Melbourne Water Corporation

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

Environmental Audit

(CARMS Reference 41460-12)

May 2014

ENVIRONMENT PROTECTION ACT 1970

Certificate of Environmental Audit

I, Mr Peter Egberts 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 Highway, Werribee, Victoria, 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 Figures 3a and 3b), 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, and
      - State environment protection policy (Waters of Victoria) 2003,

   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 that 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 CERTIFY that I am of the opinion that the condition of the site is neither detrimental nor potentially detrimental to any beneficial use of the site:

Other related information:

- A small amount of inert waste / litter including minor small pieces of concrete and metal pieces, drink containers and plastic wrappers etc. was located on-site. This is not significant enough to preclude beneficial uses of the land; however, it should be cleared as part of the site development.
- Various RAAF hangars clad with asbestos containing materials (ACM) were present near the site. Three hangers west of Part 1 of the site have been demolished and one hanger remains west of the northern part of the site (Part 2). ACM fragments have been found on-site and cleaned up to the extent practicable. However, it is possible that small quantities of ACM in the form of bonded asbestos cement (AC) fragments may remain within the soil and be uncovered during vegetation clearance and/or excavation works. These AC fragments are not anticipated to represent a health risk to occupiers of the

completed development. If encountered during future development or use of the site, any fragments should be handled and disposed in accordance with the relevant regulations.

This certificate forms part of the environmental audit report *"Melbourne Water Corporation, Audit Report for Area 4I of Riverwalk Estate, Princes Highway, Werribee, Victoria, May 2014"* (Ref: 31/1157500/219426 – CARMS Reference 41460-12). Further details regarding the condition of the site may be found in the environmental audit report.

DATED: 12 May 2014

SIGNED: .....

MR PETER EGBERTS

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

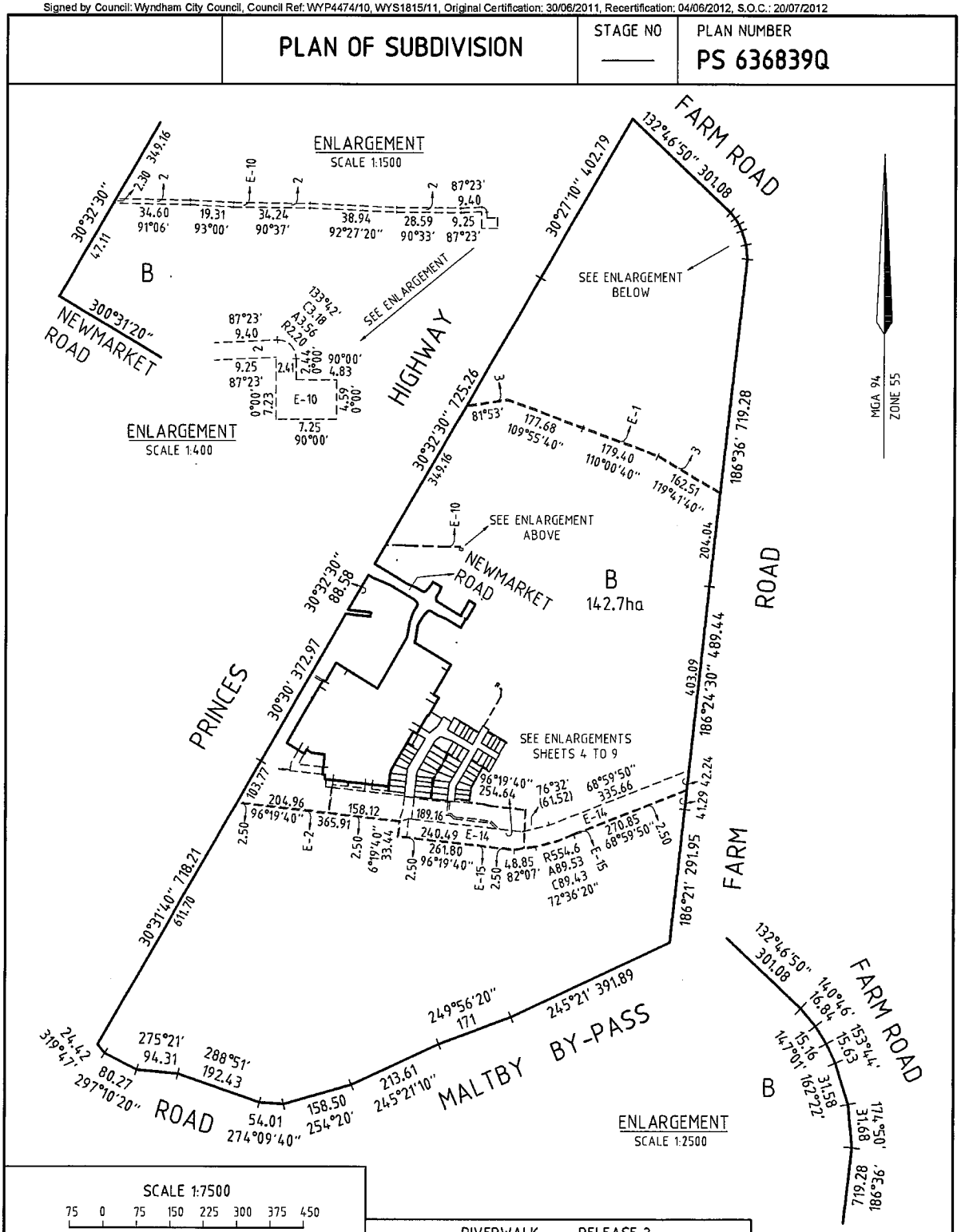
Signed by: Paavo Jukka Tynkkynen (Chris Runting & Associates Pty Ltd) Surveyor's Plan Version (23 (4.05.12)) SPEAR Ref S011384A 07/05/2012

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**



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
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

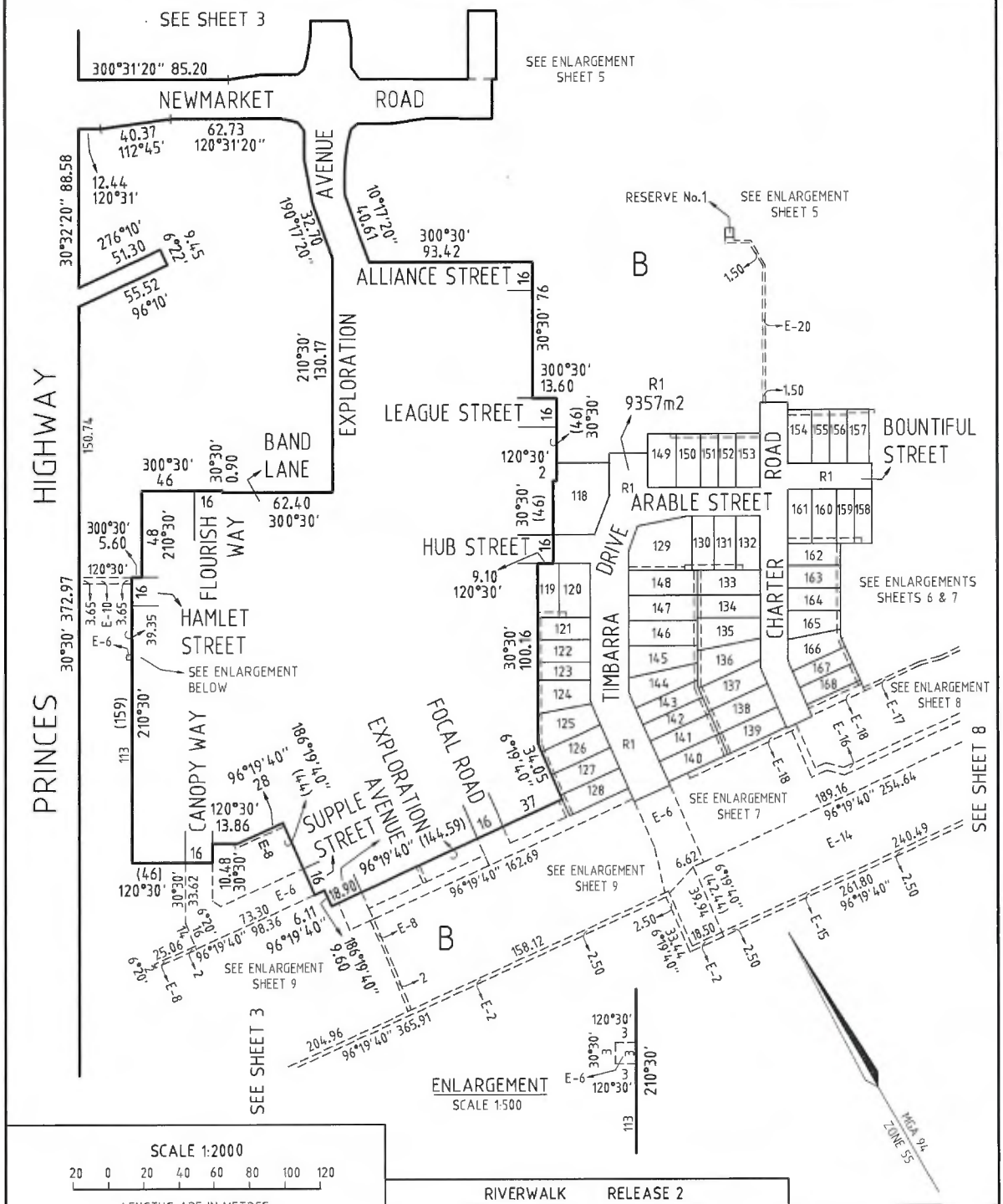
ORIGINAL SHEET SIZE A3

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



SCALE 1:2000

20 0 20 40 60 80 100 120

LENGTHS ARE IN METRES

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
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 / /

.....

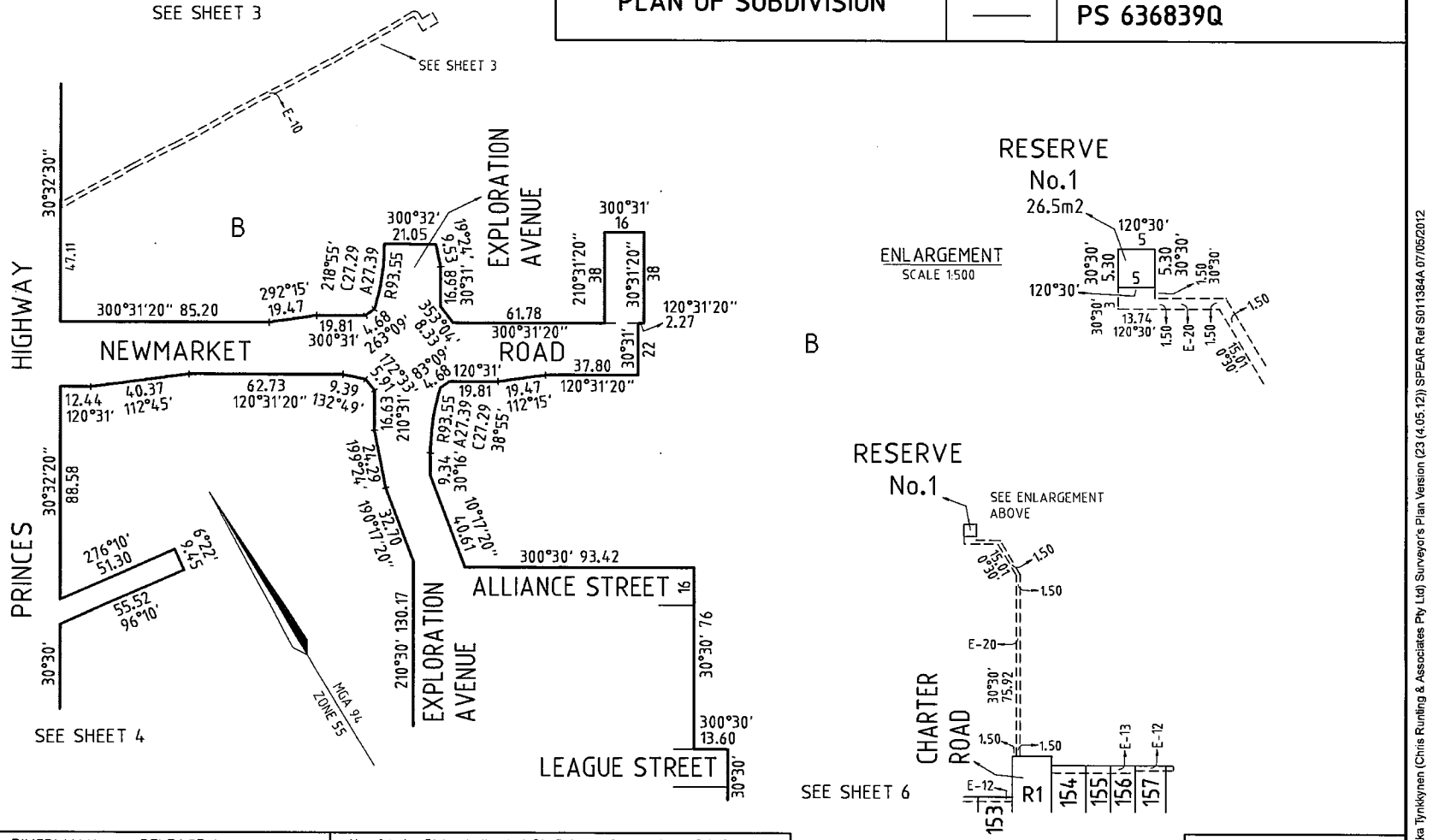
COUNCIL DELEGATE SIGNATURE

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

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

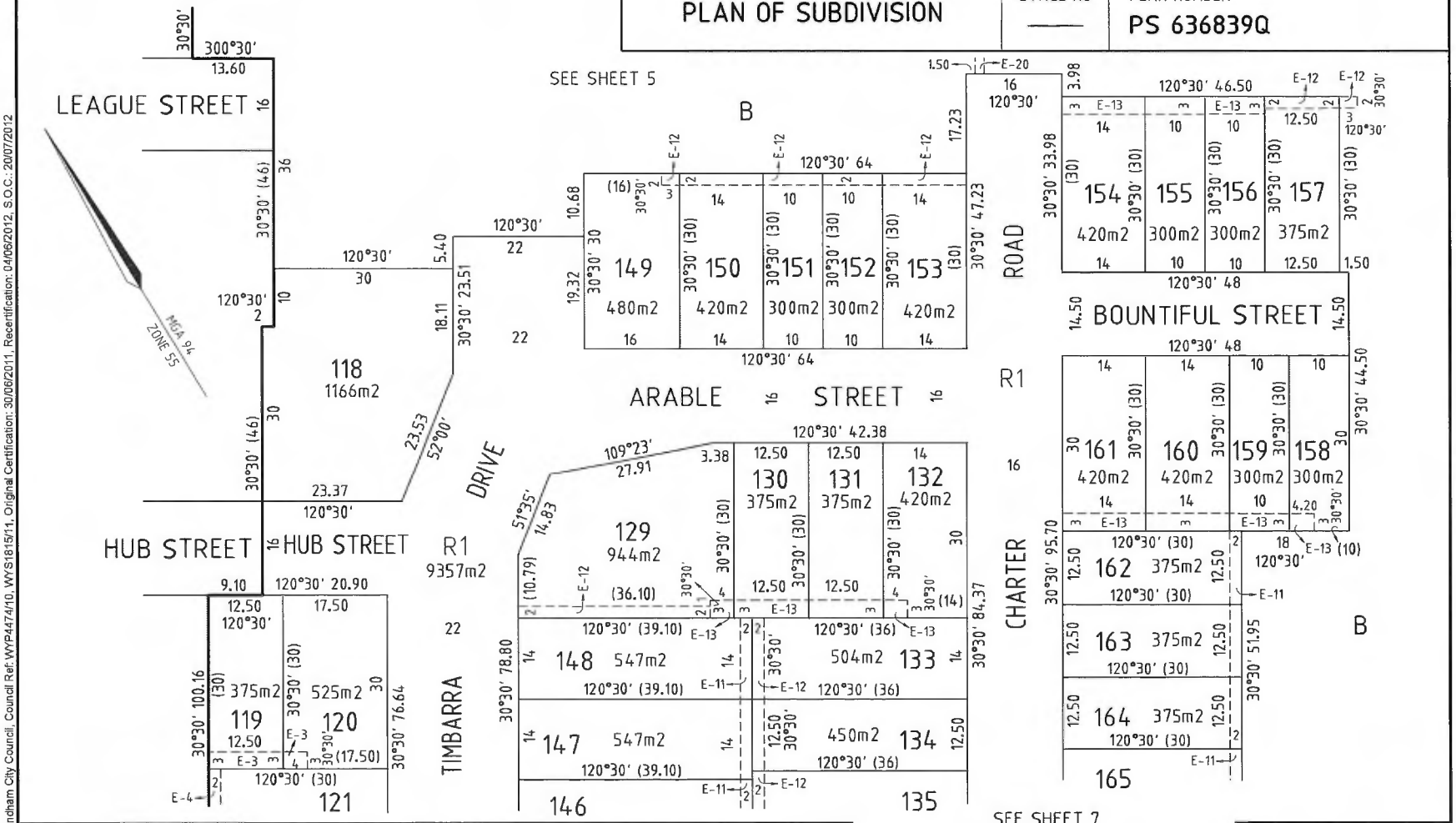
SCALE 1:1500
15 0 15 30 45 60 75 90
LENGTHS ARE IN METRES

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

SHEET 6

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 1:600

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)

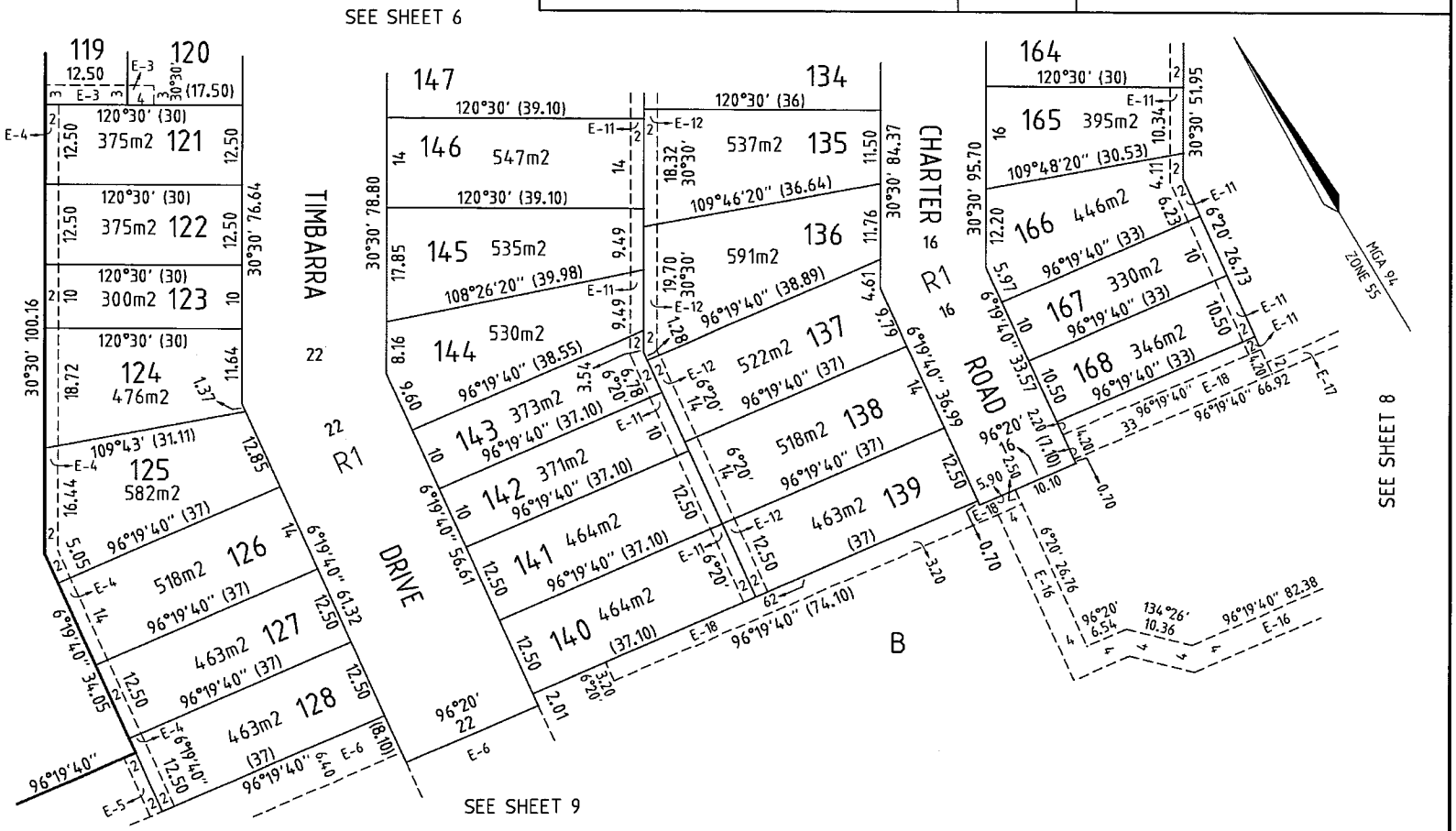
DATE / /

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 7

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 1:600

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)

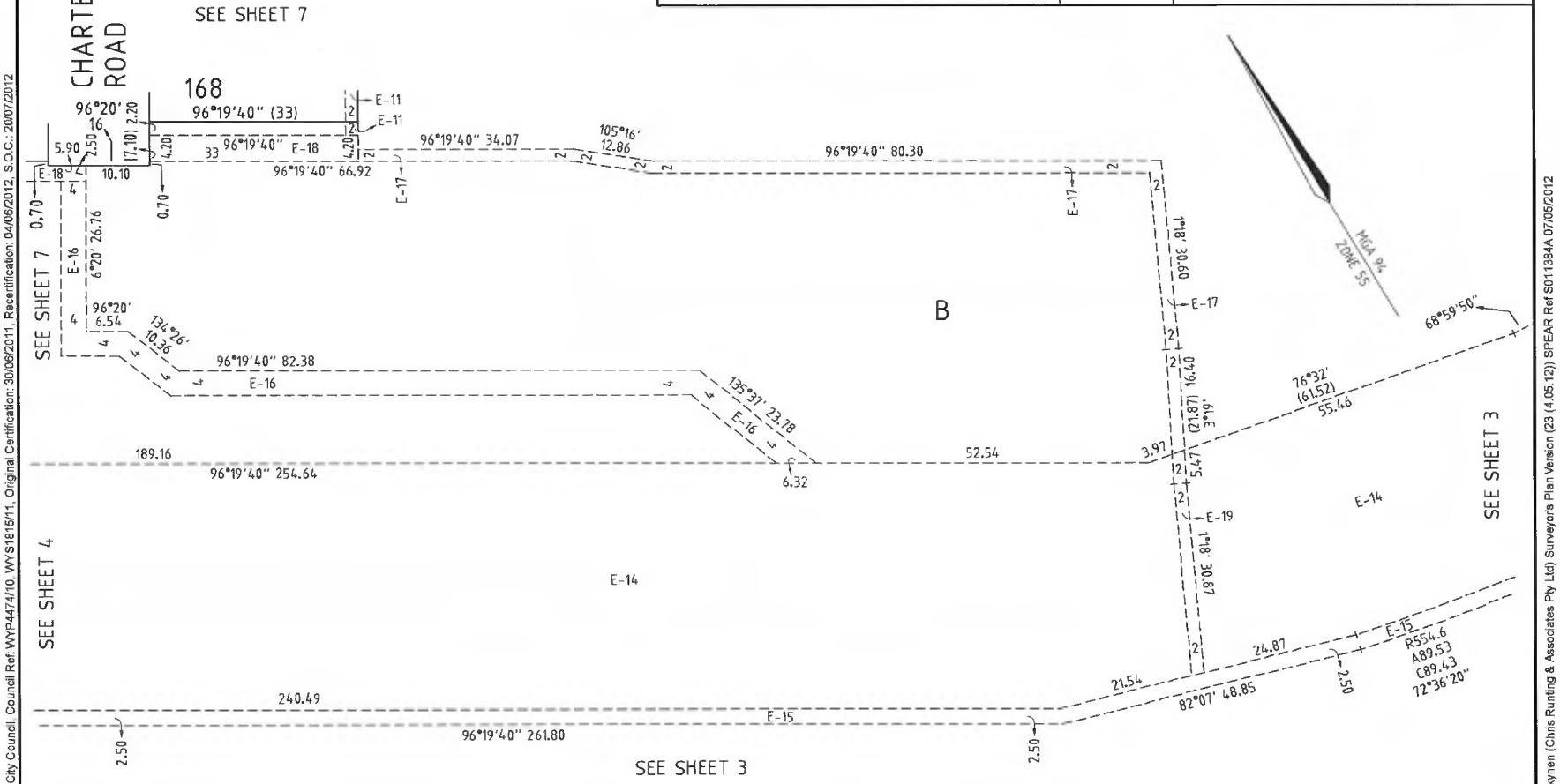
DATE / /

..... 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 8

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 1:600

6 0 6 12 18 24 30 36

LENGTHS ARE IN METRES

LICENSED SURVEYOR: P.J.S. TYNKKYNEN

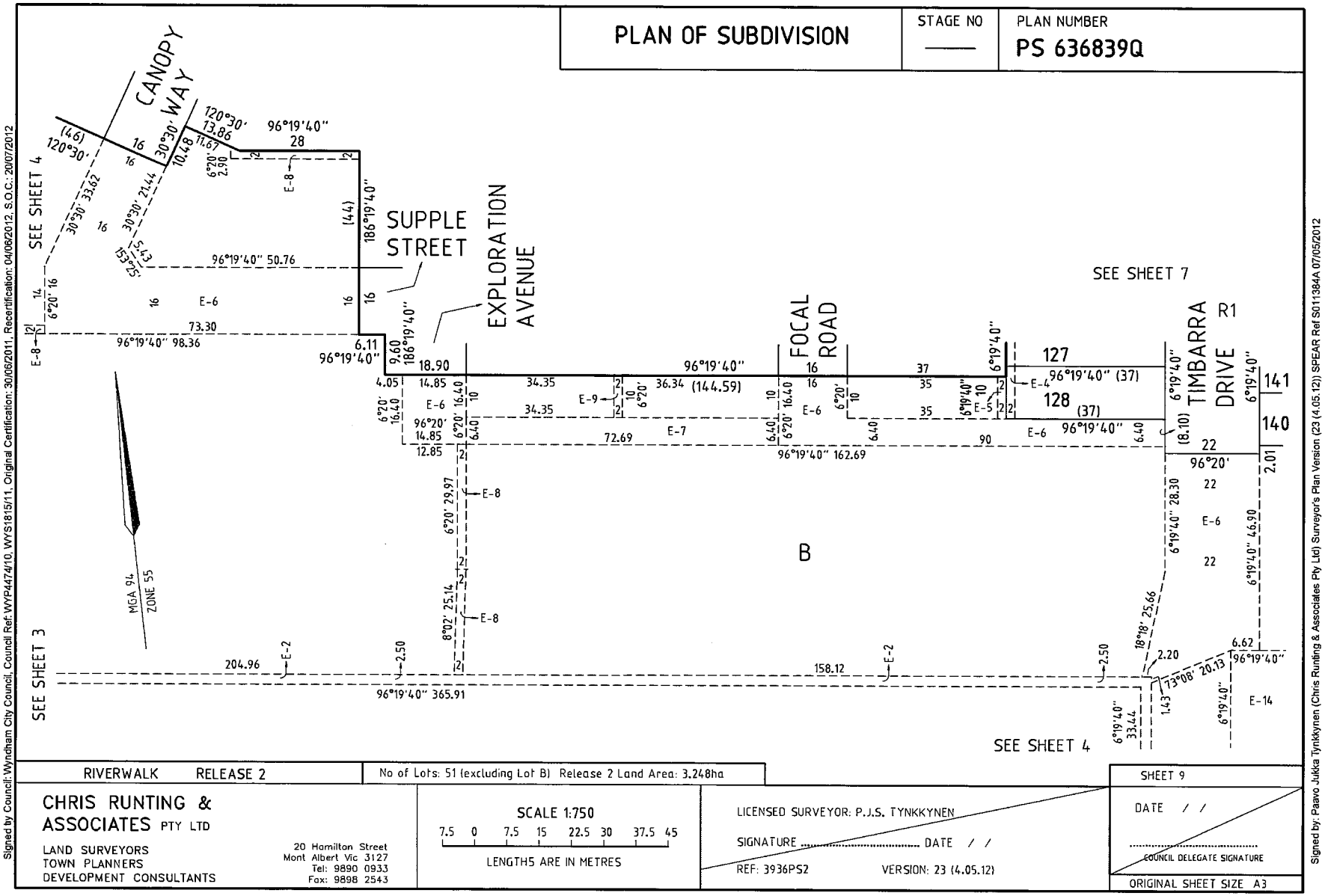
SIGNATURE ..... DATE / /

REF: 3936PS2 VERSION: 23 (4.05.12)

DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3



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

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

	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

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)

SHEET 11

DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

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

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, coast, country

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

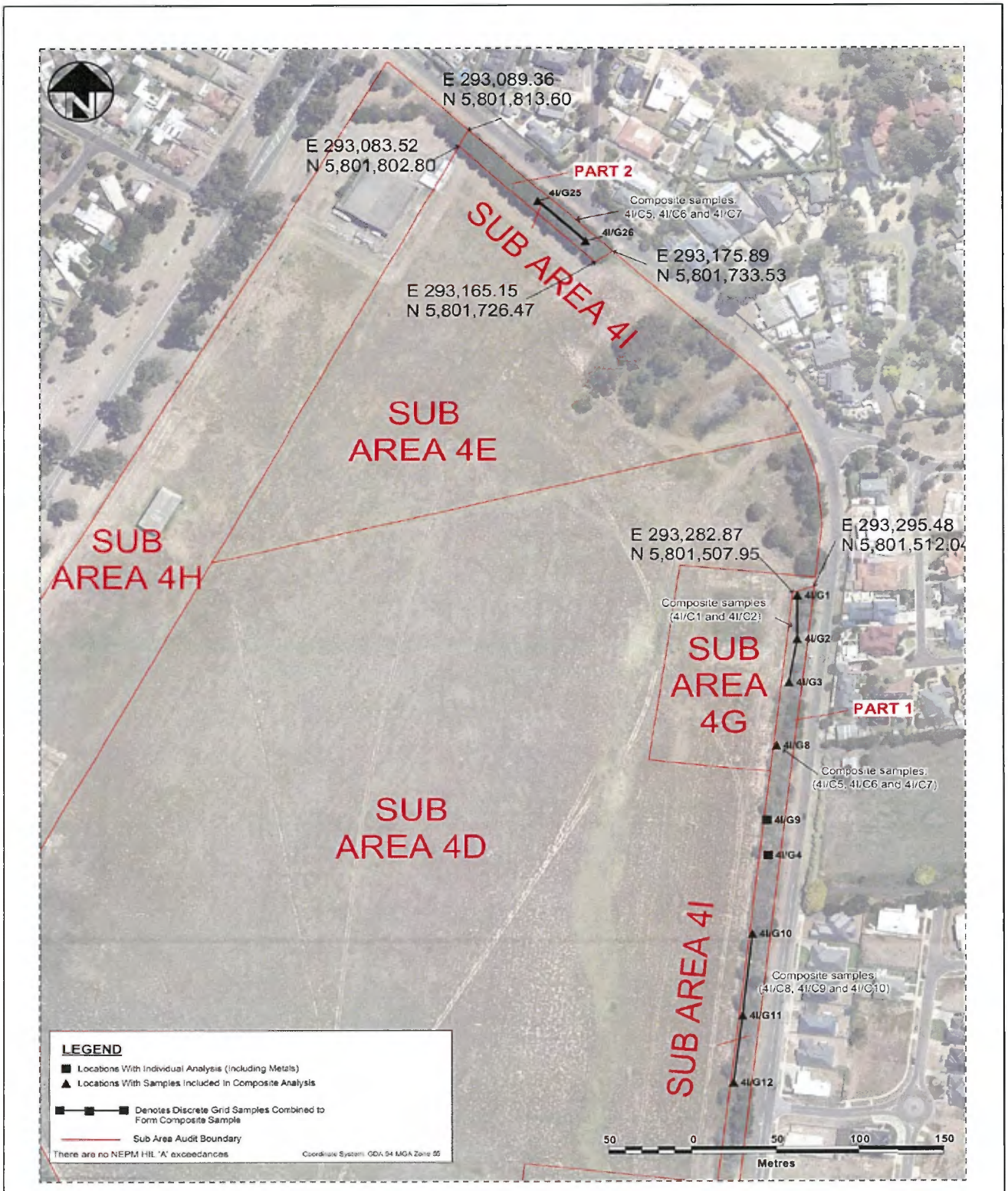
Public Open Space

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



This figure was originally prepared by OTEK for "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

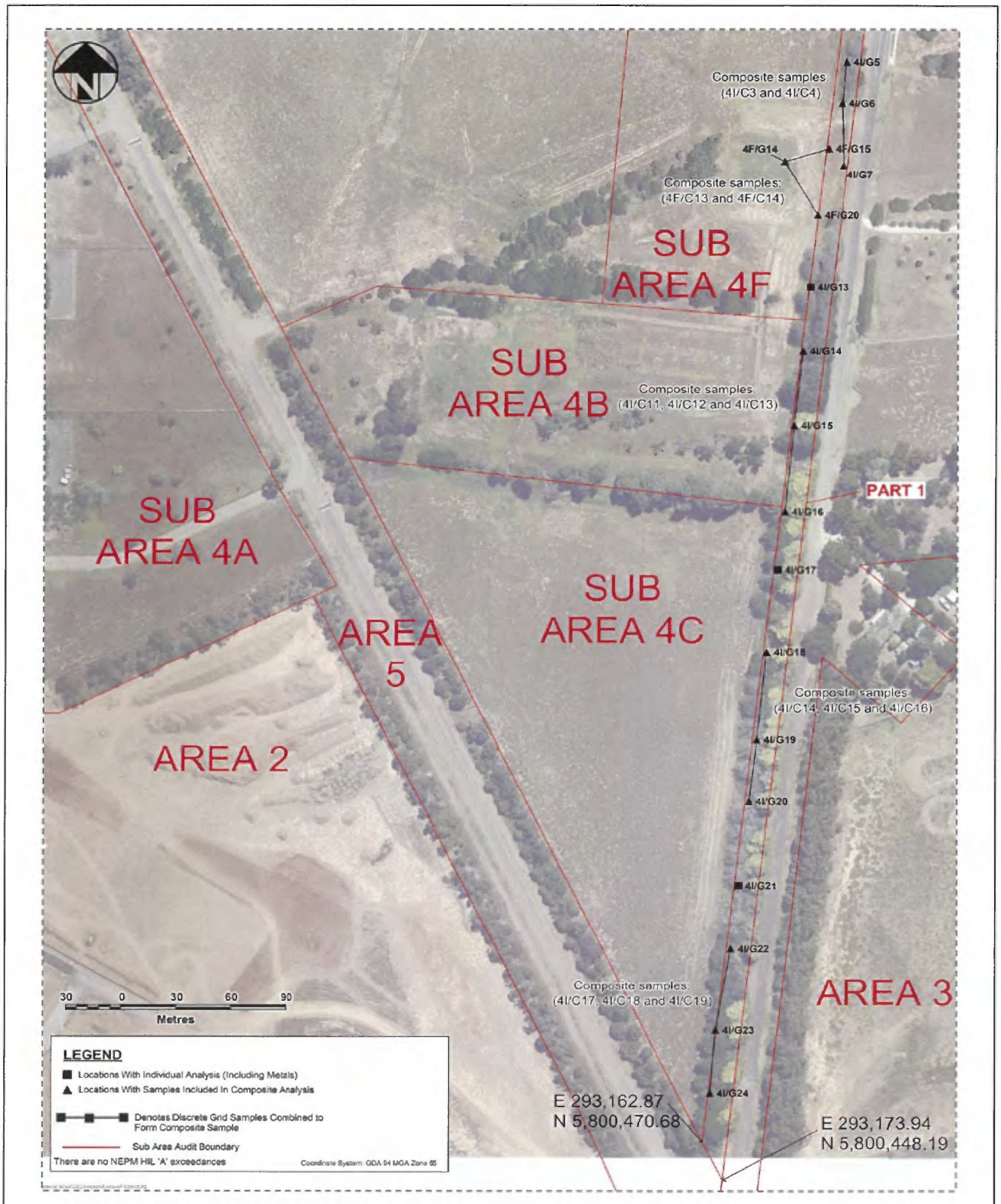
Client: Melbourne Water
Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 3a
Sub-Area 4I Grid & Composite Sample Locations

scale: Not to Scale | date: 17 June 2013

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of thia map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

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

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 3b
Sub-Area 4I Grid & Composite Sample Locations

scale: Not to Scale | date: 17 June 2013

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

Executive summary

Table 1 Summary of audit information

Summary Information Required	
EPA file reference no.	41460-12
Auditor	Mr Peter Egberts
Auditor term of appointment	10 November 2013 to 9 November 2015
Name of person requesting audit	Mr Timm Kurth of Melbourne Water Corporation (Melbourne Water)
Relationship to premises / location	Property Sales Manager
Date of request	13 February 2014
Date EPA notified of audit	18 February 2014
Completion date of the audit	12 May 2014
Reason for audit	Due diligence.
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 Figures 3a and 3b.
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
• Postcode	3030

Summary Information Required	
GIS Coordinate of Site centroid • Longitude / Northing (GDA94) • Latitude / Easting (GDA94)	Part 1: Northing 5800974.476 Easting 293227.6407
	Part 2: Northing 5801768.816 Easting 293128.8658
Site area (hectares)	1.4944 ha (Total for Part 1 and Part 2)
Members and categories of support team utilised	None
Outcome of the audit	Certificate
Further works or requirements	None
Nature and extent of continuing risk	None

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	10.8 – 13.5 m
Groundwater segment	Segment C
Groundwater flow direction	Groundwater flow is expected to be east towards the Werribee River which is located approximately 250 m to the east of the site. 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, vegetable growing, Melbourne Water activities and former RAAF occupation. The Site has primarily been used as a tree lined buffer zone / windbreak since at least 1964.
Surrounding land use	Part 1: North: Area 4G, 4D and 4E followed by Farm Road and then residential properties north of Farm Road. East: Farm Road followed residential properties and vacant land. South: New Farm Road (Area 5) followed by Area 2. West: Area 4 audit areas including 4B, 4C, 4D, 4F and 4G, all currently vacant grassed areas. Part 2: North: Residential use across Farm Road. East: Audit area 4E, Farm Road, then residential properties.

Summary Information Required	
	South: Audit Area 4E which is currently vacant and previously contained barracks, service huts and associated infrastructure. West: Audit Area 4H which includes Hangar 2 (B-24 Liberator Hangar site) to the southwest. Beyond the Riverwalk development further west is the Princess Highway.
Proposed future use	The site is proposed to be used for mixed use, including public open space, medium and low density residential use.

Table of contents

Table index

Figure index

Appendices

Appendix A – Certificate of Title

Appendix B – Proposed development plan and Planning Scheme information

Appendix C – Sub-Area 4I Environmental Site Assessment (Draft) Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK 2013)

Appendix D – Historical reports

Appendix E – Melbourne Water and TEC correspondence

Appendix F – Groundwater database search

Appendix G – QA/QC review

Appendix H – 2013 targeted soil sampling locations

Appendix I – Sampling and analysis of imported fill

Appendix J – MW-4 borelog and data

1. Introduction

1.1 Background

This environmental audit report sets out the findings of an environmental audit conducted in accordance with Part IXD of the Environment Protection Act, 1970. This report was completed in accordance with the guidelines issued by the EPA for environmental audit of contaminated sites.

A large portion of Melbourne Water Corporation's 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 Overall Audit Area is shown on Figure 1; and 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 B.

The Overall Audit Area was divided into 13 areas: Areas 1, 2, 3, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 4H and 4I and 5 to allow for areas with specific issues and development times to be considered separately. This audit report pertains to Area 4I only, herein referred to as 'the site'. Figure 1 shows the site locality, and Figure 2 shows the site area together with the rest of the Area 4 sub-areas. The total area of the site is approximately 1.5 hectares. The site comprises two sections: Part 1 which is an elongated parcel of land forming the eastern boundary of the Overall Audit Area; and Part 2, a smaller section located to the north of the Overall Audit Area. The audit boundary for the site was created to assess two sections of the tree line adjacent to Farm Road along the northern and eastern site boundaries. For the purposes of this audit, 'the site' is used to refer to both Part 1 and Part 2 unless otherwise specified. The site boundary is shown on Figure 1.

The site is part of the Riverwalk Estate which was proposed to be developed for residential purposes (with lot sizes between 300 m^2 and 600 m^2; which, in accordance with EPAV Publication 759.2 (2014) is defined as 'Residential – single dwelling' and 'medium-density') and associated uses such as public open space and recreation areas.

1.2 Purpose

The purpose of the audit is to achieve a Certificate or Statement of audit for the site. The conduct of an environmental audit, the preparation of an environmental audit report and the subsequent issue of a certificate or statement is a statutory process outlined in Part IXD of the Act. The role of the auditor is to evaluate the environmental condition of a site at the date of signing of the certificate or statement and to form an opinion regarding the suitability of the site for use.

1.3 Input to this report by auditor's support team

The auditor's support team were not involved with this audit. The GHD staff members that assisted with this audit are listed in Table 3.

Table 3 Auditor's team assisting with audit

Name	Qualification/Role/ Experience area	Contribution to audit
Dr Fouad Abo	Previous site auditor	Was the site auditor until 18 February 2014, provided background information as required and inspected the site.
Kate McCallum	Project manager / auditor's assistant	Assisted in the auditing process, assisted in preparation the draft environmental audit report.
Laura Saunders	auditor's assistant	Assisted in the auditing process and preparation of the draft environmental audit report.

The previous auditor (Dr Fouad Abo) notified the EPA with a request to undertake an audit of the site on 13 July 2009. Dr Fouad Abo then terminated his audit on 18 February 2014 and Peter Egberts was engaged as the auditor for the site. The reason for the transfer was to assist with meeting the client's timing constraints.

1.4 Documents reviewed

The following report related directly to the site and was reviewed and relied upon as part of the audit. This report is included in Appendix C.

- OTEK, 21 March 2013, *Sub-Area 4I Environmental Site Assessment (Draft) Riverwalk Area 4, New Farm Road, Werribee, Victoria.*(OTEK 2013)

The following documents were also reviewed for background purposes for the audit.

- 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.*
- Milsearch Pty Ltd (Milsearch), April 2000, *A Review of World War II-ERA Military Activity at Werribee Fields.*
- Enterra Pty Ltd (Enterra), 31 May 2001, *Werribee Fields Development – Sub Surface Investigation.*
- OTEK, 10 October 2002, *Phase One Report, Werribee Fields, Werribee, Victoria*, (OTEK, 2002).

These reports are included in Appendix D and are discussed in more detail in Section 2.8.1.

In addition, and where relevant 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. Work plans were reviewed prior to intrusive works for the various phases of investigation undertaken during the audit, and comments provided to OTEK.

1.4.1 Environmental assessment report (draft status)

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 Area. OTEK conducted all the works mentioned above as the environmental assessor for the purpose of issuing audits for the different areas of the Overall Audit Area until 30 April 2013. During these years a number of assessments were completed and finalised by OTEK. 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 Audit Area 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).

GHD has been 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 C.

GHD 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 at the time (Dr Fouad Abo), 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 and data interpretation to reach conclusions and audit outcomes as stated in this report. It should be noted that this was conducted having regard for EPA Bulletin 759.2.

1.5 Limitations

This statutory environmental audit report *Area 4I of Riverwalk Estate, Princes Highway, Werribee, Victoria* ("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 Certificate/Statement of Environmental Audit at the date the Certificate/Statement of Environmental Audit is signed. This Report:

- has been prepared by Peter Egberts and his team as indicated in the appropriate sections of this Report for Melbourne Water Corporation;
- may be used and relied on by Melbourne Water Corporation;
- 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;
- may be provided to other third parties but such third parties' use of or reliance on the Report is at their sole risk; and
- 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 on Princes Highway, Werribee, Victoria. The site is proposed to be incorporated within a residential land development area (the Riverwalk Estate development). 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, on Certificate of Title Volume 11367, Folio 778 (Appendix A). The site boundary was defined by the coordinates below and shown on Figures 3a and 3b.			
GIS coordinates defining the boundary of the site (MGA Zone 55).	Part 1 (Eastern Site Boundary)		Part 2 (Northern Site Boundary)	
	Easting	Northing	Easting	Northing
	293,282.87	5,801,507.95	293,089.36	5.801,813.60
	293,295.48	5,801,512.04	293,175.89	5,801,733.53
	293,173.92	5,800,448.191	293,165.15	5,801,726.47
	293,162.87	5,800,470.68	293,083.52	5,801,802.80
Area	The site encompassed a total area of approximately 1.5 ha. The site comprised of two parts: Part 1 - Elongated parcel of land approximately 1.354 hectares (ha) located along the eastern site boundary of Area 4 Part 2 - Small parcel of land approximately 0.1404 ha located along the northern site boundary of Area 4			
Surrounding Land Use	Part 1 North: Sub-Area 4G, 4D and 4E followed by Farm Road and then residential properties north of Farm Road. East: Farm Road followed residential properties and vacant land. South: New Farm Road (Area 5) followed by Area 2. West: Area 4 audit areas including 4B, 4C, 4D, 4F and 4G, Beyond these are other audit areas the Melbourne Water Discovery Centre and operations building. Part 2 North: Residential use across Farm Road. East: Audit area 4E, Farm Road, then residential properties. South: Audit Area 4E which is currently vacant and previously contained barracks, service huts and associated infrastructure.			

Aspect	Comments
	West: Audit Area 4H which includes Hangar 2 (B-24 Liberator Hangar site) to the southwest beyond the Riverwalk development further west is the Princess Highway.
Topography	The site and surrounding area was generally flat.
Site Coverage / Vegetation	The site is covered by vegetation. The vegetation is dominated by cypress pine trees with occasional shrubs and grassed areas.
Sampling Locations	The locations of soil and groundwater sampling undertaken by OTEK between June 2006 and February 2013 are shown on the following figures: • Soil: Figures 3a and 3b (grid and targeted soil sampling), Figures 4a and 4b (validation sampling), and Appendix H (2013 targeted soil sampling) • Groundwater: Figure 5

2.2 Geology and hydrogeology

The borelogs for soil and groundwater assessment works are included in Appendices D (test pits) and I (groundwater monitoring wells) of OTEK 2013 which is included in this audit report as Appendix C.

2.2.1 Soils

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

- Grass surface underlain by silty clay, generally described as yellowish brown or dark yellowish orange with medium plasticity;

The depth of bore holes and test pits on-site ranged from 0.5 metres below ground level (mbgl) to 2.0 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 is expected to be towards the Werribee River, which is the nearest receiving surface water body. The Werribee River is located approximately 250 m to the east of the site. 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 referred to for the site (refer to Appendix I of OTEK 2013 (attached as Appendix C) and Appendix I (for MW-4) of this report) indicate that wells were installed within the Newer Volcanics and Werribee Delta aquifers.

2.2.4 Groundwater database and groundwater quality

Groundwater database

OTEK did not undertake a search of the Victorian Groundwater Management System (managed by DSE); therefore the auditor undertook a search and review. The search identified 33 wells within a 1 km radius of the site, as tabulated and shown on a plan in Appendix F (note several of the wells plot in the same location due to the scale of the plan). The well locations shown in Appendix F are approximate only. The information available was considered sufficient to determine the approximate proximity and location relative of wells 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. The majority of groundwater wells were located cross or up gradient of the site, or beyond the Werribee River and were considered unlikely to be in the flow path of groundwater from the site.

Two wells (141854 and S9038725/1WRK052317) were located hydraulically down-gradient of the site (and before the Werribee River). The wells were registered for domestic and domestic and stock use, respectively. Groundwater concentrations from the site are unlikely to impact the use of these bores for their proposed uses as discussed in Section 6.

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

Groundwater quality

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

2.3 Surface water

The Werribee River is located approximately 250 m to the east of the site .The Werribee River flows in a southerly direction towards Port Phillip Bay, located about 7.5 km south of the site.

No surface water bodies were located on the site.

2.4 Site physical status at audit commencement and completion

The site is divided into two parts: Part 1, an elongated parcel of land located along the eastern boundary of Area 4; and Part 2, a smaller parcel of land approximately located along the northern boundary of Area 4.

Based on OTEK's review of historical aerial photographs, the site appeared to have been used as a windbreak covered with cypress trees since at least 1964 (OTEK, 2013). In late April/early May 2013 Melbourne Water removed approximately 30 dead trees from Part 1 of the site.

At the time of audit commencement, the site remained largely covered with cypress pine trees, occasional shrubs and long grass. During the audit period approximately 20% of the trees were removed from site.

There were several historic structures present within Part 1 of Area 4I, or adjacent to the western site boundary. Residual infrastructure remaining on the site at the commencement of the audit and the status at audit completion is summarised in Table 5. There were no known structures present within Part 2 of the site.

Table 5 On-site infrastructure and status

Infrastructure	Status
Two former emergency power houses: one located on-site adjacent to Sub-Area 4G, and one located largely on Sub-Area 4F and encroaching approximately 0.5 m onto site.	Building removed from site in 1952 and concrete slab removed in 2009
Two offsite septic tanks (one located on Area 4F, and one located on Area 4G) had related infrastructure extending onto the site.	Removed in 2009
Underground water bearing galvanised metal and ACM pipelines: four lines were located crossing the site.	Pipework removed from the site during OTEK fieldworks in 2008/2009. Metal T-junctions that are connected to the offsite water mains remain in the eastern side of the site (refer Section 5.3.3).
In-situ 600 mm diameter concrete stormwater pipe	Remained on site.

A plan of the former site infrastructure is provided in Figures 4a and 4b.

At the time of audit completion the site was grass and tree covered with no obvious surface site infrastructure. Materials including wooden storage pellets, wood, a wooden box, steel equipment and steel and tyres were stored on the northern portion of Part 2 of Area 4I.

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 (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 B 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 4I.

The site is not on the EPA Priority Sites register, and is 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. Since the audit commenced an Environmental Audit Overlay (EAO) was placed over the site. It is understood the EAO was placed on the site at the time of re-zoning of the land for residential use.

2.7 Off-site investigations

At the time of the audit, investigations on other 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 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 in Appendix D of this audit report. The following historical reports were considered. The first report was not relied upon for the purposes of the audit as it was considered out-dated and superseded by the more recent site history report, geophysical report, and detailed assessments, as discussed in this report. The Historical reports excluding the SKM (1993) report are included in Appendix D.

SKM Pty Ltd (1993)

SKM (1993) conducted a preliminary site investigation for the 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 samples were collected from the site.

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 Site. 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 report did not identified any heritage or cultural issue at the site.

Milsearch Pty Ltd (April, 2000)

Milsearch undertook a review of the site history during the World War II era (during the period RAAF occupied the Overall Audit Area) to determine the potential for the presence of residual munitions and other material burials or contaminants at the site.

The report did not identify any potential contamination resulting from the occupation of the site by the Royal Australian Air Force (RAAF) during 1942 to 1952.

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 investigation was undertaken using various geophysical techniques including the use of a digital magnetometer and electromagnetic detection equipment. The survey did not identify any UXO or potential burial sites within the site.

OTEK (May, 2002)

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) and Milsearch (2000), 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).

From circa 1880 to 1900 the Overall Audit Area and land in the general vicinity was owned by the Melbourne Metropolitan Board of Works (MMBW) and leased for dairy farming, stock grazing, and vegetable growing. MMBW did not undertake the practice of wastewater irrigation on or adjacent to the site. The Overall Audit Area was temporarily occupied by the RAAF from circa 1940 to 1952. Five hangars, numerous small buildings and USTs were understood to have been constructed during this time, no hangars or USTs were constructed on the site.

2.8.2 Summary of available site history information

The site has mostly been used for agricultural purposes and as a windbreak of cypress trees for the Overall Audit Area. During the 1940s and early 1950s the RAAF used the Overall Audit Area in the vicinity of the site. Minor infrastructure from this time was on-site associated primarily with nearby hangars. There is no history of infrastructure being located on Part 2 of the site.

The OTEK 2013 report which is included in this audit report as Appendix C indicated that the site appears to have been used as a windbreak covered with cypress trees since 1964.

2.9 Identified contaminants of potential concern

OTEK provided information on the contaminants of potential concern (CoPC) in Section 5 of OTEK 2013, which was based on the site infrastructure and historical site use. A summary of the previous site uses and the associated CoPC 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			
Two former emergency power houses (associated with Hangar 3 and Hangar 4)	Total petroleum hydrocarbons (TPHs), polychlorinated biphenyls (PCBs), asbestos	Two powerhouses associated with Areas 4F and 4G extend from the west onto the site.	Concrete slab located on Sub-Area 4F and site was removed in May 2009 and the concrete slab adjacent to Sub-Area 4G was in June 2009.
State Electricity Commission of Victoria (SECV) Transformer Enclosure	Metals, organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), TPHs, polycyclic aromatic hydrocarbons (PAHs), phenols, PCBs, asbestos, and pH	Within the site, slightly north-east of Area 4F	Removed from site prior to audit (circa 1959).
Asbestos pipes (underground)	Asbestos	Associated with Hangar 3 (within Area 4G), Hangar 4 (within Area 4F) and Hangar 5 (which included pipework which ran through Area 4C and extended across the site)	Removed during audit by OTEK in 2008/2009
Septic systems	Metals, TPH, PAH, OCPs, OPPs, pH, Ammonia, Nitrate and E.*coli*.	Two systems, located along the Area boundaries between the site and Area 4G, and the site and Area 4F	Removed during audit by OTEK in 2008/2009
Surface debris	Asbestos	Across surface of site	Bonded asbestos sheeting was identified on the ground surface of the site at one location near Sub-Area 4G, thought to be from the demolition of either Hangar 3 or the emergency power house. The debris was subsequently removed and the underlying soils validated. Bonded asbestos identified off-site on Audit area 4F was cleaned up; excavation related to this clean-up extended onto the site.

Site activity / Potential Source	Contaminants of Potential Concern	Location	Comments
Agriculture, farming, grazing.	Inorganics, OCPs/OPPs, asbestos, pH, nitrate, nitrite, and ammonia.	Entire site.	Potential for broad application of pesticides and herbicides across the site and Overall Audit Area.
Stormwater pipe	Inorganics, PAH, TPH	Crossing Part 1 of the site, from Area 4B.	Remains on site.
Off site			
Agriculture, farming and grazing	Nitrate, nitrite, ammonia, OCPs/OPPs, and herbicides.	Potential for broad application across the Overall Audit Area.	Concentrations of CoPCs across the adjacent audit areas were low.
Former RAAF infrastructure	Asbestos	Potential for scattered debris and non-friable asbestos fragments across the Overall Audit Area.	Bonded asbestos sheeting was identified in adjacent Area 4F. The area was scraped and validated, with the excavation extending extending onto the site. The asbestos was removed from Area 4F and the site.
Fuel storage	Inorganics, TPHs, benzene, toluene, ethylbenzene, xylenes (BTEX), PAHs, phenols, and SVOCs.	Areas 4C and 4E	USTs in Areas 4C and 4E were removed by OTEK. The UST on Area 4C was located approximately 100 m west (up gradient) of Part 1 of the site, and the UST on Area 4E was located immediately south (down gradient) of Part 2 of the site. A hydrogeological assessment of the Overall Audit Area (OTEK, 2010) did not identify any groundwater contamination associated with the USTs (discussed further in Section 6).
RAAF infrastructure in Areas 4B to 4H (hangars and septic systems)	Asbestos, metals, inorganics, fluoride, E.coli, ammonia, nitrate, and pH.	Potential for broad contamination from runoff from areas located adjacent to the east and north east (Areas 4B, 4C, 4D, 4E, 4F, 4G and 4H) of the site.	A hydrogeological assessment of the Overall Audit Area (OTEK, 2010) did not identify any contamination associated with septic systems. With regards to soil impact, the potential for contamination through dust migration from other Riverwalk Area 4 areas to migrate to the site was considered to be low

Auditor's opinion on site history assessment

The site history information from various sources 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 historically 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 proposed development plan proposes residential uses for the site 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. The main assessment work for the audit was undertaken during 2006 to February 2013 which was 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*; 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. 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 states "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 that "*pH, sulfate, 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.

Investigation levels are not specified and reference has been made to AS2159-2009 Piling – Design and installation. The criteria for soil exposure to both steel and concrete piles will be considered.

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*".

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 also considered the EILs as they are 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	✓	✓	✓	✓	
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation (e.g. Bathing, swimming)	✓	✓	✓	✓	

Beneficial Uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1000)	B (1001-3500)	C (3501-13,000)	D (greater than 13,000)
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 (2014) *Publication 759.2, Environmental Auditor (Contaminated Land) Guidelines for Issue of Certificates and Statement of Environmental Audit* provides further explanation:

- Section 9.2 (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:
    (i) use of groundwater 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".

Groundwater protected beneficial uses have been assessed on the basis of the Groundwater SEPP.

There are no groundwater monitoring wells located on the site. TDS measured in groundwater wells located on adjacent sites in the Overall Audit Area was considered to be representative of groundwater conditions hydraulically up and cross gradient of the site. TDS measured in the groundwater from these wells ranged from 4 670 mg/L to 5,510 mg/L. 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. The SEPP generally refers to *Australian Water Quality Guidelines for Fresh and Marine Waters* ANZECC (1992). These guidelines have been superseded by *Australian Water Quality Guidelines for Fresh and Marine Waters* ANZECC (2000). The relevant investigation levels are specified in Table 9 below.

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 and New Zealand Guidelines for Fresh and Marine Water Quality*, refers to the Australian NHMRC and ARMCANZ (1996) *Australian Drinking Water Guidelines*. The 2011 NHMRC and ARMCANZ *National Water Quality Management Strategy -Australian Drinking Water Guidelines* (ADWG 2011) – *as updated 2013* 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 and New Zealand Guidelines for Fresh and Marine Water Quality*, investigation levels for Primary Industries (Chapter 4.2 Water Quality for irrigation and general water use).
Stock Watering	ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, investigation levels for Primary Industries (Chapter 4.3 Livestock drinking water quality).
Industrial Water use	ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* 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	NHMRC (2008) Guidelines for Managing Risks in Recreational Water. The ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality noted that Guidelines for Recreation Water Quality and Aesthetics* were under preparation and should replace the chapter in the 2000 guidelines once complete. These guidelines were completed in 2008 (i.e. NHMRC 2008).

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 and a consideration of risks to human health and the environment is provided 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 prepared for the Overall Audit Area	Section 2.8.1 (list of reports) Section 2.8.2 (summary of findings)
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	Section 2.8.1
June, July, August 2006 & April 2008	OTEK undertook a soil investigation at the site, including collection of soil samples from 28 grid-based sampling locations . Select soil samples were analysed individually, and /or combined into three-part composites for analysis.	Section 5.2
July 2006	OTEK undertook a targeted soil sampling program to investigate two former septic tanks located on Area 4F and 4G but which encroached onto site and the former SECV transformer (on-site). Samples were collected from 4 testpits within Area 4I.	Section 5.2
22-23 August 2007	GME 1 - Groundwater monitoring event across Overall Audit Area	Section 6.4
14-15 November 2007	GME 2 - Groundwater monitoring event across Overall Audit Area	Section 6.4
4-5 February 2008	GME 3 - Groundwater monitoring event across Overall Audit Area	Section 6.4
July 2008, January, June and August 2009	OTEK undertook sampling to validate the removal of above ground and sub-surface infrastructure from the area and adjoining areas where infrastructure crossed the boundary of Area 4I.	Section 5.3 (specific works and dates described in Table 16
25-26 November 2009	GME 4 - Groundwater monitoring event across Overall Audit Area	Section 6.4
7-8 December 2011	GME 5 - Groundwater monitoring event across Overall Audit Area	Section 6.4
February 2013[1]	At the auditor's request, OTEK undertook additional soil sampling at five locations to further investigate areas of dense Cyprus tree habitation.	Section 5.3.4

Date of investigation	Site activity and objective	Report reference
March 2014	The initial site inspection by Peter Egberts as auditor for the site identified some non-friable asbestos containing materials (ACM) that appeared to be broken pieces of pipe on the site's surface. TEC managed the removal of the ACM (see below).	Section 4.3.2
7 March 2014	TEC removed ACM fragments identified by the auditor during the March 2014 site inspection.	Section 4.3.2
1 May 2014	The auditor undertook his final site inspection.	Section 4.3.2

NOTES

[1] OTEK 2013 Section 6.1 stated that this work was undertaken in February 2012. This is a typographical error as the auditor is aware that this took place in February 2013. Sampling records and bore logs are dated February 2013.

4.2 Field sampling and laboratory testing program

The field sampling and laboratory testing program was designed by OTEK to identify contamination in the natural soils, any fill materials on site, and the groundwater beneath the site. OTEK provided a Sampling and Analysis Plan (SAP) to the auditor for review prior to undertaking the various phases of work. The previous auditor provided feedback on the SAP to OTEK.

Analysis of soil samples was undertaken by the following laboratories:

- Primary Laboratory: ALS and Labmark Laboratories Pty Ltd (Labmark); and
- Secondary (split sample) testing: Labmark, Amdel and Leeder

Note that while the primary and secondary laboratories used alternated throughout the program, the secondary was always an independent laboratory from the primary. 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 D and indicated the following:

- For grid and target samples, the frequency of QC samples met the requirements.
- For validation sampling, no duplicate or split samples were collected from Area 4I however they were collected from adjacent areas 4F and 4G during the same sampling program. Validation sampling took place over various rounds/dates (refer to Table 32 of OTEK 2013) and overall the frequency and analytical suite of QC samples was slightly less than required. However, the auditor was satisfied that sufficient information was available to assess the integrity and the reliability of the data set based on the following:
  - 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; and
  - Results for QA/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, particularly for metals in soil. These were considered minor in the context of the entire data set. It was also considered that at least partly this would be due to the inherent soil heterogeneity.
- Some rinsate and trip blank sample results for soil were slightly above the laboratory detection limit for some metals. OTEK noted that cross contamination between samples, although unlikely, would not have had a significant impact on the primary results because concentrations of the analytes detected in the rinsate samples were significantly lower in comparison to the concentrations detected in the primary samples. Additionally, it should be noted that the laboratory LOR for the rinsate/trip blank water analyses are significantly lower than that of the soil. The auditor also notes that there is a possibility that the metals were present in the rinsate water supplied by the laboratory.
- 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. Based on historical activities at the site, volatiles were not considered CoPC.
- All rinsate and trip blank sample results for groundwater were below the laboratory detection limit for all analytes tested.
- Sample holding times were generally acceptable. Where holding times were occasionally exceeded (for pH and E.coli), the auditor was satisfied that analytical results were unlikely to have been compromised given correct handling and storage of samples.
- Laboratory internal QA/QC results were generally acceptable. Minor exceedances were noted on the laboratory reports and discussed by OTEK.

As discussed in Section 5.1.1, composite samples were analysed for pH and semi-volatile analytes (PAHs, OCPs/OPPs), which is not in accordance with Australian Standard 4482.1. Composite sampling was also not considered appropriate by the auditor for some lithologies, therefore additional sampling was recommended.

Despite the error in the methodology employed for analysis of composite samples, a reasonable number of individual samples were analysed for pH, PAHs and OCPs/OPPs across the site providing the auditor with confidence that concentrations of these contaminants were acceptable. Furthermore, results of the composite samples were consistent with the results of the individual samples, as well as those from the Overall Audit Area.

4.3.2 Auditor verification activities

The auditor and/or his representative 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. Based on these inspections the auditor is satisfied that OTEK's field methodologies and sampling procedures were of a suitable standard to adequately characterise the condition of soil and groundwater at the site.

The following inspections were of particular relevance to the site:

- 19 April 2006: The auditor's assistant visited Areas 4C, 4F and 4G to observe field works concurrently being undertaken in these Areas. OTEK was 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 (the site) was also inspected, including the former emergency powerhouse concrete slab and underground septic system located further south which extended onto the site. OTEK indicated that these two areas would be further assessed.

- 10 July 2006: Inspection of Areas 4E, 4H and 4I. The auditor conducted a site overview and inspection of the tree clearance area which had been cleared in accordance with scope of works prepared by Tree Logic. The target areas had been cleared, and two small areas had been cleared in between Hangar 4 and Hangar 5.
- 8 December 2008: Accompanied by OTEK's field staff, the auditor's assistant undertook a drive over Area 4 to view and discuss the works being undertaken across the Overall Audit Area. Hangar 4 and the underground asbestos and galvanised metal pipework surrounding the hangar and extending below the site had been removed from site by qualified personnel. Validation and backfilling of the resultant excavations was in progress at the time of the inspection. The auditor's assistant noted that standard field procedures were followed.
- 11 February 2013: The auditor was on site to observe the additional five test pits in the tree line of the site all soils were observed to be natural and no fill material or ACM was observed.
- 25 February 2014: The previous auditor and new auditor attended the site for the purpose of familiarisation with the site. The auditors noted pieces of bonded asbestos that appeared to be from a broken pipe. It appeared the ACM material had been placed on the site surface and was not mixed within the soil profile. The material was located on Sub-Area 4D and the site opposite the entrance to 35 Farm Road. Melbourne Water indicated to the auditor that the ACM was new to the site, and appeared to be from illegal dumping. On 7 March 2014 the asbestos containing material was removed by TEC in accordance with Work Safe Australia Code of Compliance: *How to Safely Remove Asbestos* (2011b). The area was raked carefully to uncover material while avoiding breakage. The ACM was removed and then the area was carefully inspected and re-raked where required to ensure no ACM remained. Approximately 2kg[1] of ACM fragments described by TEC as strongly bonded and not visibly weathered were removed. The removal of this ACM is documented in a letter from TEC, included in Appendix E.
- 1 May 2014: Final site inspection to confirm the final condition of the site and to inspect the area where dumped ACM was removed from site. The Final site inspection did not identify any remaining ACM fragments remaining on site and no aesthetic issues were identified that would preclude the beneficial uses of the land.

4.3.3 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.

[1] It was noted that the EPA Transport Certificate recorded that 2000 kg of ACM was removed. The Auditor discussed this volume with Melboume Water who indicated that only 2kg was disposed of. The issue was raised with the assessor who indicated the error was due to an incorrect decimal place This was supported by Melbourne Water confirming that they only paid for the disposal of 2 kg of ACM. The Auditor considers that the removal of 2 kg seems reasonable based on his observations of the scale of dumping and size of the area assessed / remediated.

5. Assessment of soil quality

A summary of the locations of key information within the Assessor's report is provided in Table 12 below.

Table 12 Assessor's site assessment information – soil

Assessment Details	Section in Assessor's Report (OTEK 2013, attached as Appendix C of this report)
Site History	Section 3
Details of soil sampling (including for the assessment, remediation, and validation) and laboratory analysis	Sections 6, 9 and 12.1
Field Observations	Sections 4.1, 6.2.4, 6.3.4, and 9.2
Borelogs	Appendix D
Site Plans	Figures 1 to 5
Analytical Results (Summary Tables)	Tables 1 to 34

5.1 Soil sampling and analytical program

To assess soil quality at the site, OTEK developed a SAP, which was based on previous investigations (Milsearch 2000, Enterra 2001) and OTEK's Phase I assessment (OTEK 2002). The SAP was finalised after the auditor's review, and implemented accordingly. The SAP is included in Appendix F of OTEK 2013 (Appendix C of this report). OTEK collected soil samples from grid based and targeted locations between 2006 and 2008 and, at the auditor's request undertook sampling from an additional five targeted locations in 2013. A SAP was not submitted for the 2013 sampling, however the general approach and plan was approved by the auditor via email correspondence. OTEK summarised the soil investigation activities in Section 6 of OTEK 2013 (attached as Appendix CC of this report).

5.1.1 Grid samples

A total of 28 grid-based soil sampling locations (i.e. test pits and hand augured boreholes) were advanced at the site between June and August 2006 and in April 2008. Soil from varying depths at all 28 locations was analysed either as part of a composite, or as an individual sample.

The site area is approximately 1.5 ha, and the Australian Standard (AS4482.1, Table E1) indicates a sampling density of 25 locations should be advanced to detect circular hotspots. AS4482.1 refers to a square grid and OTEK 2013 states that grid sample locations were determined using a 42 m x 42 m grid pattern. However, the auditor noted that given the linear shape of the site, the application of a square grid sample pattern was not practical, and as such, comparison to Table E1 must be treated with caution. There were no samples selected for analysis from the north western half of Part 2 of the site during the 2006/2008 sampling events; therefore further targeted sampling c was undertaken in this area during 2013, discussed in Section 5.1.2.

During the 2006/2008 sampling events, three-part composites were formed from 24 test pit locations from which composites were created at depths of 0.25 mbgl, 0.5 mbgl and 1.0 mbgl). Composites were formed using samples collected from comparable depths. A total of 21 composite samples were then analysed for a range of CoPC. Grid and composite soil sampling locations are shown on Figures 3a and 3b.

Table 13 below provides a summary of the grid and composite analytical schedule (derived from Tables 1 through 19 in OTEK 2013).

Table 13 Grid-based sample analytical schedule

Analyte	No. of individual samples analysed	No. of composite samples analysed
Inorganics[1]	13	19
OCPs	9	12
OPPs	8	9
Asbestos	21	-
pH	14	9
EPA screen[2]	2	-
PAHs	11	18
TPHs	15	-

NOTES:
[1] Inorganics: As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Sb, Se, Sn, V, Zn, Hg
[2] EPA screen: Inorganics, Cr^{6+}, cyanide, fluoride, phenols, BTEX, TPHs, MAHs, OCPs, PCBs, chlorinated hydrocarbons.

Composite samples were analysed for pH and semi-volatile analytes (PAHs, OCPs/OPPs), which is not in accordance with Australian Standard 4482.1, and is not standard industry practice. The auditor followed up with OTEK, which acknowledged (OTEK 2012) that this practice was not appropriate, and additional target samples were collected in 2013 to help close this potential data gap.

It was considered that composite results still provided information regarding the condition of soils at the site. The auditor considered the composite results 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, PAHs and OCPs/OPPs across the site (refer Table 13) and results were consistent with data from the Overall Audit Area, this error in methodology was not considered to affect the outcome of the audit.

The auditor considered the 2006/2008 sampling program was generally appropriate based on the site history and limited potential for contamination across the broader site area. However, five additional test pits were advanced in February 2013 at the request of the auditor to address a potential data gap from compositing samples for analysis of semi-volatile contaminants, and to increase the sampling density where analysis was limited, particularly in Part 2 of the site. These samples are addressed in Section 5.1.2 of this report

5.1.2 Target samples

Four target sampling locations (test pits) were advanced in July 2006 to assess potential contamination sources (former SECV transformer and septic systems) that were identified as part of the site history review (as discussed in Section 2.9).

An additional five test pits were advanced in February 2013 at the request of the auditor to address a potential data gap from compositing sampling of semi-volatiles, and to increase the sampling density where analysis was limited, particularly in Part 2 of the site

Targeted sample locations from 2006/2008 are shown on Figure 4b; however, the locations of the additional samples collected in February 2013 (4I/T1-4I/T5) are not included. The test pit

locations from the February 2013 sampling event are included on OTEK Figure 1 included in Appendix H.

Works undertaken in 2006/2008 and 2013 are summarised in Table 14. A total of 26 samples were collected from the 9 test pits, 20 of which were selected for analysis.

Table 14 Potential contamination sources and associated target sampling locations

Potential Contamination Source	No. of Target Locations	Sampling Locations	Date/s	Analytes [1]
Former SECV Transformer	2	4D/T7, 4D/T8	20 July 2006	TPH, PAH, Phenols, OCPs, OPPs, pH, PCB (Total), and Asbestos.
Former septic system (East of Area 4F)	1	4F/T6	20 July 2006	Metals[2], TPH, PAH, OCPs, OPPs, pH, Ammonia, Nitrate and E.*coli*.
Former septic system (East of Area 4G)	1	4G/T3	20 July 2006	Metals[2], TPH, PAH, OCPs, OPPs, pH, Ammonia, Nitrate and E.*coli*.
Extra target samples at auditor request to investigate areas of dense Cyprus trees	5	4I/T1 – 4I/T5	11 February 2013	Metals[3], TPH, BTEX, PAH, OCPs, OPPs, pH

NOTES:
[1] Samples were analysed for one or more of COPCs (i.e. not all samples were analysed for all analytes)
[2] metals: As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Sb, Se, Sn, V, Zn, Hg
[3] metals: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, V, Zn, Hg

The original targeted sampling was conducted prior to the distinction of Area 4I (the site), as such the sample nomenclature relates to the adjacent areas (4D, 4F and 4G), even though the sample locations fall within the boundary of the site. The former SECV transformer was located within the site, and the two septic tanks extended across the western site boundary from Areas 4F and 4G.

One sample location targeted each of the septic tanks (the test pits were advanced near the septic tanks). This targeted sampling was supported with validation sampling conducted following the removal of the two septic systems, discussed further in Section 5.3.

Five targeted test pits were excavated at locations within the tree line. The locations were specified by the auditor. Soil samples were collected from 0.25 m and 0.5 m below ground surface (BGS).

Infrastructure including septic systems, the concrete base of the former emergency power houses and ACM water piping were removed during the audit. Validation samples were collected to assess the potential contamination from these sources; this is discussed further in Section 5.3.

5.1.3 Auditor's opinion on adequacy of soil assessment program

It is 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:

- *Where some gaps were identified in OTEKs initial assessment, additional sampling was requested and conducted in February 2013.*
- *The sampling program was based on a thorough understanding of historical and current potential sources and activities which might have resulted in contamination of soil at the site;*
- *The analytical program sufficiently addressed all CoPC;*
- *Samples were collected using appropriate methodologies; and*
- *The auditor and his assistant undertook multiple site visits during the assessment of the site, and of the Overall Audit Area.*

Infrastructure remained in place after the initial grid and targeted sampling and it was appropriate to conduct further validation sampling below infrastructure when it was removed. This validation sampling was completed and is discussed further in Section 5.3.

The auditor considered that based on the detailed site history review, an adequate number of sampling locations (grid and target) were investigated at the site.

5.2 Summary of soil assessment results

5.2.1 Inorganics

Thirteen individual grid soil samples and fourteen target soil samples were analysed for metals. In addition, nineteen composite samples, each of which was formed from mixing three individual samples that were collected from grid based sampling locations were analysed for metals.

Two individual grid samples contained concentrations of barium above the EILs. Four grid and one target soil sample contained concentrations of vanadium above the EIL. No individual samples contained concentrations of heavy metals above the HILs.

Multiple composite samples contained concentrations of one or more of arsenic, barium, manganese, nickel and vanadium above the modified EILs. Two composite samples exceeded the modified HILs (one for cobalt and one for manganese).

A summary of maximum concentrations of each contaminant identified above the adopted investigation levels in fill and/or natural soil during the assessment works is provided in Table 15 below. The table shows only individual samples containing contaminants at concentrations exceeding the adopted investigation levels (i.e. samples with concentrations below the investigation levels have not been included), and does not include composite samples, which are discussed further below.

A full summary of soil analytical results is presented in Tables 1 to 34 of OTEK 2013, attached as Appendix C of this report.

Table 15 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	340	Natural	4I/G17/0.5
			Grid	460	Natural	4I/G21/0.5
Vanadium	50	-	Grid	69	Natural	4I/G4/0.25

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				
			Grid	64	Natural	4I/G9/0.25
			Grid	57	Natural	4I/G17/0.25
			Grid	60	Natural	4I/G21/0.25
			Target	56	Natural	4I/T1/0.5

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

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").

- Arsenic: 11 composites.
- Barium: 6 composites.
- Manganese: 17 composites.
- Nickel: 16 composites.
- Vanadium: 19 (all) composites.

Two composite samples exceeded the modified HILs (one for cobalt and one for manganese). Both concentrations were well below the unmodified guidelines and not outside the concentration range expected for individual samples across the overall audit area.

Due to an error, OTEK did not analyse any of the individual samples making up the composites. This was not considered to impact the overall findings of the audit as the results were all below the un-modified guideline values and given 27 other individual samples (i.e. not forming part of a composite) were analysed for the above inorganics, and the majority of concentrations were below the respective EILs (with the exception of barium and vanadium, as discussed above) and HILs. Furthermore, as discussed in Section 5.1.2 above, additional target samples were collected and were analysed for metals to provide further confidence in the site condition. Results for these samples for arsenic, barium, manganese, nickel and vanadium were all below HILs and EILs.

Barium and Vanadium

OTEK attributed the concentrations of barium and vanadium detected in samples across the site to be representative of or consistent with background concentrations, as all concentrations were within the ranges detected in samples collected across the Overall Audit Area (Table P in OTEK 2013). The auditor further notes that all concentrations of nickel and vanadium were within the NEPM background ranges, and there were no specific sources identified.

Based on his understanding of the Overall Audit Area, the lines of evidence presented above, and the geology of the Werribee region, the auditor considered that the concentrations of barium and vanadium were likely to be naturally occurring, and are not discussed as exceedances henceforth.

Nitrate, Nitrite and Ammonia

Target samples 4F/T6/0.25, 4F/T6/1.0, 4G/T3/0.25 and 4G/T3/1.0, and validation sample 4G/T3/VS-1 were analysed for ammonia, nitrate and nitrite. Ammonia was below the laboratory reporting limit for all five samples. The nitrate and nitrite results were low (maximum nitrate concentration 8.0 mg/kg in validation sample 4G/T3/VS-1 and maximum 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 M OTEK 2013). 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.

Ammonia, nitrate and nitrite results are summarised in Table 30 and 34 of OTEK 2013.

Other inorganics

Cyanide, fluoride, E.coli and coliforms were also analysed on selected samples, however all results were below EILs and HILs (where applicable) and/or below laboratory limits of reporting.

5.2.2 Asbestos

ACM in the form of non-friable bonded asbestos sheeting was identified on the ground surface near test pit 4I/G2. OTEK considered that based on the location of the ACM, it was a remnant from Hanger 3 or the emergency power house. OTEK 2013 indicated that the asbestos containing materials were subsequently removed from site during site clean-ups carried out by the hanger removal and clean up contractors.

5.2.3 Organics

Concentrations of organic analytes tested (OCPs, OPPs, phenols, PAHs, PCBs, TPHs, BTEX) were below the laboratory limits of reporting in all soil samples.

5.3 Infrastructure removal and validation sampling

During the course of the soil assessment works remains of former RAAF infrastructure were removed from the site, and the underlying soils validated. Figures 4a and 4b show the location of former RAAF infrastructure (including structures removed prior to the commencement of the audit), and the associated validation samples. Details of works undertaken were summarised in Table G of OTEK 2013 and in Table 16 below. It is noted that some infrastructure was located on adjacent areas but crossed the boundary of 4I, and that validation samples were collected from adjacent sites as well as on 4I.

Table 16 Assessment and removal of infrastructure and validation sampling

Works Undertaken	Date of Works	Date sampled	Validation Samples Collected	Analysis [1]	Sample(s) exceeding adopted investigation level	Backfill/Site reinstatement
Removal of underground water bearing ACM and galvanised pipework associated with Area 4C	13 October 2008	23 June 2009	Visual Inspection 4I/VS-1	Asbestos	None	Backfilled
Removal of septic system at Hangar 3 (located on the boundary with Area 4G)	17 June 2009	17 June 2009 and 17 July 2009	4G/T3/VS-1 and 4G/VS-19	Metals, E.*coli*, Faecal coliforms, ammonia, nitrate, nitrite Metals, TPH, OCP, faecal coliforms, E.*coli*	None	Backfilled
Removal of underground water bearing ACM and galvanised pipework associated with Hangar 4 (Area 4F).	September & October 2008	N/A	Visual Inspection	N/A	N/A	Backfilled
Removal of underground water bearing ACM and galvanised pipework associated with Hangar 3 (Area 4G)	July & September 2008	23 July 2008	Visual Inspection + 4G/VS-1/1 4G/VS-1/2 4G/VS-1/3	Asbestos, metals	None	Backfilled
Former emergency powerhouse at Hangar 3	1952 (Building), Concrete slab removed in 2009	26 June 2009	4G/T5/VS-2 4G/T5/VS-3 4G/T5/VS-4 4G/T5/VS-5 4G/T5/VS-6	Metals, PAH, VOC Metals, TPH, PCB Metals, PAH, VOC Metals, TPH, PCB Metals, PAH, VOC	None	No soil excavated
In-situ stormwater pipe from Area 4B. Remains on site.	N/A	11 September 2009	4B/VS-59	Metals, TPH, PAH	None	Remains on site.
Removal of septic system at Hangar 4 on Area 4F	5 June 2009	20 July 2009	4F/VS-15	Metals, OCP, TPH, E.*coli*, Faecal coliforms	None	Backfilled

Works Undertaken	Date of Works	Date sampled	Validation Samples Collected	Analysis [1]	Sample(s) exceeding adopted investigation level	Backfill/Site reinstatement
Asbestos validation of soils after removal of Hangar 4	17 July 2008	15 Jan 2009	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	None	No soil excavated
Surface scrape of soil to remove any ACM fragments location adjacent Hangar 4	14 Aug 2009	14 Aug 2009	4F/VS-26 4F/VS-27 4F/VS-28 4F/VS-29 4F/VS-30 4F/VS-31	Asbestos	None	Disposed of offsite at Maddingley Brown Coal, Bacchus Marsh
SECV Transformer		20 July 2006	Removed from Site pre OTEK investigations. Target samples collected in this location (4D/T7 and 4D/T8)			

OTEK confirmed all validation samples were collected from natural soils, which were consistent with natural soils observed across the remainder of the site (refer Section 2.2). The auditor noted that target sample locations 4D/T7 and 4D/T8 appeared to be located within the footprint of the former SECV transformer. These are not referred to by OTEK as validation samples. The bore logs for these locations noted *"Well graded sand for slab foundation to 0.3 m BGS"*. Irrespective, the auditor noted that the samples collected from the fill/sand and the natural material directly beneath the fill/sand at 4D/T7 and 4D/T8 reported concentrations below the LOR for COPCs associated with the SECV transformer.

PID readings were negligible in all samples (0.0 to 7.1 ppm), and OTEK indicated there were no visual or olfactory observations of hydrocarbons or other volatiles.

All analytical results for all validation samples were below the investigation levels, with the exception of a detection of asbestos in one sample, which was subsequently removed (discussed further below).

5.3.1 Septic systems

Two septic systems, located on Area 4F and Area 4G, adjacent to the western boundary of Area 4I were considered as potential off site sources of contamination. Removal of both septic systems was undertaken in 2009.

The excavation of the septic system on Area 4F extended onto Area 4I, with approximately 18 m^2 of the total excavation within Area 4I. One validation sample (4F/VS-15) was collected from Area 4I, and five samples were collected from Area 4F (plus two from the adjoining ceramic pipe). All analytical results for validation samples collected were below adopted criteria for all CoPC. OTEK did not observe any visual or olfactory signs of contamination.

Based on Section 5.2.2 (OTEK 2013), the excavation of the septic tank on the boundary of Area 4G comprised an area of approximately 92 m^2, 18 m^2 of which was located within the boundary of Area 4I. Validation samples 4G/T3/VS-1 at and 4G/VS-19 were collected from 1.2 m and 3.7 m BGS depths respectively from within Area 4I. In addition, four validation samples were collected from within Area 4G. Analytical results for all samples from within this excavation were below the EILs and HILs. This was supported by field observations.

5.3.2 Former emergency power houses

Figures 4a and 4b show the former locations of two emergency power houses, one associated with Hangar 3 on Area 4G, and one associated with Hangar 4 on Area 4F.

The former emergency power house associated with Hangar 3 is noted to have been located within the site boundary, adjacent to Area 4G and was considered a potential source of contamination. The concrete base of the former emergency power house was excavated in June 2009. The extent of the excavation was 4.5 m by 5.0 m (to 0.1 m deep) and extended into Area 4G. Five samples (4G/T5/VS-2 to 4G/T5/VS-6) were collected from within Area 4I and were analysed for a selection of metals, TPHs, PCB, PAHs and VOC. All samples were below the adopted investigation levels.

The former emergency power house associated with Hangar 4 was 6 m wide by 8 m long in total and the majority was located on Area 4F, and extended approximately 0.5 m onto the site. As discussed in OTEK 2013, Section 5.2.2, nine validation samples were collected from the area of the former footprint on Area 4F. Analytical results of the nine validation samples were all below the investigation levels, indicating that no contamination had resulted from the presence of the power house. This was supported by field observations. Although there were no samples collected from the site (Area 4I), it was considered that the infrastructure was successfully validated.

5.3.3 Underground asbestos and galvanised metal pipes

Hangars 3, 4 and 5 located on the broader Overall Audit Area had associated pipework that travelled through the site at four locations to the eastern site boundary. The underground water bearing ACM and galvanised water pipes associated with the former Hangars were removed from site. The bonded asbestos pipes were dedicated pipes for firefighting, associated with a former watering system and hydrant. The galvanised metal pipes were associated with the distribution of mains water to RAAF infrastructure.

The pipework was removed during 2008. Validation sampling associated with the removal of the pipelines associated with Hangar 3 (on sub-area 4G) and Hangar 5 with pipework entering site from audit sub-area 4C was summarised in Table G of Section 6.3 (OTEK 2013).

Sample 4I/VS-1 was taken to validate the condition of soil beneath the pipeline in Area 4C, with a sample collected at 0.6 m depth. Samples 4G/VS-1/1, 4G/VS-1/2 and 4G/VS-1/3 were collected to validate soil beneath the asbestos piping extending from Area 4G, with samples collected at 0.6 m depth. Asbestos was not detected in any of the validation samples.

No soil samples were collected from within Area 4I to validate soils beneath the asbestos pipe associated with Hangar 4 on Sub-Area 4F. Validation soil samples were collected from Area 4F beneath the bonded asbestos pipe and results were discussed in the Area 4F report (OTEK, 2013a). The auditor has referred to this report regarding Area 4F for additional information and found that in October 2008, 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. Three more samples (at depths of 1.2 m and 1.6 m) from this location were analysed by ASET (ASET 16645). No asbestos was detected in these samples.

The methodology for removal of asbestos pipelines was not described in the ESA report (OTEK 2013), however it was described in OTEK's document titled "*Riverwalk Area 4 - Scope of Works for removal and validation of Asbestos Pipeline*", dated 5 June 2008 which stated that pipes would be excavated and removed in accordance with the Victorian Occupational Health and Safety (Asbestos) Regulations 2003 and the enHealth document *Management of asbestos in the non-occupational environment* (2005). Care was taken to remove pipework in full sections to avoid breaking pipework.

Although no soil samples from Area 4I associated with the pipelines east of Hangar 4 were tested for asbestos on site, the auditor considered the data from Area 4F to be sufficient based on the following lines of evidence:

- Visual observation confirmed that pipework was in good condition and consisted of non-friable ACM;
- OTEK performed adequate visual assessment for potential asbestos;
- Pipework was removed by licenced personnel; and
- Asbestos was not detected in soil samples validating the removal of asbestos pipes extending from Area 4C or Area 4G.

The pipe was in good condition and consisted of non-friable bonded asbestos; and as such this would not be expected to release asbestos fibres, as has been confirmed where sampling has been conducted.

ACM pipework crossed the site at four locations, with one pipe coming from Area 4G, two pipes coming from Area 4F and one location coming from Area 4C. The auditor noted that Figure 4b did not identify removal of pipework east of Area 4F up to the site boundary. The auditor

discussed this with the previous site auditor and Melbourne Water, who understood all pipes were removed and the metal junctions that they joined onto (connected to the water mains) were sealed. The auditor asked for a document to clarify the process. This process is described in a letter "*Removal of Asbestos Pipe, Riverwalk Sub-Area 4I, Farm Road, Werribee, Victoria*" dated 19 March 2014 (included within Appendix E). The letter incorrectly referenced two (rather than four) asbestos pipes in the site (Area 4I), as the letter was focused to the area near 4F. Therefore, on 2 April 2014 the auditor discussed this issue with TEC, which confirmed four pipes crossed the site, and indicated that the letter only focused on the area adjacent to 4F, where the accuracy of the figure was questioned. TEC confirmed the removal and validation process was the same for all four pipes that crossed into the site. The TEC letter indicates that the asbestos pipe was removed in its entirety leaving only the metal T-junctions in place which are connected to the water mains. The metal T-junctions extend approximately 2.7 m into the site from the water main that runs adjacent to Farm Road.

5.3.4 Asbestos removal

ACM in the form of non-friable bonded asbestos sheeting was identified on the ground surface near test pit 4I/G2. OTEK considered that based on the location of the ACM, it was a remnant from Hanger 3 or the emergency power house. OTEK 2013 referred to this ACM as an asbestos fragment in the text of the report, however the soil borelog for test pit 4I/G2 noted the presence of broken asbestos sheeting in the area. The auditor confirms from a review of photographs taken at the site that the reported asbestos was in fact two or three corrugated bonded asbestos sheets lying flat on top of each other and looked to be placed on the site surface. OTEK 2013 indicated that the asbestos containing materials were subsequently removed from site during site clean-ups carried out by the hanger removal and clean up contractors.

Remediation of asbestos on 4F required excavation extending onto the site. Due to bonded asbestos being reported in a grid sample on Area 4F, (4F/G14) and bonded asbestos sheeting observed in the area, a near surface scrape was completed to excavate and validate around this location. The delineation works extended approximately 40 m^2 onto the site from the adjacent Sub-Area 4F. The excavation extended to approximately 0.15m BGS. OTEK noted (Section 6.3.5 of OTEK 2013) that ACM at this location was stockpiled and removed from site by licensed asbestos removalists Alex Fraser to a licensed landfill.

The excavation extent is shown on Figure 4b. Six validation samples (4F/VS-26 to 4F/VS-31) were collected from the surface within Area 4I on 14 August 2009 and analysed for asbestos. No asbestos was detected in any of the validation samples from Area 4I from this event.

Following the removal of Hangar 4 on Area 4F, validation surface samples were collected to identify any potential asbestos impacts. Fifty samples were collected on 15 January 2009 from Areas 4F and 4I. Fourteen of the validation samples were located on site (as listed in Table 16 above). No asbestos was detected in any of the validation samples.

5.3.5 Backfill material

The reinstatement of excavations was discussed in Section 6.3 of OTEK, 2013 (attached as Appendix C 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 classified as suitable for use as backfill material across the Overall Audit area (refer to Appendix G of OTEK, 2013 attached as Appendix C of this report). Details of sampling and analysis were provided under separate covers, which the auditor reviewed and provided comment on (attached as Appendix I 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) and across the Overall Audit Area, and were considered to be naturally occurring given the basaltic origin of the material. The auditor is satisfied the material used to backfill excavations was of suitable quality for the proposed intended residential use of the site.

5.3.6 Auditor's opinion on infrastructure removal and validation sampling

Where infrastructure removal and validation sampling was not adequately reported or discussed in the Area 4I ESA report, the auditor referred to reports for Area 4F (OTEK 2013a) and Area 4G (OTEK 2013b) for further detail and information on sampling and results.

From a review of the information provided by OTEK and TEC, 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 Consistency with clean up regulations

Aside from minor inorganic exceedances described in Section 5.2.1, there was no contamination identified in soils at the site. As such, remediation and offsite disposal of contaminated soils was not required.

Site infrastructure was appropriately removed and disposed of offsite by a licenced contractor (as described in Section 5.3.

Surface debris was identified on the ground surface at several locations within the site adjacent to Areas 4B, 4F and 4G. The surface debris identified included bricks, concrete, reinforcing rods, bolts, wire, steel plates, nails, pegs, etc. This material was suspected to be related to RAAF hangars located on adjoining audit areas. Two or three sheets of corrugated non-friable ACM material were identified lying flat on the ground surface near test pit 4I/G2. The debris was subsequently removed from site. OTEK stated (OTEK 2013) that the asbestos containing materials were removed from site during site clean-ups carried out by the hangar removal and clean up contractors, Transfield Services (Hangar 3) and Alex Fraser (Hangar 4).

Although no asbestos clearance and waste transportation documentation were provided in OTEK (2013), 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.

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

Following completion of the assessment, infrastructure removal, and validation works, slightly elevated concentrations of barium and vanadium above the EILs remained on the site. These concentrations are considered to be representative of background levels and not considered to be contamination that may to pose an ecological or human health risk (as discussed in Section 5.2.1).

5.5.1 Maintenance of ecosystems

Concentrations of barium and vanadium above the EILs were detected in soils on the site. As discussed in Section 5.2.1, these concentrations were all detected in natural soils and were considered representative of background conditions.

Additionally, the range of pH (6.8 to 8.8) encountered at the site was not expected to adversely impact the beneficial use maintenance of ecosystems, as it was naturally occurring and there were no visual effect on site vegetation.

5.5.2 Human health

Concentrations of the majority of analytes tested were below the investigation levels for protection of human health (NEPM HIL A), apart from two composite samples, one of which contained concentrations of cobalt and one that contained concentrations of manganese above the modified HILs. The concentrations were below the non-modified guideline value for HILs, and if they were multiplied by three (to account for the compositing) and the concentration attributed to a single sample, the concentrations would be less than 2.5 times the NEPM HIL, (cobalt was 1.17 times greater than the modified guideline and manganese was 1.49 times the modified guideline). The grid samples immediately north and south of the composite were analysed as individual samples (4I/G17 and 4I/G21) together with two target sampling locations north of the composite area (4I/T4 and 4I/T5, 2013 sampling event (refer Appendix H)). Samples from these target locations did not identify manganese or cobalt above the guidelines. The auditor did not consider the elevated concentrations of cobalt and manganese in composite samples to be of concern, based on the following lines of evidence:

- As noted in Section 5.2.1, the manner in which investigation levels were modified to account for compositing (i.e. divided by the number of individual samples within the composites) can be conservative. Both cobalt and manganese are detected naturally in soil in the area, and an assumption that the entire concentration is derived from a single sample is highly conservative.
- The composite samples collected 0.25 m above and 0.5 m below the sample with elevated cobalt were tested and did not contain cobalt above the modified HILs, and the composite sample collected 0.25 m below the sample with the elevated manganese result was tested with a manganese result below the guidelines.
- Concentrations of cobalt and magnesium in individual samples were consistent with concentrations across the Overall Audit Area, and were all below the investigation levels, and the concentrations in the composite samples were well below the standard (unmodified) investigation levels;
- The concentrations of both cobalt and manganese in the composite samples were both within the NEPM background ranges (1-40 mg/kg and <850 mg/kg respectively); and
- There were no specific sources of these inorganics identified at the site.

The auditor did not consider that the concentrations of cobalt or manganese detected in the two composite samples would impact on beneficial use of human health for future residential use.

5.5.3 Buildings & structures

The pH in soils sampled from the site ranged slightly acidic to slightly alkaline (5.1 – 9.5), with approximately 50% of results outside of the background range specified in ANZECC 1992 (6-8). OTEK did not comment on cause of the variability.

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 naturally occurring and not associated with any onsite anthropogenic source.

OTEK compared the soil pH results with the exposure classification for concrete piles in Australian Standard AS2159-2009. All apart from four samples were above pH 5.5, indicating "non aggressive" soil conditions. The four outliers are not expected to affect the soil classification, and the majority of the soil pH range observed was not expected to adversely

impact the integrity of future concrete buildings and structures on site. OTEK also commented that the soil at the site did not appear corrosive and would not adversely affect the integrity of structures or buildings constructed on-site.

Soil samples from the site were not analysed for sulphate concentrations, however the auditor has considered sulphate concentrations from adjacent areas 4F and 4G which reported concentrations below the 5000 ppm indicating that soil conditions (for silts and clays) were 'non-aggressive' (Australian Standard AS2159-2009). Acid sulphate soils were not encountered or expected at the site given the geological conditions and location of the site.

5.5.4 Aesthetics

OTEK reported (OTEK 2013) that no offensive odours were observed during the intrusive field works, and that surface debris and rubble was collected and disposed of off-site, including identified bonded asbestos sheets (discussed in Section 5.2.2). OTEK concluded that there were no aesthetic concerns associated with the site.

During his final site inspection on 1 May 2014, the auditor observed the site surface was predominantly covered with grass. Some litter and minor rubble was present on the site, which appeared to be derived from offsite (windblown or dumping). The litter was not extensive and not considered a source of potential soil contamination. Various materials including wood (e.g. timber, storage pellets, boxes), steel and steel equipment and tyres were stored on the northern end of Part 2 of Area 4. The auditor did not identify any issues precluding the aesthetics beneficial use.

5.5.5 Production of food, flora & fibre

The objectives of this beneficial use are 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. Two composite samples exceeded the modified HIL for cobalt and manganese (one sample for each). As discussed in Section 5.5.2 above, these results were considered to be representative of background conditions and were not considered to impact human health, or the beneficial use of production of food, flora and fibre.

The auditor considered the EILs should also be taken into account. Concentrations of barium and vanadium exceeded the EIL. As discussed in Section 5.2.1, these concentrations were all detected in natural soils and were considered representative of background conditions. 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.

OTEK also noted in OTEK 2013, that existing vegetation at the site was observed to be abundant and did not appear to be distressed, indicating that underlying soil was suitable for plant growth. No areas were observed where plants do not grow or plant growth was suppressed.

5.6 Off-site soil 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.

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

As per the proposed development plan provided in Appendix B, the site is part of the Riverwalk Estate which is 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 is of the opinion that the site is 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 December 2011. The site was originally part of the Overall Audit Area (refer Section 1.1), no potential sources of groundwater contamination were identified on the site, and therefore no monitoring wells were installed within the site.

Three monitoring wells (MW-1, MW-2 and MW-3) installed hydraulically up and cross gradient of Part 1 and down gradient of Part 2 of the site were considered by OTEK to represent background conditions. The results for the relevant monitoring wells MW-1, MW-2 and MW-3 were reported in OTEK 2013 (refer Appendix C). The auditor also considered that monitoring well MW-4 upgradient of Area 4I was relevant to the site. The results from MW-4 have been sourced from the Area 4C and Area 4F ESA reports (OTEK, 2013c and OTEK, 2013a) and included in this report in Appendix J. Monitoring well locations are shown on Figure 5.

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 4I were reported in OTEK 2013.

A summary of key information within OTEK 2013 is provided in Table 17 below.

Table 17 Assessor's site assessment information – groundwater

Assessment Details	Section in assessor's report (OTEK 2013, Appendix C of this report)
Details of Groundwater Sampling and Analysis	Section 7
Groundwater results	Section 9.3
Field Observations	Appendix I and Appendix J
Monitoring Well Installation Logs	Appendix I
Field Measurements (Groundwater)	Appendix J
Site Plan	Figure 5
Analytical Results (Summary Tables)	Tables 35 to 46

6.1 Adequacy of the groundwater assessment program

OTEK installed 11 groundwater monitoring wells (MW-1 - MW-11) across Area 4 of the Overall Audit Area between June 2007 and October 2009. No monitoring wells were installed within the site (Area 4I), however, OTEK referred to three monitoring wells (MW-1, MW-2 and MW-3). The auditor also considered monitoring well MW-4, which were installed hydraulically up gradient of the southern portion of Part 1 of the site.

Figure 5 shows the locations of wells installed for the purposes of the audit across the Overall Audit Area. Table 18 provides information on the monitoring wells present in the vicinity of the site.

Table 18 Monitoring Well Details

Monitoring Well ID	Potential Source Targeted	Total Well Depth (mbgl)	Aquifer[1]	SWL (mTOC)[2]	Top of screen (mbgl)
MW-1	Infrastructure (UST) in Area 4E	16.20	Werribee Delta	10.784	10
MW-2	Groundwater conditions in Area 4D	17.80	NVA	13.445	11
MW-3	Infrastructure (former TTP and timber drying area) in Area 4B.	15.80	NVA	13.451	10.8
MW-4	Infrastructure (UST) in Area 4C	12	Werribee Delta	11.473	8

NOTES:
mTOC – metres below top of casing
mbgl – metres below ground surface
[1] As per Section 7.1.3 of OTEK 2013
[2] Measured on 7-8 December 2011.
NVA – Newer Volcanics aquifer

Groundwater across the site and Overall Audit Area was inferred to flow towards the east and south east (refer to Figure 5) which was consistent with the expected flow direction towards the Werribee River, which flows approximately north-south and is located approximately 250 m to the east of the site. Regionally, the groundwater is 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 inferred groundwater flow in the area monitoring well MW-1 is located hydraulically down gradient from Part 1 of the site (and down gradient of the UST in Area 4E), and MW-2, MW-3 and MW-4 appeared to be located hydraulically up gradient of Part 2. Refer to Figure 5 for the location of these wells.

The boreholes used for the installation of groundwater monitoring wells were drilled with hollow stem augers, and air hammer when drilling through basalt to the maximum depth. Screens were constructed above the measured standing water in all wells to allow for the ingress of non-aqueous phase liquids (NAPL) if present. A sand pack was installed from the base of each well to approximately 1 m above the screened interval, a bentonite seal of 1 m was installed above the sand pack, followed by grout to surface.

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. However, when considering the number of sampling events over multiple years and the consistency of results across sampling events, the auditor was satisfied that the method of well development was unlikely to have a significant negative impact on the groundwater analytical results.

Five groundwater monitoring events (GMEs) for wells MW-1, MW-2, MW-3 and MW-4 were undertaken (as part of sampling events across the Overall Audit Area), as summarised in Table 19.

Table 19 Summary of groundwater sampling events and analysis

Monitoring Event	Date	Wells Sampled	Analysis
GME1	22-23 August 2007	MW-1, MW-2, MW-3 and MW-4	Inorganics[2], BTEX, TPH, PAHs, cations/anions[3], TDS, pH
GME 2	14-15 November 2007	MW-1, MW-2, MW-3 and MW-4	Inorganics[2], BTEX, TPH, PAHs, cations/anions[3], TDS, pH
GME 3	4-5 February 2008[1]	MW-1, MW-2, MW-3 and MW-4	Inorganics[2], BTEX, TPH, PAHs, cations/anions[3], TDS, pH
GME 4	25-26 November 2009	MW-1, MW-2, MW-3 and MW-4	Inorganics[2], BTEX, TPH, PAHs, cations/anions[3], TDS, pH
GME 5	7-8 December 2011	MW-1, MW-2, MW-3 and MW-4	Inorganics[2], BTEX/TPH (MW-1 and MW-4 only), cations/anions[3], TDS, pH

NOTES:
[1] Field record sheets stated that purging was undertaken on 2/5/2008 for MW-1, MW-2 and MW-3, and on 2/4/2008 for MW-4 and MW-6. These are considered to be typographical errors, as sampling records indicate sampling was undertaken on 4/2/2008 and 5/2/2008.
[2] antimony (GME 4 and 5 only), arsenic, barium, beryllium, boron, cadmium, chromium, hexavalent chromium (MW-3 and MW-4 only), 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 GMEs were included in Appendix J of OTEK 2013, attached as Appendix C of this report. OTEK reported that samples were collected in laboratory provided bottles which were 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 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 the hydrogeology in the area of the site. The assessment across the Overall Audit Area was considered adequate to assess identified potential historical sources of groundwater contamination and no likely sources of groundwater contamination were identified on-site;
- The monitoring wells were placed appropriately to assess groundwater quality from potential off-site sources (there were no on-site sources identified);

- Appropriate construction methods were generally adopted for the monitoring wells;
- The analytical schedule and field measurements were adequate; and
- The low flow sampling methodology adopted was considered appropriate.

6.1.1 Auditor's opinion on the adequacy of the groundwater assessment program

No potential sources of groundwater contamination were identified on either Part 1 or Part 2 of the site; therefore no on-site wells were required. The off-site monitoring wells were located in the vicinity of potential sources on the adjacent audit areas to allow an assessment of the quality of groundwater entering Part 1 of the site. The well (MW-1) located immediately down gradient of Part 2 of the site allowed an assessment of the potential for groundwater contamination arising from the former UST. There were no other potential sources identified in the vicinity of Part 2. Wells were correctly constructed to allow assessment of contamination. An adequate number of sampling events were undertaken with an appropriate analytical suite to address all CoPC, given that soil and groundwater analytical results did not indicate contamination at levels considered to adversely impact the relevant beneficial uses, and no potential ongoing sources of groundwater contamination were identified within Part 1 or Part 2 of the site.

6.2 Beneficial uses of groundwater to be protected

The assessor's groundwater field investigations indicated the TDS of groundwater in monitoring wells MW-1 (Area 4E), MW-2 (Area 4D), MW-3 (Area 4B) and MW-4 (Area 4C) proximate to the site ranged from 3780 mg/L (MW-4 in 2011) to 5510 mg/L (MW-2 in 2007) (OTEK 2013, attached as Appendix C of this report). On this basis, groundwater at the site was 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 comprehensive 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 (e.g. 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 20, and discussed further below. It was noted that much of this data was collected up to 10 years ago,

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 of nearby sites found groundwater quality of a similar nature.

Table 20 Regional groundwater quality

Analyte	Investigation Level Maintenance of Ecosystems[e]	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
Zinc	0.008	0.015-0.019	0.009-0.014	0.01-0.047	0.01-0.331[b]
Nitrate-N	0.7[f]	12.4[d]	5.3-6.7	2.3-9.8	1.25-5.82

NOTES:
[a] isolated result in MW-6 Area 4, November 2007, all other results for Area 4 wells ≤0.011 mg/L
[b] isolated result in MW-6 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-NO_3 (55 mgL)
[e] ANZECC (2000), 95% level of protection (slightly to moderately disturbed ecosystems) for freshwater guidelines
Data sources: , GHD 2004, GHD 2008, GHD 2011 (refer Section 8 References), OTEK 2010, OTEK, 31 October 2012, *Remediation and Validation Report (Draft), Sub-Area 4B, Werribee, Victoria,*
[f] 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 retained for general guidance only.

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 investigation levels across the whole data set. There were no specific point sources of these inorganics identified in the vicinity of the Overall Audit Area or the site itself;
- A review of nearby audits undertaken during the audit of Area 3 (GHD 2003) found that groundwater at two sites located approximately 5 km north east (Dames & 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 site contained concentrations of chromium, selenium, zinc, nickel and copper above the investigation levels. It was concluded in these audits that the concentrations were considered naturally occurring in the Newer Volcanics Aquifer.

Nitrate

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 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 retained for general guidance only. The concentrations of nitrate observed across the Overall Audit Area were considered either naturally occurring or representative of the regional land use, based on the following lines of evidence.

- Although septics and associated infrastructure located in Areas 4A, 4B, 4C, 4D, 4E4F/4I and 4G were identified as potential point sources of nitrate in the Overall Audit Area, 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 potential sources). The concentrations of nitrate observed across the Overall Audit Area were reasonably consistent (refer Table 20 above), with up gradient (i.e. background) wells containing similar concentrations to wells in the vicinity and down gradient of potential sources. Furthermore, use of the septic tanks ceased circa 1950s.
- Concentrations of nitrate in soil across Area 4 were typically low (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 Volcanics 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, were 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 of monitoring wells proximate to the site (MW-1, MW-2, MW-3 and MW-4) are discussed below. As discussed in Section 6.1, no monitoring wells were installed on the site as there was not considered to be a risk to groundwater contamination. OTEK referred to three monitoring wells (MW-1, MW-2 and MW-3) which were considered to represent the likely groundwater conditions on Area 4I. The auditor also considered MW-4. Tabulated groundwater results for MW-1 to MW-3 from 2007 to 2011 are presented in Tables 35 to 38 of OTEK 2013. Results for MW-4 were presented in OTEK 2013c. Figure 5 shows the locations of wells installed for the purposes of the audit across the Overall Audit Area.

6.4.1 Organic analytes

Concentrations of BTEX, TPH and PAHs, were below the laboratory limit of reporting for all samples analysed.

6.4.2 Inorganic analytes

Boron, copper, nickel, zinc and nitrate

Concentrations of boron, copper, nickel, zinc and nitrate in monitoring wells (MW-1, MW-2, MW-3 and MW-4) were within the range of the regional groundwater concentrations reported in Table 20 (Section 6.3 above)

As discussed in Section 6.3 and discussed in OTEK 2013 (Section 12.2.1), the concentrations of these inorganics were considered to be representative of background conditions. In accordance with the Groundwater SEPP (part IV, 10, 2(c)), where concentrations encountered are considered to be representative of regional conditions (rather than attributed to an onsite source), these concentrations become the objective and no groundwater clean-up is required. Therefore, concentrations of boron, copper, nickel, zinc and nitrate-N were not considered to exceed the environmental objectives and are not discussed as exceedances henceforth.

Manganese

A concentration of manganese (0.861 mg/L) was detected in groundwater from MW-4 in 2009, however the concentration observed in 2011 (0.002 mg/L) was below all investigation levels and several orders of magnitude lower than the 2009 concentration. OTEK was not able to attribute the cause of the elevated concentration of manganese in the 2009 event. It was noted that similarly elevated manganese concentrations were also observed in other wells sampled across the Overall Audit Area during the same event. Therefore, OTEK considered the elevated manganese concentrations during the 2009 round (including in MW-4) to be anomalous, and unlikely to represent site conditions.

The auditor agreed that the 2009 manganese concentration in MW-4 was inconsistent with the findings across the Overall Audit Area for all other monitoring events and agreed that the manganese concentrations reported in the 2009 event were anomalous. It was noted that the rinsate blank samples collected during the 2009 GME reported all concentrations below the LOR (including manganese), indicating that it was unlikely that cross contamination occurred during sampling, particularly given the low concentrations of manganese in soil and other groundwater samples, and also given the absence of a potentially contaminating source.

Irrespective of the source of manganese, when accounting for the limited likely ingestion associated with primary contact recreation, the guidelines suggest the criteria be modified by a factor of 20 (NHMRC 2008). On this basis the concentration of manganese at MW-4 was below the modified investigation level. Additionally, the concentration detected in the subsequent monitoring event was well below all investigation levels and was consistent with concentrations across the Overall Audit Area. It is therefore not discussed as an exceedance henceforth.

Hexavalent chromium

A single concentration of hexavalent chromium above the investigation level for maintenance of ecosystems was detected in MW-3 during GME3 (February 2008). OTEK did not comment on the likely source of the hexavalent chromium concentration in MW-3 in OTEK (2012a) or OTEK (2012b). The auditor considers the former timber treatment activities were potentially a former source.

The result for hexavalent chromium from MW-3 in GME5 was below the laboratory LOR, however the LOR was above the investigation level and therefore it was not possible to make a meaningful comparison with the investigation level. The auditor therefore compared the results for total chromium with the investigation levels for hexavalent chromium, on the basis that hexavalent chromium concentrations would be less than the results for total chromium. The auditor did not consider the marginally elevated concentrations of hexavalent chromium observed in MW-3 in 2008 were indicative of a significant issue, based on the following:

- The total chromium result for MW-3 was 0.005 mg/L in GME3 (equal to the hexavalent chromium result); in GME4 was 0.003 mg/L, decreasing to 0.001 mg/L in GME5, which indicated concentrations of hexavalent chromium equal to or below the investigation level in GME5.
- All primary sources of chromium had been removed from the source site and activities had ceased (i.e. former timber treatment processes, etc.), and the majority of secondary sources (i.e. chromium impacted soil) were removed during the remediation works conducted on Area 4B;
- Two monitoring wells (MW-10 and MW-11) installed in the vicinity of the residual hexavalent chromium impacted soils in the area west of Hangar 5 reported total chromium concentrations were below the investigation level for total chromium and hexavalent chromium.
- Natural attenuation of hexavalent chromium in groundwater can occur through reduction of organic matter, hydrogen sulphide, sulphur, iron sulphide, ammonium and nitrate[2]. Given the presence of nitrate in groundwater, it was considered possible that natural attenuation had occurred and would continue to occur before groundwater discharges to the Werribee River where the guidelines apply.

In summary, given the minor detections of chromium, absence of an ongoing source, distance to potential groundwater discharge point (i.e. the Werribee River) and likely natural attenuation, the concentrations of hexavalent chromium detected are not considered to pose a risk to the beneficial use maintenance of ecosystems.

Chloride and sodium

In addition to the abovementioned inorganics, OTEK noted that concentrations of chloride and sodium were above the investigation levels for recreational use in all wells during all sampling rounds. These analytes were not considered CoPC, rather were assessed to provide an indication of groundwater hydrogeochemistry and are considered indicative of the natural hydrochemistry in the area, and have not been discussed henceforth.

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

Results of the groundwater assessment program for wells considered representative of groundwater beneath the site (located hydraulically up gradient of Part 1 and immediately down gradient of Part 2 of the site) indicated groundwater was not polluted and that elevated concentrations of boron, copper, nickel, zinc and nitrate were naturally occurring and therefore potential or existing beneficial uses were not impacted. The minor concentrations of hexavalent chromium detected in one upgradient well were not considered to impact on any beneficial uses of groundwater. No potential sources of groundwater impact were identified at the site. The relevance of protected beneficial uses at the site and the potential impact of the groundwater

[2] Agency for Toxic Substances & Disease Registry (ATSDR), *Toxicological Profile for Chromium,* 6. Potential for Human Exposure (http://www.atsdr.cdc.gov/ToxProfiles/TP.asp?id=62&tid=17)

conditions (of wells considered representative of groundwater beneath the site) on the relevant beneficial uses is summarised in Table 21.

Table 21 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 2500 m to the east and 7.5 km to the south east of the site respectively.	Boron, copper, nickel, zinc and nitrate Hexavalent chromium	Maintenance of ecosystems not precluded. Concentrations of boron, copper, nickel, zinc and nitrate were considered naturally occurring in the region. The minor concentration of hexavalent chromium above the guideline is considered likely to attenuate prior to discharge of groundwater to Werribee River. Hexavalent chromium was not detected in the most recent GME.
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, lot size and access to a reticulated water system make this unlikely.	None	Beneficial use not precluded
Primary contact recreation	Unlikely	Not currently relevant on site, however, groundwater wells may be used to fill or top up swimming pools in the vicinity of the site. However, this was considered unlikely given access to a reticulated water system.	None	Beneficial use was not precluded. Concentrations below the adopted investigation levels
Industrial use	No	Criteria are usually industry specific, however, given neutral pH and the TDS groundwater could support a number of industries.	NA	Beneficial use was not precluded. Use of groundwater for this beneficial use was considered unlikely given the 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 AS2159:2009 (Piling – Design and Installation). The pH results indicated that the groundwater was not aggressive. It was considered that buildings and structures would not be likely to come into contact with the groundwater.	NA	Beneficial use not precluded given that conditions do not indicate potentially corrosive conditions to buildings and structures. It was also considered that realisation of this beneficial use was unlikely as the depth of foundations are unlikely to come into contact with groundwater.

6.5.1 Conclusion on groundwater quality, existing and likely future uses

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 contaminants tested. 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 sources have not impacted any beneficial uses of groundwater. This is further supported by the absence of elevated concentrations of concern in soil, and observations made during field works (e.g. no visible staining or odours).

Groundwater sampling conducted in the vicinity of the site identified concentrations of boron, copper, nickel, zinc, nitrate-N and hexavalent chromium were reported above the adopted investigation levels for the beneficial uses maintenance of ecosystems. However, with the exception of hexavalent chromium, the concentrations of these inorganics were considered naturally occurring, and were not considered to have impacted any beneficial use of groundwater at the site (refer discussions through Section 6.4 above). One occurrence of hexavalent chromium was reported above the investigation levels for the beneficial uses maintenance of ecosystems, however this was not considered likely to impact upon the nearest receptor applicable for maintenance of ecosystems (refer Section 6.4).

7. Audit conclusions

Following completion of this environmental audit for Area 4I 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, 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 appear representative of site conditions and could be relied on to reach the opinions stated in this audit report at the time of assessments (refer to Section 4.3 for details
- The density and distribution of sampling appeared appropriate to a site that has largely remained a greenfield site without sources of pollution and where potential sources were identified they were targeted with sampling that did not identify soil contamination. The sampling program was considered acceptable (refer to Section 5 for details).
- Based on the data available up to the completion of the audit, concentrations of barium 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 5.5.1 for details).
- Two composite samples exceeded the modified HILs (one for cobalt and one for manganese). Both concentrations were well below the unmodified HIL guidelines and not outside the concentration range expected for individual samples across the Overall Audit Area. These results are considered likely to represent natural soil concentrations and not considered contaminants in regard to human health guidelines.
- Groundwater was not considered polluted at the site. The elevated concentrations of boron, copper, manganese, nickel, zinc and nitrate were considered to be naturally occurring and as such were not considered to impact relevant beneficial uses.
- At the time of completion of this audit, the site was vacant and contained Cyprus trees and grass vegetation. The auditor confirmed the site appearance during his final site inspection on 1 May 2014. The auditor did identify some litter and minor rubble on the site, however it appeared to be derived from offsite (e.g. windblown or through dumping). Materials including wooden storage pellets, wood, a wooden box, steel and steel equipment and tyres were stored on the northern portion of Part 2 of Area 4I. The litter and stored materials were not extensive, and were not considered a source of potential soil contamination. It is assumed that prior to any development the stored material and litter would be removed. The contamination conditions in soil and groundwater were not expected to adversely impact off-site uses.

The auditor is therefore of the opinion that the condition of the site is neither detrimental nor potentially detrimental to any beneficial use of the site.

These conclusions must be read in conjunction with the full audit report, *"Melbourne Water Corporation, Audit Report for Area 4I of Riverwalk Estate, Princes Highway, Werribee, Victoria, May 2014"* (Ref: 31/1157500/219426 – CARMS Reference 41460-12).

DATED: 12 May 2014

SIGNED:

PETER EGBERTS
ENVIRONMENTAL AUDITOR
(Appointed pursuant to the Environment Protection Act 1970)

8. References

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

ANZECC 1992, Australian Water Quality Guidelines for Fresh and Marine Waters, National Water Quality Management Strategy, Australian and New Zealand Environment & Conservation Council.

ANZECC/ARMCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy, Australian and New Zealand Environment and Conservation Council / Agriculture and Resource Management Council of Australia and New Zealand.

U.S. Department of Health and Human Services Public Health Service Agency for Toxic Substances and Disease Registry, *ToxGuideTM for Barium,* October 2007, (ATSDR, 2007) (http://www.atsdr.cdc.gov/toxguides/toxguide-24.pdf)

Agency for Toxic Substances & Disease Registry (ATSDR), *Toxicological Profile for Chromium,* 6. Potential for Human Exposure (http://www.atsdr.cdc.gov/ToxProfiles/TP.asp?id=62&tid=17)

Biosis Research Pty Ltd (Biosis), March 2000, *Werribee Field, Victoria: An Archaeological and Cultural Heritage Survey.*

Douglas, JG & Ferguson, JA (eds) 1998, *Geology of Victoria*, Victoria Division, Geological Society of Australia Incorporated.

Enterra Pty Ltd (Enterra), 31 May 2001, Werribee Fields Development – Sub Surface Investigation.

EPAV 2009, *Sampling and Analysis of Waters, Wastewaters, Soils and Wastes*, Industrial Water Resource Guidelines (IWRG701), June 2009.

EPAV 2000, *Groundwater Sampling Guidelines,* Publication 669, April 2000.

EPAV 2014, *The Clean Up and Management of Polluted Groundwater,* Publication 840.1, February 2014.

EPAV 2007, *Classification of Wastes*, Publication 448.3, May 2007.

EPAV 2009, Environment Protection (Industrial Waste Resource) Regulations 2009.

EPAV 2007, *Environmental Auditor (Contaminated Land) Guidelines for Issue of Certificates and Statements of Environmental Audit*, Publication 759.2 February 2014.

EPAV 2007, *Environmental Auditor Guidelines - Provision of Environmental Audit Reports, Certificates and Statements*, Publication 1147.1 December 2012.

Geological Survey of Victoria (1959), Melbourne Map Sheet (1:63,360).

GHD, October 2004, *Area 2, Melbourne Water's Werribee Fields, Werribee, Environmental Audit Report* (GHD 2004)

GHD, September 2008, *Area 3 Werribee Fields, New Farm Road, Werribee, Victoria, Environmental Audit Report,* (GHD 2008)

GHD, July 2011, *Audit Report for Area 1 of Riverwalk Development, New Farm Road, Werribee,* (GHD 2011)

GHD, October 2004, *Area 2, Melbourne Water's Werribee Fields, Werribee, Environmental Audit Report* (GHD 2004)

GHD, September 2008, *Area 3 Werribee Fields, New Farm Road, Werribee, Victoria, Environmental Audit Report,* (GHD 2008)

GHD, July 2011, *Audit Report for Area 1 of Riverwalk Development, New Farm Road, Werribee,* (GHD 2011)

Leonard, J., 1992, *Port Phillip Region Groundwater Resources – Future Use and Management,* Department of Water Resources Victoria.

Leonard, J., 2006, *Hydrogeology of the Melbourne Area,* Australian Geomechanics, Vol 41 No 3, September 2006

MHSPE 2009, *Environmental Quality Objectives in the Netherlands.* Ministry of Housing, Spatial Planning and Environment, Netherlands.

Milsearch Pty Ltd (Milsearch), April 2000, *A Review of World War II-ERA Military Activity at Werribee Fields.*

National Environment Protection Council 1999, *National Environment Protection (Assessment of Site Contamination) Measure,* December 1999.

National Health and Medical Research Council (NHMRC) and National Resource Management Ministerial Council (NRMMC) 2011, *Australian Drinking Water Guidelines, National Water Quality Management Strategy.*

NHMRC (2008), *Guidelines for Managing Risks in Recreational Water.*

NSW Department of Primary Industries, 2004, *How to interpret your soil test,* (http://www.dpi.nsw.gov.au/agriculture/resources/soils/testing/interpret#Nitrate-nitrogen)

NSW EPA 1994, *Guidelines for Assessing Service Station Sites,* New South Wales Environmental Protection Authority, EPA 94/119.

OTEK, 10 October 2002, *Phase One Report, Werribee Fields, Werribee, Victoria,* (OTEK, 2002).

OTEK, 2010, Hydrogeological Assessment Report (DRAFT), Riverwalk Area 4, New Farm Road Werribee, Victoria (OTEK 2010).

OTEK, August 2007, *Riverwalk – Imported Fill Material Stockpile Sample Results.*

OTEK, June 2008, *Readymix Quarry Preliminary Site Assessment.*

OTEK, September 2009, *Riverwalk – Imported Fill Material Stockpile Sample Results.*

OTEK, June 2008, *Riverwalk Area 4 Scope of Works for removal and validation of Asbestos Pipeline*

OTEK, 26 September 2012, *Sub-Area 4B Environmental Site Assessment (Draft) Riverwalk Area 4, New Farm Road, Werribee, Victoria* (OTEK 2012)

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

OTEK, 4 February 2013, *Environmental Site Assessment (Draft) Riverwalk Sub-Area 4G, New Farm Road, Werribee, Victoria.(*OTEK 2013b)

OTEK, 15 February 2013, *Environmental Site Assessment, Riverwalk Sub-Area 4C, New Farm Road, Werribee, Victoria* (OTEK 2013c)

OTEK, 21 March 2013, *Sub-Area 4I Environmental Site Assessment (Draft) Riverwalk Area 4, New Farm Road, Werribee, Victoria* (OTEK 2013)

Sinclair Knight Merz Pty Ltd (SKM), 17 February 1993, Report 5V3590001.rp1 (only incomplete report provided).

Standards Australia 2005, Australian Standard, *Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*, AS4482.1 - 2005.

Standards Australia 1999, Australian Standard, *Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances*, AS4482.2 - 1999.

Standards Australia, (2009). Australian Standard, *Piling – Design and Installation.* AS2159-2009.

Total Environmental Consulting, 30 July 2013, *Environmental Site Assessment (Draft), Riverwalk Sub Area 4E, Melbourne Water, New Farm Road, Werribee* (TEC, 2013)

Victorian Government 1997, *State environment protection policy (Groundwaters of Victoria),* Victorian Government Gazette No. S160, 17 December 1997.

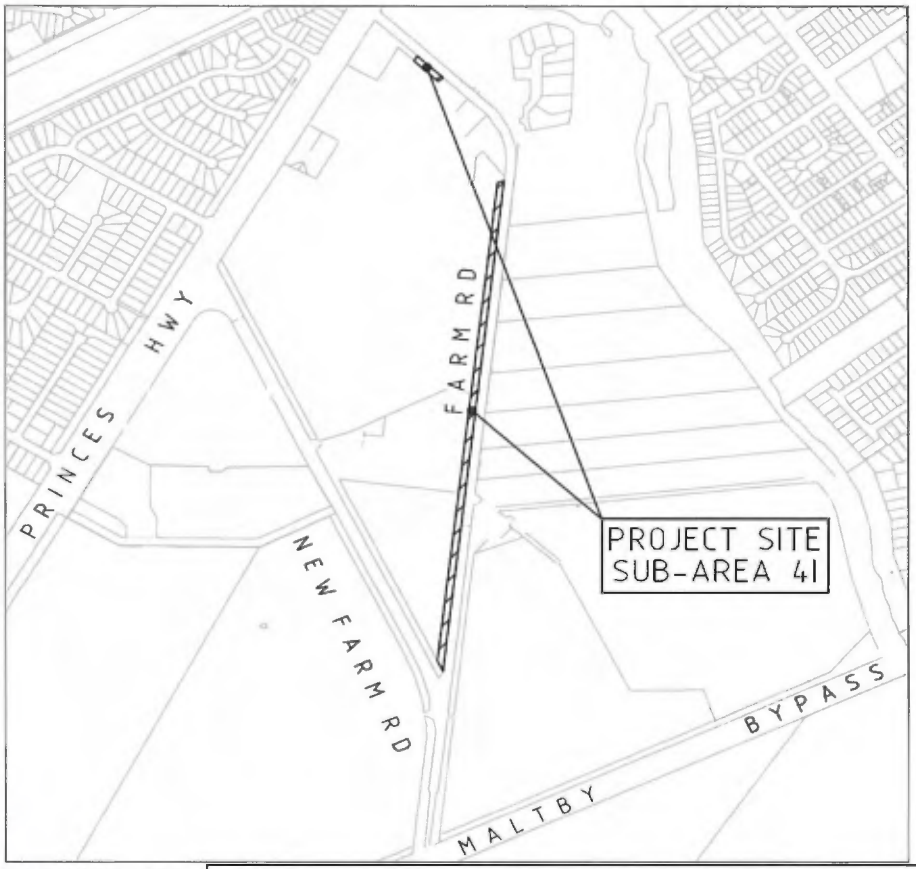
Victorian Government 2002, *State environmental protection policy (Prevention and Management of Contamination of Land,* Victorian Government Gazette No. S95, 4 June 2002.

Victorian Government 2003, *State environment protection policy (Waters of Victoria),* Victorian Government Gazette No. S107, 4 June 2003.

Figures

REGIONAL MAP
NOT TO SCALE

LOCALITY MAP
METRES
0 100 200 300 400 500 1000
APPROXIMATE SCALE ONLY



VICINITY MAP
METRES
0 50 100 150 300m
APPROXIMATE SCALE ONLY

This figure was originally prepared by OTEK for "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented here is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and

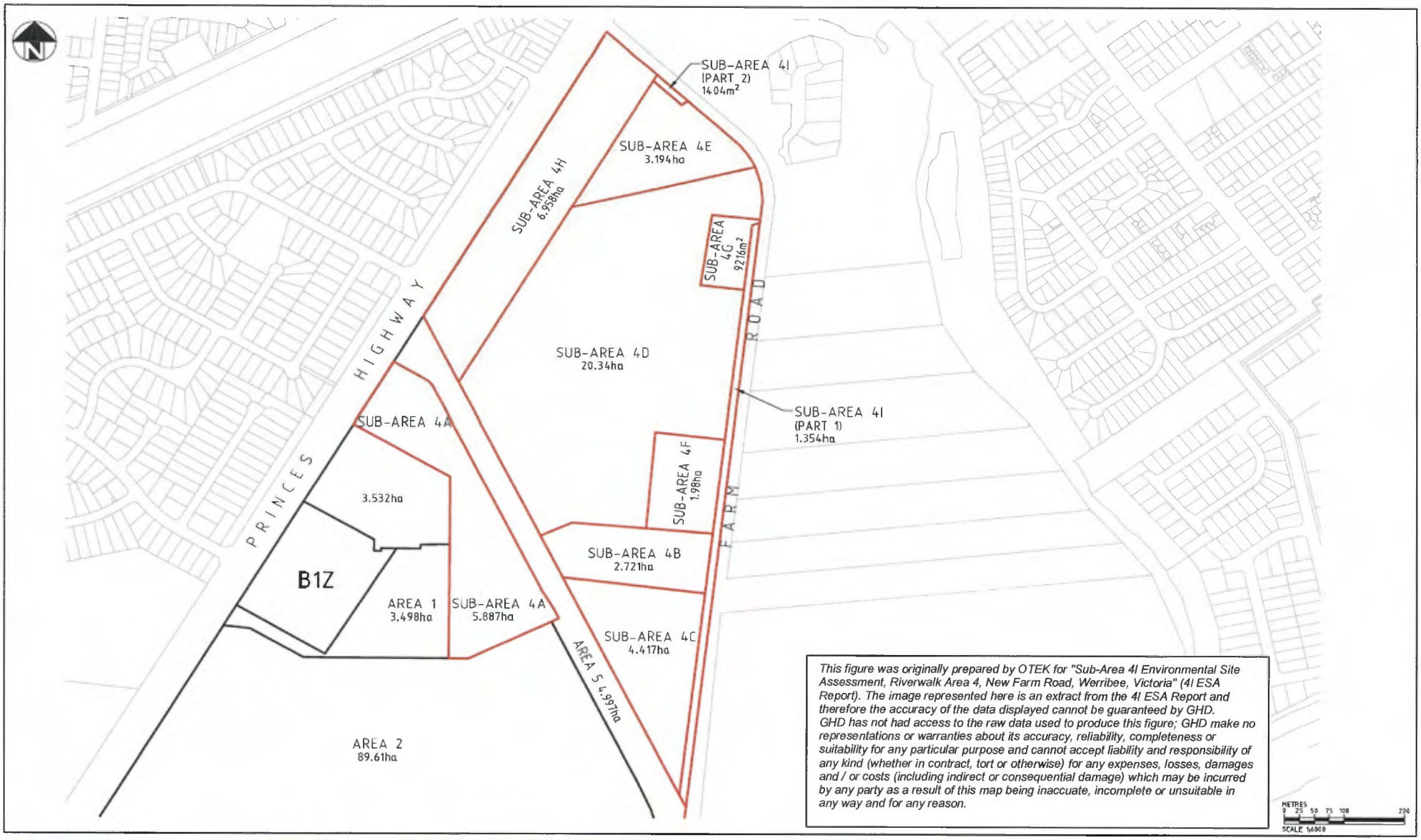
Note: Image was extracted from OTEK ESA Report (above) and is not represented to scale.

Client: Melbourne Water
Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)
scale: | Not to Scale | date: | 17 June 2013

Job No. | 31 / 1157500
Report No. | 219426
Rev No. | A

Figure 1
Regional & Vicinity Maps

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented here is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD. GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

Client: Melbourne Water

Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee

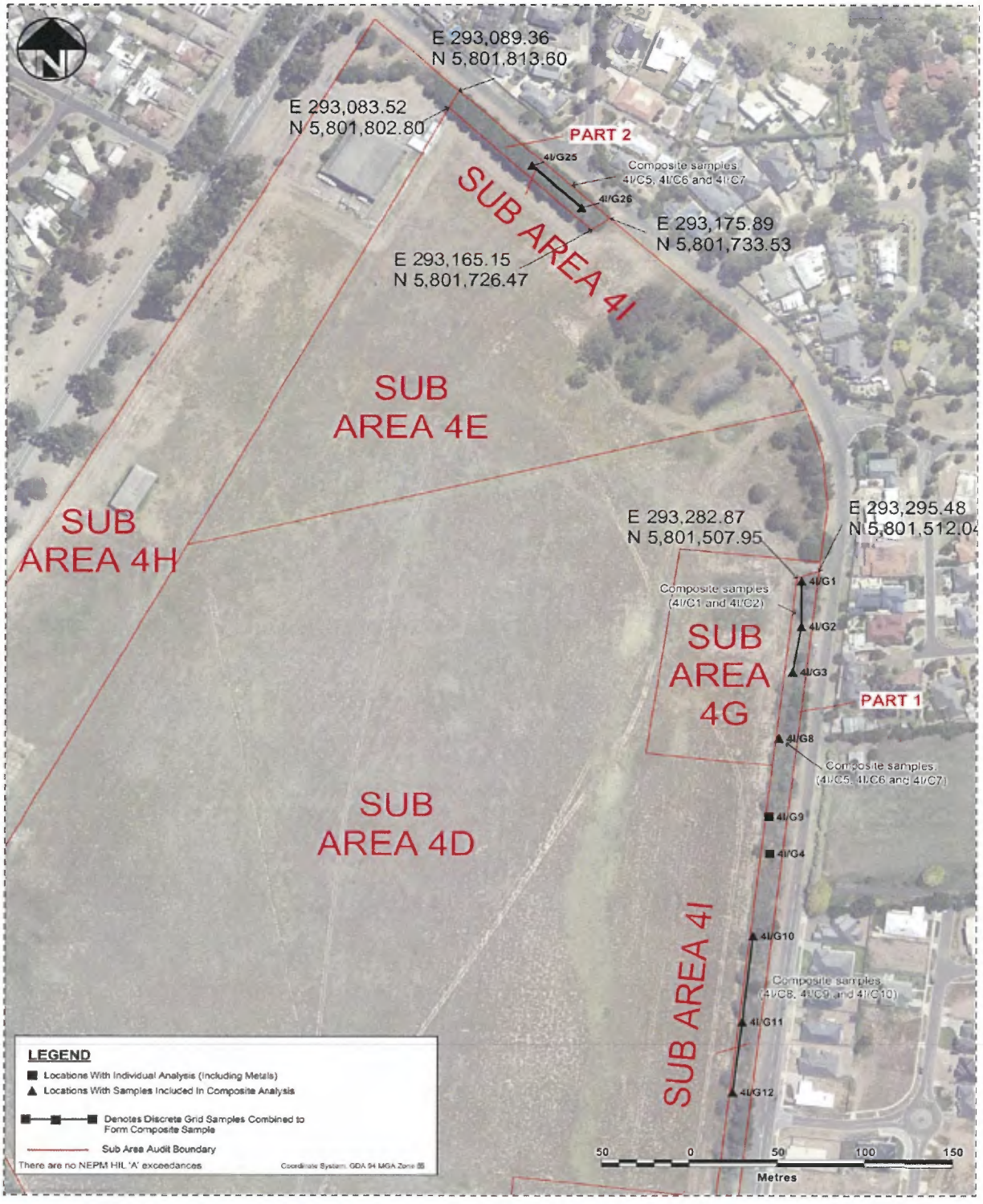
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)

scale: | Not to Scale | date: | 17 June 2013

Job No. | 31 / 1157500
Report No. | 219426
Rev No. | A

Figure 2
Riverwalk Area 4 Site Map

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

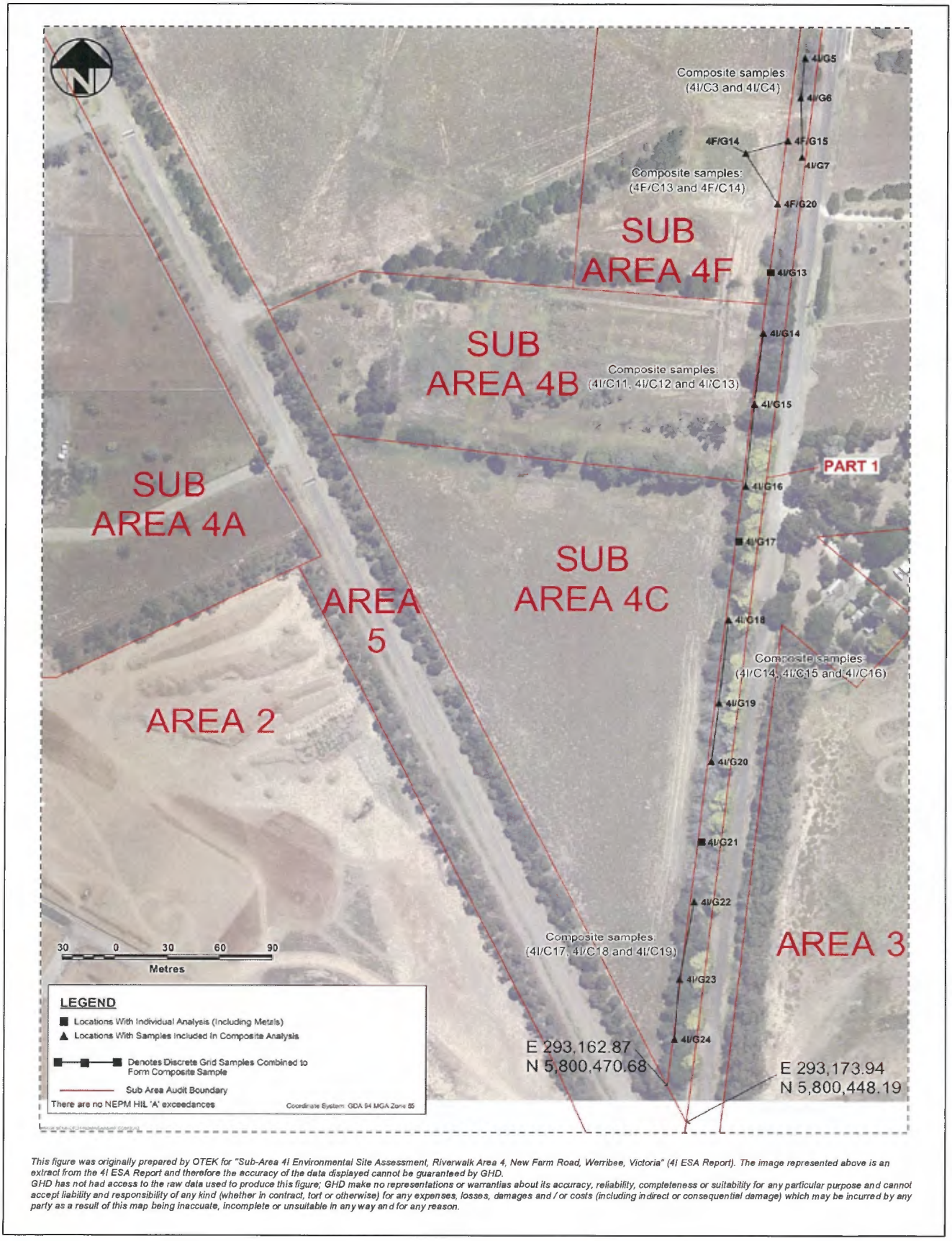
Client: Melbourne Water
Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 3a
Sub-Area 4I Grid & Composite Sample Locations

scale: Not to Scale | date: 17 June 2013

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

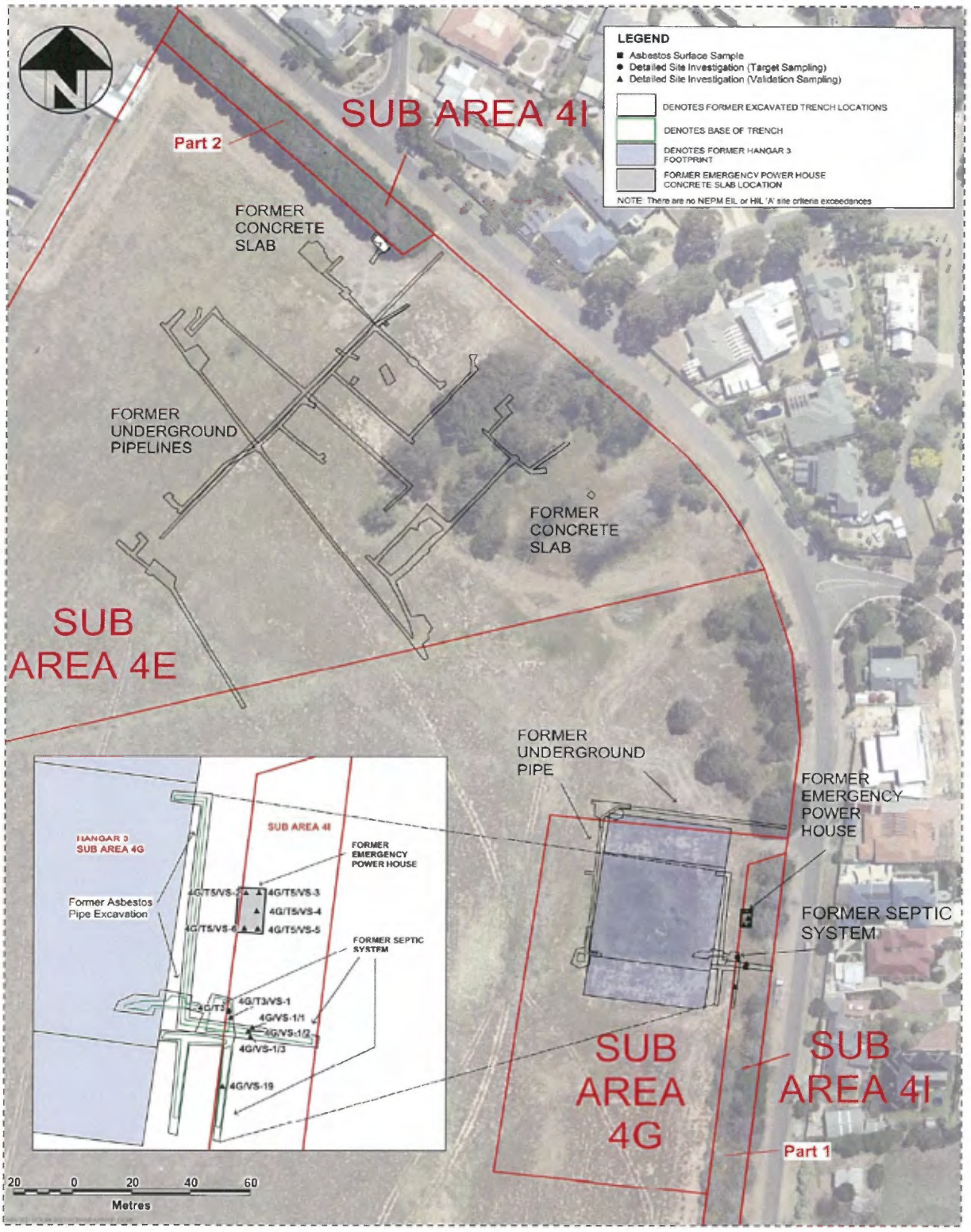
Client: Melbourne Water
Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 3b
Sub-Area 4I Grid & Composite Sample Locations

scale: Not to Scale | date: 17 June 2013

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

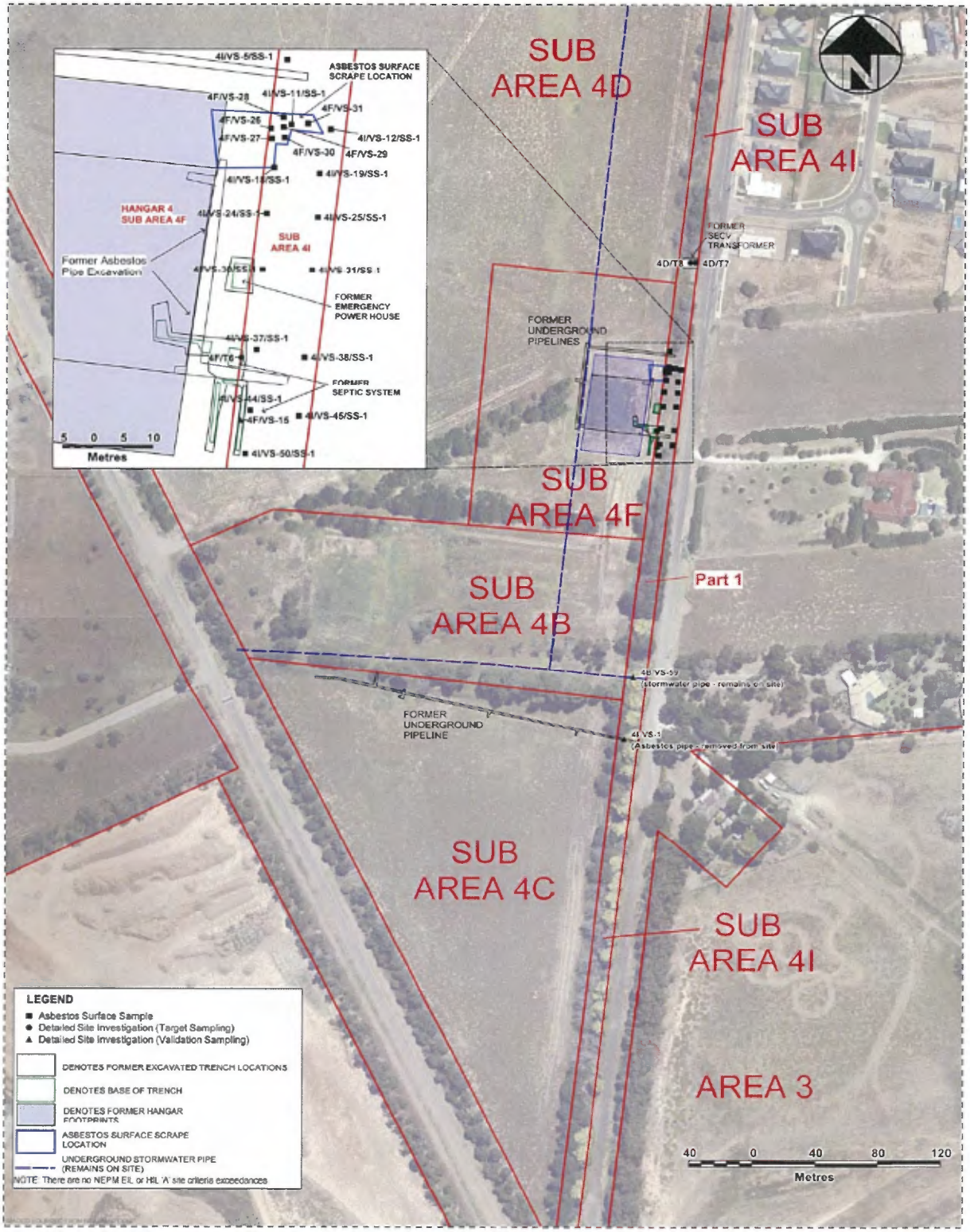
Client: Melbourne Water
Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 4a
Sub-Area 4I Infrastructure Target & Validation Sample Locations

scale: Not to Scale | date: 17 June 2013

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccurate, incomplete or unsuitable in any way and for any reason.

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

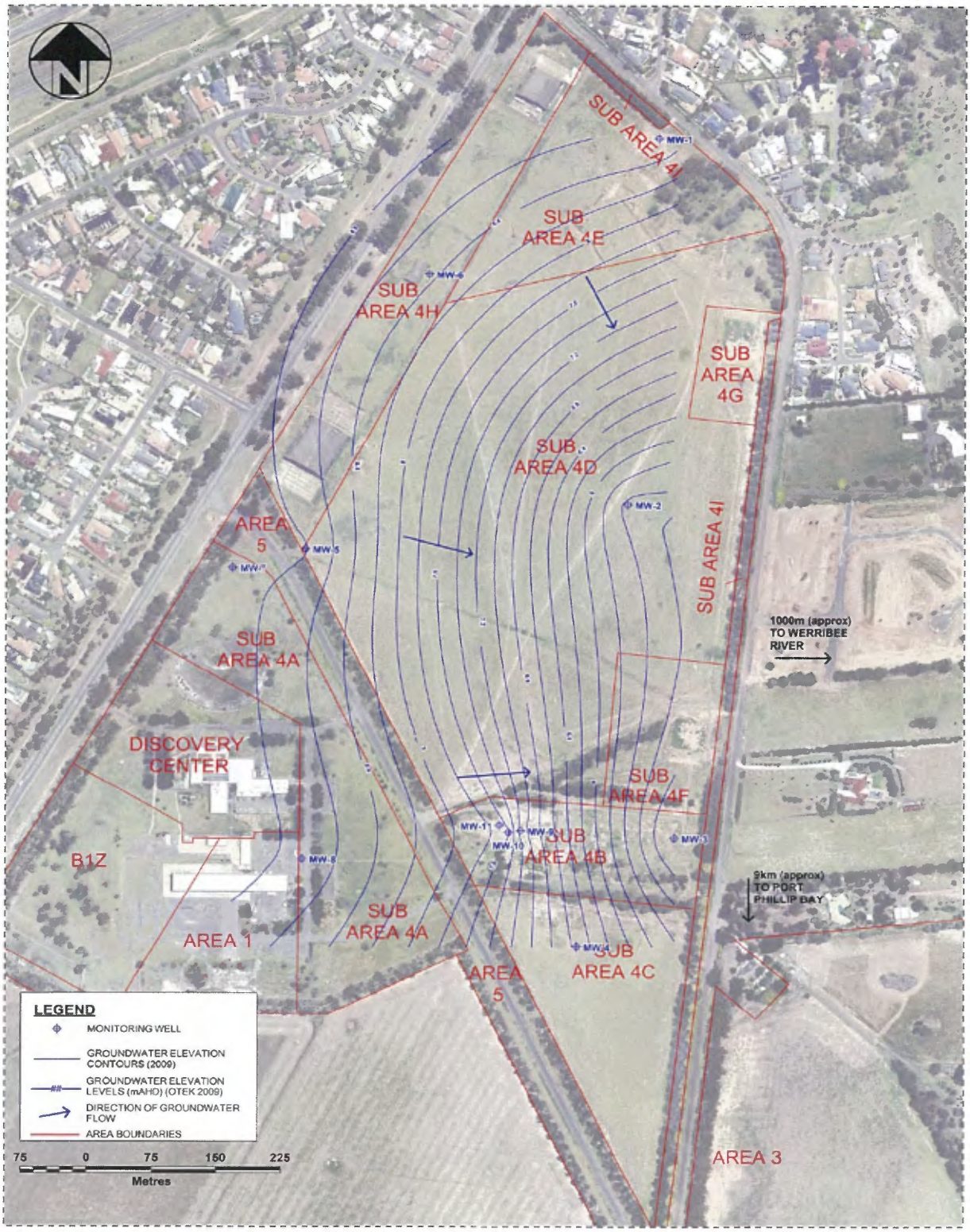
Client: Melbourne Water
Project: Environmental Audit of Area 4I, Riverwalk Estate, Princes Highway, Werribee
Source: Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria (OTEK, 2013)

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 4b
Infrastructure Target & Validation Sample Locations

scale: Not to Scale | date: 17 June 2013

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 "Sub-Area 4I Environmental Site Assessment, Riverwalk Area 4, New Farm Road, Werribee, Victoria" (4I ESA Report). The image represented above is an extract from the 4I ESA Report and therefore the accuracy of the data displayed cannot be guaranteed by GHD.
GHD has not had access to the raw data used to produce this figure; GHD make no representations or warranties about its accurecy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and / or costs (including indirect or consequential damage) which may be incurred by any party as a result of this map being inaccuate, incomplete or unsuitable in any way and for any reason.

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

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

Job No. 31 / 1157500
Report No. 219426
Rev No. A

Figure 5
Riverwalk Area 4 Groundwater Contour Map (OTEK2009)

scale: Not to Scale | date: 17 June 2013

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

Appendices

Appendix A – Certificate of Title

Appendix B – Proposed development plan and Planning Scheme information

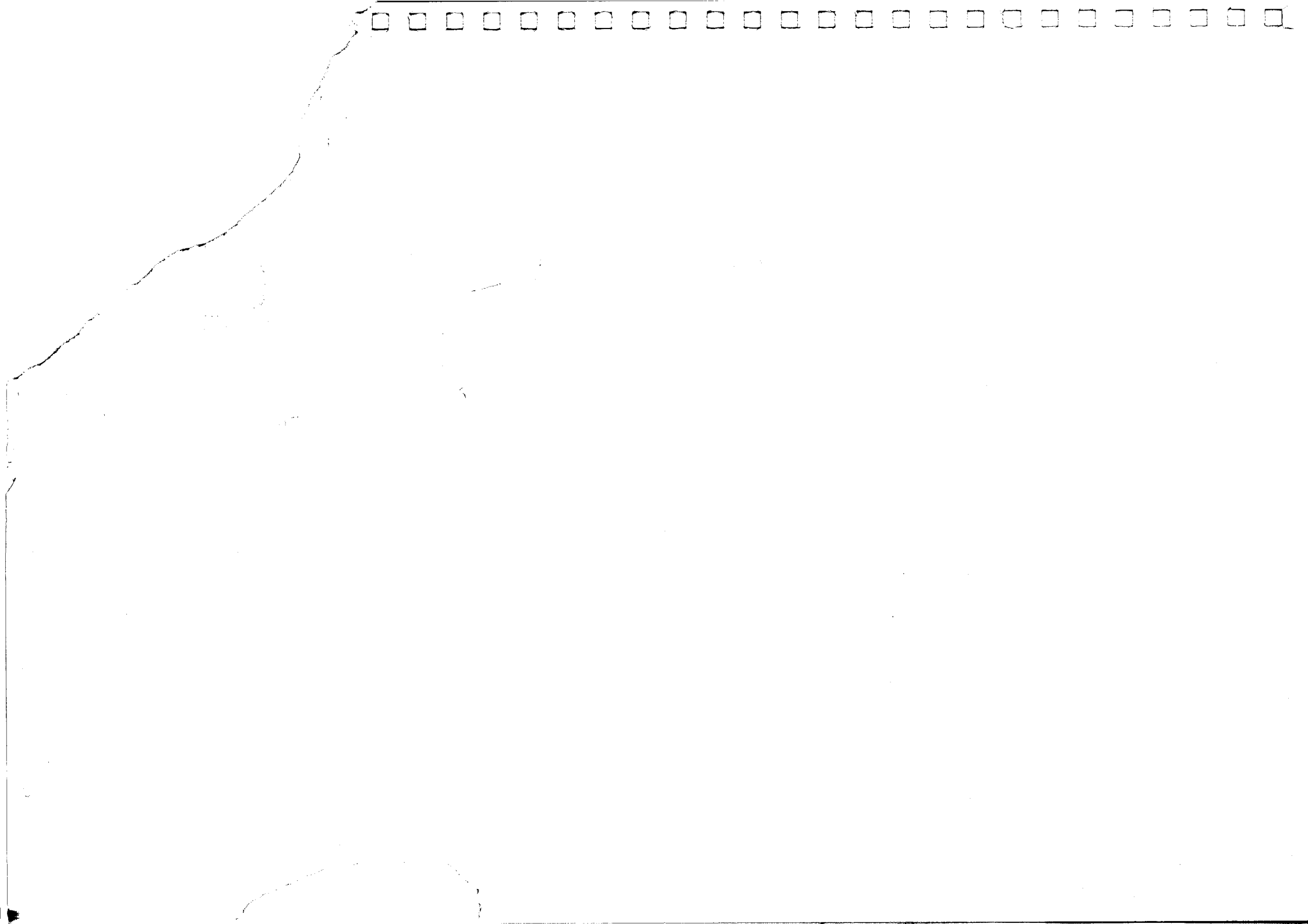
Appendix C – *Sub-Area 4I Environmental Site Assessment (Draft) Riverwalk Area 4, New Farm Road, Werribee, Victoria* (OTEK 2013)

Appendix D – Historical reports

Appendix E – Melbourne Water and TEC correspondence

Appendix F – Groundwater database search

.ıx G – QA/QC review



Appendix H – 2013 targeted soil sampling locations

Appendix I – Sampling and analysis of imported fill

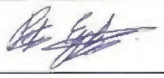
Appendix J – MW-4 borelog and data

GHD

180 Lonsdale Street
Melbourne, Victoria 3000
T: (03) 8687 8000 F: (03) 8687 8111 E: melmail@ghd.com.au

G:\31\1157500\WP\219426.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	P Flukes / P Egberts	P Egberts		P Egberts		12/05/14