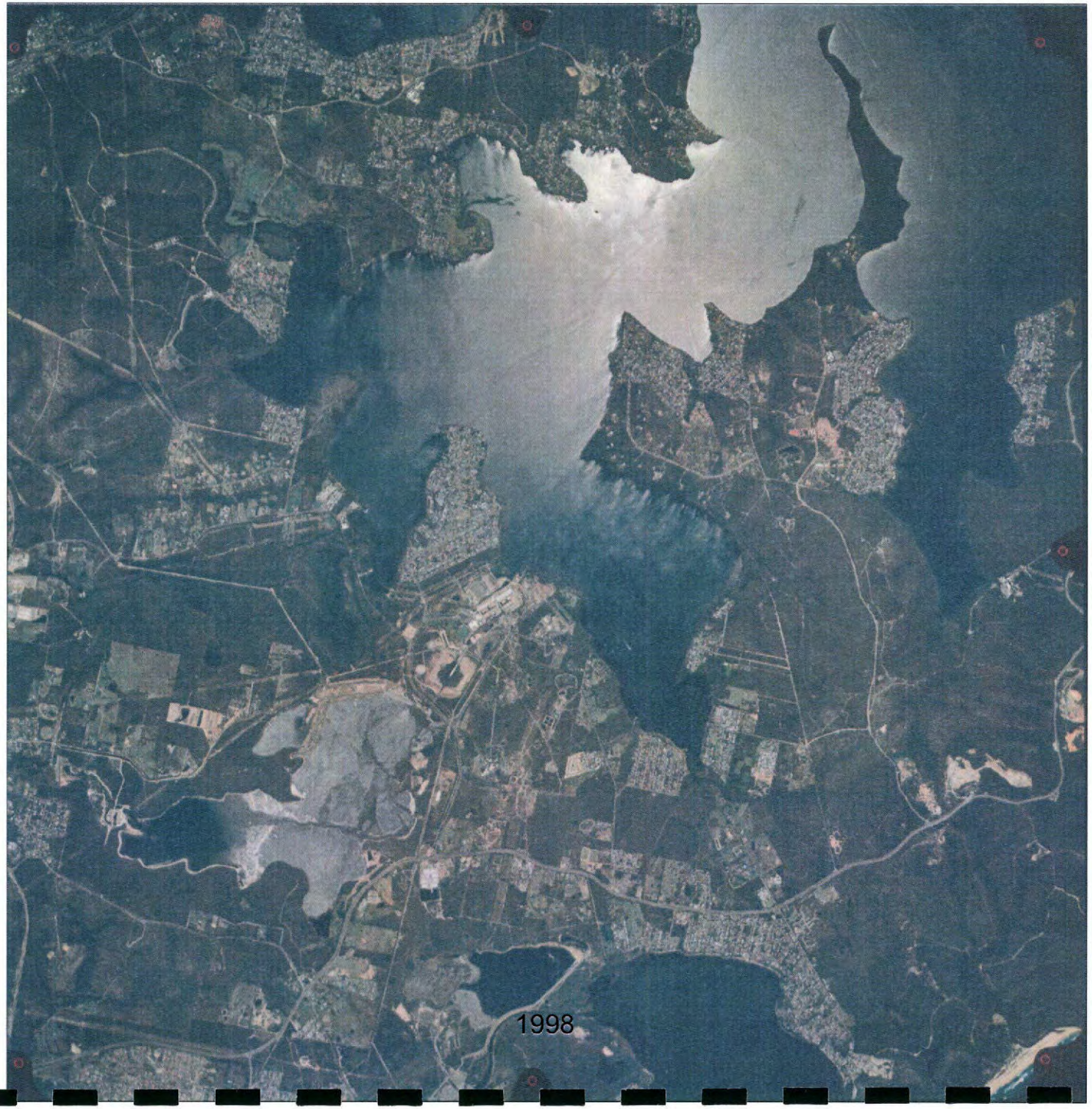
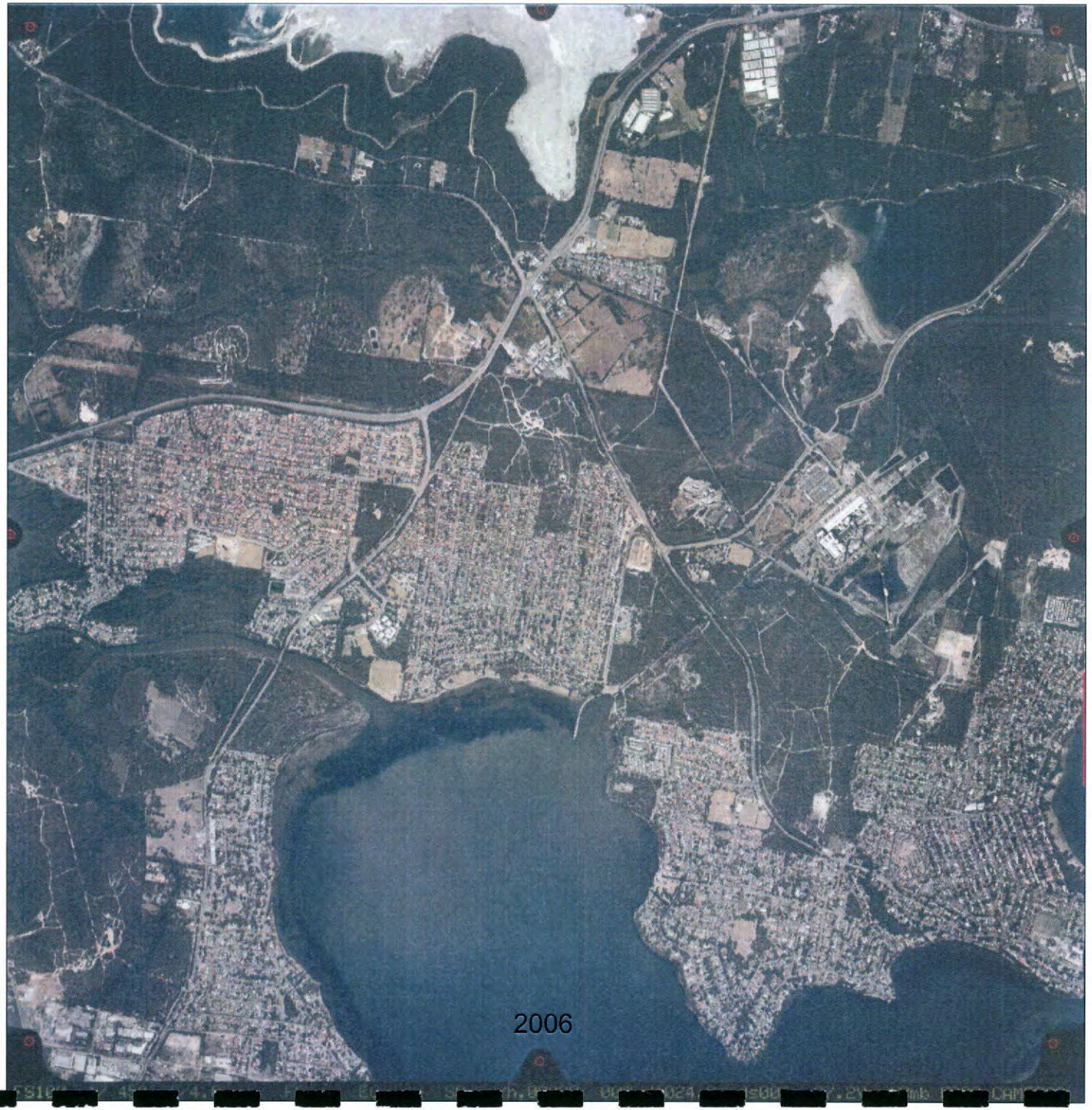

1987


1987


1998


1998


2006


2006

October 2012

Appendix D

NOW Groundwater Bore Search


N
GW080419
GW024560
GW032383
GW047061
GW200173
GW200174
Colongra Lake
GW027930
GW027933
GW027929

NSW Office of Water
Work Summary

GW027930

Licence: 20BL021487 | Licence Status: ACTIVE

Authorised Purpose (s): DOMESTIC,WASTE DISPOSAL
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type: Private

Commenced Date:
Completion Date: 01/04/1967
Final Depth:
Drilled Depth: 29.90 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: 603 - SYDNEY BASIN
GW Zone: -
Standing Water Level (m):
Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	366
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot //

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:
CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6325714.0
Easting: 362389.0
Latitude: 33°11'55.3"S
Longitude: 151°31'25.1"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Backfill	Backfill	0.00	29.80				

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
7.30	7.30	0.00	(Unknown)	3.00		0.02			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Soil	Soil	
0.30	0.76	0.46	Stones	Gravel	
0.76	6.70	5.94	Clay	Clay	
6.70	7.31	0.61	Sandstone Soft	Sandstone	
7.31	29.87	22.56	Conglomerate Water Supply	Conglomerate	

Remarks

07/08/1974: DOYALSON-WYEE R.S.L. DOYALSON

*** End of GW027930 ***

NSW Office of Water
Work Summary

GW027929

Licence: 20BL021488 | Licence Status: CANCELLED

Authorised Purpose (s): NOT KNOWN
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type: Private

Commenced Date:
Completion Date: 01/04/1967

Final Depth:
Drilled Depth: 29.30 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: 603 - SYDNEY BASIN
GW Zone: -

Standing Water Level (m):
Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	366
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot //

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:

CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6325653.0
Easting: 362390.0

Latitude: 33°11'57.3"S
Longitude: 151°31'25.1"E

GS Map: -

MGA Zone: 0

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Backfill	Backfill	0.00	29.20				

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
7.90	8.20	0.30	(Unknown)	2.70		0.04			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Soil	Soil	
0.30	1.37	1.07	Clay Stones	Clay	
1.37	4.87	3.50	Clay	Clay	
4.87	7.92	3.05	Sandstone	Sandstone	
7.92	29.26	21.34	Conglomerate Water Supply	Conglomerate	

Remarks

07/08/1974: DOYALSON-WYEE R.S.L. DOYALSON

***** End of GW027929 *****

NSW Office of Water
Work Summary

GW027933

Licence: 20BL021486 | Licence Status: CANCELLED

Authorised Purpose(s): NOT KNOWN
Intended Purpose(s): DOMESTIC

Work Type: Well
Work Status:
Construct.Method: Hand Dug
Owner Type: Private

Commenced Date:
Completion Date: 01/10/1967

Final Depth: 3.60 m
Drilled Depth:

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: 603 - SYDNEY BASIN
GW Zone: -

Standing Water Level (m):
Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	366
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot //

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:

CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6325653.0
Easting: 362415.0

Latitude: 33°11'57.3"S
Longitude: 151°31'26.1"E

GS Map: -

MGA Zone: 0

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Concrete Cylinder	0.00	0.90	1981			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW027933 ***

NSW Office of Water
Work Summary

GW080419

Licence: 20BL168505 **Licence Status:** ACTIVE

Authorised Purpose(s): DOMESTIC
Intended Purpose(s):

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 13/11/2002
Final Depth: 30.00 m
Drilled Depth: 30.00 m

Contractor Name: Paul Edwin SLADE
Driller: Paul Edwin Slade
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level (m): 6.000
Salinity Description: Good
Yield (L/s): 5.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	LT344 DP755266
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot 344//755266

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:
CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6326930.0
Easting: 364761.0
Latitude: 33°11'16.9"S
Longitude: 151°32'57.4"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	30.00	185			Rotary - Percussion (Down Hole Hammer)
1		Annulus	Waterworn/Rounded	1.00	30.00				Graded, Q:0.300m3
1	1	Casing	Pvc Class 9	0.00	30.00	125	107		Seated on Bottom, Glued
1	1	Opening	Slots - Diagonal	20.00	24.00	125		1	Mechanically Slotted, PVC Class 9, SL: 1.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.00	23.00	1.00	Unknown	6.00		5.00		02:00:00	

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Top Soil	Topsoil	
0.30	1.30	1.00	Pebble	Unknown	
1.30	30.00	28.70	Conclomerate	Invalid Code	

Remarks

*** End of GW080419 ***

NSW Office of Water
Work Summary

GW032383

Licence: 20BL024651 **Licence Status:** ACTIVE

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore open thru rock
Work Status:
Construct.Method: Rotary
Owner Type: Private

Commenced Date:
Completion Date: 01/05/1970
Final Depth: 18.20 m
Drilled Depth: 18.30 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: 603 - SYDNEY BASIN
GW Zone: -
Standing Water Level (m):
Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	346
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot 1//755266

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:
CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6326794.0
Easting: 384679.0
Latitude: 33°11'21.3"S
Longitude: 151°32'54.1"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	8.80	127			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
10.60	13.30	2.70	(Unknown)			0.88			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Soil	Soil	
0.30	1.37	1.07	Clay Gravel	Clay	
1.37	8.53	7.16	Clay	Clay	
8.53	10.66	2.13	Sandstone	Sandstone	
10.66	13.41	2.75	Conglomerate Loose Water Supply	Conglomerate	
13.41	18.28	4.87	Conglomerate	Conglomerate	

Remarks

*** End of GW032383 ***

NSW Office of Water
Work Summary

GW047061

Licence: 20BL106746 Licence Status: CANCELLED

Authorised Purpose(s): STOCK,IRRIGATION,DOMESTIC
Intended Purpose(s): HORTICULTURE

Work Type: Bore
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/01/1975
Final Depth: 7.30 m
Drilled Depth:

Contractor Name:
Driller:
Assistant Driller:

Property: NOT KNOWN 20 BASFORD ROAD DOYALSON NORTH 2262 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description: 0-500 ppm
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	L2 (346)
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot 20//849787

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:
CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6326763.0
Easting: 364705.0
Latitude: 33°11'22.3"S
Longitude: 151°32'55.1"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.20	7.10	127			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW047061 ***

NSW Office of Water
Work Summary

GW200173

Licence: 20BL168715 Licence Status: ACTIVE

Authorised Purpose (s): STOCK,DOMESTIC
Intended Purpose(s):

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 17/02/2003
Final Depth:
Drilled Depth:

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.63	20 849787
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot 20//849787

Region: 20 - Hunter
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6326712.0
Easting: 364757.0
Latitude: 33°11'24.0"S
Longitude: 151°32'57.1"E

GS Map: -
MGA Zone: 0
Coordinate Source: Map Interpretation

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

17/02/2003: Form A Remarks:
No Form A received
Bore location map received

*** End of GW200173 ***

NSW Office of Water
Work Summary

GW200174

Licence: 20BL168714 Licence Status: ACTIVE

Authorised Purpose (s): STOCK,DOMESTIC
Intended Purpose(s):

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 17/02/2003
Final Depth:
Drilled Depth:

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.63	20 849787
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot 20//849787

Region: 20 - Hunter
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6326697.0
Easting: 364704.0
Latitude: 33°11'24.5"S
Longitude: 151°32'55.0"E

GS Map: -
MGA Zone: 0
Coordinate Source: Map Interpretation

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

17/02/2003: Form A Remarks:
No Form A received
Bore location received

*** End of GW200174 ***

NSW Office of Water
Work Summary

GW024560

Licence: 20BL014878 **Licence Status:** ACTIVE

Authorised Purpose(s): INDUSTRIAL
Intended Purpose(s): INDUSTRIAL

Work Type: Bore open thru rock
Work Status:
Construct.Method: Rotary Mud
Owner Type: Private

Commenced Date:
Completion Date:

Final Depth: 15.20 m
Drilled Depth: 15.20 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A
GWMA: 603 - SYDNEY BASIN
GW Zone: -

Standing Water Level (m):
Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	NORTH	NORTH.063	440
Licensed:	NORTHUMBERLAND	WALLARAH	Whole Lot //

Region: 20 - Hunter
River Basin: 211 - MACQUARIE - TUGGERAH LAKES
Area/District:

CMA Map: 9231-4S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6326930.0
Easting: 365609.0

Latitude: 33°11'17.3"S
Longitude: 151°33'30.1"E

GS Map: -

MGA Zone: 0

Coordinate Source: PR.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	0.00	4.20	152			Seated

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
13.70	14.00	0.30	Unconsolidated	6.00		0.03			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.15	0.15	Soil	Soil	
0.15	1.67	1.52	Stones	Gravel	
1.67	3.65	1.98	Clay	Clay	
3.65	7.31	3.66	Sandstone	Sandstone	
7.31	13.71	6.40	Conglomerate	Conglomerate	
13.71	14.02	0.31	Clay Water Supply	Clay	
14.02	15.24	1.22	Conglomerate	Conglomerate	

Remarks

07/08/1974: SITED TALL TIMBERS RD. DOYALSON

*** End of GW024560 ***

Appendix E

Site Photographs

PHOTOGRAPH 1 *General site topography and outlay- south western corner of the site, looking east.*

PHOTOGRAPH 2 *General site topography and outlay- north western corner of the site, looking south.*

Client:	De Witt Consulting	**RCA Australia**
Project:	Phase 1 ESA	
Location:	Pacific Highway, Doyalson	**RCA ref:** 11481-701/0

PHOTOGRAPH 3 *General site topography and outlay- northern corner of the site, looking south west.*

PHOTOGRAPH 4 *General site topography and outlay- northern corner of the site, looking south.*

Client:	De Witt Consulting	**RCA Australia**
Project:	Phase 1 ESA	
Location:	Pacific Highway, Doyalson	**RCA ref:** 11481-701/0

PHOTOGRAPH 5 *General site topography and outlay- central eastern portion of the site, looking west.*

PHOTOGRAPH 6 *General site topography and outlay- south eastern portion of the site, looking west*

PHOTOGRAPH 7 *General site topography and outlay- central southern portion of the site, looking north.*

PHOTOGRAPH 8 *General site topography and outlay- central southern portion of the site, looking south along the proposed pedestrian access route.*

Client:	De Witt Consulting	**RCA Australia**
Project:	Phase 1 ESA	
Location:	Pacific Highway, Doyalson	**RCA ref:** 11481-701/0

PHOTOGRAPH 9 *General site topography and outlay- central western portion of the site, looking north east.*

PHOTOGRAPH 10 *Buildings/ Sheds existing on the site*

PHOTOGRAPH 11 *Large Dam located centrally within the site.*

PHOTOGRAPH 12 *The use of fill before or during the construction of the obstacle/ assault course.*

PHOTOGRAPH 13 (above) and 14 (below) *Eroded surfaces from the use as an obstacle/ assault course.*

Client:	De Witt Consulting	**RCA Australia**
Project:	Phase 1 ESA	
Location:	Pacific Highway, Doyalson	**RCA ref:** 11481-701/0

PHOTOGRAPH 15 *Use of fill in the construction of the obstacle/ assault course and evidence of erosion*

PHOTOGRAPH 16 *Stockpile of sandy material located on Lot 49* DP 707586

PHOTOGRAPH 17 *Area A- Evidence of disturbance and minor excavation*

PHOTOGRAPH 18 *Area A- Piles of mixed dirt and concrete. Unknown source or age.*

PHOTOGRAPH 19 *Area A- Close up of mixed dirt and concrete pile. Unknown source or age and evidence of general building waste.*

PHOTOGRAPH 20 *Area A- General detritus amongst a heavily vegetated area close to the Pacific Highway boundary of the site.*

PHOTOGRAPH 21 *Area A- Materials/ general items stored outside of buildings, generally within plastic drums.*

PHOTOGRAPH 22 *Area B- Piles waste dumped including white goods. Unknown source or age.*

Client:	De Witt Consulting	**RCA Australia**
Project:	Phase 1 ESA	
Location:	Pacific Highway, Doyalson	**RCA ref:** 11481-701/0

PHOTOGRAPH 23 *Area B- General detritus. Unknown source or age.*

PHOTOGRAPH 24 *Area B- Partial burial of items including electrical cables and fridge/ metal container. Unknown source or age.*

PHOTOGRAPH 25 *Area B- General detritus amongst the heavy vegetation. Unknown source or age.*

Appendix F

Field Sheets

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

ENVIRONMENTAL SAMPLE COLLECTION RECORD

CLIENT: deWitt Consulting
PROJECT: 110 Pacific Highway, Doyalson. Phase 1 Odour assessment.
LOCATION: " " " "

DATE: 9/7/15.
PROJECT No:
CLIENT REF: 10481

PROJECT MANAGER: MC.

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y / n)
S1a	0362710, 6326209.	0.05			Silty SAND, slightly moist, yellow	Existing excavation No odour/visual contam	Y
S1b.	" "	0.5.		N	Silty clayey SAND, slightly moist, brown	" " No odour/visual contam	N
S2.	0363153, 6326308	0.05		N	Silty SAND slightly moist, L. brown.	No odour.	Y
S3	0363200, 6326267	0.05.		Pot. Fill	Sandy, small brick pieces & gravel. yellow Light brown.	Small dist mound wires, plastic Metal door holy buried bricks. No odour.	N.
S4.	0362880, 6326124	0.05		N.	Sandy clay, dark brown, slightly moist.	No visual/odour signs contamination.	Y
S5	036867, 6326229	0.05.		N.	Sandy SILT, dry, brown.	No visual/odour sign of contam	Y
S6	0362821, 6326378	0.05.		Fill	Sandy clayey GRAVELS, pieces of brick, slightly moist, yellow/orange/d.brown.	No odour/visual contam.	Y

RCA Australia		Sampled by: KS	Date: 9/7/15.
Office: Newcastle.		Checked by:	Date:

Appendix G

Laboratory Report Sheets

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 131042

Client:
RCA Australia
PO Box 175
Carrington
NSW 2294

Attention: Katy Shaw, Matt Clark

Sample log in details:

Your Reference:	**11481 Phase 1**	
No. of samples:	5 Soils	
Date samples received / completed instructions received	14/07/15	/ 14/07/15

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	21/07/15	/ 20/07/15
Date of Preliminary Report:	Not Issued	

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	131042-1	131042-2	131042-3	131042-4	131042-5
Your Reference	----------	S-1a	S-2	S-4	S-5	S-6
Depth	----------	0.05	0.05	0.05	0.05	0.05
Date Sampled		09/07/2015	09/07/2015	09/07/2015	09/07/2015	09/07/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/07/2015	15/07/2015	15/07/2015	15/07/2015	15/07/2015
Date analysed	-	15/07/2015	15/07/2015	15/07/2015	15/07/2015	15/07/2015
TRHC6 - C9	mg/kg	<25	<25	<25	<25	<25
TRHC6 - C10	mg/kg	<25	<25	<25	<25	<25
vTPHC6 - C10 less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	83	89	96	96	89

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	131042-1	131042-2	131042-3	131042-4	131042-5
Your Reference	----------	S-1a	S-2	S-4	S-5	S-6
Depth	----------	0.05	0.05	0.05	0.05	0.05
Date Sampled		09/07/2015	09/07/2015	09/07/2015	09/07/2015	09/07/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/07/2015	15/07/2015	15/07/2015	15/07/2015	15/07/2015
Date analysed	-	16/07/2015	16/07/2015	16/07/2015	16/07/2015	16/07/2015
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	90	89	96	85	92

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	131042-1 S-1a 0.05 09/07/2015 Soil	131042-2 S-2 0.05 09/07/2015 Soil	131042-3 S-4 0.05 09/07/2015 Soil	131042-4 S-5 0.05 09/07/2015 Soil	131042-5 S-6 0.05 09/07/2015 Soil
Date extracted	-	15/07/2015	15/07/2015	15/07/2015	15/07/2015	15/07/2015
Date analysed	-	15/07/2015	15/07/2015	15/07/2015	15/07/2015	15/07/2015
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL(+)VE	NIL(+)VE	NIL(+)VE	NIL(+)VE	NIL(+)VE
Surrogate p-Terphenyl-d14	%	104	103	110	97	109

Acid Extractable metals in soil						
Our Reference:	UNITS	131042-1	131042-2	131042-3	131042-4	131042-5
Your Reference	----------	S-1a	S-2	S-4	S-5	S-6
Depth	----------	0.05	0.05	0.05	0.05	0.05
Date Sampled		09/07/2015	09/07/2015	09/07/2015	09/07/2015	09/07/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	16/07/2015	16/07/2015	16/07/2015	16/07/2015	16/07/2015
Date analysed	-	16/07/2015	16/07/2015	16/07/2015	16/07/2015	16/07/2015
Arsenic	mg/kg	<4	<4	<4	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	6	1	5	3	19
Copper	mg/kg	<1	<1	2	<1	<1
Lead	mg/kg	2	3	11	4	8
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	<1	<1	<1	<1
Zinc	mg/kg	1	4	48	7	2

Moisture Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	131042-1 S-1a 0.05 09/07/2015 Soil	131042-2 S-2 0.05 09/07/2015 Soil	131042-3 S-4 0.05 09/07/2015 Soil	131042-4 S-5 0.05 09/07/2015 Soil	131042-5 S-6 0.05 09/07/2015 Soil
Date prepared	-	15/07/2015	15/07/2015	15/07/2015	15/07/2015	15/07/2015
Date analysed	-	16/07/2015	16/07/2015	16/07/2015	16/07/2015	16/07/2015
Moisture	%	10	16	20	7.7	12

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/07/2015	[NT]	[NT]	LCS-1	15/07/2015
Date analysed	-			15/07/2015	[NT]	[NT]	LCS-1	15/07/2015
$TRHC_6$ - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-1	104%
$TRHC_6$ - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-1	104%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-1	101%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-1	104%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-1	104%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-1	105%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-1	101%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	89	[NT]	[NT]	LCS-1	86%
QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/07/2015	[NT]	[NT]	LCS-2	15/07/2015
Date analysed	-			15/07/2015	[NT]	[NT]	LCS-2	15/07/2015
$TRHC_{10}$ - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-2	105%
$TRHC_{15}$ - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	116%
$TRHC_{29}$ - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	105%
TRH>C_{10}-C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-2	105%
TRH>C_{16}-C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	116%
TRH>C_{34}-C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	105%
Surrogate o-Terphenyl	%		Org-003	87	[NT]	[NT]	LCS-2	102%
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/07/2015	[NT]	[NT]	LCS-2	15/07/2015
Date analysed	-			15/07/2015	[NT]	[NT]	LCS-2	15/07/2015
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	111%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	97%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	104%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	105%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	111%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	103%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-2	100%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	105	[NT]	[NT]	LCS-2	103%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			16/07/2015	[NT]	[NT]	LCS-13	16/07/2015
Date analysed	-			16/07/2015	[NT]	[NT]	LCS-13	16/07/2015
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-13	103%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-13	97%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-13	100%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-13	103%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-13	94%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-13	84%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-13	97%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-13	97%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: RCA Australia	**Client Project Name / Number / Site etc (ie report title):** 11481 Phase 1
Contact person: Katy Shaw	**PO No.:**
Project Mgr: Matt Clark	**Envirolab Quote No. :**
Sampler: Katy Shaw	**Date results required:** 21/7/15
Address: 92 Hill St Carrington 2294	**Or choose:**
	Note: Inform lab in advance if urgent turnaround is required - surcharge applies
Phone: 02 4902 9200 **Mob:** 0408467698	**Lab comments:**
Fax:	
Email: katys@rca.com.au, administrator@rca.com.au	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample Information					Tests Required													Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	RTA Coal Tar Colorimetric Test						Combo 03 (TRH/BTEX/PAH/8 metals- As, Cd, Cr, Cu, Ni, Pb, Zn, Hg								Provide as much information about the sample as you can
1	S-1a	0.05	09/07/2015	Soil							x							Silty SAND, yellow
2	S-2	0.05	09/07/2015	Soil							x							Silty SAND, light brown
3	S-4	0.05	09/07/2015	Soil							x							Sandy CLAY, brown
4	S-5	0.05	09/07/2015	Soil							x							Sandy SILT, brown
5	S-6	0.05	09/07/2015	Soil							x							Sandy Clayey GRAVEL

ENVIROLAB — Envirolab Services, 12 Ashley St, Chatswood NSW 2067, Ph: (02) 9910 6200

Job No: 13042

Date Received: 14/7/15
Time Received: 900
Received by: KB
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	RCA	**Received by (company):**	ECS
Print Name:	Katy Shaw	**Print Name:**	KBR
Date & Time:	13/07/15 12:00pm	**Date & Time:**	14/7/15 9.00
Signature:		**Signature:**	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Appendix H

Exposure Scenarios

Table 5-A

Residential with garden/accessible soil

Summary of Exposure Pathways	Abbreviations	Units	Parameters	
			Adult	Child
Body weight	BW_A or BW_C	kg	70	15
Exposure duration	ED_A or ED_C	years	29	6
Exposure frequency	EF	days	365	365
Soil/dust ingestion rate[1]	IR_{SA} or IR_{SC}	mg/day	50 [2]	100 [2]
Soil/dust to skin adherence factor	AF	$mg/cm^2/day$	0.5	0.5
Skin surface area	SA_A or SA_C	cm^2	20 000	6100
Fraction of skin exposed	F_s	%	31.5	44.3
Dermal absorption factor	DAF	%	Chemical specific values applied	
Time spent indoors on site each day	ET_i	hours	20	20
Time spent outdoors on site each day	ET_o	hours	4	4
Home-grown fraction of vegetables consumed	F_{HG}	%	10	10
Vegetable & fruit consumption rate	C_y (veg and fruit)	g/day	400	280
Averaging time for carcinogens ('lifetime')	AT_{NT}	years	70	70
Dust lung retention factor	RF	%	37.5	37.5

Soil ingestion rates for children are based on a child aged 2-3 years where normal hand-to-mouth activity is assumed and does not account for pica behaviour

Soil ingestion rates for the HIL A scenario include the ingestion of both outdoor soil, including soil adhering to home-grown produce, and indoor dust (derived from outdoor soil tracked indoors)

Appendix I

Summary of Results

Sample Identification	Sample Depth (m) [B]	Date	Sample Profile	Dominant Stratum [C]	Sample Fate	Laboratory Reference Number	Sample Purpose	Sample Collected by	Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	Benzene	Toluene	Ethylbenzene	meta- and para-Xylene	ortho-Xylene	Total Xylenes	Polycyclic Aromatic Hydrocarbons (PAH)	Naphthalene	Total Recoverable Hydrocarbons (TRH)	TRH C_6-C_{10}	TRH >C_{10}-C_{16}	TRH >C_{16}-C_{34}	TRH >C_{34}-C_{40}	F1	F2
Guideline [A]							HSL 'A' HSL 'B'	SAND 0-<1m		0.5	160	55			40		3						45	110
								SILT 0-<1m		0.6	390	NL			95		4						40	230
								CLAY 0-<1m		0.7	480	NL			110		5						50	280
							ESL URPOS	Coarse		50	85	70			105		170		120	300	2800	180		
								Fine		65	85	125			45		170		120	1300	5600	180		
							Sensitive ML	Coarse										700	1000	2500	10000			
								Fine										800	1000	3500	10000			
							DC A			100	14000	4500			12000		1400	4400	3300	4500	6300		
										0.2	0.5	1	2	1	3		1	25	50	100	100	25	50
S1a	0.05	9/07/2015	Silty SAND, Slightly moist, yellow, No Odour, FILL	Sand	Accepted	131042-1	Investigation	KS		<0.2	<0.5	<1	<2	<1	1.5		<1	<25	<50	<100	<100	<25	<50
S2	0.05	9/07/2015	Silty SAND, slightly moist, light brown, No odour	Sand	Accepted	131042-2	Investigation	KS		<0.2	<0.5	<1	<2	<1	1.5		<1	<25	<50	<100	<100	<25	<50
S4	0.05	9/07/2015	Sandy CLAY, dark brown, slightly moist, No odour	Clay	Accepted	131042-3	Investigation	KS		<0.2	<0.5	<1	<2	<1	1.5		<1	<25	<50	<100	<100	<25	<50
S5	0.05	9/07/2015	Sandy SILT, dry, brown	Silt	Accepted	131042-4	Investigation	KS		<0.2	<0.5	<1	<2	<1	1.5		<1	<25	<50	<100	<100	<25	<50
S6	0.05	9/07/2015	Sandy CLAY, gravels, pieces of brick, slightly moist, yellow/orange/dark brown, FILL	Clay	Accepted	131042-5	Investigation	KS		<0.2	<0.5	<1	<2	<1	1.5		<1	<25	<50	<100	<100	<25	<50

All results are in units of mg/kg. Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from that presented by laboratory

F1 = TRH C_6-C_{10} minus BTEX. F1 PQL deemed equal TRH C_6-C_{10}.

F2 = TRH >C_{10}-C_{16} minus naphthalene. F2 PQL deemed = TRH >C_{10}-C_{16}.

[A] NEPM 1999 (amended April 2013) Vapour Based Health Screening Levels (HSL) 'A' (Residential)

[A] NEPM 1999 (amended April 2013) Ecological Screening Levels (ESL) URPOS (Urban Residential and Public Open Space)

[A] NEPM 1999 (amended April 2013) Management Limits (ML) Sensitive Sites (Residential, open space)

[A] CRC Care Technical Report 10, September 2011 Direct Contact (DC) Health Screening Levels 'A' (Residential)

[B] Note that this is a generalisation for the purpose of comparing to the HSL criteria. Where two strata equally represented, most conservative criterion used

[C] Start of sample, generally over a 0.1m interval

For the purpose of the Tier 1 ESL/EIL assessment, all background concentrations are assumed to be zero

Presented ESL for naphthalene is an Ecological Investigation Level

Results for TRH have been compared to TPH guidelines.

ESL for TRH >C_{16}-C_{34} and >C_{34}-C_{40} are low reliability

NL designates 'Not Limiting' indicating that the pore water concentration required to constitute a vapour risk is higher than the solubility capacity for that compound based on a petroleum mixture. Vapour is therefore not a risk for this compound.

Results shown in BOLD are in excess of the vapour based HSL

Results shown in shading are >250% of the Vapour based HSL

Results shown in underline are in excess of the ESL

Results shown in *italics* are in excess of the management limit

Results shown in patterned cells are in excess of the direct contact HSL

Where summation required (Xylene, F1, F2) calculation includes components reported as non detected as 1/2 PQL.

Sample Identification	PQL	Guideline [A]		S1a	S2	S4	S5	S6
Sample Depth (m) [B]		HIL 'A'	EIL URPOS	0.05	0.05	0.05	0.05	0.05
Date				9/7/15	9/7/15	9/7/15	9/7/15	9/7/15
Sample Profile				Silty SAND, Slightly moist, yellow. No Odour. FILL	Silty SAND, slightly moist, light brown. No odour	Sandy CLAY, dark brown, slightly moist. No odour	Sandy SILT, dry, brown	Sandy CLAY, gravels, pieces of brick, slightly moist, yellow/orange/dark brown. FILL
Sample Fate				Accepted	Accepted	Accepted	Accepted	Accepted
Laboratory Report Reference				131042-1	131042-2	131042-3	131042-4	131042-5
Sample Purpose				Investigation	Investigation	Investigation	Investigation	Investigation
Sample collected by				KS	KS	KS	KS	KS
Polycyclic Aromatic Hydrocarbons (PAH)								
Acenaphthene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Benz(a)anthracene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a) pyrene	0.05		0.7	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b),(j) & (k)fluoranthene	0.2			<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(g,h,i)perylene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(a,h)anthracene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	0.1		170	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	0.1			<0.1	<0.1	<0.1	<0.1	<0.1
Carcinogenic PAH (B(a)P equivalent)	0.19	3		0.096	0.096	0.096	0.096	0.096
Sum of reported PAH	1.55	300		0.775	0.775	0.775	0.775	0.775
Metals								
Arsenic	4	100	100	<4	<4	<4	<4	5
Cadmium	0.4	20		<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	1	100	190	6	1	5	3	19
Copper	1	6000	280	<1	<1	2	<1	<1
Mercury	0.1	40		<0.1	<0.1	<0.1	<0.1	<0.1
Lead	1	300	1100	2	3	11	4	8
Nickel	1	400	30	<1	<1	<1	<1	<1
Zinc	1	7400	230	1	4	48	7	2

All results are in units of mg/kg.

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from that presented by laboratory

[A] NEPM 1999 (amended April 2013) Vapour Based Health Screening Levels (HSL) 'A' (Residential)

[A] NEPM 1999 (amended April 2013) Ecological Screening Levels (ESL) URPOS (Urban Residential and Public Open Space)

[B] Start of sample, generally over a 0.1m interval

The Carcinogenic PAH value is calculated by multiplying the concentration of each of the 8 carcinogenic PAH compounds by its B(a)P toxic equivalence factor and summing these products.

HIL for Chromium are for Chromium VI

For the purpose of the Tier 1 ESL/EIL assessment, all background concentrations are assumed to be zero

Presented ecological value for benzo(a)pyrene is a low reliability ESL

EIL for Naphthalene are for fresh (<2years) Naphthalene

EIL for Arsenic are for aged (>2years) Arsenic

EIL for Chromium are the added contaminant limit for aged (>2years) Chromium III in soils of 1% clay, the most conservative of the criteria.

EIL for Copper are the added contaminant limit for aged (>2years) Copper in soils of pH 6.5.

EIL for Lead are the added contaminant limit for aged (>2years) Lead.

EIL for Nickel are the added contaminant limit for agad (>2years) Nickel in soils of 5% CEC the most conservative of the criteria.

EIL for Zinc are the added contaminant limit for aged (>2years) Zinc in soils of 5% CEC and pH of 6.5, the most conservative of the criteria at pH 6.5.

EIL for DDT are for fresh (<2years) DDT

PCB analysis includes non-Dioxin like and Dioxin-like compounds compared to a guideline of non-Dioxin like PCB

Results shown in **BOLD** are in excess of the primary acceptance criteria

Results shown in shading are >250% of the primary acceptance criteria

Results shown in underline are in excess of primary EIL

Where summation required (PAH, OCP, PCB) calculation includes components reported as non detectad as 1/2 PQL.

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TL140107

2nd December 2014

The Mine Subsidence Board
Attention: Mr Paul Gray
P.O. Box 488G
NEWCASTLE NSW 2300

Dear Paul,

Re: Mine Subsidence Impact Statement
Lot 7 DP 240685 – No 110 Pacific Highway, Doyalson
TENQ14-11755W1

Further to your email to Mr Doug White dated 10th September 2014 containing your preliminary comments we provide the following mine subsidence impact statement.

As we understand it this site is potentially affected by mine subsidence due to future mining beneath the site at a depth of approximately 170 - 180m. Your correspondence of September 10th, 2014 also included guidance on ground strains and tilt of +/- 4.5mm/m and 7mm/m respectively. According to "Holla 1987" this would equate to a curvature of about 5km.

As I understand it Centennial Coal have not finalised any planning for mining beneath the site and any mine subsidence parameters would still represent nothing more than a best guess based on mining using similar techniques and at similar depths. At the time of preparing this report we understand that Centennial Coal have still not provided an estimate of predicted vertical settlement however a figure of 375mm has been provided for the Doyalson RSL site. Based on our previous experience we would expect the maximum vertical settlement to be in the order of 500mm with an absolute worst case of 1000mm.

Therefore the following design parameters have be considered:

Maximum Subsidence, Smax	1000mm
Maximum Tensile Strain, +Emax	4.5mm/m
Maximum Compressive Strain, -Emax	4.5mm/m
Maximum Tilt, Gmax	7mm/m
Curvature Radius	5km

The scope of the work involves the construction of modular housing that is founded on stacked blocks and chained down to concrete pad footings or small concrete bored piers and readily re-levelled. The remainder of the works are site infrastructure as set out below:

- Earthworks;
- Stormwater pipes, pits, and associated connections;
- Stormwater detention pond;
- Sewer gravity pipes, manholes and associated connections;
- Sewer pump station/s;

- Water pipes and associated connections;
- Flexible road pavements and kerbing;
- Stacked block retaining walls.

There are no detention tanks and no in-ground gas services on site.

As I understand it the client has agreed to reduce the number of modular dwellings from 224 to 139 in line with your previous advice.

The risk assessment undertaken for the site considers the modular buildings to be low risk in fact it would be hard to imagine a building more suitable for a mine subsidence affected site. The only slight area of concern for the buildings would be the connection to in-ground services. As I understand it the hot water system is typically a small electric system located inside in the laundry.

The assessment of the site infrastructure would be considered a moderate risk considering the ground strains of +/- 4.5mm/m. Of particular susceptibility are the in ground gravity sewer and stormwater services. The detention pond would typically only be designed to temporarily retain stormwater in large storm events and not to permanently store water.

The following mitigation measures should be incorporated into the design of the future stages of the site infrastructure:

In ground sewer lines

Gravity sewer lines should be mine subsidence grade UPVC with rubber ring joints at 3.0m centres. These pipes shall be laid at a grade 0.7% steeper than they have been designed for to account for future tilt due to mine subsidence. This is to ensure that they still meet the minimum code requirements after a subsidence event. All pipework should be not only be bedded but completely encapsulated in sand to minimise the transfer of any ground strains into the pipework.

Connections to all buildings and infrastructure should be flexible. Pipes should extend into pits by at least 50mm and the joint sealed with mastic on the inside of the pit.

In ground stormwater lines

Gravity stormwater lines should be mine subsidence grade UPVC with rubber ring joints at 3.0m centres or RC in 2.4m lengths with rubber ring joints. These pipes should be laid at a grade 0.7% steeper than they have been designed for to account for future tilt due to mine subsidence. This is to ensure that they still meet the minimum code requirements after a subsidence event.

All pipework should be not only bedded but completely encapsulated in sand to minimise the transfer of any ground strains into the pipework. Connections to all buildings and infrastructure should be flexible. Pipes should extend at least 50mm into pits and shall be sealed with mastic on the inside of the pit.

In ground water supply lines

Water lines should be flexible grade polythene pipe (of suitable class for pressure systems) capable of withstanding a change in grade of 1% and an elongation of 4.5mm/m without fracture.

All pipework should be not only bedded but completely encapsulated in sand to minimise the transfer of any ground strains into the pipework. Connections to all buildings and infrastructure should be flexible.

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In ground fire service supply lines

Fire services should be double rubber ring pressure jointed blue brute pipe in maximum 6m lengths capable of resisting a change of grade of up to 1% and up to 4.5mm/m of ground strain without rupture.

All pipework should be not only bedded but completely encapsulated in sand to minimise the transfer of any ground strains into the pipework. Connections to booster assemblies, tanks, pumps and infrastructure should be flexible.

Stormwater detention structures

All detention structures are to be clay lined earth dams that can be easily repaired. These structures are typically not designed to retain stormwater for any length of time so any tension cracks would only increase the rate of infiltration.

Sewerage pump stations

If sewer pump stations are required for the site they are typically small discrete units that should be capable of handling subsidence without distress. All units however should be wrapped in a compressible material similar to EPS foam to avoid the transfer of ground strains. All connections to these units should also be flexible and have adequate allowance for movement.

Roads and kerbing

Roads and access ways should be constructed using flexible pavements i.e. asphalt or two coat seal on an unbound granular base and sub-base. A simple timber or concrete edge would be preferred, if concrete kerbs are to be used they should be provided with full depth jointex expansion joints at a maximum of 3m centres.

Building structures

The skirt area from the underside of the modular home to the ground shall be of lightweight flexible construction, masonry fender walls should not be used.

All connections of in-ground services to the building should be carefully considered and detailed to ensure that they are not damaged in a subsidence event. Consideration should be given to providing voids around pipes penetrating slabs and additional length in pipes to ensure that they can accommodate adequate movement and to allow re-levelling after a subsidence event.

All retaining structures shall be constructed using stackable walls laid without mortar (keystone garden wall or similar) that are not susceptible to damage and can be readily repaired.

Provided this development is constructed incorporating the mine subsidence mitigation measures outlined above it is our opinion that the building structures and site infrastructure will remain safe serviceable and repairable after being subjected to the subsidence parameters set out above.

We trust this meets your current requirements however should you require anything further please contact the undersigned.

Yours faithfully

Neil Petherbridge
BE (Civil) GradDip (Struct) FIEAust CPEng NPER

05 Supporting Documents (E) Mine Subsidence Correspondence

From: Paul Gray <p.gray@minesub.nsw.gov.au>
Sent: Friday, 4 September 2015 1:43 PM
To: Mark Maund
Cc: paul.duncan@centennialcoal.com.au; TChisholm@ldocoal.com.au; kevin.ruming@industry.nsw.gov.au
Subject: TENQ14-11755W1 : Lot 7 DP 240685. No 110 Pacific Highway Doyalson

Hi Mark, the Board has discussed the proposed use of this site with the leaseholder (Centennial Coal) and they have agreed that some development would be supported subject to the following conditions:

1. All infrastructure is designed and constructed as per the subsidence parameters listed in the Northrop letter to the MSB, dated 2 December 2014 2. The property (Lot 7 In DP 240685) remains in the ownership of a single entity.
3. The SSR parameters for this site are the same as the design parameters.

Note that the majority of this block overlies a sublease area that is now part of Chain Valley Colliery and they were also given an opportunity to comment on this proposal. They have no objection to the proposal subject to the above conditions.

Any Development Proposal will require the formal approval of the Board.

Regards,

Paul Gray
Acting District Manager
Mine Subsidence Board, Wyong District Office

P: PO BOX 157 Wyong 2259
T: (02) 4352 1646
M: 0425 275572
E: p.gray@minesub.nsw.gov.au
W: www.minesub.nsw.gov.au

-----Original Message-----
From: Mark Maund [mailto:mark.maund@dewittconsulting.com.au]
Sent: Friday, 4 September 2015 12:02
To: Paul Gray
Subject: FW: Image YOU scanned from the photocopier

Hi Paul,

As discussed see attached Planning Proposal submitted to Council with revised concept layout and the latest information I have from you in relation to the site.

Can you please send through some words that I can use to update Council on the current view on the Board in relation to the site and proposal.

Thanks for your help and please call if you want to discuss.

MARK MAUND
Senior Town Planner
mark.maund @dewittconsulting.com.au

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-----Original Message-----
From: Administrator On Behalf Of copier@
Sent: Friday, 4 September 2015 12:03 PM
To: Mark Maund <mark.maund@dewittconsulting.com.au>
Subject: Image YOU scanned from the photocopier

Reply to: copier@dewittconsulting.com.au <copier@dewittconsulting.com.au> Device Name: Dewitt Consulting
Device Model: MX-3114N
Location: Charlestown

File Format: PDF MMR(G4)
Resolution: 200dpi x 200dpi

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