bay Berth 6, Balmain East, NSW.

The purpose of this assessment is to determine the potential impact of the construction and operational stages of the proposed CUMF, in terms of particulate matter and odour, on the local area.

1.1 Project Background

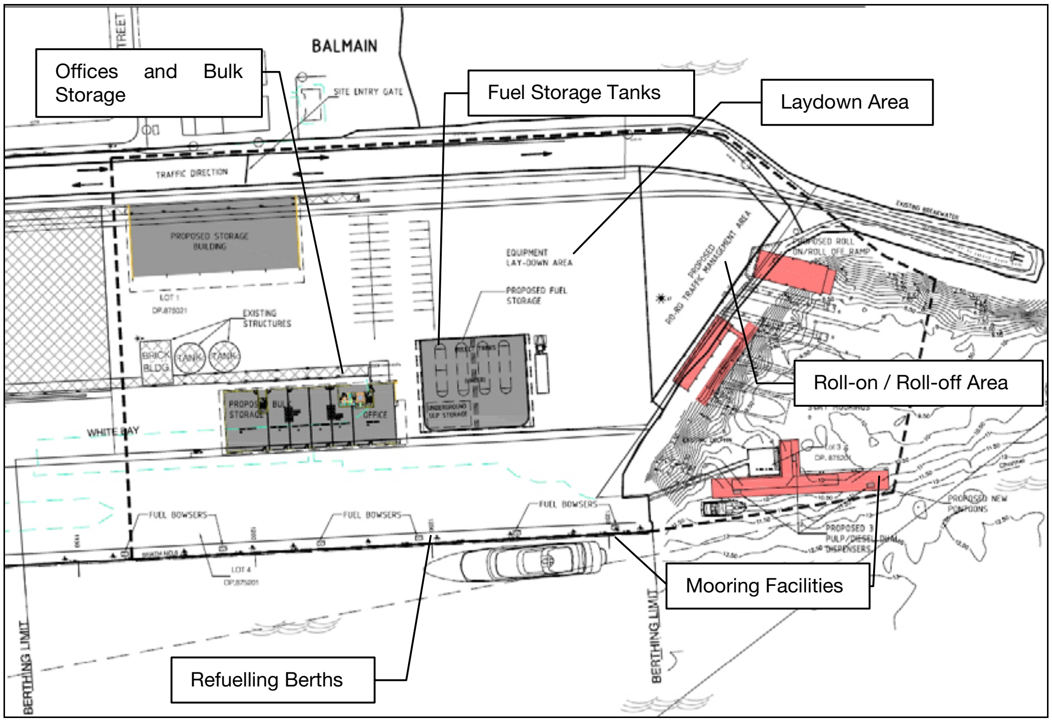
The proposed CUMF is to be located at White Bay Berth 6 at Balmain East in Sydney's Inner West on land currently owned and run by Sydney Ports Corporation (SPC). The proposed site is adjacent to residential development to the north and marine use to the south.

The proposed CUMF is planned to comprise of the following components:

- Bulk indoor and outdoor storage space for marine equipment like rope, buoys, lifeboats or other marine hardware;
- Roll-on/roll-off ramp for land to barge (or similar) to service harbour islands with an associated lay down area for temporary storage of goods for water transport;
- Marine refuelling facilities, grey water and sullage pump facilities for commercial vessels, professional fishing vessels, tug boats, water taxis, public transport vessels operated by Sydney Ferries and recreational vessels;
- A small number of office leases for commercial marine service businesses;
- Supply point for commercial vessels to collect pre-ordered supplies;
- Dedicated space for port security and emergency services to mobilise and use as a control point in the event of harbour emergencies;
- Temporary vessel moorings for short term berthing of vessels while repair or maintenance works are undertaken or other services offered through the supply facility are utilised;

Figure 1 details the layout of the proposed CUMF.

Figure 1 Layout of the Proposed CUMF, White Bay Berth 6



2 EXISTING AIR QUALITY ENVIRONMENT

2.1 Background Dust Deposition Environment

Background dust deposition data is not available for the area surrounding East Balmain. In the absence of background data, it is assumed that the incremental increase in dust deposition will be the governing criterion for this assessment (see **Section 3.3**). Such a conservative assumption is dependent upon a background ambient level of less than or equal to 2 g/m^2/month; a conservative assumption for urban Sydney.

2.2 Particulate Matter Less than 10 Microns (PM_{10})

The term "particulate matter" refers to a category of airborne particles typically less than 50 microns (μm) in aerodynamic diameter and ranging down to 0.1 μm in size. Particles less than 10 μm are referred to in this report as PM_{10}.

Site representative PM_{10} data was obtained from the NSW Department of Conservation (hereafter, DEC) air quality monitoring station at Rozelle, located approximately 3 km west-southwest of the proposed site. The monitoring station is located in the grounds of Rozelle Hospital, off Balmain Road, Rozelle.

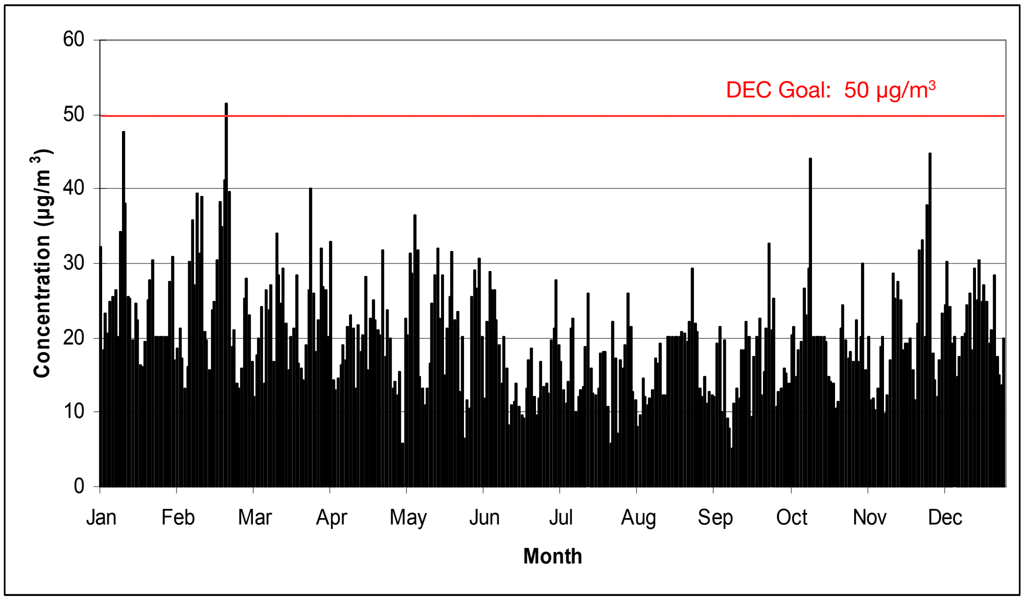
The following air pollutants are measured at the Rozelle monitoring station:

- PM_{10};
- Ozone (O_3);
- Oxides of nitrogen (NO, NO_2 & NO_X);
- Sulphur dioxide (SO_2); and
- Carbon monoxide (CO).

Ambient concentrations of PM_{10} are recorded at Rozelle using a Tapered Element Oscillating Microbalance (TEOM) instrument. This instrument gives real-time recordings of ambient particulate matter, detected by observing changes to the loading on a filter mounted within the unit.

The verified data for 2004, showing 24-hour average PM_{10} concentrations at the Rozelle monitoring site, is presented in **Figure 2**.

Figure 2 24-Hour Average PM_{10} Concentrations - Rozelle, 2004



As illustrated in **Figure 2**, the recorded 24-hour average PM_{10} concentrations at Rozelle exceed the DEC's goal of 50 µg/m³ once during 2004. This highest observed concentration was 51.4 µg/m³, occurring on the 21 February 2004.

For modelling purposes, this exceedance has been removed and replaced with the annual average for the data set. The highest observed concentration that did not exceed the DEC's goal of 50 µg/m³ was 47.7 µg/m³, occurring on the 10 January 2004. The annual average PM_{10} concentration for 2004 was 20.2 µg/m³.

2.3 Odour

Background odour data is not available for the area surrounding East Balmain. The White Bay Berth 6 is currently used for new car storage and odour sources from the surrounding area are those typical of an urban water body and associated marine vessel operations, including onboard generators and exhausts.. These odour emissions are not deemed to be significant and it is thus assumed that there is negligible background odour within the vicinity of the project site.

2.4 Background Air Quality for Assessment Purposes

The background ambient air quality adopted for the assessment of the proposed CUMF are summarised in **Table 1**.

Table 1 Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Assumed Background Concentration
PM_{10}	24-Hour	Varies[1]
	Annual	20.2
Deposited Dust	Annual	2.0
Odour	1-second (Nose Response)	Negligible

Note 1 Daily-varying 24-hour average PM_{10} concentrations are to be used within the PM_{10} modelling

3 AIR QUALITY GOALS AND RELEVANT APPROVALS

3.1 Criteria Applicable to Particulate Matter Less than 10 Microns (PM_{10})

Emissions of PM_{10} are considered important pollutants in terms of impact due to their ability to penetrate into the respiratory system. Recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM_{10} include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

One of the difficulties in dealing with air quality criteria governing fine particles such as PM_{10} is that the medical community has not been able to establish a threshold value below which there are no adverse health impacts.

The NSW DEC PM_{10} impact assessment criteria, as expressed in their document *Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales* (DEC 2005) (hereafter AMMAAP), are:

- A 24-hour maximum of 50 $\mu g/m^3$.
- An annual average of 30 $\mu g/m^3$.

The 24-hour PM_{10} reporting standard of 50 $\mu g/m^3$ is numerically identical to the equivalent NEPM reporting standard except that the NEPM reporting standard allows for five exceedances per year.

3.2 Criterion Applicable to Total Suspended Particulate (TSP)

The annual goal for Total Suspended Particulate (or TSP) is given as 90 $\mu g/m^3$ as recommended by the National Health and Medical Research Council (NHMRC) at their 92nd session in October 1981. It was developed before the more recent results of epidemiological studies suggested a relationship between health impacts and exposure to PM_{10} concentrations.

It is noted that the PM_{10} sub-set is typically 50% of total suspended particulate (TSP) mass in regions where road traffic is not the dominant particulate source (USEPA, 2001). This would be consistent with an annual average PM_{10} goal of approximately 45 $\mu g/m^3$ (derived from 50% of the annual NHMRC goal of 90 $\mu g/m^3$). Thus, the historical NHMRC goal may be regarded as not as stringent as the newer PM_{10} goal of 30 $\mu g/m^3$ expressed as an annual average.

Where road traffic is the dominant source of particulate pollution, (as may be the case in the East Balmain region), the PM_{10} subset of TSP from vehicle exhaust emissions (diesel emissions) can be as high as 96% (Watson et al, 2000). Therefore, as the annual TSP goal is seen to be achieved if the annual PM_{10} goal is satisfied, TSP has not been considered further in this report.

3.3 Nuisance Impacts of Fugitive Emissions

The preceding sections are concerned with the health impacts of particulate matter. Nuisance impacts also need to be considered, mainly in relation to dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 g/m^2/month.

Table 2 presents the NSW DEC impact assessment criteria for dust fallout, showing the allowable increase in dust deposition levels over the ambient (background) level which would be acceptable so that dust nuisance could be avoided.

Table 2 DEC Criteria for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m^2/month	4 g/m^2/month

Source: AMMAAP, DEC 2005.

As the ambient dust deposition level has been assumed to be less than or equal to 2 g/m^2/month (see **Section 2.1**), the maximum increase in deposited dust level will be the governing goal for the project.

3.4 Goals Applicable to Odour Emissions

Impacts from odorous air contaminants are often nuisance-related rather than health-related. Odour performance criteria guide decisions on odour management, but are not specifically intended to achieve "no odour". The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. This point is called the odour threshold and defines one odour unit per cubic metre (OU/m^3). Therefore, an odour criterion of less than 1 OU/m^3 would theoretically result in no odour impact being experienced.

In practice, the character of a particular odour can only be judged by the receiver's reaction to it, and preferably only compared to another odour under similar social and regional conditions. Based on the literature available, the level at which an odour is perceived to be a nuisance can range from 2 OU/m^3 to 10 OU/m^3

Odour performance criteria need to be designed to take into account the range in sensitivities to odours within the community, and provide additional protection for individuals with a heightened response to odours, using a statistical approach which depends on the size of the affected population. A summary of odour performance criteria for various population densities is shown in **Table 3**.

Table 3 DEC Odour Performance Criteria vs. Population Density

Population of Affected Community	Odour Performance Criteria OU/m^3
Urban area (≥ 2000)	2.0
500 - 2000	3.0
125 - 500	4.0
30 - 125	5.0
10 - 30	6.0
Single residence (≤ 2)	7.0

Source: *Technical Notes: Draft Policy, Assessment and Management of Odours from Stationary Sources in New South Wales*, DEC 2001

Note: These should be regarded as interim criteria to be refined over time through experience and case studies.

The area surrounding the Project Site may be regarded as urban. Consequently, the project odour performance goal adopted for this assessment is:

- A maximum of 2.0 odour units per cubic metre (OU/m^3) expressed as a nose response average (1-second) value.

3.5 Project Air Quality Goals

In view of the foregoing, the air quality goals adopted for this assessment, which conform to current DEC air quality targets and other relevant air quality criteria, are summarised in **Table 4.**

Table 4 Project Air Quality Goals

Pollutant	Averaging Time	Maximum Concentration	Reference
PM_{10}	24 hours Annual	50 µg/m^3 30 µg/m^3	DEC/NEPM
Dust Deposition	Annual	Incremental increase of 2 g/m^2/month [1]	DEC
Odour	1-Second	2 OU/m^3	DEC

Note 1: Assumes a background of less than or equal to 2.0 g/m^2/month

3.6 Relevant Approvals

In addition to compliance with the ground level concentration criteria detailed above, the proposed CUMF should satisfy the requirements as set out under *"Control of Volatile Organic Liquids"* (Part 5) of the *Protection of the Environment Operations (Clean Air) Amendment Regulation 2005* (the "Regulation") with respect to fuel storage and handling operations. This regulation is made under the *Protection of the Environment Operations Act 1997* (POEO Act).

The proposed CUMF will comprise of 4 small tanks in total for petroleum storage, with small tanks defined by Part 5 as:

> *"storage tank having a capacity of 8 kilolitres or more but less than 150 kilolitres."*

Part 5 states that for small tank facilities, such as the proposed CUMF:

> *"the occupier of any premises must not use or operate, or cause or allow to be used or operated, any fuel burning equipment or industrial plant in or on those premises",*

unless the following control system requirements, as follows, are in place:

> *"(1) This clause applies to any small storage tank situated anywhere within the Sydney Metropolitan Area other than the local government area of Hawkesbury.*
>
> *(2) ....the following control equipment is the prescribed control equipment to be fitted to a small storage tank:*
>
> > *(a) a vapour transfer system by which all vapour displaced by the transfer of volatile organic liquid into the storage tank is returned to the delivery tank being unloaded by means of a vapour return line,*
> >
> > *(b) a coupling on the vapour return line that makes a vapour-tight connection with the vapour return hose on the delivery tank and that closes automatically when disconnected,*
> >
> > *(c) in the case of a tank that is filled by the operation of gravity, an overfill protection system designed to stop the flow of volatile organic liquid into the storage tank before there is insufficient space in that tank to receive the contents of the tank vehicle's transfer hose,*
> >
> > *(d) a coupling on the storage tank's fill-pipe that makes a liquid-tight connection with the delivery tank's liquid transfer hose,*

(e) in the case of a storage tank located above the ground, pressure vacuum valves on all atmospheric vents.

(3) The vapour transfer system referred to in subclause (2) (a) may be used to serve more than one storage tank on the same premises.

(4) A vapour return line referred to in subclause (2) (a) must be of vapour-tight construction and must have an internal diameter:

(a) in the case of such part of the vapour return line as is upstream of the first fitting or change in direction from the tank:

(i) not less than 50 per cent of the internal diameter of the fill-pipe, or

(ii) in the case of a tank installed before 1 May 1982 and in which the vapour return line is taken from the atmospheric vent, as large as practicable having regard to the internal diameter of the existing vent connection, and

(b) in the case of such part of the vapour return line as is downstream of the first fitting or change in direction from the tank, not less than 65 per cent of the internal diameter of the fill-pipe.

(5) The pressure vacuum valves referred to in subclause (2) (e):

(a) except as provided in paragraph (b), must be set to be closed when the pressure in the tank is between 15 kilopascals above, and 0.5 kilopascals below, ambient pressure, or

(b) in the case of tanks installed before 1 May 1982, may be set to be closed when the pressure in the tank is between the design operating maximum pressure and the design operating maximum vacuum.

(6) ….a hatch, manhole or other cover on or associated with a storage tank fitted with the prescribed control equipment referred to in subclause (2) must not be opened if, in so doing, vapour would be likely to be emitted to the atmosphere, except:

(a) in an emergency, or

(b) for the purpose of tank gauging or sampling through a dip hatch (when no liquid transfer hoses are connected to the tank or when any connected hoses are closed), or

(c) for the purpose of reasonable maintenance."

In relation to the unloading of large tank vehicles into small storage tank facilities, as would be the case at the proposed CUMF, Part 5 states the following:

"(1) This clause applies to:

(a) the loading of a large tank vehicle from large loading plant, and

(b) the unloading of a large tank vehicle into a small storage tank,

where the loading or unloading takes place anywhere within the Sydney Metropolitan Area.

(2) While a tank vehicle is being loaded with volatile organic liquid from large loading plant, the person in charge of the vehicle must ensure that the delivery tank mounted on the vehicle is properly connected to the vapour collection system of that plant.

(3) While a tank vehicle is being used to load volatile organic liquid into a small storage tank, the person in charge of the vehicle must ensure that:

(a) before any such loading takes place, the vapour return hose is connected to the appropriate vapour line coupling on the tank vehicle (except in the case of a permanently connected hose) and to the appropriate vapour return coupling on or associated with the storage tank, and

(b) the vapour return hose is not disconnected while volatile organic liquid is being loaded into the storage tank, and

(c) the connection or disconnection of any hose is done in such a manner as to avoid or minimise spillage, and

(d) the liquid transfer hose is not disconnected from the storage tank until the hose is empty of liquid.

(4) The person in charge of a tank vehicle must not, without reasonable excuse, leave open a hatch, manhole or other cover on any delivery tank mounted on the vehicle if to do so would be likely to result in vapour being emitted to the atmosphere."

4 DISPERSION MODELLING

4.1 Methodology

The atmospheric dispersion modelling carried out for assessment of the construction phase of the proposed CUMF utilises the Ausplume Gaussian Plume Dispersion Model software developed by EPA Victoria, Version 6.0.

Ausplume is the approved dispersion model for use in the majority of applications in NSW. Default options specified in the Technical Users Manual (EPA Victoria, 2000) have been used, as per AMMAAP (DEC 2005).

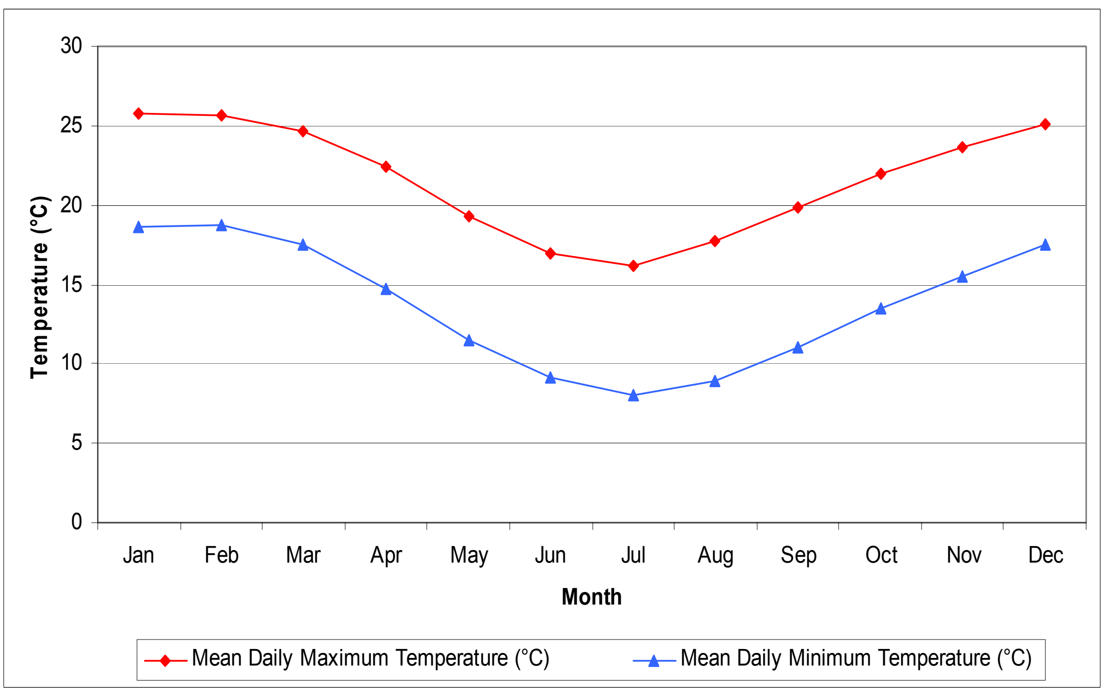
4.2 Climate Averages

The nearest Bureau of Meteorology (BoM) Automatic Weather Station (AWS) to the proposed CUMF site is the Observatory Hill AWS, located approximately 1.2 km to the east. Climatic averages are available since records began in 1858. Full details of the climate averages for the Observatory Hill AWS are given in **Appendix A**.

4.2.1 Air Temperature

The monthly fluctuations in mean daily minimum and mean daily maximum temperatures at Observatory Hill are shown in **Figure 3**.

Figure 3 Monthly Temperature Averages for Observatory Hill, 1858 – 2004



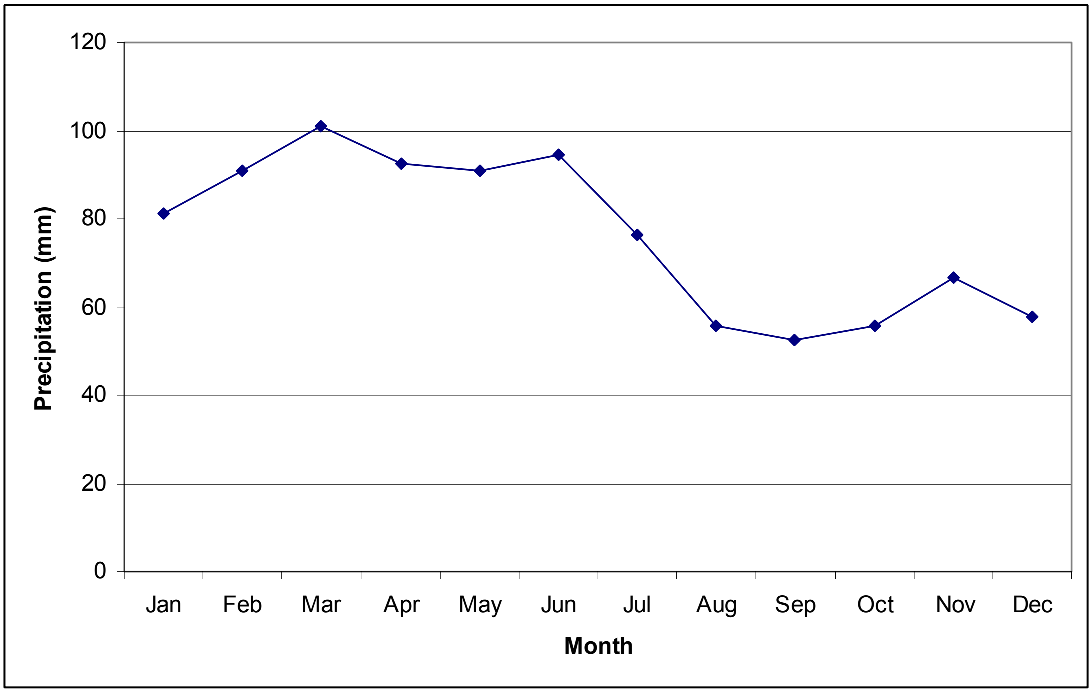
It can be seen from **Figure 3** that the temperature at the Observatory Hill AWS may be described as mild to warm overall. Air temperatures during the day tend to be mild to warm, varying from 16 °C - 18 °C in winter, to 25 °C – 26 °C in summer.

Air temperatures during the night tend to be cool to mild, varying from 8 °C – 9 °C in winter to 18 °C – 19 °C in summer.

4.2.2 Rainfall

A graph displaying the median (5th decile) monthly rainfall at the Observatory Hill AWS is shown in **Figure 4**.

Figure 4 Median (5th decile) Monthly Rainfall Measurements, Observatory Hill



The rainfall experienced at the Observatory Hill AWS can be described as moderate, with the area receiving, on average, approximately 1174 mm per annum. Rainfall at the Observatory Hill AWS is relatively uniform during the first six months of the year, with a decrease in rainfall during winter months and beyond.

Rainfall has a significant effect on the way in which particles behave in the atmosphere, and hence the way in which pollution is dispersed. When rainfall occurs, pollutants are flushed out of the atmosphere quickly, thus reducing potential nuisance impacts, as well as those on health and visibility.

4.2.3 Relative Humidity

The relative humidity at the Observatory Hill AWS can be described as moderate. The mean 9 am and 3 pm relative humidity is 69% and 57% respectively, with some variation occurring between the warmer and cooler months.

4.3 TAPM Generated Meteorology

TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), is a prognostic model which may be used to predict three-dimensional meteorological data, with no local data inputs required.

The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations. TAPM is often used where insufficient on-site meteorological data is available, and as such is considered suitable to predict indirect meteorological parameters in this assessment.

Thus, direct measurements obtained at the Fort Dension AWS (hourly average wind speed, wind direction and temperature), located approximately 3.2 km to the east of the project site, have been used in creating a meteorological input file for modelling purposes. Parameters not recorded by the AWS (atmospheric stability class, mixing height and sigma theta) but required by the meteorological input file have been synthetically generated using TAPM.

It is noted that while the Observatory Hill AWS is located at a closer proximity to the project site than the Fort Dension AWS, it does not record wind speed or direction and therefore could not be incorporated within the modelling. The Observatory Hill AWS was however a more suitable location for obtaining historical climate data, therefore the use of both AWS sites is justified.

4.3.1 Wind

A summary of the 2004 annual wind behaviour for the Fort Denison AWS presented as a wind rose is included in **Appendix B.** This wind rose displays occurrences of winds from all quadrants.

The annual wind rose indicates that light to moderate (between 1.5 m/s and 8 m/s) westerly winds are predominate (approximately 25%).

The seasonal variation in wind behaviour at the site is also presented in **Appendix B**. The seasonal wind roses indicate that:

- In spring, light to fresh winds (between 1.5 m/s and 10.5 m/s) are experienced from the west.
- In summer, light to fresh winds are experienced from the eastern quadrant.
- In autumn, light to moderate winds are experienced predominately from west (approximately 25%).
- In winter, light to fresh winds are experienced from predominately from west (approximately 45%).

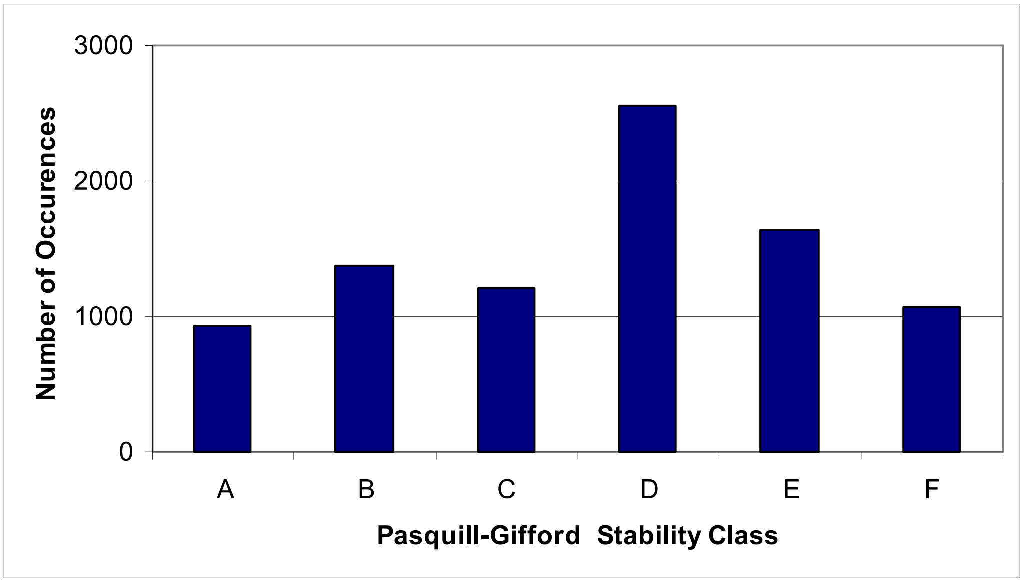
4.3.2 Atmospheric Stability

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Gifford assignment scheme identifies six Stability Classes, “A” to “F”, to categorise the degree of atmospheric stability. These classes indicate the characteristics of the prevailing meteorological conditions.

Stability Class “A” represents highly unstable conditions that are typically found during summer, categorised by strong winds and convective conditions. Conversely, Stability Class “F” relates to highly stable conditions, typically associated with clear skies, light winds and the presence of a temperature inversion. Classes “B” through to “E” represent conditions intermediate to these extremes.

The frequency of occurrence of each Stability Class for the year 2004, as predicted by TAPM, is presented in **Figure 5**.

Figure 5 Atmospheric Stability Class – Fort Denison 2004



The results indicate a high frequency of conditions typical to Stability Class "D". Stability Class "D" is indicative of neutral conditions, which will neither enhance nor impede atmospheric pollutant dispersion.

Appendix C illustrates the seasonal variation in atmospheric stability class at Fort Denison.

4.4 Nearest Sensitive Receptors

As previously discussed, the location of the proposed CUMF is within an urban area of Sydney and has nearby residential receptors that may be affected by the construction operations at the site.

The details of five representative receptors used in the modelling assessment are presented in **Table 5**.

Table 5 Details of Nearest Receptors

Receptor ID	Receptor Description	Easting (m)	Northing (m)
R1	1 Grafton Street	332455	6251694
R2	12 Grafton Street	332420	6251698
R3	10 Grafton Street	332419	6251714
R4	12 B Grafton Street	332357	6251701
R5	14 Grafton Street	332334	6251702

4.5 Emission Factors

A review has been carried out of the potentially particulate-generating activities expected during the construction phase of the proposed CUMF. For the modelling, the following activities (where applicable) have been included in the particulate emissions inventory.

- Excavation of materials in proposed fuel tank storage area
- Breaking and removal of hard surface material (concrete and asphalt) for the establishment of building foundations, new roads etc within proposed project site.
- Wind erosion of open pit areas and material stockpiles.
- Movement of heavy vehicles on roads within the site (truck wheel-generated dust).

Table 6 presents the emission factors used for the key atmospheric pollutants used in the dispersion modelling carried out for this report.

These relate to emissions expected under normal operating conditions. The ratio of the PM_{10} fraction of the total particulate emission (used to predict dust deposition) ranges from 50% (eg wind erosion) down to 25% (eg wheel-generated dust). The proportion of the PM_{10} fraction for each activity was derived primarily from the National Pollutant Inventory document, *Emission Estimation Technique Manual for Mining, Version 2.3*, (EETMM) (Environment Australia, 2001).

In general, default emission factors have been used as contained in Table 1 of the EETMM. In some instances, the moisture content of materials at the proposed CUMF site is not adequately reflected within the default emission factors contained in the EETMM, and the equations given in Table 1 of the EETMM document were therefore used to derive representative emission factors. The following emission factors were derived using this method.

- Excavator.
- Loading Haul Trucks.
- Haul truck wheel dust.

Table 6 Particulate Emission Factors for Air Quality Dispersion Modelling

Activity	Total Particulate Emission Factor[1]	PM_{10} Emission Factor	Emission Factor Units
Excavator – Rock Braking and Excavation	0.0012	0.0006	kg/t
Haul Truck Loading (by Excavator)	0.0012	0.0006	kg/t
Haul Truck Wheel-generated dust	1.76	0.55	kg/VKT[2]
Open Pit Wind Erosion	0.4	0.2	kg/ha/hr
Stockpile Wind Erosion	0.4	0.2	kg/ha/hr

Note 1: Total Particulate emission factor is used to derive the rate of dust deposition

Note 2: VKT = Vehicle Kilometre Travelled

It is noted that while the emission factors listed in **Table 6** are principally designed for assessment of extractive operations. However, it is anticipated that use of these emission factors will provide a conservatively high approximation of particulate generation during the construction phase of the CUMF.

4.5.1 Modelling Assumptions

Appendix D provides details of the emission inventory associated with the modelled construction period of the proposed CUMF using the emission factors given in **Table 6**.

The emission inventory has been derived to reflect the worst-case scenario for airborne emissions over a 24 hour period. The location of construction and excavation activities and related mobile sources have been chosen so as to present the highest potential for impact, that is, at the closest distances to nearby residences.

It is noted that construction activities have been modelled closer to the residences than the proposed layout detailed in **Figure 1.** This has been conducted for the purposes of representing worst-case emissions for the construction activities associated with the proposed CUMF.

The following assumptions were made in creating the emissions inventory for the dispersion modelling:

- Construction hours are assumed to be 7:00 am to 5:00 pm Monday to Friday and 8:00 am to 2:00 pm on Saturdays.
- It is assumed that 50% of the total 40 week construction period (ie 20 weeks) will comprise of excavating operations.
- It is assumed that the total area of disturbance is 14,000 m^2.
- Of the total area, 13,200 m^2 is assumed to be disturbed by excavator and rock-breaking activities. This includes the area allocated for the office and storage buildings and is therefore deemed to be a conservatively high assumption.
- The area of extraction to accommodate the fuel storage tanks is assumed to be 800 m^2. It has been assumed that extraction will be to a depth of the order of 4 m. These assumptions are considered to be conservatively high.
- A total tonnage of extractable material for the CUMF is assumed to be of the order of 6,900 t. This equates to 4,600 t from rock-breaking excavation and 2,300 t from fuel tank excavation.
- Hourly throughput values for extraction operations have been calculated from the total working hours and the total extraction tonnage.
- Haul trucks are assumed to have a capacity of 20 t.
- As detailed in the project's construction details, it is assumed that there will be 12 truck movements (arriving/departing) daily to/from the site. This equates to 1.3 truck movements per hour.
- Based on the hourly extraction rate of materials, it is assumed that 3 of the 12 daily trucks will be haul trucks. The hourly throughput has been calculated based on this assumption and the assumed haul truck capacity.
- The internal haul route is assumed to be 60 m. To simulate potentially high levels of entrained dust on haul truck wheels, this road has been assumed to be unsealed during the construction phase, thus providing a conservatively high dust and PM_{10} contribution from truck movements in the modelling.
- The movement of haul trucks has been represented as a simulated line source using the "volume source" Ausplume input. Each volume source is located along the centreline of the real line source with separations less than one quarter of the distance to the nearest residential receptor:
- It has been assumed that Level 1 watering (2 litres/m^2/hour) will be applied to the unsealed haul routes. As such, a reduction factor of 50% has been applied to the haul truck emission rates, as per Table 3 of EETMM.

- An extracted materials stockpile is assumed to be located adjacent to the fuel tank extraction zone and haul route, with an exposed area of 60 m^2.
- A soil moisture content of 8% and silt content of 10% were assumed for the modelling.
- The emission factors for the excavator and loading of trucks were derived from Table 1 of EETMM. The equation corresponding to Excavators/Front-end Loaders on overburden was used.
- A "Pit Retention" control factor has been applied to the emission rate corresponding to activities occurring within the fuel storage extraction area. This equates to 50% control for TSP and 5% for PM_{10}, as per Table 3 of the EETMM.
- The default emission factor for wind erosion from the stockpile and open pit has been taken from Table 1 of EETMM.
- The siting of the two excavators and associated open pit wind erosion sources have been selected at locations that present the highest potential for impact and therefore represent worst case.
- For the purposes of calculating open pit wind erosion for the rock breaking area, the open pit area is assumed to be approximately 150 m^2 located about the rock-breaking excavator location.

5 EMISSIONS ASSESSMENT

5.1 Dust Deposition

Table 7 shows the results of the Ausplume predictions for dust deposition using the emission rates calculated in **Appendix D**, at the receptors nominated in **Section 4.4.**

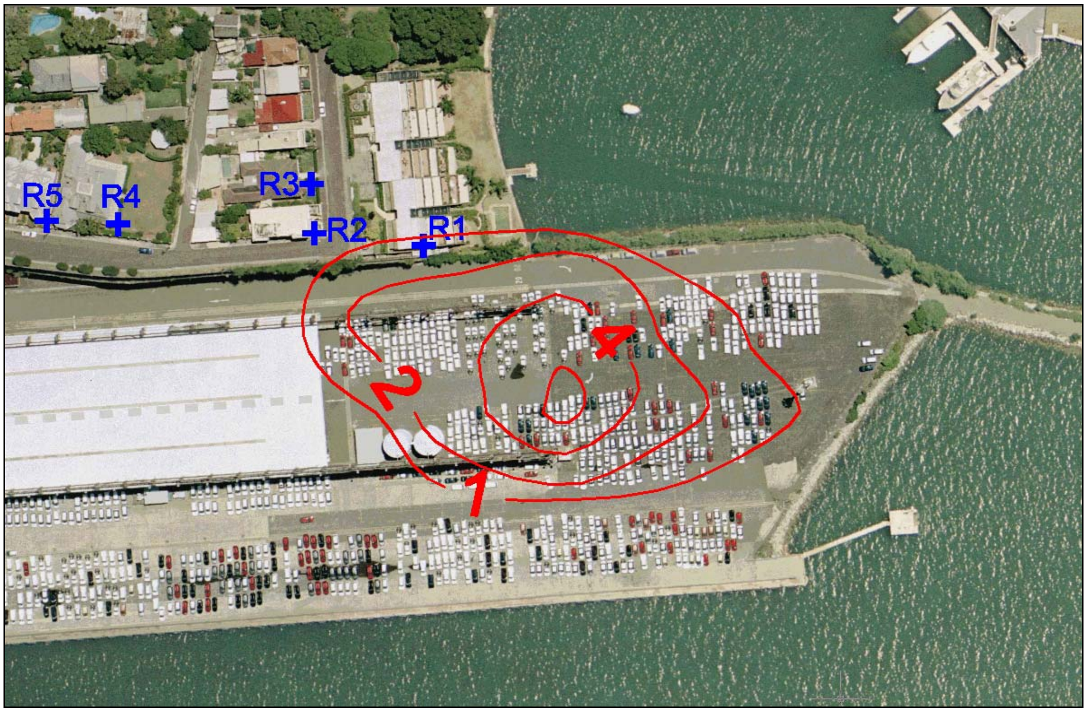
The results show the mean average monthly dust deposition predicted at the residences surrounding the Project Site over a one-year time frame. As detailed in **Section 2.1**, it has been assumed that the background level of dust deposition is less than or equal to 2 g/m^2/month for the surrounding region. A contour plot of the modelled incremental increase in dust deposition attributable to the construction of the CUMF is presented in **Figure 6**.

It can be seen from **Table 7** that the total mean monthly dust deposition levels (background plus increment) during the construction period are predicted to be less than 2.9 g/m^2/month, at all the nearest residential receptors. As such, levels of dust deposition are predicted to satisfy the project goal (incremental increase in dust deposition less than 2 g/m^2/month at all receptors).

Table 7 Background and Incremental Dust Deposition at Nearest Receptors

Receptor	Dust - Annual Average (g/m^2/month)			
	Background	Increment attributable to the construction phase of CUMF	Background + Increment	Project Goals
R1	2.0	0.9	2.9	4.0
R2	2.0	0.5	2.5	4.0
R3	2.0	0.4	2.4	4.0
R4	2.0	0.2	2.2	4.0
R5	2.0	0.1	2.1	4.0

Figure 6 Predicted Average Monthly Incremental Dust Deposition (g/m²/month)



5.2 PM$_{10}$ (24-Hour Average)

Table 8 presents the results of the Ausplume predictions for 24-hour PM$_{10}$ concentrations using the emission rates calculated in **Appendix D**, at the residences nominated in **Section 4.4**.

The results in **Table 8** present the maximum (background plus increment) 24-hour average concentration of PM$_{10}$ predicted at the residences surrounding the site applying the analysis over a one-year time frame. As detailed in **Section 2.2**, it has been assumed that background levels of PM$_{10}$ vary on a daily basis. These background levels have been incorporated into the model.

It can be seen from **Table 8** that the maximum 24-hour average PM$_{10}$ concentrations (background plus increment) associated with the construction phase of the CUMF are predicted to be less than 47.9 µg/m³ at all the nearest non-project related receptors for Scenario 1.

Table 8 Maximum PM$_{10}$ Concentrations at Nearest Receptors

Receptor	PM$_{10}$ - 24-Hour Average (µg/m³)			
	Background	Increment attributable to the CUMF	Background + Increment	Project Goal
R1	47.7	0.0	47.7	50
R2	47.7	0.0	47.7	50
R3	47.7	0.0	47.7	50
R4	47.7	0.2	47.9	50
R5	47.7	0.2	47.9	50

In addition to establishing the maximum (background plus increment) value, it is instructive to evaluate the maximum predicted incremental increase in 24-hour average PM_{10} concentrations at each of the nearest receptors. This refined assessment will involve the addition of each individual predicted 24-hour average PM_{10} concentration to the corresponding background concentration.

The results of the refined assessment are presented in **Table 9**, with both the incidences of highest background (with corresponding predicted increment), and the highest predicted incremental increases (with corresponding background) at the five receptor locations. Background PM_{10} concentrations were derived from the 2004 Rozelle DEC PM_{10} data set (refer **Section 2.2**).

The left side of **Table 9** shows the total predicted concentration on days with the highest background concentration, while the right side of the table shows the total predicted concentration on days with the highest predicted incremental concentration.

From this additional analysis, no exceedances of the project goal of 50 µg/m^3 are predicted, and it is noted that the maximum incremental increase in 24-hour PM_{10} concentrations is 6.7 µg/m^3, equating to approximately 13% of the PM_{10} criterion in the worst case. A contour plot of the 24-hour PM_{10} values (background plus increment) attributable to the construction phase of the CUMF is illustrated in **Figure 7**.

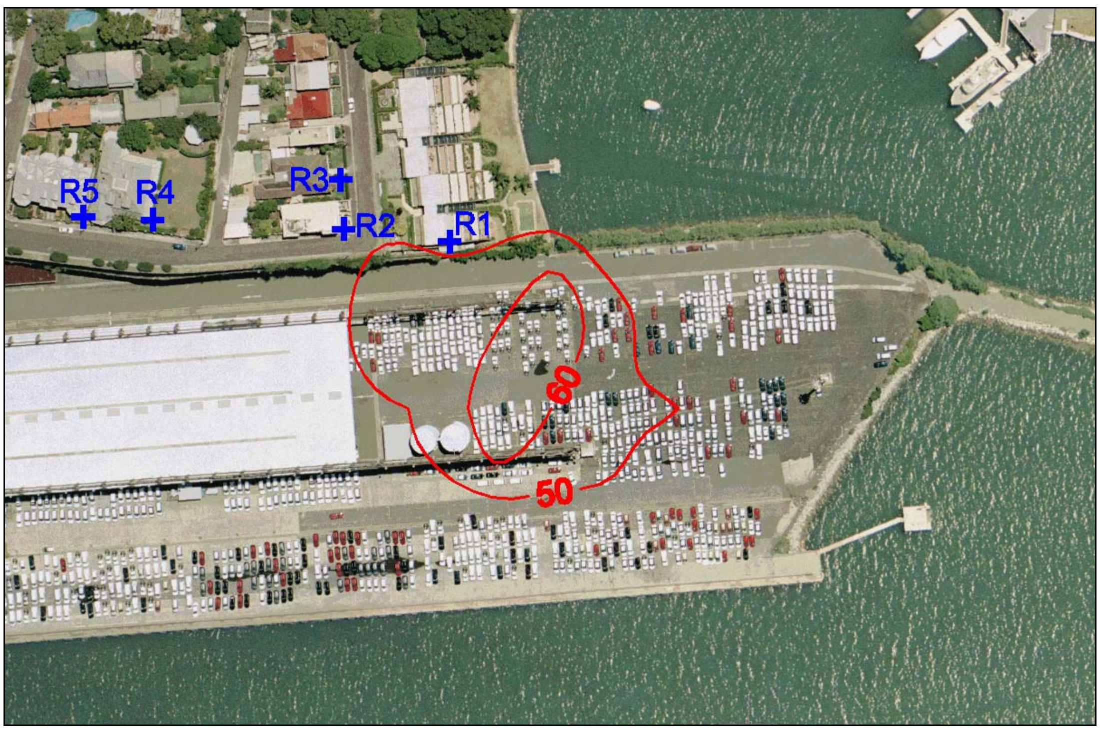
Table 9 Background and Predicted Incremental 24-Hour PM10 Maxima Concentrations

Date	PM_{10} - 24-Hour Average (µg/m^3)			Date	PM_{10} - 24-Hour Average (µg/m^3)		
	(Highest) Background	Predicted increment	Total		Background	(Highest) Predicted Incremen t	Total
R1							
10/01/2004	47.7	0.0	47.7	01/10/2004	12.8	6.7	19.5
01/12/2004	44.8	1.8	46.6	29/03/2004	22.5	6.6	29.1
14/10/2004	44.1	3.0	47.1	12/08/2004	17.2	5.8	22.9
20/02/2004	41.3	1.8	43.1	18/03/2004	20.2	5.7	25.8
26/03/2004	40.0	0.0	40.1	22/08/2004	20.2	5.2	25.4
22/02/2004	39.7	1.9	41.6	27/09/2004	32.6	5.0	37.7
09/02/2004	39.4	2.2	41.6	15/02/2004	23.8	5.0	28.8
11/02/2004	39.0	1.7	40.7	13/02/2004	20.2	5.0	25.1
R2							
10/01/2004	47.7	0.0	47.7	01/10/2004	12.8	5.9	18.7
01/12/2004	44.8	0.3	45.1	29/03/2004	22.5	4.6	27.1
14/10/2004	44.1	1.8	45.9	12/08/2004	17.2	4.6	21.8
20/02/2004	41.3	1.3	42.5	06/04/2004	14.5	3.3	17.8
26/03/2004	40.0	0.0	40.1	25/02/2004	13.8	3.3	17.1
22/02/2004	39.7	1.0	40.7	15/02/2004	23.8	3.2	27.0
09/02/2004	39.4	0.8	40.2	29/10/2004	17.3	3.2	20.5
11/02/2004	39.0	0.3	39.4	14/11/2004	12.3	3.0	15.3
R3							
10/01/2004	47.7	0.0	47.7	01/10/2004	12.8	4.0	16.8
01/12/2004	44.8	0.2	45.0	29/03/2004	22.5	3.5	26.0
14/10/2004	44.1	1.5	45.5	12/08/2004	17.2	3.5	20.7
20/02/2004	41.3	0.7	42.0	15/02/2004	23.8	2.6	26.4
26/03/2004	40.0	0.0	40.0	18/03/2004	20.2	2.4	22.6
22/02/2004	39.7	0.6	40.3	27/09/2004	32.6	2.4	35.0
09/02/2004	39.4	0.5	39.9	06/04/2004	14.5	2.4	16.8
11/02/2004	39.0	0.3	39.3	14/11/2004	12.3	2.2	14.5
R4							
10/01/2004	47.7	0.2	47.9	01/10/2004	12.8	1.5	14.3
01/12/2004	44.8	0.1	45.0	15/03/2004	29.3	1.4	30.7
14/10/2004	44.1	0.0	44.1	06/12/2004	23.2	1.3	24.4
20/02/2004	41.3	0.8	42.1	19/04/2004	22.6	1.2	23.7
26/03/2004	40.0	0.0	40.1	03/12/2004	14.3	1.2	15.4
22/02/2004	39.7	0.6	40.3	16/04/2004	20.4	1.1	21.6
09/02/2004	39.4	0.7	40.1	07/01/2004	16.4	1.1	17.5
11/02/2004	39.0	0.1	39.1	29/10/2004	17.3	1.1	18.4

Table 10 (Cont.) Background and Predicted Incremental 24-Hour PM10 Maxima Concentrations

Date	PM_{10} - 24-Hour Average (µg/m³)			Date	PM_{10} - 24-Hour Average (µg/m³)		
	(Highest) Background	Predicted increment	Total		Background	(Highest) Predicted Increment	Total
R5							
10/01/2004	47.7	0.2	47.9	06/12/2004	23.2	1.0	24.2
01/12/2004	44.8	0.1	45.0	15/03/2004	29.3	1.0	30.3
14/10/2004	44.1	0.0	44.1	07/01/2004	16.4	1.0	17.4
20/02/2004	41.3	0.7	41.9	01/10/2004	12.8	0.9	13.7
26/03/2004	40.0	0.0	40.1	03/12/2004	14.3	0.9	15.2
22/02/2004	39.7	0.5	40.2	16/04/2004	20.4	0.9	21.3
09/02/2004	39.4	0.6	40.0	19/04/2004	22.6	0.9	23.4
11/02/2004	39.0	0.1	39.1	23/12/2004	27.0	0.8	27.8

Figure 7 Predicted Maximum 24-hour Ground Level Concentrations of PM_{10} (µg/m³)



5.3 PM_{10} (Annual Average)

Table 11 presents the results of the Ausplume predictions for annual average PM_{10} using the emission rates calculated in **Appendix D**, at the residences nominated in **Section 4.4**. As detailed in **Section 2**, it has been assumed that the annual average background concentration of PM_{10} is 20.2 µg/m³ for the surrounding region. This background level has been incorporated into the model.

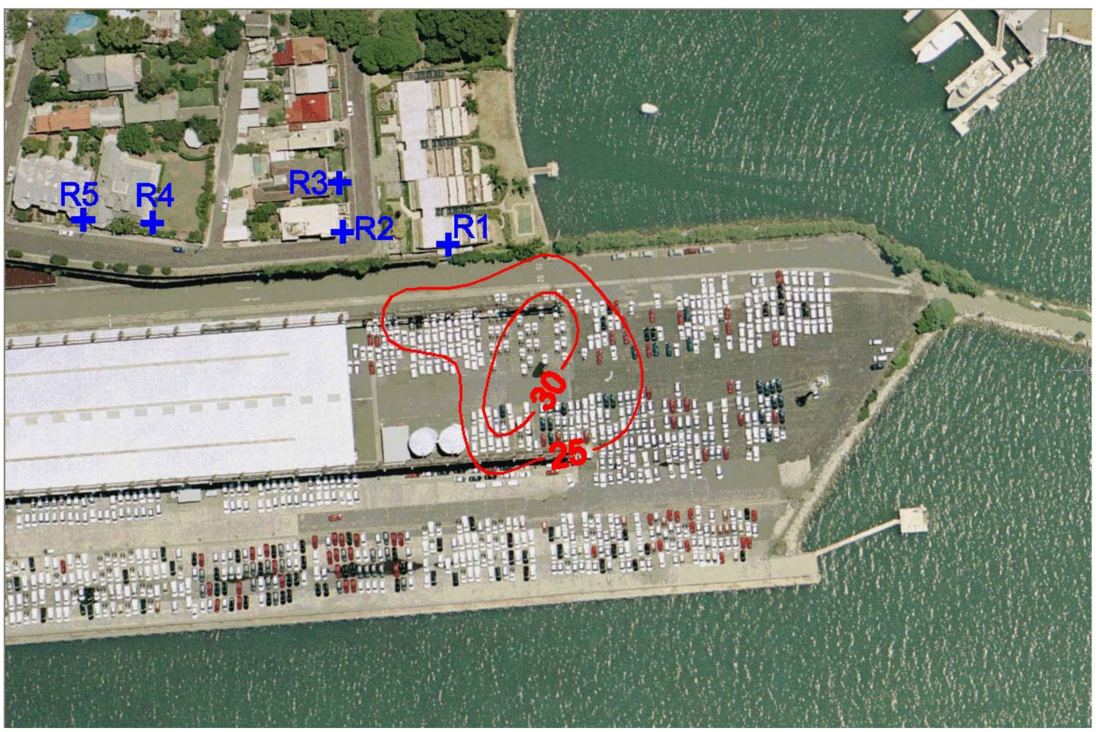
A contour plot of the modelled annual average PM_{10} concentrations (background plus increment) attributable to the construction of the CUMF is presented in **Figure 8**.

Total annual average PM_{10} concentrations (background plus increment) associated with the construction phase of the CUMF are predicted to be less than 21.6 µg/m³ at all nearest non-project related receptors. As such, annual concentrations of PM_{10} are predicted to satisfy the project goal of 30 µg/m³.

Table 11 Background and Incremental Annual PM_{10} Concentrations at Nearest Receptors

Receptor	PM_{10} - Annual Average (µg/m³)			
	Background	Increment attributable to the CUMF	Background + Increment	Project Goal
R1	20.2	0.9	21.2	30
R2	20.2	0.5	20.7	30
R3	20.2	0.3	20.5	30
R4	20.2	0.1	20.3	30
R5	20.2	0.0	20.2	30

Figure 8 Predicted Maximum Ground Level Concentrations of Annual PM_{10} (µg/m³)



6 OPERATIONAL EMISSIONS ASSESSMENT

Following the construction phase, there is not anticipated to be any particulate or dust generating activities at the proposed CUMF during full operation, which will comprise primarily of refuelling and sewage removal activities from marine vessels.

As these activities have the potential for emissions of hydrocarbon vapour and odour, abatement technologies are planned for implementation to minimise the impact of the CUMF is operations on surrounding area and successfully meet project air quality goals.

Following discussion with the DEC Air Policy Unit, it has been concluded that quantitative assessment (modelling) of the operational phase is not required. However, details of the proposed air pollution abatement technologies intended for use at the proposed CUMF have been provided.

6.1 Fuel Transfer and Storage

As previously discussed, the proposed CUMF will comprise of a marine refuelling facility and four associated underground fuel tanks (three 100,000 litre Diesel and one 100,000 litre Diesel/Motor Spirit split compartment).

As specified by KBR, the refuelling facility has been designed to Australian Standard AS 1940-2004 *The Storage and Handling of flammable and combustible liquids*. The layout of the refuelling and storage components is planned to be similar in design to the typical layout for this type of facility, as presented in **Appendix E**.

As delivery of fuel by trucks to the underground tanks presents the greatest potential for vapour emissions, it is assumed that vapour recovery technologies, satisfying the requirements listed in **Section 3.6**, will be implemented at this point of the system.

As a means of preventing vapour release from the underground tanks at refilling, vapour check valves and locking caps will be implemented at the unloading point. This closed system prevents the loss of product as vapour is reclaimed.

Provided the above vapour recovery techniques are implemented at the proposed CUMF (ie the facility is compliant with the POEO approval requirements as detailed in **Section 3.6**), it is anticipated that no significant hydrocarbon vapour impacts will be experienced at the surrounding receptors.

6.2 Sewage Removal

In addition to refuelling, the proposed CUMF will provide a means for the removal of sewage from vessels into the main sewer line.

At the time of writing, BMF envisages use of a proprietary pump-out system for sewage removal. A typical sewage pump-out system for a similar facility would comprise of a single-action diaphragm pump, creating a closed vacuum link between the on-board sewage tank and the land based sewer line. **Appendix E** illustrates the layout of a typical sewage pump-out system.

The pump-out system would be custom designed to meet the requirements of the CUMF site. Due to its fully enclosed nature, the release of odour emissions from the proposed CUMF is not anticipated to present an odour emission impact on the surrounding area.

Anticipated discharges to sewer are not anticipated to constitute a net increase in inputs to the Sydney sewer system.

6.3 Hazard and Risk Assessment

Detailed analysis of adverse operations, including spillages, at the proposed CUMF site is not a requirement of Air Quality Impact Assessment for compliance purposes. Such issues have been addressed within a stand-alone Hazard and Risk Assessment report.

The Hazard and Risk Assessment report identifies that risks associated with fire, explosion and environmentally damaging events, have been estimated as acceptably low, provided key reduction measures are in place, including prevention of ignition, spill contamination and provision of sufficient access and egress.

7 CONCLUSION

Modelling of fugitive dust emissions was undertaken to determine the resulting air quality impacts of the construction phase of the proposed CUMF.

Atmospheric dispersion modelling predictions of fugitive emissions from the CUMF were undertaken using the Ausplume Gaussian Plume Dispersion Model software developed by EPA (Victoria).

These predictions indicate that, provided the specific design and operational safeguards documented within this report are implemented, particulate matter and dust deposition attributable to the construction of the CUMF are anticipated to be within the current DEC (and NEPM) air quality goals at all surrounding residences.

Following discussion with the DEC Air Policy Unit, it has been concluded that quantitative assessment (modelling) of the operational phase is not required. However, details of the proposed air pollution abatement technologies intended for use at the proposed CUMF have been provided.

The planned installation of vapour recovery and odour abatement technologies is designed to ensure that the operational phase activities, (including marine vessel refuelling, underground tank loading and sewage transfer) will have a negligible impact on the surrounding area.

8 REFERENCES

This assessment has utilised the following references:

Regarding Existing Air Quality

- NSW Department of the Environment and Conservation PM_{10} data as measured by TEOM at the DEC's Rozelle monitoring site, 2004.

Regarding Air Quality Goals

- NSW Department of Environment and Conservation (2005) *Approved Methods and Guidance for Modelling and Assessment of Air Pollutants in New South Wales*.
- US Environmental Protection Agency (2001). *AP-42: Compilation of Air Pollutant Emission Factors, Fifth Edition*.
- Watson, J. G., Chow, J. C. & Pace, T. G., Chapter 4: *Fugitive Dust Emissions* in Davis, W. T. (ed.), *Air Quality Engineering Manual*, 2000.

Regarding Site Meteorology

- Bureau of Meteorology (2005), Climate Averages for Station 066062 (Observatory Hill AWS).
- Heggies generated meteorology file (hourly observations for the year 2004) for the proposed Project Site using TAPM software.
- Meteorological observations (wind speed and direction) for 2004 from BoM Fort Denison AWS.

Regarding Emissions Inventory

- Environment Australia National Pollution Inventory (2001), *Emission Estimation Technique Manual for Mining Version 2.3*.

Regarding Operational Emissions Assessment

- AS 1940-2004 *The Storage and Handling of flammable and combustible liquids*
- Personal correspondence with Mr Stephen Butcher, Sykes Group, 18 April 2006.

Climate Averages for Observatory Hill

Table A Climate Averages for Observatory Hill AWS

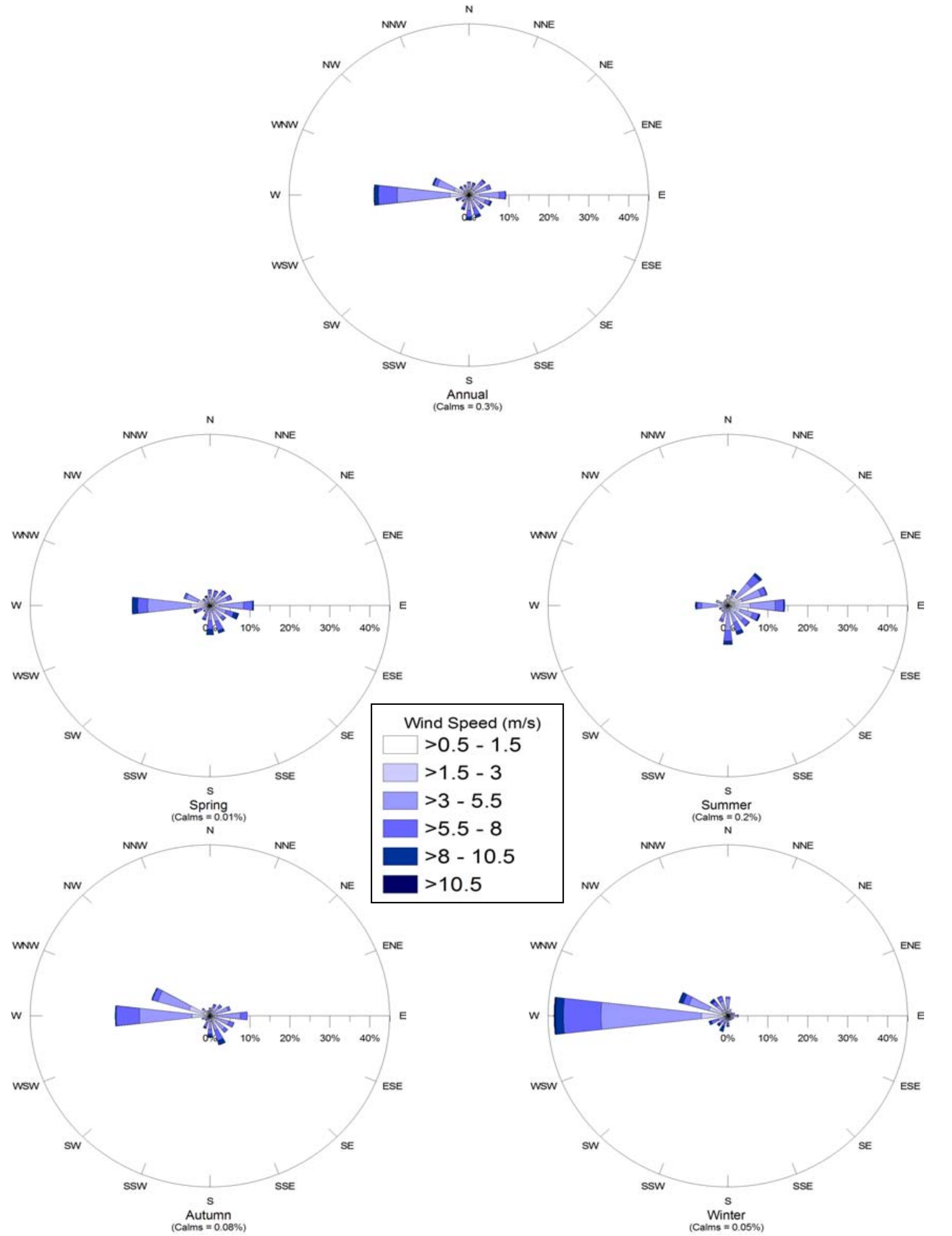
Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Daily Maximum Temperature (°C)	25.8	25.7	24.7	22.4	19.3	16.9	16.2	17.7	19.9	22	23.6	25.1	21.6
Mean no. of days where Max Temp >= 40.0 (°C)	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0.3
Mean no. of days where Max Temp >= 35.0 (°C)	0.8	0.5	0.2	0	0	0	0	0	0	0.2	0.5	0.8	3.1
Mean no. of days where Max Temp >= 30.0 (°C)	3.1	2.3	1.6	0.4	0	0	0	0	0.3	1.5	2.3	3.2	14.6
Highest daily Max Temp - deg C	45.3	42.1	39.8	33.9	30	26.9	25.9	31.3	34.6	37.4	41.8	42.2	45.3
Mean Daily Minimum Temperature (°C)	18.6	18.7	17.5	14.7	11.5	9.2	8	8.9	11	13.5	15.5	17.5	13.7
Mean no. of days where Min Temp <= 2.0 (°C)	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean no. of days where Min Temp <= 0. (°C)	0	0	0	0	0	0	0	0	0	0	0	0	0
Lowest daily Min Temp - deg C	10.6	9.6	9.3	7	4.4	2.1	2.2	2.7	4.9	5.7	7.7	9.1	2.1
Mean 9am air temp - deg C	22.6	22.4	21	17.8	14	11.4	10.4	12	15.3	18.3	20.2	21.9	17.3
Mean 9am wet bulb temp - deg C	18.9	19.1	18	15.2	11.9	9.5	8.3	9.4	11.8	14.3	16.1	17.8	14.2
Mean 9am dew point - deg C	16.5	17.3	16	12.9	9.7	7.2	5.4	5.9	7.9	10.4	12.6	14.9	11.4
Mean 9am relative humidity - %	71	74	74	72	74	74	71	66	62	61	65	67	69
Mean 9am wind speed - km/h	8.8	8.3	7.9	8.8	10.5	11.9	13.1	13.3	12.4	12.2	11	9.8	10.7
Mean 3pm air temp - deg C	24.1	24.1	23.2	21	18.3	16	15.4	16.5	18.3	20.1	21.5	23.2	20.1
Mean 3pm wet bulb temp - deg C	19.5	19.7	18.8	16.7	14.1	12.1	11.1	11.7	13.3	15.1	16.7	18.3	15.6
Mean 3pm dew point - deg C	16.5	17.2	15.8	13.1	10.1	7.7	5.7	5.9	7.9	10.4	12.6	14.8	11.5
Mean 3pm relative humidity - %	62	64	62	59	58	57	52	50	51	56	58	60	57
Mean 3pm wind speed - km/h	17.9	16.8	15.2	13.8	12.7	13.6	15.3	17.6	18.3	19.1	19.5	19.5	16.6
Mean monthly rainfall - mm	103.3	117.4	131.2	127.2	123.3	128.1	98.1	81.5	68.7	76.9	83.1	78.1	1217
Median (5th decile) monthly rainfall - mm	81.2	90.8	101.1	92.6	91	94.7	76.2	55.9	52.7	55.7	66.8	57.7	1175.2
9th decile of monthly rainfall - mm	203.6	258	293.3	295.3	281.4	293.7	223.2	191.7	156.1	175.6	157.7	174.6	1687.2
1st decile of monthly rainfall - mm	25	19.1	28.5	23.6	19	23.2	9.7	9.5	12.9	16.7	15.2	20.9	817.8
Mean no. of raindays	12.1	12.3	13.3	12	12	11.4	10.3	9.9	10.3	11.5	11.4	11.5	138
Highest monthly rainfall - mm	387.1	630.6	521.4	622.1	585	642.7	336.1	482.6	355.8	285	517.2	401.9	
Lowest monthly rainfall - mm	5.6	3	8.4	1.4	3.7	4.1	1.8	0	2.1	0.6	1.9	2.8	

Table A Cont. Climate Averages for Observatory Hill AWS

Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Highest recorded daily rainfall - mm	191	243.6	280.7	191	212.3	150.6	198.1	327.6	144.5	161.8	234.6	126	327.6
Mean no. of clear days	6.7	5.3	6.9	8.9	9.1	9.3	11.8	13.3	10.8	7.9	5.9	6.5	102.4
Mean no. of cloudy days	13.6	13.2	13	10.8	11	10.8	8.6	7.9	8.7	11.4	12.4	12.9	134.4
Mean daily hours of sunshine	7.2	6.7	6.4	6.3	5.9	5.4	6.3	7	7.2	7.3	7.7	7.6	6.8
Highest recorded wind gust - km/h	150.1	111.2	96.5	105.5	135.4	135.4	105.5	113	131.4	113	118.4	120.6	150.1
Mean daily evaporation - mm												3.9	3.9

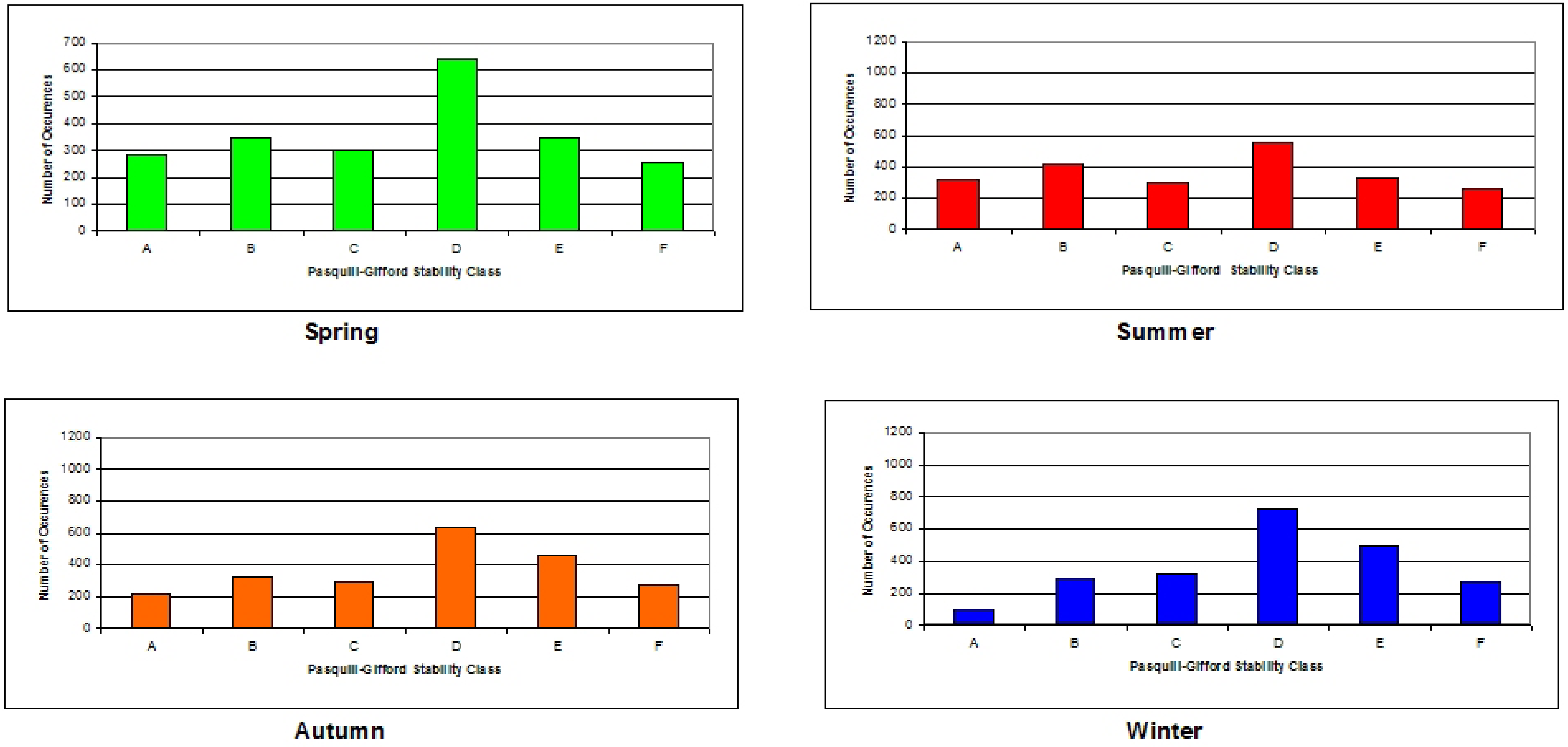
Source: Bureau of Meteorology, 2005

Annual/Seasonal Windroses for Fort Dension, 2004



Heggies Australia Pty Ltd Consulting Engineers Level 2, 2 Lincoln Street Lane Cove NSW 2066 Australia PO Box 176 Lane Cove NSW 1595 Telephone +612 9427 8100 Facsimile +612 9427 8200 Email Sydney@heggies.com.au	Designed by	Checked by	Approved by - date	Filename	Dated	Quality System Quality Endorsed Company ISO 9001 Lic 3236 Standards Australia
	SF	DR	DR – 31/03/2006	10-4638	31/03/2006	
	Appendix B: Annual/Seasonal windroses for Fort Dension, 2004					

Seasonal Stability Class Frequency Distribution for Fort Denison, 2004



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	SF	DR	DR - 04/04/2006	10-4683	04/04/2006

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Appendix C
Seasonal Stability Class Frequency Distribution for Fort Denison, 2004

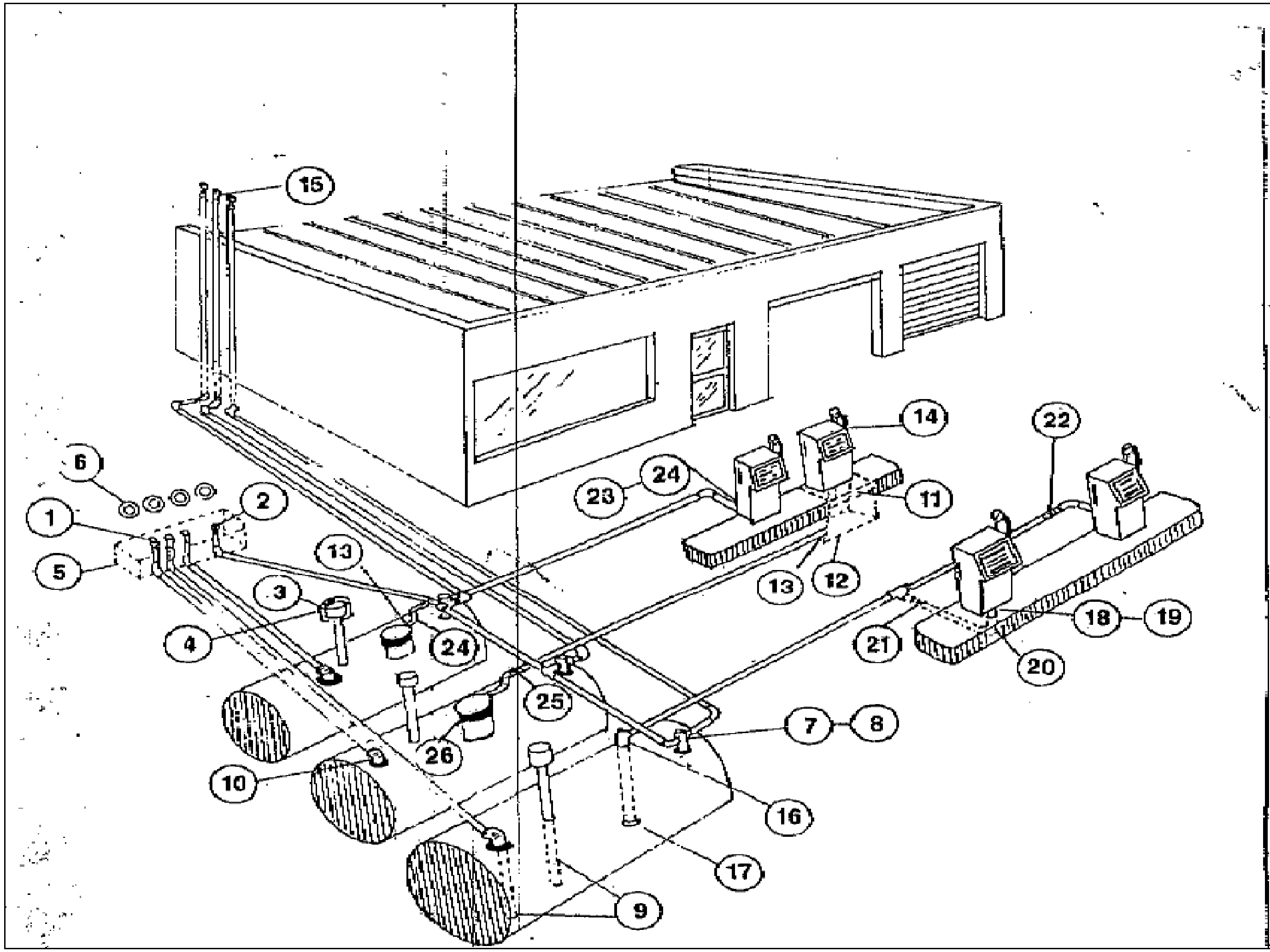
Quality System
Quality Endorsed Company
ISO 9001 Lic 3236
Standards Australia

Proposed CUMF Emissions Inventory

Scenario 1	TSP Emission Factor	PM_{10} Emission Factor	Emission Factor Units	Throughput (tonnes per hour)	Number of Hectares of stockpile	Average number of kilometres per hour	Working days available	Working hours per day	Dust Deposition Emission Rate 240days (mg/s)	PM_{10} Emission Rate 240days (mg/s)	Dust Deposition Emission Flux (mg/s/m2) 240days	PM_{10} Emission Flux (mg/s/m2) 240days
Rock Breaking Excavator	0.0012	0.0006	kg/t	7	N/A	N/A	303	12	1.4951	0.7071	N/A	N/A
Petrol Storage Excavator	0.0012	0.0006	kg/t	7	N/A	N/A	303	12	0.7475	0.6718	N/A	N/A
Truck Loading	0.0012	0.0006	kg/t	7	N/A	N/A	303	3	1.4951	0.7071	N/A	N/A
Haul Truck Movement (source 1)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 2)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 3)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 4)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 5)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 6)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 7)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 8)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 9)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 10)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Haul Truck Movement (source 11)	1.76	0.55	kg/VKT	N/A	N/A	0.16	303	12	2.3410	0.7371	N/A	N/A
Wind Erosion open pit	0.40	0.20	kg/ha/hr	N/A	N/A	N/A	344	24	N/A	N/A	0.0073	0.0037
wind erosion stockpile	0.40	0.20	kg/ha/hr	N/A	N/A	N/A	344	24	N/A	N/A	0.0073	0.0037
Wind Erosion petrol pit	0.40	0.20	kg/ha/hr	N/A	N/A	N/A	344	24	N/A	N/A	0.0037	0.0035

Fuel and Sewage System Schematics

Figure E1 Typical Fuel Storage Installation Layout (Figure provided by BMF)



1. Fill Adaptor & Cap
2. Vapour Check Valve & Cap
3. Dip Cap Assembly
4. Ground Box - Fittings & Monitoring
5. Overfill Catchment Box
6. Product ID Markers
7. Extractor Float Vent Valve Assembly
8. Float Valve Valve
9. Fill & Dip Drop Tubes
10. Product Line Isolation Valve
11. Pump Base Assembly
12. Underpump Containment
13. Flexible Entry Seals
14. Safe-T-Guard Hose Coupling
15. Upflow Vent

SUCTION SYSTEM

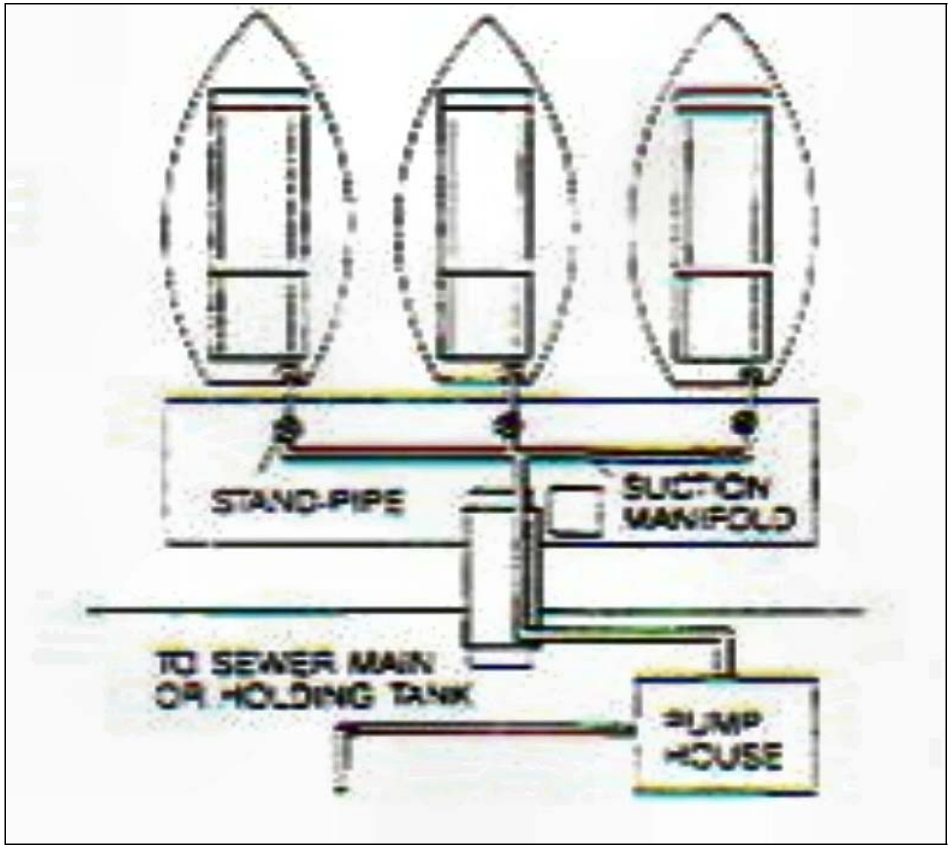
16. Tank Valve
17. Suction Stub
18. Offset Underpump Valve
19. Triangle Underpump Valve
20. Eskay S/S Connectors
21. TTS Line Valve
22. Eskay Line Valve

PRESSURE SYSTEM

23. Emergency Shut-Off Valve
24. Teleflex Connector
25. Ball Valve
26. Submersible Pump

This typical Installation Layout is to be used as a guide to locating the various products you will find in the catalog. Please note that not all products detailed in the catalog are shown in the illustration. Rather, the layout should be used only as a guide to the general locations of the different products

Figure E2 Sewage Pump-Off System Schematic (Figure provided by Sykes Group)



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Appendix L

NOISE ASSESSMENT

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BRIDGES ACOUSTICS

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NOISE IMPACT ASSESSMENT

PROPOSED MARINE SUPPLY BASE, WHARF 6 WHITE BAY

REPORT J0114-04-R3
3rd MAY 2006

Prepared for:
Kellogg Brown & Root Pty Ltd
Level 9, 210 Kent Street
SYDNEY NSW 2000

Prepared by:
Mark Bridges BE Mech (Hons) MAAS
Principal Consultant

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Bailey's Marine Fuels Australia (Bailey's) proposes a Marine Supply Base on White Bay Wharf 6 in Balmain. The Base would include a refuelling depot, sewage and sullage facilities, office and storage buildings, a travel lift to remove boats from the water for maintenance, a roll on roll off ramp allowing vehicular access to barges and a temporary storage and handling area for materials associated with construction projects in Sydney Harbour. The proposed development would operate 24 hours per day, 7 days per week although limited night activity is anticipated. The report forms part of an Environmental Assessment (EA) being prepared by KBR to accompany a Development Application (DA) to the Minister for Planning.

This assessment shows future noise levels produced on the site are likely to remain within current DEC noise criteria at almost all residences near the site, with occasional exceedances of up to 3 dBA above the criteria at the closest residence near the site's entrance gate. The facade of this residence is understood to have been designed and constructed to provide additional noise insulation, to maintain satisfactory internal noise levels, so the predicted exceedances are expected to cause minimal and acceptable noise impacts.

Worst case noise levels associated with construction work are expected to exceed the construction noise criteria at closest residences. Worst case noise levels are expected during excavation for the underground fuel tanks and preparation of foundations for the roll on roll off ramp, with lower noise levels and compliance with the construction noise criteria expected at other times. Construction noise mitigation measures have been recommended to minimise the occurrence, duration and level of such exceedances.

Noise from the site's access road, and on nearby public roads, is expected to be acceptable at all residences. Truck movements and occasional material handling noises may exceed the sleep disturbance criterion at the closest residences to the site and residences adjacent to the private access road just west of the site, although residents would be accustomed to truck movements on the site at night and would receive lower noise levels than many residents who live near main roads.

The site has been used intensively for container handling activities for some years and new residents are made aware of industrial activities on the site via notification on Section 149 certificates. New residential apartments in this area have been designed to satisfactorily exclude noise from external sources such as trucks and forklifts on this site.

This assessment shows the proposal will cause acceptable environmental noise levels at nearby residential properties assuming proposed noise mitigation measures are successfully implemented on the site.

1 INTRODUCTION

Bailey's Marine Fuels Australia (Bailey's) proposes a Marine Supply Base on White Bay Wharf 6 south of Grafton Street, Balmain. The Base would include the following facilities:

- Refuelling depot with 8 dispensers for diesel and petrol,
- Four bulk fuel storage tanks holding approximately 355,000 litres of diesel and 45,000 litres of unleaded petrol,
- Sewage and sullage pumping and disposal facilities,
- Office facilities for businesses such as marine electricians and surveyors,
- Storage buildings for items such as emergency response equipment,
- Roll-on, roll-off ramp allowing land-based traffic to board construction and other vessels,
- A travel lift which allows removal of boats from the water for maintenance,
- A laydown area for temporary storage of construction materials and equipment for projects within the harbour,
- Cool rooms for charter vessels to store provisions,
- Secure storage facilities for construction and other equipment and materials,
- Temporary mooring area for vessels being repaired or for visiting vessels such as Sydney to Hobart yachts.

The proposed development would operate 24 hours per day, 7 days per week although limited night activity is anticipated. This assessment is based on:

- The DEC's Industrial Noise Policy (INP) for on-site sources including vehicle movements and specific off-site sources such as boat and ship movements.
- The DEC's Environmental Criteria for Road Traffic Noise (ECRTN) for traffic associated with the proposal on public roads between the site and Victoria Road,
- The DEC's Environmental Noise Control Manual (ENCM) for sleep disturbance, construction noise and ground vibration assessments.
- Background noise monitoring results obtained during earlier assessments in the White Bay area, as previously provided by Sydney Ports Corporation (SPC).
- Inspections of the White Bay 6 site with SPC personnel in relation to a previous proposal for this site.

This assessment and report has been commissioned by Kellogg Brown & Root Pty Ltd (KBR) on behalf of Bailey's to provide information on likely noise levels produced by construction and operation of the facility, identify any noise impacts to neighbouring residential properties and recommend noise mitigation measures where required and appropriate. The report forms part of an Environmental Assessment (EA) being prepared by KBR to accompany a Development Application (DA) to the Minister for Planning.

2 EXISTING NOISE LEVELS

Measurement of existing background noise levels is required to determine appropriate criteria for this assessment, as noise criteria depend on the background noise level and the existing level of industrial noise in the absence of the noise source being considered. Background noise levels have previously been measured and assessed according to the EPA's Industrial Noise Policy (INP) by other acoustic consultants at residential properties near the site and have not been repeated specifically for this assessment. Copies of the following documents have been made available by Sydney Ports Corporation for the purposes of this assessment:

1. Glebe Island / White Bay Port Area, Noise Monitoring Study, Report TB278-01F02 (REV2) dated November 2003 prepared by Renzo Tonin & Associates (Tonin).

2. Independent Cement & Lime, Environmental Impact Statement, Report 22357 dated December 2005 prepared by Environmental Resources Management Australia (ERM).

The Tonin report describes results from noise surveys carried out at 12 locations around the White Bay and Glebe Island area in August and September 2003, with one location surveyed in August 2002. Each location was surveyed using an unattended noise logger for a period of at least one week with background and ambient noise levels determined from the logger results according to procedures recommended in the DEC's Industrial Noise Policy (INP). The report does not specifically indicate the relative noise contributions from industrial, road traffic and other sources.

The ERM report describes noise monitoring results obtained at three locations in the area in October and November 2004. Each location was surveyed using unattended noise loggers for a period of at least one week plus operator-attended short term noise measurements to assist in quantifying the dominant sources of ambient and background noise at each location. Table 1 shows a summary of monitoring locations and background noise levels as reported by Tonin and ERM.

Table 1: Summary of Measured Background and Ambient Noise Levels, 2002-2004, dBA.

Data Source and Location *	Background Level, LA90,15min			Ambient Level, LAeq,15min		
	Day	Evening	Night	Day	Evening	Night
RTA1 – 18 Johnston St Balmain	46	42	39	50	47	47
RTA2 – 18 Grafton St Balmain	45	43	44	56	54	49
RTA3 – 33 Donnelly St Balmain	47	46	45	58	54	50
RTA4 – 90 Buchanan St Rozelle	48	46	43	58	57	53
RTA5 – 39 Mansfield St Rozelle	42	41	36	56	53	49
RTA6 – 47 Crescent St Rozelle	52	50	41	58	55	53
RTA7 – 13 Hornsey St Rozelle	49	47	40	54	51	48
RTA8 – 48 Burt St Lilyfield	45	45	38	55	51	48
RTA9 – 15 Bayview Cr Annandale	51	50	43	54	53	50
RTA10 – 14 Oxley St Glebe Point	53	52	45	58	59	53
RTA11 – 202 Refinery Dr Pyrmont	50	48	46	54	52	51
RTA12 – 114 Bowman St Pyrmont	48	46	47	56	52	51
ERM1 – White Bay 1 site	50	49	46	56	56	54
ERM2 – 1 Batty St Rozelle	54	52	47	49	56	54
ERM3 – 6 Bradford St Balmain	47	47	44	67	55	57

* RTAx denotes locations surveyed by Renzo Tonin & Associates in 2002/03, while ERMx denotes locations surveyed by ERM in 2004.

Locations RTA1 to RTA4 inclusive represent the closest residences to the site. Appendix A shows a plan of the site and surrounding area with all noise monitoring locations marked. Tonin's location 3 (RTA3) and ERM's location 3 (ERM3) are very close to each other and returned similar background noise levels. ERM's location 3 is therefore omitted from the remainder of this assessment.

Tonin's location 5 (RTA5) and ERM's location 2 (ERM2) are also close to each other, although Tonin's Mansfield Street noise measurement was taken in a location shielded from Anzac Bridge traffic noise behind Robert Street industrial properties. Results from this location are not representative of background noise levels at closest residences to the site, unlike ERM's Batty Street location adjacent to those residences. Tonin's location 5 is therefore omitted from the remainder of this assessment. ERM's location 1 (on the White Bay 1 site) is not a receiver property and has therefore been omitted from the assessment.

Earlier noise monitoring reports prepared by Tonin included comments regarding dominant sources that are typically audible at some noise monitoring locations. It is noted that industrial noise levels vary significantly depending on the presence of a ship berthed at either Glebe Island or White Bay, primarily due to Auxiliary Power Units (APU's) on individual ships and either loading or unloading activity on the wharf. White Bay is also currently used for temporary storage of cars from Glebe Island, involving a number of car trips within the port to store the cars in the White Bay area then retrieve them at a later date. A number of ERM's attended measurements indicated industrial noise levels were insignificant and the measurement represented a 'background' situation, while at other times noise from a berthed ship or other port-related source was dominant and affected most or all relevant noise level percentiles. Other industrial developments exist near Robert Street and Mansfield Street Rozelle and these developments would produce some industrial noise at times, although the noise survey reports referred to above do not quantify noise levels currently produced by these industries.

Other sources of environmental noise include regional traffic on Victoria Road and the Anzac Bridge, local traffic on various minor roads, natural sounds from wind, birds and insects and various intermittent domestic sounds such as children and lawnmowers.

3 CRITERIA

3.1 Construction Noise

Noise criteria for a construction activity are different from criteria applied to operation of an industry or road, in recognition of the short term and temporary nature of construction work and, in some cases, the practical and economic difficulties associated with carrying out some construction activities in a quiet manner.

Construction noise criteria for residential properties are recommended in Chapter 171 of the EPA's Environmental Noise Control Manual (ENCM). Noise criteria depend on the background noise level and the total duration of the construction activity, as follows:

- For a construction period of 4 weeks and under, the LA10 level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background noise level by more than 20 dBA.
- For a construction period greater than 4 weeks and not exceeding 26 weeks, the LA10 level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background noise level by more than 10 dBA.
- Criteria apply Monday to Friday 7am to 6pm and from 8am to 1pm on Saturday. Construction work may begin at 7am on Saturday if it is inaudible at any residential premises, which may or may not be the case depending on the work being carried out.
- No construction work is to take place on Sunday or a public holiday.

Table 2: Recommended Daytime Construction Noise Criteria.

Residential Area	Daytime Background Level LA90,15min (from Table 1)	Construction Criteria, LA10,15min
RTA1 – 18 Johnston St Balmain	46	51
RTA2 – 18 Grafton St Balmain	45	50
RTA3 – 33 Donnelly St Balmain	47	52
RTA4 – 90 Buchanan St Rozelle	48	53
ERM2 – 1 Batty St Rozelle	54	59
RTA6 – 47 Crescent St Rozelle	52	57
RTA7 – 13 Hornsey St Rozelle	49	54
RTA8 – 48 Burt St Lilyfield	45	50
RTA9 – 15 Bayview Cr Annandale	51	56
RTA10 – 14 Oxley St Glebe Point	53	58
RTA11 – 202 Refinery Dr Pyrmont	50	55
RTA12 – 114 Bowman St Pyrmont	48	53

Proposed construction work is expected to take approximately 40 weeks to complete. As no criteria are recommended for periods in excess of 26 weeks, a criterion 5 dBA above the background noise level is typically adopted to minimise noise impacts. As all work would be carried out during normal construction hours listed above, noise criteria are determined by referring only to the daytime background noise levels listed in Table 1 and are shown in Table 2.

The LA10,15min percentile recommended in the ENCM for construction noise assessment represents the 'level exceeded 10% of the time in a 15 minute period' which can be considered the noise level representing the loudest 10% of the time in a typical 15 minute period. For most construction sites this level is influenced by intermittent sources such as truck movements close to the residence being considered, rather than by continuous noise sources such as compressors or generators. Construction noise criteria typically apply at the boundary of any residential premises.

3.2 Operational Noise

Noise criteria for this assessment are sourced from the Environment Protection Authority's Industrial Noise Policy (INP). The INP includes procedures to determine background noise levels in an area, as described in Section 2, and to derive appropriate operational noise criteria for an industrial site near sensitive receivers such as residences.

Two noise criteria are normally referred to in each of the day, evening and night time periods:

- an intrusive limit set 5 decibels above the background noise level, and
- an amenity limit which depends on existing industrial noise levels, in the absence of the site being considered, and the nature of the receiver area.

The lowest of the intrusive or amenity criteria are normally adopted as the limiting criterion for each receiver area and time period. According to the INP, amenity criteria are normally determined by considering the acceptable limit for the receiver zoning and dominant land use combined with the existing level of industrial noise from sources off the site being considered. The intent of the INP procedure is to control noise from all industrial developments in an area so that cumulative impacts from all audible industrial sources do not exceed the relevant acceptable limit. The INP therefore intends potential cumulative impacts to be implicitly considered when setting recommended noise criteria for each proposed industrial development.

An alternative approach that achieves the same outcome is to evenly apportion the acceptable amenity limits over all existing and likely future developments that would be audible at a receiver, rather than determine existing noise levels from existing industries and ignore future developments. This holistic approach is recommended in principle by the DEC and has been used successfully on other sites such as new subdivisions where a number of new industrial developments are currently proposed or are likely to be proposed in the future.

White Bay wharves as a whole are presently under utilised although SPC is actively exploring possible uses for this area. Independent Cement & Lime have proposed development on White Bay Wharf 1, while Bailey's have proposed this Marine Supply Base on White Bay Wharf 6. No specific proposals for Wharves 2 to 5 are currently known although it is reasonable to assume some development may occur in these areas in the future.

Assuming all wharves are developed at some point in the future, individual residences are potentially exposed to noise from a number of sites depending on the location of each residence. Amenity criteria have therefore been determined for each group of residences assuming significant noise is received from three industrial sites in the future, resulting in adopted amenity criteria being 5 dBA lower than the relevant acceptable limits. While it is true that some residences are likely to receive audible noise from more than three port-related industrial developments, in all cases only three developments are expected to produce significant noise while the others would be too far from the residence to be significant.

This procedure inherently allows for future development, as intended by the INP's amenity criterion, without the need for each development proposal to explicitly consider actual noise levels produced by other existing or proposed developments in the area.

Table 3 shows the calculations and assumptions required to develop appropriate noise criteria in each representative receiver area, with the lowest of the intrusive or amenity criteria listed as the 'limiting criteria' in the Table for each receiver area and time period. The Acceptable Amenity Limits are based on the 'urban-industrial interface' category due to the site's long history of industrial activity and short distances from the site to nearest residential boundaries.

Table 3: Recommended Operational Noise Criteria, LAeq,15min.

Residential Area	Noise Level LAeq,15min, Day - Evening - Night				
	Time Period	Intrusive Criteria	Acceptable Limit *	Amenity Criteria	Limiting Criteria
RTA1 – 18 Johnston St	Day Evening Night	51 47 44	65 55 50	60 50 45	51 47 44
RTA2 – 18 Grafton St	Day Evening Night	50 48 49	65 55 50	60 50 45	50 48 45
RTA3 – 33 Donnelly St	Day Evening Night	52 51 50	65 55 50	60 50 45	52 50 45
RTA4 – 90 Buchanan St	Day Evening Night	53 51 48	65 55 50	60 50 45	53 50 45
ERM2 – 1 Batty St	Day Evening Night	59 57 52	65 55 50	60 50 45	59 50 45
RTA6 – 47 Crescent St	Day Evening Night	57 55 46	65 55 50	60 50 45	57 50 45
RTA7 – 13 Hornsey St	Day Evening Night	54 52 45	65 55 50	60 50 45	54 50 45
RTA8 – 48 Burt St	Day Evening Night	50 50 43	65 55 50	60 50 45	50 50 43
RTA9 – 15 Bayview Cr	Day Evening Night	56 55 48	65 55 50	60 50 45	56 50 45
RTA10 – 14 Oxley St	Day Evening Night	58 57 50	65 55 50	60 50 45	58 50 45
RTA11 – 202 Refinery Dr	Day Evening Night	55 53 51	65 55 50	60 50 45	55 50 45
RTA12 – 114 Bowman St	Day Evening Night	53 51 52	65 55 50	60 50 45	53 50 45

* Based on the 'urban-industrial interface' situation given industrial activity has occurred on the site for some years.

Table 3 shows intrusive criteria lower than the amenity criteria and are therefore more limiting during the day at all residential receivers. The amenity criteria are more limiting in areas of higher background noise level during the evening and night.

3.3 Sleep Disturbance

Sleep disturbance criteria are sourced from the EPA's Environmental Noise Control Manual, which recommends an LA1,1min limit of 15 decibels above the background noise level during the hours 10pm to 7am or to 8am on Sundays and public holidays. While noise levels and character capable of causing sleep disturbance are poorly understood, this criterion is the most widely accepted for situations of this type. According to the EPA, sleep disturbance criteria do not apply to the day and evening periods.

3.4 Road Traffic

The proposal would generate traffic movements on public roads leading to the site. Access is currently gained via Victoria Road and Robert Street while future access via The Crescent, James Craig Road and private roads within the Port area has been proposed and is subject to separate approvals. This assessment assumes access to the site would be via both Robert Street and James Craig Road. Changes in noise level due to traffic on public roads associated with the proposal are assessed to the EPA's Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999).

Victoria Road and The Crescent are arterial roads, defined as roads carrying predominately regional rather than local traffic, while Robert Street is best described as a collector road. Table 1 in the ECRTN contains various traffic noise criteria depending on the type of development and road classification, with relevant criteria shown in Table 4 below.

Table 4: ECRTN Traffic Noise Criteria, dBA.

Development Type	Noise Criteria		
	Day 7am to 10pm	Night 10pm to 7am	Comments
Land use developments with potential to create additional traffic on existing arterial roads.	60 LAeq,15hr	55 LAeq,15hr	In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.
Land use developments with potential to create additional traffic on existing collector roads.	60 LAeq,1hr	55 LAeq,1hr	

According to both the INP and ECRTN, vehicle movements on the site are to be assessed as site sources, not traffic. The traffic noise criterion only applies to vehicles on public roads and therefore does not apply to truck movements on James Craig Road, on other roads within the port area or on the site itself.

4 RESULTS

4.1 Construction Noise Sources

Construction of facilities on the site including storage and office buildings, roads, fuel tanks and dispensers and boat mooring devices would be required before the site begins operation. Construction noise levels depend on the machines and processes occurring at the time and would vary substantially from week to week as the site develops. Major activities required to complete the project include:

- Excavation and installation of underground fuel tanks and associated pipelines,
- Construction of storage and office buildings, and
- Installation of the roll-on, roll-off (RORO) ramp and travel lift tracks.

As these three major activities are likely to take some time compared to more minor activities such as installation of the fuel dispensers, this construction noise assessment assumes all three major activities would occur simultaneously. Worst case construction noise levels are therefore likely to occur towards the beginning of the period, during excavation work for the tanks with concrete pouring for the RORO ramp foundations and pile driving for the travel lift tracks, with a number of sources on the site as shown in Table 5.

Table 5: Assumed Worst Case Construction Noise Sources and Sound Power Levels, dBA.

Area	Noise Source	Sound Power LA10 re 1pW	Total Area Sound Power
Fuel tanks	Excavator	113	115
	Truck x2	109	
	Mobile crane	106	
Buildings	Truck	106	110
	Mobile crane	106	
	Various hand tools	100	
Travel lift tracks	Pile driver	122	122
RORO ramp	Concrete truck x3	113	114
	Concrete pump	108	
	Compressor, compactors	100	
TOTAL SITE		118 excluding pile driver 123 including pile driver.	

4.2 Received Construction Noise Levels

Received noise levels depend on the distance from noisy machines to the receiver, topography and barriers between the noise source and receiver and the number and type of machines operating in a typical 15 minute period. Calculations assume all machines listed in Table 4 are operating at various locations on the site and are fairly evenly spread over each working area, which is a scenario that normally occurs to minimise conflicts between various machines completing different tasks and to maximise the productivity of each machine.

Received noise level calculations are based on the sound power levels listed for each major working area in Table 5, distance from the acoustic centre of each working area to the closest residence in each residential area listed in Table 3 and the acoustic effect of any existing shielding such as the top of the embankment adjacent to the site. Predicted received noise levels from each working area to each residential area, in the absence of any control measures, as shown in Table 6 assuming all construction activities occur simultaneously which represents the worst case. Results in bold type highlight possible criteria exceedances while residences that are obviously too far from the site to be affected by construction noise levels have been omitted from the Table.

Table 6: Predicted Received On-Site Construction Noise Levels, No Noise Control, dBA.

Location	Predicted Received Noise Level, LA10,15min					Criteria, LA10
	Fuel tanks	Buildings	RORO	TOTAL	Pile driver	
RTA1 18 Johnston St Balmain	**60**	54	**63**	**65**	**71**	51
RTA2 18 Grafton St Balmain	**68**	**64**	**62**	**73**	**70**	50
RTA3 33 Donnelly St Balmain	49	45	47	**53**	**55**	52
RTA4 90 Buchanan St Rozelle	44	45	45	49	53	53
RTA11 202 Refinery Dr Pyrmont	52	48	51	55	**59**	55
RTA12 114 Bowman St Pyrmont	53	47	52	**56**	**60**	53

Table 6 shows anticipated worst case construction noise levels are likely to exceed the construction noise criteria at times at residences within approximately 700m and with a full view of the site, particularly during operation of the pile driver to install foundations for the travel lift tracks extending over the water. Closest residences are expected to receive up to 23 dBA over the criterion during the loudest construction periods, although noise levels are expected to be substantially lower and within the criteria for a large proportion of the time.

Section 4.8 of this report includes recommended noise mitigation measures to result in the lowest practically and economically achievable construction noise levels at all residences. Adoption of the recommended measures may not result in compliance with the criteria for the entire construction period but will serve to limit the occurrence, extent and duration of any criteria exceedances.

4.3 Operational Noise Sources

Dominant noise sources on the site would include car and truck movements, forklifts, main engines and auxiliary generators on boats, refrigeration and air conditioning equipment. Noise would occasionally be produced by other intermittent sources including material handling impacts, voices, fuel pumps and sewage pumps. All of these sources can potentially occur at any time of the day or night, although most activity is expected to occur during the day.

Sound power levels typically produced by sources expected to occur on the site have been estimated based on previous measurements for or reported by others. Noise levels produced by cars, trucks and boats cannot be directly controlled by Bailey's and have been estimated based on previous noise measurements taken on other sites. Noise levels produced by refrigeration and air conditioning plant on the site are based on typical, relatively quiet equipment of this type.

Table 7 shows sound power levels produced by anticipated noise sources on and adjacent to the site, the typical location or working area for each source and the assumed 'average maximum' duration of each source. Locations or working areas are based on a proposed site layout prepared by KBR. The listed sound power level for the forklift is for a relatively new Linde model measured on another site in February 2006.

Table 7: Typical Source Sound Power Levels, dBA.

Noise Source	Sound Power dBA re 1pW	Main Working Locations	Average Maximum Duration **		
			Day	Evening	Night
Truck (manoeuvring)	104	Access road, all site areas	2 mins	1 mins	1 min
Car	85	Access road, carpark	3 mins	2 mins	1 min
Forklift	85	All storage areas	3 mins	1 min	1 min
Boats, barges	100 (est)	All water areas	10 mins	5 mins	5 mins
Material handling impacts	110 *	All storage areas	3 sec	1 sec	1 sec
Voices, raised	85	All site areas	2 mins	1 min	30 sec
Refrigeration, aircon	85 #	Bulk storage, office	10 mins	10 mins	10 mins
Fuel pumps	75 #	Fuel storage area	5 mins	4 mins	3 mins
Sewage, sullage pumps	75 #	Adjacent to tanks	3 mins	2 mins	1 min
Travel lift	95 (est)	Storage area and tracks	5 mins	nil	nil

* Maximum instantaneous sound power level produced by metallic impacts on the concrete wharf.

\# Maximum allowable sound power levels for these sources will be specified in order to comfortably meet night noise criteria at all residences.

** The average assumed duration of each noise source in a typical 15 minute period during the day, evening and night for the purposes of this assessment.

The average durations listed in Table 7 for the day, evening and night represent the expected period of time each noise source would operate in a 15 minute period assuming the source operates at all. Trucks, for example, are assumed to be audible on the site for 2 minutes in a 15 minute period for the purposes of calculating noise levels but in reality would not be audible for many 15 minute periods in a typical day.

As many of the listed sources would not be audible during many 15 minute periods, calculated noise levels from all listed sources operating together are likely to overstate received levels for the majority of the time.

4.4 Received Operational Noise Levels

Received noise levels depend on the distance from noise sources to the receiver, topography and barriers between the noise source and receiver and the number and type of noise sources operating at the time. Weather effects, particularly temperature inversions and light winds, can also affect received noise levels but these effects are insignificant over the short distance from the site to nearest receivers. Inversions and winds would affect received noise levels at more remote receivers but, in all cases, would not affect the conclusions in this report regarding compliance with the criteria. Weather conditions and their effects on noise propagation are not considered further in this assessment.

As it is impossible to calculate received noise levels during any particular 15 minute period with acceptable accuracy, average noise levels over a typical 15 minute period are predicted in this assessment and are presented in Table 8. Calculations are based on source sound power levels and the proportion of time each source is assumed to operate during each time period as listed in Table 7, the average distance from each source to the closest receiver in each residential area and the effect of any topographical or other barriers between the source and receiver.

Table 8: Predicted Received On-Site Noise Levels, No Noise Control, dBA.

	Received Noise Level, LAeq,15min		
Location	Day	Evening	Night
RTA1 – 18 Johnston St	47	44	44
RTA2 – 18 Grafton St	**52**	48	**48**
RTA3 – 33 Donnelly St	33	30	30
RTA4 – 90 Buchanan St	32	29	29
ERM2 – 1 Batty St	30	27	27
RTA6 – 47 Crescent St	28	25	25
RTA7 – 13 Hornsey St	27	24	24
RTA8 – 48 Burt St	26	23	22
RTA9 – 15 Bayview Cr	25	22	22
RTA10 – 14 Oxley St	29	26	26
RTA11 – 202 Refinery Dr	37	34	34
RTA12 – 114 Bowman St	38	35	35

Table 8 shows predicted noise levels meet the adopted noise criteria in Table 3 at all except the closest residences that immediately adjoin the northern boundary of the site. Predicted noise levels at these residences are 2 dBA and 3 dBA over the day and night noise criteria, respectively, in the absence of any noise control measures including boundary fences or similar barriers along the residential boundaries. Many of the closest residences are located on the northern side of Grafton Street and would therefore have a limited view of the site due to the large difference in elevation between the residences on high ground and the site on lower ground.

The only residential building that is sufficiently exposed to site noise and is likely to receive noise levels over the criteria is the multiple occupancy residence east of Grafton Street between the site and Ewenton Park. This building is understood to have been designed and constructed to control noise intrusion into occupied areas, resulting in acceptable noise levels within the building despite exceedances of the criteria outside the building. Predicted exceedances of 3 dBA above the criteria were therefore considered in the design of affected residences which limits the need for noise control on the site.

The main sources of noise associated with the proposal would be trucks and boats. Average 15 minute noise levels in the absence of these two sources would be at least 10 dBA lower than the levels reported in Table 8 and would be below the background level at all residences, although individual sources would still be intermittently audible at closest residences for relatively brief periods of time. Trucks are expected to produce significant average noise levels due to their proximity to residences and higher maximum noise levels than most other sources. Boats are typically quieter than trucks and remain further from residences but would normally be audible for a longer period of time as they approach and tie up to a berth then cast off and leave the area. It is noted that residents are accustomed to noise from trucks and boats operating in the Port given previous use of the White Bay 6 site for container handling.

4.5 Access Road Noise Levels

Noise associated with the proposal would be produced by vehicle movements on the site access road. Vehicles would typically include staff and visitor cars, courier vans and delivery trucks, with mobile cranes and other specialised vehicles required occasionally for specific tasks.

The access road considered in this section includes James Craig Road, Solomons Way on Glebe Island and a proposed new private road from Solomons Way to meet the existing extension to Robert Street east of Buchanan Street. The new road has been proposed but is not yet approved or constructed and is subject to separate approvals. Fewer vehicles are expected to approach or leave the site via Robert Street once the new road from Glebe Island is completed. As vehicle movements on the site and on public roads are treated differently, noise levels from proposed vehicle movements over most of Robert Street and on The Crescent and Victoria Road are assessed as road traffic noise in Section 4.7 below.

The number of vehicles using the access road is expected to vary from time to time. No movements are expected to occur during many 15 minute periods, while other periods may see a number of trucks or cars entering or leaving the site. This assessment considers average vehicle movements based on the following assumptions:

- 10 fuel deliveries (20 truck movements) per week,
- 3 waste trucks (6 truck movements) per week,
- 5 material storage or pickup trucks (10 truck movements) per week,
- 1 mobile crane or other specialised vehicle (2 movements) per week,
- 2 courier vans (4 movements) per day,
- 25 staff and visitor cars (50 movements) per day.

These assumptions imply an average of 0.23 truck movements per hour and 2.25 car movements per hour along the access route, leading to an average noise level of 39 LAeq,15min at a nominal distance of 20m from the centre of the road. This predicted noise level is 5 dBA below the existing background level and well within the criterion at the closest residences, particularly at residences located on a higher elevation than the site and partially shielded from vehicle noise by the top of the road cutting.

No noise control measures are required for traffic on the private access road, based on the levels calculated above. This conclusion applies to traffic accessing the site via Robert Street or via the separately proposed new access road from Glebe Island.

4.6 Sleep Disturbance

Vehicle movements and other activities during 'night' hours of 10pm to 7am, or to 8am on Sundays or public holidays, have the potential to disturb a resident's sleep. While noise-induced sleep disturbance is currently not well understood, adopted criteria are acknowledged to be conservative and higher sleep disturbance criteria have since been proposed by the EPA to apply to road traffic noise. Research has indicated relatively short, sharp sounds that are significantly louder than the background level are more likely to disturb sleep, rather than a constant or semi-constant noise at a higher level. The adopted sleep disturbance criteria therefore compare maximum noise levels produced by activities on the site with the measured background noise level to indicate the potential for disturbance.

An existing night background noise level of 44 LA90,15min reported in Table 1 for Grafton Street residences during the night implies a sleep disturbance criterion of 59 LA1,1min.

Trucks are likely to produce the loudest noise levels at closest residences, particularly as they travel along the access road in the area around the entrance gate. A typical truck produces a sound power level of 104 dBA as it manoeuvres around a site, equivalent to a maximum received noise level of 70 LA1,1min at a distance of 20m from the truck. Noise levels from the truck would reduce to 59 dBA at a distance of 70m, implying a truck movement within 70m of a residence is likely to cause noise levels over the sleep disturbance criterion in the absence of fences or other control measures. A typical fence offering a noise reduction of 8 dBA would reduce the acceptable truck-receiver distance to 28m.

Calculations therefore imply sleep disturbance is not likely to occur at residences more than 70m from the access road or the site in the absence of a fence or other barrier, or at residences 28m from the access road or site where the bedroom windows are not directly visible from the truck. These results indicate noise from truck movements is likely to remain within the sleep disturbance criterion at most residences in the area.

Three residences at the southern end of Stephen Street and the multi-residential building east of Grafton Street may receive noise levels over the sleep disturbance criterion as a truck enters and leaves the site at night, although such truck movements are only expected to occur occasionally and these residents would be accustomed to vehicle movements on the access road and the site.

Occasional impact sounds produced by material loading and unloading activities can produce a sound power level of 110 dBA, equivalent to a maximum noise level equal to the sleep disturbance criterion at a distance of 140m from the source assuming a full view of the source from the residence. As nearest residences east of the site are at least 140m from storage areas, sleep disturbance impacts are not expected to occur to this area.

Nearest Grafton Street residents are located just over 60m from material storage areas on the site and would potentially receive short term impact sounds over the sleep disturbance criterion in the absence of a barrier. As limited material handling activity is expected at night and this residential building is understood to have been designed and constructed to protect residents from external noise, disturbance to a resident's sleep is not expected to occur or may occur rarely.

Other Grafton Street residences are close to or over 140m from material storage areas and at least partly shielded by the top of the existing embankment on the northern boundary of the site so are expected to receive acceptable impact noise levels in the absence of any additional noise mitigation measures.

4.7 Traffic Noise Levels

Traffic accessing the site would normally travel via James Craig Road and internal port roads. Noise from internal roads has been assessed in Section 4.5 above, while traffic noise on public roads is assessed in this Section.

Section 4.5 concluded site activities would normally generate an average of 0.23 truck movements and 2.25 car movements per hour, for a total of nearly 2.5 vehicle movements per hour. Compared to existing Victoria Road and The Crescent traffic flows, proposed traffic accessing the site via James Craig Road is expected to increase traffic flows on public roads by less than 1% and increase traffic noise levels by less than 0.1 dBA. Traffic noise associated with the site is therefore insignificant at any sensitive receiver.

Site traffic on Robert Street is expected to produce up to 41 LAeq,1hr at a nominal distance of 10m from the traffic lane, compared to criteria of 60 LAeq,1hr during the day and 55 LAeq,1hr during the night. Predicted traffic noise levels associated with the proposal are therefore at least 10 decibels below the criteria at any sensitive receiver and are considered acceptable.

4.8 Construction Noise Mitigation Measures

Section 4.2 assessed construction noise levels and indicated potential exceedances of the construction noise criterion may occur at times at closest residences to the site. While the relatively short duration of construction noise tends to limit the severity of any impacts, the following noise management measures are recommended to further limit the occurrence of noise levels over the construction noise criterion:

- Construction work on the site would occur during normal construction hours of 7am to 6pm Monday to Friday and 8am to 1pm on Saturday. No construction work is recommended outside those hours unless the work will comply with the evening or night operational noise criteria listed in Table 3 or will be inaudible at residences.
- Construction equipment such as earthmoving machines should be maintained in good condition with particular regard to exhaust silencers, engine covers and similar noise control components.
- Construction equipment should be carefully chosen to suit each task to increase efficiency, reduce the number of machines operating simultaneously and minimise the construction period.
- Reverse alarms should be controlled to the lowest possible noise level consistent with safe working practice. Truck paths around the site should be designed to avoid or minimise the need to reverse.
- Machines should be switched off when not required, rather than be left idling for extended periods.
- Storage areas for construction materials should be allocated as far from residences as possible.
- Components should be fabricated off-site then simply assembled and installed, to minimise the amount of work required on the site.

4.9 Operational Noise Mitigation Measures

Section 4.4 indicated site activities may produce noise levels over the day and night noise criteria at the closest residential units during 15 minute periods that include truck and boat movements. Noise levels from the site are expected to be within the criteria for most of the time and the closest residential building has been designed to offer increased noise insulation, reducing the need for noise control measures on the site. Nevertheless, the following control measures are recommended:

- Fuel deliveries and other truck movements on the site should be scheduled to avoid the evening and night whenever possible,
- Unloading or loading activities during the night should occur as far from residences as possible,
- Truck paths should be designed to minimise the need for trucks to reverse, in order to avoid audible reverse alarms,
- Boats should be encouraged to visit the site to refuel during the day where possible, rather than during the evening or night,
- Use of the roll-on, roll-off ramp during the night should be discouraged where the vehicles and barge are available for loading or unloading during the prior day,
- Use of the travel lift should be avoided during the evening and night,
- Trucks, other heavy vehicles and boats should have their engines switched off when not required, rather than be left idling unnecessarily, and
- Staff and patrons should be encouraged to minimise raised voices on the site at any time but particularly during the evening and night.

While the above recommendations are intended to discourage unnecessary night activity for the benefit of residents, some activity during the evening and night should be expected to occur and is unlikely to cause a significant noise nuisance to any residence. It must be acknowledged that the proposal is a less intense use of the site and is likely to produce less noise than the previous container handling activity that occurred for some years.

5 CONCLUSION

This assessment shows future noise levels produced on the site by the proposed Marine Supply Base are likely to remain within current DEC noise criteria at almost all residences near the site. Slight exceedances of the criteria are predicted to occur occasionally at the closest residence near the site's entrance gate. The facade of this residence is understood to have been designed and constructed to provide additional noise insulation, to maintain acceptable internal noise levels despite external noise levels over the criterion.

Given the minor, occasional nature of the predicted criteria exceedances to a residential building designed for such noise, the predicted exceedances are considered acceptable. Nevertheless, noise mitigation measures have been recommended to further minimise noise from the site, particularly during the evening and night.

Construction work is expected to produce noise levels over the construction noise criteria at times, mainly during earthworks to install the fuel tanks and prepare the foundations and supports for the roll-on roll-off ramp. Construction noise mitigation measures have been recommended to minimise the occurrence, duration and level of such exceedances. As the relatively short duration of construction work serves to limit any noise impacts, the predicted exceedances are not considered sufficient to jeopardise the proposal provided all feasible and reasonable mitigation measures are adopted.

Noise from the site's access road, and on nearby public roads is expected to be acceptable at all residences.

Truck movements and occasional material handling noises may exceed the sleep disturbance criterion at the closest residences to the site and to the private access road just west of the site, although residents would be accustomed to truck movements on the site at night and would receive lower noise levels than many residents who live near main roads.

Recent research reported in the EPA's Environmental Criteria For Road Traffic Noise (ECRTN) suggests the sleep disturbance criterion adopted in this report is too conservative for vehicle passby noise typically heard from roads, although it must be acknowledged that this subject is currently poorly understood. Current research results indicate a noise level of 55 dBA in a bedroom, equivalent to 65 dBA outside the bedroom with the windows open or above 70 dBA outside with the windows closed is unlikely to cause awakening reactions and would not be exceeded by site sources.

The site has been used intensively for container handling activities for some years and new residents are made aware of industrial activities on the site via notification on Section 149 certificates. New residential apartments in this area have been designed to satisfactorily exclude noise from external sources such as trucks and forklifts on this site.

This assessment shows the proposal will cause acceptable environmental noise levels at nearby residential properties, assuming all proposed noise mitigation measures, or equivalent options, are successfully implemented on the site.

APPENDIX A –SITE AND AREA PLANS

Photograph showing the site and closest residential areas. North is to the left of the page.

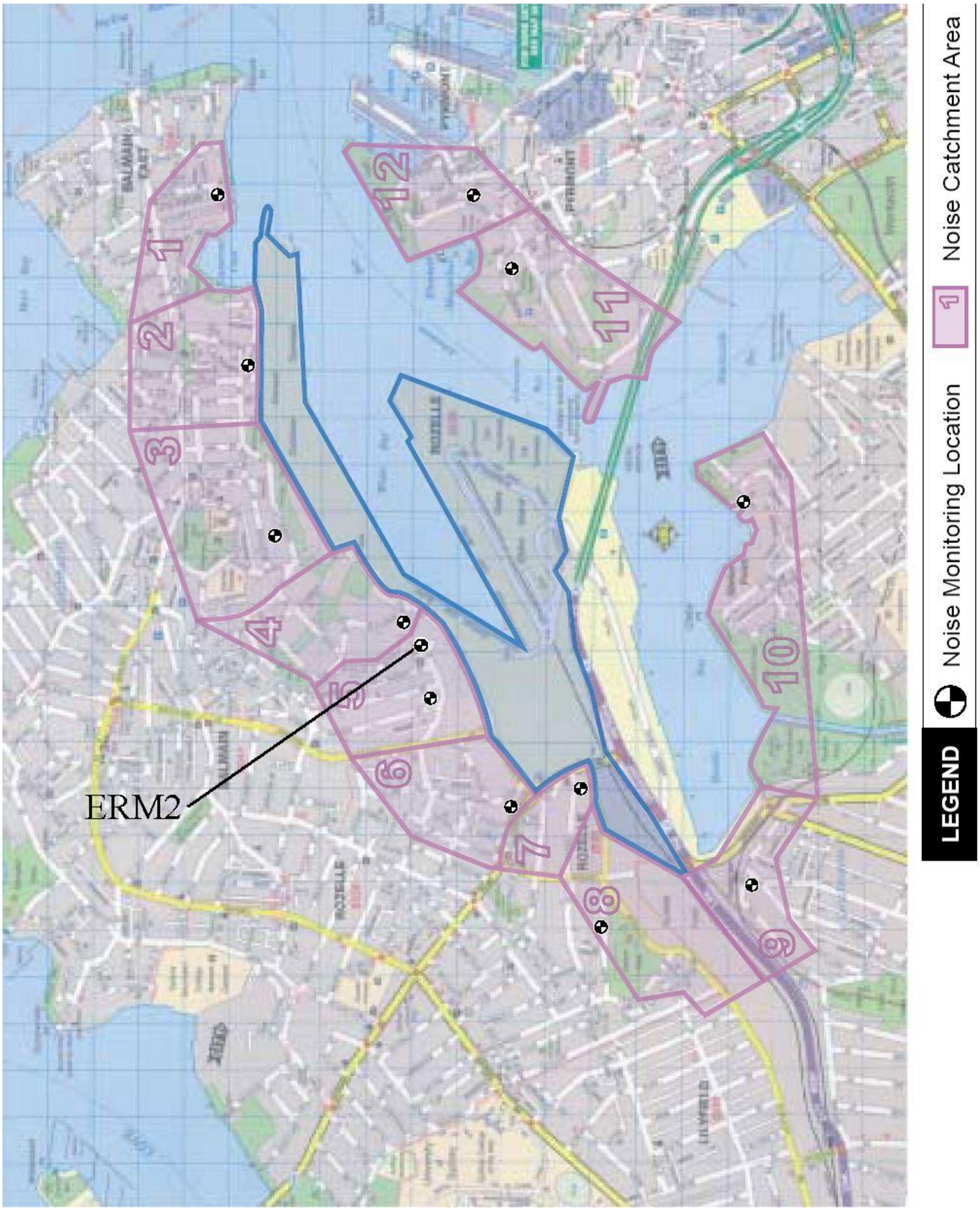
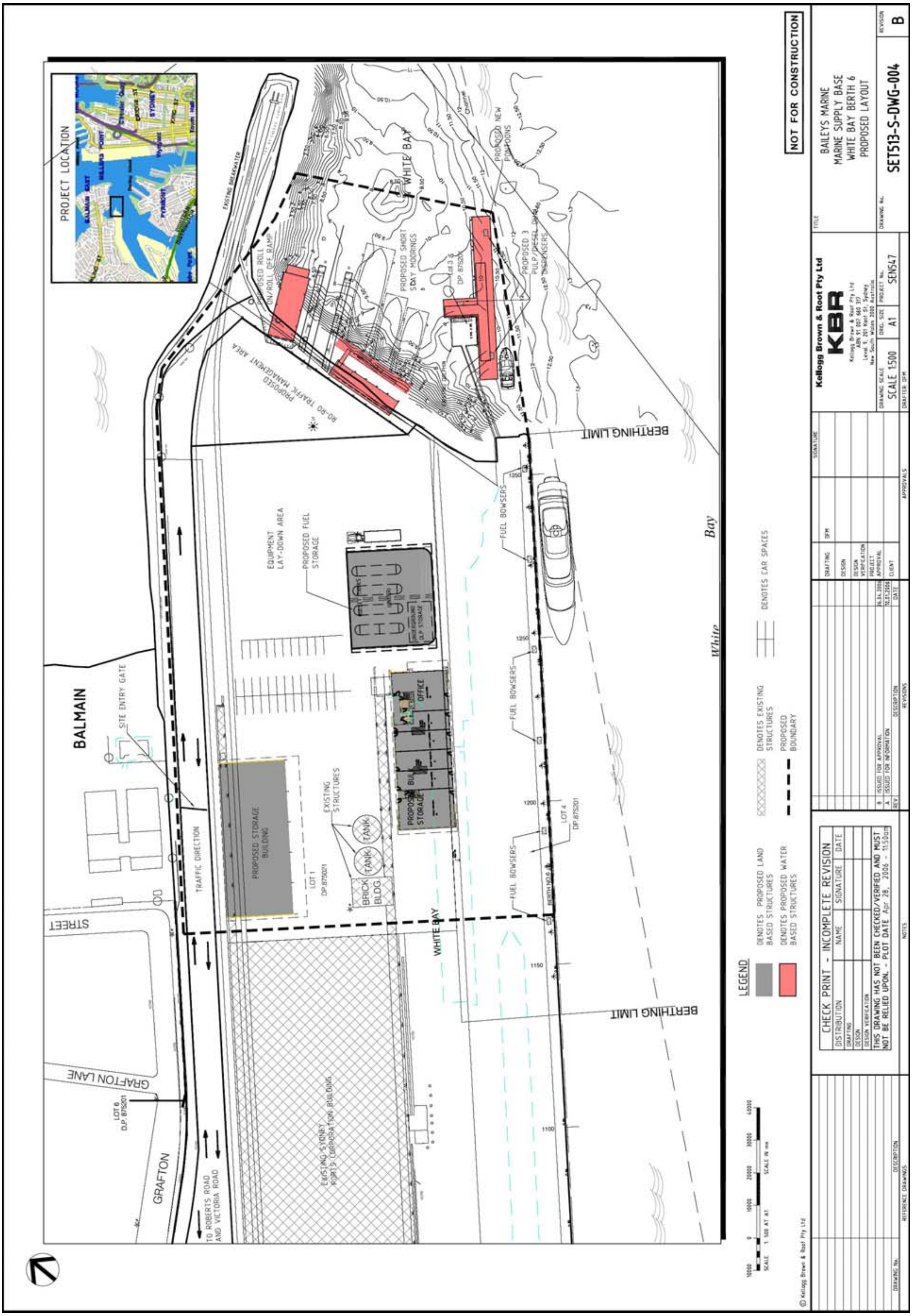


Figure 2 - Noise Catchment Areas Around the Glebe Island/ White Bay Port Area

Plan extracted from Renzo Tonin & Associates Report TB278-01F02 (rev2) to show noise monitoring locations referenced in this report. ERM's location 2 referred to in this report has been added to the plan.



Site plan extracted from Drawing SET513-S-DWG-004 revision B prepared by KBR dated 26 April 2006.

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Appendix M

LIGHT SPILL ASSESSMENT

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BAILEYS MARINE FUELS AUSTRALIA PTY LTD, PROPOSED DEVELOPMENT, BERTH 6, WHITE BAY. NSW LIGHT SPILL ASSESSMENT.

SUMMARY

Bassett Consulting Engineers Pty Ltd was engaged by Kellogg Brown & Root Pty Ltd to assess the light spill from the proposed development at Berth 6, White Bay, New South Wales, for Baileys Marine Fuels Australia Pty Ltd. The proposed development is a marine supply facility on land owned and operated by Sydney Ports Corporation.

The existing port facilities at Berth 6 are lit by electric lights during the night-time hours for its previous use as a container and general cargo terminal. The existing luminaires include high intensity discharge floodlights, streetlights and wharf edge lights as well as some weatherproof linear fluorescent luminaires for its previous use as a container terminal. Less than 50 percent of the luminaires were functioning at the time of observation for various reasons as noted.

Lighting for the proposed development will comprise a combination of some of the existing lighting on the site and the addition of selected luminaires at specific locations such as along the proposed pontoons and around the buildings. Some of the existing lighting, particularly some floodlights at high level are intended to be de-commissioned as they are not needed for the proposed facility and would minimise any effects on the surrounding environment. Some more appropriate localised lighting will be used in areas such as on pontoons and in the vicinity of the proposed buildings.

The proposed marine supply facility has been modelled using AGI32 lighting software to predict the extent of light spill from the development. The model shows the distribution of potential light spill with iso-lux lines revealing the pattern and extent of potential effects.

The net overall effect will be no additional light spill towards the north of the site. The effect towards the south will be less than the existing situation. The effect towards the east will be the appearance of subdued lighting from louvred bollards on the pontoons, one additional weatherproof fluorescent luminaire adjacent the steps on the existing dolphin plus an extra navigational aid on one of the pontoons as directed by the Harbour Master.

BAILEYS MARINE FUELS AUSTRALIA PTY LTD,
PROPOSED DEVELOPMENT,
BERTH 6, WHITE BAY. NSW
LIGHT SPILL ASSESSMENT.

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GLOSSARY

Term	Definition
Luminaire	A technical term for the complete assemblage of apparatus that distributes, filters or transforms the light given by a lamp or lamps and consists of lamp, control gear, housing, reflector system, glass or refractor and mounting arrangement commonly referred to as a *"light fitting"*.
Lumen	A lighting unit of measurement. The quantity of light emitted from a light source (lamp) in a specific direction.
Lux	A lighting unit of measurement. It is a measure of illuminance where illuminance is the quantity of light received at a given point but averaged per square metre (lumens/square metre). It is measured with an illuminance meter that is corrected to simulate the performance of the human eye.
Iso-lux	Iso-lux curves are a locus of points on or in a plane where the illuminance has the same value
Dazzle	A non technical term used to describe the brightness of the appearance of lights in the field of view which do not necessarily produce glare. Glare is a technical term relating to the brightness of lights and the resultant discomfort or reduction in the ability to perform visual tasks.

BAILEYS MARINE FUELS AUSTRALIA PTY LTD, PROPOSED DEVELOPMENT, BERTH 6, WHITE BAY. NSW LIGHT SPILL ASSESSMENT.

Report by:
Tim Shotbolt BBldg, MBdgSc FIES
Associate (Senior Lighting Designer)
Bassett Consulting Engineers Pty Ltd

Date: 29 August 2006.

1. Introduction

Bassett Consulting Engineers Pty Ltd was engaged by Kellogg Brown & Root Pty Ltd to assess the light spill from the proposed development at Berth 6, White Bay, New South Wales for Baileys Marine Fuels Australia Pty Ltd. The land is owned and operated by Sydney Ports Corporation. The original site was lit for the purpose of loading and unloading containers and general cargo to and from vessels which has some different parameters to the new proposed development. The proposed development is a marine supply facility on land owned and operated by Sydney Ports Corporation. This report documents the existing lighting based on observations made on site and in the general area as well as predicting the light spill from the proposed development.

2. Australian Standards

A number of lighting design standards apply to the design for this proposal. Professional lighting would be designed according to these standards. The standards applicable include:

AS/NZS 1680	Interior Lighting (all parts)
AS/NZS 1158.3.1: 1999	Road Lighting Part 3.1: Pedestrian area (Category P) lighting – Performance and installation design requirements.
AS 4282 – 1997	Control of the obtrusive effects of outdoor lighting.

Assessment of the obtrusive effects of lighting from the installation broadly falls within the scope of AS 4282, although this standard does not include light emanating from within a building.

3. The Site

3.1 The site is at the eastern end of the port facilities (refer Figure 1) with Camerons Cove and Ewenton Park to the north. Residential properties surround and look down into Camerons Cove, across Johnstons Bay, Jones bay and further across to the city. There are also views across to Glebe Island port facilities. The Water Police Marine Area Command is also located in Camerons Cove.

3.2 On the opposite side of Johnstons Bay, high-rise residential developments face the proposed development.

4. Surrounding Residents

4.1 All residents facing the proposed development require consideration, some more than others. The locations that appear the most obvious are the east end of Grafton Street, Union/Hosking street south west end, and Pyrmont Point.

4.2 The residences at the east end of Grafton Street are elevated to varying heights above the general site level. Some of the residences are above the height of the existing built structures on the proposed development site (refer Photos 1 and 2).

4.3 The multi-storey apartment block on the waters edge (Union/Hosking Streets south west end, East Balmain) overlooks the proposed development but does not directly face the proposed development. Lounge rooms and balconies face more directly towards the city (refer Photo 4).

4.4 Residential multi-storey developments beyond Pyrmont Point (refer Photo 14) are over 300 metres from the proposed development and face the full extent of the existing port facilities at White Bay including the small portion allocated to the proposed development (refer Photo 6).

5. Existing Lighting

5.1 On the site of the proposed development there is operational lighting installed as part of the general port facility. The existing lighting provided for the use of the site as a container terminal and more recently that has been modified for the purpose of new vehicle storage inclusive of security. On the night of observation (25th July 2006) some of the installed lighting was functioning and some was not (refer Figure 2). The majority of the lighting is provided from high level by Wide-Lite brand series F floodlights complete with small hoods attached. These types of floodlights have a vertical high intensity discharge lamp and are used generally along the whole port facility. The floodlights are also mounted on the 30 metre tower (refer Photo 5) and at regular intervals along the gantry structures and above the existing building structure. These floodlights can be clearly seen from Pyrmont Point at night (refer Photo 6).

There are road-lighting luminaires attached to the northern gantry structure lighting the access route along the north of the site (refer Photo 3 which have the dual function of security). Also, there are weatherproof fluorescent luminaires mounted above the walkway to the dolphin (refer photo 4), a navigation beacon on the dolphin and high intensity discharge lighting along the edge of the wharf (refer Photo 13 and Figure 2).

5.2 The residents of the east end of Grafton Street at high level have night-time views as shown in Photos 11 and 12. Note that at the corner of Grafton Street at high level there are two off street lighting luminaires, each luminaire a 2 x 18W bare fluorescent lamp luminaire which contribute significant illuminance spill to residents such as the 2 storey residence on the corner. Illuminance measurements of the existing site had to be taken behind the timber pole to shield the fluorescent light sources from contribution to site readings.

5.3 Residents at lower level (Grafton Street) near the waters edge will have views resembling those shown in Photos 7 and 8. The brightness of the Central Business District exceeds the impact of the existing site lighting.

5.4 Residents further around Cameron Cove and Union/Hosking Streets will have views similar to those shown in Photos 9 and 10. Obviously the more elevated the observation point the more the proposed development site is visible. Photo 10 illustrates that the port facilities on Glebe Island are more prominent than those existing on the proposed development site.

6. Lighting Recommendations for the Proposed Development

6.1 Accommodation of the proposed development as described in Chapter 5 of the draft Environmental Assessment (KBR 2006) requires the existing lighting to be changed. Use of all of the existing floodlighting installed on site would not enhance night-time facilities usage. It is therefore recommended that existing Wide-Lite floodlights in the following areas be de-commissioned for this proposal:

a) Any floodlighting mounted on gantry structures that also would be aimed over the roof of the proposed buildings will create bright roof surfaces and reflect light towards residents. This will be particularly important for existing Wide-Lite floodlights positioned above the proposed storage building adjacent to Grafton Street.

b) Similarly, Wide-Lite floodlights above the proposed office/storage building be circuited so that they are used only in the event of an emergency or as required by Sydney Ports Corporation.

c) The Wide-Lite floodlights mounted on the south gantry structure and facing northwards towards Grafton Street should continue not to be used as they could become sources of brightness in the field of view to residents and there would be reflected light from the tops of the existing tanks and existing brick building roof (white colour).

d) Not all of the existing Wide-Lite floodlights on the 30 metre tower are required. A maximum of 3 floodlights directed away from Camerons Cove should be retained. One additional existing Wide-Lite floodlight complete with hood may be oriented almost westward (but not towards Grafton Street directly) providing the front glass is angled no greater than 20 degrees above the horizontal which means the hood should screen direct views of the floodlight from residents in Grafton Street. Four of the existing eight floodlights are not required.

6.2 Lighting should be provided in front of the proposed storage building by use of 60 degree asymmetric distribution floodlights installed with front glass horizontal and mounted either on or under the leading edge of the storage building roof. The floodlight luminaire to be similar to that shown in Figure 3.

6.3 Lighting should be provided in front of the proposed office/storage building by floodlights mounted along the roof line and of the type shown in Figure 3 and oriented towards the wharf edge and installed with the front glass horizontal.

6.4 Lighting should be provided to the office/storage building above each roller/tilt access door and at strategic points around the perimeter for security and safety. The weatherproof luminaires would have downward directed lighting only.

6.5 Lighting of subdued recreational style should be applied to the pontoons. Luminaires to be louvred bollards with compact fluorescent lamps (warm colour temperature – 3000K). Bollards to be spaced 7.5 to 10 metre centres.

6.6 Existing fluorescent lighting of access path to the dolphin should be utilised. An additional similar luminaire will be required on the dolphin adjacent to the steps.

6.7 The existing navigation beacon on the dolphin to be retained and an additional navigational aide provided on one of the pontoons as directed by the Harbour Master.

6.8 The ro/ro ramp and the adjacent hardstand area should be lit from the 30 metre tower using new floodlights. The new floodlights shall ensure complete screening of the floodlight face and light source from adjacent residents by using a long screening snoot and appropriately aimed. Figure 3 shows the type of floodlight and snoot attachment required.

6.9 The existing road-lighting luminaires along the north gantry structure should be retained to maintain the current level of security with security enhancements being provided using low light level CCTV camera technology.

6.10 The existing lighting to the southern edge of the wharf should be retained.

7. Lighting Spill Assessment

7.1 Various measurements were taken at locations as noted in Figure 1. The figures are only a guide for two reasons. Firstly there was no practical method of eliminating all light sources in the field of view from being measured. Secondly, there was no method of establishing the number of hours each lamp had been burning. As the number of hours a lamp has been burning increases, the light output decreases (in some cases significantly).

7.2 The only method of determining the extent of light spill from the proposed development compared to the existing situation is to model both the proposed development and simulate the existing environment using only those floodlights determined as operating on the night of observation. Both simulations use new lamps. Assumptions have been made based on experience and observation about the orientation and aiming of the existing lights. The spill light calculation plane is a horizontal plane 1.5 metres above the site hardstand level and takes no account of undulating terrain and reductions in light spill as elevation of the observer increases above the hardstand level. Not withstanding these limitations, it is a useful tool for comparison purposes.

7.3 The simulated existing installation reveals that the predicted light spill (Ev) is higher than those measured at the points noted in Figure 1. The difference is within a range expected as a result of lamp light output depreciation with hours of burning and that the actual aiming angles of each floodlight are not known.

7.4 As anticipated, the proposed development and the lighting actually reduce the extent and amount of light spill across Johnstons Bay. In Camerons Cove the amount and extent of light spill is virtually identical to the existing with a 0.1 lux increase at the south east corner of Camerons Cove (refer Figure 4). In reality this increase is unlikely to occur because the photometry of the new proposed floodlights does not include the reduction effect of the screening snoots and overstates light spill as it is only the photometry of the bare floodlight that is used in the calculations. Photometry is not currently available from the manufacturer on the proposed floodlight complete with snoot fitted.

7.5 AS4282 was initially prompted in response to the proliferation of floodlit backyard tennis courts and was expanded to consider a wider range of activities. In AS4282 there are two proposed locations used as assessment points. One is the boundary of the property likely to be affected and the other, after curfew hours, is at the windows of specific rooms such as bedrooms on the properties likely to be affected. The port operates 24 hours, seven days per week and as such there are no “curfew” hours. In this instance the location for measurement is not practical due to the interference of other local lighting (street lights, pool lights etc as noted previously) and not being able to eliminate the influence of these items from measurements. The site has been floodlit for many years and the information above shows that there is a general improvement compared to the existing lighting.

8. Night-time Appearance of Proposed Development

8.1 The reduction in use of the existing bright Wide-Lite floodlights and the use of modern asymmetric distribution floodlights installed with front glass horizontal will combine to reduce the dazzle from floodlights to residents across Johnstons Bay. Figure 5 shows a computer generated rendered impression of the lit proposed development from Johnstons Bay direction.

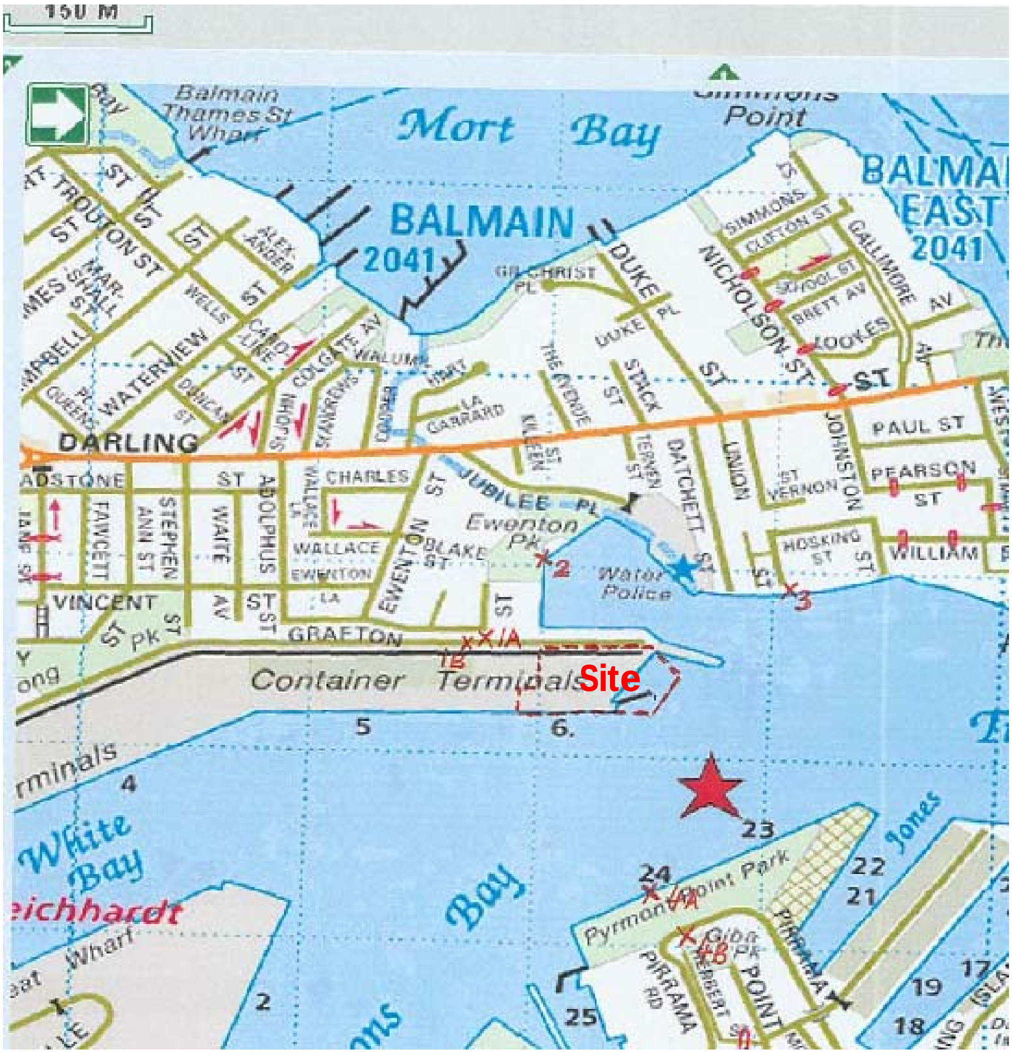
8.2 Pedestrians around Ewenton Park shore line (Camerons Cove) will experience an increase in the number of bright spots on the top of the 30 metre mast (refer Figure 6). For observers at higher elevations the effects will be virtually unnoticeable.

8.3 For observers in the vicinity of Union/Hosking Streets south west end, the subdued pools of light from the bollards on the pontoons may be visible (refer Figure 6). The effect will be considerably less that the post-top spheres lighting the swimming pool at the base of the multi-storey unit block. There may also be an extra navigation aid installed at the end of the pontoon depending on Sydney Port Corporation's Harbour Master's requirements. At lower elevations the site and pontoon areas will be screened from view by vegetation (refer Photos 7 and 9).

8.4 Photo 12 shows a view of the existing site from Grafton Street and Figure 7 is a computer generated rendered impression from a similar location showing that the roof of the proposed storage shed will screen some lit view of the site particularly when the existing floodlights on the north gantry are de-commissioned.

9. Conclusions

The requirements for lighting on the site have changed from the original function of the site, that being a container and general cargo terminal. Adopting the recommendations will provide a development on site that will generally reduce the overall environmental effect compared to the existing lighting. Adopting more appropriate task oriented lighting as proposed will produce a more appropriate result for the proposed use of this site. Having louvred bollards on the pontoons off the east end of Berth 6 will add light to that currently dark zone. Illuminance spill into the surrounds of Camerons Cove is not expected to exceed the existing situation as detailed in this report.



Location	Ev	Description of Location
1A		At chain wire fence, corner of Grafton Street behind town houses
1B	1.63	At chain wire fence behind timber light pole
2	0.38	At corner of rock wall closest proposed development
3	0.57	On timber landing of stairs forming right-of-way to shoreline
4A	0.96	At wharf edge
4B		At elevated ramp walkway

Figure 1 General location of proposed development and observation and measurement locations.

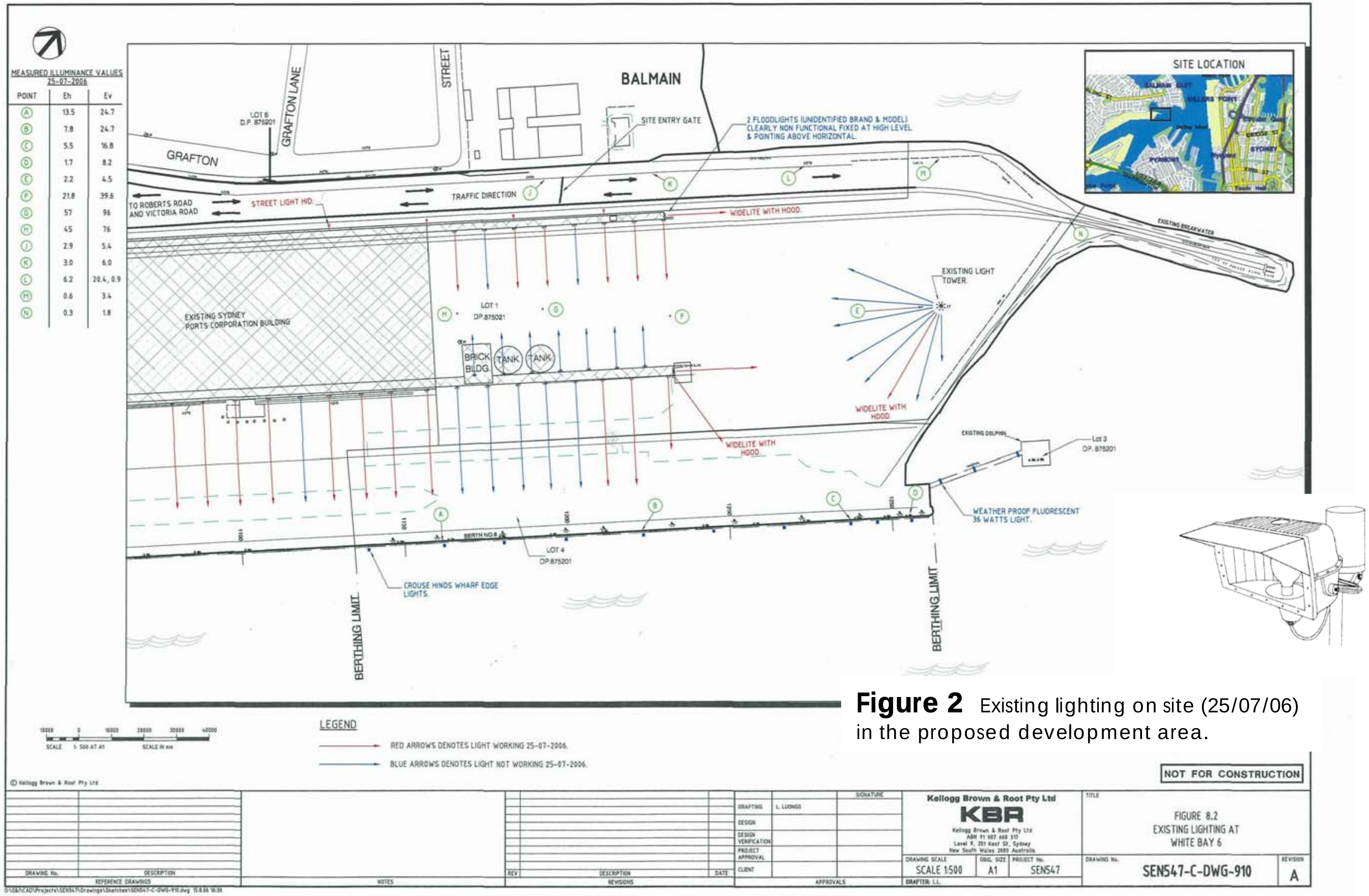


Figure 2 Existing lighting on site (25/07/06) in the proposed development area.

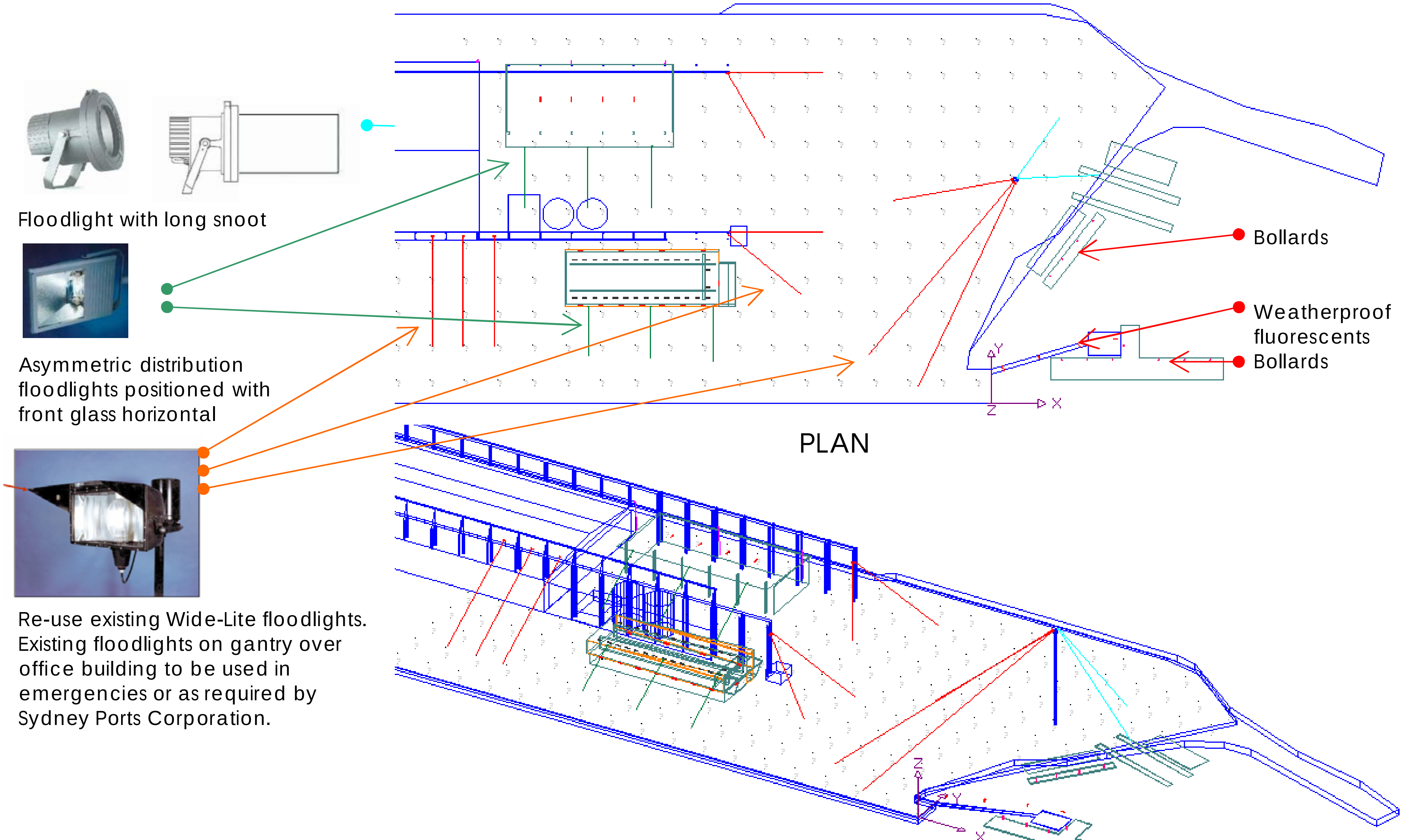
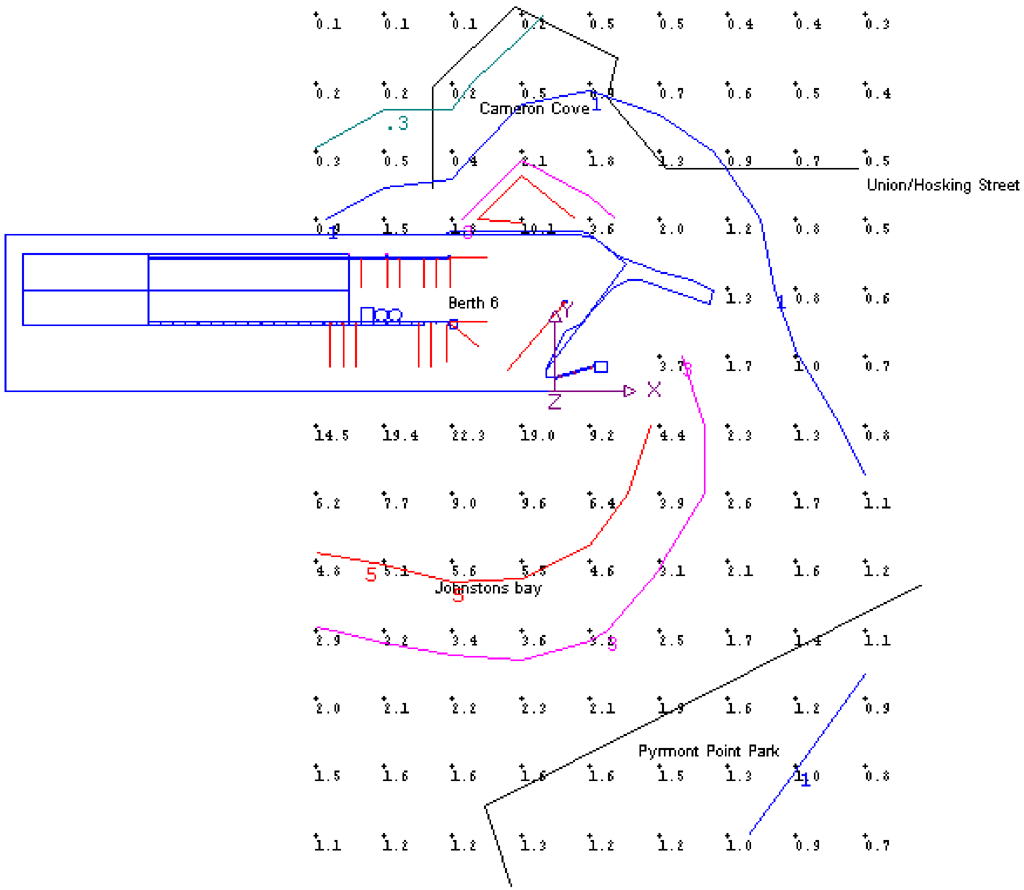
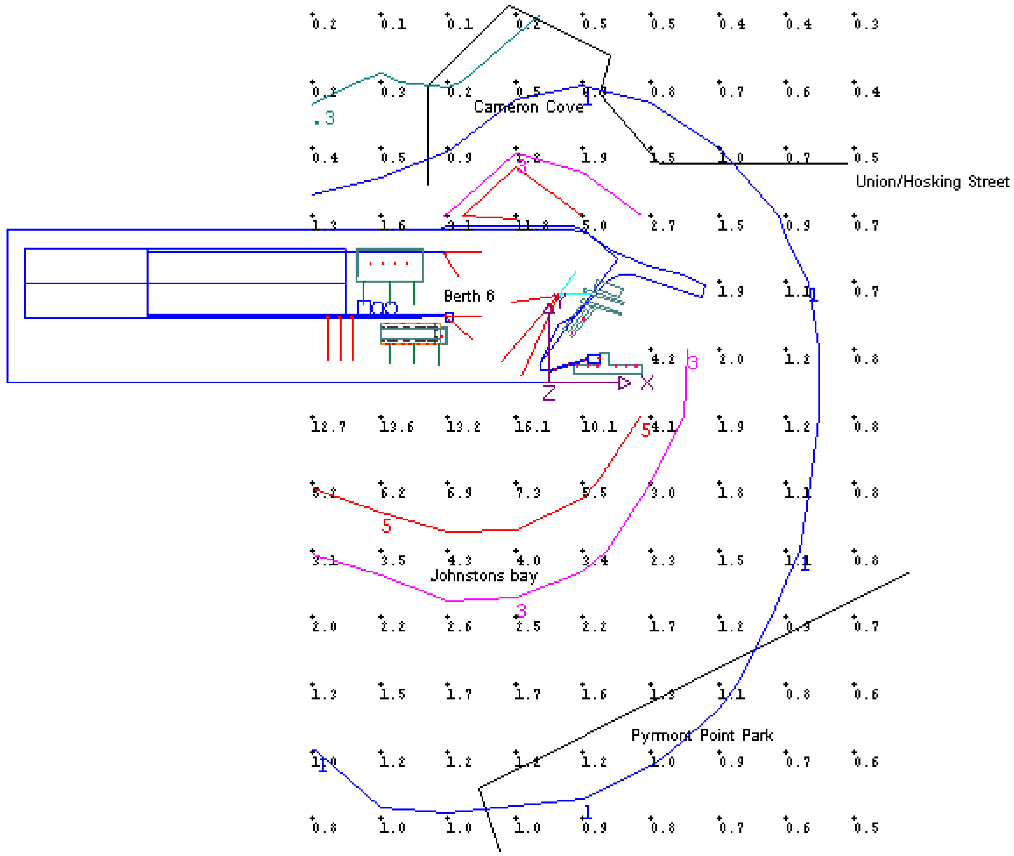


Figure 3 Lighting of Proposed Development.



Simulation of site lighting as existed 25/07/06 but with new lamps.



Simulation of proposed development and lighting with new lamps.

Figure 4 Comparison of light spill (Ev) simulations between existing site lighting and proposed development lighting.

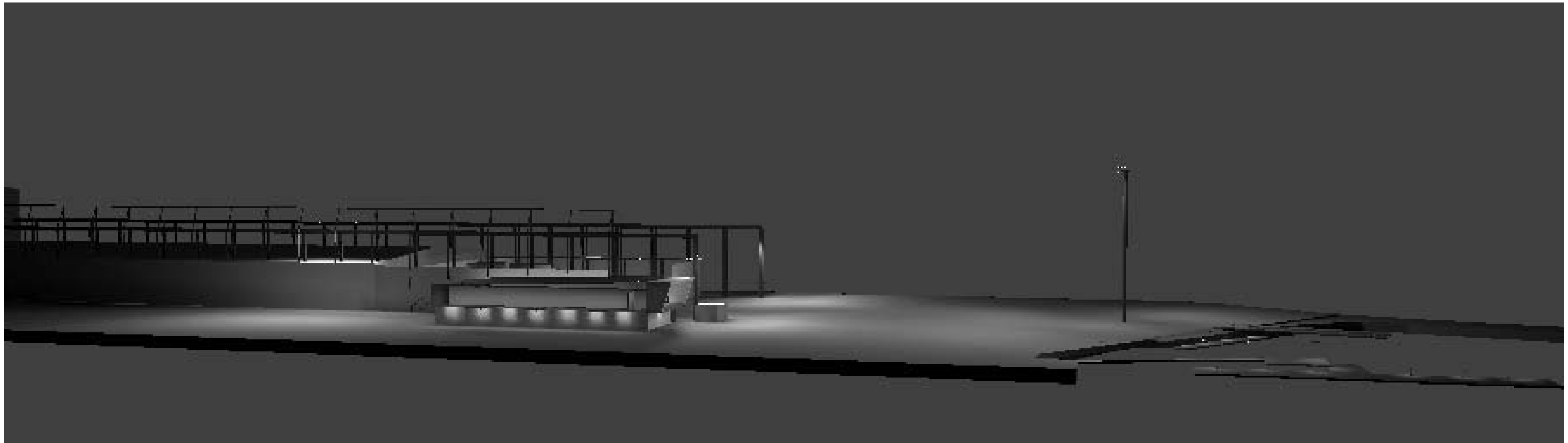


Figure 5 Computer generated rendered impression of proposed development from Johnstons Bay.

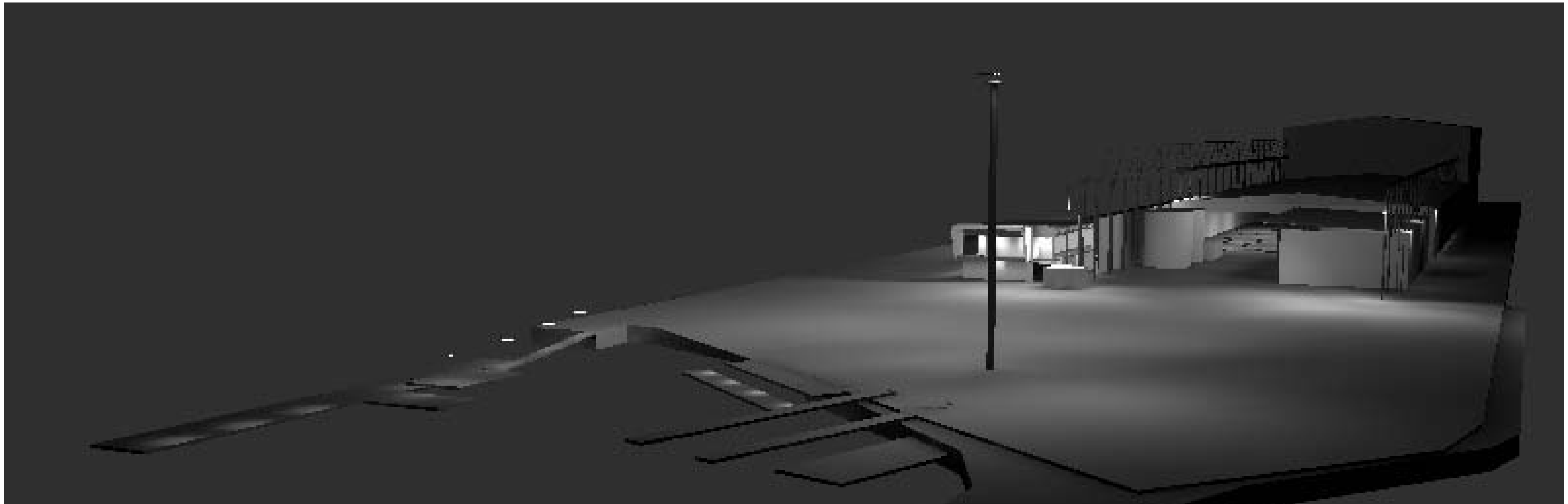


Figure 6 Computer generated rendered impression of proposed development from high level across Camerons Cove.

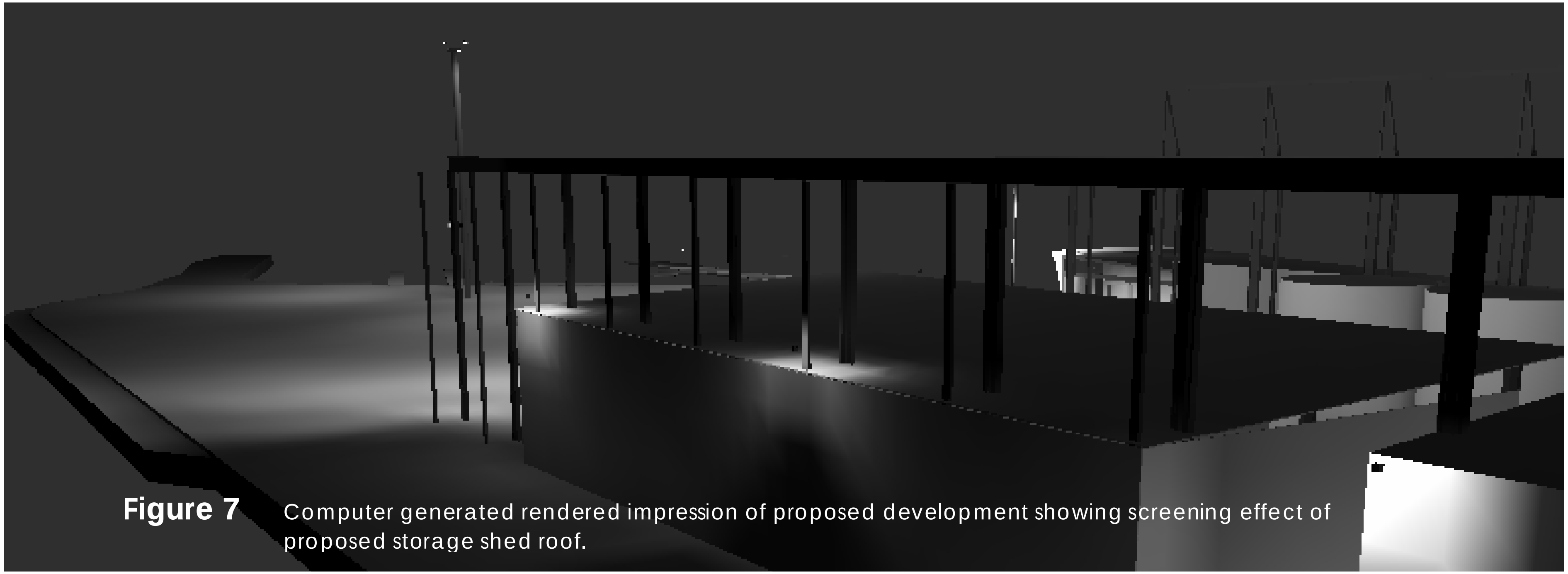


Figure 7 Computer generated rendered impression of proposed development showing screening effect of proposed storage shed roof.

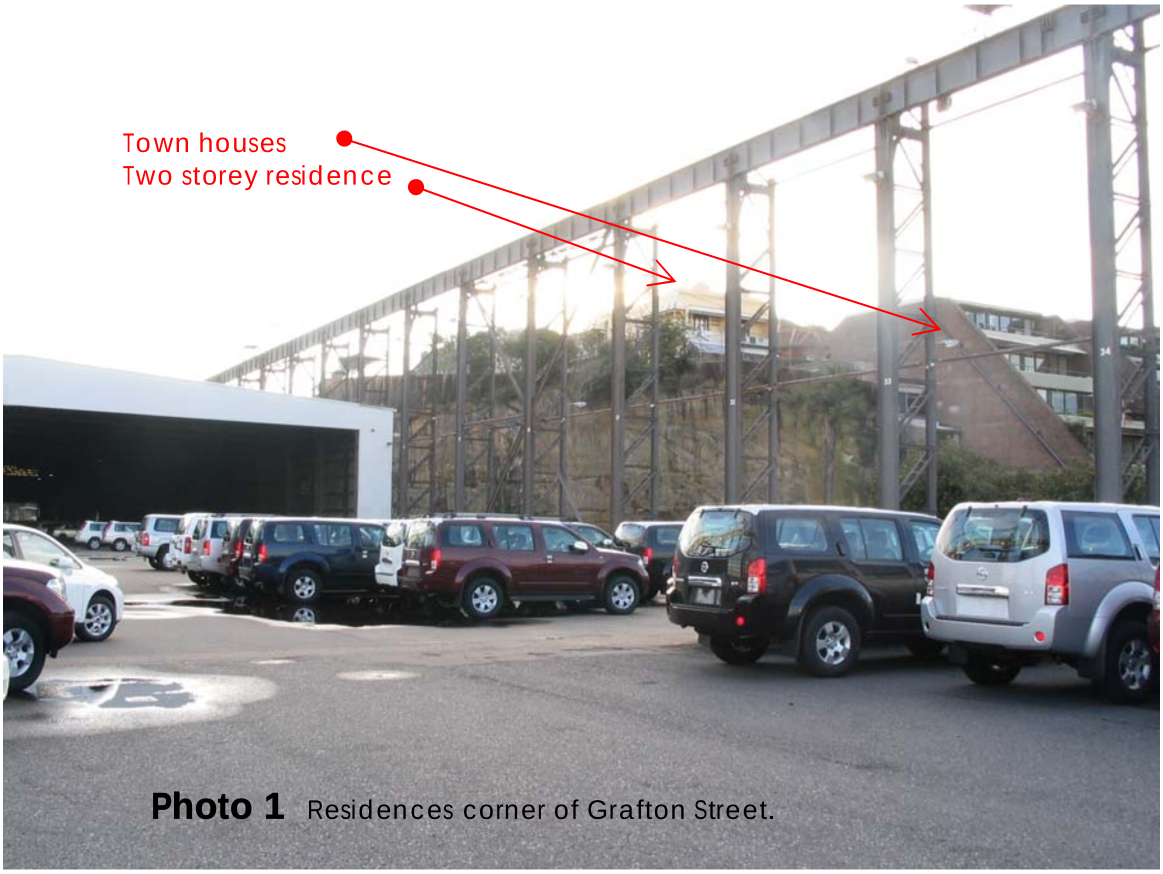


Photo 1 Residences corner of Grafton Street.

Photo 2 North boundary of site with view of residences of Grafton Street.

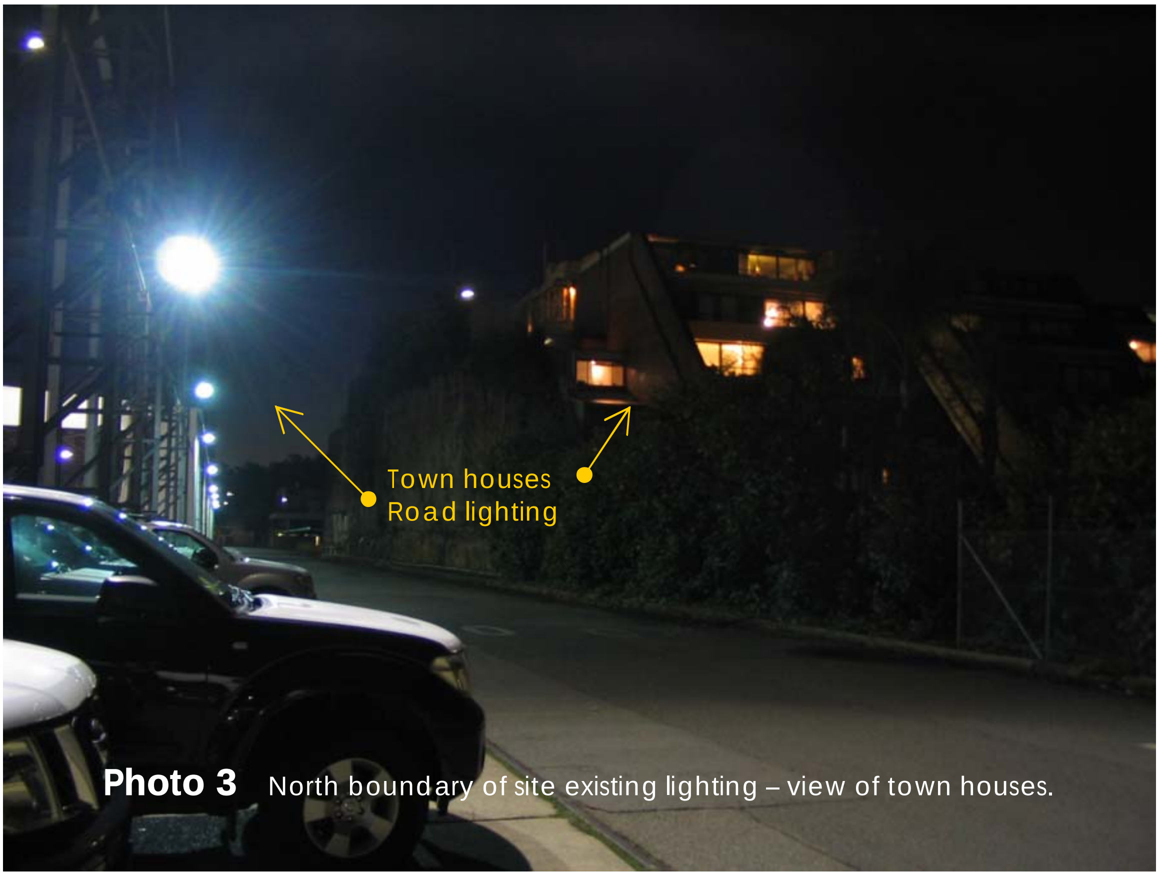


Photo 3 North boundary of site existing lighting – view of town houses.

Photo 4 Existing dolphin and lighting.

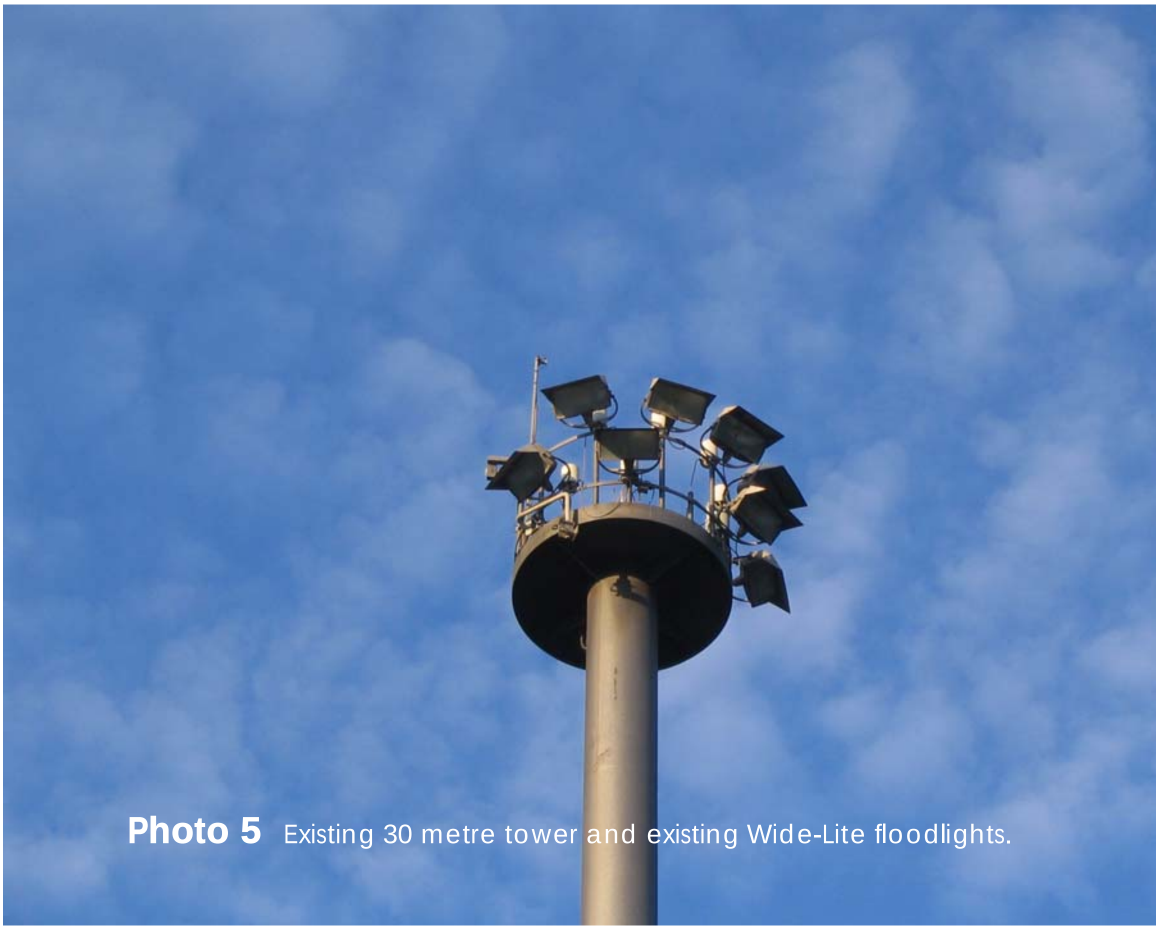


Photo 5 Existing 30 metre tower and existing Wide-Lite floodlights.

Photo 6 Existing lighting as seen from observation point 4B above Pyrmont Park.

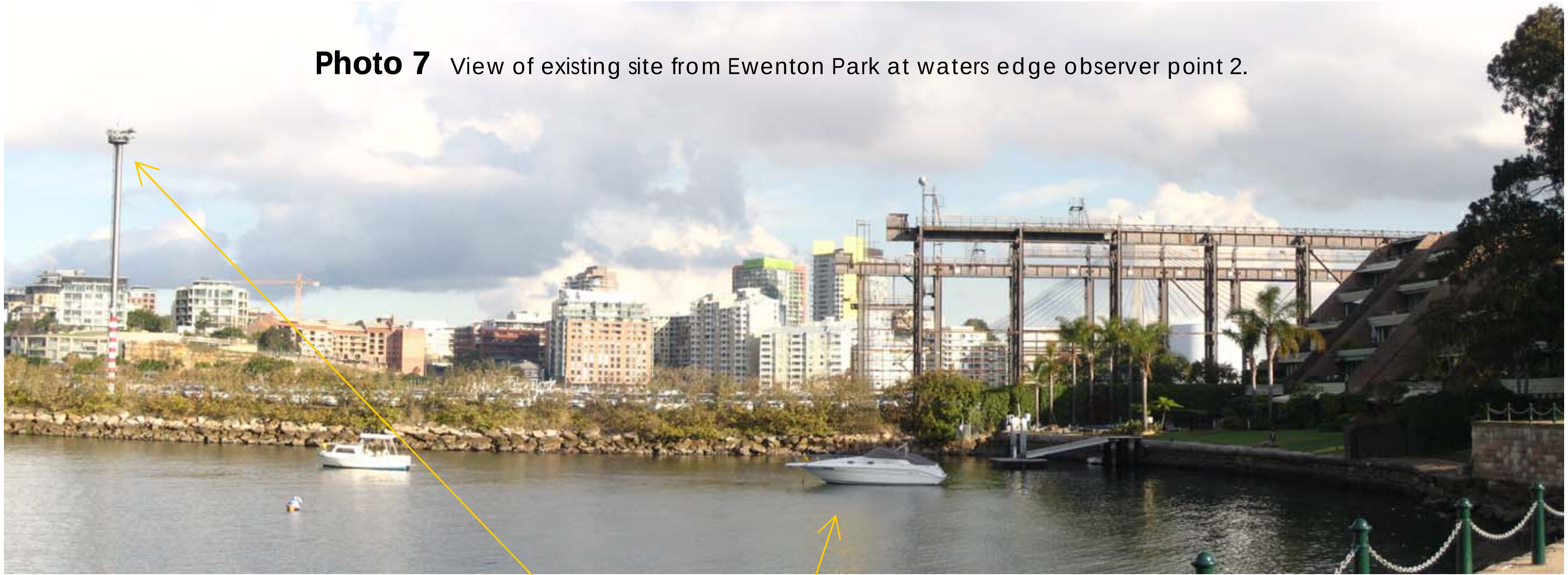


Photo 7 View of existing site from Ewenton Park at waters edge observer point 2.

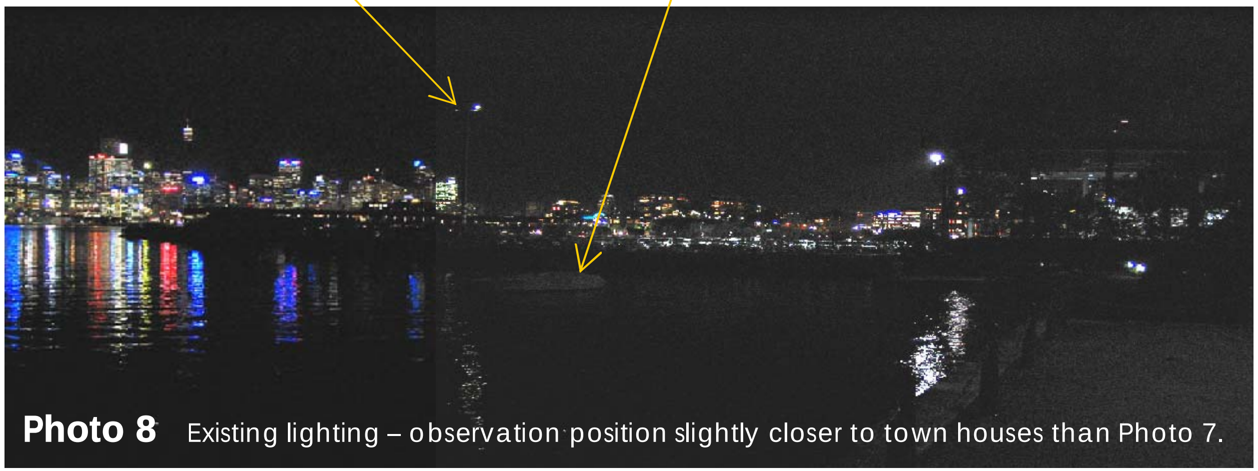


Photo 8 Existing lighting – observation position slightly closer to town houses than Photo 7.

Photo 9 View of existing site from observation point 3 (Union/Hosking Streets south west).

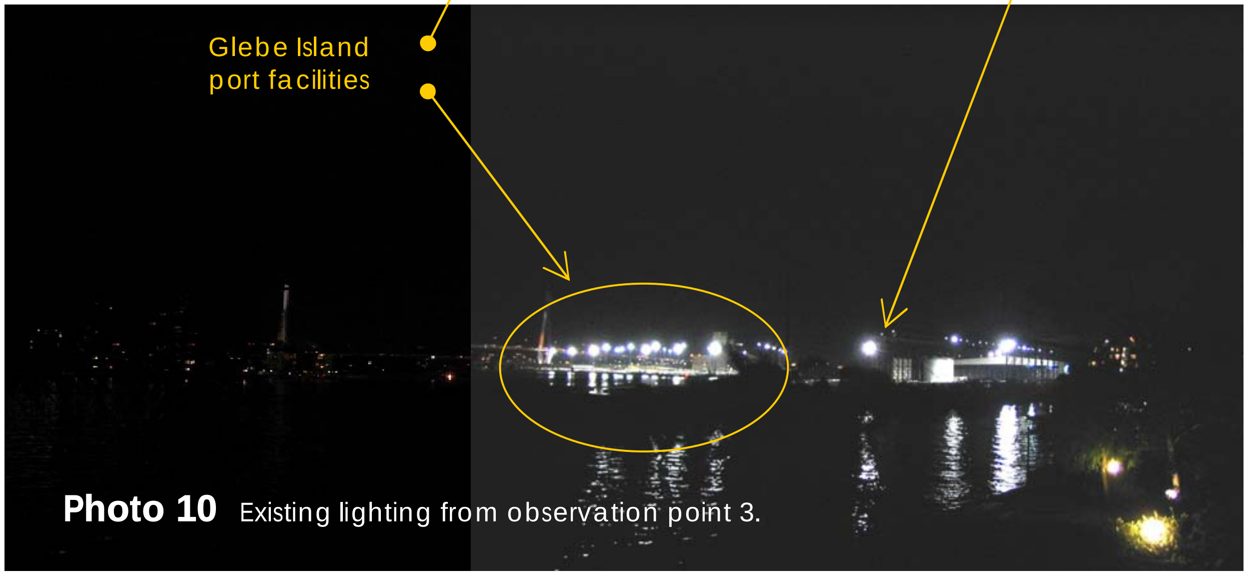


Photo 10 Existing lighting from observation point 3.

Photo 11 View of existing site from Grafton Street observation point 1A.

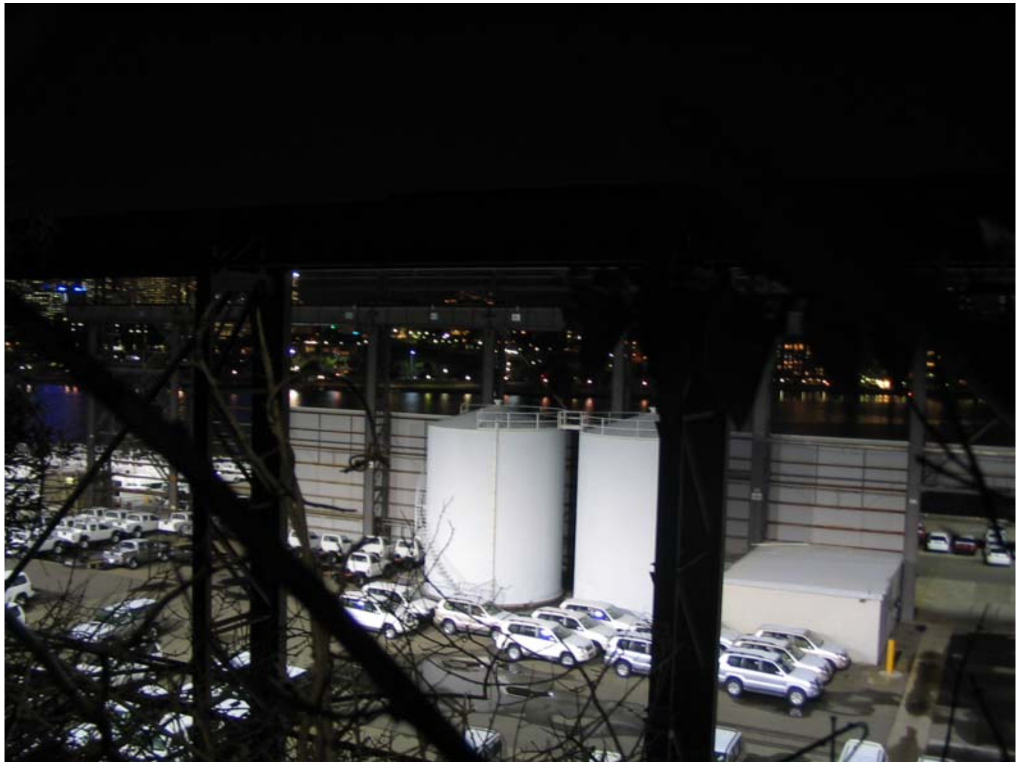


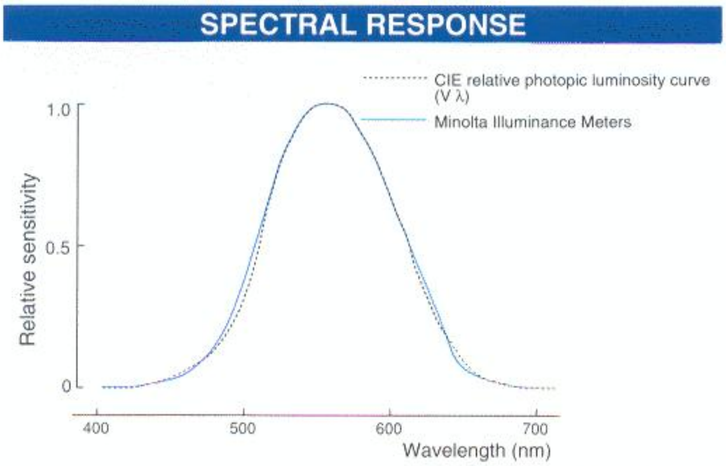
Photo 12 View of existing site from Grafton Street observation point 1B.

Photo 13 Existing lighting to edge of wharf.

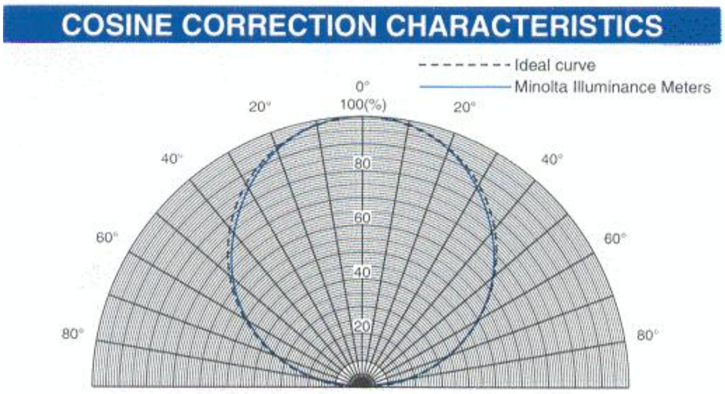
Photo 14 Residences and observation points Pyrmont Park

Appendix A – Details of Measuring Equipment

1. **Illuminance meter.** Minolta T1 auto ranging illuminance meter. Auto ranging from 0.01 lux to 100,000 lux. Last calibrated by a NATA registered laboratory 11/08/03.



As shown in the graph above, the spectral response of Minolta Illuminance Meters is within 2% of the CIE (Commission Internationale de l'Eclairage) relative photopic luminosity curve in the wavelength range of 400 to 760nm.



Since the brightness at the measurement plane is proportional to the cosine of the angle at which the light is incident, the response of the receptor must also be proportional to the cosine of the incidence angle. The graph above shows the cosine correction characteristics of Minolta Illuminance Meters compared with the ideal characteristics. The cosine error is within ±2% at an incidence angle of 30°, within ±7% at 60°, and within ±25% at 80°.

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Appendix N

HAZARD AND RISK ASSESSMENT

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MATRIX RISK PTY LTD

REPORT

WHITE BAY PRELIMINARY HAZARD ANALYSIS

Date: 21 August 2006

Submitted to: Guy Bailey

J04.0601.BMF.r01.3

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Page	**Revision**	**Date**	**Comments**
All	02	27/06/06	Revised as per review by BMF.
40	03	21/08/06	Revised to add operating hours for the recreational pontoon.
47-48	03	21/08/06	Figure 16.3-5 and Figure 16.4-1 revised.
59	03	21/08/06	Revised to add Chemical and Physical Properties of Regular Unleaded Petrol (ULP).

TABLE OF CONTENTS

1. GLOSSARY

GLOSSARY	
Acceptance Criteria	Defines the level of risk to which an individual or the environment is exposed, as either tolerable (negligible risk), intolerable or within the ALARP region.
Bow Tie Diagram	A combined fault and event tree. A typical “bow-tie” diagram is shown in Figure 6.4-1. The diagram consists of multiple paths, relating causes to consequences. Each path in the tree corresponds to a cause – consequence path.
Condition Modifier	Additional assumptions required to assess the probability that the scenario will result in a fatality.
Consequence	This is the severity of the potential effects associated with a hazardous event in terms of toxic doses, fire or explosion exposures, etc.
Environment	The surroundings of an establishment including the flora, fauna, buildings and infrastructure.
EHI	A measure of environmental consequence severity.
Frequency	This is the number of occurrences of an event expressed per unit time. It is usually expressed as the likelihood of an event occurring within one year.
Hazard	A physical situation with the potential for human injury, property damage, damage to the environment or some combination of these.
Hazard Identification	The process of identifying undesired events that may lead to a hazard being realised.
Scenario	The sequence of events, due to a single cause, leading to a single outcome.
Independent Protection Layer (IPL)	This is a device, system or action that is capable of preventing a scenario from proceeding to its undesired consequences independent of the action of any other layer of protection. IPLs are different from other safeguards which cannot often be assessed for effectiveness.
Impairment	Occurs when an item of equipment or facility no longer fills its design intent. For example, when applied to an escape route, it implies that the route is no longer passable; when applied to a safety system it means that it can no longer perform its designated function.
Individual risk	The frequency at which an individual may be expected to sustain a given level of harm from the realisation of specified hazards.
Initiating Event	An event within a “bow-tie” diagram. Only a single cause-consequence path is assessed.
Mitigation	The process of reducing the severity of the consequences of a major accident.
Prevention	The means for eliminating hazards or reducing the likelihood of realisation and for mitigating the associated consequences. This includes approaches to inherent safety and identification of suitable control measures.
Probability	The expression for the likelihood of an occurrence of an event or an event sequence or the likelihood of the success or failure of an event on test or demand. By definition, probability must be expressed as a number between 0 and 1.
Probability of Failure on Demand (PFD)	Probability that an IPL will fail when “challenged”.
Risk	The combination of frequency and consequences, the chance of an event happening that can cause specific consequences.

GLOSSARY	
Risk reduction	The process of risk assessment coupled to a systematic consideration of potential control measures and a judgement on whether they are reasonably practicable to implement. Essentially, the process for demonstrating that the adopted controls make the risk to people and the environment ALARP.
ULP	Unleaded Petrol

2. EXECUTIVE SUMMARY

Matrix Risk Pty Ltd (Matrix) has prepared a Preliminary Hazard Analysis (PHA) for the proposed Baileys Marine Fuels (BMF) development at Wharf no. 6 at White Bay. A detailed Environmental Risk Assessment has been performed as part of the PHA.

Additionally, during performance of the PHA:

- Fire hazards were identified,
- The consequences associated with fire hazards were determined,
- Fire prevention strategies and measures were assessed,
- The requirements for fire detection and protection were analysed,
- Fire detection and protection measures to be implemented were recommended,
- Fire fighting water demand and supply was determined,
- The containment of contaminated fire fighting water was addressed, and
- First aid fire protection arrangements and equipment identified.

A Final Hazard Analysis will be prepared on completion of detailed design for the facility.

The proposed development involves the installation of four underground storage tanks (three Diesel tanks and a single Diesel/ULP tank); extension of fuel piping to the wharf and three bowsers situated at the dolphin.

The following hazards were addressed:

- Fire and environmental hazards associated with the handling of Diesel and ULP at the facility and on vessels.
- A collision or overturning event involving a Diesel tanker, with potential for loss of containment;

The risks associated with these hazards were analysed. The magnitude and likelihood of possible hazardous incidents were addressed. Consideration was given to the consequences of incidents and loss of containment incidents. Hence, typical lower probability, higher consequence collision and fire scenarios were identified and assessed.

The relevance and adequacy of proposed preventative and mitigative risk reduction measures (controls and safeguards) were addressed. There was particular focus on:

- The adequacy of fire and environmental risk reduction measures proposed and to be implemented by BMF; and
- Whether these reduce the risk to acceptable levels and “ALARP” (As Low as Reasonably Practicable).

BMF participated in the hazard identification and risk assessment process. Various collision and spill scenarios were identified. These included the identification of maximum credible scenarios.

Consequence analysis addressed the direct impact of collision, radiant and convective heat (where there is such an impact), the environmental toxic effect of loss of containment and the potential for propagation and secondary effects.

The analysis examined the time exposure of people, the environment, equipment and buildings etc. Matrix used the proprietary fire model MatrixFire[1], and a standard fuel dispersion model for determining the effects of loss of containment of liquid.

Risk levels determined were compared to established risk acceptance criteria.

The adequacy of preventative and protective controls was determined by means of a simplified quantified method - Layers of Protection Analysis (LOPA). The individual risk of fatality and environmental risks determined in this manner, were compared to the results of a qualitative risk assessment.

The expected effectiveness of risk reduction measures was determined by:
- Review of documentation supplied by BMF;
- Review with BMF personnel; and
- Discussions with BMF personnel.

The risk associated with collision, fire and environmental spill scenarios, may be reduced to acceptable levels by the:
- Capability for rapid isolation of any spill. This may reduce both the risk and the severity of consequences;
- Low probability of ignition of Diesel fuel spills at the wharf and on water during transfer operations;
- Management and control of ignition sources during the storage, handling and transport of gasoline; and
- Management of tankers entering the proposed site.

For all Environmental scenarios, the risk of environmental damage may be reduced to acceptable levels due to the small quantities of Diesel or ULP fuel involved during a spill; and envisaged controls such as secondary containment, spill mitigation procedures, drainage and the capability for rapid isolation of any spill.

The level of risk of fire, collision and environmental damage for the proposed additional facility will only be acceptable, if the risk reduction measures envisaged are effective and sufficiently reliable.

It has been established that the estimated cumulative individual risk for the fuel dispensing operation is less than 5×10^{-5} p.a. and the frequency of environmental incidents is estimated to be 1.74×10^{-6} p.a. The level of risk is strongly dependent on the effectiveness and reliability of the controls to be implemented.

The risk of a tanker collision with potential loss of containment was addressed. This is at an acceptable level of risk. Without the implementation of effective and reliable controls, the risk may be unacceptably high.

3. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Details of findings, conclusions and recommendations are contained in Section 15.

1. The potential for a collision and impact with other vehicles, barriers etc. exists during entry or exit and along the road to the White Bay Wharf. The potential for this will not significantly change by the proposed installation of the tanks, Fuel Dispensing Cabinets and Bowsers. Collision between a tanker and vehicle or pedestrian may occur, resulting in injury, death or loss of containment of Diesel or ULP. In order to minimise these risks, safeguards and controls required will be management controls such as the scheduled delivery of Diesel and ULP during quiet periods at the facility, and the erection of suitable signage. Traffic speed control measures, such as speed humps, may be investigated.
2. Loss of fuel with a resulting pool may occur due to vessel drift off during refuelling, or due to a collision during mooring or whilst moored. If such a pool is ignited, the fire may escalate, involving other vessels or the wharf equipment and infrastructure. It is expected that such events may be prevented by sufficient surveillance of mooring and refuelling activities at the wharf and dolphin.
3. The exclusion distance for protection against radiant heat from a pool fire on the sea surface at the proposed location is determined by the distance to the 1.6 kW/m^2 contour from the centre of the pool

fire. This may be reduced from 69 m to approximately 40 m by implementation of measures for the rapid containment of spillage onto the sea surface and shielding provided by the wharf. The key factors are limitation of the size and extent of the spill – i.e. the diameter and spread of the pool. This is determined by the direction of the prevailing wind. Should a spill occur from a vessel during fuelling, the fuel will spread between the vessels secured and drift to the wharf and the adjacent RORO ramp. Gasoline/Diesel vapour concentration may increase in this particular area, particularly where confinement may occur. Tidal movements and the provision of vents may prevent vapour concentration from falling within the flammable ranges of Gasoline/Diesel, however there is a higher probability of ignition leading to a flash fire with the potential for escalation, during certain circumstances.

4. The exclusion distance, for protection against radiant heat from a pool fire on the wharf, may be reduced by rapid isolation of a spill and the provision of effective drainage for rapid removal of a spill.
5. The proposed procedures for the management and control of potential ignition sources for the facility will need to be implemented in accordance with Bailey's "Best Practice Approach to Marine Refuelling", including the management of hot works.
6. The risk due to ULP or Diesel spill hazards will be reduced to "as low as reasonably practicable – ALARP" for fire and environmental hazards. Risk reduction provided by implementation of the recommended preventative and protective controls, in Section 13, was considered. It is expected that the collective risk for the facility will remain at an acceptably low level. The expected effectiveness and reliability of these proposed measures (communicated by BMF) will reduce both the frequency and severity of events. The capability for rapid isolation of a spill is of particular importance in determination of the final level of risk. Risks for both types (fire and environmental) will be acceptable, provided that the risk reduction measures envisaged for implementation are both effective and reliable.
7. Access and egress is provided at the wharf. Evacuation from the landings, with wide escape routes, is considered to be adequate.
8. A number of critical risk reduction measures (controls) have been identified. The key critical controls analysed are:
    - Loss of containment prevention,
    - Prevention of ignition;
    - Rapid isolation in the event of loss of containment;
    - Spill containment measures; and
    - Provision of sufficient access and egress.

4. INTRODUCTION

Matrix Risk Pty Ltd (Matrix) has prepared a Preliminary Hazard Analysis (PHA) for the proposed Baileys Marine Fuels (BMF) development at Wharf no. 6 at White Bay. A detailed Environmental Risk Assessment has been performed as part of the PHA.

Additionally, during performance of the PHA:

- Fire hazards were identified,
- The consequences associated with fire hazards were determined,
- Fire prevention strategies and measures were assessed,
- The requirements for fire detection and protection were analysed,
- Fire detection and protection measures to be implemented were recommended,
- Fire fighting water demand and supply was determined,
- The containment of contaminated fire fighting water was addressed, and
- First aid fire protection arrangements and equipment identified.

As a result, the PHA has addressed all the requirements for a Fire Safety Study.

A Final Hazard Analysis will be prepared on completion of detailed design for the facility.

The proposed development involves the installation of four underground storage tanks (three Diesel tanks and a single Diesel/ULP tank); extension of fuel piping to the wharf and three bowsers situated at the dolphins.

The following hazards were addressed:

- Fire and environmental hazards associated with the handling of Diesel and ULP at the facility and on vessels.
- Fire and environmental hazards associated with a collision or overturning event involving a Diesel/ULP tanker, with potential for loss of containment and injury to the driver and other humans.

The risks associated with these hazards were analysed. The magnitude and likelihood of possible hazardous incidents were addressed. Consideration was given to the consequences of incidents and loss of containment incidents. Hence, typical lower probability, higher consequence collision and fire scenarios were identified and assessed.

The relevance and adequacy of proposed preventative and mitigative risk reduction measures (controls and safeguards) were addressed. There was particular focus on:

- The adequacy of spill, fire and environmental risk reduction measures proposed and to be implemented by BMF; and
- Whether these reduce the risk to acceptable levels and "ALARP" (As Low as Reasonably Practicable).

The facility will be located on vacant Sydney Port Corporation (SPC) land. The adjacent area may be used as an equipment lay down area. The proposed development will involve storage of approximately 50,000 L ULP and 350,000 L Diesel. Road tankers will supply fuel to these tanks. "B Doubles" or single tankers may be used.

The fuelling berth at the wharf/dolphin does not have specific security protection and is open to the general public via vessel access.

Fuelling will be accomplished by use of individual "swipe card" facilities at the fuelling points on the wharf/dolphin. It is expected that the facility could provide fuel for a maximum of 35 vessels per day. At the dolphin, fuel will be dispensed to varying smaller size vessels, such as recreational boats. Operations at the wharf will include fuel bunkering for vessels such as Sydney Ferries and charter boats, and the loading / unloading of cargo by commercial vessels.

Access and egress will be restricted.

There is a clear separation of equipment between the commercial dispensers and the recreational dispensers.

The process of taking fuel from White Bay 6 is given in Attachment 12 – Appendix 6. Fuel transfer for large bunkers is performed under the Pre-Delivery Guidelines given in Attachment 5 – Appendix 6. Attachments 15 and 16 show the setup for Commercial Bunkers.

5. OBJECTIVES

The general objectives were to:

- Ensure that all fire hazards associated with the storage and handling of flammable and combustible fuels (Gasoline and Diesel) are identified during a Hazard Identification process.
- Assess the risks associated with these hazards – consideration being given to the magnitude and likelihood of possible hazardous incidents.
- Consider the consequences of incidents and loss of containment incidents, including lower probability, higher consequence collision and fire scenarios.
- Evaluate the adequacy of risk prevention and mitigation control measures to be implemented by BMF for the Diesel and ULP storage and dispensing units; and to determine whether these will reduce the risks to acceptable levels or "ALARP" (As Low as Reasonably Practicable). Sufficient consideration to be given to the consequences of loss of containment incidents with due emphasis on the likelihood of occurrence. Hence, typical lower probability, higher consequence collision, fire and environmental scenarios were identified and modelled.
- Prepare the risk assessment in consultation with BMF operations personnel and management.
- Seek port personnel (Sydney Port), oil industry and emergency services involvement in hazard identification and risk assessment.
- Present data, methods and results in a sufficiently transparent and auditable manner.

6. METHODOLOGY AND APPROACH

The main elements of the hazard analysis employed are:

- Identification of the nature and scale of the hazards at the facility;
- The selection of representative incident scenarios;
- The evaluation of the likelihood of such events;
- The analysis of the consequences of incidents on people, property and the biophysical environment;
- Calculation of the resulting risk levels of the facility;
- Determination of the adequacy of safeguards and controls;
- Comparison of these risk levels with established risk criteria; and
- Identification of opportunities for risk reduction.

Hazards and associated causes were determined using a generic checklist approach and information obtained from previous risk assessments performed by BMF.

Hazards were screened by use of results from an earlier risk assessment[2] for similar facilities.

Fire and dispersion scenarios were based on consequence modelling performed using ©MatrixFire[14] and other standard calculation methods.

A simplified Quantitative Risk Assessment Method[3] was employed for calculation of risk levels (– Layers of Protection Analysis (LOPA); Section 18) was used to determine whether fire and environmental risks were acceptable and ALARP.

6.1 RISK ACCEPTANCE CRITERIA

The Risk Acceptance Criteria are given in the following sections. The following criteria are summarised:

- Individual Risk Criteria and
- Environmental Risk Criteria.

6.2 INDIVIDUAL RISK CRITERIA

The Individual Risk to people on adjacent industrial facilities has been considered in the assessment. The relevant risk acceptance criteria utilised for this study are those defined by the NSW Department of Planning[4] and CCPS[3].

A risk level, in commercial zones, of 1×10^{-6} p.a. per scenario, or less, is considered to be "negligible" and acceptable. For all scenarios affecting an individual, a risk of 1×10^{-5} p.a. is deemed to be "acceptable".

The level of risk from industrial facilities should not exceed a target of 5×10^{-5} p.a. at the site boundary for each individual facility.

6.3 ENVIRONMENTAL RISK CRITERIA

Research in the UK by the Department of Environment, Transport and Regions (DETR) suggests that the frequency, above which a major accident to the environment is considered intolerable, is 1×10^{-4} per site p.a.[5]. Such a major incident is defined as an uncontrolled incident exceeding the indicative criteria and threshold areas[6]. A major environmental incident is defined by a reference environmental harm index (EHI) value of 100 or greater (Table 10-1).

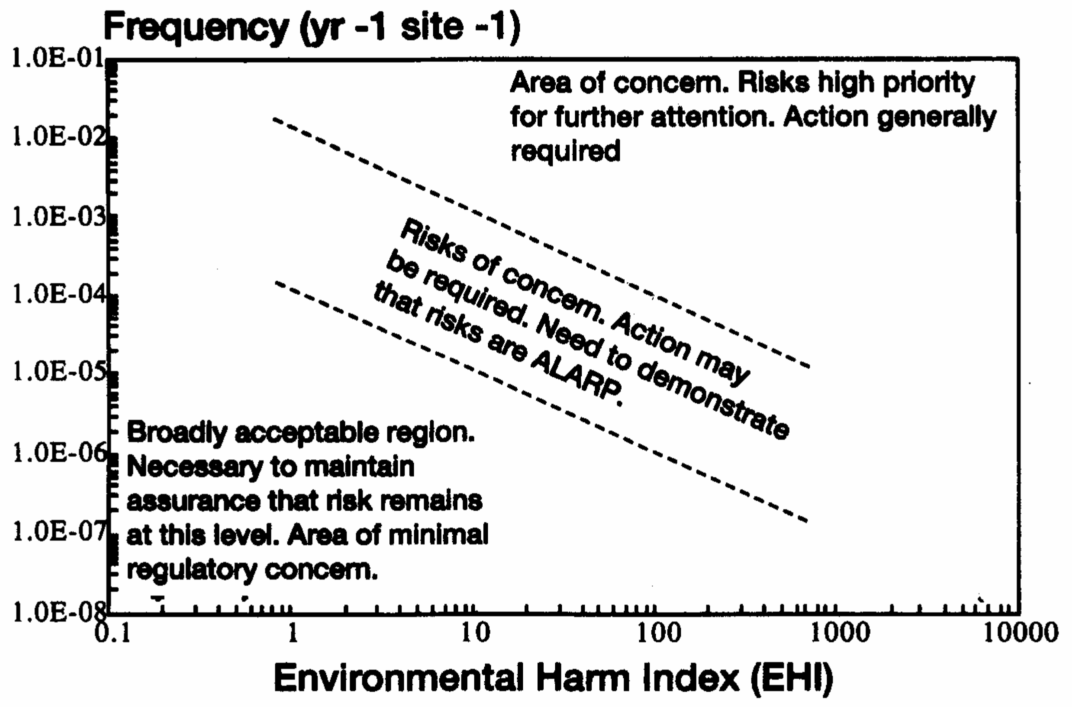
Applying this criterion, if the 1×10^{-4} per site per year contour affects any environmental receptor and a total area greater than the threshold area for that environmental receptor, then the environmental risk is considered to be "intolerable" and additional risk reduction measures are required.

The frequency below which a major accident is considered "broadly acceptable", and of "negligible" regulatory concern, is 1×10^{-6} per site per year[3].

Events falling between these criteria (1×10^{-4} and 1×10^{-6} per site per year) define the "As Low As Reasonably Practicable" (ALARP) region. The ALARP region represents risks of concern, but not of highest priority for remedial action. Risks falling in this region are considered "acceptable" provided it be demonstrated that these have been reduced to ALARP.

These criteria are shown graphically in Figure 6.3-1. The consequence categories (Environmental Harm Index) are given in Table 10-1; p. 24.

Figure 6.3-1: Proposed Environmental Risk Criteria[7]



6.4 SOURCE MATERIAL

The following source material was used for the environmental and fire systems LOPA analysis. Loss of containment initiating event frequencies were obtained from the E&P Forum statistical database[8]. Probability of Failure on Demand (PFD) data was obtained from internationally accepted data sources such as:

- CCPS (1993)[9];
- Kletz[10];
- CCPS (2000)[11]

Risk analysis methodology and the criteria for environmental and fire risks were based on the following:

- Standards Australia/Standards New Zealand. AS/NZS 4360: 1999, Risk Management.
- US Department of Transportation. CHRIS Hazardous Chemical Data.
- The Netherlands Organisation of Applied Scientific Research (TNO). Methods for the Determination of Possible Damage (to people and objects resulting from release of hazardous materials). Committee for the Prevention of Disasters caused by Dangerous Substances (CPR). CPR 16E. First Edition, 1992.
- Bureau of Meteorology – Sydney.
- Centre for Chemical Process Safety (CCPS). Guidelines for Process Equipment Reliability Data with Data Tables" New York. American Institute of Chemical Engineers. 1989.
- Bridges, W.G and Williams, T.R. Risk Acceptance and Risk Judgment Tools Applied Worldwide within a Chemical Company. CCPS International Conference and Workshop Risk Analysis in Process Safety (1997).
- Lees, F. P. Loss Prevention in the Process Industries – Hazard Identification, Assessment and Control. 2nd Edition. 1996.

7. HAZARD IDENTIFICATION

The causes for loss of containment were identified. The analysis covered the nature of the materials and quantities of fuel involved, the nature of potential fire and environmental loss of containment events, and the presence of sources of ignition.

A qualitative risk assessment was conducted initially. The information from this was used for screening of hazards and for the identification of loss of containment and collision scenarios.

Hazards were identified by:

1. Discussion and communications with BMF and SPC;
2. Use of an appropriate checklist;
3. Review of:
   - Loss Prevention in the Process Industries[12]; Transport; Section 23; 1996;
   - International Maritime Organisation; Manual on Oil Pollution; London 1988;
   - International Tanker Owners Pollution Federation Ltd; Fate of Marine Oil Spills; Tech Information Paper, No. 11, 1986[13]; and
   - National Oceanic and Atmospheric Administration; Inquiry for Oil Spills; ver 1.1, Seattle, April 1994.
   - AS 1940-2004: The Storage and Handling of Flammable and Combustible Liquids;
4. An analysis of previous incidents at similar facilities.

Data and information provided by BMF and the SPC was used for the PHA. This included preliminary layout drawings and design information. The proposed wharf layout is given in Attachment 3 – Appendix 6.

Preliminary layout and engineering data, including P&IDs were available for the analysis. Relevant data and information from BMF existing operations in Australia were also used for the analysis.

During the process of hazard identification, the wharf facilities were subdivided into the following study nodes:

- Bulk Diesel and Gasoline Storage;
- Piping and Fuel Transfer Facilities; including the Bowsers;
- Bulk Fuel Delivery;
- Fuel Dispensing;
- General Waste Management;
- Oily Water Separator System; and
- Fuel / Oil Truck Transportation.

The following Hazard Identification Checklist was used (Table 7-1).

Table 7-1: Principal Hazard Identification Checklist

A	Unignited hydrocarbon (Diesel / Gasoline) release
B	Ignited hydrocarbon (Diesel / Gasoline) release – Fire
C	Ignited hydrocarbon (Diesel / Gasoline) vapour release – Explosion
D	Toxic / Asphyxiating Release
E	Corrosive Release
F	High Pressure Liquids
G	High/Low Temperature Liquids
H	Low Pressure / Vacuum
I	Dropped Objects
J	Vehicle Impact
K	Boat Impact / Collision
L	Extreme Weather
M	Natural Hazards (Seismic Activity, Ground Instability, Flooding, etc.)
N	Structural Failure
O	Design / Construction / Material Defects
P	Electrical / Ignition
Q	Purge / Start-Up / Shut-Down
R	Maintenance Activities
S	3rd Party Activities / Sabotage
T	Other

7.1.1 Analysis of Previous Incidents

Previous loss of containment incidents were analysed to assist with the identification of hazards and hazard causes.

7.1.2 Hazards and Hazard Causes

The causes of hazards, together with the consequences are given in the following table.

Table 7-2: Hazards, Causes and Consequences

Hazardous Activity	Causes – Loss of Containment	Consequences
Fuel dispensing	• Major equipment failure > 20 litre loss. • Operational cause – vapour emission. • Human error – spill onto wharf/dolphin. • Overfilling on boat (> 5L).	Loss of containment; spreading pool and contact with ignition sources at the wharf or dolphin; the spill will most likely spread between secured vessels and drift towards the wharf and the adjacent RORO ramp. Ignition may result in a flash fire, explosion and / or fire; ground or marine contamination may result.
Bulk Diesel and ULP storage	• Tank failure (corrosion, design, fabrication, construction, maintenance) • Leaking flange (corrosion, impact, construction, maintenance).	Loss of containment; spreading pool; ignition; flash fire, explosion and / or fire; ground or marine systems contamination.
Delivery of bulk Diesel and ULP	• Operational error during tank filling. • Collision due to driver error; speeding.	Spillage / overflow of storage tank. Collision may involve people or other vehicles; tanker may overturn with loss of containment; spreading pool; ignition due to collision; flash fire, explosion and / or fire; ground or marine contamination.
Transfer of fuel from tankers and to bowsers	• Pipe leakage or rupture (corrosion, impact, design, fabrication, construction, maintenance.)	Loss of containment; ground and marine contamination.
General waste management	• Failure of housekeeping and waste management procedure.	Solid and liquid waste; ground and marine contamination.

7.1.3 Hazard Screening

For simplification of the analysis, single "cause – consequence" pairs were identified – as recommended in the LOPA methodology. The cause relates to the hazard or initiating event (loss of containment or "energy out of control"). For example, a release of diesel can occur if a loss of piping integrity occurs. In this instance, the cause would be any eventuality that could lead to a loss of piping integrity (e.g. mechanical impact, corrosion, etc.). The consequence is the outcome of the hazard being realised. For example fire, marine or ground pollution.

7.1.3.1 Initial Risk Assessment

An initial qualitative risk assessment was performed. The frequency of each event, was estimated using SPC information, BMF internal incident data, published industry incident data, experience from similar facilities, risk analysis and engineering judgement.

Frequencies were estimated in five discrete bands in accordance with AS/NZS 4360.

Table 7-3: Frequency Assessment Categories

Level	Descriptor	Description
A	Almost certain	Expected to occur in most circumstances (weekly to monthly basis).
B	Likely	Will probably occur in most circumstances (likely occurrence, several times p.a.)
C	Possible	Could occur (moderate occurrence, once per year to once every ten years).
D	Unlikely	Could occur but not expected (unlikely occurrence, low in lifetime of facility, between once every ten years and once every 100 years).
E	Rare	Occurs only in exceptional circumstances (rare occurrence, possible but improbable event, less frequent than once every 100 years).

The contributions of operations and maintenance activities, engineering design and procedural controls were taken into account when assigning the frequency categories. Consequences were estimated on a scale of 1 to 5 in accordance with AS/NZS 4360.

Table 7-4: Consequence Assessment Categories

Level	Descriptor	Example detail description
1	Catastrophic	Death – fire exposure, toxic release off-site with detrimental environmental effect, catastrophic financial loss.
2	Major	Extensive injuries – fire exposure, loss of operational capability, off-site release contained with outside assistance and little detrimental environmental impact, major financial loss.
3	Moderate	Medical treatment required – fire exposure, on-site release contained with outside assistance, high financial loss.
4	Minor	First aid treatment – fire exposure, on-site release immediately contained, medium financial loss.
5	Insignificant	No injuries – fire exposure, low financial loss, negligible environmental impact.

Assessment categories were conservatively assigned, based on the likely worst-case consequence. For example, if an incident resulted in medical treatment to personnel on-site (consequence level 3) and an off-site release with detrimental environmental effects (consequence level 1), the highest (worst-case) assessment category would be assigned, i.e. Catastrophic (consequence level 1).

7.1.3.2 Risk Assessment and Ranking

The frequency and consequences of each hazardous event were combined in a risk matrix (Table 7-5) to determine an overall risk ranking for the event. The residual risk was determined – i.e. the level of risk including proposed controls.

Table 7-5: AS/NZS 4360 Risk Matrix

Frequency	**Consequence**				
	Catastrophic	Major	Moderate	Minor	Insignificant
Almost certain	E	E	E	H	H
Likely	E	E	H	H	M
Possible	E	E	H	M	L
Unlikely	E	H	M	L	L
Rare	H	H	M	L	L

E: Extreme Risk: Immediate action required.
H: High Risk: Risk reduction to “as low as reasonably practicable” required.
M: Moderate Risk: Risk reduction to “as low as reasonably practicable” required.
L: Low Risk: Acceptable level of risk.

Risks designated M or L fall within the “as low as reasonably practicable” (ALARP) region.

7.1.3.3 Risk Assessment

The summary of risks associated with hazardous events, in Table 7-6 below, is based on the AS/NZS 4360 Risk Matrix and our understanding (Matrix) of the design specifications and operating procedures supplied by BMF and judgements made during discussions with BMF personnel.

The total number of hazardous events identified for each major element, and breakdown by level of risk, is shown in the following table.

Table 7-6: Risk Table

Major Element	Consequences				
	Catastrophic	Major	Moderate	Minor	Insignificant
Fuel dispensing			H		
Bulk Diesel and ULP storage		E			
Fuel transfer from tankers and to bowsers – pipeline				L	
General waste management					L
Management of sullage					L
Operation of oily water separator				L	
Transportation of Diesel and ULP by road tanker	E				

The hazardous events are ranked according to the risks and consequences in Table 7-6.

The risks associated with hazards, causes and consequences in Table 7-2, are qualitatively given in Table 7-6.

8. INITIATING EVENTS

Initiating events were determined by consideration of the hazardous incidents that may occur.

A loss of containment event can be initiated:

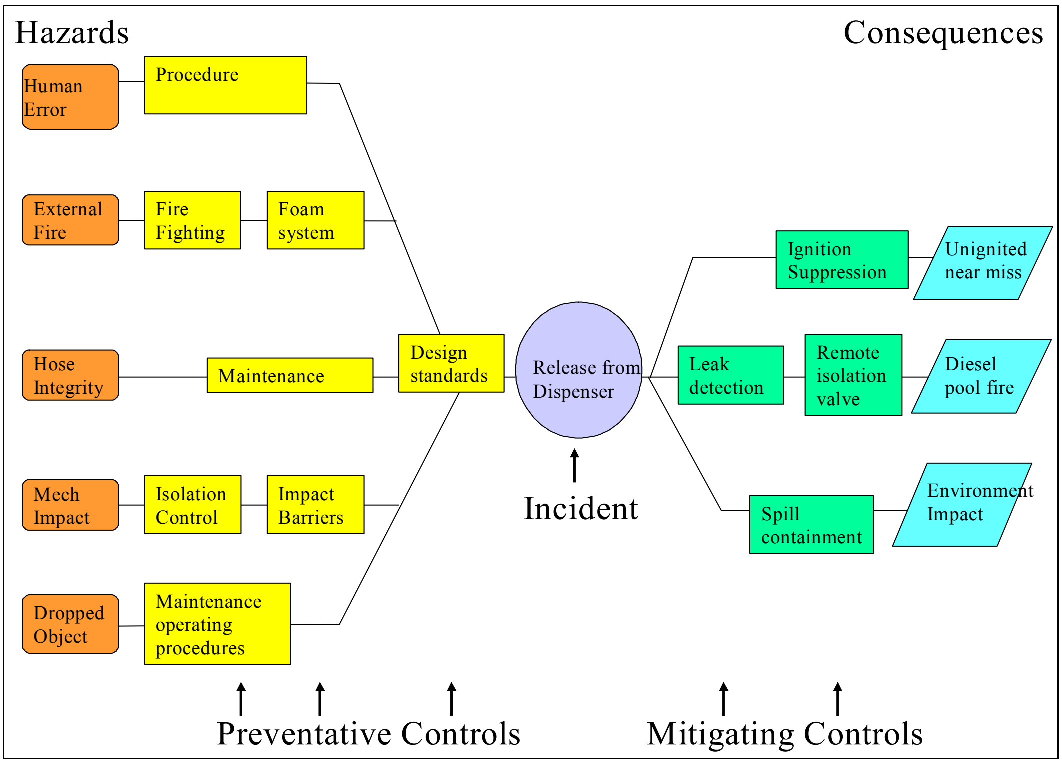
- By human error during mooring or fuelling;
- By failure of piping, flanges, fittings, valves and pumps;
- During transfers involving road tankers – also due to human error or failure of equipment; and
- By leaks, ruptures, corrosion, material failure from tanks.

9. SCENARIO DEVELOPMENT

A "cause – consequence" or "bow tie" diagram is shown for various causes leading to a loss of containment at the dispensers. This contains some of the "cause-consequence" pathways for the fuel dispensing process – Figure 6.4-1.

The scenarios given in Table 9-1, based on the results in Table 7-6, represent single "cause – consequence" pathways in the Cause – Consequence Diagram.

Figure 6.4-1: Cause – Consequence Paths & Event Tree



It was generally assumed that:

- Loss of containment may be followed by ignition and / or toxic exposure of the marine or shore environments.
- Collisions and impact with people may result in serious injuries or fatalities.

The various scenarios are analysed in Appendix 3 – Section 18.

Table 9-1: Hazards and Scenarios

Hazardous Activity	Scenario[1]
Fuel dispensing	1. Loss of containment (e.g. equipment failure, etc.) of ULP or Diesel occurs at the wharf/dolphin during fuelling. The size and location of a pool is determined by the direction of the prevailing wind (South Westerly & Northerly). The fuel spreads between vessels secured and drifts to the RORO ramp and adjacent facilities, where accumulation occurs. It is possible that the accumulated Diesel or ULP vapour flashes on exposure to an ignition source – Section 13.3. This results in a spreading pool fire on the sea surface or an immediate flash fire. 2. Loss of containment of ULP (e.g. equipment failure, etc.) or Diesel occurs at a release rate of 200 litres / minute (communicated by BMF). Maximum time until isolation of the release is 2 minutes[2] (communicated by BMF) – resulting in a 400 litre spill or 0.4 cubic meters. ULP/Diesel vapour is ignited (Diesel vapour has lower probability of ignition compared to ULP). If isolation is not effective, an equilibrium pool will form. If burning – extinguishment will occur where the pool film thickness reaches 2.4 mm. 3. Operational failure may lead to a spill of 50 litres. More likely scenario (BMF) with recorded incidences of occurrence. 4. Loss of containment of ULP/Diesel leads to either ground or marine contamination. Loss of containment - same as in 1. 5. *Note: At this stage the site will only provide Diesel or AGO (Automotive Gas Oil). At a later stage Bio-Diesel could be supplied. Blends are not known to be more flammable than straight AGO. Fire modelling was for ULP, more flammable than a Diesel blend. Minimal risk impact expected.*
Bulk Diesel and ULP storage	6. Loss of containment (e.g. a leaking flange, etc.) leads to the release of Diesel/ULP. Failure of secondary containment results in ground or marine contamination.
Delivery of bulk Diesel and ULP	7. Collision between a tanker and vehicle or pedestrian may occur on the roadway to the wharf, resulting in injury, death or loss of containment of fuel (ULP/Diesel). Loss of containment may occur during the collision or if the tanker overturns. ULP/Diesel spray or aerosol is ignited by a hot surface or other ignition source. A pool fire results. The controls envisaged are signage, policing of the area, construction of speed humps in the roadway and delivery of ULP/Diesel at times of least exposure to the public. 8. Product from tanker is transferred to the underground tanks by gravity feed. Operational error leads to spillage or leakage from tanker. ULP/Diesel spray or aerosol is generated or vapour generated during contact with a hot surface. Ignition occurs. A pool fire results. Loss of containment at a release rate of 600 LPM or 36 T/hr (product transferring through 4" hose from a truck compartment) may result. Interception of the Bridger Slab ensures that part of a full compartment can be contained, thus the size of any spillage will be limited to less than 3 m (communicated by BMF). 9. Operational error leads to spillage or leakage from tank. ULP/Diesel contamination of ground or sea water occurs. Loss of containment at a release rate of 600 LPM or 36 T/hr (product transferring through 4" hose from a truck compartment) may result. Interception of the Bridger Slab ensures that part of a full compartment can be contained – this will reduce the size of any spillage to less

1 Only single cause-consequence pairs are considered
2 Two minutes is realistic as each fuel dispensing cabinet has an emergency stop button that will cease pumping at the entire facility. There is also an emergency stop button located in the office and on the outside of the building. Pumping can be stopped from any of these locations.

Hazardous Activity	Scenario[1]
	than 3 m (communicated by BMF).
Transfer of fuel to bowsers – pipeline	10. Loss of containment due to failure of secondary containment, leads to marine contamination.
Waste management	11. Loss of containment due to failure of procedures leading to ground and marine contamination.

NOTES:

- Flow rate figures of 200 LPM of ULP or Diesel, 50 L/s of ULP and 80L/s of Diesel are based on the output of the meters that are to be used in the project. The specifications of the proposed meters are attached in Attachment 1 and 2 – Appendix 6. The Liquid Control M10 Meter, capable of dispensing 550 LPM is proposed on the commercial wharf. The Gilbarco Electroline Meter, capable of dispensing 50 L/s of ULP and 80 L/s of Diesel, is proposed on the recreational wharf.
- Operational failures maybe defined as:
    1. Split delivery hose;
    2. Handpiece malfunction;
    3. Leaking seal /flange; and
    4. Operator error.
- The typical capacity of a truck compartment is given in Attachment 4.

10. CONSEQUENCE ANALYSIS

The consequence analysis performed involved the analysis and quantification of the potential for hazardous incidents for causing injury or fatalities, damage to property or damage to the biophysical environment. The consequences of any incident was estimated independently of the likelihood of occurrence.

Consequence analysis was undertaken separately for each selected incident scenarios to estimate the effects on people, property and the biophysical environment.

Consequence analysis was performed that addressed both the direct impact of radiant and convective heat (where there is such an impact), the environmental toxic effect of loss of containment and the potential for propagation and secondary effects.

The consequences associated with collisions and impact involving people, were not analysed any further. The analysis examined the time exposure of people, the environment, equipment and buildings etc. Justification was given for the selection of targets and exposures. Matrix used the proprietary fire model ©MatrixFire[14] and a standard fuel dispersion model for resulting pools.

10.1 CONSEQUENCE MODELS

The effects of Gasoline and Diesel spread, ignition and flame extinguishment on sea water, were determined by use of a model that addresses these effects[15].

Some quantification was used in evaluating environmental consequences.

10.1.1 Fire Modelling

Potential fire scenarios associated with the transfer of Diesel are defined. Causes and consequences of loss of containment are given in Table 7-1. Scenarios identified are given in Table 9-1.

Consequences as a result of pool fires on land and water were determined. Where applicable, the potential for escalation was determined. Results are given in Section 16 - Figure 16.3-4 and Figure 16.3-5.

The consequences of a Diesel pool fire were modelled. ©MatrixFire[1], a 3-dimensional finite element radiant heat model was used to determine the radiant heat exposures to personnel and equipment - Figure 16.4-2 to Figure 16.4-4.

10.1.2 Environmental Release Modelling

The consequences of environmental spills were determined in terms of the volume and physical, chemical and toxicological effects of the material that may potentially enter the marine environment. These were qualitatively assessed using the criteria in Table 10-1. The volumes and flow rates released were determined during the process of hazard identification – this approach was considered sufficient. The need for further dispersion modelling within the aquatic environment was not considered to be necessary.

Table 10-1: Off-site Spill Consequence Categories

Consequence level	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
EHI reference value	**0.1 – 1.0**	**1.0-10**	**10- 100**	**100 –1000**	**>1000**
Broad definition of effect	Minimal / barely detectable	Observable but localised	Substantial, fairly wide-spread	Major	Catastrophic
Examples of visual effects	Marine environment slightly discoloured	Marine environment discoloured for significant length (100's of metres)	Marine environment discoloured for very significant length (1000's of metres)	Accidents meeting threshold criteria in Table 10-2.	Accidents meeting threshold criteria in Table 10-2.
Examples of effects on aquatic organisms	No/very few birds, fish, or marine organisms killed or aquatic life affected.	Significant birds, fish or marine organisms killed and other aquatic life affected	Large numbers of dead birds, fish and aquatic life badly affected.		

Published data indicate that EHI values for actual major accidents (i.e. consequence level 4 or greater) are typically at least 100. In addition, incidents resulting in EHI values of less than 10, are generally regarded to be associated with incidents much less severe than major accidents. For these reasons, an EHI value of at least 100 is considered indicative of the potential for a major accident to the environment.

As a reference, the death of, or serious sub-lethal effects, within 1 % of the population of any species would be considered "Significant"[16]. The threshold may be lower than 1 % for rare and protected species. Liaison with the appropriate statutory authority on conservation and biodiversity in Australia is necessary to determine the appropriate threshold.

Results of the environmental consequence assessments are given in Section 10.5.

10.2 GASOLINE/DIESEL FIRES

Gasoline (i.e. ULP) has a lower explosive limit (LEL) of 1.4% by volume and an upper explosive limit (UEL) of 7.6%. The figures for Diesel are respectively 3.5% and 6.9%. Therefore, a flammable gasoline/air mixture can exist when 200 drops (100 ml) of gasoline liquid is vapourised in 1 cubic metre (35 cubic feet) of confined air space. Gasoline vapour is heavier than air and tends to collect in the lower compartments of a vessel. A small leak or spill can present a significant hazard of explosion or fire.

There is a very low probability of ignition of Diesel under normal circumstances. The probability of ignition of a pool of Diesel on the wharf or sea surface is generally very low for uncontaminated Diesel and where Diesel vapour cannot accumulate – such as well ventilated areas. The probability of occurrence of such fires is very low – dominated by a probability of ignition of approximately 1/1000.

The accumulation of Diesel vapour may occur in confined areas and low spots on land – or, as is the case at the White Bay wharf, underneath the wharf. The probability of ignition of Diesel vapour can increase the probability of ignition. The MSDS for Diesel 500 warns against the possibility of flashback of Diesel vapour. The flashpoint for Diesel 500 is 61.5^{o}C. Flashback may occur if a hot surface or ignition source is encountered. The probability of ignition in such cases may be higher than 1/1000.

A spill of gasoline may also occur from vessels in the vicinity of the proposed operation. A number of vessels may carry drums of gasoline. Loss of containment from a drum may result in a flash fire or fire on board a vessel. More than one drum may be involved. The probability of loss of containment of gasoline will depend on the effectiveness of practices, procedures and controls implemented.

A gasoline spill on water may spread to the RORO ramp area. The risk of a flash or pool fire depends largely on the probability of ignition of residual gasoline vapour in this area.

The probability of ignition also increases if Diesel contains volatile material, or if Diesel mists or aerosols occur. Diesel containing contaminant gasoline may start burning at gasoline concentrations below 5% (Lees[12] refers to a maximum of 5%). For a 400 litre spill, this amounts to less than 20 litres of contaminant gasoline. The probability of a Diesel fire occurring with a simultaneous spill of gasoline at the wharf is very low. The probability of a fire occurring under the wharf, following a spill of gasoline may be significantly higher, due to the presence of accumulated Diesel. The tidal affect at the wharf, together with the vents, may limit the potential for accumulation of vapour.

An emulsion of Diesel and water may ignite if exposed to radiant heat in excess of 8 kW/m^2, such as may occur during a small gasoline fire. The probability of ignition by other means will be very low, unless the Diesel emulsion has other more volatile material in solution – such as may occur when a gasoline spill spreads to the wharf and mixes with accumulated emulsion.

10.3 POOL FIRES

A pool fire on the wharf and sea surface near the Fuel Dispensing Cabinet and Bowsers were considered to be credible.

10.3.1 Small Pool Fires

The impact of a fire due to loss of containment of 50 litres was determined - Figure 16.3-2: 50 Litre Release. At a distance of 37.8m, the incident radiant heat is expected to be limited to 1.6 kW/m^2. This level is considered safe as a maximum for planning for commercial areas[17] - and safe for community activities.

At a distance of 25.8m, the incident radiant heat is expected to be 12.5 kW/m^2. At this level, the probability of a fatality occurring is 50% for an escape time in excess of 60 seconds (Section 10.6, Table 10-3 and Table 10-4).

10.3.2 Medium Pool Fires

The impact of a fire due to loss of containment at a rate of 200 litres / minute at the wharf was determined. During hazard identification, it was communicated by BMF, that on detection of a release, an emergency shut down will occur within a period of 2 minutes. Hence, the maximum time until isolation of the release was assumed to be 2 minutes for the worst case scenario – resulting in a 400 litre spill or 0.4 cubic meters - Figure 16.3-1: 400 Litre Release.

For a 400 litre spill, the maximum area for ignition to occur was determined. The Diesel pool dispersion thickness and appropriate burn rates were used in the calculations. For rapid isolation of fuel, it was found that a short duration fire may follow a flash fire, limiting the time of exposure to less than 30 seconds.

However if isolation does not occur, it was shown that an equilibrium pool will form. In this case the duration of a pool fire will be longer.

For such a release at the wharf, the incident radiant heat is expected to be[3] 1.6 kW/m^2 at 69 m. As shielding exists, the size of a pool is limited and the cooler, smoke obscured part of the flame will be visible. It is estimated that the distance to 1.6 kW/m^2 may be reduced to below 40 m. At this distance, without shielding, the incident radiant heat is expected to be 12.5 kW/m^2. At this level, the probability of a fatality occurring is 50% if minimum escape time is greater than 60 seconds (Section 10.6, Table 10-3 and Table 10-4). Hence, limitation of the size of the pool, by rapid isolation is considered a critical control measure.

A pool fire due to loss of containment from a dispenser at the commercial wharf with a flow rate of 600 LPM was also considered. For a rapid isolation within 1 minute a 600 L spill could result in a Diesel pool of 23.2 m on the wharf. Ignition could result in a pool fire. The 1.6 kW/m^2 radiant heat contour could extend up to 76.9 m. The 3D consequence modelling for this scenario is given in Figure 16.4-3.

The impact of a fire occurring during transfer to the underground storage tanks, was addressed in the risk assessment.

10.3.3 Large Pool Fires

The impact of a fire occurring during a continuous release of 1800 LPM of Diesel on water, was determined. The equilibrium pool fire diameter is 28.8 m. Radiant heat exposures from such a low probability event, are shown in Figure 16.3-3: Various Releases: Radiant Heat Flux Graphs. This figure is a plot of radiant heat levels at various distances for spill scenarios.

10.4 FLASH FIRES

A flash fire may occur at wharf locations, where there is an accumulation of Diesel fuel or during the handling and transfer of Gasoline on vessels. Ignited Gasoline may cause ignition of Diesel during simultaneous handling of both types of fuel. The escalation of a Gasoline fire to a Diesel fire is considered to be a low probability event.

A flash fire may result in a fatality for people exposed within the flash fire envelope. A volume of a 50 L spill of Gasoline is considered too small to cause a flash fire.[18]

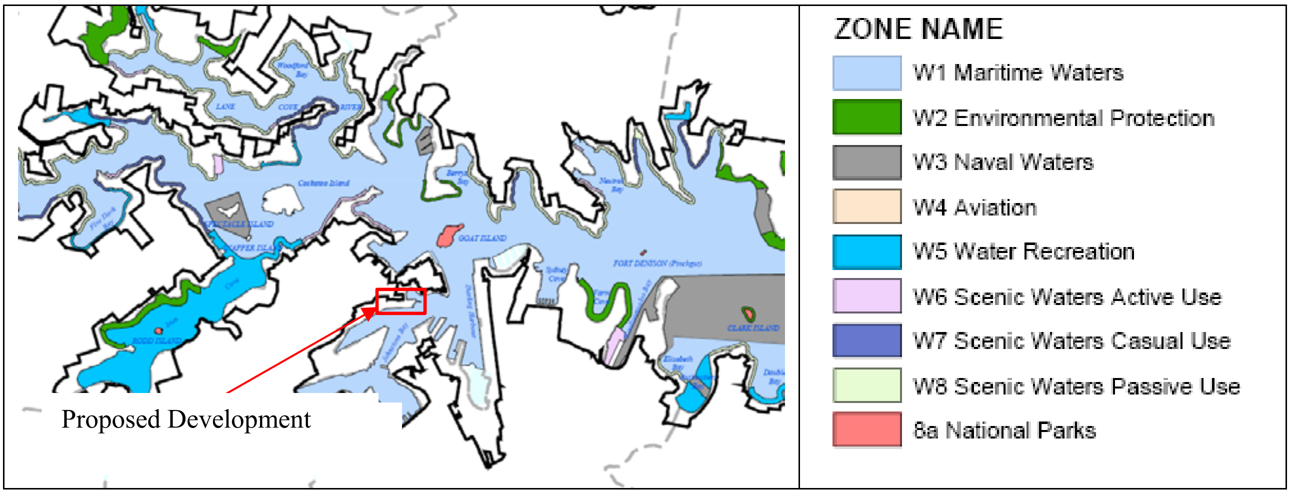
10.5 TOXIC RELEASES

The location of the new development at White Bay is categorised as Type 7 under the Sydney Harbour Foreshores and Waterways Area Development Control Plan[19]. These areas have a high level of development with a mixture of waterside industrial, residential and maritime uses.

Based on the zoning area, the location for the new development is within the Maritime Waters - Figure 10.5-1. There is no significant environmental threat to surrounding areas since it is located away from environmental protection zones. However, due to its proximity to Darling Harbour, which is a main recreational area, it is important to ensure that any potential incident will not have an adverse environmental impact in the area.

[3] This level is considered safe as a maximum for planning for commercial areas[3] - and considered to be safe for community activities.

Figure 10.5-1: Environmental Zoning Map – Sydney Waterways



The criteria and thresholds utilised in the consequence analysis are presented in Table 10-2. The potential to exceed any of these thresholds would indicate the possibility of a major accident occurring.

Table 10-2: Indicative criteria and thresholds for environmental receptors

Receptor	Media	Damage threshold
Marine	Water	>2 ha of littoral or sub-littoral zone, coastal benthic community or benthic community of any fish spawning ground.
Marine Nature Reserves, Nature Reserves	Land/water	> 0.5 ha or > 10% of area affected (whichever is less)
RAMSAR sites, Special Areas of Conservation, Conservation Parks, Special Protection areas	Land/water	> 0.5 ha or > 5% of area affected (whichever is less)
Designated land (Environmentally Sensitive Areas, National Parks, Local Nature Reserves)	Land	> 10 ha or > 10% of area affected (whichever is less)
Scarce habitat	Land/water	> 2 ha or > 10% of area affected (whichever is less)
Widespread habitat (including agricultural land)	Land/water	> 10 ha
Freshwater and estuarine habitats (river, stream, reservoir, lake, pond or estuary)	Water	River, canal or stream: >10 km or 10% of length (whichever is less) Estuary, reservoir, lake or pond: > 2ha or 10% of length (whichever is less)

10.5.1 Small Size Releases

The environmental impact of a release of 50 litres has been determined.

The expected diameter of the Diesel pool on water (i.e. sea surface) is 7.4m, covering an area of 43m^2 or 0.004 ha. This is below the threshold category of 2ha given in Table 10-2.

The EHI falls within the range 0.1-1.0 - Table 10-1: Off-site Spill Consequence Categories.

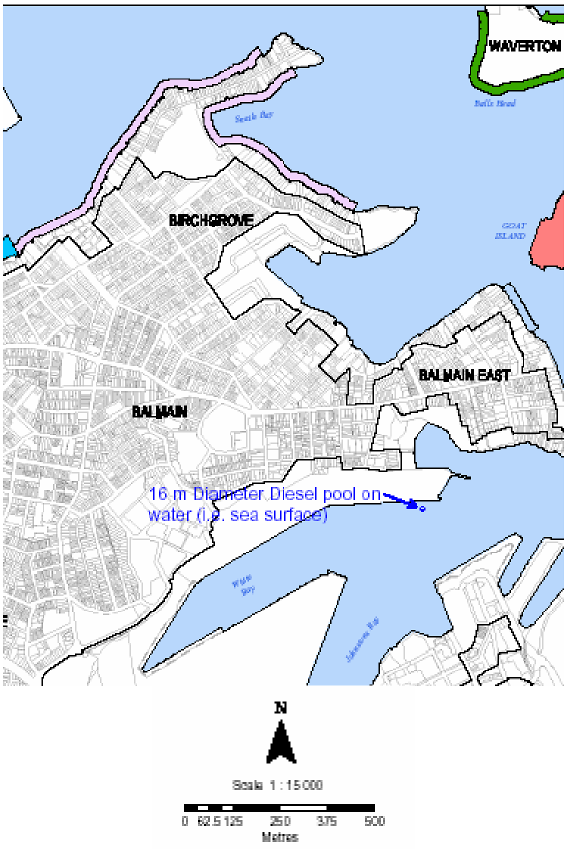
10.5.2 Medium Size Releases

The environmental impact of a release of 200 litres/minute of Diesel has been determined. Maximum time until isolation of the release is 2 minutes – resulting in a 400 litre spill or 0.4 cubic meters.

The expected diameter of a Diesel pool on water (i.e. sea surface) is 16.1m covering an area of 204m^2 or 0.02ha. This is below the threshold category of 2ha given in Table 10-2; page 27.

As shown in Figure 10.5-2, the potentially affected area is sufficiently small for any significantly adverse environmental impact in the area. The EHI falls within the range 0.1-1.0 - Table 10-1: Off-site Spill Consequence Categories; page 24.

Figure 10.5-2: Potential Affected Area - 400 L Sea Surface Diesel Spill



10.6 EFFECTS OF HAZARDOUS INCIDENTS - FIRE IMPAIRMENT

The following fire impairment criteria[22] were adopted.

The following criteria are based on safety considerations:

Muster areas:	Radiant heat exposure	< 2.3 kW/m^2
Escape routes:	Radiant heat exposure	< 4.7 kW/m^2
1% fatality:	Radiant heat exposure	≥4.7 kW/m^2
50% fatality:	Radiant heat exposure	≥12.5 kW/m^2
99% fatality:	Radiant heat exposure	≥23.0 kW/m^2
100% fatality:	Flash fire envelope	

For commercial planning purposes, involving residential areas, a maximum radiant heat exposure of 1.6 kW/m^2 has been assumed [20].

The impairment criterion for equipment and structures [21], is protection against radiant heat in excess of 8 kW/m^2.

Time exposure criteria for life safety[22] are given in Table 10-3 and Table 10-4.

Table 10-3: Heat Radiation Exposure Limits for 1% Chance of Fatality

Incident Heat Flux (kW/m^2)	Maximum Exposure Time (s)
50	3
37.5	4.6
25	8
15	16
12.5	20
10	27
6	54
5	69
3	135

Table 10-4 Incident Heat Flux for Various Fatality Levels (30 and 60 s of Exposure)

Probability of Fatality (%)	Incident Heat Flux (kW/m^2)	
	30s	60s
1	5.5	9.3
10	7.5	12.6
50	11.0	18.4
90	15.9	26.8
99	21.7	36.5

10.7 TOXIC RELEASES – ENVIRONMENTAL IMPAIRMENT

The environmental impact was assessed in terms of the volume of material released to the environment (land or water), the toxicological and physical and chemical characteristics of the material released and the sensitivity of the environmental receptor(s) affected by the event.

Environmental receptor sensitivity is based on published indicative criteria and thresholds set out for the level of damage that could constitute a major environmental incident. These criteria take into account the ecological value of the receptor and the ability to recover. For example, for areas designated for nature conservation (e.g. Nature Reserves and RAMSAR sites) an event will be regarded as a major accident at significantly lower thresholds than for other designated areas, amenity areas, and widespread habitats.

Environmental impairment criteria are given in Table 10-2; page 27.

11. ESTIMATION OF LIKELIHOOD OF HAZARDOUS INCIDENTS

The frequencies of initiating events were estimated for use in the process of risk assessment. These were estimated by reference to statistics on historical failure data. Initiating event frequencies were determined from various generally accepted data sources (events/annum).

12. RISK ANALYSIS

The risks associated with fire, explosion and environmentally damaging events, was estimated for the final outcomes of the event tree pathways described for the various scenarios – Section 9.

The objective of the risk analysis was to assess whether the proposed risk reduction measures will reduce risk levels to acceptable levels for all operations and activities.

The Layers of Protection Analysis (LOPA) method was employed for the estimation of the level of risk.

This involved:

- Identification of "cause – consequence" paths (Figure 6.4-1). The diagram consists of multiple paths, relating causes to consequences. Each path in the tree corresponds to a "cause – consequence" path, related to a given scenario.
- Identification of initiating events.
- Use of Independent Layers of Protection (IPL) as risk reduction measures.

The risk of each scenario was determined by mathematically combining the initiating event and IPL data.

The aggregated risk or cumulative risk of all the scenarios was determined and compared to the Risk Tolerance Criterion.

Where the risk does not satisfy the criterion - additional IPL or improvement of existing IPL, necessary to meet the criterion, were recommended.

12.1 INDIVIDUAL RISK – FIRE EVENTS

Individual Risk levels (fatalities) have been estimated for the various fire scenarios. These were compared to the threshold risk criteria given in Section 6.2. Results are shown in Section 18.

For the fire scenarios at the wharf, the risk of fire may be reduced to within acceptable levels by implementation of effective measures to reduce the probability of loss of containment, ignition, together with measures for containment of fuel and limitation of the extent of a spill. These are considered to be IPL – Independent Protection Layers.

The estimated maximum cumulative risk at the wharf is less than 5 x 10^{-5} p.a. This level of risk is strongly dependent on the effectiveness of the proposed measures to be implemented. The estimated cumulative individual risk is derived from all individual risks of mitigated consequences from Table 18-1, Table 18-2, Table 18-4, Table 18-5 and Table 18-6, taking into account the prevailing wind directions and probability of fatality.

The cumulative risk contours for 8 wind directions and the probability of fatality is shown graphically as a contour in Figure 12.1-1 and as a 2D map in Figure 12.1-2.

Figure 12.1-1: White Bay Wharf – Cumulative Risk Contour

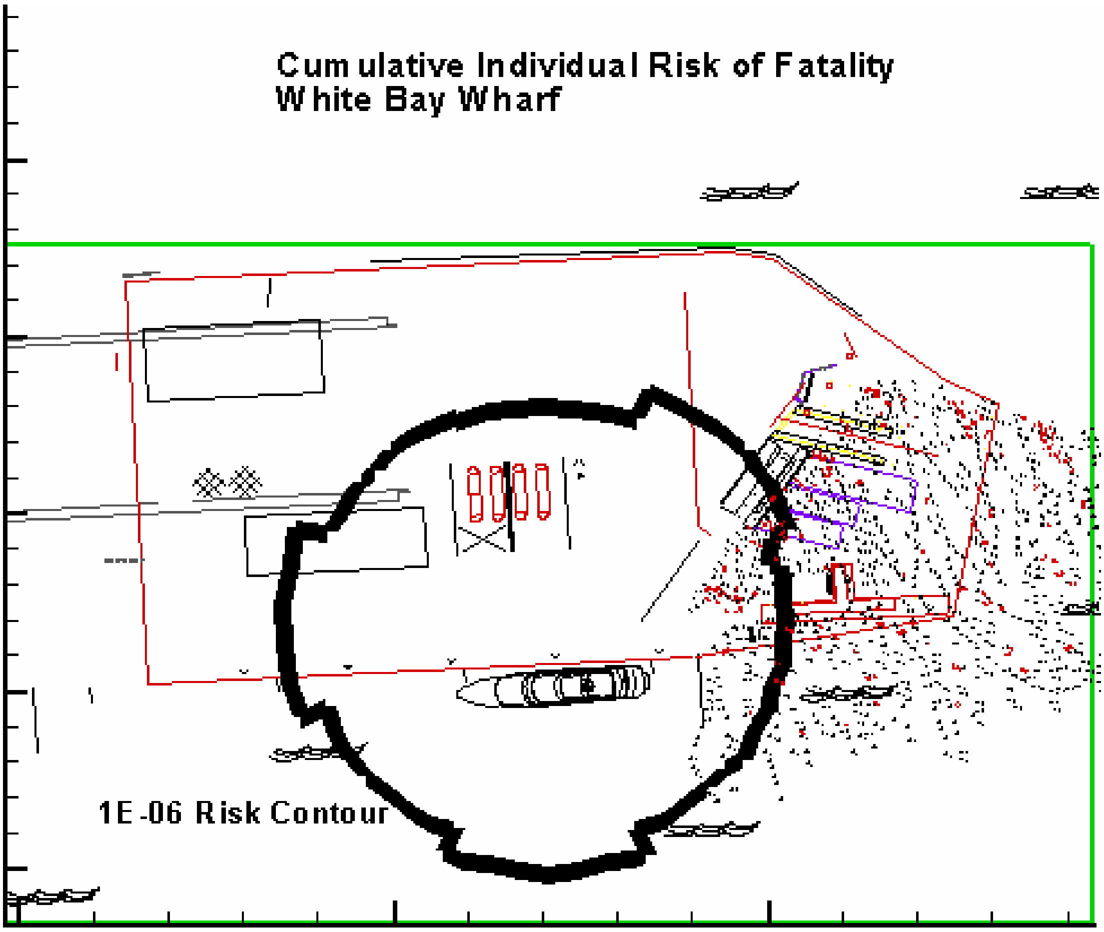
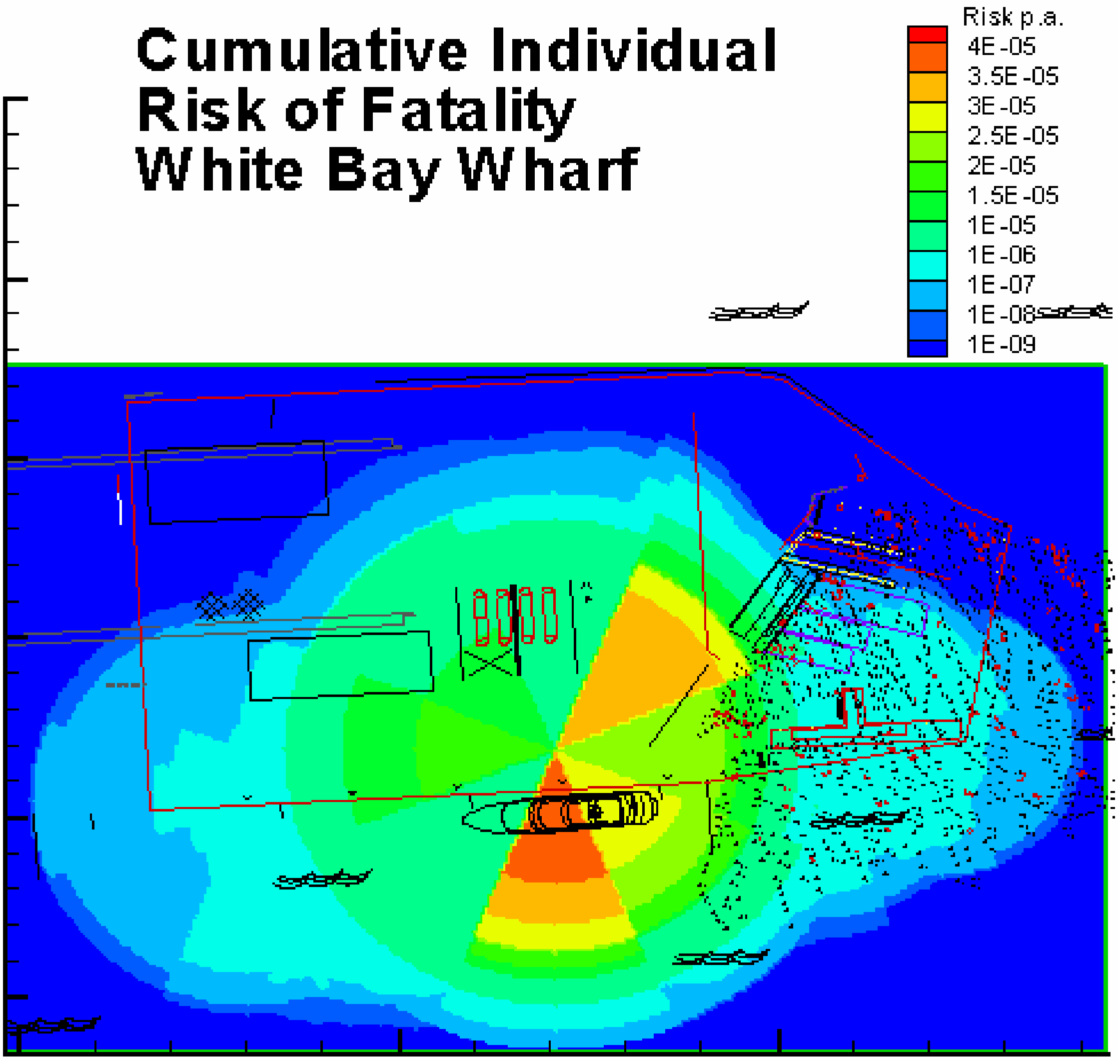


Figure 12.1-2: White Bay Wharf – Cumulative Risk Map



12.2 ENVIRONMENTAL RISK

The Environmental Risk of a Diesel spill was estimated for the various spill scenarios. These have been compared to the threshold risk criteria given in Section 6.3.

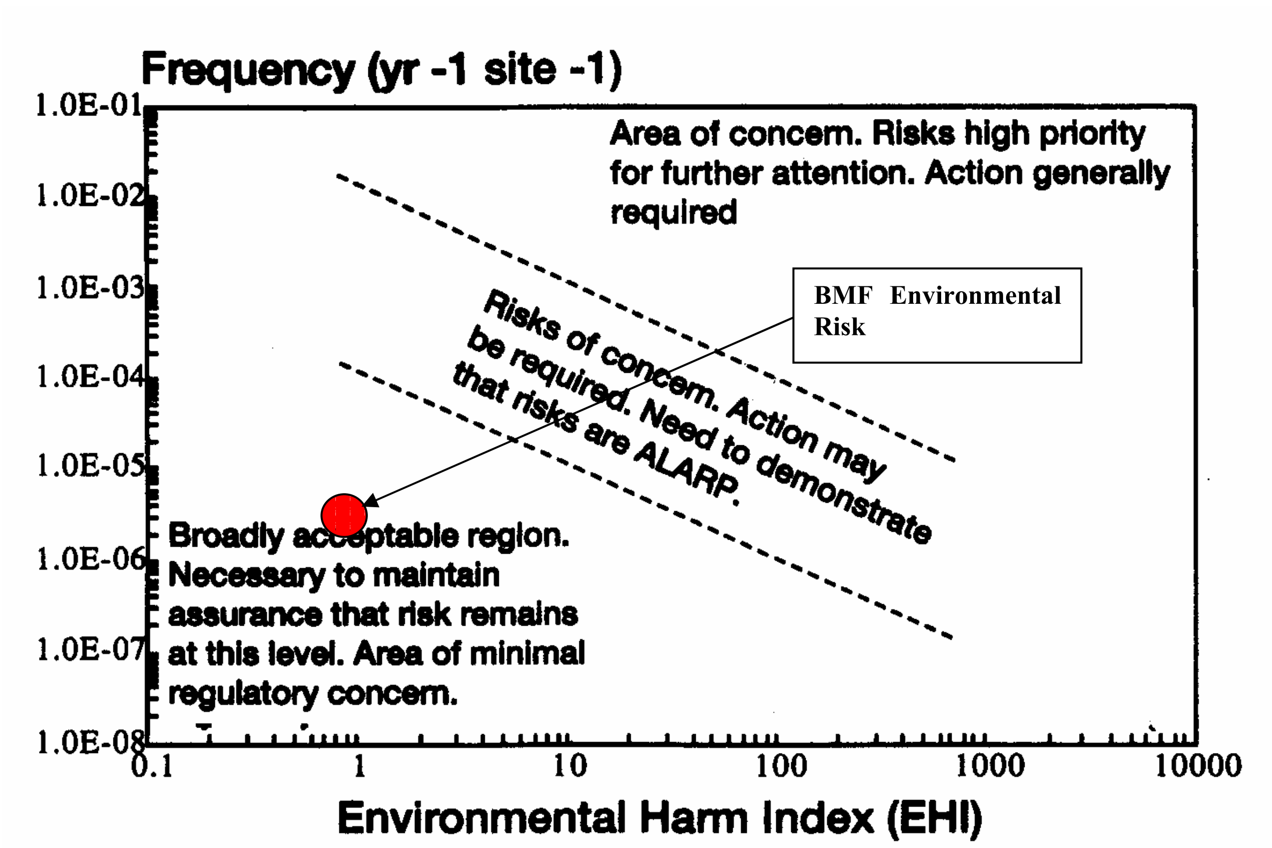
The risk of environmental damage may be reduced to within acceptable levels for the small quantities of Diesel fuel that may enter the environment, based on implementation of the identified Layers of Protection - particularly prevention of loss of containment, secondary containment, spill mitigation procedures and drainage.

The cumulative frequency of environmental incidents is estimated to be 1.74 x 10^{-6} per year. Spillage incidents for general vessels are significantly higher than this. The estimated cumulative environmental risk of 1.74 x 10^{-6} is derived from the risk of mitigated consequences from Table 18-3 and Table 18-7.

The cumulative environmental risk is indicated on Figure 12.2-1.

The qualitative risk assessment in Section 7.1.3.2 supports the quantitative assessment. In this section the risks are assessed as being "Low to Moderate" – i.e. in the "as low as reasonably practicable" region.

Figure 12.2-1: Environmental Risk



13. PREVENTATIVE AND PROTECTIVE CONTROLS

Preventative and Protective controls (risk reduction measures) envisaged are expected to:
- Minimise the potential of loss of containment;
- Provide secondary containment for any spill;
- Control and extinguish any fire that may occur on the wharf or on the sea surface;
- Provide fire protection;
- Prevent escalation of a fire; and
- Provide fire protection for adjacent areas.

The proposed preventative and protective controls are detailed in this section. In addition to these controls, the site will have the following:
1. Recordable CC TV.
2. Shear valves (AS1940 standard) on ULP dispensers;
3. Bollards around commercial cabinets (Attachments 6 and 7 – Appendix 6);
4. Underwater pontoon lighting (Attachment 8 – Appendix 6);
5. Tank Monitoring, including overfill protection (Attachment 9 – Appendix 6);
6. Dual contained tank (Attachment 10 – Appendix 6);
7. Dual contained UPP lines;
8. Leak Detection System on pumps;
9. Protection for UPP and electrics between deck of wharf and cabinet;
10. Underground Leak Detection and Protection methods (Attachment 13 – Appendix 6); and
11. Underwharf protection for recreational wharf (Attachment 14 – Appendix 6).

13.1 INHERENT SAFETY – DESIGN CONSIDERATIONS

The following protection against heat exposure will be provided in the design of the Fuel Dispensing Cabinet and Bowsers:
- Effective separation distances from any potential fire; and
- Barriers for radiant heat exposure (if required).

The proposed Commercial Dispensing Cabinet is provided in Attachment 17 – Appendix 6. Tanks, piping and equipment have been designed to the requirements of the relevant Australian Standards and Codes of Practice[23].

The location/number of flow limiting device; location of "cut-outs", hose connections and type of hose are addressed in the design.

The effectiveness/reliability of inherent safety measures has been considered during determination of the initiating frequencies in Section 18.

13.2 INDEPENDENT PROTECTION LAYERS

BMF propose to implement the following preventative and protective controls for the fuel dispensing operations[24]. These are identified independent layers of protection (IPL). The effectiveness and reliability of these measures were assessed, in terms of the probability of failure on demand (PFD) of each measure. The PFD for each of the following key preventative and protective IPL, associated with the various scenarios in tables - Table 18-1 to Table 18-7 as follows:

1. Ignition control and management (Scenarios: 1 & 2) A PFD of 0.01 was used in the applicable tables for the measures – discussed in Section 13.3. In the LOPA tables, different probabilities of ignition are used for Diesel spills and for spills where Gasoline is involved e.g. 0.001 for Diesel and 0.15 for ignition where Gasoline is involved). The effectiveness of each of the administrative controls was not explicitly determined. The collective effectiveness of these controls is reflected in the PFD used.
2. Fixed and mobile fire fighting equipment (Scenarios 1, 2, 4 & 5). A PFD of 0.1 was used for this as a mitigative/preventative IPL – CCPS[3]. The effectiveness of the equipment depends on the type of fire scenario that may arise. The effectiveness of the equipment in terms of PFD will increase with increased sized fires.
3. Emergency Shut Down (ESD) (Scenarios 3 & 5). Emergency stop button/timeout switches. A PFD of 0.01 was used for this as a mitigative IPL - CCPS[3].
4. Bunding and drainage system (Scenario 6). A PFD of 0.1 was used for this as a mitigative IPL - CCPS[3].
5. Oily water separation system (Scenario 6). A PFD of 0.1 was used or this as a mitigative IPL - CCPS[3].
6. Operator/driver action (Scenario 4). Management Practices - Prevention of tanker accident and spillage. A PFD of 0.1 was used for this as a preventative/mitigative IPL - CCPS[3].
7. Operator action (Scenario 6). Spill prevention procedures. A PFD of 0.1 was used for this as a preventative / mitigative IPL - CCPS[3]. Further, more detailed analysis regarding:
   - 24/7 and 9-5 operation;
   - self service after hours;
   - effectiveness of isolation procedure;
   - flow limiting devices;
   - blockage of wharf run-off and drains

   was not performed. Collectively, the PFD for operator action was judged conservatively.
8. Tank vent valves (Scenario 7). A PFD of 0.01 was used for this as a preventative measure for overpressure.

The IPL are discussed in the following sections.

13.3 IGNITION CONTROL AND MANAGEMENT

The risk of a pool fire at the Fuel Dispensing Cabinet and/or Bowsers depends largely on the probability of ignition of the vapour from a pool or flammable vapour or gas. The probability of ignition is discussed in Section 10.2.

The following measures will reduce the probability of ignition of fuel:

- Sources of ignition at the wharf and dolphin to be controlled by implementation of effective ignition management procedures. It is expected that these procedures will ensure that ignition sources will be restricted – matches, lighters, pagers, mobile phones, calculators, etc. Signage prohibiting smoking and the use of ignition sources, such as matches/lighters, mobile phones, etc., are provided in accordance with AS1940 requirement. Refuelling Procedure is provided in Attachment 11 – Appendix 6.
- All customers are inducted into the operation of the site and safety requirements before they obtain a Bailey's Marine fuel card that will operate the facility;
- Enforcement of Safe and Hot Work Permit procedures , where hot work activities are safely managed – Refer to Section 8.2 of Bailey's "Best Practice Approach to Marine Refuelling";
- Inspection and maintenance of electrical equipment, wiring etc. ;
- Storage of chemical products, fuels and lubricants according to the requirements of the Dangerous Goods legislation; and
- Use of signage such as "No smoking", "stop engine".

13.4 FIXED AND MOBILE FIRE FIGHTING EQUIPMENT

13.4.1 Extinguishment and Cooling Media

Fire fighting equipment required by the relevant Australian Standards, will be installed at the wharf. It is expected that water jets will be used in the event of Diesel fires with spray from nozzles for purposes of cooling and providing protection for fire fighters.

Fire extinguishers will be supplied – as required by the Australian Standard. Fire extinguishers in the following areas: Office, Wharf, Dolphin, Bulk Storage, Tank Farm Yard, RORO Ramp, Switchboard.

The following fire mitigation measures will be provided:

- Alarms (Break Glass Alarm – external police/fire/ambulance);
- Fireboxes, containing hoses and foam;
- Fire hydrants; and
- Emergency response trailer stocked as detailed in the Depot Operations Manual (absorbent material, booms, foam fire extinguishers, tools and equipment).

13.4.2 Vessel Fire Protection

Requirements for fire fighting equipment on vessels are based on the Australian USL Codes and surveyed on an annual basis by the State Authority. USL Codes require fire suppression systems on board vessels. It is expected that foam systems will be provided for fighting fires on the wharf or the vessel deck. BMF operational procedures require a fire extinguisher on deck during refuelling.

Safety audits of vessels will be conducted by BMF to ensure compliance with mitigating control procedures.

BMF intend to induct all personnel and customers (ISO 14001 requirement) and ensure that customers are familiar with the use of fire fighting equipment during refuelling.

13.4.3 Wharf Protection

BMF will provide fire fighting equipment to combat fires associated with the various fire scenarios identified.

BMF will provide all fire fighting equipment as per AS 1940-2004/AS 3846 requirements. Fire fighting may be supplemented by emergency services assistance.

The fire water system will need to be upgraded to ensure sufficient hydrant coverage.

Portable fire extinguishers will be provided near the Fuel Dispensing Cabinets and Bowsers for First Aid fire fighting.

It is expected that pre-mix foam appliances, with 100 litres capacity, may be readily available for use at the wharf. These appliances have the capability of producing 1000 litres of foam with a range of 12 metres.

13.5 EMERGENCY SHUT DOWN

13.5.1 Minimisation – loss of containment

Effective controls for minimisation of loss of containment and escalation will:

- Limit the duration of a spill;
- Control the movement of fuel released on water or the wharf; and
- Limit the spread of a pool.

The consequences of any pool fire will depend on the size of the spill, on both water and the wharf.

The exclusion distance for protection against radiant heat from a pool fire on the sea surface at the proposed locations is determined by the distance to the 1.6 kW/m^2 contour[12]. Radiant heat calculations indicate that this may be reduced from 69 m to less than 43 m by rapid isolation of a spill with good drainage. The key factor is limitation of the size of the spill – i.e. the diameter of the pool.

13.5.2 Prevention of Escalation

Fire escalation prevention or reduction measures for a fire at the wharf/dolphin will include the following:

- An emergency “stop button” – to reduce or stop the flow of fuel ; and
- Tank isolation valves – early isolation for prevention of escalation.

13.6 BUNDING, DRAINAGE – SECONDARY CONTAINMENT

Secondary containment bunds and a monitoring system will provide protection against leakage into the environment from the underground storage tanks delivering Diesel to the wharf and dolphin.

Product spillage containment procedures are required or need to be developed to limit the potential for Diesel to enter the environment.

An effective drainage system will be necessary for the collection and treatment of oily water. Waste disposal procedures are required or need to be developed for disposing of Diesel or any other hazardous materials.

Interception of the Bridger Slab will ensure that part of a full compartment of product can be contained, such that the size of any spillage will be limited to less than 3 m (communicated by BMF). The area within the slab to be sloped to collect released product and divert it to a collection pit. The drainage system is important for containment of potential pool fires. Bunding and drainage on the wharf will meet the intent of OCIMF Section 2.4 specifications.

13.7 OILY WATER SEPARATION SYSTEM

An oily water separation system or interceptor, will serve to contain any hydrocarbon spills within the interceptor in order to minimise effluent flows off site.

13.8 OPERATOR / DRIVER ACTIONS

In order to prevent a collision between a tanker and vehicle or pedestrian during the transportation of fuel, resulting in injury, death or loss of containment of Diesel or ULP, the following management controls are being considered such as:

- Scheduled delivery of Diesel and ULP during quiet periods;
- Erection of suitable signage; and
- Traffic speed controls –e.g. speed "humps".

Based on 20,000,000 litres of throughput the site would have 526 single barrel movements (1.44 / day) or 270 B Double movements (0.76 / day).

13.9 OPERATOR ACTIONS – SPILL PREVENTION PROCEDURES

The following control was considered to be a *condition modifier* (Glossary – Section 1).

BMF intend to implement operating procedures and design features that will reduce the maximum duration of a spill to within 2 minutes at the Fuel Dispensing Cabinet. This will be particularly important in determining the size and location of a pool at Wharf No. 6. This will also depend on the direction of the prevailing wind (South Westerly & Northerly). Should a spill occur from a vessel during fuelling, the fuel would spread between vessels secured and drift to the wharf and the adjacent RORO ramp. Any Diesel that may have accumulated due to such a spill from small boats and other vessels, if ignited, may result in a pool or flash fire.

Detection of a spill will be visual. All customers will be inducted into the operation of the fuelling facility, before issue of a Bailey's Marine Fuel Card for operation of the facility. Customers will be given emergency response training. On site supervision will be provided during business hours.

13.10 TANK VENTS VALVES

Tank vents[23] are provided according to the requirements of the relevant Australian Standard.

13.11 CONTROLS AND SAFEGUARDS – NON IPL

The following are the non- IPL safeguards provided. These include administrative controls and procedures that increase the effectiveness and reliability of a number of the IPL.

13.11.1 Prevention - Environmental Spills

The following controls and safeguards will be provided for prevention of loss of containment from the underground storage tanks:

- Tank level gauging equipment;
- Monitoring wells; and
- Annual pressure vessel tests – according to requirements of the relevant Australian Standard.

Product spillage containment procedures are required or need to be developed[4] to limit the potential for Diesel to enter the environment.

Waste disposal procedures[4] are required or need to be developed for disposing of Diesel or any other hazardous materials.

13.11.2 Procedures/Administrative Controls - Loss of Containment

It is expected that the following administrative controls/procedures[4] will reduce the risk associated with loss of containment from the Fuel Dispensing Cabinets and Bowsers:

- Customer induction / training;
- Tank overfill control procedures* (electronic);
- Pipeline, filters, pumps inspection and maintenance procedures;
- Leak checking procedures;
- Product discharge procedures;
- Housekeeping procedures – prevention of slips, trips and falls; minimisation of combustible material on the site etc.);
- Provision of adequate lighting – prevention of collision, impact;
- Depot operations procedures manual;
- Filter / strainer cleaning procedures – prevention of blockages and overpressure;
- Licensing and training of personnel for operation of depot equipment to reduce the potential for human error (slips, mistakes and violations);
- A security system that will include control of access, restriction to hazardous areas with an effective alarming system;
- Signage and effective identification of pumps, piping and equipment on the site;
- Operating instructions at card acceptor*;
- Customer and induction process;
- Effective and safe refuelling procedure (mooring, engine shut down, preparation of fire fighting equipment; lighting procedure, agreed emergency shut down procedures, prevention of ignition, flow regulation and hose inspection);
- Instructions for operation of fuel trigger;
- Emergency Response Plan, with exercises;
- Emergency Services assistance;
- Spill kit at office;
- Spill clean procedure;
- After - hours contact phone numbers; and
- Equipment isolation and tagging procedures.

The process of taking fuel from White Bay 6 is given in Attachment 12 – Appendix 6. Fuel transfer for large bunkers is performed under the Pre-Delivery Guidelines given in Attachment 5 – Appendix 6.

All customers will be inducted into the operation of the site before they obtain a Bailey's Marine fuel card to operate the facility. Customers will be given appropriate emergency response training. Supervision will be provided on site during business hours. All BMF operators are trained bunker operators, having attended additional specialised petroleum courses. The site will operate 24/7.

[4] Although not analysed, the PFD for "operator action" (e.g. - Scenario 6) depends on the effectiveness of these procedures.

* Critical Control

In order to prevent any night time incidents the recreational refuelling will not be available from 10:00 PM to 4:00 AM.

13.11.3 Basic Process Control System

Process controls provided for fuel dispensing and tank filling are respectively:
- Flow Regulating Valves for fuel dispensing; and
- Tank isolation valves.

13.12 PREVENTION OF ESCALATION

The following measures have been specifically incorporated for prevention of escalation.

Fire escalation prevention or reduction measures for a fire at the wharf/dolphin will include the following:
- An emergency "stop button" – to reduce or stop the flow of fuel ;
- Tank isolation valves – early isolation for prevention of escalation;
- Secondary containment - bunding and bund valves;
- Secondary containment – interceptor and interceptor valves to prevent or reduce the flow of fuel offsite; and
- Spill clean-up procedures.

A fireproofed boom, to assist with the prevention of the spread of flammable material or a fire, will be provided. Spill control devices and procedures are included in the Bailey's "Best Practice Approach to Marine Refuelling."

14. HAZOP, CONTROLS ANALYSIS AND ALARP

A HAZOP for the site has not been completed. A detailed analysis of the effectiveness and reliability of controls has not been completed. These will be provided during detail design if necessary.

The following have been implicitly included in the LOPA analysis:
- The impact of the type of operation – e.g. 24/7 or 9-5 operation;
- Self service after hours – increases in the level of risk;
- Means of isolation;
- The location of cutouts;
- The location/number of flow limiting devices, drains and wharf runoff to be blocked if spillage occurs;
- The reliability of hose connections; and
- Operational safety and reliability issues regarding type/size of hoses for different vessels with various quantities of fuel required.

Explicit inclusion of the factors above would require a more extensive analysis.

15. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

15.1 EXCLUSION DISTANCES

1. The exclusion distance for protection against radiant heat from a pool fire on the sea surface at the proposed location is determined by the distance to the 1.6 kW/m^2 contour. This may be reduced from 61 m to approximately 40 m by implementation of measures for the rapid containment of spillage onto the sea surface and shielding provided by the wharf. The key factors are limitation of the size and extent of the spill – i.e. the diameter and spread of the pool. This is determined by the direction of the prevailing wind (South Westerly & Northerly). Should a spill occur from a vessel during fuelling, the fuel will spread between vessels secured and drift to the wharf and the adjacent RORO ramp. Vapour concentration may increase in this particular area, particularly where confinement may occur. Tidal movements and the provision of vents may prevent vapour concentration from falling within the flammable range, however there is a probability of ignition leading to a flash fire with the potential for escalation, during certain circumstances.
2. The exclusion distance for protection against radiant heat from a pool fire on the wharf is determined by the distance to the 1.6 kW/m^2 contour. This may be reduced from 69 m to less than 40 m by rapid isolation of a spill and the provision of effective drainage for rapid removal of a spill. Risk reduction measures need to be implemented that limit the size and location of a pool.

15.2 SEVERITY OF CONSEQUENCES

Risk reduction measures are to be implemented that limit the size and location of a pool at the wharf. The size of location of a pool are determined by the direction of the prevailing wind. It is likely that in the event of a spill occurring during fuelling, that the fuel will spread between vessels secured and drift to the wharf and the adjacent RORO ramp.

15.3 IGNITION

The management and control of potential ignition sources needs to be implemented. Details are provided in Section 13.

15.4 RISK ASSESSMENT

Risks have been estimated to be acceptably low and "as low as reasonably practicable – ALARP" for both types of risks. The preventative and protective controls outlined in Section 13 were taken into account in estimating the levels of risk. The expected effectiveness and reliability of these proposed measures (communicated by BMF) will have an impact on the level of risk, reducing both the frequency and severity of events. The ability to rapidly identify, hence reduce the size of a spill was of particular importance in determination of the final level of risk.

15.5 ACCESS AND EGRESS

Effective access and egress is provided at the wharf. Evacuation from the landings, with a wide escape routes is considered to be adequate.

15.6 TANKER COLLISION / OVERTURNING PREVENTION

The roadway to the wharf is frequented by members of the public, being near a residential area. It is expected that the daily population frequenting this area will increase in future. As a result, the potential for collision and impact may increase. This may result in injury, death or loss of containment of Diesel/ULP. In order to minimise the risk, controls envisaged will be management controls such as scheduled delivery of Diesel/ULP during quiet periods and erection of suitable signage. Installation of speed control measures such as speed "humps" should be considered.

15.7 SURVEILLANCE

Loss of fuel, resulting in a pool of fuel accumulating on the water surface, may occur during mooring due to vessel collision. The accumulation of fuel in any specific areas or strong fuel smells and odours may be detected during surveillance. A procedure for effective surveillance should be considered for implementation.

15.8 CRITICAL CONTROLS

A number of key risk reduction measures (safeguards and controls) have been identified. These are:

- Prevention of ignition;
- Rapid isolation in the event of loss of containment;
- Spill containment measures; and
- Provision of sufficient access and egress.

16. APPENDIX 1: RADIANT HEAT FLUX CALCULATIONS

16.1 POOL FIRE ON WHARF AND SEA – PHYSICAL AND CHEMICAL PROPERTIES

Table 16-1 PHYSICAL & CHEMICAL PROPERTIES

		Diesel	Gasoline
Molecular weight	kg/kmole	240	120
Density of liquid	kg/m^3	840	751
Density of gas/vapour	kg/m^3	9.908	4.910
Boiling temperature	^oC	287.5	131.9
Specific heat of liquid	kJ/kg	2.233	1.995
Cp ratio		1.0051	1.0059
Heat of vaporization	kJ/kg	321.5	359.6
Emissive power of upper flame	kW/m^2	30	30
Emissive power of lower flame	kW/m^2	130	130
Heat of combustion	kJ/kg	**34490**	**31775**

Table 16-2 WEATHER DATA – Sydney Observatory Hill

Ambient temperature	^oC	20.1
Ambient pressure	bar	1.01
Average Wind speed	m/s	4.61
Relative humidity	%	57

16.2 PREDICTED DIESEL POOL FIRE CHARACTERISTICS – WHARF & SEA

Table 16-3: Scenario Table

SCENARIO – Scenario descriptions given in Table 9-1.		
Release type	Instant release – small pool (50L)	Instant release – medium pool (400 L)
Material	Diesel	Diesel
Surface	LAND	LAND
Wind velocity m/s	4.61	4.61
Burning rate kg/sm^2	0.038	0.038
Maximum Pool diameter m	9.15	20
Flame height m	7.9	14
Flame drag m	12.4	25.7
Flame tilt deg	64.3	60.3

Table 16-4: 1.6 kW/m^2 Distance for Various Spills (Diesel)

Spill Size (litre)	Surface	Pool Diameter (m)	Distance to 1.6 kW/m^2	Reduction in distance to 1.6 kW/m^2
600	Sea	18.8	68.4	
600	Land	23.2	76.9	Instantaneous spill without drainage.
		16.7	61.1	Continuous spill - equilibrium pool without drainage.
400	Sea	16.1	61.2	No shielding.
400	Sea		< 40	Due to existing shielding from Wharf.
400	Land	20	69.0	
400	Land		< 40	With rapid containment and drainage.
50	Sea	7.39	37.8	No shielding.
50	Sea		< 20	With shielding.
50	Land	9.15	41.6	
1800 LPM Continuous	Land / Sea	28.8	88.7	Without rapid containment and effective drainage
1800 LPM Continuous	Land / Sea	28.8	< 55	With rapid containment and effective drainage

16.3 GRAPHICAL POOL FIRE RESULTS

Figure 16.3-1: 400 Litre Release

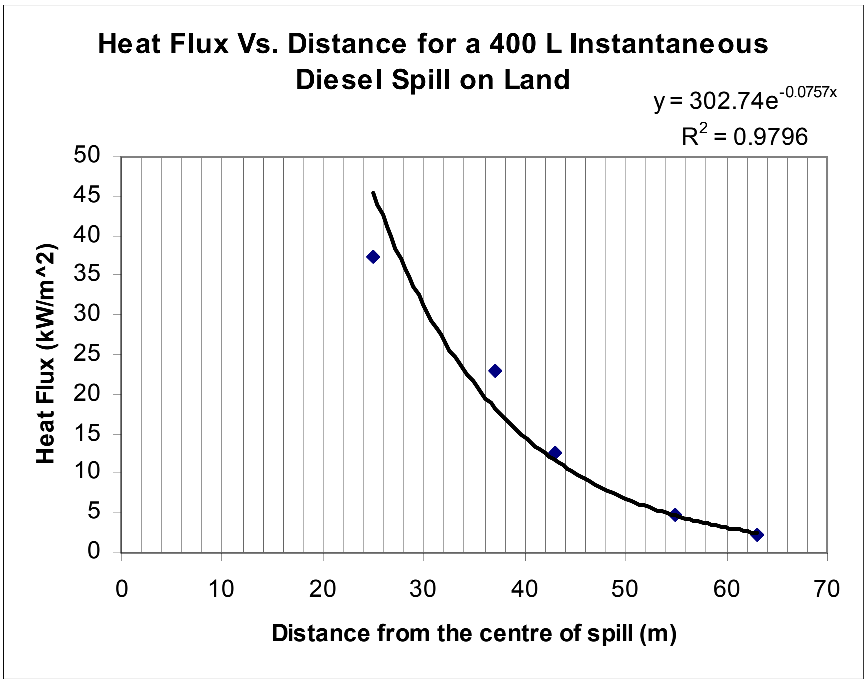


Figure 16.3-2: 50 Litre Release

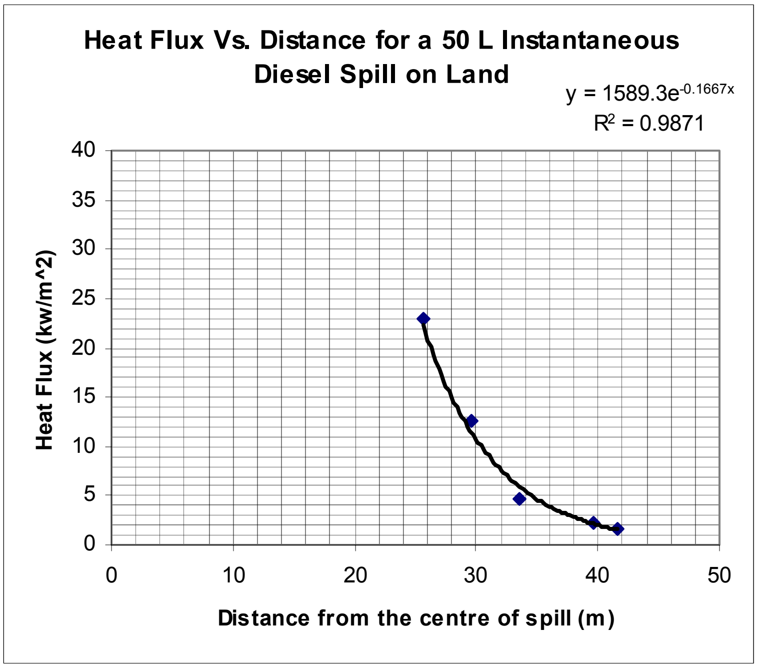


Figure 16.3-3: Various Releases: Radiant Heat Flux Graphs – Credible & Disaster Scenarios

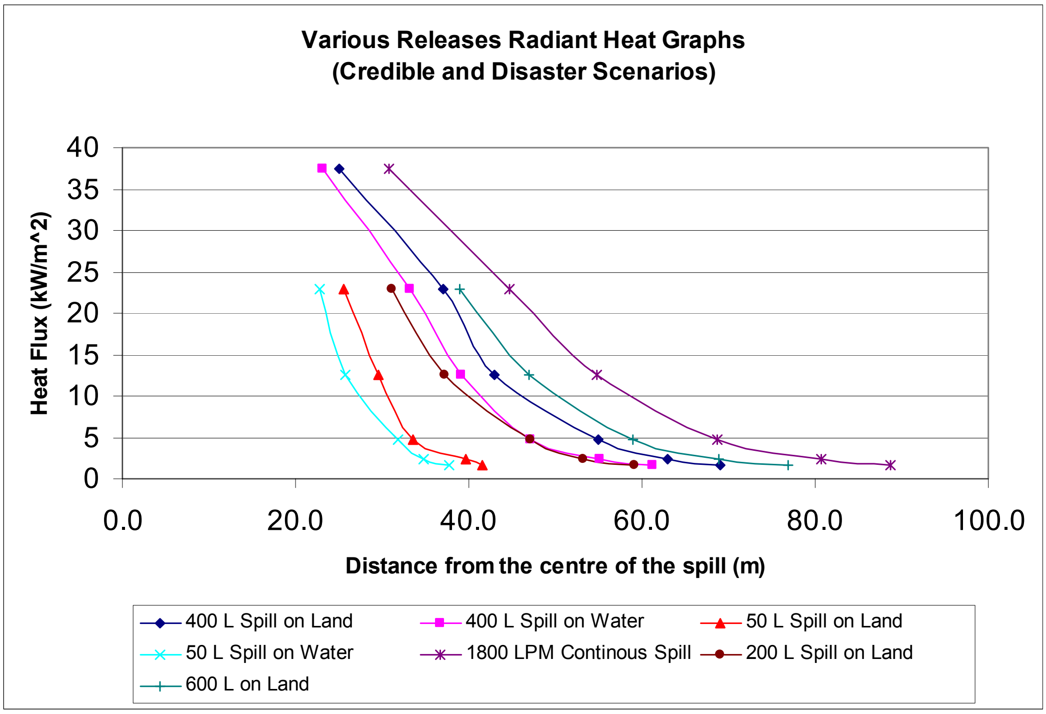


Figure 16.3-4: Radiant Heat Zones For 400 Litre Diesel Spill at Wharf No. 6

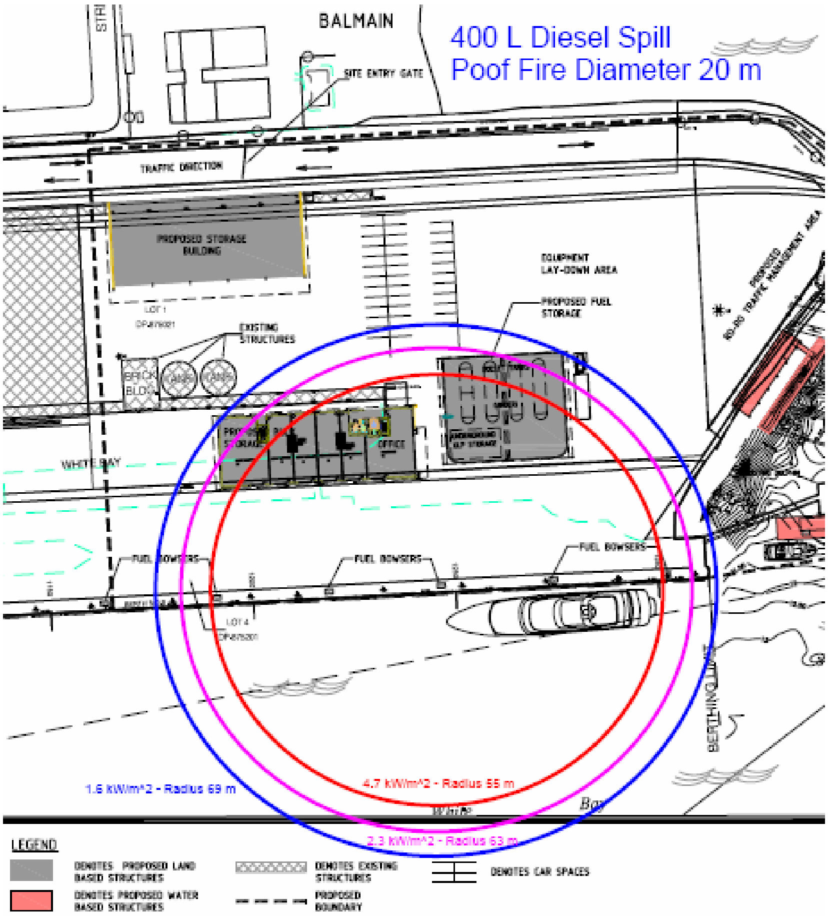
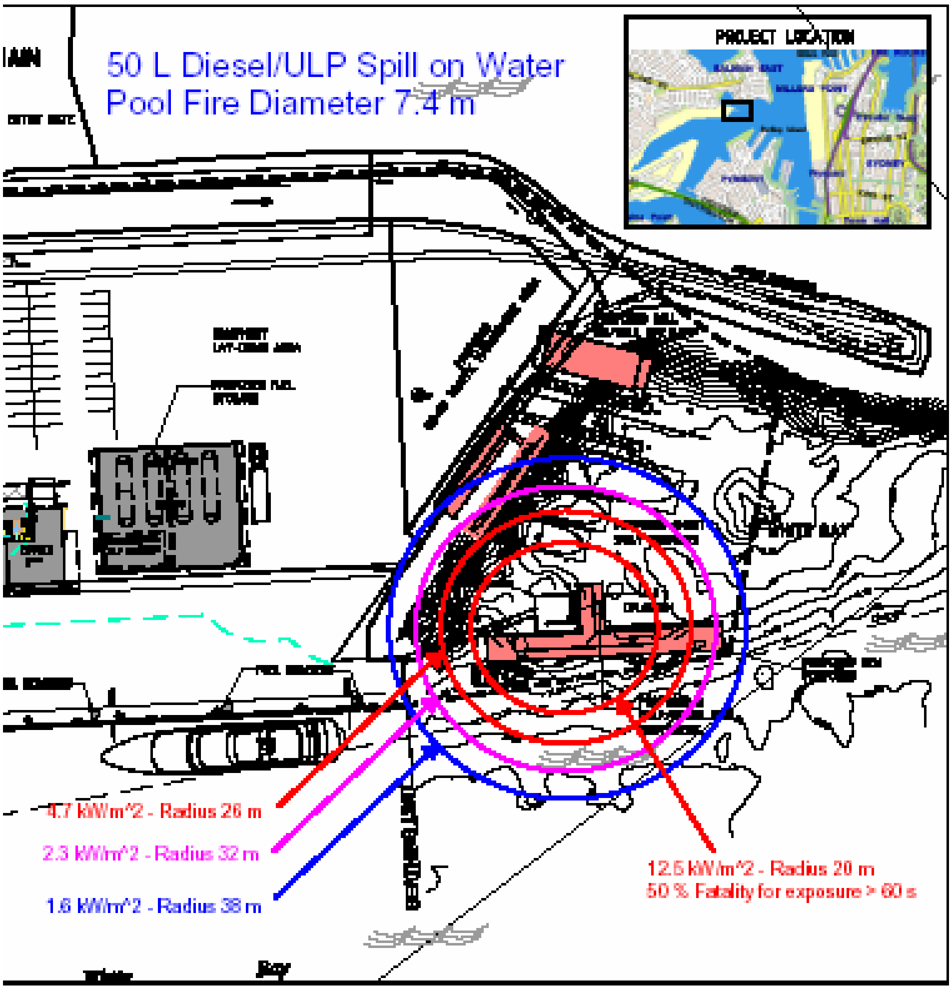


Figure 16.3-5: Radiant Heat Zones For 50 Litre Diesel/ULP Spill at Dolphin



16.4 3D FIRE MODELLING RESULTS

Figure 16.4-1: 50 litre Diesel/ULP Spill Pool Fire on Water

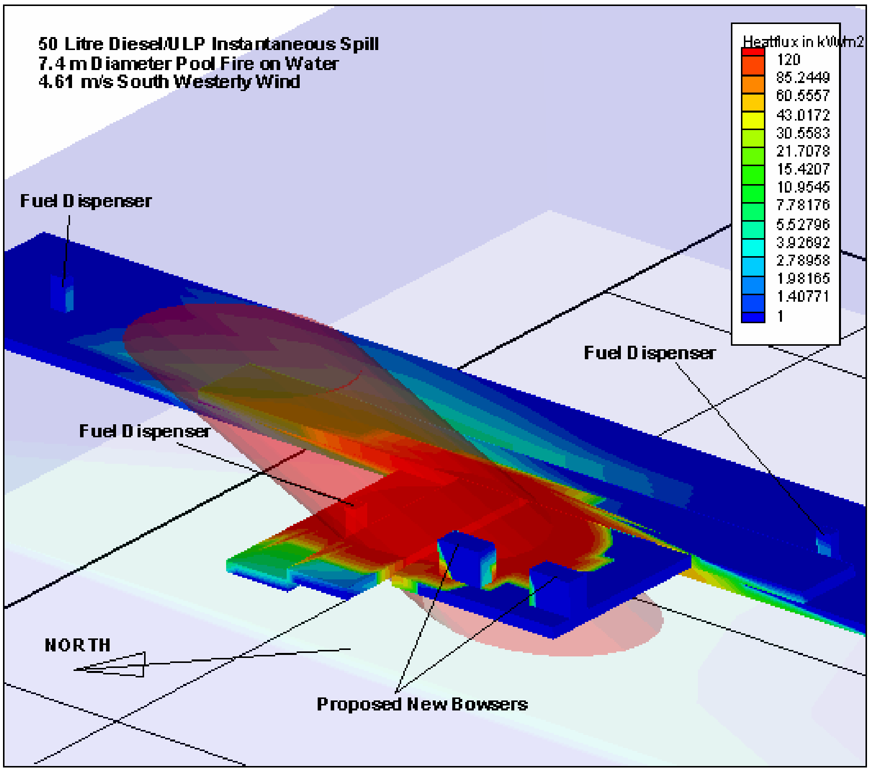


Figure 16.4-2: Pool Fire - 200 LPM Diesel Spill (2 minutes release) at Wharf No. 6

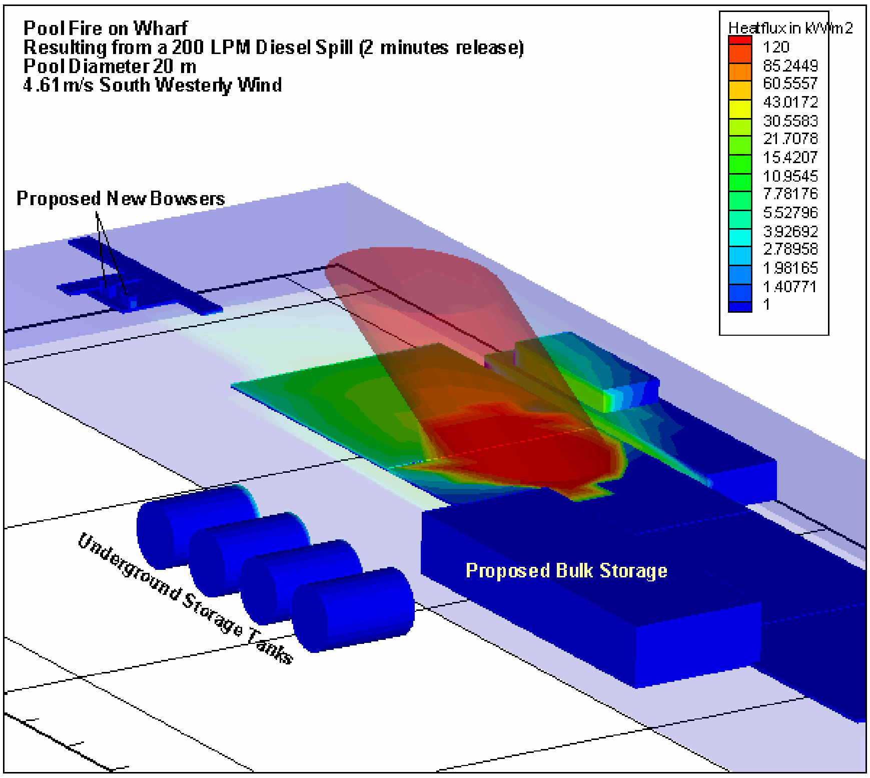


Figure 16.4-3: Pool Fire - 600 LPM Diesel Spill (1 minute release) at Wharf No. 6

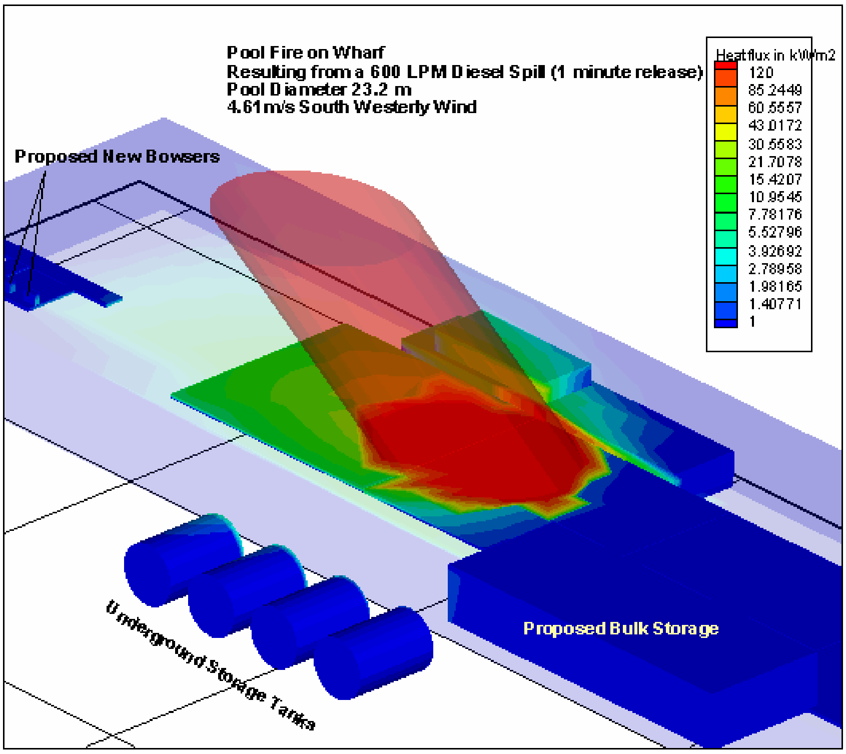
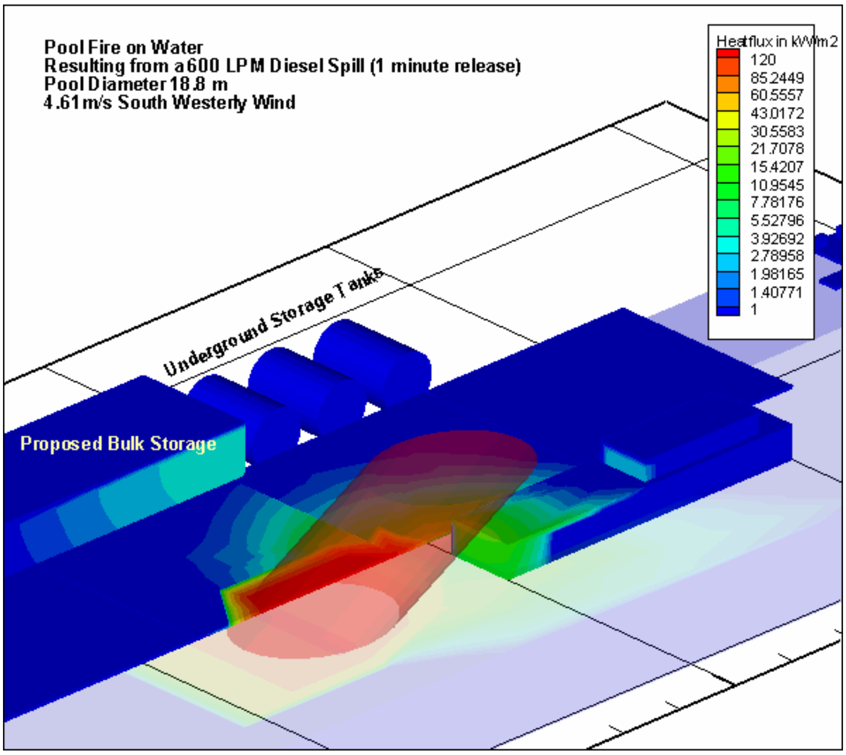


Figure 16.4-4: Pool Fire - 600 LPM Diesel Spill (1 minute release) on Water



17. APPENDIX 2: ESTIMATION OF ENVIRONMENTAL CONSEQUENCES

Environmental consequences identified are water, groundwater and soil contamination. The extent and effect of a liquid fuel release on water was modelled for various types and flow rates of releases. These were compared to the threshold "areas" determined for environmental receptors. The impact of fuel releases was found to be insignificant for all release scenarios considered.

18. APPENDIX 3: LOPA RESULTS

Table 18-1

Scenario Number: 1	**Plant / Equipment** Fuel Dispensing at White Bay's wharf/dolphin.	**Scenario Title** Pool or flash fire on the wharf/dolphin or sea surface.	
Date: 15/02/06	**Description**	**Probability**	**Frequency/year**
Consequence Description / Category	Flash fire / small fire occurs due to incorrect handling of ULP on small vessel. Some ULP (50 L) escapes to the water causing a surface fire on the water.		
Risk Tolerance Criteria (Category or Frequency)			Maximum Tolerable Risk of a Serious Fire 1.00E-04 Maximum Tolerable Risk of a Fatal Injury 1.00E-06
Initiating Event (Typically a frequency)	Estimated frequency of small fires.	CCPS	1.00E-02
Enabling Event or Condition	Presence of gasoline vapour.	1	Assumed present 100% of the time.
Condition Modifiers	Probability of ignition	0.01	CHL[25] p. 58
	Probability of personnel in the area	1	Judgement
	Ability to avoid the incident	0.5	Judgement
Frequency of Unmitigated Consequences			5.00E-05
Independent Protection Layers (IPL)	Ignition control and management.	1	Preventative IPL
	Fixed and mobile fire fighting equipment.	0.1	Mitigative/Preventative IPL – CCPS[3].
Safeguards (non-IPLs)			
Total PFD for all IPL		0.1	
Frequency of Mitigated Consequences			5.00E-06
Risk Tolerance Criteria Met?(Yes/No):			
Yes.			
Actions Required to Meet Risk Tolerance Criteria	Provide fire fighting system and ignition control procedures.		
Notes	None.		

Table 18-2

<table>
<tr><td>Scenario Number: 2</td><td>Plant / Equipment
Fuel Dispensing at White Bay's wharf.</td><td colspan="2">Scenario Title
Pool or flash fire on the wharf or sea surface at White Bay.</td></tr>
<tr><td>Date:
15/02/06</td><td>Description</td><td>Probability</td><td>Frequency/year</td></tr>
<tr><td>Consequence Description / Category</td><td>Flash fire / small fire occurs due to incorrect handling of ULP during fuel dispensing on small vessel. Escalation results in large fire adjacent to the recreational pontoon.</td><td></td><td></td></tr>
<tr><td>Risk Tolerance Criteria (Category or Frequency)</td><td></td><td></td><td>Maximum Tolerable Risk of a Serious Fire
1.00E-04
Maximum Tolerable Risk of a Fatal Injury
1.00E-06</td></tr>
<tr><td>Initiating Event (Typically a frequency)</td><td>Estimated frequency of small fires.</td><td>From Scenario 1</td><td>5.00E-06</td></tr>
<tr><td>Enabling Event or Condition</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Condition Modifiers</td><td>Probability of ignition</td><td>1</td><td></td></tr>
<tr><td>Probability of personnel in the area</td><td>1</td><td>Judgement</td></tr>
<tr><td>Ability to avoid the incident</td><td>0.5</td><td>Judgement</td></tr>
<tr><td colspan="2">Frequency of Unmitigated Consequences</td><td></td><td>2.50E-06</td></tr>
<tr><td rowspan="2">Independent Protection Layers (IPL)</td><td>Ignition control and management.</td><td>1</td><td>Preventative IPL</td></tr>
<tr><td>Fixed and mobile fire fighting equipment.</td><td>1</td><td>Mitigative/Preventative IPL – CCPS[3].</td></tr>
<tr><td>Safeguards (non-IPLs)</td><td></td><td></td><td></td></tr>
<tr><td>Total PFD for all IPL</td><td></td><td>1</td><td></td></tr>
<tr><td colspan="2">Frequency of Mitigated Consequences</td><td></td><td>2.50E-06</td></tr>
<tr><td colspan="4">Risk Tolerance Criteria Met?(Yes/No):</td></tr>
<tr><td colspan="4">Yes.</td></tr>
<tr><td>Actions Required to Meet Risk Tolerance Criteria</td><td colspan="3"></td></tr>
<tr><td>Notes</td><td colspan="3">None.</td></tr>
</table>

Table 18-3

Scenario Number: 3	**Plant / Equipment** Fuel Dispensing Cabinet and Bowsers.	**Scenario Title** Spill on the wharf or sea surface - environmental impact.	
Date: 15/02/06	**Description**	**Probability**	**Frequency/year**
Consequence Description / Category	During fuel dispensing from a commercial dispenser the handpiece fails and separates from the hose leading to a loss of containment. As correct procedure was followed the second person shuts down the system via the emergency stop button. Approximately 400 L of Diesel escapes, a spreading Diesel pool forms.		
Risk Tolerance Criteria (Category or Frequency)			Figure 12.2-1: Environmental Risk Criteria
Initiating Event (Typically a frequency)	Pump failure/ failure of dispensing equipment results in loss of containment. Equipment assumed to be designed to safety requirements of Australian Standards.	E&P Forum	1.71E-02
Enabling Event or Condition			
Condition Modifiers	Probability of environmental damage.	0.01	Judgement
Frequency of Unmitigated Consequences			1.71E-04
Independent Protection Layers (IPL)	Emergency stop button/timeout switches.	0.01	Mitigative/Preventative IPL – CCPS[3].
Safeguards (non-IPLs)	Refuelling procedures.		
Total PFD for all IPL		0.01	
Frequency of Mitigated Consequences			1.71E-06
Risk Tolerance Criteria Met?(Yes/No):			
Yes			
Actions Required to Meet Risk Tolerance Criteria			
Notes	None.		

Table 18-4

Scenario Number: 4A	**Plant / Equipment** Bulk Liquid Transportation.	**Scenario Title** Tanker collision leads to Diesel/ULP pool fire.	
Date: 15/02/06	**Description**	**Probability**	**Frequency/year**
Consequence Description / Category	Tanker collision with vehicle or people. Tanker may overturn. Spillage or leakage occurs from tanker. Diesel/ULP vapour/aerosol or mist is generated and contacts with hot surface. Ignition results in a pool fire.		
Risk Tolerance Criteria (Category or Frequency)			Maximum Tolerable Risk of a Serious Fire 1.00E-04 Maximum Tolerable Risk of a Fatal Injury 1.00E-06
Initiating Event (Typically a frequency)	Tanker collision. Spillage/leakage from tankers.	Vic Roads	1.30E-06
Enabling Event or Condition			
Condition Modifiers	Probability of ignition	0.15	Lees – immediate ignition
	Probabilty of personnel in the area	1	Judgement
	Ability to avoid the incident.	0.5	Judgement
Frequency of Unmitigated Consequences			9.75E-08
Independent Protection Layers (IPL)	Speed limit.	1	Mitigative/Preventative IPL – CCPS[3].
Safeguards (non-IPLs)			
Total PFD for all IPL		1	
Frequency of Mitigated Consequences			9.75E-08
Risk Tolerance Criteria Met?(Yes/No):			
Yes			
Actions Required to Meet Risk Tolerance Criteria			
Notes	None		

Table 18-5

Scenario Number: 4B	**Plant / Equipment** Tank filling.		**Scenario Title** Operational error leads to Diesel/ULP pool fire.	
Date: 15/02/06	**Description**		**Probability**	**Frequency/year**
Consequence Description / Category	Operational error results in spillage or leakage from tankers or tanks. Diesel/ULP vapour/aerosol or mist is generated and contacts with hot surface. Ignition occurs. Pool fire results. Loss of containment at a release rate of 600 LPM or 36 T/hr during product transfer through 4" camlock from a truck compartment may result.			
Risk Tolerance Criteria (Category or Frequency)				Maximum Tolerable Risk of a Serious Fire 1.00E-04 Maximum Tolerable Risk of a Fatal Injury 1.00E-06
Initiating Event (Typically a frequency)	Hoses not properly connected; inadvertent opening of valves.		CCPS	1.00E-02
Enabling Event or Condition				
Condition Modifiers	Probability of ignition		0.15	Lees
	Probability of personnel in the area		1	Judgement
	Ability to avoid the incident		0.5	Judgement
Frequency of Unmitigated Consequences				7.50E-04
Independent Protection Layers (IPL)	Secondary containment/interceptor.		0.01	Mitigative/Preventative IPL – CCPS[3].
	Fixed and mobile fire fighting equipment		0.1	Mitigative/Preventative IPL – CCPS[3].
Safeguards (non-IPLs)				
Total PFD for all IPL			0.001	
Frequency of Mitigated Consequences				7.50E-07
Risk Tolerance Criteria Met?(Yes/No):				
Yes				
Actions Required to Meet Risk Tolerance Criteria	Upgrade fire fighting system and provide effective secondary containment system.			
Notes	None			

Table 18-6

Scenario Number: 5	**Plant / Equipment** Fuel Dispensing at White Bay's Wharf No.6.	**Scenario Title** Pool fire on the wharf or sea surface.	
Date: 15/02/06	**Description**	**Probability**	**Frequency/year**
Consequence Description / Category	Loss of containment (pipework failure, etc.) of Diesel occurs at White Bay's Wharf No.6. Sources of ignition are present during the event. Ignition results in a spreading pool fire on land or the sea surface. Loss of containment at a release rate of 600 litres per minute may result. Maximum time until isolation of the release is 1 minute.		
Risk Tolerance Criteria (Category or Frequency)			Maximum Tolerable Risk of a Serious Fire 1.00E-04 Maximum Tolerable Risk of a Fatal Injury 1.00E-06
Initiating Event (Typically a frequency)	Small external fire - multiple causes	Table 18.3 – CHL[25] (Liquid)	3.24E-03
Enabling Event or Condition			
Condition Modifiers	Probabiltiy of personnel in the area	1	Judgement
	Ability to avoid the incident	0.5	Judgement
Frequency of Unmitigated Consequences			1.62E-03
Independent Protection Layers (IPL)	Emergency stop button/timeout switches.	1	Mitigative/Preventative IPL – CCPS[3].
	Fixed and mobile fire fighting equipment.	0.1	Mitigative/Preventative IPL – CCPS[3].
Safeguards (non-IPLs)			
Total PFD for all IPL		0.1	
Frequency of Mitigated Consequences			1.62E-04
Risk Tolerance Criteria Met?(Yes/No):			
Yes.			
Actions Required to Meet Risk Tolerance Criteria	Consider installation of hydrants and monitors for diversity of fire mitigative controls.		
Notes	None		

Table 18-7

Scenario Number: 6	**Plant / Equipment** Bulk Diesel/ULP storage.	**Scenario Title** Leaking flange leads to ground or water contamination.	
Date: 15/02/06	**Description**	**Probability**	**Frequency/year**
Consequence Description / Category	A leaking flange leads to loss of containment of Diesel/ULP. Hydrocarbons enter the environment.		
Risk Tolerance Criteria (Category or Frequency)			Figure 12.2-1: Environmental Risk Criteria
Initiating Event (Typically a frequency)	Leaking flange (corrosion, impact, construction, maintenance).	E&P Forum	3.30E-04
Enabling Event or Condition			
Condition Modifiers	Probability of some environmental damage.	0.01	Judgement
Frequency of Unmitigated Consequences			3.30E-06
Independent Protection Layers (IPL)	Oily water separation system.	0.1	Mitigative/Preventative IPL – CCPS[3].
	Drainage and bunding.	0.1	Mitigative IPL – CCPS[3].
	Tank level gauging equipment	To be determined	Mitigative IPL
	Underground Leak detection system	To be determined	Mitigative IPL
Safeguards (non-IPLs)			
Total PFD for all IPL		0.01	
Frequency of Mitigated Consequences			3.30E-08
Risk Tolerance Criteria Met?(Yes/No):			
Yes			
Actions Required to Meet Risk Tolerance Criteria	None.		
Notes	None		

19. APPENDIX 4: PROPERTIES OF FLAMMABLE MATERIALS

19.1 DIESEL FUEL 500

Chemical and Physical Properties
Diesel is a complex mixture of hydrocarbons containing paraffins, naphthenes, olefins and aromatics with carbon numbers > C9.
IBP: 150 °C.
Flashpoint: < 79°C.
Lower flammability limit (% v/v): 1.0
Upper flammability limit (% v/v): 6.0

Storage and Handling
Class C2 non combustible
Flash fire or vapour cloud explosion may occur.
Separation from sources of ignition required.
Storage at ambient temperature.
Accumulation of electric charge during pumping. Electrostatic accumulator – appropriate procedures required for charge build up. Earthing required.

Fire extinguishing media and fire fighting
Water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flame.
Water to be used to cool fire-exposed surfaces.

19.2 REGULAR UNLEADED PETROL (ULP)

Chemical and Physical Properties
ULP is a complex mixture of hydrocarbons containing paraffins, naphthenes, olefins and aromatics with carbon numbers predominantly between C4 and C12.
IBP: 131.94 °C.
Flashpoint: -40°C.
Lower flammability limit (% v/v): 1.4
Upper flammability limit (% v/v): 7.6

Storage and Handling
Class 3 PGII flammable
Flash fire or vapour cloud explosion may occur.
Separation from sources of ignition required.
Storage at ambient temperature.
Accumulation of electric charge during pumping. Electrostatic accumulator – appropriate procedures required for charge build up. Earthing required.

Fire extinguishing media and fire fighting
Water fog, foam, or dry chemical to extinguish flame.
Water to be used to cool fire-exposed surfaces.

20. APPENDIX 5: LAYERS OF PROTECTION ANALYSIS

LOPA has it's origins in the desire to answer the following cardinal questions:
- How safe is safe enough?
- How much protection is needed – how many layers of protection are needed?
- How much risk reduction should each layer provide?

LOPA assists in answering these questions by:
- Providing rational semi-quantitative risk based answers;
- Reducing reliance on subjective factors;
- Providing clarity, consistency and transparency;
- Documentation of the basis of risk decisions; and
- Facilitation understanding among plant personnel.

LOPA is a simplified, semi quantitative risk assessment methodology. The risk of hazard scenarios can be evaluated and compared against criteria for risk tolerance to establish whether existing safeguards are adequate and/or if additional safeguards are required. The consequence evaluation is qualitative and the evaluation of the event likelihood is quantitative, based upon "order of magnitude" estimates of the initiating event frequency and the availability of the protection layers.

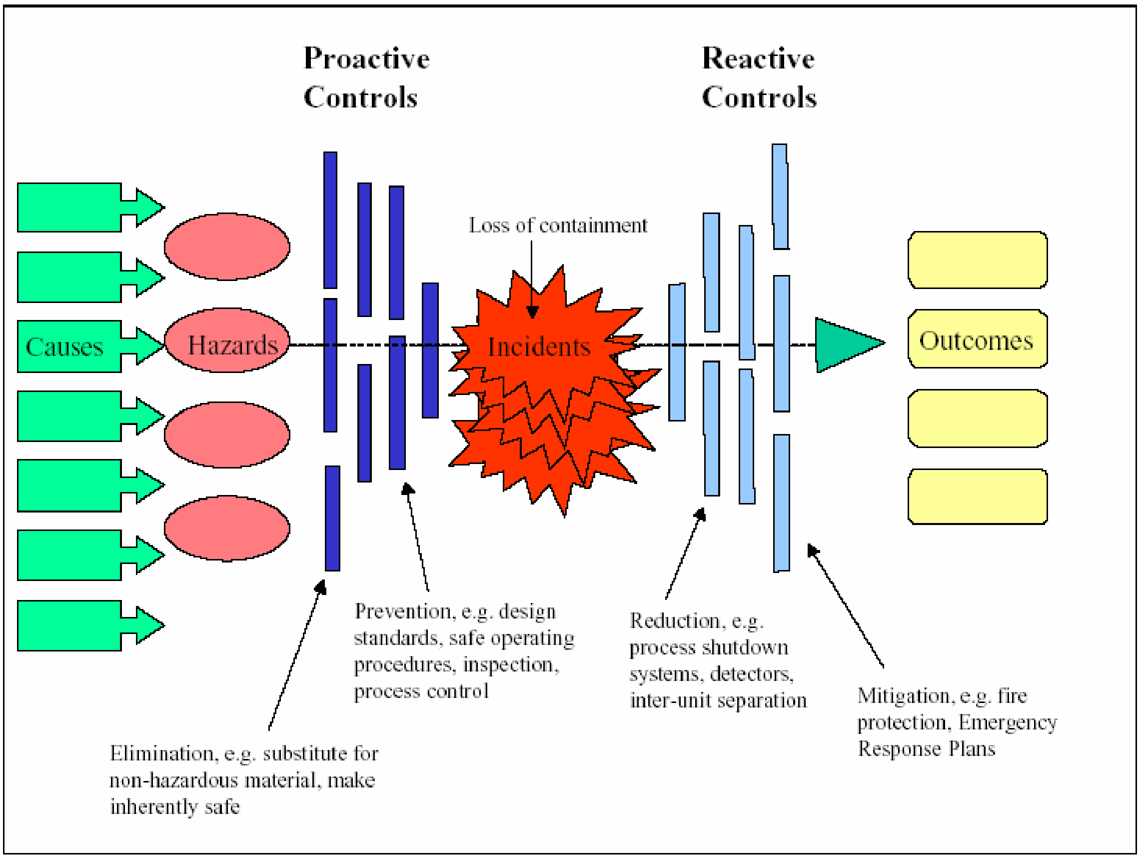
It is desirable for the protection layers to be independent from one another so that any one will perform its function regardless of the action or failure of any other protection layer or the initiating event. Protection layers meeting this criterion are termed Independent Protection Layers (IPL).

In LOPA, the individual protection layers proposed or provided are analysed for their effectiveness. The combined impact of the protective layers is compared against risk tolerance criteria. In a typical operation, various protection layers are in place to lower the frequency of undesired consequences: facility design (including inherently safe concepts); the basic control systems; safety instrumented systems; passive systems; active systems; human interventions etc.

LOPA uses a multi-disciplined team (operations, safety, engineering, instrument/electrical, reliability personnel etc.). This ensures that more informed judgments on risk reduction measures can be made based on pooling together individual process expertise/experience.

The method fits well with the real world as it takes into account the Basic Process Control System (BPCS), operator response, mechanical design, etc. It allows some credit to be taken for all protection layers and sets an acceptable risk target for hazards by severity level.

The basic concepts are summarized in the following steps:
1. Identify impact events, determine the types of impact, and classify event severity.
2. List the causes for each impact event.
3. Estimate the frequency of each initiating cause.
4. List the Protection Layers for each cause-consequence pair and assign Probabilities of Failure on Demand (PFD).
5. Determine the PFD for the system.
6. Calculate the mitigated event frequency for each cause-consequence pair.
7. Sum the frequencies for each cause-consequence pair that will place a demand on the safety system.
8. Compare the total mitigated event likelihood to the acceptability criteria for the associated event severity classification.
9. Determine Safety Integrity Level (SIL) based upon required risk reduction or identify other risk reduction measures, if required to meet the risk acceptability criteria.



HOW SAFE IS SAFE ENOUGH?

The LOPA methodology will only be effective with risk tolerance criteria in place, as the typical human response would be to keep adding safeguards even after a point where additional safeguards are unnecessary. The risk criteria help focus resources on the critical safeguards required to achieve tolerable risk. Thus, risk tolerance criteria need to be established for LOPA to answer the 'how safe is safe enough' question.

LOPA will also assist in determining what level of risk reduction is required and the number of protection layers that should be implemented. However, it does not assist in the selection of which specific independent protection layers should be used.

20.1 ADVANTAGES AND DISADVANTAGES OF LOPA

The following are the benefits of LOPA. The method:

- Requires less time than a QRA. This benefit applies particularly to scenarios that are too complex for a qualitative risk assessment.
- Assists with the resolution of conflicts in decision making by providing a consistent and simplified framework for the estimation of risk.
- Can improve the efficiency of hazard evaluation as a tool that may assist in the judgement of the level of risk.
- Allows determination of more precise “cause – consequence” pairs, improving scenario identification.
- Provides more effective determination of differences in the level of risk.
- Can be used to determine if the risk is “as low as reasonably practicable”.
- Assists in determination of adequacy of risk reduction measures – i.e. sufficiency regarding the level of risk reduction provided.
- Assists in providing a basis for a clear functional specification for an Independent Protection Layer[26].
- Assists in classification of risk reduction measures (controls). Information from LOPA will help an organisation decide which safeguards to focus on during operation, maintenance and related training – the Critical Controls.

The following are some of the limitations of LOPA. The method:

- May provide misleading results if inconsistent sets of failure data or different risk tolerance criteria are used. The method does not provide the precise risk of the scenario.
- Is a simplified approach – in some instances a risk based decision may require more involved analysis.
- Is limited to the use of single paths in an Event Tree.

21. APPENDIX 6: ATTACHMENTS

The followings are provided as separate attachments:

21.1 ATTACHMENT 1: LIQUID CONTROLS

21.2 ATTACHMENT 2: DUAL PRODUCT DISPENSER

21.3 ATTACHMENT 3: CURRENT SITE LAYOUT

21.4 ATTACHMENT 4: LINFOX DELIVERY SHEET

21.5 ATTACHMENT 5: PRE-DELIVERY GUIDELINES

21.6 ATTACHMENT 6: BOLLARDS – SIDE VIEW

21.7 ATTACHMENT 7: BOLLARDS – FRONT VIEW

21.8 ATTACHMENT 8: PONTOON LIGHTING

21.9 ATTACHMENT 9: TANK MONITORING

21.10 ATTACHMENT 10: ELUTRON TANKS

21.11 ATTACHMENT 11: REFUELLING PROCEDURE

21.12 ATTACHMENT 12: OPERATIONAL FLOW CHART

21.13 ATTACHMENT 13: UNDERGROUND LEAK DETECTION SYSTEM

21.14 ATTACHMENT 14: UNDER WHARF PROTECTION

21.15 ATTACHMENT 15: COMMERCIAL BUNKER SETUP 1

21.16 ATTACHMENT 16: COMMERCIAL BUNKER SETUP 2

21.17 ATTACHMENT 17: COMMERCIAL CABINET

22. REFERENCES

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[24] FM-1040; Darwin Due Diligence Worksheet; Rev. 01.
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[26] IEC 61508 & IEC 61511.

Appendix O

SPC GREEN PORT GUIDELINES

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GREEN PORT GUIDELINES – PROFORMA CHECKLIST

The completed Checklist is to accompany all applications for new developments/activities submitted to SPC, or when requested by SPC.

The Checklist has the following features:

- The Headings (shaded in yellow), Item numbers and Purpose/Criteria descriptions directly correspond to those in the Green Port Guidelines. This allows easy reference between this Checklist and the Guidelines.
- Applicants are to state whether each item has been addressed, not addressed or whether it is not applicable to the specific development. The *Stages of Development* indicators in the Green Port Guidelines may assist in this assessment.
- Applicants are then to explain how each item has been addressed, why it hasn't been addressed or why it is not applicable. Applicants are directed to the *Suggested Measures* provided in the Green Port Guidelines for guidance on how to address each item although alternative and innovative measures that may be more specific or relevant to the individual facility or operation are also encouraged.
- Supporting documentation (such as a Waste Management Plan, Environmental Management Plan or Design Specifications) may be referenced or attached to the Checklist.
- The Checklist can be filled out either electronically or by hand.

Applicant Details	
Name	Baileys Marine
Address	28 Mews Road, Fremantle WESTERN AUSTRALIA 6160
Phone number/Email	(08) 9335 7822 gbailey@baileysmarine.com.au
Project Details	
Location of proposed development	White Bay Berth 6
Description of proposed development	Common User Marine Refuelling facility, Ro-Ro ramp, 2 office and storage buildings.
The details on this form are the provisions and intentions for maximising the environmental sustainability of this development.	
Name	
Signature	
Date	

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
MATERIALS SELECTION				
R1	Reduce the quantity of new materials being used by reducing or reusing materials or by utilising recycled materials.	*Yes*	Bailey's Marine will reuse the RORO ramp from the Northside Storage Tunnel project and reuse the pontoons from the Australian Maritime Museum.	Supporting docs from Waterway and AMM.
R2	Encourage environmentally friendly production of materials.	*N/a*	Not applicable as the proposed development will not manufacture any materials.	See chapter 5 of the EA.
R3	Specify materials that have minimal embodied energy and environmental impact.	*N/a*	The selection of materials will be undertaken at the detailed design stage. Baileys Marine has made a commitment to consider materials with minimal embodied energy.	Material selection is outside the scope of the EA.
R4	Consider the end of life of materials and the whole building, design for deconstruction.	*N/a*	Consideration of the end of life of materials will be undertaken at the detailed design stage. Baileys Marine has made a commitment to consider the end life of materials.	Consideration of the end of life of materials is outside the scope of the EA.
WASTE MANAGEMENT				
W1	Minimise the generation of wastes.	*Yes*	Wastes generated during operation would be minor, since the refuelling facility is a zero-waste process with no waste products to be generated. The Marine Supply Base will provide waste disposal facilities for vessels and other marine users.	See section 7.6 of the EA

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
W2	Facilitate recycling to reduce the amount of waste going to landfill.	*Yes*	In terms of construction and demolition, on-site separation of materials will be undertaken for re-use and reprocessing off-site. Timber, metal and waste concrete stored separately on site and removed from site by a licensed waste disposal contractor to an aggregate recycling depot where practicable, or to licensed landfill disposal facility. Transpacific Industries will be contracted to transport, dispose and document waste materials removed from the site and treated /disposed of at the Homebush Bay Waste Liquid treatment plant. Waste paper and card would be separated for removal by paper recycling contractor (Transpacific Industries).	See section 7.6 of the EA
W3	Ensure the safe storage and handling of hazardous wastes.	*N/a*	There will not be any hazardous wastes stored or handled on site.	See section 7.6 of the EA
WATER CONSUMPTION				
H1	Reduce consumption of potable water internally.	*N/a*	The reduction of potable water use is recommended through the use of rainwater tanks and other water efficient measures; however this will be determined at the detailed design stage.	The reduction of potable water use is outside the scope of the EA.
H2	Manage and monitor water usage and any leaks.	*Yes*	Baileys Marine will monitor water usage through Sydney Water bills.	-

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
H3	Reduce the quantity of potable water used for landscape irrigation.	*N/a*	The reduction of potable water use is recommended through the use of rainwater tanks and other water efficient measures; however this will be determined at the detailed design stage.	The reduction of potable water use is outside the scope of the EA.
H4	Treat water onsite and reuse the treated water to reduce demand on the local potable water supply and the demand on the local infrastructure.	*No*	Treatment of water and reuse has not been considered to date. The detailed design stage may provide opportunities to implement measures to treat and reuse water.	-
ENERGY USE				
E1	Reduce energy consumption and hence greenhouse gas emissions.	*N/a*	The reduction of energy consumption and greenhouse gas emissions will be determined at the detailed design stage. Baileys Marine has made a commitment to reduce energy consumption.	The reduction in energy consumption and greenhouse gas emissions is outside the scope of the EA.
E2	Manage the use of energy to minimise consumption.	*N/a*	The management of energy will be determined at the construction stage, and during the operation of the development.	The management of energy is outside the scope of the EA.
E3	Source energy from renewable sources.	*N/a*	The sourcing of energy from renewable sources will be determined at the detailed design stage. Baileys Marine has made a commitment to source from renewable sources.	The sourcing of energy is outside the scope of the EA.
E4	Source energy from alternate energy sources and use less greenhouse intensive fuels (in particular limit diesel use).	*N/a*	The sourcing of energy from alternate energy sources will be determined at the detailed design stage. The proposal will not be able to limit diesel use.	The sourcing of energy is outside the scope of the EA.

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
TRANSPORTATION				
T1	Encourage the use of alternative modes of transport by employees, in order to reduce the amount of inefficient/individual car travel and therefore greenhouse gas emissions.	*Yes*	The traffic section of the EA recommends the provision of bicycle racks and pedestrian paths to encourage employees to ride, walk or run to work.	See section 8.6 of the EA.
T2	Reduce greenhouse gas emissions from operational vehicles and equipment.	*Yes*	There is the possibility of using an LPG forklift and crane.	-
INDOOR ENVIRONMENT				
IE1	Improve the quality of indoor air to protect the health of employees and enhance productivity.	*N/a*	The improvement of indoor air will be determined at the detailed design stage.	The improvement of indoor air is outside the scope of the EA.
IE2	Optimise daylighting and make best use of artificial lighting to assist eye health and productivity.	*N/a*	Optimising daylight will be determined at the detailed design stage.	Optimising daylight is outside the scope of the EA.
IE3	Provide optimum acoustical environment for productivity and to prevent ear damage.	*N/a*	Optimum acoustical environment will be determined at the detailed design stage.	Optimum acoustical environment is outside the scope of the EA.
EMISSIONS				
EM1	Protect the ozone layer and reduce the potential for global warming.	*Yes*	The proposed development will not produce or use any substances that are harmful to the ozone layer.	-
EM2	Limit the generation of air pollutants and ensure that they are emitted away from sensitive receptors.	*Yes*	The proposed fuel infrastructure will have vapour recovery technologies to prevent the release of air pollutants and vapours.	See chapter 5 and section 7.5

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
EM3	Minimise odours.	*Yes*	The proposed fuel infrastructure will have vapour recovery technologies to prevent the release of air pollutants and vapours. The sullage pump out system will be designed to ensure that no odours are released.	See chapter 5 and section 7.5
EM4	Minimise noise nuisance.	*Yes*	A noise management plan and measures will be implemented to minimise noise impacts on nearby receivers.	See section 8.1
EM5	Avoid light spill into night sky or neighbouring properties/areas.	*Yes*	The proposed development will utilise the existing lighting regime on the site.	See section 8.5
EM6	Avoid accidental contact with hazardous or poisonous goods.	*Yes*	Bailey's Marine Fuels ISO14001 Environmental Management Plan will address this issue.	-
WATER QUALITY				
HQ1	Manage stormwater to reduce peak stormwater flows and protect water quality.	*Yes*	Stormwater drainage will include pollution control measures in accordance with DEC requirements. It is likely that there will be one or a combination of Gross Pollutant Traps plus specific response procedures in the event of a spill. The capacity of the drainage system will be checked following consultation with DEC and confirmation of the design event that needs to be catered for.	See section 7.2 of the EA.

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
HQ2	Manage water quality to protect the harbour and other waterbodies.	*Yes*	Stormwater drainage will include pollution control measures in accordance with DEC requirements. It is likely that there will be one or a combination of Gross Pollutant Traps plus specific response procedures in the event of a spill. The capacity of the drainage system will be checked following consultation with DEC and confirmation of the design event that needs to be catered for.	See section 7.2 of the EA.
HQ3	Prevent damage from potential flood events and water table changes.	*Yes*	Stormwater drainage will include pollution control measures in accordance with DEC requirements. It is likely that there will be one or a combination of Gross Pollutant Traps plus specific response procedures in the event of a spill. The capacity of the drainage system will be checked following consultation with DEC and confirmation of the design event that needs to be catered for.	See section 7.2 of the EA.
LAND USE				
L1	Encourage the redevelopment of sites that have previously been developed and remediate contaminated land.	*Yes*	The site has been developed previously and has been used for maritime industrial purposes in the past.	See chapter 1 of the EA.

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
L2	Use landscaping to enhance biodiversity and conserve and create habitat for flora and fauna.	*Yes*	The existing landscape along the northern perimeter will be rehabilitated and restored through the planting of native species, and provision of mulch. The proposed pontoons will provide additional algae, encrusting biota and fish habitat.	See section 7.3, 7.4, 10.3 and 11.3 of the EA.
L3	Enhance visual amenity.	*Yes*	The proposed development will be designed to meet the provisions of the White Bay / Glebe Island Master Plan. The detailed design stage will determine the final visual impact of the development.	See section 8.5 of the EA.
L4	Avoid impact on identified heritage items.	*Yes*	The proposed development is not located in close proximity to any heritage items. Measures have been put in place in case a heritage item is discovered.	See section 8.2 and 8.3 of the EA.
ENVIRONMENTAL MANAGEMENT				
M1	Maintain good relationships with stakeholders and respond to any complaints.	*Yes*	Elton Consulting have been contracted to undertake stakeholder and community consultation. Baileys Marine will respond to any complaints.	See chapter 6 of the EA.
M2	Provide a framework for identifying, managing and minimising environmental impacts, and maximising environmental benefits.	*Yes*	Bailey's Marine Fuels ISO14001 Environmental Management Plan will address this criterion. The EA has undertaken an assessment of the environmental impacts associated with the proposed development.	See chapters 7 and 8 of the EA.

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/a)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
M3	Educate developers, tenants and employees about ESD and how to improve sustainability.	*Yes*	Bailey's Marine Fuels ISO14001 Environmental Management Plan will address this criterion.	-