Melbourne Water Corporation

Area 4F of Riverwalk Estate, Princes Highway, Werribee, Victoria

Environmental Audit

December 2013

ENVIRONMENT PROTECTION ACT 1970

Statement of Environmental Audit

I, Dr Fouad Abo of GHD Pty Ltd 180 Lonsdale Street Melbourne, a person appointed by the Environment Protection Authority ('the Authority') under the *Environment Protection Act* 1970 ('the Act') as an environmental auditor for the purposes of the Act, having:

1. been requested by Mr Timm Kurth of Melbourne Water Corporation to issue a certificate of environmental audit in relation to the site located at Riverwalk Estate, Princes Freeway, Werribee, located in the Wyndham City Council, comprising the land defined by part of Lot B on Plan of Subdivision 636839Q, derived from Certificate of Title Volume 11367, Folio 778, (the surveyed site boundary and the relevant boundary coordinates are defined on the attached Figure 3), owned/occupied by Melbourne Water Corporation.
2. had regard to, amongst other things,
   i. guidelines issued by the Authority for the purposes of Part IXD of the Act,
   ii. the beneficial uses that may be made of the site, and
   iii. relevant State environment protection policies/industrial waste management policies, namely: State environment protection policy (Prevention and Management of Contamination of Land) 2002, State environment protection policy (Groundwaters of Victoria) 1997, State environment protection policy (Waters of Victoria) 2003, and State environment protection policy (Air Quality Management) 2001.

   in making a total assessment of the nature and extent of any harm or detriment caused to, or the risk of any possible harm or detriment which may be caused to, any beneficial use made of the site by any industrial processes or activity, waste or substance (including any chemical substance), and
3. completed an environmental audit report in accordance with section 53X of the Act, a copy of which has been sent to the Authority and the relevant planning and responsible authority.

HEREBY STATE that I am of the opinion that:

The site is suitable for the beneficial uses associated with:

- *Parks and Reserves; Agricultural; Sensitive use (i.e. high density, medium and single dwelling/low density residential use, child care centre, pre-school or primary school); Recreation/Open space; Commercial; and Industrial.*

subject to the following conditions attached thereto:

1. The former gravel track/road, which started at the southern apron of the former Hangar 4 and extended to area 4B (see Figure 3) together with other aesthetically unacceptable material such as the galvanised metal pipe and residual pieces of asbestos containing material (ACM) must be removed and disposed of as part of the site development work. Such remeoval and disposal must be conducted in accordance with relevant regulations and guidelines.
2. Any fill or soil brought to the site as part of the site proposed development must be chemically tested soil or fill that classifies as "fill material" in accordance with relevant EPA guidelines.

The condition of the site is detrimental or potentially detrimental to any (one or more) beneficial uses of the site. Accordingly, I have not issued a Certificate of Environmental Audit for the site in its current condition, the reasons for which are presented in the environmental audit report. The terms and conditions that need to be complied with before a Certificate of Environmental Audit may be issued are set out as follows:

- Any unsuitable material located on site (i.e. as stated in condition 1 above) must be removed in accordance with relevant EPA guidelines.

Other related information:

- Asbestos containing materials were found on the site, particularly in the vicinity of the former Hangar 4 (refer Figure 3), and have been removed as far as practicable. Small quantities of bonded asbestos containing material (ACM) fragments may remain on or within the soil and be uncovered during excavation works. These ACM fragments were not anticipated to represent a health risk; as discussed in the audit report to occupiers of the completed development. If encountered during future development or use of the site, any fragments should be handled and disposed of in accordance with the relevant regulations.
- A stormwater pipeline and a trunk sewer were still present on site as shown in the attached Figure 3.
- Waste generated in the future as a result of the future development works should be dealt with in accordance with relevant EPA guidelines.

This Statement forms part of the environmental audit report: *Melbourne Water Corporation, Area 4F of Riverwalk Estate, Princes Highway, Werribee, Victoria, December 2013.* Further details regarding the condition of the site may be found in the environmental audit report.

DATED: 17 December 2013

SIGNED: .....

DR FOUAD ABO

ENVIRONMENTAL AUDITOR
(Appointed Pursuant to the Environment Protection Act 1970)

REGISTER SEARCH STATEMENT (Title Search) Transfer of Land Act 1958

VOLUME 11367 FOLIO 778 Security no : 124043522685M
Produced 17/10/2012 04:20 pm

LAND DESCRIPTION

Lot B on Plan of Subdivision 636839Q.
PARENT TITLE Volume 11309 Folio 105
Created by instrument PS636839Q 02/08/2012

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
MELBOURNE WATER CORPORATION of 990 LA TROBE STREET DOCKLANDS VIC 3008
PS636839Q 02/08/2012

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

NOTICE as to part Section 47(2) Heritage Act 1995
REGISTER NO. 1884
X234908X 29/12/2000

AGREEMENT Section 173 Planning and Environment Act 1987
AG017913K 08/08/2008

DIAGRAM LOCATION

SEE PS636839Q FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NUMBER		STATUS	DATE
PS636839Q (S)	PLAN OF SUBDIVISION	Registered	02/08/2012

DOCUMENT END

Delivered from the LANDATA® System by InfoTrack Pty Ltd.

Signed by Council: Wyndham City Council, Council Ref: WYP4474/10, WYS1815/11, Original Certification: 30/06/2011, Recertification: 04/06/2012, S.O.C.: 20/07/2012

PLAN OF SUBDIVISION

STAGE NO	LRS USE ONLY	PLAN NUMBER
———	EDITION 1	PS 636839Q

LOCATION OF LAND

PARISH: MAMBOURIN
TOWNSHIP: WERRIBEE
CROWN ALLOTMENTS: 22A (PART) & 10A (PART)

PARISH: MAMBOURIN
CROWN ALLOTMENTS: 4A, 5A, 6A, 7A, 8A & 9A
CROWN ALLOTMENTS: G (PT) & H (PT) SECTION 7
CROWN ALLOTMENT: 7 (PT) & 8 (PT) SECTION 8

LAST PLAN REF: PS 641301K LOT A
TITLE REFERENCE: VOL 11309 FOL 105

POSTAL ADDRESS: CNR PRINCES HIGHWAY & MALTBY BYPASS WERRIBEE 3030

MGA CO-ORDINATES OF APPROX. CENTRE OF LAND IN PLAN: E 292 680 N 5 800 580 ZONE 55

VESTING OF ROADS OR RESERVES

IDENTIFIER	COUNCIL/BODY/PERSON
R1 (ROAD)	WYNDHAM CITY COUNCIL
RESERVE No.1	POWERCOR AUSTRALIA LTD

COUNCIL CERTIFICATION AND ENDORSEMENT

COUNCIL NAME: WYNDHAM CITY COUNCIL REF:

(1) THIS PLAN IS CERTIFIED UNDER SECTION 6 OF THE SUBDIVISION ACT 1988.
(2) THIS PLAN IS CERTIFIED UNDER SEC. 11(7) OF THE SUBDIVISION ACT 1988. DATE OF ORIGINAL CERTIFICATION UNDER SECTION 6 / /
(3) THIS IS A STATEMENT OF COMPLIANCE ISSUED UNDER SECTION 21 OF THE SUBDIVISION ACT 1988

OPEN SPACE:
(A) A REQUIREMENT FOR PUBLIC OPEN SPACE UNDER SECTION 18 OF THE SUBDIVISION ACT 1988 HAS NOT BEEN MADE
(B) THE REQUIREMENT HAS BEEN SATISFIED
(C) THE REQUIREMENT IS TO BE SATISFIED IN STAGE:

COUNCIL DELEGATE
COUNCIL SEAL
SURVEYOR'S PLAN VERSION
DATE / /

RE-CERTIFIED UNDER SECTION 11(7) OF THE SUBDIVISION ACT 1988
COUNCIL DELEGATE
COUNCIL SEAL
SURVEYOR'S PLAN VERSION
DATE / /

NOTATIONS

DEPTH LIMITATION:
DOES NOT APPLY

THIS IS A SPEAR PLAN

STAGING:
THIS IS NOT A STAGED SUBDIVISION
PLANNING PERMIT NO: WYP4474/10

SURVEY:
THIS PLAN IS BASED ON SURVEY (PS 636838S)
THIS SURVEY HAS BEEN CONNECTED TO PERMANENT MARKS:
IN PROCLAIMED SURVEY AREA NUMBER:

OTHER PURPOSE OF PLAN:
TO REMOVE PART OF EASEMENT E-6 ON PS 641301K AND CREATED IN PS 636838S AND AFFECTING ROAD R1 ON THIS PLAN.

GROUNDS FOR EASEMENT REMOVAL:
WYNDHAM CITY COUNCIL
PLANNING PERMIT No. WYP4613/10

LOTS 1 TO 117 (BOTH INCLUSIVE) & LOT A HAVE BEEN OMITTED FROM THIS PLAN

RIVERWALK RELEASE 2

EASEMENT INFORMATION

LEGEND: A - APPURTENANT EASEMENT E - ENCUMBERING EASEMENT R - ENCUMBERING EASEMENT (ROAD)

EASEMENT REFERENCE	PURPOSE	WIDTH (METRES)	ORIGIN	LAND BENEFITED/IN FAVOUR OF
			SEE SHEET 2	

LRS USE ONLY

STATEMENT OF COMPLIANCE
EXEMPTION STATEMENT
RECEIVED ☑
DATE 23/07/12

LRS USE ONLY
PLAN REGISTERED
TIME 11:17am
DATE 2/08/12
G Venn
ASSISTANT REGISTRAR OF TITLES

SHEET 1 OF 12 SHEETS

CHRIS RUNTING & ASSOCIATES PTY LTD
LAND SURVEYORS
TOWN PLANNERS
DEVELOPMENT CONSULTANTS
20 Hamilton Street
Mont Albert Vic 3127
Tel: 9890 0933
Fax: 9898 2543

LICENSED SURVEYOR: P.J.S. TYNKKYNEN
SIGNATURE: DIGITALLY SIGNED
REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /
COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

Signed by: Paavo Jukka Tynkkynen (Chris Runting & Associates Pty Ltd) Surveyor's Plan Version (23 (4.05.12)) SPEAR Ref S011384A 07/05/2012

Signed by Council: Wyndham City Council, Council Ref: WYP4474/10, WYS1815/11, Original Certification: 30/06/2011, Recertification: 04/06/2012, S.O.C.: 20/07/2012

PLAN OF SUBDIVISION

STAGE NO ——

PLAN NUMBER **PS 636839Q**

EASEMENT INFORMATION

LEGEND: A - APPURTENANT EASEMENT E - ENCUMBERING EASEMENT R - ENCUMBERING EASEMENT (ROAD)

EASEMENT REFERENCE	PURPOSE	WIDTH (METRES)	ORIGIN	LAND BENEFITED/IN FAVOUR OF
E-1	SEWERAGE	3	PS412756U	CITY WEST WATER LIMITED
E-2	SEWERAGE	2.50	PS636838S	CITY WEST WATER LIMITED
E-3	DRAINAGE	3	PS641301K	WYNDHAM CITY COUNCIL
	SEWERAGE	3	PS641301K	CITY WEST WATER LIMITED
E-4	SEWERAGE	2	PS641301K	CITY WEST WATER LIMITED
E-5	DRAINAGE	2	PS641301K	WYNDHAM CITY COUNCIL
E-6	DRAINAGE	SEE PLAN	PS636838S	WYNDHAM CITY COUNCIL
	SEWERAGE	SEE PLAN	PS636838S	CITY WEST WATER LIMITED
E-7	DRAINAGE	SEE PLAN	PS636838S	WYNDHAM CITY COUNCIL
E-8	SEWERAGE	2	PS636838S	CITY WEST WATER LIMITED
E-9	DRAINAGE	2	PS636838S	WYNDHAM CITY COUNCIL
E-10	POWERLINE	SEE PLAN	PS636838S - SEC 88 ELECTRICITY INDUSTRY ACT 2000	POWERCOR AUSTRALIA LTD
E-11	DRAINAGE	2	THIS PLAN	WYNDHAM CITY COUNCIL
E-12	SEWERAGE	2	THIS PLAN	CITY WEST WATER LIMITED
E-13	DRAINAGE	3	THIS PLAN	WYNDHAM CITY COUNCIL
	SEWERAGE	3	THIS PLAN	CITY WEST WATER LIMITED
E-14	DRAINAGE	SEE PLAN	PS636838S	MELBOURNE WATER CORPORATION
E-15	SEWERAGE	2.50	PS636838S	CITY WEST WATER LIMITED
	DRAINAGE	2.50	PS636838S	MELBOURNE WATER CORPORATION
E-16	DRAINAGE	4	THIS PLAN	WYNDHAM CITY COUNCIL
E-17	SEWERAGE	2	THIS PLAN	CITY WEST WATER LIMITED
E-18	DRAINAGE	SEE PLAN	THIS PLAN	WYNDHAM CITY COUNCIL
	SEWERAGE	SEE PLAN	THIS PLAN	CITY WEST WATER LIMITED
E-19	DRAINAGE	SEE PLAN	PS636838S	MELBOURNE WATER CORPORATION
	SEWERAGE	SEE PLAN	THIS PLAN	CITY WEST WATER LIMITED
E-20	POWERLINE	1.50	THIS PLAN - SEC 88 ELECTRICITY INDUSTRY ACT 2000	POWERCOR AUSTRALIA LTD

RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha

SHEET 2

CHRIS RUNTING & ASSOCIATES PTY LTD
LAND SURVEYORS
TOWN PLANNERS
DEVELOPMENT CONSULTANTS
20 Hamilton Street
Mont Albert Vic 3127
Tel: 9890 0933
Fax: 9898 2543

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /

..... COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

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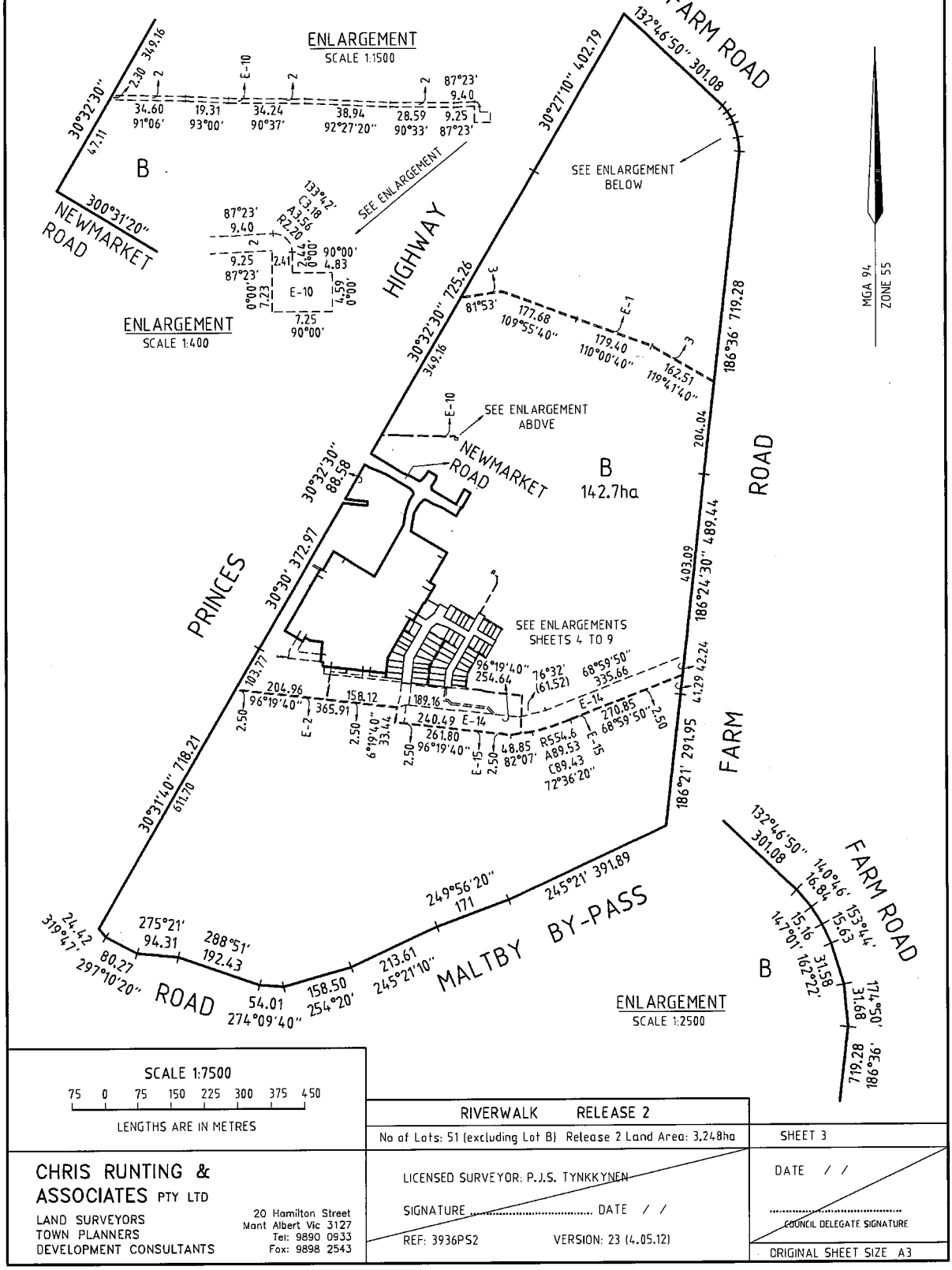
PLAN OF SUBDIVISION

STAGE NO —

PLAN NUMBER **PS 636839Q**



SCALE 1:7500

75 0 75 150 225 300 375 450

LENGTHS ARE IN METRES

RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha

SHEET 3

CHRIS RUNTING & ASSOCIATES PTY LTD
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LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

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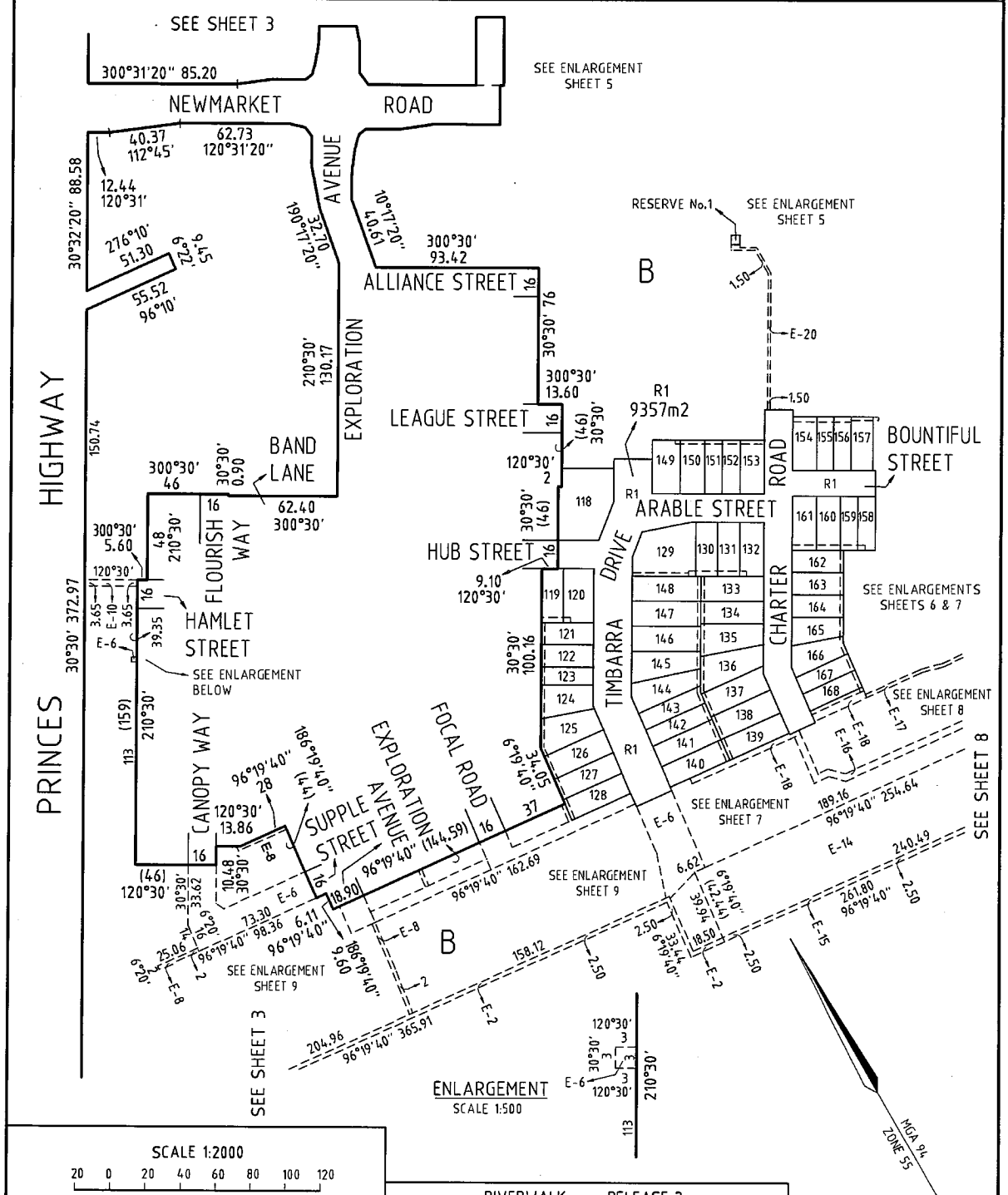
PLAN OF SUBDIVISION

STAGE NO —

PLAN NUMBER PS 636839Q



RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha

SHEET 4

CHRIS RUNTING & ASSOCIATES PTY LTD
LAND SURVEYORS
TOWN PLANNERS
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Mont Albert Vic 3127
Tel: 9890 0933
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LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

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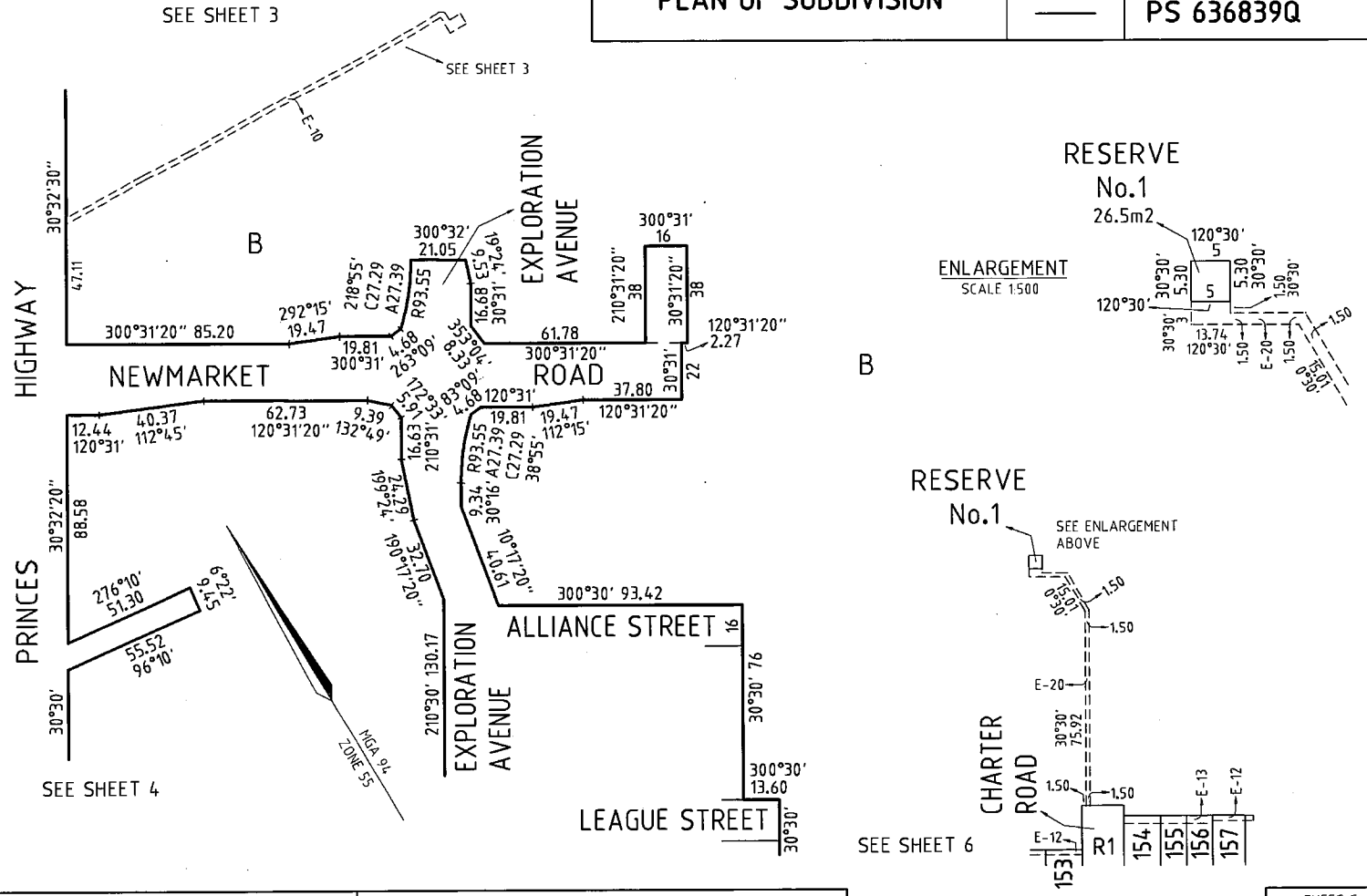
PLAN OF SUBDIVISION

STAGE NO	PLAN NUMBER
——	PS 636839Q



RIVERWALK RELEASE 2	No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha	SHEET 5

CHRIS RUNTING & ASSOCIATES PTY LTD
LAND SURVEYORS
TOWN PLANNERS
DEVELOPMENT CONSULTANTS
20 Hamilton Street
Mont Albert Vic 3127
Tel: 9890 0933
Fax: 9898 2543

SCALE 1:1500

15 0 15 30 45 60 75 90

LENGTHS ARE IN METRES

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

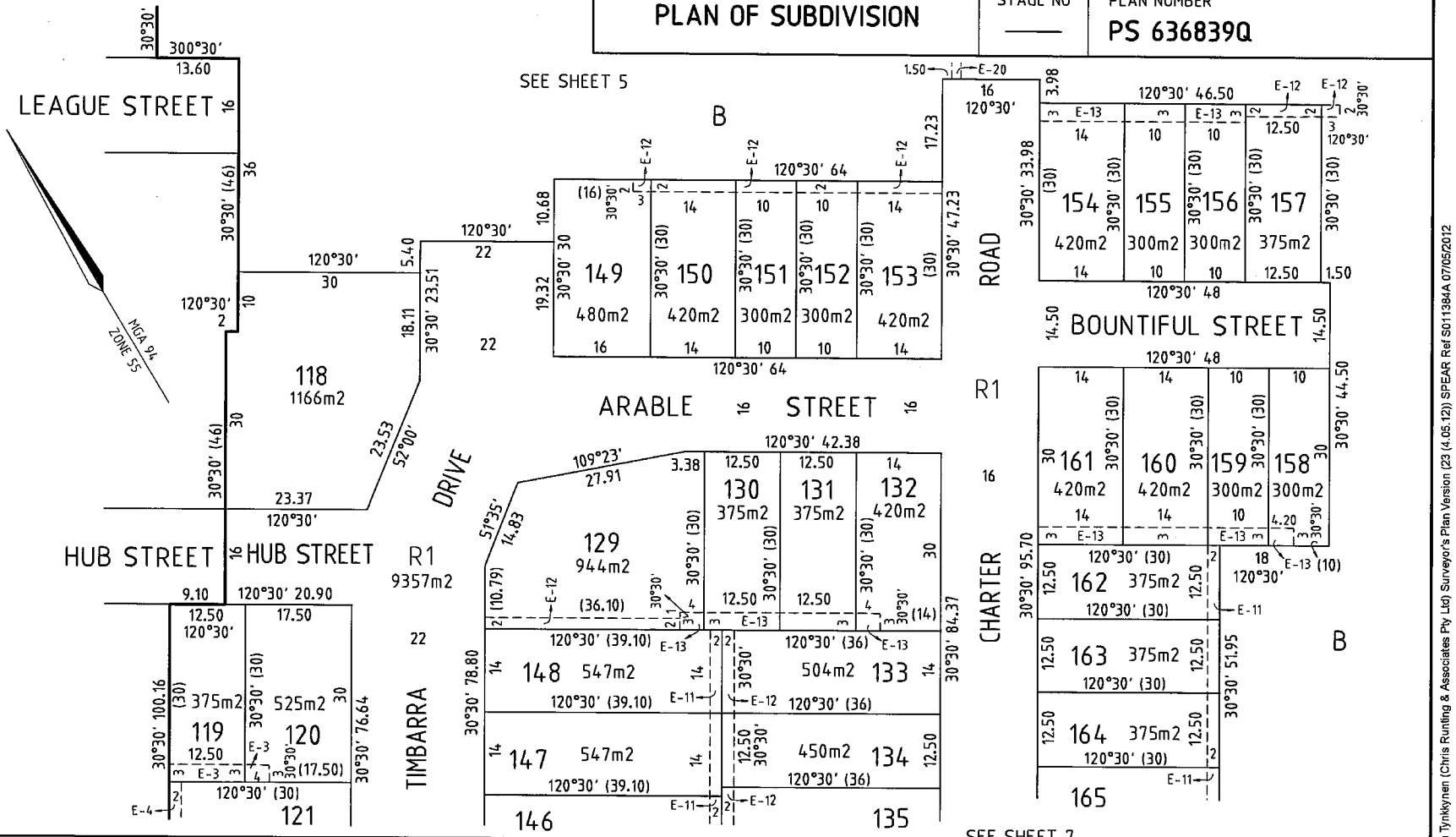
DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

PLAN OF SUBDIVISION

STAGE NO	PLAN NUMBER
——	PS 636839Q



RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha

CHRIS RUNTING & ASSOCIATES PTY LTD
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DEVELOPMENT CONSULTANTS
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SCALE 1:600

6 0 6 12 18 24 30 36

LENGTHS ARE IN METRES

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

SHEET 6

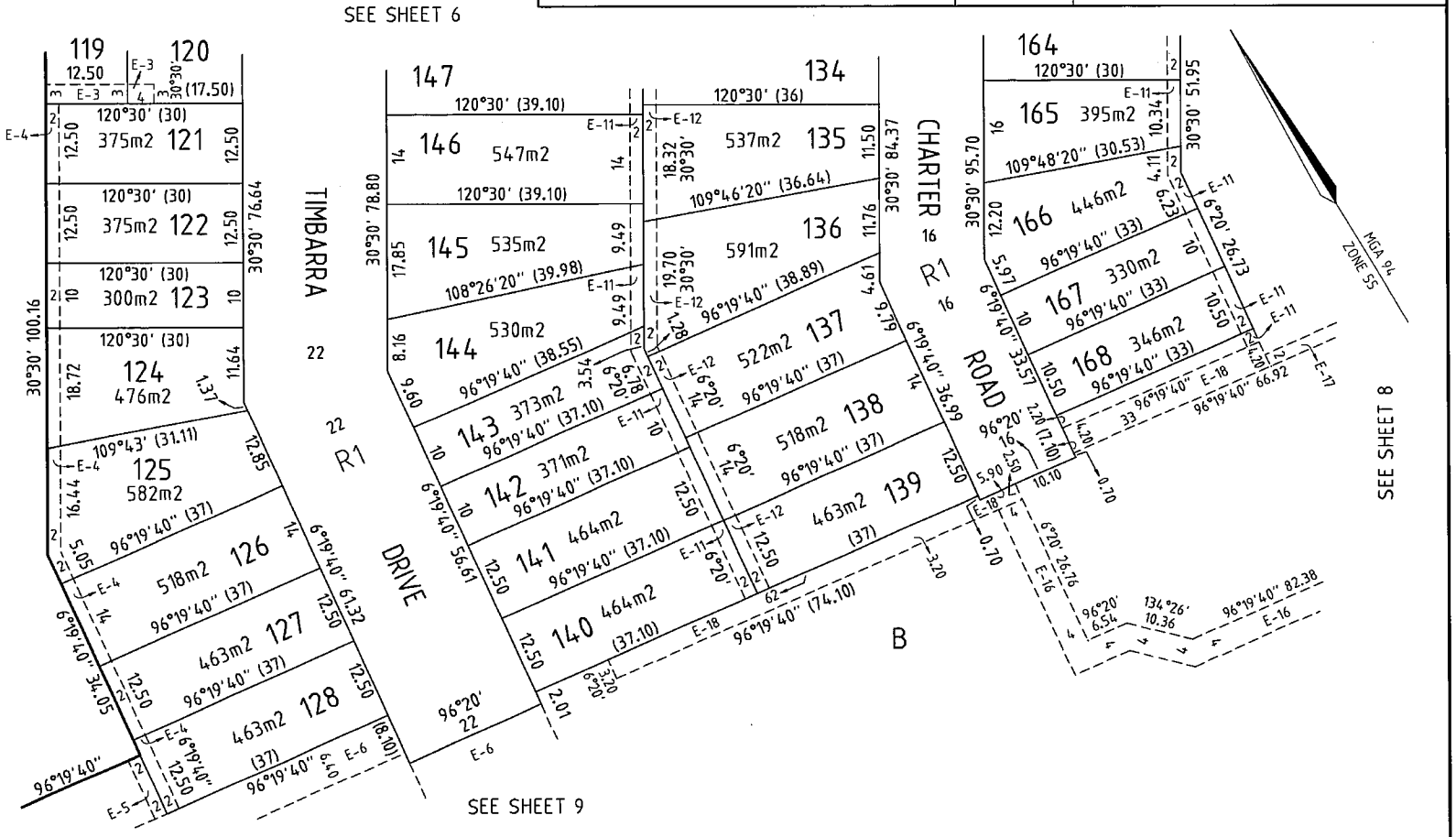
DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

PLAN OF SUBDIVISION

STAGE NO	PLAN NUMBER
——	PS 636839Q



RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha

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DEVELOPMENT CONSULTANTS
20 Hamilton Street
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Fax: 9898 2543

SCALE 1:600

6 0 6 12 18 24 30 36

LENGTHS ARE IN METRES

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

SHEET 7

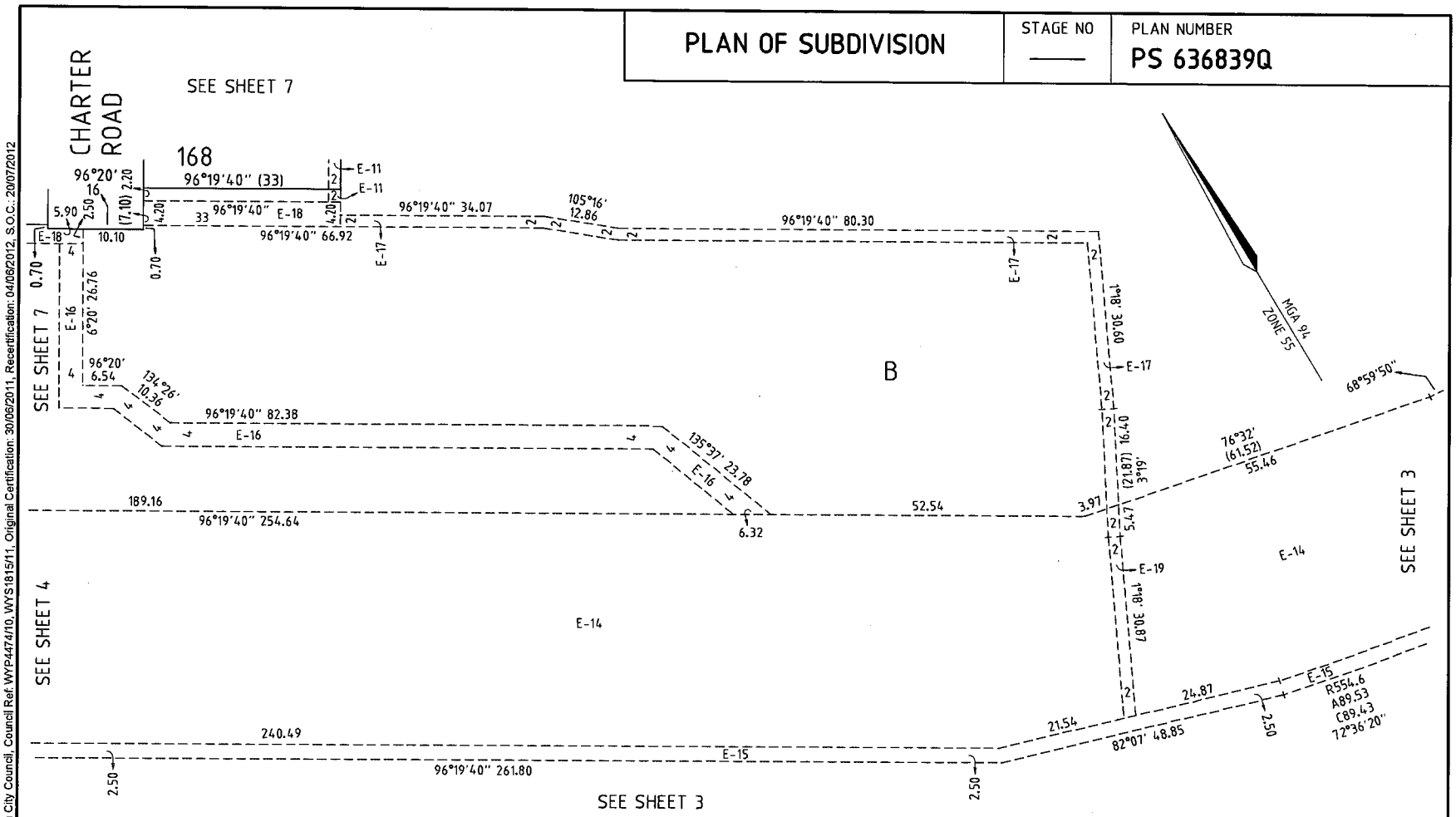
DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

PLAN OF SUBDIVISION

STAGE NO	PLAN NUMBER
——	PS 636839Q



RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha

SHEET 8

CHRIS RUNTING & ASSOCIATES PTY LTD
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SCALE 1:600

6 0 6 12 18 24 30 36

LENGTHS ARE IN METRES

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

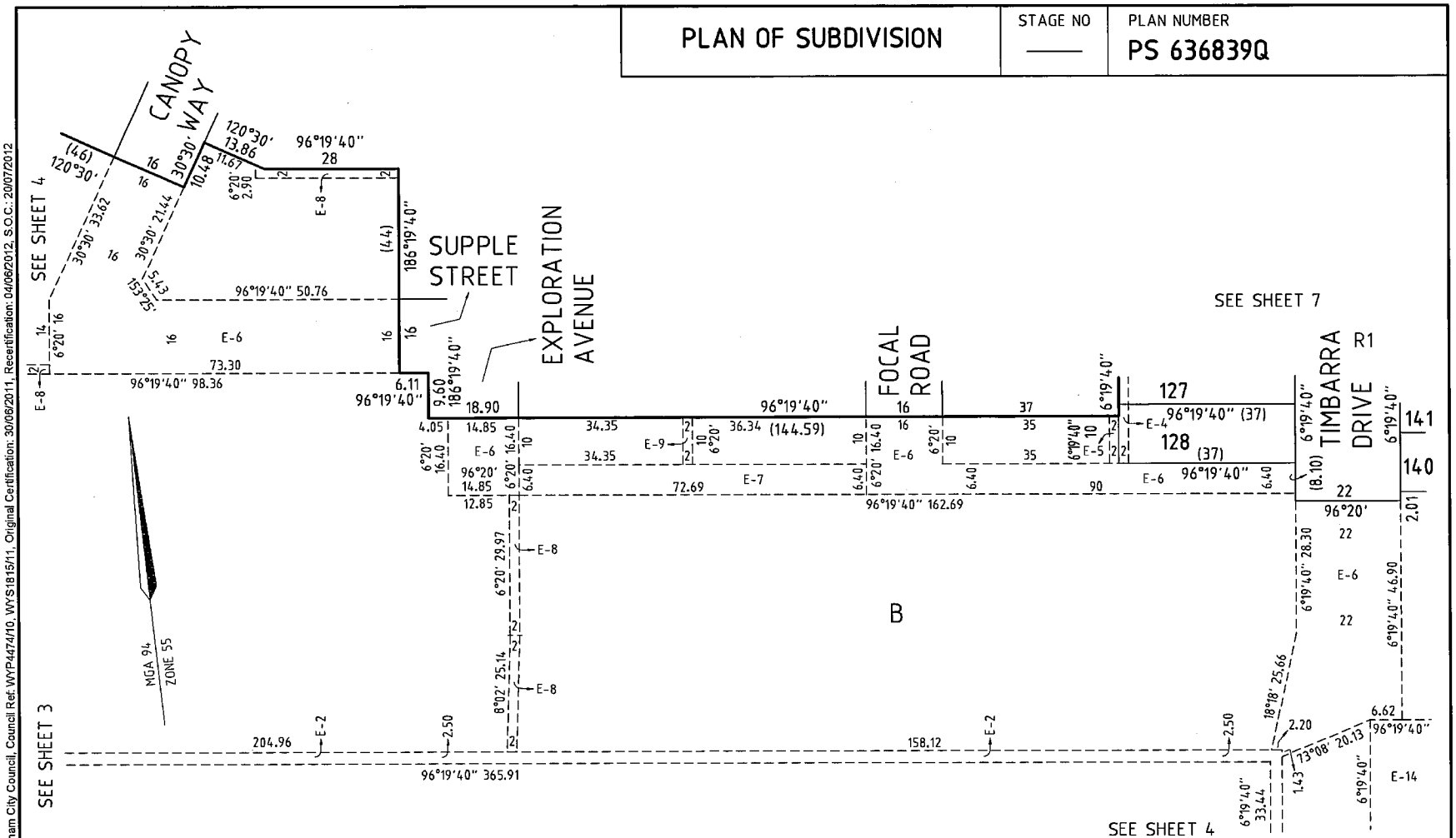
DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

PLAN OF SUBDIVISION

STAGE NO	PLAN NUMBER
——	PS 636839Q



RIVERWALK RELEASE 2	No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha	SHEET 9
CHRIS RUNTING & ASSOCIATES PTY LTD LAND SURVEYORS TOWN PLANNERS DEVELOPMENT CONSULTANTS 20 Hamilton Street Mont Albert Vic 3127 Tel: 9890 0933 Fax: 9898 2543	SCALE 1:750 7.5 0 7.5 15 22.5 30 37.5 45 LENGTHS ARE IN METRES	LICENSED SURVEYOR: P.J.S. TYNKKYNEN SIGNATURE ..... DATE / / REF: 3936PS2 VERSION: 23 (4.05.12)
		DATE / / COUNCIL DELEGATE SIGNATURE ORIGINAL SHEET SIZE A3

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	PLAN OF SUBDIVISION	STAGE NO	PLAN NUMBER
		——	PS 636839Q

CREATION OF RESTRICTION "A"

LAND BURDENED AND LAND BENEFITED: REFER TO TABLE 1

DESCRIPTION OF RESTRICTION

The registered proprietor or proprietors for the time being of any burdened lot on this plan to which this restriction applies shall not build or permit to be built or remain on the lot any building other than a building which has been constructed in accordance with endorsed memorandum of common provisions registered in dealing no AA2033 which memorandum of common provisions is incorporated into this plan.

This restriction shall cease to have affect 10 years after the date of registration of this plan.

CREATION OF RESTRICTION "B"

LAND BURDENED AND LAND BENEFITED: REFER TO TABLE 1

DESCRIPTION OF RESTRICTION

The registered proprietor or proprietors for the time being of any burdened lot must not:

B1 build or erect or permit to be built or erected or remain on the burdened lot or any part of it, any building or structure other than a building or structure which has been constructed in accordance with plans, drawings, designs and specifications which have first been approved in writing by Places Victoria ABN 61 868 774 623 in accordance with Places Victoria's Riverwalk Design Requirements and Controls as amended from time to time;

B2 erect or allow any signs to remain on the burdened lot other than the following:

- B2.1 where a dwelling constructed on the burdened lot has been completed and is offered for sale (but not if the burdened lot remains vacant or the dwelling is partly completed and is offered for sale) any real estate agent's "for sale" sign not exceeding 2.4 metres x 1.8 metres; or
- B2.2 during the period of construction of a dwelling on the burdened lot signs of builders and tradespersons who are carrying out construction work on the burdened lot;

B3 use the burdened lot or any part of it as a display home except with Places Victoria's prior written consent.

Restriction B shall cease to have affect 10 years after the date of registration of this plan.

RIVERWALK RELEASE 2 No of Lots: 51 (excluding Lot B) Release 2 Land Area: 3.248ha		SHEET 10
CHRIS RUNTING & ASSOCIATES PTY LTD LAND SURVEYORS TOWN PLANNERS DEVELOPMENT CONSULTANTS 20 Hamilton Street Mont Albert Vic 3127 Tel: 9890 0933 Fax: 9898 2543	LICENSED SURVEYOR: P.J.S. TYNKKYNEN SIGNATURE ..... DATE / / REF: 3936PS2 VERSION: 23 (4.05.12)	DATE / / ..... COUNCIL DELEGATE SIGNATURE ORIGINAL SHEET SIZE A3

Signed by: Paavo Jukka Tynkkynen (Chris Runting & Associates Pty Ltd) Surveyor's Plan Version (23 (4.05.12)) SPEAR Ref S011384A 07/05/2012

Signed by Council: Wyndham City Council, Council Ref: WYP4474/10, WYS1815/11, Original Certification: 30/06/2011, Recertification: 04/06/2012, S.O.C.: 20/07/2012

	PLAN OF SUBDIVISION	STAGE NO	PLAN NUMBER
		———	PS 636839Q

CREATION OF RESTRICTION "C"

UPON REGISTRATION OF THIS PLAN OF SUBDIVISION THE FOLLOWING RESTRICTION IS CREATED

LAND BURDENED AND LAND BENEFITED:

LAND TO BE BURDENED:
Lots 118 to 168 (inclusive)

LAND TO BENEFIT:
Lot F on Plan of Subdivision number PS636838S

DESCRIPTION OF RESTRICTION
The registered proprietor or proprietors for the time being of a burdened lot:

1. shall not develop a burdened lot, permit a burdened lot to be developed or permit a burdened lot to remain developed, other than in accordance with the Places Victoria Fibre To The Home Building Guidelines; and
2. must not occupy a dwelling on a burdened lot and must not obtain or procure an Occupancy Permit under the Building Act 1993 (Vic) for a dwelling on a burdened lot, prior to Places Victoria issuing a Fibre To The Home compliance certificate in respect of the dwelling on the burdened lot.

This restriction applies for the period from the date of registration of this Plan of Subdivision until the date that is 10 years after the issuing of an Occupancy Permit under the Building Act 1993 (Vic) in respect of the dwelling on the burdened lot.

RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B)
Release 2 Land Area: 3.248ha

SHEET 11

CHRIS RUNTING & ASSOCIATES PTY LTD
LAND SURVEYORS
TOWN PLANNERS
DEVELOPMENT CONSULTANTS
20 Hamilton Street
Mont Albert Vic 3127
Tel: 9890 0933
Fax: 9898 2543

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /

.....
COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

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	PLAN OF SUBDIVISION	STAGE NO	PLAN NUMBER
		———	PS 636839Q

TABLE 1

LAND BURDENED AND LAND BENEFITED – REFER RESTRICTIONS "A" AND "B"

CREATION OF RESTRICTION

BURDENED LOT No	BENEFITING LOTS
118	120, 129, 149
119	120, 121
120	119, 121
121	119, 120, 122
122	121, 123
123	122, 124
124	123, 125
125	124, 126
126	125, 127
127	126, 128
128	127
129	130, 148
130	129, 131, 133, 148
131	130, 132, 133
132	131, 133
133	130, 131, 132, 134, 148
134	133, 135, 147
135	134, 136, 145, 146, 147
136	135, 137, 143, 144, 145
137	136, 138, 142, 143
138	137, 139, 141, 142
139	138, 140
140	139, 141
141	138, 140, 142
142	137, 138, 141, 143
143	136, 137, 142, 144

BURDENED LOT No	BENEFITING LOTS
144	136, 143, 145
145	135, 136, 144, 146
146	135, 145, 147
147	134, 135, 146, 148
148	129, 130, 133, 147
149	150
150	149, 151
151	150, 152
152	151, 153
153	152
154	155
155	154, 156
156	155, 157
157	156
158	159
159	158, 160, 162
160	159, 161, 162
161	160, 162
162	159, 160, 161, 163
163	162, 164
164	163, 165
165	164, 166
166	165, 167
167	166, 168
168	167

RIVERWALK RELEASE 2

No of Lots: 51 (excluding Lot B)

Release 2 Land Area: 3.248ha

SHEET 12

CHRIS RUNTING & ASSOCIATES PTY LTD

LAND SURVEYORS
TOWN PLANNERS
DEVELOPMENT CONSULTANTS

20 Hamilton Street
Mont Albert Vic 3127
Tel: 9890 0933
Fax: 9898 2543

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /

.....
COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

Signed by: Paavo Jukka Tynkkynen (Chris Runting & Associates Pty Ltd) Surveyor's Plan Version (23 (4.05.12)) SPEAR Ref S011384A 07/05/2012

wyndham
city council

Plan of Subdivision PS636839Q

Certifying a New Version of an Existing Plan (Form 21)

SUBDIVISION (PROCEDURES) REGULATIONS 2000

SPEAR Reference Number: S011384A
Plan Number: PS636839Q
Responsible Authority Name: Wyndham City Council
Responsible Authority Reference Number 1: WYP4474/10
Responsible Authority Reference Number 2: WYS1815/11
Surveyor's Plan Version: 23 (4.05.12)

Certification

This plan is certified under section 11 (7) of the Subdivision Act 1988
Date of original certification under section 6: 30/06/2011
Date of previous recertifications under Section 11(7): 16/04/2012

Public Open Space

A requirement for public open space under section 18 of the Subdivision Act 1988

Has not been made

Digitally signed by Council Delegate: Peter Van Til
Organisation: Wyndham City Council
Date: 04/06/2012

Signed by: Peter William Van Til (Wyndham City Council) 04/06/2012

LEGEND

Audit Areas

Historic Site Infrastructure:

- Hanger Footprint
- Energency Powerhouse
- Septic System
- Galvonised Metal Pipe (additional section)
- Stormwater Pipeline
- Trunk Sewer
- Asbestos and Galvonised Metal Water Pipe

Note: The data displayed in this figure has been digitised from images extracted from the following reports; OTEK (2013) *Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria* and OTEK (2011) *Remediation Action Plan - Version 3 (Soil Contamination Sub-Area 4B)* . Therefore GHD cannot guarantee the accuracy of this data. **This figure should only be viewed as a point of reference.**

1:600 at A3

0 6 12 18 24

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Melbourne Water
Environmental Audit of Area 4F, Riverwalk Estate, Princes Highway, Werribee

Job Number 31/1157500
Revision 0
Date 16 Dec 2013

Audit Area 4F - OTEK Environmental Site Assessment Historic Site Infrastructure

Figure 3

G:\31\1157500\Cad\GIS\Maps\Deliverables\Area_4F\31157500_003_Historical_Site_Infrastructure_A3P_r2.mxd

Data source: Historic Site Infrastructure, OTEK 2013; Audit Boundaries, DTEK 2012; and Background Imagery (2009), Google Earth Pro 16/05/2013. Created by spalen

180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Executive summary

Table 1 Summary of audit information

Summary information required	
EPA file reference no.	41460-8
Auditor	Dr Fouad Abo of GHD Pty Ltd
Auditor term of appointment	7 January 1997 to 26 July 2016
Name of person requesting audit	Mr Timm Kurth of Melbourne Water Corporation (Melbourne Water)
Relationship to premises / location	Property Sales Manager
Date of request	Melbourne Water first requested an audit of the Riverwalk Estate (Overall Audit Area), including Area 4F in 15 March 2000. Due to the development timing requirements, Melbourne Water decided to request a separate audit for this Area (4F). The request for the audit of Area 4F was on 8 July 2009.
Date EPA notified of audit	The Riverwalk Estate was originally to be audited as one audit, hence the auditor notified EPA as such on 15 March 2000. As explained in Section 1.1 of this report, for ease of audit and to meet the development schedule, Melbourne Water later decided to divide the site into a number of "sub"-Areas and audit each of these Areas separately. Accordingly, the Auditor notified EPA of the request to undertake an audit of Area 4F specifically on 13 July 2009.
Completion date of the audit	17 December 2013
Reason for audit	Due diligence associated with a proposed zoning change.
Current land use zoning	Residential 1 Zone (R1Z) under the Wyndham City Council Planning Scheme.
EPA region	West Metro.
Municipality	Wyndham City Council.
Dominant – Lot on plan	The site is defined as part of Lot B on Plan of Subdivision 636839Q, on Certificate of Title Volume 11367, Folio 778. The surveyed site boundary and the relevant boundary coordinates are defined on the attached Figure 3.
Additional – Lot on plan	
Site/premises name	Riverwalk Estate.
• Street/Lot – Lower No.	
• Street/Lot – Upper No.	
• Street Name	Princes
• Street type (road, court, etc.)	Highway
• Street suffix (North, South etc.)	
• Suburb	Werribee

Summary information required	
• Postcode	3030
GIS Coordinate of Site centroid • Longitude / Northing (GDA94) • Latitude / Easting (GDA94)	Northing 5801038.749.
	Easting 293171.1722.
Site Area (hectares)	1.98 ha.
Members and categories of support team utilised	None.
Outcome of the audit	Statement of Environmental Audit.
Further works or requirements	As per the Statement of Environent Audit.
Nature and extent of continuing risk	None.

***NB – Leave cell blank if not applicable**

Table 2 Physical site information

Summary information required	
Site aquifer formation	Newer Volcanics and Brighton Group Formations are located in the vicinity of the site. Wells at the site were installed within the Newer Volcanics aquifer.
Average depth to groundwater	12 to 17.8 mbgl.
Groundwater segment	Segment C.
Groundwater flow direction	Groundwater flow is expected to be the east towards the Werribee River, which flows approximately north-south and is located approximately 700 m to the east of Area 4F (at its closest point). Regionally, the flow is expected to be to the south east toward Port Phillip Bay located approximately 7 km to the south east of the site.
Past use/site history	Dairy farming, stock grazing, Melbourne Water Activities and RAAF occupation.
Surrounding land use	North: Area 4D (for which and Environmental Audit is currently underway). West: Area 4D (for which and Environmental Audit is currently underway). East: Area 4I (for which and Environmental Audit is currently underway). South: Area 4B (for which and Environmental Audit is currently underway).
Proposed future use	The site is proposed to be used for mixed use, including retail, commercial, medium and low density residential use.

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1. Introduction

1.1 Background

A large portion of Melbourne Water Corporation's (Melbourne Water) Farm Road site, called the Riverwalk Estate is under Environmental Audit (herein referred to as the 'Overall Audit Area'). Melbourne Water voluntarily initiated an environmental assessment (undertaken by OTEK Pty Ltd (OTEK)) and environmental audit as a due diligence measure. The Overall Audit Area is roughly triangular in shape and comprises approximately 200 hectares. The current Melbourne Water operations office and Discovery Centre will remain onsite and are not subject to an audit. The locality of the Overall Audit Area is shown on Figure 1.

In order to simplify the audit process and allow for Areas with specific issues and development times to be considered separately, the Overall Audit Area was divided into the following 13 "Sub-Areas": 1, 2, 3, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 4H, 4I, and 5 (herein referred to as 'Areas'). Audits for a number of these areas were completed. The remainder of the Areas were under audit at the time of reporting. Figure 2 shows the majority of the Overall Audit Area with the exception of the full extent of Area 2 and Area 3. Area 2 extends further to the south, while Area 3 is located to the east and south of Area 4C. The full extent of the Riverwalk Estate (including the full extent of the Overall Audit Area) is shown on the proposed development plan attached as Appendix F.

This audit report pertains to Area 4F only, herein referred to as 'the site'. The total area of the site is 1.98 hectares. The site boundary is shown on Figure 5.

The site was part of the Riverwalk Estate, which was proposed to be developed for residential purpose (with lot sizes between 300 m^2 and 600 m^2; which, in accordance with EPAV Publication 759.1 (2007) is defined as 'Residential – single dwelling' and 'medium-density') and associated uses such as public open space and recreation areas.

1.2 Purpose

This Environmental Audit Report sets out the results of an Environmental Audit conducted for the Site in accordance with Part IXD of the Environment Protection Act, 1970. The report was completed in accordance with the guidelines issued by the EPA for environmental audit of contaminated sites in Victoria.

1.3 Input to this report by auditor's support team

The GHD staff that assisted with this audit are provided in Table 3. No members of the Auditor's support team were involved with this audit.

Table 3 Auditor's team assisting with audit

Name	Qualification/Role/ Experience Area	Contribution to audit
Kate Fairway	Project Manager / Auditor's assistant (GHD Staff)-	Assisted in the auditing process, assisted in preparation the draft environmental audit report and inspected the site.
Julie Davies	Auditor's assistant (GHD Staff)	Assisted in reviewing the consultant assessment report and the preparation of the draft environmental audit report.

Name	Qualification/Role/ Experience Area	Contribution to audit
Venetia Stewart	Auditor's assistant (then GHD Staff)	Assisted in the auditing process, inspected the site.
Elvira Ryan	Auditor's assistant (GHD Staff)	Assisted in the auditing process, inspected the site.

1.4 Documents reviewed

The following documents relating to the Overall Audit Area were reviewed as part of the audit process:

- Sinclair Knight Merz Pty Ltd (SKM), 17 February 1993, Report 5V3590001.rp1 (only incomplete report provided).
- Biosis Research Pty Ltd (Biosis), March 2000, *Werribee Field, Victoria: An Archaeological and Cultural Heritage Survey,* Appendix B.
- Milsearch Pty Ltd (Milsearch), April 2000, *A Review of World War II-ERA Military Activity at Werribee Fields* (Milsearch 2000), Appendix B.
- Enterra Pty Ltd (Enterra), 31 May 2001, *Werribee Fields Development – Sub Surface Investigation* (Enterra 2000), Appendix B.
- OTEK, 10 October 2002, *Phase One Report, Werribee Fields, Werribee, Victoria*, (OTEK, 2002), Appendix C.

These reports are discussed in more detail in Section 2.8.1.

In addition, at times the auditor has referred to data pertaining to other audits being undertaken in the Overall Audit area. Where applicable the relevant assessment reports have been referenced.

The following report related directly to the site and hence was also reviewed and relied upon as part of the audit:

- OTEK, 1 February 2013, *Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Victoria,* (OTEK 2013), Appendix D.

1.5 Audit methodology

Melbourne Water engaged OTEK AUSTRALIA Pty Ltd ("OTEK")) to undertake the environmental assessment and subsequent infrastructure removal and remediation works in 2000, where the engagement was for the overall audit Site. OTEK conducted all the works mentioned above as the environmental assessor for the purpose of issuing audits for the different areas of the Site until 30 April 2013. During these years a number of assessments were completed and finalised by OTEK and the auditor has issued a number of audits as discussed in Section 1.1 of this report. On 30 April 2013 OTEK went into Administration and is in liquidation.

Prior to going into liquidation, OTEK had completed all the work required and also prepared a draft report for the Site; however, OTEK had not issued a final report. Melbourne Water has advised GHD (letter dated 25 October 2013) that all the intellectual property produced by OTEK in relation to the Site is owned by Melbourne Water and that it has retrieved both hard and electronic data relating to the work conducted by OTEK for the overall Site including this particular site. Melbourne Water (as the client) has given permission to the Auditor and GHD to

use all the reports and all the data to enable the completion the continuation and completion of this audit (refer to Melbourne Water letter in Appendix E).

The auditor was involved with the audit since its commencement in 2000 and has overseen the various phases of works including a specialised military site history review (given that part of the site was used by the Department of Defence as discussed in this report); a subsurface geophysical survey; and various intrusive sampling and remediation works. The auditor considered that the audit has followed a logical sequence which provided the auditor with confidence that the site issues have been addressed and closed out – the details of which are the subject of later sections of this audit report.

The Auditor has followed up the standard process of reviewing the draft OTEK report for the Site and was satisfied that any significant issues including ecological and human health risks were resolved by OTEK as per its draft report attached in Appendix D. Where needed and in accordance with EPA Bulletin 759.1, the Auditor has conducted some auditor verification works as outlined in this audit report (refer Section 4.3.3).

The auditor has consulted with EPA (13 June 2013) on the fact that OTEK went into administration and consequently the OTEK report was not issued in final but only in draft. Based on discussions between EPA and the auditor, EPA agreed that given the particular circumstances and the work done by OTEK had been substantially progressed to a close to final stage, that it was appropriate for the auditor to issue this audit report based on the attached OTEK draft report. It was also discussed and agreed with EPA that the fact that OTEK went into administration prior to finalising the report, resulted in the auditor having to undertake additional data review, data interpretation, and where applicable auditor verification works to reach conclusions and audit outcomes as stated in this report, it should be noted that this was conducted having regard for EPA Bulletin 759.1.

1.6 Site assessment approach

The assessment of the Overall Audit Area involved multiple phases of work. The approach and sequence of investigations undertaken to identify and investigate potential sources of contamination was thorough and in line with industry practice and guidelines, as follows:

- A specialised site history review of former site uses during RAAF occupation (predominantly of Area 4) was undertaken in 2000 by Milsearch (Milsearch 2000);
- Based on the findings of the Milesarch review, Enterra was engaged by Melbourne Water in 2001 to undertake a geophysical survey and, where required, physical investigation of sub-surface anomalies identified by Milsearch. The objectives of Enterra's survey and investigations (Enterra 2001) were:
  - "To locate any underground storage tanks (UST) and burials.
  - To quantify the extent of both ferrous and non-ferrous debris.
  - To resolve any uncertainty regarding the presence of unexploded ordnance."

  Enterra stated after its survey and investigation (Enterra 2001):"The investigations found no evidence of unexploded ordnance (UXO) or live ammunition on the site".
- OTEK subsequently undertook a Phase 1 Assessment (OTEK 2002) of the Overall Audit Area (including the site), which comprised:
  - "Site History Study – conducting a background study of the past and present use, review of previous investigations conducted at the site, a site reconnaissance, and a report of findings for these works; and
  - Further physical investigations – to determine present sub-surface conditions at the site".

The scope included: review of Melbourne Water property files; a review of site ownership and land use history (Sands and McDougall directories; an historical title search dating back to 1880s; completion of a detailed site inspection to assess building layout, potential filled areas, usual activities, stored materials and to determine if any other visual signs of contamination exist; assessment of the nature and location of buildings and other improvements, past and present; co-ordination of archaeological historical and subsurface investigations; and derivation of conclusions concerning the potential for contamination at the property.

- OTEK then used the findings of the above reviews and investigations to develop sampling and analysis plans (SAPs) to investigate areas of potential concern in more detail. Multiple SAPs were prepared, initially for the Overall Audit Area then for individual areas as required (once the overall audit area was subdivided into separate audits as discussed above). The auditor reviewed and provided comment on each SAP prior to works being undertaken.
- Over the course of the site assessments, OTEK prepared various scopes for remedial and validation works as required which the auditor reviewed and discussed prior to implementation.

1.7 Limitations

This statutory environmental audit report *Melbourne Water Corporation, Area 4F of Riverwalk Estate, Princes Highway, Werribee, Victoria, December 2013* ("Report") has been prepared in accordance with Part IXD of the Environment Protection Act 1970. The Report represents the Auditor's opinion of the condition of the site in relation to the presence and impact of contamination at the site and its suitability for beneficial uses stated in the Statement of Environmental Audit at the date the Statement of Environmental Audit is signed. This Report:

1. has been prepared by Dr Fouad Abo and his team as indicated in the appropriate sections of this Report] ("GHD") for Melbourne Water Corporation;
2. may be used and relied on by Melbourne Water Corporation;
3. may be used by and provided to EPA for the purpose of meeting statutory obligations in accordance with the relevant sections of the Environment Protection Act 1970;
4. may be provided to other third parties but such third parties' use of or reliance on the Report is at their sole risk; and
5. may only be used for the purpose as stated in Section 1.2 of the Report (and must not be used for any other purpose).

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by the Auditor, his team and GHD in connection with preparing this Report were undertaken in accordance with current profession practice and by reference to relevant environmental regulatory authority and industry standards in accordance with Part IXD of the Environment Protection Act 1970.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by the Auditor when undertaking the audit and preparing the Report. The assumptions are specified throughout this Report.

In undertaking the audit and preparing this Report, the Auditor is required to make judgments regarding the completeness, reliability and accuracy of the information, and the potential for

contamination to impact human health and the environment. The Auditor makes these judgments based on the information available, the potential impact of contaminants based on the current scientific understanding of the significance and behavior of contaminants, the specific characteristics of the contaminants matrices and current regulatory policy and legislation. The nature of contaminated site investigations is such that there is always some uncertainty in these matters; as new information can arise, the science underlying these matters can change, and regulatory policy and legislation can change. The Auditor and his team have formed their opinion on the basis of the information available and their understanding of the current science and regulatory policy and legislation, applying processes and considerations in accordance with professional practice. It is possible that new information, a changed scientific understanding or changed regulatory policy and requirements will become available in the future that may lead to a different interpretation. The Auditor and GHD expressly disclaim responsibility for changes that arise because of any such new information, changed science or changed regulatory policy or legislation.

The Auditor and GHD have prepared this Report on the basis of information provided by Melbourne Water Corporation, assessment consultant and others who provided information to GHD (including Government authorities). The Auditor and GHD have verified the information received to the extent practicable and within the scope specified in the Guidelines for Issue of Certificates and Statements of Environmental Audit (EPA Victoria, 2007). However, there may be some information which the Auditor and GHD cannot independently verify or check ("Unverified Information").

The Auditor and GHD are not responsible for the Unverified Information, including (but not limited to) errors in, or omissions from, the Report, which were caused or contributed to by errors in, or omissions from, the Unverified Information.

This Report should be read in full and no excerpts are taken to be representative of the findings of this Report.

2. Site characterisation

2.1 Site physical definition and description

The description and definition of the site are presented in Table 4.

Table 4 Site definition and description

Aspect	Comments	
Site Locality	The site is located in the Werribee Fields, which is proposed to be developed as part of the Riverwalk Estate development, and is located on the corner of Princes Highway and Maltby Bypass Werribee, Victoria 3030. The site locality plan (provided by OTEK) is included as Figure 1 of this report.	
Certificate of Title	The site is located on part of Lot B on Plan of Subdivision 636839Q, derived from Certificate of Title Volume 11367, Folio 778 (Appendix A). The site boundary is defined by the coordinates below. The defined audit Area and survey coordinates are shown as Figure 3.	
GIS coordinates defining the boundary of the site (MGA Zone 55).	Easting	Northing
	293,122.37	5,801,131.42
	293,237.76	5,801,118.06
	293,107.14	5,800,956.04
	293,217.96	5,800,946.87
Area	The site encompasses an area of approximately 1.98 ha.	
Surrounding Land Use	North: Area 4D (for which and Environmental Audit is currently underway). West: Area 4D (for which and Environmental Audit is currently underway). East: Area 4I (for which and Environmental Audit is currently underway). South: Area 4B (for which and Environmental Audit is currently underway).	
Topography	The site and surrounding area was generally flat.	
Site Coverage / Vegetation	At the time of the audit, the site was vacant and grass covered. Areas of native shrubs were located approximate to the central west and southern boundaries. Vegetation at the site was noted to be healthy.	
Sampling Locations	The locations of soil and groundwater sampling undertaken by OTEK between April 2006 and November 2012 are shown on Figure 4 (soil) and Figure 8 (groundwater). The soil validation sampling locations are shown on Figure 5.	

2.2 Geology and hydrogeology

The borelogs for soil and groundwater assessment works are included in Appendix B of OTEK 2013, which is included in this audit report as Appendix D.

2.2.1 Soils

The assessor indicated that the soil profile on site generally comprised:

- Grass surface underlain by brown, silty clay soil to approximately 0.1 metres below ground level (mbgl);
- Soils consisting of yellowish brown silt with occasional bands of soft, high plasticity clay to approximately 1.0 mbgl;
- Medium to high plasticity clay soil of varying colour (yellow, red, brown) to approximately 8.5 mbgl; and
- Weathered basalt to approximately 16 mbgl (maximum depth of investigation).

Fill material consisting of river pebbles and asbestos containing materials (ACM) were encountered in the top 15mm of soil beneath the northern apron of Hangar 4. The issue of bonded ACM is further discussed in Section 5.2.3 and 5.4.

Fill material was also identified above the trunk sewer; however, OTEK (2013) did not provide a description of this material. The auditor inspected the fill soils identified by OTEK (2013) on 2 and 3 October 2013 and observed yellow and grey sands above the trunk sewer on the northern apron of the former hanger (refer Section 4.3.3). The trunk sewer investigation carried out by OTEK is discussed in Sections 4.3.3 and 5.1.2.

Boreholes and test pits were typically terminated at a maximum depth of 1.0 mbgl. No groundwater wells were installed on Area 4F. However; the Overall Audit Area (of whch this site was originally part of) well network consisted of 11 wells, and MW-2, MW-5 and MW-6 were considered to represent groundwater conditions on Area 4F. Standing water levels (SWLs) in these wells ranged between 10.3 mbgl and 13.4 mbgl.

2.2.2 Geology and aquifers

The 1:63 360 Melbourne Geological Map (Geological Survey of Victoria) indicates that the site is underlain by approximately 15 m of Quaternary Age 'Deutgam Silt' alluvial deposits of the Werribee Delta, comprising grey to grey-brown silt with abundant carbonate nodules and some gravel, and sand and silty sand in the lower part of the sequence. The Deutgam Silt (of the Werribee Delta Formation) overlies approximately 40 m of Quaternary Age Newer Volcanic Formation, which predominantly comprises dark to light grey olivine basalt. The Newer Volcanic is underlain by the Brighton Group Formation and the Newport Formation. Regional data indicate that the Werribee Delta alluvial deposits may also directly overlie Brighton Group sands in places.

Groundwater is likely to be present within the alluvium deposits and the basalt fractures within the Newer Volcanic Formation.

2.2.3 Groundwater flow system

The Newer Volcanic and Brighton Group Formations are the two primary aquifer systems in the vicinity of the site. Groundwater flow was expected to be towards the Werribee River, which is the nearest receiving surface water body. The Werribee River flows from approximately north to south and is located approximately 700 m to the east of Area 4F (at its closest point). Regionally, the groundwater flow is expected to be on a south-eastern direction toward the Port Phillip Bay, which is located about 7 km to the south east of the site.

The Werribee Delta is an unconfined to semi-confined shoe-string aquifer located near the mouth of the Werribee River, where it discharges to Port Phillip Bay. The Deutgam silt is not expected to constitute a significant aquifer system in the vicinity of the site. Well yields in the Werribee Delta Aquifer range up to 15 litres per second (L/s) but are generally less than 5 L/s. Groundwater quality ranges from 500 to 6000 mg/L total dissolved solids (TDS), with the lower TDS occurring within the coarser lenses.

The Newer Volcanics Formation comprises fractured basalt with interbedded clay aquitards. The shallow parts of the aquifer are unconfined, while the deeper parts range from semi-confined to confined. Water occurs in fractures and vesicular voids. Hydraulic properties vary widely depending on the condition of the basalt. Well yields in the Newer Volcanics Aquifer range up to 40 L/s but are generally less than 1.2 L/s. Groundwater quality in this aquifer ranges from 100 to 6 000 mg/L TDS with the chemistry largely dependent on the state of weathering of the surrounding basalt. This aquifer, along with the underlying Brighton Formation aquifer, is identified as a primary aquifer in the region.

Groundwater monitoring well logs for the site (refer to Appendix B of OTEK 2013) indicate that wells were installed within the Newer Volcanics aquifer.

2.2.4 Groundwater database and groundwater quality

Groundwater database search

OTEK undertook a search of the Victorian Groundwater Management System, and identified 11 wells within a 1 km radius of the site (refer Section 2.5, Table B of OTEK 2013). The wells were listed as being used for domestic, stock and investigation purposes, with the use of several wells listed as not known. No groundwater chemistry data were available.

To understand the spatial distribution of these wells, the auditor also undertook a search and review. The search identified 31 wells within a 1 km radius of the site, as tabulated and shown on a plan in Appendix G (note several of the wells plot are in the same location due to the scale of the plan). The well locations shown in Appendix G are approximate only. The information available was considered sufficient to determine the approximate location of wells relative to the site, and hence was adequate for the purposes of the audit. The wells were listed as being used for domestic, stock and investigation purposes, with the use of several wells listed as not known. No groundwater chemistry data were available. The majority of groundwater wells were located cross or up gradient of the site and were considered unlikely to be in the flow path of groundwater from the site.

In addition to the above wells, OTEK installed a further 11 monitoring wells across Area 4 of Overall Audit Area to investigate groundwater quality. Those wells that were relevant to the site are discussed in further detail in Section 6 of this report.

Regional groundwater quality

Based on groundwater data from the Overall Audit Area, information from nearby audits and published references; groundwater in the region was found to have elevated concentrations of some inorganics and nitrate, this was considered to be attributed to naturally occurring concentrations in the Newer Volcanics Aquifer, and to widespread regional agricultural land use. Regional groundwater quality is discussed further in Section 6.3 of this report

2.3 Surface water

The Werribee River flows along the east of the site and is located approximately 700 m from Area 4F and flows in a south easterly direction towards Port Phillip Bay, located about 7 km south east of the site.

2.4 Site physical status at audit commencement and completion

The site was historically used by the RAAF for aircraft and equipment storage from 1942 to 1952. Residual infrastructure from this time remaining on the site at the commencement of the audit and the status at audit completion is summarised in Table 5.

Table 5 On-site infrastructure and status

Infrastructure	Status [1]
Hangar 4 including northern and southern aprons. (Building roof and frame were constructed with asbestos sheeting)	Removed in 2008.
Water bearing asbestos pipeline (underground)	Removed in 2008.
Water bearing galvanised pipeline (underground)	Removed in 2008.
Septic system including ceramic pipework (no septic tank was identified)	Removed in 2009.
Concrete slab (formerly associated with the emergency powerhouse which was removed in 1952 prior to audit commencement)	Removed in 2009.
Stormwater pipeline	Retained on site
Trunk Sewer	Retained on site
Additional section of water bearing galvanised pipeline (underground) located on the western portion of the site.	Retained on site
NOTES 1 From OTEK 2013 and auditor inspections.	

A plan of the former site infrastructure is provided as Figure 3. At the time of audit completion, no infrastructure; aside from a concrete block, stormwater pipeline, trunk sewer and section of galvanised metal underground pipeline was present on site.

Further discussion regarding the investigation activities undertaken during the infrastructure removal is provided in Section 5.3 of this report.

2.5 Proposed site development

The site is part of the Riverwalk Estate which is proposed to be developed for residential development (with lot sizes between 300 m^2 and 600 m^2) and associated uses such as public open space and recreation areas.

As per the development plan and in accordance with EPA Publication 759.1(2007) the lot sizes would be defined as 'Residential – single dwelling' (300 m^2 to 4000 m^2) and 'medium-density' (one dwelling between 200 m^2 and 300 m^2).

The proposed development plans and planning scheme information are included in Appendix F of this report.

2.6 Review of EPA Notices, Register, Licences and/or Trade Waste Agreements

There were no EPA licences or trade waste agreements relevant to Area 4F.

The auditor's file search indicated that Area 4F was not subject to overlays related to contaminated land, was not on the EPA Priority Sites register, and was not subject to an EPA clean-up or pollution abatement notice. Melbourne Water initiated this audit and environmental assessment as part of its own due diligence measures.

2.7 Off-site investigations

At the time of the audit, investigations on the areas of the Overall Audit Area surrounding the site were being undertaken. Some of the assessment information from the surrounding sites was used in this audit due to a number of similarities (e.g. history, geology, hydrogeology, etc.). Such information hence provided further confidence in our understanding of the background conditions (where appropriate).

2.8 Site and surrounding site history

2.8.1 Summary of historical reports for the overall audit area

Various historical reports were reviewed to provide information on the site history and potential contaminants of concern. Information from the historical reports undertaken between 1993 and 2001 was detailed in OTEK (2002), included as Appendix B of this report. The following historical reports were considered. The first two were not relied upon for the purposes of the audit as they were out-dated and were superseded by a more recent site history report, geophysical report, and detailed assessments, as discussed in this report.

SKM Pty Ltd (1993)

SKM (1993) conducted a preliminary site investigation for the Overall Audit Site prior to the commencement of the Environmental Audit. A total of 52 samples were collected from 26 locations across the Audit Site. No soil samples were collected from Area 4F.

Biosis Pty Ltd (March, 2000)

Biosis conducted an archaeological and cultural survey to identify any areas of archaeological and cultural heritage that may be impacted by the proposed site investigation and development across the Overall Audit Area. The survey included research of background information relating to the Overall Audit Area, site inspections, and a systematic ground survey. Liaison was also made with the Wathaurong Aboriginal Cooperative Ltd and the South West Region Cultural Heritage Group.

The Biosis report is attached as Appendix B of this report.

Milsearch Pty Ltd (April, 2000)

Milsearch undertook a review of the site history during the World War II era to determine the potential for the presence of residual munitions and other material burials or contaminants at the site.

The report revealed that the northern portion of the Overall Audit Area was occupied by the Royal Australian Air Force during 1942 to 1952. In late 1942, a hangar complex with support workshop and refuelling facilities were constructed and used as equipment storage for the conversion of crashed aircraft to scrap and for several equipment recovery and refurbishment

programs. During 1948 to 1952, the hangar complex served as a collection and disposal centre for surplus general stores and equipment returned from former RAAF units.

Hangar 4 was used for the "storage of controlled stores and serviceable Anson mainplanes" (p. 17 of Milsearch, 2000 report).

The Milsearch report is attached as Appendix B of this report.

Enterra Pty Ltd (May, 2001)

In response to the findings of the Milsearch report, a subsurface geophysical investigation was conducted by Enterra between November 2000 and February 2001 to locate any unexploded ordnance (UXO), buried wastes or other underground facilities. The survey was undertaken using various geophysical techniques including the use of a digital magnetometer and electromagnetic detection equipment. The survey did not identify any UXO, buried wastes or other underground facilities on Area 4F.

The Enterra report is attached as Appendix B of this report.

2.8.2 Summary of available site history information

OTEK undertook a history review for the Overall Audit Area (OTEK, 2002), including a review of the historical reports by SKM (1993), Geo-Eng (1997), Biosis (2000), Milsearch (2000) and Enterra (2001), review of Melbourne Water historical property files, Sands and McDougall records and historical title records, personnel interviews, and an aerial photograph search (site photographs were not available prior to 1945). OTEK (2013) also provided a summary of the site history findings relevant to the site as follows:

- The Overall Audit Area and land in the general vicinity was used for dairy farming, stock grazing, and vegetable growing during 1880-1900.
- According to Biosis (2000), circa 1900, the Board of Works ceased leasing the land (approximately 10,000 hectares) and used it for waste water irrigation in winter and sheep grazing in summer. Further information indicated that wastewater irrigation practices were undertaken on a small portion of land located beyond the south west of Area 2 (Environmental Audit was completed for Area 2 in 2004). This was practice until 1958, when the Maltby Bypass was constructed adjacent to the southern boundary of the Overall Audit Area. The Caltex Service Station and the Freeway Access Ramp now occupy this area, which was never part of the Overall Audit Area. The available information indicated that the Overall Audit Area has not been irrigated using wastewater.
- Melbourne Water Corporation acquired the Overall Audit Area in 1920s.
- The northern part (Area 4 and a portion of Area 5) of the Overall Audit Area was occupied by the RAAF from 1942 to 1952. During this time, five hangars, a workshop and numerous small buildings were constructed, all with asbestos cladding. Hangar 4 was located on Area 4F and was used for "storage of controlled stores and serviceable Anson mainplanes" (Milsearch 2000). Upon vacating the site in 1952, the RAAF demolished and removed all buildings except the five hangars and the former workshop.
- From the early 1950s to the late 1970s, the site was used primarily for agriculture, and then in the late 1970s Melbourne Water began operating at the site.
- According to OTEK (2013) known RAAF infrastructure on Area 4F included Hangar 4, former emergency powerhouse concrete slab, underground septic system, and a number of water bearing underground pipelines including an asbestos pipeline, galvanised metal pipeline, stormwater pipeline and concrete trunk sewer. The location of the former

infrastructure is shown on Figure 3. The infrastructure removal works are discussed in Section 5.3.

2.9 Identified contaminants of potential concern

OTEK provided information on the contaminants of potential concern in Section 3.6 of OTEK (2013), which was based on the site infrastructure, historical site and surrounding land uses. A summary of the previous site uses and the associated contaminants of potential concern (COPCs) identified are summarised in Table 6, along with specific observations related to each potential source.

Table 6 Potential sources and associated contaminants of potential concern

Site activity / Potential Source	Contaminants of Potential Concern	Location	Comments
On site			
RAAF infrastructure:		Refer Figure 3	Infrastructure above and belowground. Status at time of audit:
Hangar 4	Asbestos, inorganics, polychlorinated biphenols (PCBs), organochlorine pesticides (OCPs), polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), phenols, ethylene glycol.	Located towards central eastern boundary of site	Removed and underlying soils validated during audit.
Emergency powerhouse (concrete slab remained at time of audit)	Asbestos, inorganics, PCBs, PAHs, TPHs, phenols, sulphate, volatile organic compounds (VOCs).	East of Hangar 4	Emergency powerhouse building removed prior to audit, concrete slab remained at commencement of audit, removed and underlying soils validated during audit.
Septic system	Asbestos, pH, inorganics, OCPs, PAHs, TPHs, ammonia, nitrate, nitrite, total coliforms and E.coli.	Adjacent to south eastern corner of Hangar 4. Extends into Area 4I of the Overall Audit Area.	Septic system and ceramic pipework removed and underlying soils validated during audit.
Underground asbestos pipeline (water bearing)	Asbestos	Surrounds the perimeter of Hangar 4 to the west, north and east. Extends into Area 4I of the Overall Audit Area.	Asbestos pipeline removed and underlying soils validated during audit.

Site activity / Potential Source	Contaminants of Potential Concern	Location	Comments
Underground galvanised metal pipeline (water bearing).	Inorganics	Surrounds the perimeter of Hangar 4 to the west, north and east. Extends into Area 4I of the Overall Audit Area.	Galvanised metal pipeline was removed in conjunction with the asbestos pipeline and underlying soils were validated during audit.
Additional section of galvanised metal pipe	Inorganics	Western portion of site. Extends into Area 4D and Area 5 of the Overall Audit Area.	This section of pipeline was identified during remediation works in 2012 and was retained on site at audit completion.
Stormwater pipeline (water bearing)	Inorganics, PCBs, OCPs, PAHs, TPHs, phenols, sulphate, VOCs, ammonia, nitrate, nitrite, total coliforms, and E.coli.	Runs north south through the centre of site. Extends into Area 4D and 4B of the Overall Audit Area.	Retained on site at audit completion. Soils surrounding a section of the stormwater pipeline were validated during audit.
Concrete trunk sewer located >4mbgl	Inorganics, PCBs, OCPs, PAHs, TPHs, phenols, sulphate, VOCs, ammonia, nitrate, nitrite, total coliforms, and E.coli.	Runs diagonally through the northern portion of site. Extends into Area 4D of the Overall Audit Area.	Retained on site at audit completion. Fill sands (to a depth of 3.1mbgl) surrounding the trunk sewer was investigated during audit.
Agriculture	Inorganics, organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), pH, nitrate, nitrite, ammonia, asbestos.	Entire site.	A potential for broad application of pesticides across the site and Overall Audit Area. A potential for surface debris and asbestos fragments in some parts of the Overall Audit Area. Surface debris and asbestos fragments were identified on Area 4F (further discussed in Sections 5.2.3 and 5.4.

Site activity / Potential Source	Contaminants of Potential Concern	Location	Comments
Off site			
Agriculture	Inorganics, (OCPs), (OPPs), pH, nitrate, nitrite, ammonia, asbestos.	Overall Audit Area.	Concentrations of COPCs across the adjacent audit Areas (Area 4D, 4B and 4I) were low. As noted above, there is a potential for scattered debris and non-friable asbestos fragments across the Overall Audit Area.
RAAF infrastructure in Area 4D - various water bearing underground pipelines	Inorganics, fluoride, E.coli, ammonia, nitrate, and asbestos.	Area 4D west of the site.	A hydrogeological assessment of the Overall Audit Area found that Area 4D was cross hydraulic gradient and hence the potential for contamination to migrate from this Area via groundwater to the site was low.
RAAF infrastructure in Area 4B - Hangar 5 - Former timber treatment activities	Asbestos, pH, inorganics, PCBs, OCPs, PAHs, TPHs, phenols, ethylene glycol, copper, chrome, and arsenic.	Area 4B south west of the site.	A hydrogeological assessment of the Overall Audit Area found that Area 4B was located up and cross hydraulic gradient and hence there was potential for cross contamination from copper chrome arsenate contamination associated with former timber treatment activities to migrate from this area via groundwater to the site. OTEK undertook substantial remedial works on Area 4B to address this source of contamination. The results of three groundwater wells (MW9, MW10 and MW11) installed post remediation confirmed that copper; chromium and arsenic concentrations were below relevant criteria. Consequently, the auditor considered cross contamination from Area 4B to the site via groundwater to be unlikely.

2.9.1 Auditor's opinion on site history assessment

When the site history information from various sources was reviewed in its entirety, it provided a comprehensive understanding of potentially contaminating activities that may have occurred at the site. Based on the site history review, the majority of the site was considered likely to be Greenfield land, with a low potential for contamination. The former RAAF infrastructure and site uses were considered unlikely to have generated significant impacts to soil and groundwater.

The auditor was satisfied that the site history review of the site and Overall Audit Area provided sufficient information to allow an appropriate sampling and analysis program to be developed.

3. Assessment guidelines

Environmental protection in Victoria is legislated under the *Environment Protection Act 1970* (EP Act). Sub-ordinate legislation within the EP Act includes State environment protection policies (SEPPs) that prescribe beneficial uses and objectives that are to be met to protect the various segments of the environment.

3.1 Beneficial uses of the land to be protected

For the land segment, the *State environment protection policy (Prevention and Management of Contamination of Land)*, 2002 applies. Commonly referred to as the 'Land SEPP', the policy provides the beneficial uses to be protected under a number of different land use scenarios, and provides indicators and objectives for protection of land.

The land use categories of possible relevance to any site according to the Land SEPP are:

- Parks and Reserves;
- Agricultural;
- Sensitive Use including child care centre, pre-school, primary school and residential, any of which may take place in:
  - A high density area (where there is minimal access to soil) - Sensitive Use (High Density).
  - A lower density area (where there is generally substantial access to soil) - Sensitive Use (Other).
- Recreation/Open Space;
- Commercial; and
- Industrial.

The Policy defines protected beneficial uses for land as being:

- Maintenance of natural ecosystems, modified ecosystems and highly modified ecosystems;
- Human health;
- Buildings and structures;
- Aesthetics; and
- Production of food, flora and fibre.

The protected beneficial uses for each of the respective land uses are shown in Table 1 of the Land SEPP. This table is reproduced in Table 7 below.

Table 7 Protected beneficial uses of land

Beneficial Use	Land Use						
	Parks & Reserves	Agricultural	Sensitive Use (High Density)	Sensitive Use (Other)	Recreation / Open space	Commercial	Industrial
Maintenance of Ecosystems							
Natural Ecosystems	✓						
Modified Ecosystems	✓	✓		✓	✓		
Highly Modified Ecosystems		✓	✓	✓	✓	✓	✓
Human Health	✓	✓	✓	✓	✓	✓	✓
Buildings & Structures	✓	✓	✓	✓	✓	✓	✓
Aesthetics	✓		✓	✓	✓	✓	
Production of Food, Flora & Fibre	✓	✓		✓			

The site is proposed to be developed for residential uses including residential-single dwelling and medium-density residential use and as such the beneficial uses under the sensitive use (other) land use category apply as per the Land SEPP. The relevant beneficial uses of land to be protected under the sensitive use (other) category are:

- Modified Ecosystems;
- Highly Modified Ecosystem;
- Human Health;
- Buildings & Structures;
- Aesthetics; and
- Production of Food, Flora and Fibre.

3.2 Adopted investigation levels – land

The Land SEPP refers to the National Environment Protection (Assessment of Site Contamination) Measure in December 1999 (often referred to as "the NEPM"), which was formulated by the National Environment Protection Council (NEPC), under the *National Environment Protection Council Act 1994.* NEPM 1999 was amended in May 2013. All of the assessment work for the audit was undertaken during 2006 to 2012 (and considering the site was originally part of the overall audit area, the assessment started in 2000) which was well before the amended NEPM was released. The EPA has indicated that a 12 month transition process from May 2013 applies to the implementation of the NEPM 1999 (amended 2013) and as such the auditor considered that use of NEPM 1999 was appropriate in this instance. All the States and Territories of Australia were signatories to the making of the NEPM, including Victoria under the *National Environment Protection Council (Victoria) Act 1995.*

The NEPM provides investigation levels for soil and groundwater in the assessment of site contamination including Ecological Investigation Levels (EILs) and Health Investigation Levels

(HILs) in Schedule B(1). The NEPM EILs and HILs are referred to in the Land SEPP as the principal objectives to be met to protect the beneficial uses of land.

3.2.1 Ecological protection

NEPM EILs (Interim Urban) (NEPC, 1999) were adopted as the initial screening level to assess potential impacts of soil contaminants on the environment (i.e. to consider impacts to the beneficial use 'Maintenance of Ecosystems'). EILs are set for urban land use (comprising city, suburban, and industrial areas). Where no EIL exists for an analyte, the following hierarchy of criteria were used by the auditor to assess potential ecological impact:

- Threshold concentrations for sensitive land use - soils (Table 3) from the NSW EPA (1994) Guidelines for Assessment of Service Station Sites;
- The Environmental Investigation "B" levels presented in the ANZECC & NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites;
- The Dutch Target and Intervention Values provided in MHSPE (2000).

Where composite sampling occurred during the initial investigations at this site, modified investigation levels were adopted for these samples (i.e. ecological investigation criteria were divided by the number of a samples making up the composite sample).

3.2.2 Human health protection

NEPM HIL A criteria were adopted as the initial screening level to assess impacts of soil contaminants on human health at the site. NEPM HIL A criteria are applicable for protection of human health in standard residential land uses with gardens / accessible soil (home grown produce contributing less than 10% fruit and vegetable intake; no poultry) and includes children's day care centres, preschools, and primary schools.

Where concentrations were below NEPM HIL A, it was generally considered that contamination would not adversely affect human health under any of the exposure scenarios (NEPM 1999). Where contaminant concentrations exceeded NEPM HIL A, results were then compared to HIL D to F to determine the land use scenarios under which human health would be protected. Such evaluation would typically include the nature and degree of the exceedance and a consideration of any proposed site use, human health risks or other impacts on the nominated beneficial use.

Where no HIL exists for an analyte, the following hierarchy of criteria were used by the auditor to assess potential human health impact.

- Threshold concentrations for sensitive land use - soils (Table 3) from the NSW EPA (1994) Guidelines for Assessment of Service Station Sites;
- The Environmental Investigation "B" levels presented in the ANZECC & NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites; and
- The Dutch Target and Intervention Values provided in MHSPE (2009).

Where composite sampling occurred during the initial investigations at this site, modified investigation levels were adopted for these samples (i.e. human health criteria were divided by the number of a samples making up the composite sample).

3.2.3 Aesthetics

There are no published criteria specific to assessment of aesthetic impact. However, the Land SEPP includes the aesthetic as a protected beneficial use of the land and also states (Table 2

of the SEPP) "contamination must not cause the land to be offensive to the senses of human beings". The NEPM (1999) also specifies the fundamental principle that the soils should not be discoloured, malodorous (including when dug over or wet) nor be of abnormal consistency.

3.2.4 Buildings and structures

The Land SEPP requires that "Contamination must not cause the land to be corrosive to or adversely affect the integrity of structures or building materials". The Land SEPP specifies pH, sulphate, redox potential, salinity or any chemical substances or waste that may have a detrimental impact on the structural integrity of buildings and/or other structures as indicators.

3.2.5 Production of food, flora and fibre

The Land SEPP requires that "Contamination of land must not:

(i) adversely affect produce quality or yield; and

(ii) affect the level of any indicator in food, flora and fibre produced at the site (or that may be produced) such that the level of that indicator is greater than that specified by the *Australia New Zealand Food Authority, Food Standards Code*".

The SEPP specifies any chemical substance or waste including those in the National Environmental Protection (Assessment of Site Contamination) Measure, Schedule B(2), Appendix 1.

In the absence of officially adopted investigation levels specifically for protection of food, flora and fibre, NEPM EILs have been considered for the purpose of this audit. It is noted that OTEK adopted NEPM A HILs as investigation levels for this beneficial use. The auditor considered the EILs should also be considered as they are, in relative terms more appropriate for determining potential adversity to produce quality or yield.

3.3 Beneficial uses of groundwater to be protected

The Victorian Environment Protection Authority (the Authority) will determine the segment to which groundwater in an aquifer belongs. The beneficial uses to be protected for each of the groundwater segments are defined in Table 2 of the *State environment protection policy Groundwaters of Victoria 1997*, herein referred to as the Groundwater SEPP. Water of higher quality (lower salinity) has more beneficial uses than low quality (more saline) groundwater.

The protected beneficial uses for each segment are shown in Table 2 of the Groundwater SEPP. This table is reproduced in Table 8 below.

Table 8 Protected beneficial uses of groundwater segments

Beneficial Uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1000)	B (1001-3500)	C (3501-13,000)	D (greater than 13,000)
Maintenance of ecosystems	✓	✓	✓	✓	✓
Potable water supply					
Desirable	✓				
Acceptable		✓			
Potable mineral water supply	✓	✓	✓		
Agriculture, parks & gardens	✓	✓	✓		
Stock watering	✓	✓	✓	✓	

Beneficial Uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1000)	B (1001-3500)	C (3501-13,000)	D (greater than 13,000)
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation (e.g. Bathing, swimming)	✓	✓	✓	✓	
Buildings and structures	✓	✓	✓	✓	✓

As per clause 9(2) of the SEPP, the Authority may also determine that a beneficial use specified in Table 8 above does not apply to groundwater where:

- there is insufficient aquifer yield to sustain the beneficial use;
- the background level of a water quality indicator other than TDS precludes a beneficial use;
- the soil characteristics preclude a beneficial use; or
- a groundwater quality restricted use zone has been declared.

Clause 5. (1) of the Groundwater SEPP also states that "The goal of the policy is to maintain and where necessary improve groundwater quality sufficient to protect existing and potential beneficial uses of groundwaters throughout Victoria."

EPAV (2007) *Publication 759.1, Environmental Auditor (Contaminated Land) Guidelines for Issue of Certificates and Statement of Environmental Audit* provides further explanation:

- Section 9.3 (last paragraph, Explanatory Note) states: "Any assessment of the likelihood of particular beneficial uses of groundwater being realised should be based on an evaluation of whether a owner/occupier of the site or in the vicinity of the site may reasonably expect to use or be able to use groundwater for those purposes".
- Section 13.4 states: "Beneficial uses of groundwater may be considered 'relevant' for the purpose of determining whether to issue a Certificate in the following circumstances:
  - Where the beneficial use is 'existing' in the vicinity of the site. A beneficial use may be considered 'existing' where an existing receptor (bore, spring, creek) is or could plausibly be impacted by the pollution or reasonably foreseeable conditions (including altered groundwater flow resulting from abstraction, injection or other means).
  - Where the beneficial use is 'likely' to be realised in the vicinity of the site. A beneficial use may be considered 'likely' in circumstances including but not limited to, the following:
    (i) groundwater is used in the same hydrogeological setting nearby or elsewhere in Victoria, and
    (ii) the existing and likely future land uses both at the site and in the vicinity of the site are compatible with the beneficial use".

In this case the groundwater protected beneficial uses have been determined on the basis of the Groundwater SEPP for the purposes of this report.

TDS of groundwater in monitoring wells MW2 (Area 4D), MW-5 (Area 4D) and MW6 (Area 4H) proximate to the site ranged from 5060 mg/L (MW2 in 2011) to 5740 mg/L (MW6, 2011) (Table 62, OTEK 2013). Therefore, under the Groundwater SEPP, groundwater at the site would be classified as Segment C. Accordingly, the relevant beneficial uses of groundwater to be protected are:

- Maintenance of Ecosystems;
- Stock watering;
- Industrial water use;
- Primary contact recreation (e.g. bathing, swimming); and
- Buildings and structures.

3.4 Adopted investigation levels – groundwater

Table 3 of the Groundwater SEPP specifies the water quality investigation indicators required to protect beneficial uses. These investigation levels are specified in Table 9 below. In its 2012 assessment report, OTEK adopted ANZECC 1992 guidelines for comparison purposes. The auditor requested OTEK consider the more recent ANZECC 2000 and NHRMC 2008 guidelines. The auditor considered the most recent guidelines, as summarised in Table 9 below. The adoption of these more recent guidelines does not, in this instance, alter the conclusions OTEK reached based on its consideration of ANZECC 1992.

Table 9 Groundwater quality indicators

Beneficial Use Category	Water Quality Indicators
Maintenance of Ecosystem	Those specified in the relevant SEPP for surface waters as this beneficial use applies at the point of discharge of groundwater to a receiving surface water body. This site is located within the "Cleared Hills & Coastal Plains" segment covered by the *SEPP Waters of Victoria* (June 2003). The environmental quality objectives specified for this segment are those values in the ANZECC 2000 guidelines, and the level of ecosystem protection for this Segment is generally 95% for slightly to moderately modified aquatic ecosystems.
Potable Water Supply (Desirable and acceptable)	ANZECC (2000) *Australian Water Quality Guidelines for Fresh and Marine Waters*, refers to the Australian NHMRC and ARMCANZ (1996) *Australian Drinking Water Guidelines*. The NHMRC and ARMCANZ (2004) Australian Drinking Water Guidelines supersede these guidelines.
Potable Mineral Water	Australian Food Standards Code (1987) – Standard 08 Mineral Water, criteria for potable mineral water supply.
Agriculture, Parks & Gardens	ANZECC (2000) *Australian Water Quality Guidelines for Fresh and Marine Waters*, investigation levels for Primary Industries.
Stock Watering	ANZECC (2000) *Australian Water Quality Guidelines for Fresh and Marine Waters*, investigation levels for Primary Industries.
Industrial Water use	ANZECC (2000) *Australian Water Quality Guidelines for Fresh and Marine Waters* do not provide specific guidance for industrial water use, because industrial water requirements are so varied (both within and between industries) and sources of water for industry have other coincidental environmental values that tend to drive management of the resource. Industrial water use has been considered through regard for other environmental values.
Primary Contact Recreation	The ANZECC (2000) *Australian Water Quality Guidelines for Fresh and Marine Waters*, Guidelines for Recreation Water Quality and Aesthetics which supersede these guidelines refers to the NHMRC (2008) *Guidelines for Managing Risks in Recreational Water*.

Beneficial Use Category	Water Quality Indicators
Buildings & Structures	Introduced contaminants shall not cause groundwater to be corrosive to structures or building materials (pH, sulphate, redox potential). Investigation levels are not specified and reference has been made to AS2159-2009 Piling – Design and installation.

3.5 Beneficial uses of the air environment

The State Environment Protection Policy *(Air Quality Management)* December 2001 (AQM SEPP) states (Clause 9) that the following beneficial uses are protected in the ambient (outdoor) air environment throughout the State of Victoria:

a. life, health and well-being of humans;

b. life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity;

c. local amenity and aesthetic enjoyment;

d. visibility;

e. the useful life and aesthetic appearance of buildings, structures, property and materials; and

f. climate systems that are consistent with human development, the life, health and well-being of humans, the protection of ecosystems and biodiversity.

Table 10 below outlines the likely impact scenarios and provides a screening analysis of the beneficial uses of air for further consideration (if any), as relevant to this site:

Table 10 Relevance of beneficial uses of air

Beneficial Use	Possible Exposure Scenarios	Requires Further Consideration?
Life, health and well-being of humans	Volatile contaminants were not reported during assessment works at the site.	No
Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity	Volatile contaminants were not reported during assessment works at the site.	No
Local amenity and aesthetic enjoyment	Odours were not reported during assessment works at the site.	No
Visibility	Given the site coverage at the completion of the audit, it is unlikely that significant dust would result in impact to this beneficial use.	No
Useful life and aesthetic appearance of buildings, structures, property and materials	Volatile contaminants and odours were not reported during assessment works at the site.	No
Climate systems that are consistent with human development, the life, health and well-being of humans, the protection of ecosystems and biodiversity	Volatile contaminants were not reported during assessment works at the site.	No

4. Site investigation activities

4.1 Chronology of site activities relevant to the environmental audit

The chronology of site activities and a description of the soil and groundwater works undertaken relevant to the environmental audit is presented in Table 11. The auditor's opinion of the adequacy of the assessment results and a consideration of risks to human health and the environment is discussed in Sections 5 (soil) and 6 (groundwater).

Table 11 Sequence of site activities

Date of Investigation	Site Activity and Objective	Report Reference
1993 - 2001	Various historical reports were reviewed to provide information on the site history and potential contaminants of concern (see Section 1.4).	A summary of these reports is presented in Section 2.8.1 Contaminants of potential concern for Area 4F are presented in Section 2.9.
2002 (OTEK, 2002)	OTEK undertook a site history investigation (OTEK, 2002) of the Overall Audit Area to assess whether infrastructure and former activities may have resulted in contamination. This review included the above mentioned reports so that the overall information collected from different sources were brought together and used to develop a good understanding of the potential source(s) of contamination, and then set up a work plan to investigative such potential source(s).	Section 2.8.2.
April 2006 March 2007 and February 2009	Based on the abovementioned history review, OTEK undertook a soil investigation at the site, which was based on grid sampling and consisted of collecting soil samples from 29 grid-based test pits on Area 4F and one grid based test pit on Area 4I. Selected soil samples were analysed individually, and/or combined into three-part composites for analysis.	Section 5.1.1.
April 2006, July 2006 and February 2009)	OTEK undertook a targeted soil sampling program to investigate Hangar 4 and the emergency powerhouse concrete slab. Samples were collected from seven test pits on Area 4F and one test pit on Area 4I.	Section 5.1.2.
August 2007	OTEK undertook a groundwater monitoring event across the Overall Audit Area (GME I). No groundwater wells were installed on Area 4F.	Section 6.
November 2007	OTEK undertook a groundwater monitoring event across the Overall Audit Area (GME II). No groundwater wells were installed on Area 4F.	Section 6.

Date of Investigation	Site Activity and Objective	Report Reference
February 2008	OTEK undertook a groundwater monitoring event across the Overall Audit Area (GME III). No groundwater wells were installed on Area 4F.	Section 6.
September 2008	OTEK undertook an assessment of the fill sands located above the trunk sewer. Fourteen soil samples were collected and analysed to characterise this area.	Section 5.1.2.
September and October 2008	OTEK supervised the removal of the underground asbestos and galvanised metal pipework associated with Hangar 4. Both pipelines were removed as part of the one excavation. OTEK undertook validation sampling of the underlying soils.	Section 5.3.
January 2009	OTEK supervised the removal of Hangar 4 and undertook asbestos validation sampling of the underlying soils.	Section 5.3.
May and June 2009	OTEK supervised the removal of the septic system and undertook validation sampling of the resultant excavation.	Section 5.3.
June 2009	OTEK supervised the removal of the concrete slab associated with the former emergency power house and undertook validation sampling of the underlying soils.	Section 5.3.
August 2009 and November 2012	Following identification of an asbestos fragments at 4F/G14, OTEK undertook an 'asbestos scrape' near the north eastern corner of former Hangar 4. ACM was identified at one location, and this was subsequently removed and validated in 2012.	Section 5.4.
September 2009	OTEK collected three soil validation samples beneath the stormwater pipeline, which was retained on site.	Section 5.1.2.
November 2009	OTEK undertook a groundwater monitoring event across the Overall Audit Area (GME IV). No groundwater wells were installed on Area 4F.	Section 6.
January to June 2011	OTEK undertook an emu bob/hand pick for the presence of ACM and validation sampling east of former Hangar 4.	Section 5.4.
December 2011	OTEK undertook a groundwater monitoring event across the Overall Audit Area (GME V). No groundwater wells were installed on Area 4F.	Section 6.
November 2012	OTEK discovered a section of underground galvanised metal pipe west of Hangar 4 during remediation works on Area 5. One soil validation sample was collected beneath the pipeline, which was retained on site.	Section 5.1.2.

4.2 Field sampling and laboratory testing program

The field sampling and laboratory testing program was designed by the assessor to identify contamination in the natural soils, any fill materials on site, and the groundwater beneath the site. The auditor reviewed various Sampling and Analysis Plans (SAPs) prepared by the assessor for various phases of work and provided feedback to OTEK.

Analysis of soil samples was undertaken by the following laboratories:

- Primary Laboratories: ALS Environmental (ALS); Labmark Laboratories Pty Ltd (Labmark); Australian Safer Environment & Technology Pty Ltd (ASET); and
- Secondary (QA/QC) Laboratory: ALS Environmental (ALS), Labmark Laboratories Pty Ltd (Labmark), Leeder Consulting and Groundswell Laboratories Pty Ltd (Groundswell).

It is noted that although ALS and Labmark were used as both primary and secondary laboratories at various stages of assessment, for any given sample analysis event different laboratories were used for primary and secondary (i.e. QC) analysis. The assessor indicated these laboratories were NATA accredited for the testing undertaken. The auditor noted the laboratory reports received were NATA stamped and signed by NATA signatories.

4.3 Quality Assurance and Quality Control (QA/QC)

4.3.1 Review of assessor's QA/QC procedures and documentation

The auditor undertook a detailed review of the Quality Assurance and Quality Control (QA/QC) documentation presented by the assessors, and reviewed OTEK's field procedures to verify the integrity and the reliability of the data presented. This review is provided in Appendix H, and indicated the following:

- Overall the frequency of field duplicate and field split sample analysis for inorganics was considered adequate (i.e. >1:20 primary analytes). However, field duplicate and field split sample analysis for one or more of PCBs, OCPs, OPPs, cyanide, fluoride, sulphate, ammonia, nitrate, nitrite, total coliforms, E.coli, were slightly less than required (i.e. <1:20 primary analytes). Based on the following, the auditor was satisfied that sufficient information was available to assess the integrity and the reliability of the data set:
  - OTEK followed correct field sampling procedures, and samples were stored and handled appropriately;
  - Laboratory analytical results were consistent with site observations and site history review, and with findings from the Overall Audit Area;
  - Concentrations of PCBs, OCPs, OPPs, cyanide, fluoride, sulphate, ammonia, nitrate, nitrite, total coliforms and E.coli across the Overall Audit Area were typically low; and
  - Results for QC samples that were analysed indicated good field and laboratory accuracy and precision.
- The RPDs were generally acceptable, except a limited number of results that were above the recommended range for calculated RPDs for soil and groundwater results. These were considered minor in the context of the entire data set. Elevated RPDs were likely to be associated with low analyte concentrations near the laboratory reporting limits, sample heterogeneity, and/or differences in laboratory methodologies.
- Rinsate and trip blank sample results were generally below the laboratory detection limit for analytes tested. While trip blank samples were not always analysed for volatile contaminants (as is standard practice) this was not considered a significant issue given that volatile contaminants were not detected in soil or groundwater. Additionally and based on historical activities at the site volatiles were not considered CoPC.

- Sample holding times were generally acceptable. Where minor exceedances of holding times occurred, the auditor was satisfied that analytical results were unlikely to have been compromised given correct handling and storage of samples, and low likelihood of the specific contaminants being identified.
- Laboratory internal QC results were generally acceptable. The minor outliers noted on the laboratory reports and in OTEK data validation reports (DVRs) were not considered significant given results of the majority of the QC data set were within acceptable ranges.
- As discussed in Section 5.1.1, composite samples were analysed for pH, leachability testing for barium manganese and vanadium, semi-volatile analytes (PAHs, phenols, OCPs and OPPs), which is not in accordance with Australian Standard 4482.1. However, given a reasonable number of individual samples were analysed for pH and semi-volatile analytes across the site (refer Table 14) and the results of the composite samples were consistent with the results of the individual samples, as well as those from the Overall Audit Area, this error was not considered to affect the outcome of the audit.

4.3.2 Auditor site inspections

The auditor and/or his representatives observed the field investigations across the Overall Audit Area on numerous occasions. Works were frequently undertaken both on the site and other audit areas during the same sampling event. Of particular relevance to the site were the following:

Table 12 Site inspections

Date of Inspection	Observations
17 October 2005	Inspected Area 4. The site walkover focused on areas of potential concern across the Overall Audit Area including the former timber treatment plant and drying yard, hangers, incinerators, USTs etc.
19 April 2006	The auditor's representative visited Areas 4C, 4F and 4G to observe field works concurrently being undertaken in these Areas. OTEK were undertaking grid based test pit sampling in Area 4F at the time of the inspection. Standard sampling procedures were employed. The area east of Hangar 4 was also inspected, including the former emergency powerhouse concrete slab and underground septic system located further south and into Area 4I. OTEK indicated that these two areas would be further assessed.
28 April 2006	Inspected Area 4. The tree lined area along the eastern boundary of Area 4 was inspected. The eastern boundary of Area 4F adjoins this area. Limited bonded ACM were observed in a few areas beneath the trees.
10 July 2006	Inspected Area 4. The 'Tree Clearance Areas' outlined by Tree Logic were inspected. Two small areas were observed between Hangars 4 (Area 4F) and 5 (Area 4B). Some surface debris such as asbestos cement sheeting, broken bottles, some pieces of wood and scrape metal was observed in these areas. Further works were proposed by OTEK in these areas.
31 January 2008	Project meeting held at the site to discuss project and audit objectives and outcomes. Two draft reports pertaining to stockpiled soils and surface debris across the site were discussed.

Date of Inspection	Observations
8 December 2008	Inspected Area 4. Hangar 4 and the underground asbestos and galvanised metal pipework surrounding the hangar had been removed from site by qualified personnel. Validation and backfilling of the resultant excavations was in progress at the time of the inspection. Standard field procedures were followed.
January to June 2011	Several site inspections were undertaken during this period by the auditor and his representative to observe the asbestos remediation and validation works carried out on Area 4F. Some bonded ACM of variable size were identified without the need for digging or scraping east of the former hangar. Section 5.4 of this report discusses the asbestos remediation and validation sampling program for the site (Area 4F).
27 November 2012	The auditor conducted an inspection of works carried out in Area 4E, Area 4B and Area 5. The auditor noted that a galvanised iron pipe discovered during remediation works on Area 5 extended into Area 4F. The galvanised pipe is further discussed in Section 0.
2 and 3 October 2013	Soil verification sampling works were carried out on Area 4F and 4D by the auditor and his representative. These works are discussed in Section 4.3.3 below.
13 Decemember 2013	The site appearance has not changed from the previous visit. The majority of the site is covered with dense weed that appeared healthy. There were no stockpiles on the site at all. The concrete block was not identified around sample location 4F/G8 however it is understood that the concrete block was observed at depth by OTEK. Therefore based on reporting inconsistencies, it is not possible to verify if it was present or removed from site. There is no apparent dense debris across the site, however, the auditor observed patchy and small pieces of woods/tree branches, small pieces of blue stone, gravel, a small metal rod, a piece of an old telephone cable, all of which do not pose an unaccepatable risk to the site. The dirt track/road going form the former hangar 4 to area to area 4D (see OTEK Fig 5, OTEK 2013) and also the dirt road going from the former Hangar 4 to the gate, which still remain on the site in area 4I have apparent road materials (i.e. blue stone and gravel). The asbestos pit found during the above mentioned auditor verification works has been removed. Small pieces of ACM were observed around the former hangar footprints. The site is clear form any visible blocks of concrete on the surface including the area of the former emergency powerhouse. The storm water pit still visible through its surface concrete lead and was dry.

4.3.3 Audit verification sampling

OTEK carried out asbestos remediation works at the site between January and June 2011 in the vicinity of former Hangar 4 (refer Section 5.4). The outcome of the remediation works indicated that it was likely that some small pieces of bonded ACM remained in surface soils in this area. OTEK conducted asbestos assessment on the site and concluded that the ACM concentration in soil was <0.01% w/w of the WA DH guidelines; the auditor has verified this as well (for further details see Section 5.4.2). Based on the low percentage of bonded ACM that is potentially present in soil, OTEK considered that ACM in soils was an aesthetic issue rather than a health

issue and presented a management option for this for a surveyed area as shown in Figure 5. Based on all the asbestos data available and multiple inspections of the area, the Auditor concluded that the OTEK management options proposed were not warrented. To further support his opinion, the auditor carried out verification sampling to confirm the extent of bonded ACM in this area.

The verification assessment was undertaken on 2 and 3 October 2013. The works involved excavation of three north-south (Trenches 1 to 3) and two smaller east-west trenches (Trenches 4 and 5) within the area surveyed by OTEK, to approximately 0.2 mbgl (refer Figure 7). The auditor and his assistant inspected the trenches and surrounding soils for ACM. Occasional ACM fragments were observed in near surface soils (<0.2 mbgl) in the vicinity of Trenches 3, 4 and 5. Three surface samples (4F/T1/0.1, 4F/T2/0.1 and 4F/T3/0.1) were collected and analysed for asbestos. No asbestos was detected in soils tested. Chain of custody documentation, laboratory reports and photographs are presented in Appendix K.

A Telstra pit constructed of ACM was uncovered towards the northern end of Trench 2 (refer Figure 7) during the verification works. The Telstra pit was removed by qualified personnel on 29 October 2013 and disposed off-site to a suitable land fill facility. The underlying soils were validated for asbestos. No asbestos was detected in soils tested. Field observations and relevant disposal certificates are provided in Appendix L.

During the verification works the auditor observed two areas of yellow/grey sand fill material immediately north of the asbestos investigation area. Two small trenches were excavated to approximately 1 mbgl to investigate the nature and extent of fill material. The depth of sands was not delineated vertically. No obvious signs of contamination (odours or staining) were identified. The location of these soils correlated with the 'fill soils' identified by OTEK (2013) located above the trunk sewer on the northern apron of former Hanger 4. Based on the information provided in Section 4.3.6, Table H, Table 48 and Figure 4 of OTEK (2013) it was not clear whether these soils remained on site or were disposed off-site. The audit site inspection confirmed that these soils remain in-situ above the truck sewer. Sampling of the fill sands conducted by OTEK did not detect any contamination (discussed in Section 5.1.2).

4.3.4 Conclusions on QA/QC

Overall the laboratory results were considered to be consistent with the site history review and field observations made during the assessment of the site. The auditor was satisfied that the sampling undertaken was adequate and the laboratory results reported were representative of the condition of soil and groundwater on site at the time of the assessments.

5. Assessment of soil quality

A summary of the locations of key information within the Assessor's report is provided in Table 13 below.

Table 13 Assessor's site assessment information – soil

Assessment Details	Section in Assessor's Report (OTEK 2013, attached as Appendix D of this report)
Site History	Section 3
Details of soil sampling (including for the assessment, remediation, and validation) and laboratory analysis	Section 4, 6 and 8
Field Observations	Section 4
Borelogs	Appendix B
Site Plans	Figures 3 and 4
Analytical Results (Summary Tables)	Analytical Tables 1 to 56

5.1 Soil sampling and analytical program

To assess soil quality at the site, OTEK developed a sampling and analysis plan (SAP) (*Scope of Works – Target and Grid Sampling Analysis Plan* (SAP), 2005) which was based on previous investigations (Milsearch 2000, Enterra 2001 and OTEK, 2002). The SAP was finalised after the auditor's review, and was implemented accordingly.

A SAP for the validation of the stormwater pipeline identified at the site was prepared in 2009 (attached as Appendix H of OTEK 2013). The SAP reported that one sample would be collected every 100 m along the alignment of the stormwater pipe that remained in-situ. The stormwater pipe that remained in situ at audit completion is discussed in Section 5.1.2 of this report.

Following excavation of the former infrastructure, validation samples were collected. OTEK summarised the soil investigation activities in Table G of OTEK (2013) and the findings are discussed in Section 5.2 and 5.3 of this report.

5.1.1 Grid samples

A total of 29 grid-based soil sampling locations (i.e. test pits) were advanced at the site in April 2006. This provides a sampling density of 14.6 locations per hectare, which was marginally less than the density specified in Australian Standard (AS4482.1). The Standard indicates that to detect hot spots of contamination of 30.5 m diameter (refer Table E1 of AS4482.1) with a confidence of 95%, 30 sampling points per hectare are required for a 2 ha site. Grid soil sampling locations are shown on Figure 4.

Fifty six individual samples from the 29 grid based test pits were selected for laboratory analysis. Additionally, 21 three-part composite samples were formed from 26 of the 29 grid based test pit locations on the site, and one additional grid based test pit location on Area 4I (4F/G15). All 21 composite samples were selected for laboratory analysis. Furthermore, 44 samples from the 27 target sampling locations were selected for laboratory analysis. Given both the grid and target sampling and considering that the majority of the site was essentially a green

field and infrastructure was removed and appropriately validated; the auditor considered the sampling density adequate to characterise the site.

Table 14 below provides a summary of the grid and composite analytical schedule (derived from Tables 1 through 25 in OTEK 2013).

Table 14 Grid-based sample analytical schedule

Analyte	No. of individual samples analysed	No. of composite samples analysed
Inorganics[1]	18	21
pH	9	21
TPHs	5	-
PCBs	7	13
OCPs	4	13
OPPs	3	4
Phenols	5	18
PAHs	5	18
Asbestos	29	-
Cyanide	4	18
Fluoride	13	18

NOTES:

1 Inorganics: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, V, Zn, Hg

It was considered that, based on the site history and limited potential for contamination across the broader site area sufficient samples were analysed for COPC.

It was noted that the 2005 Sampling and Analysis Plan was developed prior to the 2009 *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in WA (DOH, 2009)* asbestos guidelines. OTEK noted that approximately 50% of all soil samples from across the site (grid, target, and validation) were analysed for asbestos. Based on the site history review and field observations, it is considered there is a low risk associated with asbestos across the site. Specific sources of asbestos identified at the site included Hangar 4 and the underground asbestos pipeline, both of which were appropriately removed and validated (refer Section 5.3 and 5.4).

Composite samples were analysed for pH, leachability testing for barium, manganese and vanadium and semi-volatile analytes (PAHs, phenols, OCPs, and OPPs), which is not in accordance with Australian Standard 4482.1, and is not standard industry practice. The Auditor followed up with OTEK (refer Appendix I) and the 2013 report acknowledged that this practice was not appropriate, but considered that composite results still provided information regarding the condition of soils at the site. The auditor has considered the composite results, as a source of contamination data in his assessment of the site condition, and noted they were consistent with results from individual sample analysis from the site. Given a reasonable number of individual samples were analysed for pH, leachability testing and semi-volatile analytes across

the site (refer Table 14) and results were consistent with data from the Overall Audit Area, this error in methodology was not considered to affect the overall reliability of the analytical data.

During the grid sampling program, OTEK observed a concrete block in the vicinity of grid location 4F/G8. According to Section 2.2 and 4.3.5 of OTEK (2013) the concrete block intersected the trunk sewer and stormwater pipeline in the vicinity of 4F/G8, It was OTEK understanding that this block remains in this location. However, Section 4.4.3 of a draft summary report for the site (OTEK 2011) suggested that the concrete block was further investigated in March 2007 and believed to be associated with an anchor block for the asbestos pipeline. The block was apparently removed during the infrastructure removal program completed from July to December 2008.

During the auditor final site inspection on 13 December 2013, the concrete block was not visible in the area surrounding sample location 4F/G8. The auditor is of the opinion that no gross contamination was identified at a number of concrete blocks and associated pipework across the Overall Audit Area and the auditor is of the opinion it is unlikely that contamination of concern would be associated with this concrete block.

5.1.2 Target samples

A total of twenty seven target sampling locations were advanced between April 2006 and November 2012 to further assess potential contamination sources that were identified as part of the site history review (as discussed in Section 2.9). Works undertaken are summarised in Table 15.

Table 15 Potential contamination sources and associated target sampling locations

Potential Contamination Source	No. of Target Sampling Locations	Sampling Locations	Date/s	Analytes[2]
Emergency powerhouse (concrete slab)	2	4F/T3, 4F/T4	12/04/2006	BTEX, pH, inorganics, PCBs, OCPs and TPHs.
Septic system	1	4F/T6[1] (Area 4I)	20/07/2006	Asbestos, pH, inorganics, OCPs, PAH, TPH, OPPs, ammonia, nitrate, nitrite, E.coli.
Hangar 4 – footprint	5	4F/T1, 4F/T2, 4F/T5, 4F/T7, 4F/T8	5/02/2009	Asbestos, pH, inorganics, PCBs, OCPs, PAHs, TPHs, phenols, ethylene glycol.
Fill soils above concrete trunk sewer located >4mbgl (water bearing)	15	4F/FM-1/1 to 4F/FM-1/14 and 4F/FM-1/4A	18/09/2008	EPA screen[3] for 4F/FM-1/1 to 4F/FM-1/14; nitrate, nitrite, total coliforms and E.coli for 4F/FM-1/4A.
Stormwater pipeline (water bearing)[4]	3	4F/VS-32 to 4F/VS-34	11/09/2009	Asbestos, pH, inorganics, PCBs, OCPs, PAHs, TPHs, phenols, sulphate, VOCs, ammonia, nitrate, nitrite, total coliforms, and E.coli.
Additional section of galvanised metal pipe	1	4F/VS-35	28/11/2012	Inorganics, PAHs and TPHs.

NOTES:

[1] Soil samples from soil location 4F/T6 were collected from Area 4I. This target location assisted with characterisation of soils surrounding the septic system, which crosses the boundary of Area 4F and 4I.

[2] Samples were analysed for one or more of COPCs (i.e. not all samples were analysed for all analytes)

[3] EPA screen: Inorganics, As, Cd, Cr^{6+}, cyanide, fluoride, phenols, BTEX, TPHs, MAHs, OCPs, PCBs, chlorinated hydrocarbons.

[4] A concrete block was identified in the vicinity of 4F/G8, intersection of stormwater pipeline and trunk sewer. No further sampling was undertaken at this location. Concrete block possibly retained on site at Audit completion (refer Section 5.6).

Targeted sampling

The grid and targeted sampling did not assess all potential source areas identified. Areas not assessed included the septic system and the asbestos and galvanised piping. These areas were adequately validated during the validation sampling works discussed in Section 5.3.

OTEK (2013) reported the soil samples associated with the fill sands above concrete trunk sewer; stormwater pipeline and section of galvanised metal pipe as validation samples. The auditor, however, discussed these locations as part of the targeted sampling works given that these site features were targeted.

Surface debris

Section 2.4 of OTEK (2013) indicated that "surface debris was identified at 15 locations during the grid and target test pitting works (4F/G5, 4F/G10, 4F/G13, 4F/G16, 4F/G17, 4F/G18, 4F/G20, 4F/G23, 4F/G25, 4F/G26, 4F/G27, 4F/G28, 4F/G29, 4F/G30 and 4F/T6)" which were conducted either in April 2006 or March 2007. Surface debris included some bricks, concrete pieces and metallic items such as reinforcing rods, bolts, wire, steel plates, cartridge cases, nails and pegs (refer Appendix B of OTEK (2013) contained in Appendix D of this report). Items of surface debris were removed during the infrastructure removal program from May to September, 2009.

The auditor requested that OTEK provides further details regarding the nature and extent of the surface debris, however, no further information was provided (refer item 14 of GHD Audit comments, Appendix I). To close out this matter, the Auditor observed minimal surface debris during his final inspection on 13 December 2013.

Infrastructure: retained on site

As mentioned above, infrastructure including the trunk sewer, stormwater pipeline and a section of galvanised metal pipe were assessed for potential contamination sources that were identified as part of the site history review. These items remained on site at audit completion (refer Section 5.6). The investigation results of these items did not indicate contamination of concern.

Trunk sewer

In September 2008, OTEK investigated the fill sands located above the trunk sewer, which is located approximately four metres below ground. Fifteen soil samples were collected and analysed for an EPA screen (referTable 15 and Figure 5). Soil results were compared against the Victorian EPA Industrial Waste Resource Guidelines (621). Given the fate of these soils was not clearly indicated in OTEK (2013) report, the auditor assessed the suitability of these soils against NEPM and confirmed that all 15 soil samples reported concentrations below the adopted EIL and HILs.

To close this issue the auditor and his assistant undertook a verification investigation on 2 and 3 October 2013 at the site. During these works the auditor observed the fill soils identified by OTEK, located above the trunk sewer on the northern apron of former Hanger 4. The yellow/grey sandy soils remained in situ and no obvious signs of contamination (odours or staining) were observed (refer Section 4.3.3 for further details).

Based on the analytical results provided by OTEK and the auditor's field observations; it was considered unlikely that these soils posed a risk to future users of the site.

Stormwater pipeline

In September 2009, OTEK investigated soils underlying the stormwater pipeline at three locations on Area 4F (referTable 15 and Figure 5). Samples were collected every 100 linear

metres of pipework, which was consistent with the sampling methodology adopted across the Overall Audit Area. All three soil samples reported concentrations below the adopted EILs and HILs. No asbestos was detected (refer Table 49 of OTEK 2013).

Galvanised metal pipe

In November 2012 during remediation works on Area 5, OTEK identified a section of galvanised metal pipe that was thought to be associated with mains water distribution. One soil sample 4F/VS-35 was collected and analysed (refer Table 15 and Figure 5). Only cadmium was reported marginally above the EIL and this is discussed further in Section 5.2.1.

5.1.3 Auditor's opinion on adequacy of soil assessment program

The auditor and his team assessed the information available. It was considered that overall the grid-based and targeted sampling locations and analytical program provided adequate coverage to allow determination of the potential risk from potentially contaminating sources at the site. This was based on the following lines of evidence:

- The sampling program was based on a thorough understanding of potential sources and activities which might have resulted in contamination of soil at the site;
- The auditor, based on the site history information, Enterra geophysical and physical investigation, and his field visit reviewed and provided feedback on the sampling and analysis plans prior to commencement of work;
- The analytical program sufficiently addressed identified COPC;
- Samples were collected using appropriate methodologies with adequate QA/QC program implemented; and
- The auditor and his representatives undertook multiple site visits during the assessment of the site, and of the Overall Audit Area

It is noted the auditor had to provide numerous comments regarding OTEK's draft ESA report before a draft report of suitable quality was provided. Audit trail documentation is provided in Appendix I.

5.2 Summary of soil assessment results

5.2.1 Inorganics

A summary of maximum concentrations of each contaminant identified above the adopted investigation levels in natural soil during the assessment works is provided in Table 16. The table shows only individual samples containing contaminants at concentrations exceeding the adopted investigation levels (i.e. the majority of the samples showed concentrations below the investigation levels and for practical reasons were not included). Also, the table does not include composite samples, which are discussed further below. A full summary of soil analytical results is presented in Tables 1 to 38 of OTEK 2013, attached as Appendix D of this report.

Of the 100 individual samples analysed, 12 individual soil samples contained concentrations of one or more of barium, cadmium, manganese and vanadium above the EILs (refer Table 16). Additionally, multiple composite samples contained concentrations of one or more of arsenic, barium, manganese, nickel and vanadium above the modified EILs. Concentrations of all other CoPC were below the EILs.

Concentrations of all CoPCs analysed were below the HILs with the exception of one composite sample containing concentrations of manganese marginally above the modified HIL A.

Table 16 Summary of maximum contaminant exceedances in soil (individual samples)

Analyte	NEPM or Adopted Investigation Level (mg/kg)		Sample Type	Concentration (mg/kg)	Fill/ Natural	Samples exceeding adopted investigation level
	NEPM EIL	NEPM HIL A				
Barium	300	-	Grid	420	Natural	4F/G27/0.5
			Grid	320	Natural	4F/G19/0.5
			Target	360	Natural	4F/T4/0.25
Cadmium	3	*20*	Target	6	Natural	4F/VS-35
Manganese	500	*1500*	Grid	760	Natural	4F/G13/0.5
			Grid	550	Natural	F/G18/0.5
Vanadium	50	-	Grid	52	Natural	4F/G12/0.5
			Grid	56	Natural	4F/G21/0.5
			Grid	58	Natural	4F/G22/0.5
			Grid	59	Natural	4F/G23/0.5
			Grid	63	Natural	4F/G26/0.5
			Grid	54	Natural	4F/G28/0.5

NOTES:
Underlined: result higher than NEPM EIL investigation levels
Italics: result higher than NEPM HIL A investigation levels

The following provides a discussion of each analyte where concentrations exceeded the EIL. Also, as OTEK did not refer to any investigation levels in OTEK 2013 for the results of nutrient (i.e. nitrate, nitrite and ammonia) analyses, the Auditor also discussed these as they were considered CoPC.

Arsenic, Barium, Manganese, Nickel, Vanadium

Multiple composite samples contained concentrations of the following contaminants above the modified ecological investigation levels (as per AS4482.1 the investigation levels were divided by number of samples in the composite, which is conservative in reality. AS4482.1 indicated that such "method of adjustment may give rise to false positive results"). The number of composite samples and concentration range above the adjusted EIL criteria is provided below:

- Arsenic: 11 composites, (7 mg/kg to 11 mg/kg).
- Barium: 5 composites, (120 mg/kg to 520 mg/kg).
- Manganese: 20 composites, (170 mg/kg to 560 mg/kg).
- Nickel: 16 composites, (21 mg/kg to 48 mg/kg).
- Vanadium: 21 (all) composites, (28 mg/kg to 60 mg/kg).

To confirm composite sampling results, individual samples from composite samples 4F/C11, 4F/C16 and 4F/C19; and a further nine grid samples from across the site were analysed for inorganics (including arsenic, barium, manganese, nickel and vanadium) with the following results:

- Arsenic and nickel:
  - Concentrations of arsenic and nickel were below the EILs for all samples. On this basis, and considering the comparability of results with the Overall Audit Area, and absence of a specific source for arsenic and nickel, the arsenic and nickel detected in composite samples were considered within the naturally occurring background and are not discussed as an exceedance henceforth.
- Barium, manganese, and vanadium:
  - Concentrations of barium, manganese and vanadium were below the EILs for all shallow (i.e. <0.25 mbgl) individual grid-based samples.
  - Concentrations of barium, manganese and vanadium were marginally above the EILs for soils ≥0.5 mbgl, but within NEPM background ranges and consistent with soil data from the Overall Audit Area.
  - The concentration ranges for barium, manganese and vanadium reported for individual samples were consistent with the composite sample results mentioned above.

The concentrations of barium, manganese, and vanadium detected in individual samples during the soil assessment works were considered to be within the naturally occurring background levels, based on the following:

- Samples were all collected from natural soils;
- Results were consistent with concentrations detected across the Overall Audit Area (as detailed in Section 8.1.1, Table Z of OTEK 2013);
- There were no identified potential sources of these contaminants; and
- Concentrations were all within NEPM background ranges.

Three composite samples (4B/C11, 4B/C16, 4B/C17) were selected for leachability testing (refer Analytical Tables 11 and 12, OTEK 2013); the results indicated low leachability. However, the auditor did not consider this to be standard practice, therefore relied on the individual grid samples selected for toxicity characteristic leaching procedure (TCLP) and the Australian standard leaching procedure (ASLP) to assess the bioavailability of these elevated inorganics concentrations and the potential for migration following the infiltration of rainwater.

Three grid based samples were selected for leachability testing for barium and vanadium (refer Analytical Tables 24 and 25, OTEK 2013). No leachability testing was completed for manganese. The results from the leachability tests returned low leachability, however, the auditor noted that when the extract solution was of a low pH (i.e. for the TCLP test) there was some low leaching of barium in the soil (1.4 mg/L). Also as expected, the ASLP tests, where the extract solution was relatively neutral the leaching concentration for barium was lower (i.e. 0.9mg/L). The auditor considered that the ASLP results were more representative of "real life conditions" (e.g. the natural rainwater infiltration conditions on Area 4F). It is noted that the TCLP is more relevant for leachate testing in landfill environments.

Cadmium

Target location 4F/VS-35 (as shown in Table 16 and Figure 5) contained cadmium (6 mg/kg) marginally above the EIL. OTEK (2013) suggested that soils in the vicinity of the galvanised metal pipe may contain cadmium concentrations that could potentially impact upon the growth of some vegetation. OTEK considered these impacts to be minimal. The auditor concurred with this based on the following lines of evidence:

- This was an isolated occurrence of soils containing cadmium concentrations above the EIL at depth (0.5mbgl). All remaining grid and target samples analysed reported cadmium concentrations below the EIL and HIL criteria.
- The average concentration for cadmium in natural soils at 0.5mbgl at the site was <2mg/kg, which is below the EIL.
- The nature of the soil (with clay generally from volcanic origin) was expected to have above average cation exchange capacity (CEC);
- The fine texture of the soil (i.e. silty clay) was considered to minimise any leaching of contaminants; and
- There were no potential sources of cadmium identified in the site history review.

Nitrate, nitrate and ammonia

Target samples 4F/T6/0.25, 4F/T6/1.0, 4F/FM-1/4A and 4F/VS-33 were analysed for nitrate, nitrite and ammonia (as shown in Figure 4 and Figure 5). The nitrate and nitrite results were low (maximum nitrate concentration 7.2 mg/kg and nitrate concentration 1.0 mg/kg in target sample 4F/T6/0.25) and were within the range of concentrations detected in the Overall Audit Area (provided in Table O, OTEK 2013). The auditor further noted that nitrate results were below 10 mg/kg, which is the concentration often required for pasture soils (NSW DPI, 2004). Ammonia was not detected in any of these samples. Based on this, it was considered these concentrations were likely representative of background conditions, and unlikely to be attributed to historical activities at the site. Further discussion is provided in Section 5.6.

5.2.2 Organics

Minor concentrations of total petroleum hydrocarbons (TPHs) were detected in grid sample 4F/G19/0.25, and targeted samples 4F/T1/0.25 and 4F/T7/0.25, which were located within the former building footprint of Hangar 4 where there was potential for the use of mineral oil/lube oil during RAAF occupancy (refer Analytical Tables 15 and 28, OTEK 2013).Table 15 TPH concentrations were only marginally above the laboratory limits of reporting and well below the threshold concentrations for sensitive land use outlined in Table 3 of the NSW EPA (1994) *Guidelines for Assessment of Service Station Sites,* therefore the auditor considered that the reported TPH concentrations did not pose a risk to any beneficial uses of the land.

All remaining organic analytes tested were below the investigation levels, and predominantly below the laboratory limits of reporting.

5.2.3 Asbestos

During the assessment works undertaken at the site, ACM were identified in the vicinity of former Hangar 4. The related information was presented in OTEK (2013); however, the report text was not clear. In order to address this matter, the auditor relied on multiple sources of information including site inspections, progress field work meetings, photographs and primary analytical data, as well as his knowledge of the Overall Audit Area to assess the adequacy of the asbestos works and on-going potential for asbestos risk at the site.

In April 2006, OTEK undertook a visual assessment for surface ACM across Area 4F. Consequently, twenty nine grid samples from Area 4F and one grid sample (4F/G15) from Area 4I were sent to primary laboratories ALS (report EM0602373) and Labmark (reports E026241 and E026229). Laboratory results indicated that only one sample (4F/G14/0.15) located near the north eastern corner of Hangar 4 contained chrysotile asbestos, which was detected in fibro plaster cement. The auditor reviewed the bore log for 4F/G14 (Appendix B, OTEK 2013) and

confirmed that "asbestos sheeting" was logged in the top 15 mm of soil. This location was later remediated and validated and is discussed further in Sections 5.3 and 5.4 of this report.

In February 2009, OTEK collected five targeted soil samples from below the former hanger footprint (refer Table 15 and Figure 4). These samples were sent to primary laboratory Labmark (report 09ENME0004583) for asbestos analysis. No asbestos was detected in soils sampled.

Asbestos was not observed at any other grid or target location.

Independent of the soil assessment works, in January 2009, asbestos remediation and validation was carried out post demolition and removal of Hangar 4. This is discussed in detail in Section 5.3.

5.2.4 Auditor's opinion on the soil assessment results

Based on all the information available at the time, the auditor concluded that the information obtained during the soil assessment, including field observations and analytical results, indicated that the identified potential contamination sources and activities historically undertaken at the site had not resulted in soil contamination of concern for the proposed development. Concentrations of several inorganics above the investigation levels for maintenance of ecosystems were considered to be within the naturally occurring background levels, this is based on NEPM background ranges, data from the Overall Audit Area, nature of the site geology and soil, and absence of potential sources. TPH concentrations reported within the former Hanger 4 building footprint were only minor and not considered to pose a risk to any beneficial uses of the land.

A bonded ACM fragment was observed at one location during the soil assessment works. The fragment was later removed and the underlying soils successfully validated (discussed further in Sections 5.3 and 5.4).

5.3 Infrastructure and validation sampling

During the course of the soil assessment works (discussed in Sections 5.1 and 5.2), remains of former RAAF infrastructure including Hangar 4, emergency powerhouse concrete slab, septic system, and underground asbestos and galvanised metal pipelines were removed from site and the underlying soils validated.

Figure 3 of this report shows the location of former RAAF infrastructure including structures removed prior to the commencement of the audit. The resultant excavations and validation sampling locations are shown in Figure 5 of this report. Details of the works undertaken are summarised in Table 17 below.

Table 17 Removal of infrastructure and validation sampling

Validation Works Undertaken	Date of Works	Validation Samples Collected [1]	Analysis [2]	Sample(s) exceeding adopted investigation level	Fate of Sample(s)	Fate of Excavated Material and Backfill/Site reinstatement
Hangar 4	15/01/2009	Area 4F 4F/VS-1/SS-1 to 4F/VS-4/SS-1, 4F/VS-6/SS-1 to 4F/VS-10/SS-1, 4F/VS-13/SS-1 to 4F/VS-17/SS-1, 4F/VS-20/SS-1 to 4F/VS-23/SS-1, 4F/VS-26/SS-1 to 4F/VS-29/SS-1, 4F/VS-32/SS-1 to 4F/VS-36/SS-1, 4F/VS-39/SS-1 to 4F/VS-43/SS-1, 4F/VS-46/SS-1 to 4F/VS-49/SS-1 Area 4I 4I/VS-5/SS-1, 4I/VS-11/SS-1, 4I/VS-12/SS-1, 4I/VS-18/SS-1, 4I/VS-19/SS-1, 4I/VS-24/SS-1, 4I/VS-25/SS-1, 4I/VS-30/SS-1, 4I/VS-31/SS-1, 4I/VS-37/SS-1, 4I/VS-38/SS-1, 4I/VS-44/SS-1, 4I/VS-45/SS-1, 4I/VS-50/SS-1	Asbestos	No asbestos detected.	NA	Approximately 26.28 tonnes of ACM and 418m^3 of concrete was disposed offsite to a licenced concrete recycling facility (i.e. Alex Fraser concrete recycling facility, Laverton). Surface samples collected only. No reinstatement of soil required.
Validation of asbestos fragment identified at 4F/G14 (north east of Hangar 4). Described by OTEK as 'Asbestos Scrape'	14/08/2009	Area 4F 4F/VS-16 to 4F/VS-25, 4F/VS-24A Area 4I 4F/VS26 to 4F/VS31	Asbestos	4F/VS-24: asbestos detected. 4F/VS-24A – no asbestos detected.	4F/VS-24 removed from site	A total of 21 m^3 was excavated and stockpile 4F/SP4 was created. Stockpile disposed offsite to Maddingley Brown Coal, Bacchus Marsh as Category C containing less than 1% ACM. A further 5 m^3 was excavated and SP-1 was created during the validation of 4F/VS-24. Stockpile was disposed offsite to Hi Quality Sales Bulla as fill material.

Validation Works Undertaken	Date of Works	Validation Samples Collected [1]	Analysis [2]	Sample(s) exceeding adopted investigation level	Fate of Sample(s)	Fate of Excavated Material and Backfill/Site reinstatement
Emergency powerhouse concrete slab	24/06/2009	4F/T3/VS-1 to 4F/T3/VS-5 4F/T4/VS-1 to 4F/T4/VS-4.	Asbestos, pH, inorganics, PCBs, PAH, TPH, phenols, VOC, sulphate, ammonia, nitrate, nitrite, and E. coli	4F/T3/VS-5 Nitrate 480mg/kg E.coli 31 MPN/g No asbestos detected.	Remain on site.	Only concrete slab removed. No soil removed. Fate of concrete slab unknown but did not remain on site.
Septic system	5/06/2009 17/06/2009	Area 4F 4F/VS-13, 4F/VS-14 4F/T6/VS-1 to 4F/T6/VS-5 Area 4I 4F/VS-15	Asbestos, pH, inorganics, OCPs, PAH, TPH, ammonia, nitrate, nitrite, total coliforms and E. coli.	None	Remain on site.	OTEK indicated that the fate of the excavated basalt cobbles from the former septic system was not known. Excavation was reinstated with imported fill material sourced from Cemex Werribee Quarry.
Underground asbestos and galvanised metal pipelines (water bearing)	11/09/2008, 26/09/2008, 15/10/2008, 21/10/2008	4F/VS-1 to 4F/VS-12 (all locations had 3 samples except VS-4 which had 6) 4F/VS-9/4 to 4F/VS-9/6	Asbestos, inorganics, nitrite, nitrate, total coliforms and E. coli	4F/VS-4/3: mercury and zinc identified above EIL 4F/VS-9/2: asbestos detected 4F/VS-9/4 to 4F/VS-9/6 – no asbestos detected	4F/VS-4/3 removed from site. 4F/VS-9/2 removed from site	A total of 85m^3 was excavated and stockpiles 4F/SP1 (combined with 4F/SP2 prior to analysis), 4F/SP2 and 4F/SP3 were created. Stockpiles disposed offsite to Hi Quality Sales Bulla as fill material. Excavation was reinstated with imported fill material sourced from Cemex Werribee Quarry.

NOTES:

[1] Soil samples collected from Area 4I were included to provide a complete appreciation of the sampling undertaken for each infrastructure item.

[2] Samples were analysed for one or more of COPCs (i.e. not all samples were analysed for all analytes)

OTEK confirmed all validation samples were collected from natural soils (refer Section 2.2). PID readings were negligible in all samples (0.0 to 17.1 ppm), and OTEK indicated there were no visual or olfactory observations of hydrocarbons or other volatiles.

5.3.1 Hangar 4

In 2008 demolition and removal of Hangar 4 was undertaken by Transfield Services Limited (Transfield) and its sub-contractor Alex Fraser Proprietary Limited (Alex Fraser). According to OTEK (2013) approximately 26.28 tonnes of ACM was removed and disposed of to an accredited facility. In addition 418m^3 of concrete was removed from site and disposed of at Alex Fraser concrete recycling facility at Laverton. However, asbestos clearance and waste transport documentation was not provided in OTEK (2013). This omission is discussed in Section 5.5.

Following demolition of Hangar 4, surface validation samples were collected in January 2009 from soils surrounding the former hangar footprint for the absence or presence of asbestos. Thirty six surface samples were collected within Area 4F and an additional 14 surface samples were collected from Area 4I (as detailed in Table 17). No asbestos was detected in samples analysed (refer Analytical Table 49, ALS report EM0900459, Appendix N of OTEK 2013).

5.3.2 Emergency powerhouse concrete slab

According to OTEK (2013), the emergency power house concrete slab was approximately 48 m^2 and the eastern portion of the slab extended into Area 4I by half a metre (refer Figure 5). In May 2009 the concrete slab was removed from site by Enviropacific Services Pty Ltd (Enviropacific). Information regarding the fate of the concrete was not provided in OTEK (2013) report. The auditor confirmed that there was no visible concrete on the site during his final inspection on 13 December 2013.

In June 2009 nine validation samples were collected from the former footprint and analysed (as detailed in Table 17 andFigure 5). No validation samples were collected from Area 4I. With the exception of 4F/T3/VS-5, analytes tested reported concentrations below the adopted criteria, predominantly below the laboratory limits of reporting. The nitrate and E.coli results for 4F/T3/VS-5 were considered to be anomalous and are further discussed in Section 5.6.

One surface validation sample (4F/T3/VS-5) was analysed for asbestos. No asbestos was detected in this sample (refer Analytical Table 49, Labmark report 09ENME0019807, Appendix N of OTEK 2013).

5.3.3 Septic system

In June 2009, the septic system was removed from site by Enviropacific and was transported to Hi Quality Sales, Bulla by Transport Industries.

The septic system was described by OTEK as containing boulders and cobbles to a maximum depth of 3.5 m, underlain by natural soils. OTEK did not observe any visual or olfactory signs of contamination (refer Photograph 2 and 3, Appendix G, OTEK 2013). In Section 4.6 of OTEK 2013, OTEK indicated they did not have any waste transport records confirming the nature of this material for disposal purposes. The auditor did not consider this to be an issue as the composition of the material removed (boulders and cobbles) meant it was unlikely to be contaminated, and results from underlying soils did not indicate any gross contamination.

The final excavation crossed the boundary of Area 4F and 4I. Seven validation samples were collected within Area 4F and one validation sample was collected from Area 4I (as detailed in Table 17 and Figure 5). Samples were collected from the walls and base of the excavation and all analytes tested reported concentrations below the adopted criteria, predominantly below the laboratory limits of reporting. One validation sample (4F/T6/VS-3) was collected and analysed

for asbestos. No asbestos was detected (refer Table 49, Labmark report 09ENME 0018309, Appendix N of OTEK 2013).

5.3.4 Underground asbestos and galvanised metal pipelines

The asbestos and galvanised metal pipelines surrounding former Hangar 4 (refer Figure 5) were removed together in September and October 2008. The asbestos pipe was associated with a former watering system and hydrant. The galvanised metal pipe was associated with former distribution of mains water to RAAF infrastructure. The pipes were removed and disposed of by licenced contractors Transfield and Alex Fraser. Waste transport documentation was not provided in OTEK (2013) report. This omission is discussed in Section 5.5.

Thirty nine validation samples were collected from 12 locations along the pipeline trench on Area 4F (refer Table 17 and Figure 5).

In September 2008 soil sample 4F/VS-4/3 collected from 0.8 mbgl reported mercury (1.4 mg/kg) and zinc (228 mg/kg) concentrations above the EILs. Further excavation at this location was undertaken and underlying soils validated by soil samples 4F/VS-4/4 4F/VS-4/5 and 4F/VS-4/6 (refer Analytical Table 48, OTEK 2013). No elevated inorganic concentrations were reported in these samples.

In October 2008, further pipework removal and validation works were undertaken. Six samples from two locations were analysed for asbestos. These samples were subcontracted by ALS (EM0807562) to ASET for analysis. Soil sample 4F/VS-9/2 detected asbestos (chrysotile in fibro plaster cement at 1.1 mbgl). This location was further excavated and re-validated on 21 October 2008 (refer Photograph 4, Appendix G of OTEK 2013). Three more samples (at depths of 1.2 and 1.6 m) from this location were analysed by ASET (Analytical Table 49 ASET report 16645, Appendix N of OTEK 2013). No asbestos was detected in these samples.

Six soil samples from two locations were tested for asbestos, the auditor considers this to be sufficient based on the following lines of evidence:

- The pipework was underground;
- Visual observation confirmed that pipework was in good condition;
- OTEK performed adequate visual assessment for potential asbestos; and
- Pipework was removed by licenced personnel.

Soil from above the pipework (overburden) was excavated and stockpiled separately in the vicinity of the pipes. The overburden, which had been characterised as part of the grid-based and targeted assessment, was reused as backfill.

5.3.5 Stockpile management and backfill material

Stockpile management and disposal was discussed in Section 4.6 of OTEK (2013). OTEK indicated that stockpiles 4F/SP1, 4F/SP2, 4F/SP3 were formed from soils excavated from below the asbestos and galvanised piping (as summarised in Table 17 above) and were transported to Hi Quality Sales, Bulla by Transport-Recycling Industries. The analytical results for these stockpiles are presented in Analytical Table 50 (OTEK, 2013).

OTEK (2013) indicated that stockpiles SP-1 and 4F/SP-4 were formed from soils excavated during the asbestos remediation works carried out east of former Hangar 4 (refer Section 5.4). SP-1 was classified as fill material and 4F/SP-4 was classified as Category C. Both stockpiles were disposed off-site to Maddingley Brown Coal, Bacchus Marsh.

OTEK indicated the fate of the excavated basalt cobbles from the former septic system was not known. The auditor does not consider this to be an issue of significance as the composition of

the material removed (basalt cobbles), the available photographs, and results from underlying soils did not indicate gross contamination indicating it was unlikely to be contaminated.

Waste transport certificates were not provided for soil disposed offsite. While this is not in line with industry practice, the auditor does not consider this absence of waste transport certificates to affect the outcome of the audit. This opinion is based on no exceedances of the adopted waste criteria having been reported in the stockpile samples analysed; the auditor has observed that there were no stockpiles onsite during his final inspection (i.e. 13 December 2013); and OTEK, 2013 reporting the imported fill material was used to backfill the excavations.

The reinstatement of excavations was discussed in Section 4.7 of OTEK, 2013 (attached as Appendix D of this report). Imported fill material sourced from Cemex Werribee Quarry (formerly Readymix Werribee Quarry) was used to complete backfilling of the excavations on site. This material was formerly classified as suitable for use as backfill material across the Overall Audit area (refer to Appendix K of OTEK, 2013). Details of sampling and analysis were provided under separate covers, which the auditor reviewed and provided comment on (attached as Appendix N of this report). The fill material was found to contain concentrations of barium, manganese, nickel and vanadium above the EILs but within NEPM background levels. The concentrations were consistent with those detected at the site (as discussed in Section 5.2.1) and across the Overall Audit Area, and were considered to be naturally occurring given the basaltic origin of the material. The auditor was satisfied the material used to backfill excavations was of suitable quality for the proposed intended residential use of the site.

For ease of reporting, a summary of the final condition of soil at the site is presented in Section 5.6 below.

5.3.6 Auditor's opinion on infrastructure removal and validation sampling

From a review of the information provided by OTEK, including description of infrastructure removed, validation sampling methodology, analytical suite, and analytical results; the auditor considered that potential contaminating structures were adequately removed from the site, and the underlying soils appropriately validated.

5.4 Asbestos remediation and validation

ACM were identified during various phases of the site investigation works. The grid and targeted sampling asbestos results are discussed in Section 5.2.3. The validation sampling conducted following removal of Hangar 4, which included analysis of soil samples beneath the hangar footprint for asbestos, is discussed in Section 5.3.1. This section discusses the remediation of ACM observed on Area 4F in the vicinity of former Hangar 4.

5.4.1 Location 4F/G14

As discussed in Section 5.2.3 an ACM fragment was identified at 4F/G14. In August 2009 near-surface validation samples were collected from soils east of Hangar 4 and analysed for asbestos (referred to as 'asbestos scrape' in Section 4.3.7 of OTEK 2013) to delineate the extent of ACM found in 2006 at 4F/G14. During these works, pieces of broken ACM sheeting were identified, stockpiled, and removed from site by licenced handler (i.e. Alex Fraser). Within the scrape zone (refer Figure 5) 10 near-surface samples were collected on Area 4F and an additional 6 near-surface samples were collected from Area 4I (as detailed in Table 17). One sample only (4F/VS-24) contained chrysotile asbestos fibres (refer Analytical Table 49, ALS report EM0907769, Appendix N of OTEK 2013).

In December 2012, sampling location 4F/VS-24 was removed from site and underlying soils validated by sample 4F/VS-24A/0.2 (refer Analytical Table 49, ALS report EM1214169,

Appendix N of OTEK 2013). No asbestos was detected in this sample. Based on the above, the auditor considered this issue to have been resolved.

5.4.2 Surface ACM proximate to Hangar 4

As discussed in Section 4.3.2, the auditor observed ACM near former Hangar 4 during a site visit in January 2011. This triggered asbestos remediation that had not previously been identified in OTEK 2010 Remediation Action Plan (Asbestos in Soil) (refer Appendix I of OTEK 2013). Given the Asbestos RAP was appended to and referenced in OTEK (2013), it was assumed that the same or a similar methodology to that proposed in the Asbestos RAP was adopted.

The works in January 2011 included a hand pick/emu bob in an area east of former Hangar 4 (refer Figure 6). According to Section 4.3.10 of OTEK (2013), the hand pick/emu bob area was divided into four lanes, each being approximately 5 m x 4 m, and therefore it was assumed the total area was approximately 80 m^2. However, the area defined by the survey coordinates in Figure 5 of OTEK (2013) appeared to be much larger than this. For the purpose of calculating the percentage of asbestos in soil (detailed below), and as a conservative approach the hand pick/emu bob area was assumed to be 80 m^2. Additionally, the auditor conducted a verification assessment across the area defined by the coordinates provided (refer Section 4.3.3) to confirm the extent of the bonded ACM identified.

A qualified person from Alex Fraser completed three passes on each of the four lanes, reporting the number of ACM identified in each lane. The greatest number of ACM were observed in Lane 2 (refer Appendix I, OTEK, 2013). These works were generally carried out in accordance with Section 4.1 Table 2 of DOH (2009) asbestos guidelines.

Based on the results of the hand/pick/emu bob, OTEK calculated the asbestos concentration in soil to be 0.00025% weight/weight (w/w), which was well below the DOH (2009) soil asbestos investigation criterion of 0.01% w/w asbestos for ACM (refer Appendix I, OTEK 2013). However, our review indicated that this percentage was calculated incorrectly. This is discussed further below and the asbestos concentration was recalculated.

The percentage soil asbestos calculation described in Table 4.1.7 of DOH (2009) is presented below:

$$\% \text{ Soil Asbestos} = \frac{\% \text{ Asbestos Content} \times \text{ACM (kg)}}{\text{Soil Volume (L)} \times \text{Soil Density (kg/L)}}$$

Where % Asbestos Content (within asbestos cement materials) = 15%

Soil Density = 1.70 kg/L (silty clay soils)

Depth of soil raked = 0.01m

Using the raw data presented in Appendix I (OTEK 2013), the auditor calculated the asbestos concentration in soil (%w/w) as follows:

Table 18 Asbestos Concentration in Soil (%w/w)

Lane	Area (m^2) (each lane 5m x 4m)	Total Volume (L)	Total Weight of ACM (kg)	% Asbestos content x Total Weight of ACM (kg)	% Soil Asbestos[1]
1	20	200	0.102	1.53	**0.004**
2	20	200	0.169	2.535	**0.007**
3	20	200	0.13	1.95	**0.006**

Lane	Area (m^2) (each lane 5m x 4m)	Total Volume (L)	Total Weight of ACM (kg)	% Asbestos content x Total Weight of ACM (kg)	% Soil Asbestos[1]
4	20	200	0.071	1.065	**0.003**
Total	80	800	0.472	7.08	**0.005**

[1] Total soil volume estimated only, therefore % soil asbestos calculated has a positive bias

Based on the above results, the asbestos concentration in soil (%w/w) for each lane were well below the DOH (2009) soil asbestos investigation criteria of 0.01%w/w asbestos for ACM. The results were above the 0.001 % w/w asbestos for fibrous asbestos (FA) and asbestos fine (AF). However, no FA or AF were identified in any of the soil samples analysed.

In February 2011, the auditor conducted another site inspection of this area and a few small additional ACM pieces were observed. Consequently further investigation was conducted in the vicinity of Lane 2 where the most ACM were found. A $10m^2$ area was excavated and stockpiled. Three samples were analysed and a small asbestos fragment (35 x 8 x 6 mm) containing chrysotile (white asbestos) was detected in soil sample F1/SP-1/3 (refer Analytical Table 49, ALS report EM1101283, Appendix N of OTEK 2013).

OTEK indicated that these works were conducted in accordance DOH (2009) asbestos guidelines; however, the sampling method used to assess the stockpiled soils for asbestos was not compliant with the sampling method outlined in Section 4 Table 7 of the DOH (2009), which states that "samples [should be] screened manually on-site through a < 7 mm sieve or spread out inspection on a contrasting colour fabric)". As samples were analysed by the laboratory the non-compliance was not considered significant.

The stockpiled soils were placed back into the excavation on site following a positive result for asbestos in soil sample F1/SP-1/3, (refer Table I, F1/SP-1, OTEK 2013).The auditor was not made aware of this until the report (OTEK 2013) was issued two years later. Although the auditor did not consider it best practice to use the stockpile as backfill material, based on multiple lines of evidences discussed below, it was not considered to pose any significant risk to future users of the site.

5.4.3 Auditor's opinion on the asbestos remediation and validation

Sources of ACM were identified during the site history review including Hangar 4. The hangar was removed by a qualified asbestos handler (i.e. Melbourne Water contractors Transfield and Alex Fraser); however, asbestos clearance and waste transport documentation for these works were not provided in OTEK (2013) for verification. During these works the audit team visited the site on numerous occasions to verify working conditions and sampling protocols. Based on the following lines of evidence:

- field observations of the work were conducted by the auditor/auditor's team,
- underlying soils were visually inspected for ACM by the auditor/auditor's team ,
- OTEK carried out multiple assessment and validation samples , which were analysed for asbestos in accordance with current industry practice, and
- Site meetings including with the auditor were held in preparation for the work as well as during the work by contractors.

The auditor considered that the hangar was, to the extent practicable appropriately removed and the soil was adequately tested and validated.

The results of the grid excavation and sampling program indicated that ACM were not widespread across the site; instead the auditor was of the opinion that it was likely that some occasional small pieces of ACM were present within the vicinity of former Hangar 4. As indicated by OTEK, out of a total of 98 soil samples collected and analysed for asbestos across Area 4F, only two small bonded ACM fragments were observed during field works and confirmed by laboratory analysis at 4F/G14/0.15 and 4F/VS-24 respectively. Both samples were collected within the vicinity of former Hangar 4. No asbestos fibre bundles were reported in soil samples analysed. The auditor was of the opinion that both samples' locations were adequately investigated, removed from site, and underlying soils appropriately validated.

To address the issue of bonded ACM observed within the top 15 mm of soil profile in the vicinity of former Hangar 4, Alex Fraser undertook a hand pick/emu bob and subsequent soil excavation works in the vicinity of Lane 2 where the highest quantity of ACM were identified. As detailed in Section 5.4.2, the asbestos concentration in soil (%w/w) for each lane were well below the DOH (2009) soil asbestos investigation criteria of 0.01%w/w asbestos for ACM. This approach was considered to be systematic and successful in removing the majority of the surface ACM observed in the vicinity of former Hangar 4, however, it is still likely that occasional small pieces of ACM may be present in this area. The auditor verification trenching works conducted in October 2013, also confirmed this (refer Section 4.3.3). As part of this verification works, three surface samples were collected and analysed for asbestos and no asbestos was detected in soils tested.

Based on all the information available to the auditor and as discussed in this report, the auditor is of the opinion that the estimated asbestos soil concentration which was well below the above mentioned DHO (2009) criteria and hence unlikely to pose an unacceptable human health risk to future users of the site; therefore it was suitable for its proposed use.

5.5 Consistency with clean up regulations

Aside from minor inorganic exceedances described in Sections 5.2 and 5.3, there was no contamination identified in soils at the site.

Site infrastructure including Hangar 4, emergency power house, septic system and underground asbestos and galvanised metal pipework were removed and disposed offsite by a licenced contractor (as described in Section 5.3).

Two small asbestos fragments identified in the vicinity of former Hangar 4 and one small asbestos fragment identified at depth during the removal of the underground asbestos pipeline were removed and adequately validated (refer Sections 5.2.3 and 5.4). Further asbestos remedial works were undertaken in the vicinity of former Hangar 4 to identify and remove surface ACM in this area. With the exception of the sampling and reinstatement of stockpile F1/SP-1 onto site, these works were undertaken in general accordance with DOH (2009) asbestos guidelines.

Although the fate of the basalt cobbles removed from the septic system was not known, it was not considered an issue of concern, as there was no indication of contamination within or underlying the material and it was understood that the basalt cobbles were removed offsite, which was confirmed by site inspection during the auditor's verification work discussed above.

Waste transport documentation was not provided in OTEK (2013) report. This matter was discussed with OTEK on a number of occasions as detailed in item 23 of the audit trail documentation (refer Appendix I of this report), however, no further information was

forthcoming. Although this information was not provided, the auditor noted that OTEK (2013) referenced the appropriate waste guidelines for the duration of the works, and stated that works were undertaken in accordance with these guidelines. The auditor liaised with Melbourne Water on 25 July 2013 (email correspondence provided in Appendix M) to discuss this matter further. Melbourne Water confirmed that the contract for the demolition of Hangar 4 and the underground asbestos pipeline works were awarded to Transfield in May 2008; who in turn sub-contracted the asbestos works to Alex Fraser. The asbestos roof and pipe were disposed off-site at Wallert Landfill under dockets 617564, 617601, 617360 and 617667. Based on this information, the auditor was satisfied that the works were conducted in accordance with industry best practice and the materials were disposed off-site to an appropriate landfill facility.

5.6 Summary of final soil conditions and protected beneficial uses of land

As discussed in Sections 5.3 and 5.4, the remediation works included the removal and validation of potentially contaminating infrastructure. Apart from the discussed remediation of ACM in the vicinity of former Hangar 4, no soil clean up or disposal of contaminated soils was required.

At the completion of the audit the following items still remained on site (refer Figure 5):

- The trunk sewer, a concrete block, and stormwater pipeline in the vicinity of grid sample location 4F/G8;
- Stormwater pipeline; and
- Section of galvanised metal pipe.

Following completion of the assessment, infrastructure removal, and validation works, a concentration of cadmium (above the EIL) remained onsite beneath the galvanised metal pipe (refer Figure 5, 4F/VS-35 at 6 mg/kg). Additionally, several slightly elevated concentrations of barium, manganese and vanadium above the EILs remained on the site; which were considered to be representative of background levels encountered across the Overall Audit Area and not likely to pose an ecological or human health risk (as discussed in Sections 5.2.1).

As discussed in Sections 5.2.1 and 5.3, the analytical suite for some of the targeted and soil validation samples included nitrate, nitrite and ammonia. OTEK did not compare the concentrations to any guidelines values. With the exception of 4F/T3/VS-5 (nitrate 480mg/kg, located beneath the former emergency powerhouse concrete slab), nitrate and nitrite results were within the range of concentrations observed across the Overall Audit Area (refer Table O in OTEK 2013). The auditor questioned the rational for the analytical suite selection for 4F/T3/VS-5 given that nitrate was not considered to be a contaminant of concern for the former emergency powerhouse. The result was considered to be an outlier. Ammonia was not detected in any sample analysed.

The samples collected in the vicinity of the septic system would be the most likely to exhibit high concentrations of nitrate, and hence the results obtained provide a 'worst case' scenario. The maximum nitrate and nitrite concentrations for the septic system were reported in 4F/T6/VS-5 (9.1mg/kg and <2mg/kg respectively). The auditor further noted that nitrate results were below 10 mg/kg, which is the concentration often required for pasture soils (NSW DPI, 2004). Given these concentrations were low, the site was not considered to have been significantly impacted by nitrate from potential onsite sources (including septic system and general agricultural use).

5.6.1 Maintenance of ecosystems

Concentrations of barium, manganese, and vanadium above the EILs remained on the site. As discussed in Section 5.2.1, these concentrations were all detected in natural soils and are considered representative of background concentrations as they were also consistent with those encountered on the Overall Audit Area.

One concentration of cadmium in a target sample collected beneath the galvanised metal pipe, which remained on site, was marginally above the EIL. The average concentration for cadmium in natural soils at 0.5mbgl at the site was <2mg/kg, which is below the EIL. On this basis OTEK considered that this single result would not preclude this beneficial use. The auditor concurs with this.

One concentration of nitrate in a validation sample collected beneath the former emergency powerhouse concrete slab was reported outside the background range across the Overall Audit Area. The auditor considered this result to be an outlier and not consistent with the use of the area where it was collected. All other nitrate results ranged between <0.1 mg/kg and 23.2 mg/kg, which is in the order of magnitude recommended for pasture soils (10 mg/kg or more), and horticultural crops (greater than 20 mg/kg) (NSW DPI, 2004) and was not considered to adversely affect this beneficial use.

Based on the above two paragraphs, the auditor did not consider that the cadmium and nitrate concentrations present in the target and validation samples posed an unacceptable level of risk to the maintenance of ecosystems.

Additionally, the range of pH (5.2 to 9.5) encountered at the site was not expected to adversely impact the beneficial use maintenance of ecosystems, as it was consistent with the Overall Audit Area range of pH and most likely naturally occurring, also there were no visual effect on site vegetation or soil profile appearance.

5.6.2 Human health

All concentrations of all analytes tested were below the investigation levels for protection of human health (HIL A).

5.6.3 Building and structures

The pH in soils across all assessment and validation samples was broadly ranging from slightly acidic to slightly alkaline soils (5.2 to 9.5). The pH range observed was consistent with that observed in similar natural soils across the Overall Audit Area, and was consistent with the nature of the soil developed from the parent materials described in this report (refer to Section 2.2). Given the distribution of the pH results observed across the site, and given there were no identified potential sources that might have attributed to altering soil pH; the pH range observed was considered within natural background occurrence. The soil pH range observed was not expected to adversely impact the integrity of future concrete buildings and structures on site.

Additionally, OTEK compared soil sulphate concentrations and pH levels with the exposure classification for concrete piles in Australian Standard AS2159-2009. OTEK concluded soil at the site would not impact the integrity of structures or buildings.

Acid sulphate soils were not encountered or expected at the site given the geological conditions and location of the site.

5.6.4 Aesthetics

OTEK reported (in OTEK 2013) there were no offensive odours noted during field works, and surface debris was collected to the extent practicable and disposed off-site during the infrastructure removal program from May to September, 2009.

As discussed in Sections 5.3 and 5.4 above, extensive asbestos investigation and clean-up were conducted followed by validation; however, it is still likely that occasional small pieces of ACM may be present in this area. This is noted in the Statement of environmental Audit.

The auditor, during his final site inspection on 13 December 2013, observed the site surface was predominantly covered with weeds and grasses. The auditor confirmed there was no visual evidence of contamination.

5.6.5 Production of food, flora and fibre

The objectives of this beneficial use were discussed in Section 3.2.5, and are generally applicable in an agricultural setting for which produce may be available for consumption.

As noted in Section 3.2.5, OTEK adopted HIL A investigation levels when assessing this beneficial use. The auditor considered the EILs should also be taken into account. Concentrations of barium, manganese and vanadium exceeded the EIL. As discussed in Section 5.2.1, these concentrations were all detected in natural soils and are considered representative of background conditions. In addition one concentration of cadmium in a target sample was marginally above the EIL. The average concentration for cadmium in natural soils at 0.5mbgl at the site was <2mg/kg, which is below the EIL. These results were considered unlikely to pose an adverse impact to ecological receptors and hence nor to the beneficial use production of food, flora or fibre.

The one elevated nitrate result located beneath the former emergency powerhouse was reported outside the background range across the Overall Audit Area and was considered to be an outlier. All other nitrate results ranged between <0.1 mg/kg and 23.2 mg/kg which is in the order of magnitude recommended for pasture soils (10 mg/kg or more), and horticultural crops (greater than 20 mg/kg) (NSW DPI, 2004), and was also considered unlikely to adversely impact this beneficial use.

5.7 Off-site contamination

Based on the available information through the collation of data for the Overall Audit Area, there was no evidence that any activities undertaken on the site have resulted in contamination of soil at the surrounding sites.

5.8 Consistency of the proposed development with the condition of the site

As per the proposed development plan provided in Appendix F, the site was part of the Riverwalk Estate which was proposed to be developed for residential 'single dwelling' and 'medium-density' development and associated uses such as public open space and recreation areas.

Based on all the data available as discussed in this report, the auditor was of the opinion that the site was currently suitable for the proposed sensitive land use, as it was considered the relevant beneficial uses of the land were protected.

6. Assessment of groundwater quality

OTEK undertook a groundwater assessment across the Overall Audit Area, including the installation of 11 groundwater monitoring wells (MW-1 through MW-11) between June 2006 and October 2009. There were no monitoring wells installed within Area 4F as the potential for groundwater contamination was considered to be low (OTEK 2013). OTEK considered monitoring wells MW-2, MW-3 and MW-5 installed hydraulically up and cross gradient of the site to represent background conditions. The auditor agreed with the representation for MW2 and MW5, however, MW-3 was not likely to represented background conditions given that it was located down gradient of the former copper chrome arsenate (CCA) contamination located on Area 4B. The auditor, howver, noted that MW3 did not report contamination associated with the former CCA contamination located on Area 4B and analytical results were consistent with the other wells located on the Over All Audit Area. The auditor considered MW-2, MW-5 and MW-6 installed hydraulically up and cross gradient of the site to represent groundwater conditions on Area 4F.

The findings of the overall groundwater assessment were reported under separate cover as a draft document (OTEK, 2010). The auditor referred to the draft hydrogeological report for background information, but did not rely on it for the purposes of this audit as the findings relevant to Area 4F were reported in OTEK (2013).

Summary of key information within OTEK (2013) is provided in Table 19 below.

Table 19 Assessor's site assessment information – groundwater

Assessment Details	Section in assessor's report (OTEK 2013, Appendix C of this report)
Details of groundwater field sampling and assessment	Section 4.8
Groundwater Analytical Results	Section 6.2
Field Observations	Section 4.8, Appendix B and L
Monitoring Well Logs	Appendix B
Field Measurements (Groundwater)	Appendix L
Site Plan	Figure 6
Analytical Results (Summary Tables)	Tables 57 to 71

6.1 Adequacy of the groundwater assessment program

As discussed above, OTEK undertook a groundwater assessment across the Overall Audit Area but not directly in Area 4F due to the low potential of site use impact on groundwater. The auditor considered that specifically wells MW-2, MW-5 and MW-6 installed hydraulically up and cross gradient of the site to represent groundwater conditions on Area 4F.

Table 20 provides information on the monitoring wells present in the vicinity of the site.

Table 20 Monitoring Well Details

Monitoring Well ID	Potential Source Targeted	Total Well Depth (mbgl)	Aquifer[1]	SWL (mTOC)[2]	Top of screen (mbgl)
MW-2	Groundwater conditions in Area 4D	17.80	NVA	13.445	11
MW-5	Groundwater conditions in Area 4D and Area 5. Suspected former UST (within Area 5, no evidence of UST identified)	15.8	NVA and Werribee Delta	10.275	10.8
MW-6	Groundwater condition coming onto the Overall Audit Area	13.00	Werribee Delta	11.604	9

NOTES:
mTOC – metres below top of casing
mbgl – metres below ground surface
[1] As per Appendix B of OTEK 2013
[2] Measured on 7 December 2011.
NVA – Newer Volcanic Aquifer

Groundwater across the Overall Audit Area was inferred to flow towards the east (refer to Figure 8), which was consistent with the expected flow direction towards the Werribee River which flows approximately north-south and was located approximately 700 m to the east of the site. Regionally, the groundwater was expected to flow to the south east toward Port Phillip Bay located approximately 7 km to the south east of the site.

Based on the flow regime identified from gauging for the Overall Audit Area, MW-2 appeared to be located hydraulically cross gradient; and MW-5 and MW-6 appeared to be located hydraulically up and cross gradient. Refer to Figure 8 for the location of these wells.

Wells were installed using a combination of hollow stem augers and air hammer drilling through basalt (where encountered) to the maximum depth. Screens were constructed above the measured standing water in all wells indicating that the potential for non-aqueous phase liquids (NAPL) and hydrocarbons could be adequately assessed if present. A sand pack was installed from the base of each well to approximately 1m above the screened interval, a bentonite seal of 1.0 m was installed above the sand pack, followed by grout to surface. The standing water level (SWL) in MW-5 (provided in Table J of OTEK 2013) was above the screened interval; however, as there was no indication of any hydrocarbon contamination in groundwater, this was not considered an issue.

The monitoring wells were developed in November 2006 by injecting compressed air into the well to cause a surging action of the groundwater within the well. Groundwater quality parameters were not collected at the time of development. The auditor noted the use of compressed air to surge the water column without extraction of groundwater and sediment was not a preferred method of development, as although it may adequately increase connectivity with the aquifer, the process does not remove drilling fines. However, when considering the number of sampling events, consistency of results across sampling events, and adequate time elapsed between the wells development and sampling (more than seven days) the auditor was satisfied that the method of well development was unlikely to have impacted on the groundwater analytical results.

Five rounds of groundwater sampling events for wells MW-2, MW-5 and MW-6 were undertaken. These are summarised in Table 21.

Table 21 Summary of groundwater sampling events and analysis

Monitoring Event	Date	Wells Sampled	Analysis
GME1	22-23 August 2007	MW-2, MW-5 and MW-6	Inorganics[2], BTEX, TPHs, PAHs, cations/anions[3], TDS, pH
GME 2	14 November 2007	MW-2, MW-5 and MW-6	Inorganics[2], BTEX, TPHs, PAHs, cations/anions[3], TDS, pH
GME 3	4-5 February 2008[1]	MW-2, MW-5 and MW-6	Inorganics[2], BTEX, TPHs, PAHs, cations/anions[3], TDS, pH
GME 4	26-27 November 2009	MW-2, MW-5 and MW-6	Inorganics[2], BTEX, TPHs, PAHs, OCPs/OPPs (MW6 only), cations/anions[3], TDS, pH
GME 5	7 December 2011	MW-2, MW-5 and MW-6	Inorganics[2], BTEX, TPHs, PAHs, cations/anions[3], TDS, pH

NOTES:
[1] Field record sheets stated that purging was undertaken on 2/5/2008 for MW-2, and on 2/4/2008 for MW-5 and MW-6. This is considered to be a typographical error as sampling records indicated sampling occurred on 4/2/2008 and 5/2/2008.
[2] antimony (GME 4 and 5 only), arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, ferrous iron (GME 2 only) manganese, mercury, molybdenum, nickel, selenium, tin, vanadium, zinc.
[3] alkalinity, bicarbonate, calcium, carbonate, chloride, electrical conductivity, magnesium, nitrate, nitrite, potassium, sodium, sulphate.

Groundwater samples were collected using low flow micro-purge to reduce the potential loss of volatiles. Purging continued until stabilisation of the groundwater's physical and chemical parameters had occurred. Groundwater quality parameters for the wells sampled during the five GMEs were included in Appendix L of OTEK (2013) attached as Appendix D. OTEK reported that samples were collected in laboratory provided bottles, placed on ice and transported to the NATA certified laboratory under chain of custody protocol. While some deficiencies in the chain of custody protocol were observed, the sampling methodologies employed were considered generally appropriate.

Samples were submitted to Labmark Pty Ltd (Labmark) as the primary laboratory and ALS Pty Ltd (ALS) as the secondary laboratory for GMEs 1 to 3. For GME 4, ALS was the primary laboratory and Labmark was the secondary laboratory. For GME 5, ALS was the primary laboratory and Groundswell Laboratories Pty Ltd (Groundswell) was the secondary laboratory. Laboratory reports were NATA stamped and signed by a NATA signatory.

Based on available relevant guidelines and current industry practice, the groundwater characterisation works completed by OTEK were considered adequate for the purposes of assessing the groundwater quality beneath the site. In summary:

- The number of monitoring wells installed across the Overall Audit area enabled groundwater flow direction to be inferred;
- The data from the Overall Audit Area allowed for an assessment of regional groundwater conditions and provided a good indication of groundwater quality beneath the site;
- The monitoring wells were placed appropriately to assess the potential for an adverse impact on groundwater quality from potential contamination sources;
- Appropriate construction methods were generally adopted for the monitoring wells, with two of the wells screened across the standing water level;
- The analytical schedule and field measurements were adequate; and

- The low flow sampling methodology adopted was considered appropriate.

6.2 Beneficial uses of groundwater to be protected

The assessor's groundwater field investigations indicated the TDS of groundwater in monitoring wells MW2 (Area 4D), MW-5 (Area 4D) and MW6 (Area 4H) proximate to the site ranged from 5060 mg/L (MW2 in 2011) to 5740 mg/L (MW6, 2011) (Table 62, OTEK 2013). On this basis, groundwater at the site is classified as Segment C of the protected beneficial categories of the groundwater environment (Groundwater SEPP, 1997). Based on the salinity of the groundwater, the beneficial uses protected under the *Groundwater SEPP* were:

- Maintenance of Ecosystems;
- Stock watering;
- Industrial water use;
- Primary contact recreation (e.g. bathing, swimming); and
- Buildings and structures.

In addition to these beneficial uses, groundwater contamination should not be present at concentrations that would adversely affect the use of land at the site. Given that volatile contaminants were not encountered in groundwater at the site, it was not considered that groundwater conditions would have any adverse impact on the beneficial uses of land.

6.3 Regional groundwater quality

In order to gain a good understanding of regional groundwater quality, the auditor undertook a review of groundwater data across the Overall Audit Area (i.e. data from Areas 1, 2, 3, and 4). This review found that elevated concentrations of various inorganics in groundwater (i.e. boron, copper, manganese, nickel, selenium, zinc, and nitrate) above the investigation levels (predominantly for maintenance of ecosystems) were widespread across the region.

Typical concentrations of inorganics, considered to be naturally occurring and/or regionally representative in groundwater across the Overall Audit Area are summarised in Table 22, and discussed further below. It was noted that much of this data was collected over a number of years, but as the site activities had not changed, the data was still considered valid to provide a good indication of groundwater quality across the region. Additionally, as noted below, two previous audits conducted on nearby sites found groundwater quality of a similar nature.

Table 22 Regional groundwater quality

Analyte	Investigation Level Maintenance of Ecosystems	Audit Area and Sample Dates			
		Area 1 March 2003	Area 2 October 2003	Area 3 May to September 2005 (three monitoring events)	Area 4 August 2007 – Dec 2011 (six monitoring events)
		Concentration Range (mg/L)			
Boron	0.37	0.18-0.42	0.29-0.71	0.16-0.23	0.16-0.45
Copper	0.0014	<0.001-0.008	0.005-0.011	0.002-0.021	0.004-0.158[a]
Manganese	1.9	0.017-0.068	0.018-0.13	0.15-2.3	<0.001-0.861[c]
Nickel	0.011	<0.001-0.006	0.006-0.01	0.011-0.26	0.002-0.100
Selenium	0.011	0.028-0.051	0.038-0.072	<0.005-0.031	<0.01-<0.02

Analyte	Investigation Level Maintenance of Ecosystems	Audit Area and Sample Dates			
		Area 1 March 2003	Area 2 October 2003	Area 3 May to September 2005 (three monitoring events)	Area 4 August 2007 – Dec 2011 (six monitoring events)
		Concentration Range (mg/L)			
Zinc	0.008	0.015-0.019	0.009-0.014	0.01-0.047	0.01-0.331[b]
Nitrate-N	0.7	12.4[d]	5.3-6.7	2.3-9.8	1.25-5.82

NOTES:

[(a)] isolated result in MW6 Area 4, November 2007, all other results for Area 4 wells ≤0.011 mg/L.

[(b)] isolated result in MW6 Area 4, November 2007, all other results for Area 4 wells ≤0.066 mg/L.

[(c)] Results from November 2009 for manganese were an order of magnitude great than all other manganese results for Area 4, and considered anomalous.

[(d)]converted from nitrate-NO3 (55 mgL).

[(e)] ANZECC (2000), 95% level of protection (slightly to moderately disturbed ecosystems) for freshwater guidelines

Sources:

GHD 2003, GHD 2004, GHD 2008 (refer Section 8 References), OTEK 2010, OTEK, 31 October 2012, *Remediation and Validation Report (Draft), Sub-Area 4B, Werribee, Victoria*

6.3.1 Boron, copper, manganese, nickel, selenium, and zinc

Detected concentrations of boron, copper, manganese, nickel, selenium, and zinc were considered to be generally naturally occurring and representative of regional groundwater conditions in the Werribee Area, rather than attributed to point source contamination arising from historical uses of the Overall Audit Area. This was based on the following lines of evidence:

- Concentrations of inorganics were generally consistent across all audit Areas (i.e. Areas 1, 2, 3 and 4), in both up and down gradient monitoring wells;
- The concentrations of these analytes in soils were typically low, with few exceedances of soil ecological investigation levels across the whole data set. In addition, the depth to groundwater, the low permeability of soils, and the low concentrations in groundwater indicated migration from surface soil concentrations is unlikely to have occurred to any significant extent across the Overall Audit Area;
- There were no specific point sources of these inorganics identified in the Overall Audit Area or the site itself;
- A review of nearby audits undertaken during the audit of Area 3 (GHD 2008) found that groundwater at two sites located approximately 5 km north east (Dames and Moore Pty Ltd, 2000, Statutory Environmental Audit, 200-208 Derrimut Road, Hoppers Crossing, Victoria) and 6 km north east (HLA Envirosciences Pty Ltd, 2002, Statutory Environmental Audit, 60 Warringa Crescent) of the Overall Audit Area contained concentrations of chromium, selenium, zinc, nickel, and copper above ANZECC maintenance of ecosystem and stock water criteria (selenium and nickel only). The audits concluded that these concentrations were considered naturally occurring in the Newer Volcanic Aquifer.

6.3.2 Nitrate

Similarly, groundwater in the vicinity of the Overall Audit Area was found to contain elevated concentrations of nitrate, with concentrations in groundwater across all audit Areas (Areas 1, 2, 3 and 4) exceeding the ANZECC maintenance of ecosystems guidelines. It was noted that ANZECC issued an errata in June 2005 stating that all nitrate trigger values should be deleted

and replaced with "under review". The investigation level was therefore referenced for general guidance only. Based on the following lines of evidence, the concentrations of nitrate observed across the Overall Audit Area were considered either naturally occurring or representative of the regional land use:

- Although potential point sources of nitrate were identified in the Overall Audit Area, including septic tanks and associated infrastructure located in Areas 4A, 4B, 4C, 4D, 4E, 4F, 4G and 4I, the distribution of nitrate concentrations in groundwater did not indicate contamination from point sources (i.e. no elevated concentrations of nitrate were detected close to these potential sources). The concentrations of nitrate observed across the Overall Audit Area were reasonably consistent (refer Table 22 above), with up gradient (i.e. background) wells containing similar concentrations to wells in the vicinity and down gradient of such potential sources. Furthermore, use of the septic tanks ceased circa 1950s.
- Concentrations of nitrate in soil across Area 4 were typically low (generally less than 20 mg/kg, with the exception of a few isolated higher concentrations in Area 4D) and were considered unlikely to migrate to groundwater given the low permeability of soils and depth to groundwater.
- Nitrate is known to be naturally occurring in the Newer Volcanic Aquifer at concentrations up to 60 mg/L (as nitrate, Leonard 1992). Furthermore, the widespread agricultural land use across the Werribee Area may have contributed, to an extent, to the nitrate concentrations (e.g. through fertilizer application and livestock).

Given these lines of evidence, the concentrations of the abovementioned inorganics (including nitrate) observed across the Overall Audit Area, including the site, are considered to be regionally occurring and not derived from a site source.

Further discussion regarding specific analyte concentrations is provided in Section 6.4 below.

6.4 Summary of groundwater assessment results

The findings of the groundwater assessment undertaken in the vicinity of the site (i.e. wells MW-2, MW-5 and MW-6) are summarised below. Tabulated groundwater results from 2009 and 2011 are presented in Tables 57 to 68 of OTEK 2013 (attached as Appendix D of this report). As noted in Section 3.4, OTEK adopted ANZECC 1992 investigation levels, despite the auditor requesting OTEK consider the more recent ANZECC 2000 guidelines. The following discussion is based on a comparison of groundwater analytical results with ANZECC 2000 and NHMRC 2008.

6.4.1 Organic analytes

Concentrations of BTEX, TPHs, PAHs, and OCPs/OPP (analysed in well MW6 only) were below the laboratory limit of reporting.

6.4.2 Inorganic analytes

Concentrations of inorganics above the adopted investigation levels in groundwater at the site are summarised in Table 23 below.

Guidelines for industrial water use have not been included given that the relevant investigation levels would depend upon the broad potential application of this use. The beneficial use of buildings and structures was not considered to be adversely impacted by the elevated concentrations of inorganics and, therefore this beneficial use has not been presented in Table 23.

Table 23 Exceedances of adopted investigation levels (mg/L)

Beneficial use requiring protection		Analyte / Adopted Investigation Levels					
		Boron	Copper	Lead	Nickel	Zinc	Nitrate
Maintenance of Ecosystems[1]		*0.37*	*0.0014*	*0.0034*	*0.011*	*0.008*	*0.7*[7]
Primary Contact Recreation[2]		4[4]	2[4], 1[5]	0.01[4]	0.02[4]	3[5]	50[4]
Stock watering[6]		**5**	**0.4**	**0.1**	**1**	**20**	
GME date	Monitoring Well	Analytical Results					
22 & 23 Aug 2007	MW-2				*0.020*	*0.024*	*4.44*
	MW-5				*0.014*	*0.021*	*5.03*
	MW-6				0.026	*0.030*	*2.97*
14 Nov 2007	MW-2					*0.011*	-
	MW-5		*0.011*			*0.039*	-
	MW-6		*0.158*	*0.004*	0.024	*0.331*	-
4 & 5 Feb 2008	MW-2					*0.031*	-
	MW-5					*0.030*	-
	MW-6		*0.011*			*0.034*	-
26 & 27 Nov 2009	MW-2		*0.010*		*0.019*	*0.041*	*3.87*
	MW-5		*0.012*			*0.031*	*1.28*
	MW-6				*0.019*	*0.031*	*3.14*
07 Dec 2011	MW-2		*0.008*			*0.043*	*3.06*
	MW-5	*0.390*	*0.004*		*0.012*	*0.044*	*1.24*
	MW-6		*0.004*			*0.016*	*3.13*

NOTES:
Only results exceeding ILs are presented (if cell blank result was <IL)
Italicised results exceed ecosystem protection criteria.
Underlined results exceed stock watering guidelines.
Bold results exceed protection of primary contact recreation.
NA - Not analysed
1. ANZECC (2000), 95% level of protection (slightly to moderately disturbed ecosystems) for freshwater guidelines.
2. NHMRC (2008); Guidelines for Managing Risks in Recreational Water.
3. Values range for various animals. Most conservative value for sheep selected.
4. Health Guideline.
5. Aesthetic Guideline.
6. ANZECC (2000) water quality trigger values (low risk) for heavy inorganics and metalloids in livestock drinking water
7. ANZECC issued an errata in June 2005 stating that for nitrate: "*Delete all trigger values and replace with "Under review*". The investigation level has been retained for general guidance only.

A single result for lead in MW-6 in 2007 and a single result for boron in MW-5 in 2011 marginally exceeded the investigation level (IL) for maintenance of ecosystems. Concentrations of copper, nickel, zinc and nitrate exceeded ILs for maintenance of ecosystems in one or more of the abovementioned wells during the groundwater monitoring program. Concentrations of nickel also exceeded ILs for primary contact recreation in MW-6 in August and November 2007. These exceedances are discussed further below:

Boron, copper, nickel, zinc

OTEK provided a reasonable discussion regarding the concentrations of boron, copper, nickel and zinc in Sections 6.2 and 8.2 of OTEK 2013, concluding that these inorganics were naturally occurring. Based on the following lines of evidence, the auditor concurred with OTEK's conclusion:

- The general absence of elevated levels of these inorganics in soil sampled from the site indicated that the groundwater concentrations reported are likely to be representative of regional conditions (as discussed in Section 6.3);
- There were no specific widespread sources of boron, copper, nickel or zinc identified at the site, suggesting concentrations of these analytes are most likely to be naturally occurring and within the range of natural background variation;
- Boron was not analysed in soil samples collected from MW-5, therefore it is not possible to assess whether migration from soil had occurred. However, all boron concentrations in soil samples collected from grid locations across the site were below the LOR. Also, due to the nature of the site soil (i.e. generally clayey), it was expected that the soil would have high cation exchange capacity (CEC) and hence the soil was likely to slow migration of boron to groundwater due to this high adsorption capacity. On this basis, and given the broad range of boron concentrations detected in groundwater across the Overall Audit Area, it was considered the boron concentrations at MW-5 are likely naturally occurring;
- A review of data from adjacent Areas (4A, 4B and 4C) indicated that concentrations of boron, copper, nickel and zinc at the site were within the range of concentrations detected in the Overall Audit Area (data from Area 4 summarised in Table AA of OTEK 2013);
- Sources or activities undertaken at the site were not expected to be associated with the elevated inorganic concentrations reported suggesting that the inorganics at the site were not from an onsite anthropogenic source;
- The generally low permeability clayey site soil developed over basaltic/volcanic geology is likely to affect the fate and behaviour of contaminants (i.e. retard movement of contaminants through soil and minimise infiltration into the aquifer). Such soils are usually known to be able to adsorb higher concentrations than lighter soils (e.g. sandy soils) as they have higher cation exchange capacity and hence higher inorganics assimilation capacity; and
- The depth to the groundwater is considerable and hence it is expected to reduce migration of inorganics.

Nitrate

Concentrations of nitrate-N were above the investigation level for maintenance of ecosystems in all monitoring wells. As discussed in Section 6.3, the auditor is of the opinion the concentrations of nitrate to be representative of regional background conditions, based on the following lines of evidence;

- Concentrations in the vicinity of the site were consistent with those observed across the Overall Audit Area (data are provided in Table AA of OTEK (2013).
- Concentrations were consistent with levels expected in groundwater agricultural areas, and in the Newer Volcanics Aquifer (Leonard, 1992); and
- Aside from former agricultural use in the region, there were no point sources of nitrate identified on the site. It was noted that agriculture activities on the site ceased a few years ago and hence were not considered an ongoing potential primary source of nitrate.

Additionally, considering the nature of nitrate, any residual nitrate in soil (i.e. potential secondary source) from previous activities would have decreased over time, and hence any potential risk would have further diminished.

Based on the discussion above and in accordance with the Groundwater SEPP (part IV, 10, 2(c)), where "the background level of a groundwater quality indicator is greater than the objective, the background level becomes the objective". Therefore, concentrations of boron, copper, nickel, zinc and nitrate were not considered to exceed the environmental objectives and are not discussed as exceedances within the remainder of this report.

Furthermore, the groundwater results were consistent with the soil results and field observations that had already demonstrated the potential sources of impact had not resulted in adverse impacts to groundwater.

6.4.3 Aesthetic impacts

There was no sheen or odour observed in groundwater from any of the wells.

6.4.4 Off-site migration of groundwater contamination

Groundwater was not considered to be polluted and, therefore offsite migration of groundwater is not an issue.

6.5 Summary of groundwater conditions and impact on beneficial uses

As discussed above, the results of the groundwater assessment program for wells, which are considered to be representative of groundwater quality beneath the site indicated groundwater was not polluted. Elevated concentrations of boron, copper, nickel, zinc and nitrate were representative of regional conditions (likely naturally occurring and from a widespread anthropogenic sources such as agriculture use). The relevance of protected beneficial uses at the site and the potential impact of the groundwater conditions on the relevant beneficial uses are summarised in Table 24.

Table 24 Likelihood of beneficial uses being realised

Protected Segment C Beneficial Uses	Existing Use?	Likelihood/ Relevance of Beneficial Use	Analytes	Comments
Maintenance of ecosystems	Yes	The groundwater is likely to discharge to the Werribee River and/or Port Phillip Bay, located approximately 400 m to the east and 7 km to the south east of the site respectively.	Boron, copper, nickel, zinc and nitrate-N	Maintenance of ecosystem not precluded, given that concentrations of boron, copper, nickel, zinc and nitrate were considered naturally occurring in the region as discussed in this report.
Stock watering	Unlikely	It is possible given the current rural setting that stock watering may be realised on neighbouring properties in the future. However, the proposed urban development and access to a reticulated water system makes this unlikely.	None	Beneficial use was not precluded given that concentrations of nickel were considered naturally occurring in the region as discussed in this report.

Protected Segment C Beneficial Uses	Existing Use?	Likelihood/ Relevance of Beneficial Use	Analytes	Comments
Primary contact recreation	Unlikely	Not relevant on site. Groundwater wells may be used to fill or top up swimming pools in the vicinity of the site. However, this is considered unlikely given access to a reticulated water system.	Sulphate, sodium, manganese, nickel	Beneficial use was not precluded, given that concentrations of sulphate, sodium, nickel and manganese were below modified criteria. Additionally concentrations of nickel, sulphate and sodium were considered to be naturally occurring.
Industrial use	No	Criteria are usually industry specific, however, given neutral pH and low TDS groundwater could support a number of industries.	NA	Use of groundwater for this beneficial use was considered unlikely given proposed development.
Buildings and structures	No	When assessing the groundwater with respect to this beneficial use the groundwater results were compared with the requirements set in Australian Standard AS2159:1995 (Piling – Design and Installation). The pH results indicated that the groundwater is not aggressive. It is considered that buildings and structures would not come in to contact with the groundwater.	NA	Beneficial use not precluded given that concentrations do not indicate potentially corrosive conditions to buildings and structures. It is also not considered that such beneficial use is likely as the depth of any foundation is unlikely to come into contact with groundwater.

6.5.1 Conclusion on groundwater quality, existing and likely future uses

As discussed above, the relevant beneficial uses of maintenance of ecosystems, stock watering, industrial water use, primary contact recreation (e.g. bathing, swimming), and buildings and structures were not precluded by the concentrations of any contaminant tested that were attributed to the site (i.e. not naturally occurring). Therefore, groundwater at the site was not considered to have adversely impacted on-site or off-site current or future uses.

6.5.2 Auditors opinion on the groundwater conditions and impact to beneficial uses

Based on all the information available and as per the multiple lines of evidence provided above; the auditor is of the opinion that onsite potential sources and activities have not impacted the beneficial uses of groundwater to any extent of concern. This was further supported by the absence of elevated contaminants' concentrations of concern in soil, and observations made during field works.

7. Audit conclusions

Following completion of this environmental audit for Area 4F of Riverwalk Estate, Princes Highway, Werribee, Victoria and based on the data available to the auditor at the time of the completion of the ESA and the auditor verification work, as detailed and discussed in this report, the following conclusions are provided:

- The overall QA/QC activities undertaken by the assessor indicated that the analytical results of the soils and groundwater were representative of site conditions and can be relied on to reach the opinions stated in this audit report at the time of assessments (refer to Section 4.3 for details). It was noted the auditor had to provide numerous comments to OTEK prior to obtaining a report of suitable quality and that OTEK made a number of errors during the assessment works. These were discussed throughout this audit report, and were not considered to impact on the overall conclusions.
- The density, locations, and frequency of sampling were in general accordance with AS 4482.1 requirements. Given the majority of the site was essentially a green field, grid and targeted sampling was undertaken, and infrastructure was removed and appropriately validated; the auditor considered the sampling adequate to characterise the site contamination condition (refer Section 5.1.3).
- Identified former potential sources and activities were appropriately targeted or dealt with during the validation sampling. The sampling program was considered acceptable (refer to Sections 5.2.4 and 5.3.6).
- Based on the data available up to the completion of the audit, concentrations of barium, manganese and vanadium were observed above the EILs in soils across the site. These concentrations were considered to be naturally occurring, and were not considered to impact the future use of the site (refer to Section 5.2.1).
- One concentration of cadmium in a target sample collected beneath the galvanised metal pipe which remained on site was marginally above the EIL. The average concentration for cadmium in natural soils at 0.5mbgl at the site was <2mg/kg, which is below the EIL. This single result was not considered to adversely impact the future use of the site (refer Section 5.2.1).
- A nitrate concentration in a validation soil sample collected beneath the former emergency powerhouse concrete slab was elevated compared to other concentrations across the site. The auditor considers this result to be an outlier especially considering its location. Also, given the majority of samples were reasonably low, the site was not considered to have been significantly impacted by nitrate from potential onsite sources (including septic system and general agricultural use) (refer Sections 5.3.2 and 5.6.1).
- As discussed in this report, remediation and validation works were carried out in the vicinity of former Hangar 4 and concluded that level of asbestos was well below the DOH (2009) soil asbestos investigation criterion of 0.01% w/w asbestos for ACM. Furthermore, the auditor conducted verification work consisting of excavating trenches and surrounding soils for observation of bonded ACM. Few small pieces of ACM were observed in 2 trenches. As part of this verification, three surface samples were collected and analysed for asbestos. No asbestos was detected in any of these samples. The auditor considered that it is still likely that occasional small ACM fragments may still be present on that area of the site (refer Sections 5.2.3 and 5.4).

- Groundwater was not considered polluted at the site. The elevated concentrations of boron, copper, nickel, zinc, and nitrate were considered to be naturally occurring and as such were not considered to impact relevant beneficial uses (refer Section 6.5).
- At the time of completion of this audit, the site surface was vacant and mainly covered with grass. As described in this report and shown on Figure 5, a concrete block which intersected the trunk sewer and stormwater pipeline, stormwater pipeline; and a section of galvanised metal pipe remained on site. The auditor confirmed the site appearance during his final site inspection on 13 December 2013 and verification works conducted on 2 and 3 October 2013 (refer Sections 4.3.2 and 4.3.3).

The auditor was, therefore of the opinion that the site is suitable for Parks and Reserves; Agricultural; Sensitive use (i.e. high density, medium and single dwelling/low density residential use, child care centre, pre-school or primary school); Recreation/Open space; Commercial; and Industrial uses. In accordance with the Environment Protection Act 1970 and the appropriate policies and guidelines issued by the EPA, a Statement of environmental Audit has been issued as part of this report.

These conclusions must be read in conjunction with the full audit report, "*Melbourne Water Corporation, Area 4F of Riverwalk Estate, Princes Highway, Werribee, Victoria, December 2013.*"

Dated: 17 December 2013

Signed:

Dr FOUAD ABO of GHD Pty Ltd

ENVIRONMENTAL AUDITOR

(appointed pursuant to the Environment Protection Act 1970)

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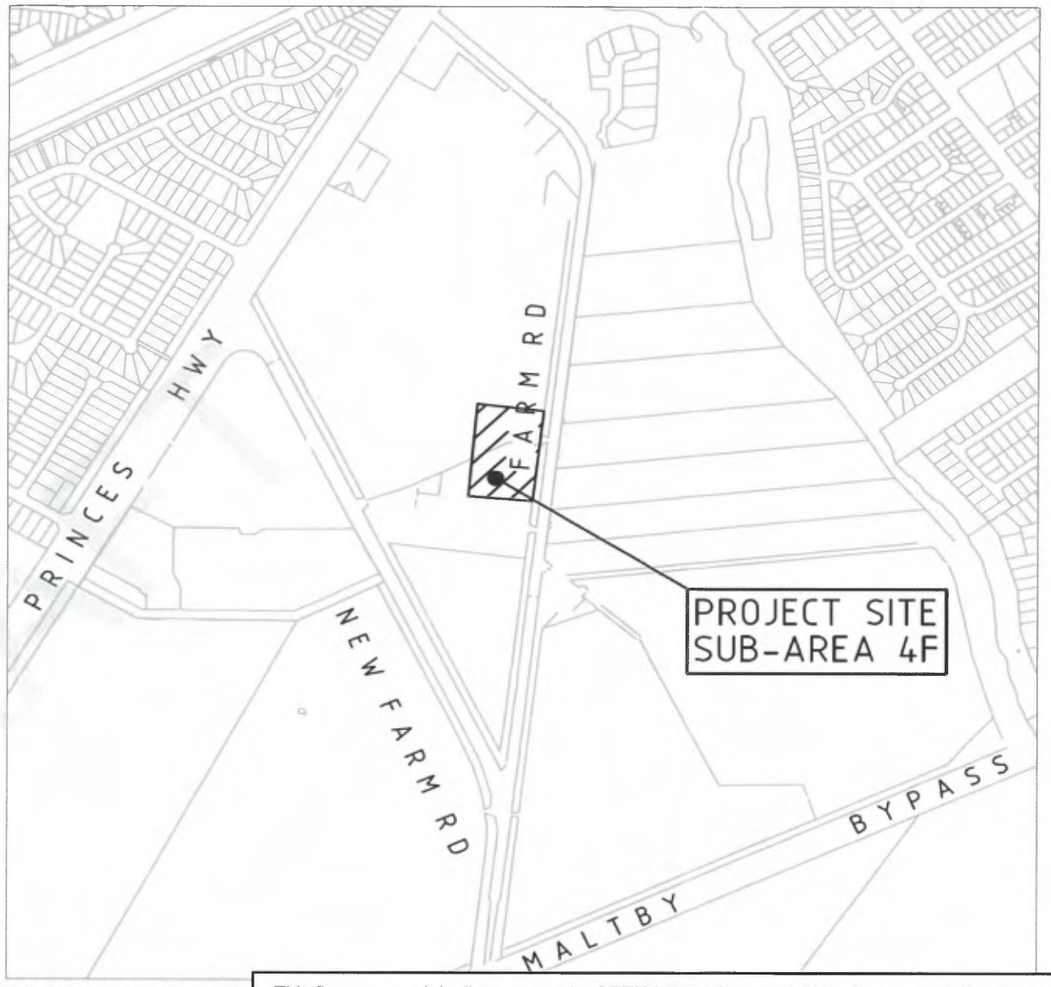
Figures

REGIONAL MAP

LOCALITY MAP



VICINITY MAP

This figure was originally prepared by OTEK for "Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria" (4F ESA Report). The image represented here is an extract from the 4F ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
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Note: Image was extracted from OTEK ESA Report (above) and is not represented to scale.

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Project: Environmental Audit of Area 4F, Riverwalk Estate, Princes Highway, Werribee
Source: Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria (OTEK, 2013)

scale: Not ot Scale | date: 4 November 2013

Job No. 31 / 1157500
Report No. 220078 ©
Rev No. 0

Figure 1
Regional & Vicinity Maps

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Note: Image was extracted from OTEK ESA Report (above) and is not represented to scale.

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Rev No. 0

Figure 2
Riverwalk Area Site Map

scale: Not to Scale | date: 4 November 2013

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MGA Zone GDA 94		
	Easting	Northing
1	293122.369	5801131.415
2	293237.764	5801118.056
3	293217.959	5800946.863
4	293137.14	5800956.045

LEGEND

- Audit Areas
- **Historic Site Infrastructure:**
  - Hanger Footprint
  - Energency Powerhouse
  - Septic System
- Galvonised Metal Pipe (additional section)
- Stormwater Pipeline
- Trunk Sewer
- Asbestos and Galvonised Metal Water Pipe

Note: The data displayed in this figure has been digitised from images extracted from the following reports; OTEK (2013) *Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria* and OTEK (2011) *Remediation Action Plan - Version 3 (Soil Contamination Sub-Area 4B)* . Therefore GHD cannot guarantee the accuracy of this data.
This figure should only be viewed as a point of reference.

1:600 at A3
0 6 12 18 24
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Melbourne Water
Environmental Audit of Area 4F, Riverwalk Estate, Princes Highway, Werribee

Job Number 31/1157500
Revision 0
Date 16 Dec 2013

Audit Area 4F - OTEK Environmental Site Assessment Historic Site Infrastructure

Figure 3

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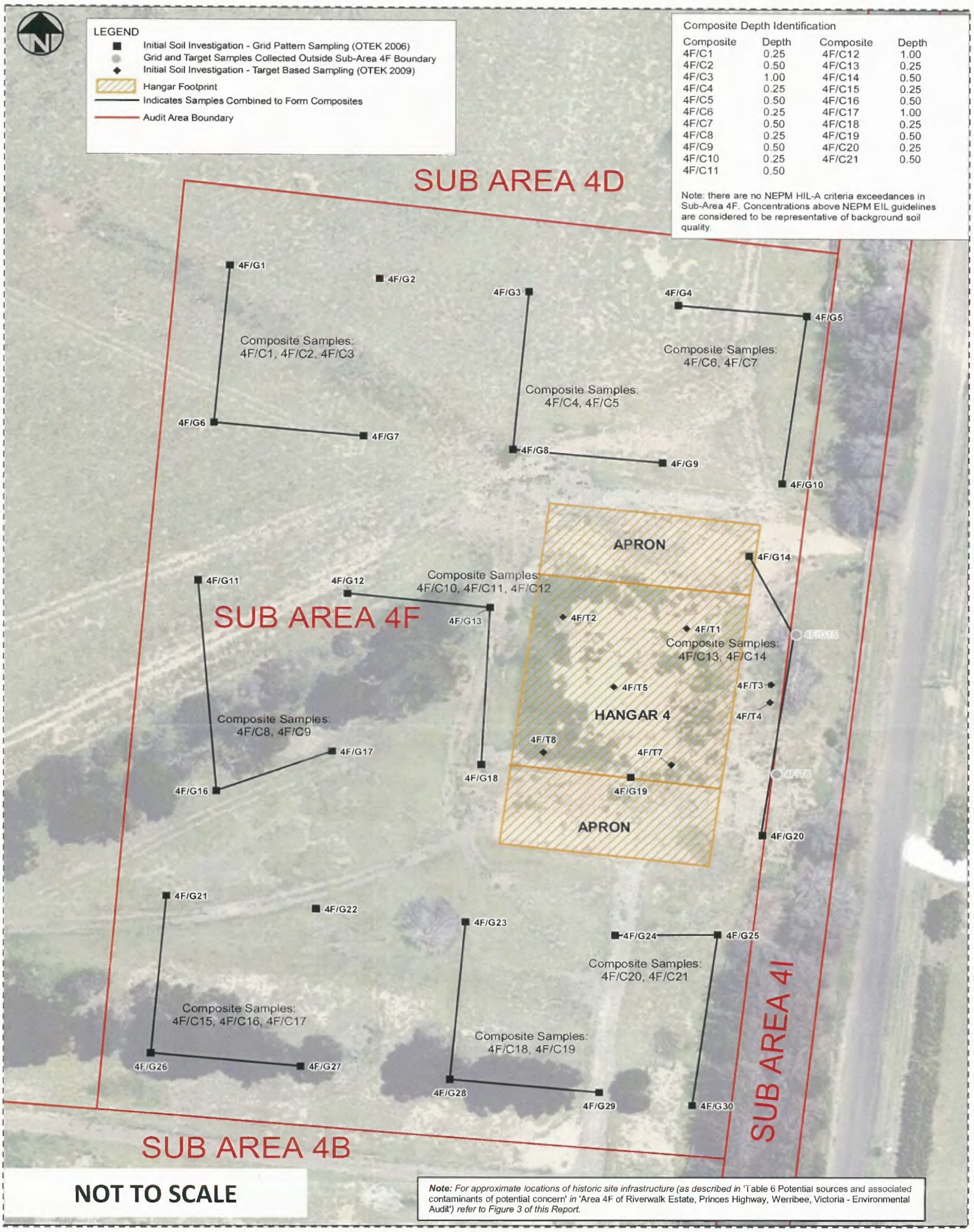
180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: Historic Site Infrastructure, OTEK 2013; Audit Boundaries, OTEK 2012; and Background Imagery (2009), Google Earth Pro 16/05/2013. Created by:spaleri



This figure was originally prepared by OTEK for "Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria" (4F ESA Report). The image represented above is an extract from the 4F ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
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Figure 4
Grid, Target and Composite Soil Sampling Locations

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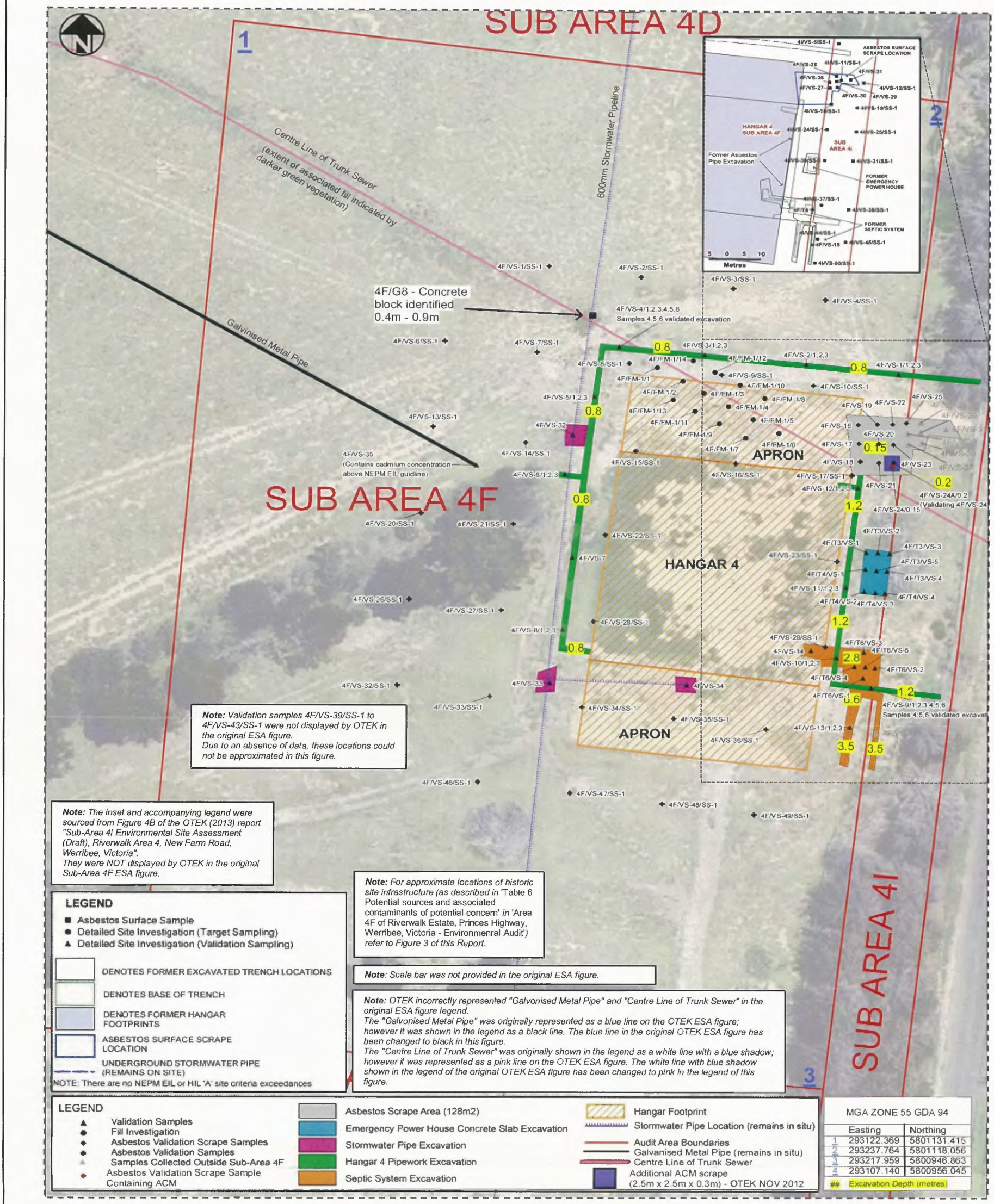

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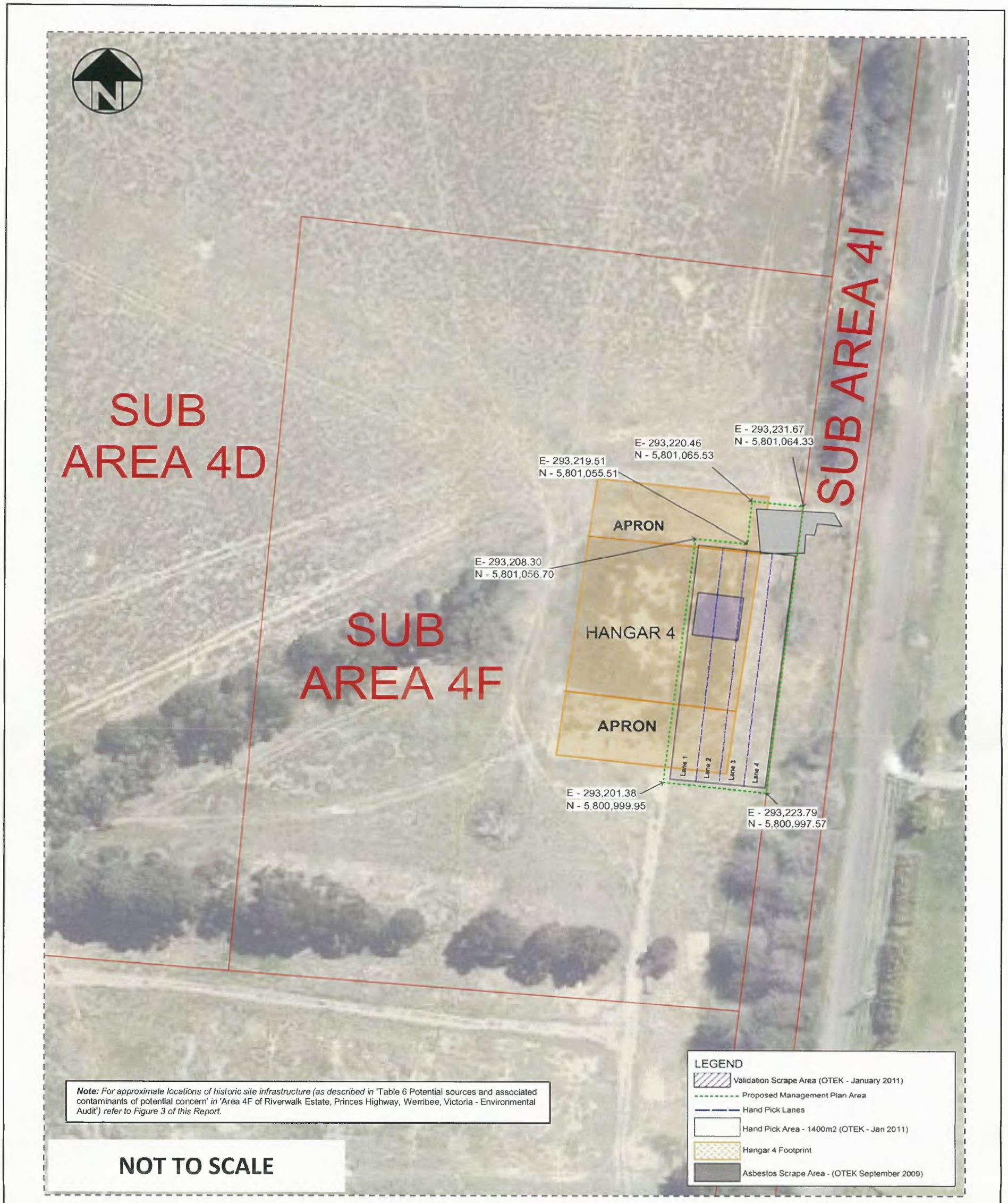
Figure 5
Validation Sampling Locations

Level 8, 180 Lonsdale Street, Melbourne VIC 3000 T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au



This figure was originally prepared by OTEK for "Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria" (4F ESA Report). The image represented above is an extract from the 4F ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
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Source: Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria (OTEK, 2013)

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Figure 6
ACM Removal and Validation - Hand Pick & Scrape Locations

scale: Not to Scale | date: 4 November 2013

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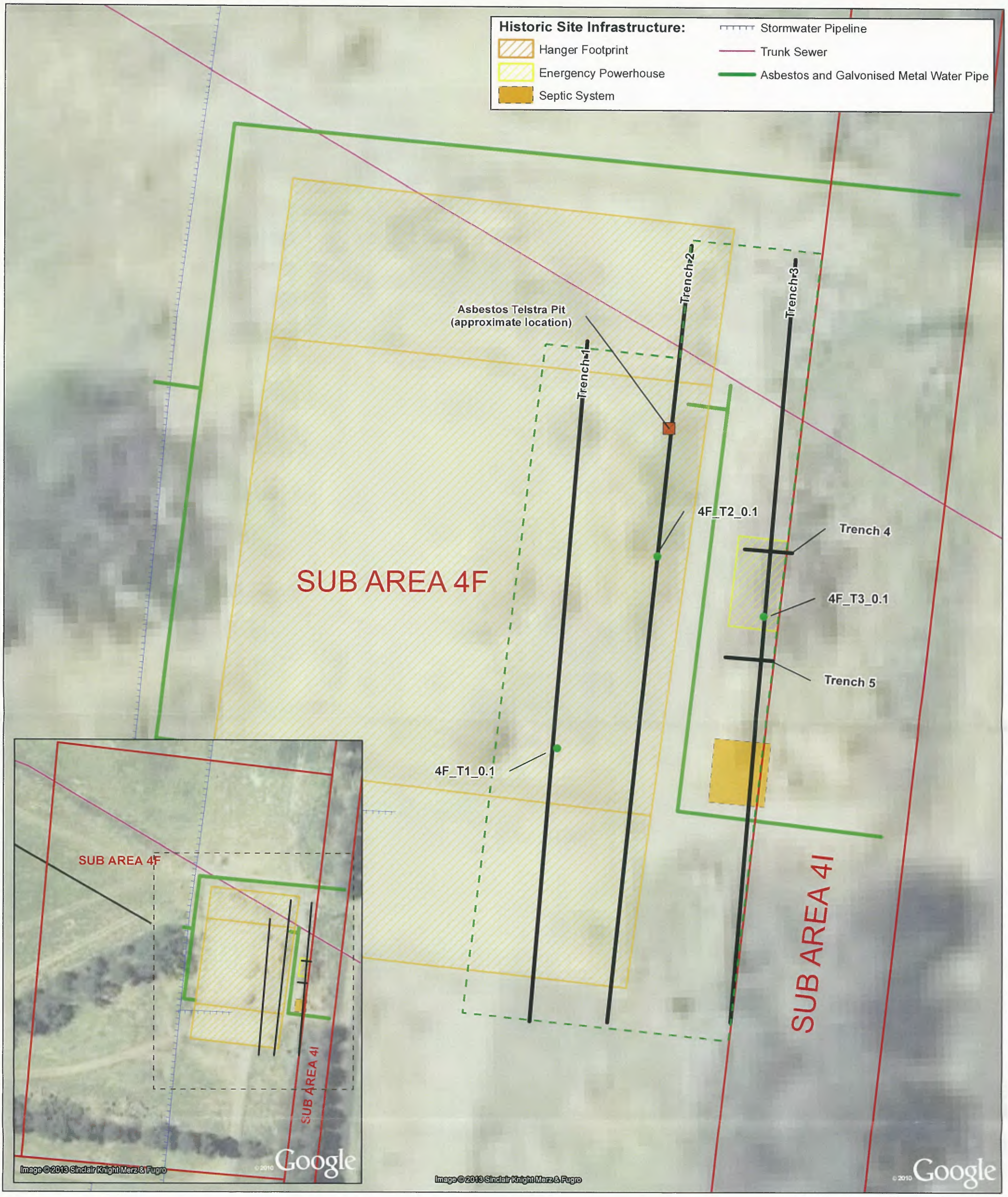

LEGEND

- Audit Areas
- Approximate Location of Auditor Verification
- OTEK Proposed ACM Management Plan Area
- Auditor Verification Trench
- Asbestos Telstra Pit (approximate location)
- Auditor Verification Sample

Note: The data displayed in this figure has been digitised from images extracted from the following reports; OTEK (2013) *Environmental Site Assessment (Draft), Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria* and OTEK (2011) *Remediation Action Plan - Version 3 (Soil Contamination Sub-Area 4B)* . Therefore GHD cannot guarantee the accuracy of this data. **This figure should only be viewed as a point of reference.**

Note: Total depth of all trenches is 0.2mbgl.

Main Map - 1:300 at A3
0 3 6 9 12
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

Locality Inset Map - 1:1,500 at A3
0 15 30 45 60
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

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Melbourne Water
Environmental Audit of Area 4F,
Riverwalk Estate, Princes Highway, Werribee

Job Number 31 / 1157500
Revision 0
Date 06 Nov 2013

Auditor Verification (October 2013)

Figure 7

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180 Lonsdale Street Melbourne VIC 3000 Australia **T** 61 3 8687 8000 **F** 61 3 86878111 **E** melmail@ghd.com **W** www.ghd.com

Data source: Validation Locations & Trenches, GHD 2013; Historic Site Infrastructure, OTEK 2013; Proposed ACM Management Plan Area, OTEK 2013; Audit Boundaries, OTEK 2012; Background Imagery (2009), Google Earth Pro (16/05/2013). Created by:bcoughlan

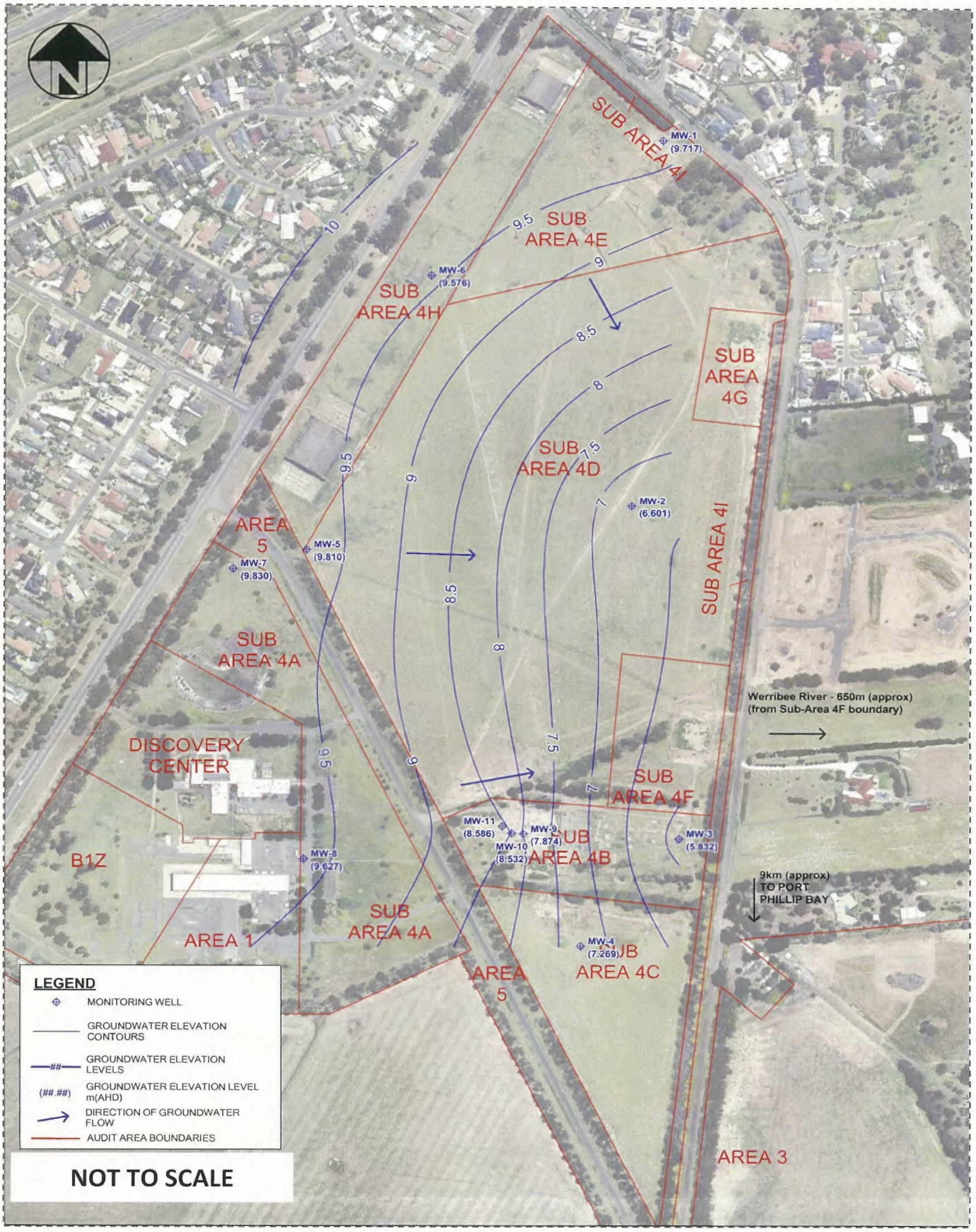

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Figure 8
Riverwalk Area 4 - Groundwater Contour Map

scale: Not to Scale | date: 4 November 2013

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Appendices

Appendix A - Certificate of Title

Appendix B - Historical Reports

Appendix C - Phase One Report, Werribee Fields, Werribee, Victoria (OTEK, 2002)

Appendix D - Environmental Site Assessment, Riverwalk Sub-Area 4F, New Farm Road, Werribee, Victoria (OTEK 2013)

Appendix E - Melbourne Water letter (OTEK liquidation)

Appendix F - Development Plans

Appendix G - Groundwater database search

Appendix H - Auditor's QA/QC Review

Appendix I - Auditor comments on OTEK 2013

Appendix J - Photograph log – 4F/G8

Appendix K - Auditor verification sampling

Appendix L - Asbestos Telstra pit removal works

Appendix M - Asbestos clearance documentation (email correspondence between GHD and Melbourne Water)

Appendix N - Imported fill reports

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		Name	Signature	Name	Signature	Date
0	F Abo / J Davies	F Abo		F Abo		17/12/13

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