Homebush Bay Bridge | Environmental Assessment

APPENDIX J

Audit statement and audit report

NSW Site Auditor Scheme
SITE AUDIT STATEMENT

ENVIRONMENT PROTECTION AUTHORITY

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the Contaminated Land Management Act 1997 on 12 May 2011. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. ...184

This site audit is a **statutory audit** within the meaning of the *Contaminated Land Management Act 1997*.

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name ...Rod Harwood Company ...Environmental Strategies Pty Ltd

Address ...Level 1, Suite 2, 20 Chandos Street

...St Leonards NSW Postcode ...2065

Phone ...02 9437 4587 Fax ...

Site details

Address ...Homebush Bay Bridge, NSW

... Postcode ...2127

Property description *(attach a list if several properties are included in the site audit)*

...Lot 122 DP 1156412

Lot 310 in DP 1163025

possibly impinging on Lots 311 and 316 in DP 1163025

CT V5018FI (Homebush Bay)

Local Government Area ...City of Canada Bay Council and Auburn City Council

Area of site (e.g. hectares) ...Wenworth Point to Rhodes Peninsula Current zoning ...Open Water

* *Select as appropriate*

To the best of my knowledge, the site **is** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985.*

Declaration no(s) ...21001 & 28042

** Select as appropriate*

Site audit commissioned by

Name ...Rick Graf Company ...Graf International

Address ...1 Kings Cross Rd

...Darlinghurst, NSW Postcode ...2010

Phone ...02 9360 1400 Fax ...

Name and phone number of contact person (if different from above) ...

Purpose of site audit

☐ ~~A. To determine land use suitability (please specify intended use[s])~~

...

OR

☐ ~~B(i) To determine the nature and extent of contamination, and/or~~

☒ B(ii) To determine the appropriateness of an **management plan**, and/or

☐ ~~B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified **management plan** *(please specify intended use[s])*~~ ...

Information sources for site audit

Consultancy(ies) which conducted the site investigation(s) and/or remediation

...Golder Associates Pty Ltd

Thiess Services Pty Ltd;

GHD Pty Ltd;

Environmental Resources Management Pty Ltd;

Contamination Management Pty Ltd;

Sinclair Knight Mertz Pty Ltd;

PPL Environment and Infrastructure Pty Ltd; and

Parsons Brinckerhof Pty Ltd

Title(s) of report(s) reviewed ...

Golder Associates Pty Ltd (February 2012) Homebush Bay Bridge Contamination Management Plan for Proposed Bridge Construction. (Ref: 117623030-001-R-Rev3).

Golder Associates Pty Ltd (August 2011) Homebush Bay Bridge Contamination Management Plan for Proposed Bridge Construction. (Ref: 117623030-001-R-RevD).

Thiess Services Pty Ltd (May 2011) Environmental Management Plan, Lots 310, 312, 313 and 316 DP1163025 40 Walker Street, Rhodes NSW

GHD Pty Ltd (February 2010) Report for Homebush Bay West Contamination Assessment, Sediment Investigation

Environmental Resources Management Australia (September 2005) Groundwater Monitoring Event Final Report (Ref: 0036992RP01)

Environmental Resources Management Australia (December 2004) Site Characterisation

Environmental Resources Management Australia (December 2003) Master Plan

Environmental Resources Management Australia (July 2004) Groundwater and Acid Sulphate Soil

Investigation, 1 Bennelong Road, Homebush Bay, NSW.

Environmental Resources Management Australia (May 2003) Tankpit Validation and Additional Investigation.

Contamination Management Pty Ltd (July 2002) Addendum to May 2001 Investigation at Part of the Former Lednez Site, Rhodes. (report provided for review is incomplete)

Sinclair Knight Mertz Pty Ltd (May 2002) Detailed Human Health and Ecological Risk Assessment of Homebush Bay Sediments.

PPK Environment and Infrastructure (June 2002) Draft Homebush Bay Dioxin Remediation, Environmental Impact statement.

Parsons Brinckerhof Pty Ltd (December 2002a) Environmental Impact Statement, Remediation of Lednez Site Rhodes, Homebush Bay.

Parsons Brinckerhof Pty Ltd (December 2002b) Technical Paper 10, Remediation of Lednez Site Rhodes, Homebush Bay.

Other information reviewed (including previous site audit reports and statements relating to

the site) ...

AECOM Pty Ltd (May 2011) Site Audit Report, Lots 305 to 313 and 316 DP 1163025, Walker Street, Rhodes. (Ref: 60153315)

AECOM (February 2011) Site Audit Report, Homebush Bay Remediation Verification

Contamination Management Pty Ltd (April 2002) Summary Site Audit Report, Investigation of Dioxins in Sediments in North-east Homebush Bay

Site audit report

Title ...Site Audit Report SAN 184, Proposed Homebush Bay Bridge, Homebush NSW

Report no. ...11010 SAR184 Date ...28 February 2012

PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. *(Strike out the irrelevant section.)*

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

** Select as appropriate*

Section A

☐ **I certify that, in my opinion, the site is SUITABLE for the following use(s)** *(tick all appropriate uses and strike out those not applicable):*

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☐ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☐ Commercial/industrial
- ☐ Other *(please specify)* …

subject to compliance with the following environmental management plan (insert title, date and author of plan) **in light of contamination remaining on the site:** …

OR

☐ **I certify that, in my opinion, the site is NOT SUITABLE for any use due to the risk of harm from contamination.**

Overall comments …

Section B

Purpose of the plan[1] which is the subject of the audit ...To evaluate the suitability of a Contamination Management Plan

I certify that, in my opinion:

- ☐ ~~**the nature and extent of the contamination HAS/HAS NOT* been appropriately determined**~~

AND/OR

- ☒ **the management plan IS appropriate for the purpose stated above**

AND/OR

- ☐ ~~**the site CAN BE MADE SUITABLE for the following uses** *(tick all appropriate uses and strike out those not applicable)*:~~
  - ☐ ~~Residential, including substantial vegetable garden and poultry~~
  - ☐ ~~Residential, including substantial vegetable garden, excluding poultry~~
  - ☐ ~~Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
  - ☐ ~~Day care centre, preschool, primary school~~
  - ☐ ~~Residential with minimal opportunity for soil access, including units~~
  - ☐ ~~Secondary school~~
  - ☐ ~~Park, recreational open space, playing field~~
  - ☐ ~~Commercial/industrial~~
  - ☐ ~~Other (please specify)~~...

---

if the site is managed in accordance with the following management plan *(insert title, date and author of plan)*

...Golder Associates Pty Ltd (February 2012) Homebush Bay Bridge Contamination Management Plan for Proposed Bridge Construction. (Ref: 117623030-001-R-Rev3)

~~**subject to compliance with the following condition(s):**~~

...

---

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

* *Select as appropriate*

Overall comments

...This Audit report supercedes Audit SAS 160 which was based on a review of Golder (August 2011, Ref:117623030-001-R-RevD).

This new report has been written in response to Golder(February 2012, Ref:117623030-001-R-Rev3) which is listed above. This report was produced after stakeholder input from NSW EPA, Planning NSW and NSW Transport Roads and Maritime Services.

PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. ...(0304).

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997*, and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete,.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed ... 

Date ...28 February 2012

PART IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979.*

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

Environment Protection Authority, Department of Premier and Cabinet

Contaminated Sites Section

PO Box A290, SYDNEY SOUTH NSW 1232

Fax: (02) 9995 5930

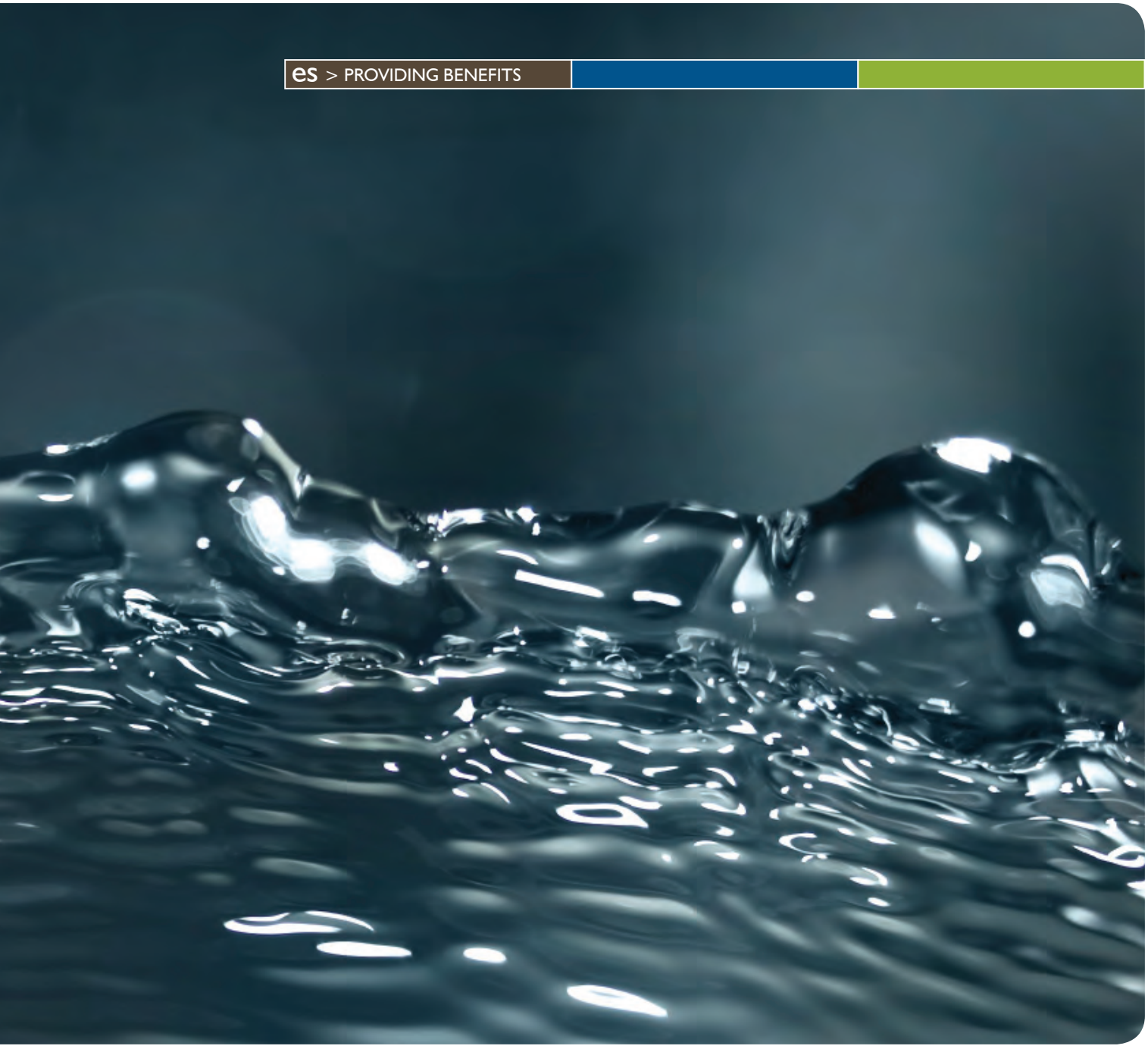
AND

the **local council** for the land which is the subject of the audit.

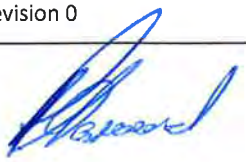
Site Audit Report (SAR 184)

Proposed Homebush Bay Bridge, Homebush Bay NSW

Prepared for Graf International| February 2012



Document Information

Client:	Graf International Pty Ltd
Project:	Proposed Homebush Bay Bridge, Homebush NSW
Project Number:	11010
Report Title:	Site Audit Report
Date:	28 February 2012
Document Name:	11010 SAR184 (Rev0).docx
Revision Number:	Revision 0
Signed: Rod Harwood NSW EPA Accredited Site Auditor 0304	

This report has been prepared in accordance with the scope of services described in the contract or agreement between ES and the Client. The report relies upon data, surveys, measurements and results taken at or under particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client, Council and NSW EPA and ES accepts no responsibility for its use by other parties.

Table of Contents

Tables in Text

Appendices

Executive Summary

Background

This Audit is a Statutory Site Audit under the Contaminated Land Management (1997) Act as the Audit is a condition under the Director General's Requirements for application (MP 10-0192) in relation to the proposed Homebush Bay Bridge connecting Gauthorpe Street in Rhodes and the Future Bridge Boulevard in Wentworth Point, within the Canada Bay and Auburn local government areas. This Site Audit Report has been written in accordance with DEC (2006) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition). Statutory Site Audit Notification was provided to the Environment Protection Authority (EPA) on 27 February 2012. The Homebush Bay Bridge is envisaged to be 11.5 m wide and some 455 m long (hereafter referred to as "the site").

Environmental Assessment

The proposal is for a new bridge across Homebush Bay to connect Rhodes Peninsula and Wentworth Point.

The bridge will allow a mix of pedestrian access, cycleway access, public transport (bus) services and emergency services access, whilst accommodating a range of utilities within its structure and enabling continued navigation of the Bay. The bridge will have a connecting ramp of some 80 m on the Rhodes Peninsula side linking with Gauthorpe Street and a connecting ramp of up to 80 m on the Wentworth Point side.

Construction of a bridge across the Bay will require that piles be driven through the soft sediment and into firmer ground. The construction techniques and accompanying environmental management process will need to be undertaken with minimal impact and disturbance upon the Bay and its sediments, particularly in the capped area along the eastern shore. Appropriate turbidity containment devices, e.g. silt curtains will be required around piling and barge areas to contain resuspended materials and minimise suspension of sediments and associated contaminants in the Bay.

The major objective of this Summary Site Audit Report is to ensure that:

1. proposed construction works will be conducted in a way that minimises disturbance to the sediment environment, soil and groundwater;
2. there will be sufficient proposed monitoring and mitigation controls in place to ensure that the project is protective of human health and the environment; and
3. contamination has been assessed and managed in a manner consistent with NSW EPA requirements.

Audit Conclusions

Environmental Assessment

Based on the discussion presented above, the Auditor considers that the site (CT V5018FI, Lot 122 in DP 1156412, Lot 310 in DP 1163025, and possibly impinging on Lots 311 and 316 in DP 1163025) has been demonstrated, through the preparation of a Contamination Management Plan, to have met the Director General's Requirements for the environmental assessment stage of the proposed Homebush Bay Bridge Construction.

Pre Construction (plans and mitigation measures)

The following are just some of the documents that will need to be prepared for the next stage (Pre Construction):

- Acid Sulfate Soil Management Plan; and
- A Construction and Environmental Management Plan (CEMP).

These plans will be independently audited by an Auditor accredited under the CLM Act 1997.

Post Construction (validation of contamination aspects)

It is envisaged that a final Site Audit Report will be prepared at completion of construction and before bridge opening to document the success of meeting the construction environmental management objectives as contained in the project's CEMP.

A detailed assessment of the potential impacts related to contamination of the construction of the proposed bridge and the construction mitigation measures has been conducted based on documentation provided for this Audit. This reviewed documentation is considered to be suitable to meet the Director General's Requirements for the proposed Homebush Bay Bridge Construction.

1 Introduction

This Site Audit Report (SAR) has been developed to document the information reviewed as part of a site audit of the first, of three stages, for the assessment of potential impacts and construction mitigation measures, and to give the basis and rationale for the conclusions contained in the associated Site Audit Statement No. 184 (SAS). This SAR has been prepared for the proposed Homebush Bay Bridge Project, Homebush Bay, NSW.

This audit report supersedes an earlier one (SAS 160) 19 August 2011 and has been completed to document changes to the original Contaminated Land Management Plan and has been updated based on pertinent comments made by stakeholders including NSW EPA, Planning NSW and NSW Transport Roads and Maritime Services.

The Homebush Bay Bridge is envisaged to be 11.5 m wide and some 455 m long. The western end of the bridge will land on Lot 122 in Deposited Plan (DP) 1156412, with the eastern end of the bridge landing on Lot 310 in DP 1163025, and possibly impinging on Lots 311 and 316 in DP 1163025.

Details of Environmental Strategies Pty Ltd (ES), New South Wales Environment Protection Authority (EPA), Contaminated Land Accredited Site Auditor and the scope of the Audit are contained in Section 3. The SAS and SAR relate to the site identified in Section 4.

1.1 Overview of the Audit Process

The Site Audit has been conducted in accordance with the requirements of the Contaminated Land Management (CLM) Act 1997. The CLM Act (S.47(1)) describes a site audit as:

An independent review:

a) that relates to investigation, or remediation, carried out (whether under this Act or otherwise) in respect of the actual or possible contamination of land, and,
b) that is conducted for the purpose of determining any one or more of the following matters:
    i. the nature and extent of any contamination of the land;
    ii. the nature and extent of the investigation or remediation;
    iii. whether the land is suitable for any specified use or range of uses;
    iv. what investigation or remediation remains necessary before the land is suitable for any specified use or range of uses; and/or
    v. the suitability and appropriateness of a plan of remediation, a long-term management plan, a voluntary investigation proposal or a remediation proposal.

DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition),* describes the site assessment and audit process as:

1. The contaminated land consultant, or other relevant party, designs and implements the site assessment and, where required, all remediation and validation activities to achieve the stated objectives; and,
2. The site Auditor independently reviews the works undertaken to ensure that they comply with current regulations, standards and guidelines, and that the site has been assessed, remediated and validated to a standard appropriate to the proposed land use.

Section 51 of the CLM Act describes that site audits conducted by EPA accredited site Auditors must take the following matters into account:

- the provisions of the CLM Act and the CLM Regulations;

- the provisions of any environmental planning instruments applying to the site;
- the guidelines made or approved by the EPA; and
- guidelines made or approved by DECCW.

Guidelines made by NSW EPA are:

- EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites. NSW EPA, Sydney*;
- EPA (1995a) *Contaminated Sites: Guidelines for the Vertical Mixing of Soil on Former Broad-acre Agricultural Land. NSW EPA, Sydney*;
- EPA (1995b) *Contaminated Sites: Sampling Design Guidelines. NSW EPA, Sydney*;
- EPA (1997a) *Contaminated Sites: Guidelines for Assessing Banana Plantation Sites. NSW EPA, Sydney*;
- DEC (2005*) Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens. NSW DEC, Sydney*;
- DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition). NSW DEC, Sydney*; and
- DEC (2007) *Contaminated Sites: Guidelines for Assessment and Management of Groundwater Contamination. NSW DEC Sydney*;
- DECC (2008) *Waste Classification Guidelines, NSW DECC, Sydney*;
- DECC (2009) *Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land management Act 1997. NSW DECC, Sydney*; and
- DECCW (2010) *Vapour Intrusion: Technical Practice Note, NSW DECCW, Sydney.*
- OEH (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites. NSW OEH, Sydney*;
-

Guidelines approved by NSW EPA are:

- Acid Sulfate Soil Management Advisory Committee NSW (1998) *Acid Sulfate Soil Manual*;
- ANZECC/NHMRC (1992) *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council, Canberra;
- NSW Agricultural/CMPS&F (1996) *Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes*, NSW Agricultural and CMPS&F Environmental, Canberra;
- Lock, W. H., (1996) Composite Sampling, *National Environmental Health Forum Monographs, Soil Series No. 3*, National Environmental Health Forum, SA Health Commission, Adelaide;
- NEPC (1999) *National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B(1)-B(10).* National Environment Protection Council, Adelaide;
- ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, Canberra;
- Department of Health and Ageing and EnHealth Council (2002) *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards.* Commonwealth of Australia, Canberra; and
- NHMRC/NRMMC (2004) *Guidelines for Drinking Water Quality in Australia*. National Health and Medical Research Council and National Resource Management Ministerial Council, Canberra.

2 Limitations

This Site Audit relates only to those matters relevant to the Contaminated Land Management Act 1997, which describes that "*The general object of this Act is to establish a process for investigating and (where appropriate) remediating land areas where contamination presents a significant risk of harm to human health or some other aspect of the environment*". The SAS and SAR do not seek to provide an opinion regarding other aspects of the environment not related to site contamination, to the suitability of the site in regard to the occupational health and safety legislation, or in regards to the suitability of the engineering design.

By definition, Auditing involves the review and critique of Consultants' and Contractors' work, including site histories, site surveys, subsurface investigations, chemical and physical analyses, risk assessments and modelling. Accordingly, the Auditor relies on the experience, expertise and integrity of the relevant organisations. The information sources referenced have been used to determine site history and local subsurface conditions. While the Auditor has used reasonable care to avoid reliance on data and information that is inaccurate or unsuitable, the Auditor is not able to verify the accuracy or completeness of all information and data made available.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements and site history, not on sampling and analysis of all media at all locations for all potential contaminants.

Limited environmental sampling and laboratory analyses were undertaken as part of the investigations reviewed by the Auditor, as described herein. Ground conditions between sampling locations may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site which was not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this site audit are based on the information provided at the time of the investigations.

3 Audit Details

3.1 Site Audit Statement

This SAR relates to Site Audit Statement (SAS) Number **160**.

3.2 Site Auditor

The NSW EPA Contaminated Land Accredited Site Auditor who conducted this site audit was Mr Rod Harwood; NSW EPA Accreditation Number 0304.

3.3 Input to this Report by Auditor's Support Team

In carrying out particular aspects of the audit, the Auditor was assisted as follows:

Name	Position	Role
Dean Stafford	Senior Environmental Scientist	Assistant

3.4 Type of Audit

This Audit is a Statutory Site Audit under the Contaminated Land Management (1997) Act as the Audit is a requirement for Director General's Requirements (Project MP 10-0192). This Site Audit Report has been written in accordance with DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition).*

Statutory Site Audit Notification (SAN 184) was provided to the EPA on the 27 February 2012.

3.5 Background to the Audit

The proposal is for a new bridge across Homebush Bay to connect Rhodes Peninsula and Wentworth Point (formerly known as Homebush Bay West).

The bridge will allow a mix of pedestrian access, cycleway access, public transport (bus) services and emergency services access, whilst accommodating a range of utilities within its structure and enabling continued navigation of the Bay. The bridge will have a connecting ramp of some 80 m on the Rhodes Peninsula side linking with Gauthorpe Street and a connecting ramp of up to 80 m on the Wentworth Point side.

NSW Maritime has indicated that the deepwater channel along the western edge of the Bay needs to be maintained and this will need to correspond with a minimum clearance. The height of the bridge and clearance above mean high water for the remainder of the structure will be established to ensure that there is clearance of 5.7 m and sufficient spacing between piers to allow rowing and canoeing craft to use the Bay. The current design for the bridge involves five piers installed in Homebush Bay.

Construction of a bridge across the Bay will require that piles be driven through the soft sediment and into firmer ground. The construction techniques and accompanying environmental management process will need to be undertaken with minimal or negligible impact and disturbance upon the Bay and its sediments, particularly in the capped area along the eastern shore, to avoid the potential for mobilisation and redistribution of contaminants to other parts of the Bay and the Harbour. Appropriate turbidity containment devices, e.g. silt curtains will be required around piling areas to contain resuspended materials and minimise suspension of sediments and associated contaminants in the Bay.

Golder Associates Pty Ltd (Golder) have prepared a contamination management plan (CMP) to address potential impacts from the construction of the proposed bridge.

The objectives of the CMP are to assist in

- Addressing the Director General's Requirements(DGRs) relating to contamination issues
- Evaluation of potential environmental impacts at the planning stage so that these impacts may be addressed prior to the proposed bridge construction works.
- Compliance with relevant environmental legislation and the management of contamination during construction in a manner consistent with the Office of Environment and Heritage (EPA) requirements.
- Ensuring all employees and contractors involved in the proposed bridge construction are aware of their environmental responsibilities and of the procedures for management and reporting of environmental incidents.
- Ensuring that proposed construction works are conducted in a way that minimises disturbance to the sediment environment, soil and groundwater.
- Establishing the basis for a sound monitoring and reporting approach during the maritime based construction activities.

The Auditor notes that a stronger word such as 'negates' may be more suitable in the sentence "ensuring that proposed construction works are conducted in a way that minimises disturbance…" to instil a sense of confidence that the construction works will be conducted in such a way that every effort will be undertaken that prevents contamination to the surrounding environment. This would obviously depend on the degree of confidence that Golder feel is appropriate to allay potential stakeholder issues.

The Audit for the proposed Bridge will be conducted in three stages as follows:

- Environmental Assessment (to meet the Director General's Requirements);
- Pre Construction (plans and mitigation measures); and
- Post Construction (validation of contamination aspects).

This report has been prepare to address the Environmental Assessment Stage and has been prepared by Rod Harwood of Environmental Strategies Pty Ltd and should be read in conjunction with the Site Audit Statement (SAS), which will be issued in conjunction with this report. Details of this report will be issued to NSW EPA as part of the Auditor's annual return but will also be submitted to NSW EPA at the same time as the release of the Site Audit Statement .

3.6 Objectives of Audit

The major objective of this Summary Site Audit Report is to ensure that:

1. proposed construction works will be conducted in a way that minimises or negates disturbance to the sediment environment, soil and groundwater;
2. there will be sufficient proposed monitoring and mitigation controls in place to ensure that the project is protective of human health and the environment; and
3. contamination has been assessed and managed in a manner consistent with NSW EPA requirements.

3.7 Documents Reviewed

This SAR has relied on information reported by the following consultancies:

- Golder Associates Pty Ltd
- AECOM;
- Thiess Services Pty Ltd;
- GHD Pty Ltd;
- Environmental Resources Management Pty Ltd;
- Contamination Management Pty Ltd;
- Sinclair Knight Mertz Pty Ltd;

- PPL Environment and Infrastructure Pty Ltd; and
- Parsons Brinckerhof Pty Ltd.

The Auditor has been provided with the following final reports documenting the environmental investigations conducted at the site to date:

- Golder Associates Pty Ltd (February 2012) *Homebush Bay Bridge Contamination Management Plan for Proposed Bridge Construction.* (Ref: 117623030-001-R-Rev3).
- Thiess Services Pty Ltd (May 2011) *Environmental Management Plan, Lots 310, 312, 313 and 316 DP1163025 40 Walker Street, Rhodes NSW*
- AECOM Pty Ltd (May 2011) *Site Audit Report, Lots 305 to 313 and 316 DP 1163025, Walker Street, Rhodes.* (Ref: 60153315)
- AECOM (February 2011) *Site Audit Report, Homebush Bay Remediation Verification*
- GHD Pty Ltd (February 2010) *Report for Homebush Bay West Contamination Assessment, Sediment Investigation*
- Environmental Resources Management Australia (September 2005) *Groundwater Monitoring Event Final Report* (Ref: 0036992RP01)
- Environmental Resources Management Australia (December 2004) *Site Characterisation*
- Environmental Resources Management Australia (December 2003) *Master Plan*
- Environmental Resources Management Australia (July 2004) *Groundwater and Acid Sulphate Soil Investigation, 1 Bennelong Road, Homebush Bay, NSW*.
- Environmental Resources Management Australia (May 2003) *Tankpit Validation and Additional Investigation.*
- Contamination Management Pty Ltd (April 2002) *Summary Site Audit Report, Investigation of Dioxins in Sediments in North-east Homebush Bay*.
- Contamination Management Pty Ltd (July 2002) *Addendum to May 2001 Investigation at Part of the Former Lednez Site, Rhodes.* (report provided for review is incomplete)
- Sinclair Knight Mertz Pty Ltd (May 2002) *Detailed Human Health and Ecological Risk Assessment of Homebush Bay Sediments*.
- PPK Environment and Infrastructure (June 2002) *Draft Homebush Bay Dioxin Remediation, Environmental Impact statement*.
- Parsons Brinckerhof Pty Ltd (December 2002a) *Environmental Impact Statement, Remediation of Lednez Site Rhodes, Homebush Bay*.
- Parsons Brinckerhof Pty Ltd (December 2002b) *Technical Paper 10, Remediation of Lednez Site Rhodes, Homebush Bay*.

The main focus of this SAR is the Golder Associates Pty Ltd (February 2012) *Homebush Bay Bridge Contamination Management Plan for Proposed Bridge Construction* in order to meet the Director General's Requirements.

3.8 Audit Meetings and Site Inspection

Audit meetings and site inspections are summarised Table 3-1 below:

Table 3-1 Audit Meetings and Site Inspections

Date	Purpose	Comments
17 Feb 2011	Site Inspection to observe site and areas of proposed bridge construction.	The site inspection was conducted by the Auditor, Golder Associates and ARUP. Inspection was undertaken in a boat to observe surrounding environment and area of proposed bridge.
5 Aug 2011	Meeting to discuss CMP	Meeting with ARUP, Golder Associates and ES to discuss the finer details of the CMP document.

11 Jan 2012	Meeting to discuss EPA comments	Meeting with ARUP, Golder Associates, ES and John Coffey of the EPA to discuss comments made by the EPA on the Environmental Assessment document and the Contamination Management Plan.
3 Feb 2012	Meeting to discuss responses to EPA comments	Meeting with ARUP, Golder Associates, ES and the EPA to discuss response to the EPA comments and CMP draft. EPA required additional information to satisfy their concerns.

3.9 Audit Correspondence

The Site Auditor provided feedback during the course of the audit on reports provided by the Consultant and documented them as Interim Audit Advice letters and in email correspondence.

Copies of letters of Interim Advice and email correspondence are presented in **Appendix B**.

4 Site Identification & Surrounds

This section provides details of the site and its land use, it describes the surrounding land uses and summarises the potentially sensitive human health and environmental receptors. This information has been sourced primarily from the Golder (February 2012) report

4.1 Site Identification and Land use

The site location is shown in Figure 1, Appendix A. The site identification and land use details are included in Table 4-1.

Table 4-1 Site Identification and Land use

Descriptor	Value
Street address	N/A
Property description	Western end of Bridge will land in Lot 122 in DP 1156412, with the eastern end of the bridge landing on Lot 310 in DP 1163025, and possibly impinging on Lots 311 and 316 in DP 1163025
Property size	N/A
Local government area	City of Canada Bay and Auburn Council

5 Environmental Setting

This information has been sourced from the Golder (February 2012) report and published literature (as referenced). The Auditor has also reviewed primary documentation in providing opinions in all of the following chapters. Reports reviewed by the Auditor are provided in Section 3.7 above.

5.1 Geology

Golder (February 2012) describe the site geology as follows:

> *"The geology of the western shore was described in the ERM Masterplan (ERM 2003) as fill material underlain by soft, dark grey, estuarine clays with an organic odour to the maximum investigation depth of 4.5m. The depth of the fill layer varied from 0.4 to 2.2m thick across the site. In 14 of the 32 sampling locations, predominately sandy, shell was encountered at depths ranging between 0.4 and 1.7m. This material was thought to be dredged sediments which were excavated from Homebush Bay and used for land reclamation. Generally, overlying the shelly sand horizon was firm, moist, light brown clay that was thought to have been imported to improve the load bearing capacity of the soils.*
>
> *A subsequent investigation completed in 2006 (ERM 2006) provided a detailed description of the western shore site geology. Fill material at a borehole located close to the western landing of the bridge was described as black sandy clay, shell and some gravel which overlayed sandy, silty clay."*

5.2 Sediments

Golder (February 2012) describe the site soils and geology as follows:

> *"Homebush Bay is a tidally-influenced estuarine environment, which is characterised by a deeper (up to 4m) channel along the western margins that shoals to the eastern and north-eastern shores. Water depths near the eastern and north-eastern shores are generally <1m.*
>
> *Tides at Homebush Bay are semi-diurnal and asymmetric, with the tidal ranges varying significantly throughout each lunar month (spring-neap cycle) and from month to month. Very high and very low tides occur more frequently at solstices around Christmas and the mid-winter months. The spring high tide range varies from 1.8 m to 2.2m.*
>
> *Tidal currents cause a periodic flow into and out of the Bay, and coupled with turbulent mixing, this process effectively replaces the Bay water with adjacent main body estuarine water from the Parramatta River. The flushing time for Homebush Bay is estimated to be around three to four days.*
>
> *Sedimentation rates for the Bay for the period from 1978 to 1985 were estimated by AWACS (AWACS, 1989 cited in PB 2002) using data from hydrographic surveys (MHL 2001 cited in PB, 2002). Sedimentation in the Bay was reported to range from minimal change to greater than 215 mm/yr. The average rate is between 25 mm and 30 mm/yr. As part of regional contaminant assessment throughout Port Jackson sedimentation rates at three core locations were estimated on the eastern shoreline of Homebush Bay (Taylor 2000). The average sedimentation rate at the location closest to the proposed bridge was 6.8±1.5 mm/yr.*
>
> *The AECOM Site Audit Report (AECOM 2011) provides verification of the Homebush Bay remediation works undertaken by Thiess Services Pty Ltd. Contaminated sediments along the eastern foreshore of the Bay were excavated,*

and classified and/or treated prior to placement on the former Union Carbide site. The seawall was reconstructed as part of the remediation works. A geofabric marker layer was then placed over the excavated surface prior to the placement of backfill. A mixture of imported sandstone (virgin excavated natural material - VENM) and shale from the former Union Carbide site was used to backfill the sediment excavation."

5.3 Acid Sulphate Soil

Golder (February 2012) note that:

> *"Moderate to high potential acid sulfate soil capacity in material from depths of 1.0 m below ground level at most investigation locations was identified (ERM 2004)."*

5.4 Audit Comments

The consultant report presented a simple but clear summary of the geology and sediments located at and in the vicinity of the site.

The Auditor notes that the acid sulfate soil investigation mentioned above was conducted on the western shore only. It can be assumed that acid sulfate soils exist in natural soils on both the eastern and western shores as well as the bay sediments themselves.

The commentary agrees with the Auditor's opinion based on a review of primary documentation.

6 Site History

The following review of the site history was derived from Golder (February 2012):

> *"Homebush Bay, and former industrial/commercial sites along both the eastern and western shorelines, have been the subject of numerous investigations over the past 20 years. The levels of dioxin and chlorinated compound contamination in the Bay are amongst the highest identified in studies from around the world. All fishing in Homebush Bay was banned in 1989 due to unacceptable risks posed by sediment contamination and subsequent bioaccumulation in edible species. In 2006 a total ban was placed by the Department of Primary Industries on commercial fishing in Sydney Harbour as a precautionary measure following the identification of elevated levels of dioxin in a number of species of fish and crustaceans.*
>
> *Following extensive investigations, including a detailed human health and ecological risk assessment (SKM 2002), the scope of the remediation of Homebush Bay sediments was determined. The investigations found elevated concentrations of dioxins (PCDDs) and furans (PCDFs), DDT, heavy metals particularly copper, zinc and lead and PAH in the Homebush Bay sediments (see Section 2.2). A remedial strategy for the Bay was developed and implemented in the period 2002-2010. The remediation included the removal of sediments to a depth of 0.5±0.15 m, or a minimum of 0.5 m where contamination hotspots had been identified, adjacent to the former Union Carbide and former Allied Feeds properties, and replacement with clean materials to restore bathymetric levels. The clean materials (the "cap") are intended to provide environmental isolation from deeper, more highly contaminated sediments.*
>
> *Residual contamination remains in surficial materials within Homebush Bay, however, it is at levels thought not to present unacceptable risks of adverse effects to the environment or human health. Higher concentrations of contaminants in sediments have been isolated below the "cap" on the eastern side of the Bay and may be present at depth elsewhere in the Bay.*
>
> *On the western shore of the Bay, the land was extensively reclaimed by filling from the late 1940s. Investigations indicate that in the area of the proposed bridge landing contamination issues are likely to be limited and localised. Further investigations and monitoring were recommended, however, there is nothing in the investigation outcomes to suggest that the area, (subject to appropriate remediation) would be unsuitable for the proposed redevelopment.*
>
> *The former Union Carbide site on the eastern shore of the Bay has been recently remediated, with removal and treatment of contaminated fill, soils and sediments and replacement with clean materials. In the area in which bridge construction will be undertaken it is understood that the area has been remediated to a standard suitable for open space land use, and is subject to an environmental management plan (EMP). The EMP (Thiess 2011) requires that approvals from the Office of Environment and Heritage (OEH) be obtained prior to intrusive works commencing in this area"*

6.1 Audit Discussion

The Auditor considers that the history of the site and immediately surrounding areas have been sufficiently well documented with multiple lines of evidence examined. Whilst the Golder statement 'residual contamination remains in surficial materials within Homebush

Bay, however, it is at levels thought not to present unacceptable risks of adverse effects to the environment or human health' is true based on available data, the surficial layer is likely to be very thin in some locations. In the area of the location of the proposed piers the closest site specific data point is some 50m laterally distant.

A thin layer of lower concentrations of contamination is consistent with the current understanding of depositional rates of sedimentation within the Bay.

7 Contamination Status

The following review of the contamination status of the site and the immediate vicinity of the site was derived from Golder (February 2012):

7.1 Homebush Bay

"Sediment quality investigations undertaken prior to remediation are summarised in the Environmental Impact Statement for the Bay (PB 2002).

Parametrix Inc. and AWT Ensight undertook a screening level human health and ecological risk assessment of Homebush Bay sediments in 1996 (Parametrix 1996). Three of the sampling locations in the study on the western shore of Homebush Bay (not sampled in later investigations) are understood to have not been remediated. Sediment sample locations of greatest interest include locations 11, 12 and 13 and location 14 on the western shore. Surface sediment at location 14 contained 690 µg/kg dichlorodiphenyltrichloroethane (DDT) and <0.64 µg/kg 2,3,7,8- tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD). It should be noted that a sample at location 9, also on the western shore, but not in the proposed bridge alignment contained 1,180 µg/kg of DDT.

Subsequent sediment investigations were undertaken by EVS Environmental Consultants (EVS) and URS Australia Pty Ltd (URS). The sampling was concentrated along the eastern seawall between the former Union Carbide and Allied Feeds sites, with lower sampling densities in the central, western and southern portions of northern Homebush Bay. The URS investigation, performed in 2001, was reported in 2002 (URS 2002, summarised in PB 2002). The results of the investigations indicated widespread contamination across the Bay, that contaminant concentrations generally decreased from the eastern shore to the western shore of the Bay, and contamination concentrations were typically higher in the subsurface sediments. The URS report identified concentrations of 2,3,7,8-TCDD of up to 360 µg/kg (equivalent to 360,000 pg/g), with an average concentration of 5.2 µg/kg (5,200 pg/g) in the sediment samples analysed.

Elevated dioxin concentrations were identified in surface and subsurface sediments in areas along the foreshore of the former Union Carbide and Allied Feeds sites. Concentrations of dioxins were reported at levels of up to 154,000 pg/g I-TEQ in sediments collected from 0-0.1m depth, 380,000 pg/g I-TEQ in sediments collected from 0.4-0.5m depth and 238,000 pg/g I-TEQ in sediments collected from 0.9-1.0m depth.

The highest concentrations of dioxins reported by URS in the 0-0.1m and 0.9-1.0m depth ranges were from samples in the vicinity of the proposed bridge alignment. It should be noted that sediments to a depth of approximately 0.5m adjacent to the eastern seawall of the Bay were removed as part of the sediment remediation works.

Due to the history of dredging in the Bay, it is possible that isolated areas of sediment containing higher levels of contaminants are present in the Bay.

7.2 Eastern Shore

"The remediation of the former Union Carbide site included the removal of sediments along the eastern foreshore of the Bay adjacent to the former Union Carbide and Allied Feeds properties, and the removal and treatment of contaminated fill, soils and sediments from the land based areas and replacement

with clean materials. Samples were collected from the remediation excavations for chemical analysis."

"The AECOM Site Audit Report (AECOM 2011) provides verification of the Homebush Bay remediation works undertaken by Thiess Services Pty Ltd. Contaminated sediments along the eastern foreshore of the Bay were excavated, and classified and/or treated prior to placement on the former Union Carbide site. The seawall was reconstructed as part of the remediation works. A geofabric marker layer was then placed over the excavated surface prior to the placement of backfill. A mixture of imported sandstone (VENM) and shale from the former Union Carbide site was used to backfill the sediment excavation. AECOM 2011 reported that the Bay remediation and sediment classification works were performed in accordance with the remedial action plans, validation plan, excavation management plan and remediation protocol for the works.

The samples collected from the residual excavation surface were analysed for organochlorine pesticides, monocyclic aromatic hydrocarbons, oxygenated compounds, halogenated aromatic compounds, phenolic compounds, polynuclear aromatic compounds, phthalate esters and chlorinated hydrocarbons.

The results for the organic contaminant analyses were generally below the laboratory detection limits. However, it is noted that the laboratory detection limits for a number of analytes were orders of magnitude greater than the interim sediment quality guidelines (ISQG)-low and ISQG-high guidelines (ANZECC 2000).

DDE and DDD exceeded the ISQG-high guidelines, and naphthalene, phenanthrene and anthracene exceeded the ISQG-low guidelines. The residual sediments also contained highly elevated concentrations of dioxins, with concentrations ranging from approximately 3,500 pg/g to 13,500 pg/g TEQ. These concentrations exceed the US EPA Region 5 ecological screening level of 11.0 pg/g for polychlorinated dibenzo-p-dioxins and the Canadian ISQG of 0.85 pg/g TEQ and Probable Effect Level (PEL) of 21.5 pg/g TEQ.

The dioxin concentrations reported by Thiess in AECOM 2011 in the vicinity of the proposed alignment of the bridge for the residual excavated surface are generally lower than those reported in URS 2002 for the 0.4-0.5m depth interval.

Significant variations in the minimum and maximum concentrations of analytes across the remediation area were observed. This high variability suggests that the maximum concentrations identified during characterisation of the Bay sediment should be taken into account for the bridge construction, as it is appears that even small changes in sample location can have a significant influence on the analytical results.

It is understood an environmental management plan (EMP) for Homebush Bay has been commissioned by Roads and Maritime Services (RMS). This EMP has not been completed at the time of issue of this report.

AECOM undertook a site audit of the remediation of Lots 305 to 313 and 316 in DP 1163025, being part of the former Union Carbide Site (AECOM 2011). The purpose of the audit was to confirm the suitability of areas of the site for specific land uses. The eastern end of the proposed bridge will land on Lot 310 in DP 1163025, with associated works possibly impinging on Lots 311 and 316 in DP 1163025.

The Site Audit Statement (SAS) for the Site Audit Report (SAR) includes an environmental EMP (Thiess 2011) for Lots 310, 312, 313 and 316. Lots 310 and 316 were remediated to a standard suitable for use as Open Space Foreshore. Lot 313 was remediated to a standard suitable for use as Open Space Parkland, and

Lot 312 was remediated to a standard suitable for use as both Open Space Foreshore and Open Space Parkland.

The SAR and EMP describe the subsurface conditions on the eastern shore of Homebush Bay in the vicinity of the landing area of the proposed bridge. As part of the remediation of the former Union Carbide site contaminated materials were excavated and either treated and reused, or re-used without treatment, by placement at depth on the site subject to meeting soil remediation criteria based on the location and depth of the material. Imported VENM was used to reinstate the area immediately adjacent to Homebush Bay, and as a capping layer in the 40m wide foreshore reuse zone.

The EMP requires that any party proposing intrusive works within 40m of Homebush Bay must consult with and satisfy the requirements of the OEH prior to commencement of any activity that disturbs the subsurface of the area.

It is understood an environmental management plan (EMP) for Homebush Bay has been commissioned by Roads and Maritime Services (RMS). This EMP has not been completed at the time of issue of this report.

Cross sections presented in Thiess 2011 indicate the elevations of subsurface layers on the site. The cross sections show the presence of a 1m deep maintenance layer of VENM extending from the current surface of the site. Fill material of varying depths is present below the maintenance layer and the validated surface of the remedial excavations.

Subsurface conditions for the area subject to the EMP are summarised as follows:

- *The area within 3m of Homebush Bay was reinstated with VENM.*
- *The area between 3m and 40m from Homebush Bay was reinstated with fill complying with the adopted re-use criteria and capped with a 1m layer of VENM.*
- *The open space area greater than 40m from Homebush Bay was reinstated with fill complying with the adopted re-use criteria for open space <1m depth and open space 1-5m depth."*

7.3 Western Shore

"A series of investigations of the properties on Wentworth Point have been performed, focussing on the area bounded by Burroway Road to the north and Hill Road to the west. Relevant investigations were performed on Lot 10 in Deposited Plan (DP) 776611, which has been subdivided into Lots 121 and 122 in DP 1156412 since the contamination investigations were undertaken.

The geology of the western shore was described in the ERM Masterplan (ERM 2003) as fill material underlain by soft, dark grey, estuarine clays with an organic odour to the maximum investigation depth of 4.5 m. The depth of the fill layer varied from 0.4 to 2.2 m thick across the site.

Remediation works have involved the removal of underground storage tanks (USTs) identified at five areas on the western shore (ERM 2003). One of the areas, Area D, was located approximately 30 m from the location of the proposed bridge. Soil samples collected from Area D as part of the site investigation works were reported to contain TPH, BTEX, inorganics and phenols concentrations which were less than the adopted site assessment guidelines (NEPM Level 'D' guidelines). The excavation of two trenches to the north of the proposed bridge landing did not indicate the potential presence of any USTs or associated service lines. As such, it was considered that the soils in this area were suitable for combined commercial/residential land use with minimal access to soil."

7.4 Audit Discussion

The Auditor considers that the investigations conducted at the site are adequate to characterise contamination in Homebush Bay and the eastern and western shores.

The Auditor notes that particular care and attention should be taken to piers to that will be constructed next to Parametrix Inc. and AWT Ensight sampling locations 11, 12, 13 and 14. These sampling locations appear (according Thiess Services Figure 5.2 in PB (2002) Technical Paper 3) to be within 50m of the proposed bridge alignment.

In reference to Section 7.1 above, the data indicated that the concentrations of dioxins were generally higher in the subsurface sediments (400-500mm) than surface sediments (0-100mm), particularly adjacent to the former Union Carbide site. The concentrations of dioxins in the deeper subsurface sediments (900-1000mm) varied with respect to the overlaying sediments. In some locations concentrations were higher, while others were significant lower. Golder state that "*The highest concentrations of dioxins reported by URS in the 0-0.1m and 0.9-1.0m depth ranges were from samples in the vicinity of the proposed bridge alignment.*" The Auditor notes that this is contradictory to Section 1.2 of the CMP "*Residual contamination remains in surficial materials within Homebush Bay, however, it is at levels thought not to present unacceptable risks of adverse effects to the environment or human health. Higher concentrations of contaminants in sediments have been isolated below the "cap" on the eastern side of the Bay…*" This contradiction should be removed or clarified.

In reference to Section 7.1 above, the paragraph stating that "*The dioxin concentrations reported by Thiess in AECOM 2011 in the vicinity of the proposed alignment of the bridge for the residual excavated surface are generally lower than those reported in URS 2002 for the 0.4-0.5m depth interval*" does not read clearly.

The Auditor does not understand what "the residual excavated surface" is referring to and what is the significance, if any, of the statement.

The Auditor also notes that in spite of a relatively comprehensive database, with lesser levels of contaminants towards the western shore and at depth, the future CEMP should assume a worse case concentration of contaminants in sediment and soils and provide appropriate contingency plans. This is consistent with the strategy adopted by Golder.

The Auditor considers that the Golder report would have been improved by including one plan with all data summarised from surface, sub surface and deep sediments indicating the data from eastern, Bay and western locations. This would have provided a complementary Figure to enhance what has already been presented.

8 Environmental Control Measures

8.1 Proposed Construction Works (based on concept design)

The main physical features of the proposed bridge construction involving potential disturbance of soils and sediment, and with the potential for health and environmental impact, are listed as follows:

- Construction of four (4) marine piled structures to bedrock to support the cantilevered section of the bridge (the "Main Bridge"). The marine piles would be installed from a barge, and would involve driving precast piles through the soft sediments and installation of pile caps at the waterline. During construction, the activities of vessels (including propeller wash) may locally resuspend surficial sediments into the water column. Driving piles through the sediment would displace and may resuspend surficial materials into the water column. The re-suspended materials would be either VENM backfill in the remediated area adjacent to the eastern foreshore of the Bay, or ambient surficial sediments in the central and western areas of the Bay. Based on experience the predominant movement of sediment caused by piling would be down and sideways - with a low potential for sediments to migrate upward along the side of the pile.
- The eastern end of the bridge (the "Approach Bridge") will be supported on piles spaced at maximum 4.5m centres through the remediated area adjacent to the former Union Carbide site. The precast concrete piles will be driven through the capping layer and sediments to bedrock. Driving piles through the sediment would displace and may locally resuspend surficial VENM materials into the water column. The piles are expected to perforate the geotextile marker layer (Bidim A44) without causing widespread pulldown or disturbance of the marker layer. The Approach Bridge would be built incrementally and westward from the foreshore. No barges would be utilised during the construction of this section of the bridge.
- Construction of 1 land pier and 2 abutments. The concept design for the bridge includes approximately 6 precast driven piles for each abutment. Piles for these would be driven through the layers of fill soil and underlying natural soil into bedrock. Minor earthworks would be needed to create a level piling and work platform and involve placement of fill. The proposed land based works on Wentworth Point will include disturbance of surface material to a depth of approximately 0.4 m below existing ground level. Proposed land based excavations on the former Union Carbide site will include excavations to less than 1 m below the capped level, which will be limited to within the imported VENM capping layer. Construction of pile caps may involve excavation and backfilling.
- Excavation of fill soils and natural soils landward of the two abutments and if practical, reuse and compaction of these materials in the same vicinity (engineered in-situ fill).
- Importation and compaction of fill material over the engineered reused/fill soils.
- Construction of drainage in the filled zones.
- Removal of stockpiled waste soil (offsite disposal). Based on previously reported results, it is expected that the waste soil generated from near-surface land based works could be disposed to landfill as General Solid Waste.

The proposed piling methodology has been selected to prevent the potential for generation of sediment wastes which would consequently require disposal..

8.2 Proposed Mitigation Measures for Construction Works

Golder state that to ensure pathways of contaminants to a receptor are not complete (or significantly reduced), the site management measures must:

- Minimise dispersal of sediment and associated contaminants.
- Prevent exposure of soil-bound contaminants to humans.
- Minimise leaching of soil contaminants to groundwater and the receiving environment.

Golder (February 2012) presented the following summary of impacts and measures based on the concept design:

- Piling and construction works for the bridge and approaches in and on the foreshore of Homebush Bay have the potential to disturb, intercept and expose contaminated material (containing elevated concentrations of metals, OCPs, dioxins (PCDDs) and furans (PCDFs), PAH and TPH) or acid sulfate soils. Contaminated materials exposed by piling works may come into contact with site workers, discharge from the site into Bay, and may affect ecological communities.
  - No dredging or boring of piles is proposed.
  - Based on previous experience soft sediments, sediment movement caused by driving piles would be down and sideways, with a low potential [the Auditor considers that a stronger word, such as 'minimal' or 'negligible', instead of 'low' should be used in this instance] for sediments to migrate up the side of the pile through the capping layer adjacent to the eastern foreshore. A further measure to mitigate the potential for voids and therefore minimise the potential exposure of the underlying sediment would be placing approximately 0.5m cover of pea gravel or similar materials at the piling locations prior to works. The gravel would fill voids in the capping if they occurred. The gravel would be lowered into place and carefully released to minimise disturbance of the sediments near the piles.
  - Installation of a sediment boom and curtain ("sediment control device") around barge works sites for over-water pile installation.
  - The sediment curtain used would be the full depth of the Bay (i.e. from surface of the water, extending to the sediment of the Bay).
  - The sediment control device will be installed, as much as practicable, during high tide periods from a boat, thereby minimising any disturbance to the existing sediments. The sediment control device will be designed to rise and fall with the tide to prevent sediments disturbed during the piling works dispersing in Homebush Bay.
  - Inspection of the sediment control device will occur prior to commencement of each working day, following storm events, daily on ebbing tides and prior to recommencement of work following rainfall of more than 15 mm.
  - As with installation, disturbance to surrounding sediments will be minimised by decommissioning the device by boat during high tide periods.
  - Prior to removing the sediment control device, visual and field instrument verification that sediment has settled resulting in similar water turbidity to that outside the curtain.
  - Attended turbidity monitoring during works, using a portable turbidity meter/logger, will be performed. A tiered response to sediment releases based on the magnitude of measured turbidity levels outside the primary silt curtain is proposed.
  - Monitoring of contaminants of potential concern in the water column will be performed using semi-permeable membrane devices (SPMDs) or alternative devices during the works to assess the impact of the construction works on the Bay.
  - Contingency response protocols should identify contamination containment materials (e.g. oil containment booms, sediment control curtains) and personnel protective equipment to be used during incident response.
- Barges and other vessels used during the construction phase have the potential to disturb, intercept and expose contaminated material. Contaminated materials

remobilised (e.g. by propeller wash) may be advected from the work site to other parts of the Bay, with potential for adverse effects on environmental receptors.
    - Dredging or other disturbance to sediment to allow barge movement/access is not proposed.
    - Vessel movements will be, as far as practicable, at higher tidal levels to minimise the potential for disturbance of sediments.
    - A sediment boom and curtain will be installed around barge works sites. Details of these mitigation measures are to be provided in a site specific environmental management plan prepared prior to the construction stage of the project.
    - Contingency response protocols will also be incorporated into the site specific environmental management plan. The protocols should identify materials to contain contaminants (e.g. oil containment booms, sediment control curtains) and personnel protective equipment to be used during incident response.
- Land based excavations have the potential to intercept and expose contaminated soils and acid sulfate soil (ASS) material. ASS have the potential to oxidise and generate actual acidity following excavation.
    - Proposed excavations on Wentworth Point include surface works to a maximum depth of 0.4m below existing ground level. Based on previous investigation results, ASS will not disturbed by the surface works.
    - Proposed excavations on the former Union Carbide Site are to be limited to a depth of less than 1.0m below the existing cap level. The original material in the area of the bridge landing on the former Union Carbide site has been excavated, assessed and/or treated prior to replacement as fill and covering with 1m of VENM. It is considered that there is a low probability of ASS being disturbed by land based excavations on the former Union Carbide Site.
    - Store, characterise and assess contamination and ASS in excavation spoil, and treat and dispose at an appropriately licensed facility. Details of this activity are to be provided in a site specific acid sulfate soil management plan prepared for the construction stage of the project.
- Contaminated materials (containing metals, PAHs and TPH) may be retained onsite (western foreshore) at depth following construction works (re-use of existing contaminated fill as engineered fill).
    - Excavated fill on the western foreshore contaminated by metals, PAHs or TPH could be managed by placement at depth, with appropriate capping by imported “clean fill” and pavement.
    - Future excavations within the site (e.g. for underground services), should be managed under a long-term environmental management plan prepared for the area, indicating the location of contaminated materials, and management processes for works in such areas.

Details of the above management measures are to be provided in a site specific environmental management plan prepared for the construction and operational stage of the project.

8.3 Audit Discussion

The Auditor notes that the term “widespread” in Section 8.1, in relation to the disturbance of the Bidim layer above is a qualitative term which would be better expressed in a quantitative manner.. It would have been beneficial to be able to quantify the pile driving method in saying that it will not disturb the layer or to propose a lateral and vertical displacement measurement.

The Auditor notes that Golder do nor prefer to have an alarm detection system in place. The Auditor is satisfied with this as long as the appropriate trigger levels discussed are instituted as management tools.

The summary of potential impacts stated above would require refinement in association with the finalised construction works plans. The detailed measures are to be documented in site management plans to be implemented during the construction phase of the proposal.

Any western shoreline capping strategies will need to ensure that there are no residual issues in relation to groundwater migration.

9 Monitoring and Reporting

Golder (February 2012) propose the following monitoring during the Homebush Bay Bridge Project:

- Sediment control devices will be inspected prior to piling commencing each working day. Defects or faults in the curtain(s) will be repaired prior to works commencing.
- Turbidity in Homebush Bay will be monitored while piling and allied water based activities with potential to resuspend sediment within Homebush Bay occur. Turbidity will be measured regularly and at high frequency using a portable turbidity meter (submersible data logger).
- Measurements will be performed at 15 minute intervals at locations inside the sediment curtain and up and downstream of the sediment control device (and appropriate control locations as required) when piling and allied activities (e.g. barge movements) take place. Personnel performing the measurements will note the turbidity levels and record other observations including the presence of sheens, odours or excessive visual turbidity.
- Operations will cease if the turbidity of the water inside the sediment control device AND outside the sediment control device downstream of piling operations is markedly lower than the turbidity of water upstream of the sediment control device. The cause/source of suspended sediment release (e.g. faulty sediment control curtains) would be determined and rectified before piling operations recommence.
- Based on the measurement results, corrective actions such as the deployment of additional sediment controls may occur to manage suspended sediment. A tiered response, based on a three-level trigger system, is proposed to address potential sediment releases outside the silt curtain. The response system, including monitoring locations and depths, background control locations, and actions to be taken at nominated turbidity levels above background, are to be detailed in the site specific environmental management plan prepared for the construction stage of the project once the construction methodology has been finalised.
- Monitoring reports will be prepared on a weekly basis by the construction contractor. The reports will include tabulated turbidity measurements, observations made during piling and allied activities (e.g. presence of oil sheens, odours, excessive turbidity), a photographic record of site activities, a record of piling activities and results of any additional chemical or physical analyses performed. In addition, reports will be submitted by the construction contractor to the superintendent if excessive turbidity is observed outside of the sediment control curtains during piling activities.
- Monitoring of contaminants of concern in the water column will be performed using semi-permeable membrane devices (SPMDs), or alternative devices, during the works. SPMDs measure time-averaged concentrations of contaminants of concern during the deployment period (typically 28-days). This monitoring will provide analytical data to complement the turbidity measurements (a proxy for contaminant measurements during day to day operations). SPMDs will be used to assess the potential for concentrations of contaminants of concern (specifically dioxins) in the Bay to be increased by the proposed works.
- The sampling devices [the Auditor notes that turbidity data loggers should be included here also] will be placed in the vicinity of the works area and at control locations in the Bay to assess the potential for the bridge construction works to alter concentrations of contaminants of concern in Homebush Bay waters and adversely affect biota in the Bay. Similar to turbidity monitoring, protocols will be agreed with EPA.
- The construction contractor would set up monitoring and reporting responsibilities, authority, communication chain and protocols for the monitoring and reporting

regime discussed in this section. Such details would be included in the construction environmental management plan for the bridge.

Golder (February 2012) have prepared an indicative organisational chart showing the communication chain. This communication chain will be fully detailed and finalised by the construction contractor as part of the construction environmental management plan for the bridge.

9.1 Audit Discussion

The Auditor notes that there is insufficient discussion on what the SPMD actually do or how they function. An introductory statement on the objectives and function of the device is required. This information can be detailed in the CEMP.

The indicative organisational chart prepared by Golder should also include the Auditor as a stakeholder. This can be detailed in the CEMP.

10 Regulatory Requirements

The following regulatory aspects are considered to relate to the project and future works conducted at the site.

10.1 Guidelines made by the NSW EPA:

EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites*. NSW EPA, Sydney;

EPA (1995a) *Contaminated Sites: Guidelines for the Vertical Mixing of Soil on Former Broad-acre Agricultural Land*. NSW EPA, Sydney;

EPA (1995b) *Contaminated Sites: Sampling Design Guidelines*. NSW EPA, Sydney;

EPA (1997a) *Contaminated Sites: Guidelines for Assessing Banana Plantation Sites*. NSW EPA, Sydney;

DEC (2005) *Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens*. DEC, Sydney;

DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme – 2nd Edition*. NSW DEC, Sydney;

DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*. NSW DEC, Sydney;

DECC (2009) *Waste Classification Guidelines*. NSW DECC, Sydney;

DECC (2009) *Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*. NSW DECC, Sydney; and

DECCW (2009) *Vapour Intrusion: Technical Practice Note*. NSW DECCW, Sydney.

OEH (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*. NSW OEH, Sydney;

10.2 Guidelines approved by the EPA

Acid Sulfate Soil Management Advisory Committee NSW (1998) *Acid Sulfate Soil Manual*

ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, Canberra;

ANZECC/NHMRC (1992) *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council, Canberra;

Department of Health and Ageing and EnHealth Council (2002) *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards*. Commonwealth of Australia, Canberra;

Lock, W. H., (1996) Composite Sampling, *National Environmental Health Forum Monographs, Soil Series No. 3*, National Environmental Health Forum, SA Health Commission, Adelaide;

NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B (1)-B (10). National Environment Protection Council, Adelaide;

NSW Agricultural/CMPS&F (1996) *Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes*, NSW Agricultural and CMPS&F Environmental, Canberra; and

WA Department of Health (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.*

10.3 Other

NSW *Fisheries Act 1935*

NSW *Marine Safety Act 2010*

NSW *Maritime Services Act 1935*

NSW *Protection of the Environment Operations Act 1997*; and

NSW *Waste Avoidance and Resource Recovery Act 2001.*

11 Adequacy of Consultant's Work

The works conducted by Golder Associates Pty Ltd were generally conducted to an appropriate industry standard.

The revised CMP has benefitted from discussion with appropriate stakeholders and is a more robust document.

12 Audit Conclusions

12.1 Environmental Assessment

Based on the discussion presented above, the Auditor considers that the site (CT V5018FI, Lot 122 in DP 1156412, Lot 310 in DP 1163025, and possibly impinging on Lots 311 and 316 in DP 1163025) has been demonstrated, through the preparation of a Contamination Management Plan, to have met the Director General's Requirements for the environmental assessment stage of the proposed Homebush Bay Bridge Construction.

12.2 Pre Construction (plans and mitigation measures)

The following documents will need to be prepared for the next stage (Pre Construction):

- Acid Sulfate Soil Management Plan; and
- A Construction and Environmental Management Plan.

These plans will be independently audited by an Auditor accredited under the CLM Act 1997.

12.3 Post Construction (validation of contamination aspects)

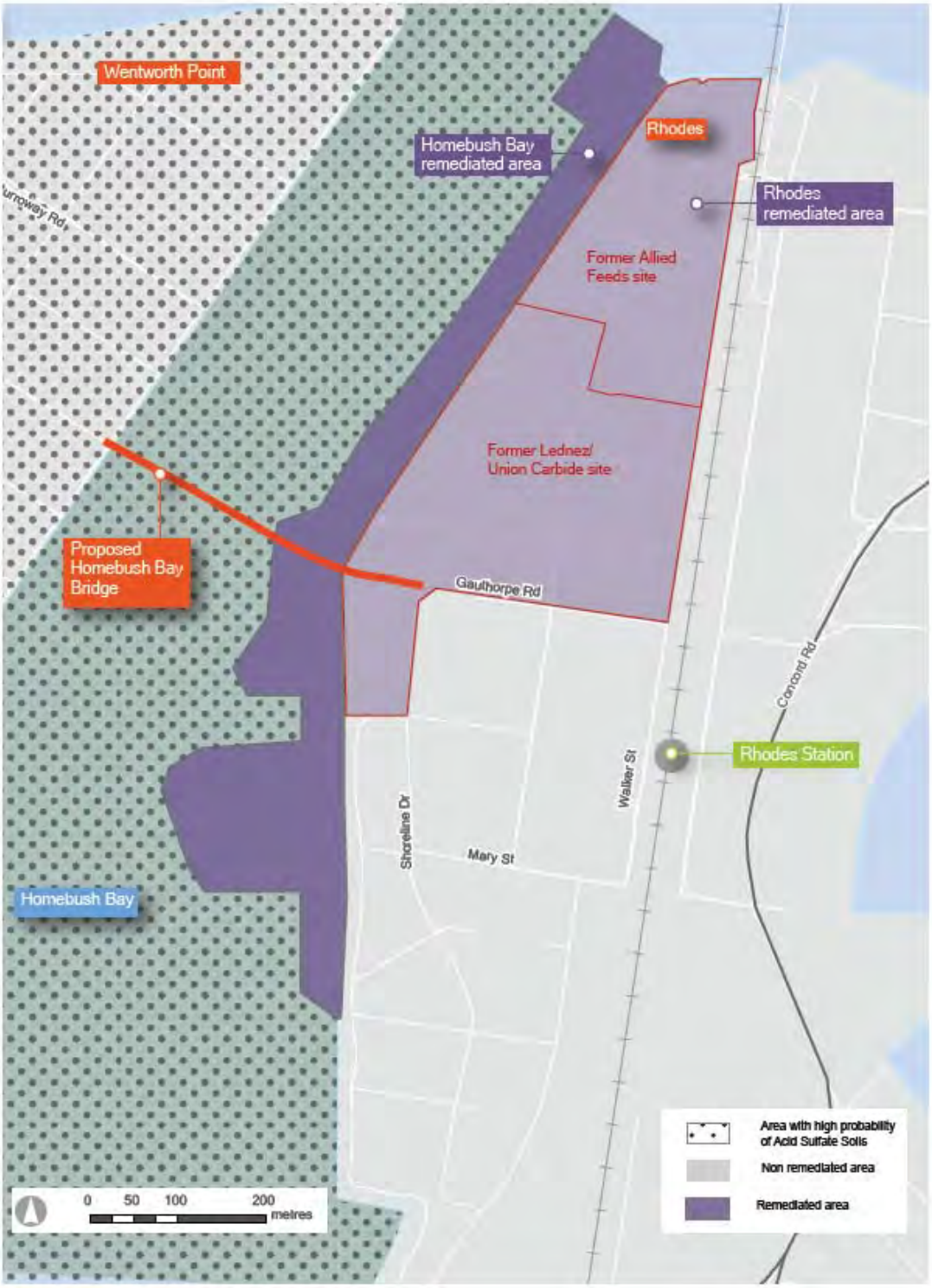
It is envisaged that a final Site Audit Report will be prepared at completion of construction and before bridge opening to document the success of meeting construction environmental management objective as contained in the project's CEMP.

A detailed assessment of the potential impacts related to contamination of the construction of the proposed bridge and the construction mitigation measures has been conducted based on documentation provided for this Audit. This reviewed documentation is therefore considered to be suitable to meet the Director General's Requirements for the proposed Homebush Bay Bridge Construction.

Appendix A

Site Plans

Homebush Bay West DCP (boundaries)



Sediment remediation along the Rhodes foreshore.

Sediment collection locations from the Screening Level Risk Assessment study (Parametrix and AWT Ensight, 1996)

Appendix B

Letters of Interim Advice

4 April 2011

Mr Javier Valderrama
Arup Pty Ltd
Level 10, 201 Kent St
Sydney NSW 2001

Reference: 11010L01_ Interim Advice 1 (Rev0).docx

SUBJECT: Interim Advice 1, Homebush Bay NSW – Review of Environmental Assessments in Relation to Potential Impact from Sediments

Dear Javier,

1.1 Introduction

This Interim Advice is the first in several which have the ultimate objective of providing a Summary Audit Report and Site Audit Statement stating that the Homebush Bay Bridge project should proceed as defined in the Environmental Management Plan which will be produced.

This letter presents the findings of the review of environmental reports associated with the assessment of sediments and acid sulphate soils (ASS) within Homebush Bay, specifically the footprint of the proposed Homebush Bay bridge (here on referred to as the Site), and provides interim advice (as discussed below) regarding the reports.

The review of current reports focuses mainly on dioxin but also does contain other contaminants of concern.

1.2 Nature of interim advice

To act as Auditor for this project Graf International, via Arup has engaged Rod Harwood, a New South Wales Environment Protection Authority (EPA, an entity within the Department of Environment, Climate Change and Water, DECCW) contaminated land accredited site auditor (accreditation number 03-04), employed by Environmental Strategies (ES) to act as Auditor for this project). The final outcome of this engagement is to be a site audit statement (SAS) and associated site audit report (SAR), indicating the suitability of the land and the proposed development in accordance with the Guidelines for the NSW Site Auditor Scheme (2nd Edition), 2006.

This interim audit advice does not constitute a SAS or a SAR, but rather is provided to assist Arup in the assessment and management of contamination issues at the site. The information provided herein should not be considered pre-emptive of the final site audit conclusions, but rather represents the site audit opinion based on the current review of available site information.

1.3 Scope of audits

Whereas interim audit advice is provided to assist in the assessment and management of contamination issues at the site, the interim audit advice should not be regarded as 'approval' of any proposed investigations or remedial activities, as any such approval is beyond the scope of an independent review.

DEC (2006) '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)*', describes the site assessment and audit process as:

1. the contaminated land consultant, or other relevant party, designs and implements the site assessment and, where required, all remediation and validation activities to achieve the stated objectives; and
2. the site auditor independently reviews the works undertaken to ensure that they comply with current regulations, standards and guidelines, and that the site has been assessed, remediated and validated to a standard appropriate to the proposed landuse

Section 8.1 of the Auditor Guidelines states that audits conducted by NSW EPA accredited site auditors must take the following into account:

- the provisions of the CLM Act and the CLM Regulations;
- the provisions of any environmental planning instruments applying to the site; and
- the guidelines made or approved by the DECCW.

Therefore, the contaminated land consultant and other relevant parties should be satisfied that the work to be conducted conforms to all appropriate regulations, standards and guidelines and is suitable based on the site history and the proposed land use.

1.4 Current Interim Audit Advice

In preparing this Interim Advice No. 1, the Auditor has conducted his review of reports in the context of previous investigations in the area associated with the assessment of sediments and acid sulphate soils within Homebush Bay, and specifically within close proximity to the site. This interim advice has been specifically drafted to review any reports currently available which may address the contaminant and engineering constraints with bridge pilling. The review of these reports will allow the design team to be aware of potential constraints.

The following documents are the focus of this interim advice:

- Contamination Management Pty Ltd (April 2002a) *Summary Site Audit Report, Investigation of Dioxins in Sediments in North-east Homebush Bay*.
- Sinclair Knight Mertz Pty Ltd (May 2002b) *Detailed Human Health and Ecological Risk Assessment of Homebush Bay Sediments*.
- PPK Environment and Infrastructure (June 2002c) *Draft Homebush Bay Dioxin Remediation, Environmental Impact statement*.
- Parsons Brinckerhof f Pty Ltd (December 2002d) *Environmental Impact Statement, Remediation of Lednez Site Rhodes, Homebush Bay*.
- Parsons Brinckerhof f Pty Ltd (December 2002e) *Technical Paper 10, Remediation of Lednez Site Rhodes, Homebush Bay*.
- Environmental Resources Management Australia (July 2004) *Groundwater and Acid Sulphate Soil Investigation, 1 Bennelong Road, Homebush Bay, NSW*.
- GHD Pty Ltd (February 2010) *Report for Homebush Bay West Contamination Assessment, Sediment Investigation*.

The review of this document has been in general accordance with the requirements in the NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)* and the NSW EPA (1997) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

The overall objective of this audit is to provide comment on whether the proposed footprint of the Homebush Bay Bridge is suitable for development.

Within that context, of the reports reviewed here, it is intended to provide detail of environmental conditions that may be encountered when construction of the proposed Homebush Bay bridge occurs.. The Auditor reserves the right to review these reports in greater detail to satisfy wider objectives. This Interim Advice is focused on the objectives mentioned above.

1.5 Land Contamination Status & Site History

The following Bay and Surrounding area description is sourced from the SKM (2002b) report:

"Homebush Bay is a 75 hectare tidal embayment opening into the Parramatta River at its northern end, as shown. The Bay is bounded to the east by the Rhodes Peninsula, which was historically used for chemical manufacturing and other industrial purposes. To the west is the 2000 Olympic Precinct, with Bicentennial Park and Powells Creek to the south.

The Bay supports significant fish and bird species. The main fish species include goby, mullet and bream, while the main bird species include pelicans, cormorants and herons. It is comprised of various estuarine habitats including mangroves, salt marshes and muddy substrates.

Much of the foreshore of Homebush Bay has been reclaimed, as evidenced by the seawalls that occur in most areas. The eastern part of the Bay is shallower than the western part, which is up to 5 m deep. Inter-tidal mudflats occur along the eastern shoreline.

As a result of historical manufacturing and chemical processing on the Rhodes Peninsular, in conjunction with land reclamation, the Bay sediments have been contaminated with dioxins/furans and other organic and inorganic compounds. The key contaminant of potential concern for human health in the Bay is 2,3,7,8-tetrachlorodibenzo-p-dioxin, that is more commonly known as "dioxin" or 2,3,7,8-TCDD. This concern is due to its toxicity in relatively small doses and the elevated concentrations found in the Bay. Following fish and prawn tissue analyses in 1989, a commercial fishing ban was imposed on the Parramatta River west of Gladesville Bridge, and a recreational fishing ban was imposed on the Bay, which continues to this day."

The following provides an overview of the contamination status in the area of the site based on the reports previously reviewed (specifically reports related to sediment and ASS):

Previous Investigations

- The previous investigations (CM (2002a), SKM (2002b), PPK (2002c), PB (2002d) and PB(2002e)) addressed sediment up to a maximum depth of 2m on the eastern half of Homebush Bay adjacent to the former Allied Feeds site, the former Lednez site and the former Orica site (refer to Figures 1,2 and 3). Sediment was also investigated (GHD (2010)) on the western side of Homebush Bay and the southern side of the Parramatta River adjacent to the proposed Maritime Development, however, figures and appendices were not provided with this report. As a result sample locations cannot be confirmed.
- Acid Sulfate Soil (ASS) and groundwater was investigated (ERM (2004)) at a site at 1 Bennelong Road, Homebush Bay. Sediment sampling was conducted using a grid based approach and the ASS and groundwater investigation was conducted using a combination of judgemental sampling and grid based sampling (refer to Figure 4). The results of this investigation indicated that analysis of soil samples across the site (1 Bennelong Rd) confirmed a moderate to high potential acid sulphate soil capacity in material from depths of 1.0m below ground level in most of the areas sampled.
- The results of the URS (2002) investigation reported in the PB (2002d) report indicated that the extent of dioxin contamination is greatest at the surface of the sediments, with the size of the contamination footprint decreasing with depth. The SKM (2002b) report stated that the bay wide average for dioxin in Homebush Bay surface sediments has been estimated at approximately 3ug/kg expressed as toxic equivalency.

1.6 Auditor comments

In undertaking his review, the Auditor notes the following:

- Various sediment investigations have been conducted in Homebush Bay. Investigations on the eastern side of the bay have been conducted by EVS Environmental Consultants and URS. Remediation conducted by Thiess on behalf of Brookfield Multiplex of the sediments was conducted 50m from the shoreline of the eastern side of the bay (former Lednez and Allied Feeds properties). Following excavation of the sediments in this area a geotextile layer was placed at approximately 1m below the sediment surface and fill material (clay, crushed sandstone and shale) was placed over this layer. The proposed bridge piles should avoid disturbing the geotextile layer as it is helping contain some of the deeper contaminated sediments;
- The auditor is aware that the tidal movement within the bay is relatively slow, however, the bridge piles will need to be designed to limit the scouring of sediments (potentially contaminated) from around the piles;
- The construction of bridge piles will need to be conducted in such a way to minimise any disturbed/excavated sediment s required for offsite disposal. Waste will firstly require appropriate sampling and classification in accordance with the NSW DECCW (2009) *Waste Classification Guidelines*;
- Appropriate silt curtains will be required to be installed around pile construction areas to contain sediment and minimise the mobilisation of disturbed sediments within Homebush Bay. Arup to provide silt curtain design options and select a preferred method; and
- The auditor is unaware of any ASS investigations previously undertaken within the bay sediments, however, the ERM (2004) ASS investigation at 1 Bennelong Road, Homebush Bay concluded that acid sulphate soils do exist in that area. It is reasonable to assume that the bay sediments will be ASS. An ASS management plan will be required for the Homebush Bay bridge project as per the requirements of the NSW Acid Sulfate Soil Management Advisory Committee (1998) *Acid Sulfate Soil Manual*. ASS only becomes acid producing when exposed to oxygen. If the sediments remain under the water they are unlikely to produce acid and corrode the bridge foundations (piles). Soil excavated for proposed piles on the banks of Homebush bay and Rhodes will require treatment and protection of the concrete/steel piles from acid attack may be necessary.

1.7 Conclusions

In preparing the **Interim Audit Advice 1**, the auditor has relied on the information provided in the reports referenced on Page 2.

The above review reports do not address the stratigraphic environment in any comprehensive manner. In fact the majority of the reports simply have general lithological details of a very shallow nature (maximum depth 2.0m). Coffey's have completed deep geotechnical boreholes on the landward edge of the Wentworth Point area. These have been used to recommend a piled raft construction for home units.

As discussed above the auditor is unaware of ASS studies within Homebush Bay, however ASS work by ERM on Wentworth point has indicated that the soils below 1m are potentially acid sulphate containing and a management plan will need to be instituted if any of the proposed works disturb these soils by dewatering.

Some reports contain a comprehensive list of contaminants of concern (particularly on the eastern foreshore) but there has been no specific data in relation to corrosivity or potential attack on concrete and steel by saline of sulphate rich waters. This issue can be resolved by either further sampling of the water and sediments to obtain specific design data or to ensure the piles are resistant to corrosive, highly saline or sulphate rich conditions.

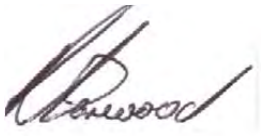
We are currently unaware of reports relating to wave currents (hydrodynamics) or bathymetry and are therefore unable to provide any comment related to erosion by pilling activities.

The Auditor comments above should be addressed when designing the bridge and preparing and construction management plans.

✧ ✧ ✧ ✧

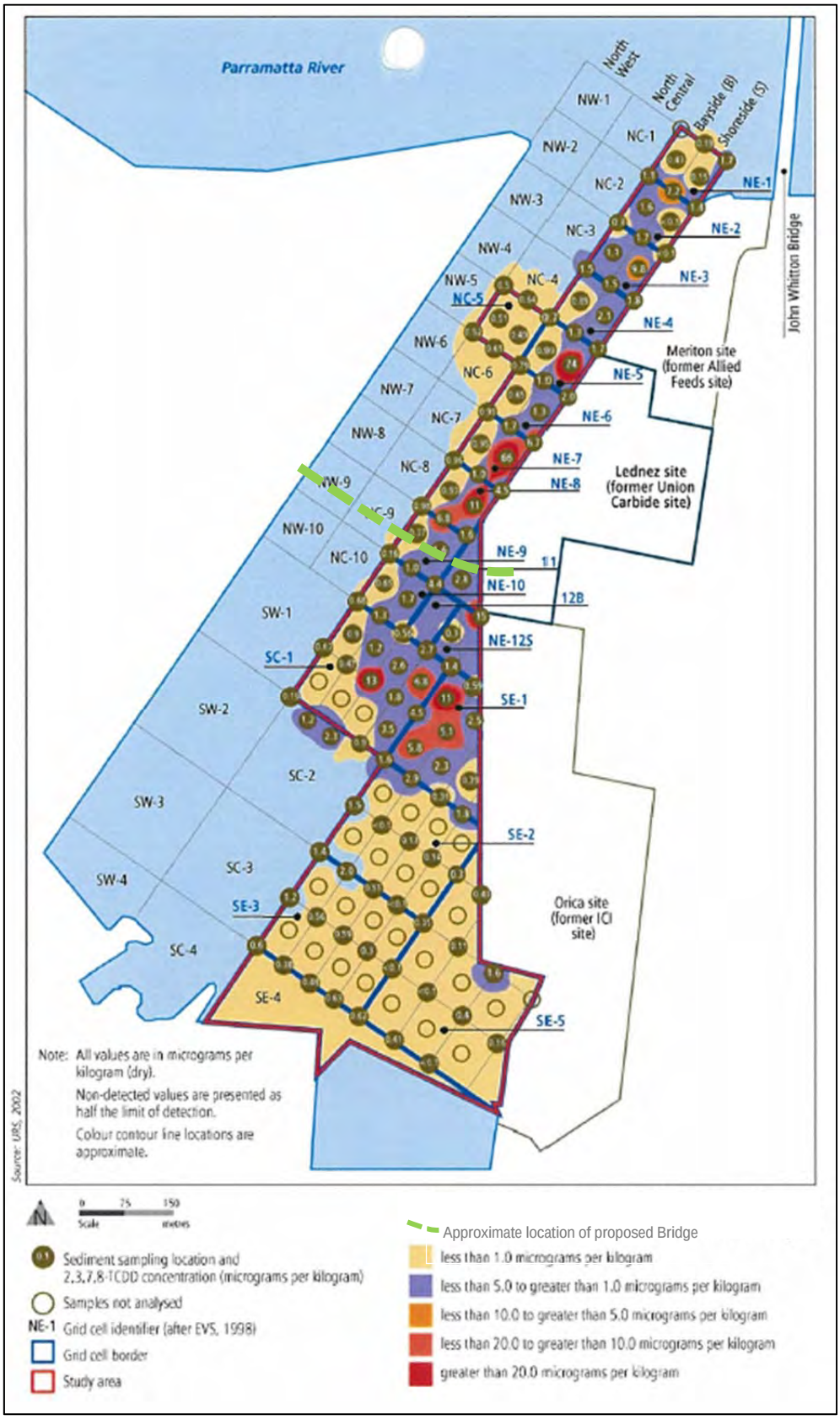
Thank you for your time in regard to this matter. Please do not hesitate to contact the undersigned if you require additional information or clarification.

Yours sincerely



Rod Harwood

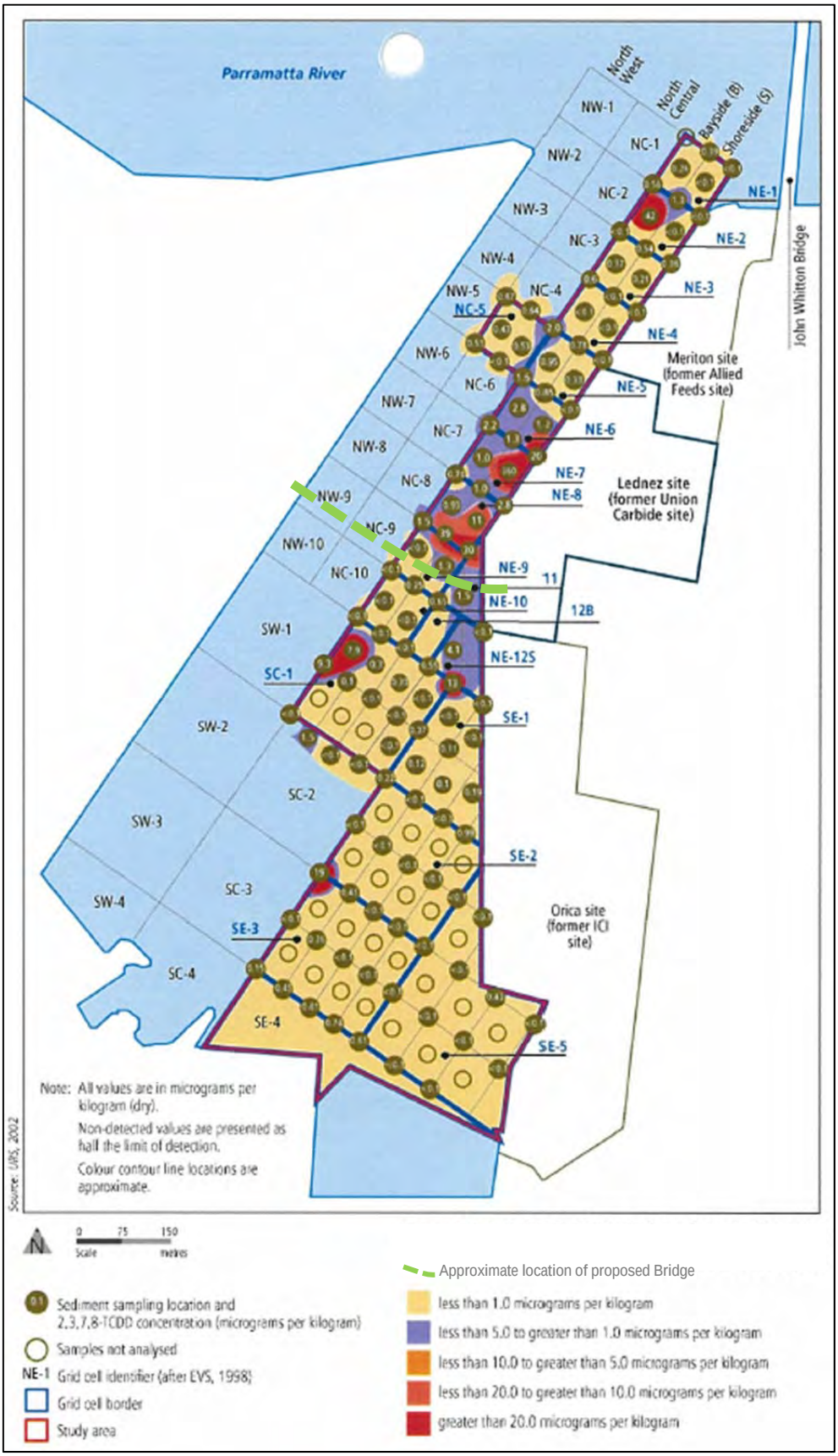
DEC WA Accredited Contaminated Site Auditor (03-04)



Sediment Sample Locations at 0-0.1m Depth

Interim Advice 1, Homebush Bay NSW – Review of Environmental Assessments

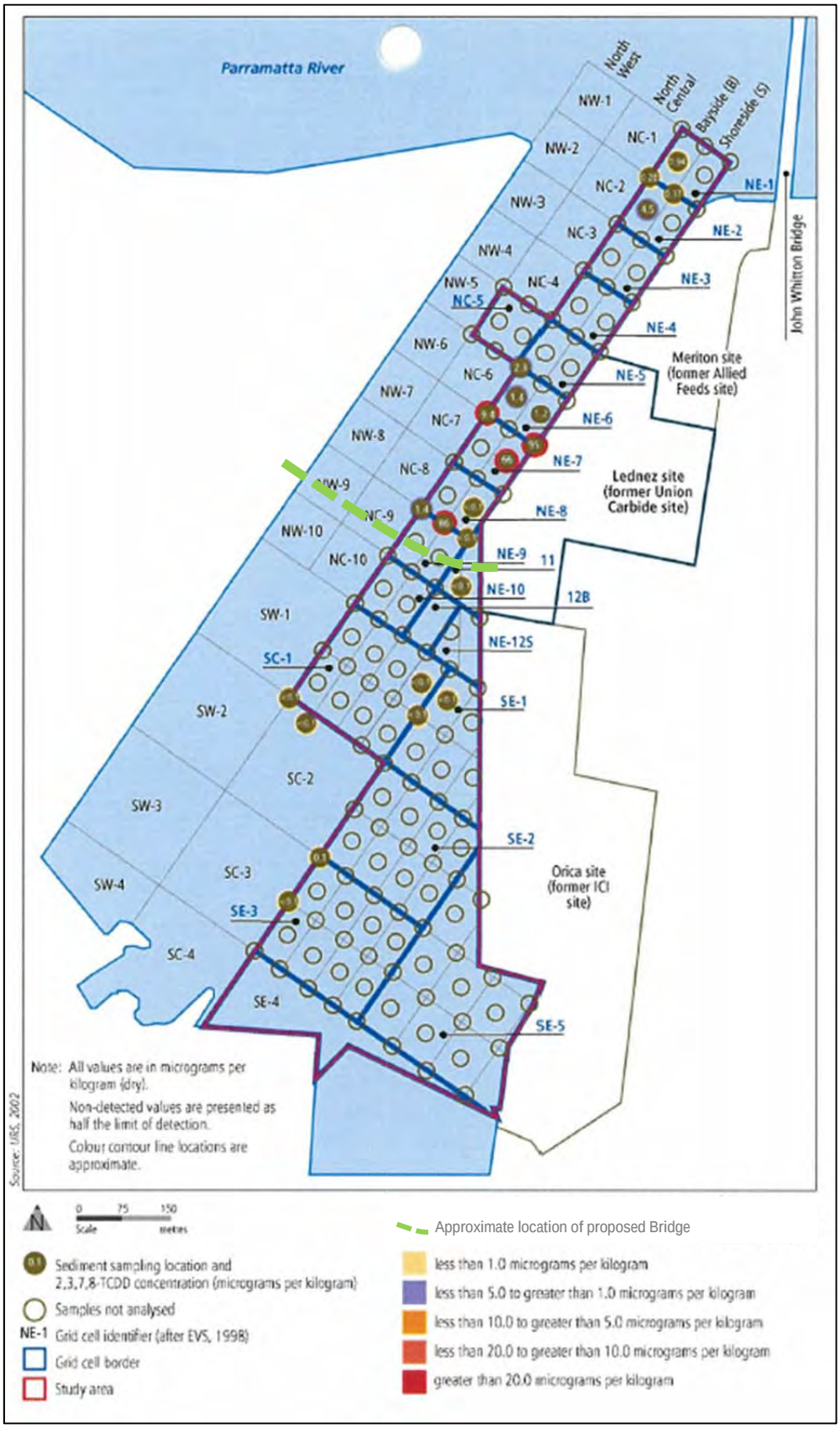
Figure 1



Sediment Sample Locations at 0.4-0.5m Depth

Interim Advice 1, Homebush Bay NSW – Review of Environmental Assessments

Figure 2



Sediment Sample Locations at 0.9-1.0m Depth

Interim Advice 1, Homebush Bay NSW – Review of Environmental Assessments

Figure 3

Acid Sulphate Soil Sample Locations

Interim Advice 1, Homebush Bay NSW – Review of Environmental Assessments

Figure 4

29 July 2011

Mr Javier Valderrama
Arup Pty Ltd
Level 10, 201 Kent St
Sydney NSW 2001

Reference: 11010L02_ Interim Advice 2 (Rev0).docx

SUBJECT: Interim Advice 2, Homebush Bay NSW – Review of Contamination Management Plan for Proposed Bridge Construction

Dear Javier,

1.1 Introduction

This Interim Advice is the second in several which have the ultimate objective of providing a Summary Audit Report and Site Audit Statement stating that the Homebush Bay Bridge project should proceed as defined in the Contamination Management Plan.

This letter presents the findings and comments of the review of Contamination Management Plan for the proposed Homebush Bay bridge (here on referred to as the Site), and provides interim advice (as discussed below) regarding the report.

1.2 Nature of interim advice

To act as Auditor for this project Graf International, via Arup has engaged Rod Harwood, a New South Wales Environment Protection Authority (EPA, an entity within the Office of Environment and Heritage, OEH) contaminated land accredited site auditor (accreditation number 03-04), employed by Environmental Strategies (ES) to act as Auditor for this project). The final outcome of this engagement is to be a site audit statement (SAS) and associated site audit report (SAR), indicating the suitability of the land and the proposed development in accordance with the Guidelines for the NSW Site Auditor Scheme (2nd Edition), 2006.

This interim audit advice does not constitute a SAS or a SAR, but rather is provided to assist Arup in the assessment and management of contamination issues at the site. The information provided herein should not be considered pre-emptive of the final site audit conclusions, but rather represents the site audit opinion based on the current review of available site information.

1.3 Scope of audits

Whereas interim audit advice is provided to assist in the assessment and management of contamination issues at the site, the interim audit advice should not be regarded as 'approval' of any proposed investigations or remedial activities, as any such approval is beyond the scope of an independent review.

DEC (2006) '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)*', describes the site assessment and audit process as:

1. the contaminated land consultant, or other relevant party, designs and implements the site assessment and, where required, all remediation and validation activities to achieve the stated objectives; and
2. the site auditor independently reviews the works undertaken to ensure that they comply with current regulations, standards and guidelines, and that the site has been assessed, remediated and validated to a standard appropriate to the proposed landuse

Section 8.1 of the Auditor Guidelines states that audits conducted by NSW EPA accredited site auditors must take the following into account:

- the provisions of the CLM Act and the CLM Regulations;
- the provisions of any environmental planning instruments applying to the site; and
- the guidelines made or approved by the OEH.

Therefore, the contaminated land consultant and other relevant parties should be satisfied that the work to be conducted conforms to all appropriate regulations, standards and guidelines and is suitable based on the site history and the proposed land use.

1.4 Current Interim Audit Advice

In preparing this Interim Advice No. 1, the Auditor has conducted his review of reports in the context of previous investigations in the area associated with the assessment of sediments and acid sulphate soils within Homebush Bay, and specifically within close proximity to the site. This interim advice has been specifically drafted to review any reports currently available which may address the contaminant and engineering constraints with bridge pilling. The review of these reports will allow the design team to be aware of potential constraints.

The following documents are the focus of this interim advice:

- Golder Associates Pty Ltd (July 2011) Homebush Bay Bridge, *Contamination Management Plan for Proposed Bridge Construction*. Report Number: 117623030-R-RevB.

The review of this document has been in general accordance with the requirements in the NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)* and the NSW EPA (1997) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

The overall objective of this audit is to provide comment on whether the proposed footprint of the Homebush Bay Bridge is suitable for development.

Within that context, of the report reviewed here, it is intended to provide detail of environmental conditions that may be encountered when construction of the proposed Homebush Bay bridge occurs. This Interim Advice is focused on the objectives mentioned above.

1.5 Report Review Summary

The following provides an overview of the CMP prepared by Golder Associates:

The proposal is for a new bridge across Homebush Bay to connect Rhodes Peninsula and Wentworth Point (formerly known as Homebush Bay West). The western end of the bridge will land on Lot 122 in Deposited Plan (DP) 1156412, with the eastern end of the bridge landing on Lot 310 in DP 1163025, and possibly impinging on Lots 311 and 316 in DP 1163025.

The bridge will allow a mix of pedestrian access, cycleway access, public transport (bus) services and emergency services access, whilst accommodating a range of utilities within its structure and enabling continued navigation of the Bay. The bridge will have a connecting ramp of some 80 m on the Rhodes Peninsula side linking with Gauthorpe Street and a connecting ramp of up to 80 m on the Wentworth Point side. The current design for the bridge involves five piers installed in Homebush Bay.

Construction of a bridge across the Bay will require that piles be driven through the soft sediment and into firmer ground. The construction techniques and accompanying environmental management process will need to be undertaken with minimal impact and disturbance upon the Bay and its sediments, particularly in the capped area along the eastern shore. Appropriate turbidity containment devices, e.g. silt curtains will be required around piling areas to contain resuspended materials and minimise suspension of sediments and associated contaminants in the Bay.

Proposed construction works based on concept design. The main physical features of the proposed bridge construction involving disturbance of soils and sediment, and with the potential for health and environmental impact, are listed as follows:

- Construction of 5 marine piled structures through the water column and sediments to bedrock to support the cantilevered section of the bridge. The marine piles would be installed from a barge or platform, and would involve driving precast piles and installation of pile caps above the existing sediments. During construction vessels (including propeller wash} may resuspend surficial sediments into the water column. Driving piles through the sediment would displace and locally resuspend materials into the water column.
- Driving piles at maximum 4.5m centres through the remediated area adjacent to the former Union Carbide site to support the eastern end of the bridge. The precast concrete piles will be driven through the water column, capping layer and sediments to bedrock. Driving piles through the sediment would displace and locally resuspend surficial materials into the water column. Piers located near the shoreline may be installed from a platform on-shore.
- Construction of 1 land pier and 2 abutments. Piles for these would be driven through the layers of fill soil and underlying natural soil into bedrock. Minor earthworks would be needed to create a level piling and work platform and involve placement of fill. Construction of pile caps may involve excavation and backfilling.
- Excavation of fill soils and natural soils landward of the two abutments and if practical, reuse and compaction of these materials in the same vicinity (engineered in situ fill).
- Importation and compaction of fill material over the engineered reused/fill soils.
- Construction of drainage in the filled zones.
- Construction of abutment walls and retaining structures involving earthworks near the foreshores of Homebush Bay.
- Removal of stockpiled waste soil (offsite disposal).
- The proposed bridge construction technique excludes dredging and bored piles, which have the potential for generation of contaminated spoil.

1.6 Auditor comments

The document is a good introduction to the project for the purposes of planning consent but the auditor will require further documentation to be more specific to ensure that processes and procedures will negate or minimise actual effects to the environment. The Director-General's Requirements (DGR) state that "A detailed assessment of the potential impacts…..and will need to include a thorough description of the methodology used in the assessment, justification for the methodology. Details of construction mitigation measure and proposed remedial works (if any)."

In undertaking his review, the Auditor notes the following:

- Additional detail on the curtain design should be provided, is it a single or double curtain, type etc.
- Proposed management/mitigation of disturbance of sediments via propeller wash from barges to be included with action criteria based on potential disturbance to the ecosystem.

- Proposed action levels/procedures to be undertaken if disturbed sediment is observed outside of the sediment barrier area. Proposed emergency response plans, turbidity, wind, inclement weather action levels.
- Proposed dust monitoring during earthworks/construction works on land. Proposed noise and control from machinery during construction works.
- Corrosion protection of bridge materials (i.e chemical attack from acid sulphate soils).
- Pollution incident response, appropriate action response based on diagnostic physicochemical parameters such as action levels for turbidity exceedences.
- Monitoring requirements (not sure if this will be included in the CEMP during detailed design).
- More detail on waste management (excavated/stockpiled material from land based earthworks).
- Responsibility (organisation chart, who is in charge etc), authority and communication. Works timeline should also be included.
- Erosion of sediment following pile installation (modelling of wave currents (hydrodynamics) or bathymetry etc).
- Details on stormwater protection from sediment runoff from land based activities.

The auditor understands that a specific environmental management plan (EMP) and an acid sulphate soil management plan will be prepared during the detailed design phase of the project before construction works commence. We look forward to seeing a number of the issues listed above addressed in these plans.

1.7 Conclusions

In preparing the **Interim Audit Advice 2**, the auditor has relied on the information provided in the report referenced on Page 2.

The Auditor comments above should be addressed when designing the bridge and preparing the contamination management plan. It is understood that construction management plans, environmental management plans and acid sulphate soil management plans will be prepared during the detailed design phase of the project and provided to the auditor before construction works commence.

✧ ✧ ✧ ✧

Thank you for your time in regard to this matter. Please do not hesitate to contact the undersigned if you require additional information or clarification.

Yours sincerely

Rod Harwood

OEH Accredited Contaminated Site Auditor (03-04)

From:	Dean Stafford
To:	"Javier Valderrama"; "Rod Harwood"
Cc:	"Rick Graf"; "Peter Rand"
Subject:	RE: HBB EA - auditor"s review
Date:	Monday, 20 February 2012 7:33:12 PM

Javier,

Rod has reviewed the reports and Golders should expand on the following before a SAR and SAS can be prepared/finalised:

EPA comment No 3 – The Auditor considers that he response from Golders is inappropriate from a political perspective. The Client, in this case EPA, have stated that there is insufficient text in relation to objectives. Stating that they are appropriate is like putting a red rag in front of a bull. The dots points should be expanded to address the uniqueness of the project. For example, an objective Golders could consider would be: construction of Homebush Bay bridge without disturbing known contaminated sediments.

EPA comment No 4 – Golders have still not fully outlined the extent of contamination in the Bay. A lot of detail is provided in Appendix B, however, more information should be added to Section 2.3 regarding contamination in the Bay compared to that of the bridge alignment and the depths of sample locations where maximum concentrations of contamination have been encountered and are still present or have been remediated. Details about extent of sediment contamination (e.g laterally and vertically) within the entire Bay and/or beyond should be included. To be consistent with EPA comments Golders should reiterate the range of concentrations of Dioxin found within the Bay and compare those to the concentration within the immediate area of the proposed bridge. Golders to detail the highest recorded concentration in the Bay and compare this to the levels quoted in the CMP to allow the reader to understand the difference in the perceived risk profile between the proposed bridge alignment and other parts of Homebush Bay.

EPA comment No 7 – The Auditor considers that the current CMP document contains too much data on the contamination levels which were encountered during remediation by Thiess. Whilst of interest, it detracts from the relevant conditions which will be encountered during the building of the bridge. The document needs to be forceful in stating that there will be no waste generated from the piling process (all references to waste classification of sediments and material under the cap on the Eastern shoreline should be removed) and to state that proposed construction works on the Eastern shoreline will be within inert capping material. The eastern shore bridge construction therefore will not encounter any of the toxic chemicals described and the text needs to reinforce this.

In relation to Wentworth Point, the only potential for offsite disposal of soil is if the shallow fill is removed offsite (to be classified as general solid or restricted solid waste as detailed in the ERM reports which have been completed for this area). Even at Wentworth Point it is understood that any ramp structures are likely to be provided as capping material above the existing sediments and may even be capped by imported VENM to meet the final reduced levels of the bridge footprint.

EPA comment No 10 – The Auditor agrees with the removal of Secchi disk as a turbidity monitoring tool, and replacing with a portable meter/logger and semi-permeable membrane devices. Golders to detail where turbidity loggers and SPMDs are to be installed. (i.e distance up and down gradient of constructions works, control point location and depths of sample

locations/monitoring locations) estimated sample logging frequency should also be included. The EA contains more detail (including an alarm detection process which the Auditor recommends) which is required within the CMP. The Auditor also questions why Golders consider that such detail is not relevant in the CMP. The Auditor notes that the CMP and EA are conflicting. The CMP says no secchi disk measurements, however, the EA (Section 13.5) says it will be both logging and secchi desk will be used.

Section 4.4 Golders should expand what are the three level trigger system. What are the three trigger levels (i.e turbidity at certain concentrations above control point?) and the proposed actions at each level? Some detail is included in the EA however further detail is required in the CMP.

The Auditor notes that EPA comment of section 13.2 and 13.2.1 (now Section 13.3, 13.3.1 and 13.3.2) have not been addressed and should be before final submission.

Regards,

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From: Javier Valderrama [mailto:Javier.Valderrama@arup.com.au]
Sent: Monday, 20 February 2012 6:03 PM
To: Rod Harwood
Cc: deanstafford@environmentalstrategies.com.au; Rick Graf; Peter Rand
Subject: HBB EA - auditor's review

Hi Rod/Dean,
How're you progressing with your review of the contamination report and contamination chapter of the EA?

Please email your comments as soon as possible so Golder have enough time produce an updated report tomorrow. Give me a call if you have any issues. Thanks.
Cheers,

Javier Valderrama
Senior Consultant

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