

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

A

ENVIRONMENTAL DATA

Table A1: Types of Work that may Expose Potential Acid Sulfate Soils

Class of Land	Works
1	Any works
2	Works below the natural ground surface. Works by which the watertable is likely to be lowered.
3	Works more than 1 metre below the natural ground surface. Works by which the watertable is likely to be lowered more than 1 metre below the natural ground surface.
4	Works more than 2 metres below the natural ground surface. Works by which the watertable is likely to be lowered more than 2 metres below the natural ground surface.
5	Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

Table A2: List of Contaminated Sites Notified to the EPA

Suburb	Site description	Address	Activity that caused contamination	EPA Management Class
Marrickville	TRW Steering and Suspension	22-28 Carrington Road	Other Industry	Contamination formerly regulated under the CLM Act
Marrickville	RailCorp	361 Victoria Road	Other Industry	Regulation under CLM Act not required
Marrickville	Former Mobil Service Station	384 Illawarra Road	Service Station	Under assessment
Marrickville	Mackey Park	Cnr Richardsons Crescent and Carrington Road	Landfill	Regulation under CLM Act not required
Sydenham	SRA Land	117 Railway Parade	Other Industry	Regulation under CLM Act not required
Sydenham	Sydenham XPT Maintenance Facility	Way Street	Other Industry	Regulation under CLM Act not required
Tempe	Tempe Depot	1a Gannon Street	Other Petroleum	Regulation under CLM Act not required
Tempe	Railcorp Site Renwick Street	Renwick Street	Other Industry	Regulation under CLM Act not required

Table A3: Threatened Species known or likely to occur in the area (DotE, 2016a)

Scientific Name	Common Name	Status (C'wealth)
Birds		
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	Endangered
<i>Diomedea epomophora epomophora</i>	Southern Royal Albatross	Vulnerable
<i>Diomedea epomophora sanfordi</i>	Northern Royal Albatross	Endangered
<i>Diomedea exulans antipodensis</i>	Antipodean Albatross	Vulnerable
<i>Diomedea exulans exulans</i>	Tristan Albatross	Endangered
<i>Diomedea exulans gibsoni</i>	Gibson's Albatross	Vulnerable
<i>Diomedea exulans (sensu lato)</i>	Wandering Albatross	Vulnerable
<i>Grantiella picta</i>	Painted Honeyeater	Vulnerable
<i>Lathamus discolor</i>	Swift Parrot	Endangered
<i>Macronectes giganteus</i>	Southern Giant Petrel	Endangered

Scientific Name	Common Name	Status (C'wealth)
<i>Macronectes halli</i>	Northern Giant Petrel	Vulnerable
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	Critically Endangered
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)	Vulnerable
<i>Rostratula australis</i>	Australian Painted Snipe	Endangered
<i>Thalassarche bulleri</i>	Buller's Albatross, Pacific Albatross	Vulnerable
<i>Thalassarche cauta cauta</i>	Shy Albatross, Tasmanian Shy Albatross	Vulnerable
<i>Thalassarche cauta salvini</i>	Salvin's Albatross	Vulnerable
<i>Thalassarche cauta steadi</i>	White-capped Albatross	Vulnerable
<i>Thalassarche eremita</i>	Chatham Albatross	Endangered
<i>Thalassarche melanophris</i>	Black-browed Albatross	Vulnerable
<i>Thalassarche melanophris impavida</i>	Campbell Albatross	Vulnerable
Fish		
<i>Epinephelus daemellii</i>	Black Rockcod, Black Cod, Saddled Rockcod	Vulnerable
Frogs		
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable
<i>Litoria aurea</i>	Green and Golden Bell Frog	Vulnerable
Mammals		
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat, Large Pied Bat	Vulnerable
<i>Dasyurus maculatus maculatus</i>	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (Eastern)	Endangered
<i>Phascolarctos cinereus</i>	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	Vulnerable
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable
Plants		
<i>Acacia pubescens</i>	Downy Wattle, Hairy Stemmed Wattle	Vulnerable
<i>Allocasuarina glareicola</i>	-	Endangered
<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid, Daddy Long-legs	Vulnerable
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	Vulnerable
<i>Genoplesium baueri</i>	Yellow Gnat-orchid	Endangered
<i>Pelargonium sp. Striatellum</i>	Omeo Stork's-bill	Endangered
<i>Pimelea curviflora var. curviflora</i>		Vulnerable
<i>Pimelea spicata</i>	Spiked Rice-flower	Endangered
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly, Magenta Cherry, Pocket-less Brush Cherry, Scrub Cherry, Creek Lilly Pilly, Brush Cherry	Vulnerable
<i>Thesium australe</i>	Austral Toadflax, Toadflax	Vulnerable
Reptiles		
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered

Scientific Name	Common Name	Status (C'wealth)
<i>Chelonia mydas</i>	Green Turtle	Vulnerable
<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle, Luth	Endangered
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Vulnerable
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	Vulnerable
<i>Natator depressus</i>	Flatback Turtle	Vulnerable

Table A4: Flora Records in the Marrickville LGA (OEH, 2016a)

Scientific Name	Common Name	Status (NSW)	Status (C'wealth)
Flora			
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E1	E
<i>Senecio spathulatus</i>	Coast Groundsel	E1	
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	E2	
<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	E1	E
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V	
<i>Hibbertia puberula</i>		E1	
<i>Hibbertia sp. Bankstown</i>		E4A	CE
<i>Hibbertia sp. Turramurra</i>	Julian's Hibbertia	E4A	
<i>Hibbertia superans</i>		E1	
<i>Tetradthea glandulosa</i>		V	
<i>Tetradthea juncea</i>	Black-eyed Susan	V	V
<i>Epacris purpurascens var. purpurascens</i>		V	
<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	V
<i>Chamaesyce psammogeton</i>	Sand Spurge	E1	
<i>Dillwynia tenuifolia</i>		V	
<i>Pultenaea pedunculata</i>	Matted Bush-pea	E1	
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V
<i>Acacia pubescens</i>	Downy Wattle	V	V
<i>Acacia terminalis subsp. terminalis</i>	Sunshine Wattle	E1	E
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E1	
<i>Gyrostemon thesioides</i>		E1	
<i>Haloragodendron lucasii</i>		E1	E
<i>Camarophyllopsis kearneyi</i>		E1	
<i>Hygrocybe anomala var. ianthinmarginata</i>		V	
<i>Hygrocybe aurantipes</i>		V	
<i>Hygrocybe austropratensis</i>		E1	
<i>Hygrocybe collucera</i>		E1	
<i>Hygrocybe griseoramosa</i>		E1	

Scientific Name	Common Name	Status (NSW)	Status (C'wealth)
<i>Hygrocybe lanecovensensis</i>		E1	
<i>Hygrocybe reesiaae</i>		V	
<i>Hygrocybe rubronivea</i>		V	
<i>Maundia triglochinosides</i>		V	
<i>Hypsela sessiliflora</i>		E1	X
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	
<i>Darwinia biflora</i>		V	V
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V
<i>Leptospermum deanei</i>		V	V
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1	V
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E1	E
<i>Microtis angusii</i>	Angus's Onion Orchid	E1	E
<i>Prasophyllum fuscum</i>	Slaty Leek Orchid	E4A	V
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E
<i>Pterostylis sp. Botany Bay</i>	Botany Bay Bearded Orchid	E1	E
<i>Deyeuxia appressa</i>		E1	E
<i>Grevillea caleyi</i>	Caley's Grevillea	E4A	E
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	V	V
<i>Persoonia hirsuta</i>	Hairy Geebung	E1	E
<i>Persoonia nutans</i>	Nodding Geebung	E1	E
<i>Pimelea curviflora var. curviflora</i>		V	V
<i>Pimelea spicata</i>	Spiked Rice-flower	E1	E
<i>Zannichellia palustris</i>		E1	

P = Protected, V = Vulnerable, E1,E2 = Endangered under the TSC Act, E4A = Critically Endangered under the TSC Act, E = Endangered under the EPBC Act, X = Extinct under the EPBC Act

Table A5: Fauna Records within the Marrickville LGA (OEH, 2016a)

Scientific Name	Common Name	Status (NSW)	Status (C'wealth)
Amphibia			
<i>Crinia tinnula</i>	Wallum Froglet	V	
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	
Aves			
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	E1	
<i>Stictonetta naevosa</i>	Freckled Duck	V	
<i>Ptilinopus superbis</i>	Superb Fruit-Dove	V	

Scientific Name	Common Name	Status (NSW)	Status (C'wealth)
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1	
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E
<i>Ixobrychus flavicollis</i>	Black Bittern	V	
<i>Circus assimilis</i>	Spotted Harrier	V	
<i>Hieraaetus morphnoides</i>	Little Eagle	V	
<i>Lophoictinia isura</i>	Square-tailed Kite	V	
<i>Pandion cristatus</i>	Eastern Osprey	V	
<i>Falco subniger</i>	Black Falcon	V	
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	
<i>Esacus magnirostris</i>	Beach Stone-curlew	E4A	
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	
<i>Haematopus longirostris</i>	Pied Oystercatcher	E1	
<i>Charadrius leschenaultii</i>	Greater Sand-plover	V	C,J,K
<i>Charadrius mongolus</i>	Lesser Sand-plover	V	C,J,K
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E
<i>Calidris alba</i>	Sanderling	V	C,J,K
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE,C,J,K
<i>Calidris tenuirostris</i>	Great Knot	V	C,J,K
<i>Gallinago hardwickii</i>	Latham's Snipe	P	C,J,K
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	C,J,K
<i>Limosa lapponica</i>	Bar-tailed Godwit	P	C,J,K
<i>Limosa limosa</i>	Black-tailed Godwit	V	C,J,K
<i>Numenius madagascariensis</i>	Eastern Curlew	P	CE,C,J,K
<i>Xenus cinereus</i>	Terek Sandpiper	V	C,J,K
<i>Hydroprogne caspia</i>	Caspian Tern	P	C,J
<i>Sternula albifrons</i>	Little Tern	E1	C,J,K
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	
<i>Lathamus discolor</i>	Swift Parrot	E1	E
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	E4A	CE
<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V	
<i>Ninox connivens</i>	Barking Owl	V	
<i>Ninox strenua</i>	Powerful Owl	V	
<i>Tyto novaehollandiae</i>	Masked Owl	V	
<i>Tyto tenebricosa</i>	Sooty Owl	V	
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E
<i>Chthonicola sagittata</i>	Speckled Warbler	V	
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	CE

Scientific Name	Common Name	Status (NSW)	Status (C'wealth)
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2,V	
<i>Grantiella picta</i>	Painted Honeyeater	V	V
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V	
<i>Petroica boodang</i>	Scarlet Robin	V	
<i>Petroica phoenicea</i>	Flame Robin	V	
<i>Stagonopleura guttata</i>	Diamond Firetail	V	
Gastropoda			
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	E1	
<i>Pommerhelix duralensis</i>	Dural Woodland Snail		E
Mammalia			
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E1	E
<i>Perameles nasuta</i>	Long-nosed Bandicoot population in inner western Sydney	E2	
<i>Phascolarctos cinereus</i>	Koala	V	V
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	
<i>Miniopterus australis</i>	Little Bentwing-bat	V	
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	
<i>Myotis macropus</i>	Southern Myotis	V	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	P	V
Reptilia			
<i>Caretta caretta</i>	Loggerhead Turtle	E1	E
<i>Dermochelys coriacea</i>	Leatherback Turtle	E1	E
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V

P = Protected, V = Vulnerable, E1, E2, E4A = Endangered under the TSC Act, E = Endangered under the EPBC Act, J = Japan-Australia Migratory Bird Agreement (JAMBA), C = China-Australia Migratory Bird Agreement (CAMBA), K = Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

Table A6: Threatened Ecological Community Records within the Marrickville LGA (OEH, 2016a)

Common Name	Status (NSW)	Status (C'wealth)
Blue Gum High Forest in the Sydney Basin Bioregion	E4B	CE
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	V2	E
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	V
Coastal Upland Swamp in the Sydney Basin Bioregion	E3	E
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E3	CE
Cumberland Plain Woodland in the Sydney Basin Bioregion	E4B	CE
Duffys Forest Ecological Community in the Sydney Basin Bioregion	E3	
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E3	E
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE
Moist Shale Woodland in the Sydney Basin Bioregion	E3	CE
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Shale Gravel Transition Forest in the Sydney Basin Bioregion	E3	CE
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	E4B	CE
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E3	
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E3	
Sydney Turpentine-Ironbark Forest	E3	CE
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE

V2 = Vulnerable Ecological Community under the TSC Act, E3 = Endangered Ecological Community under the TSC Act, E4B = Critically Endangered Ecological Community under the TSC Act, V = Vulnerable under the EPBC Act, E = Endangered under the EPBC Act, CE = Critically Endangered under the EPBC Act.

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

B

DEMOGRAPHIC DATA

Table B1: Age Structure for Marrickville LGA (ABS, 2016)

Age Group (Years)	Number of Persons in Marrickville	% of Total Persons in Marrickville	Number of Persons in NSW	% of Total Persons in NSW
0-4 years	5,002	6.5	458,736	6.6
5-9 years	3,491	4.6	434,608	6.3
10-14 years	2,741	3.6	439,168	6.3
15-19 years	2,891	3.8	443,416	6.4
20-24 years	5,699	7.4	449,685	6.5
25-29 years	8,055	10.5	473,160	6.8
30-34 years	8,406	11	468,336	6.8
35-39 years	8,023	10.5	488,124	7.1
40-44 years	6,801	8.9	483,502	7
45-49 years	5,643	7.4	481,428	7
50-54 years	4,673	6.1	469,024	6.8
55-59 years	3,878	5.1	419,612	6.1
60-64 years	3,210	4.2	390,678	5.6
65-69 years	2359	3.1	304,327	4.4
70-74 years	1957	2.6	237,362	3.4
75-79 years	1649	2.2	186,032	2.7
80-84 years	1116	1.5	150,724	2.2
85 years and over	907	1.2	139,735	2.0

Table B2: Languages Spoken at Home (other than English) (ABS, 2014)

Languages Spoken at Home	Persons in Marrickville	% of Total Persons in the Marrickville	Number of Persons in NSW	% of Total Persons in NSW
Greek	4235	5.5	86,602	1.3
Vietnamese	2825	3.7	87,499	1.3
Arabic	1790	2.3	184,251	2.7
Portuguese	1515	2	16,301	0.2
Cantonese	1277	1.7	136,373	2

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

C

HERITAGE DATA

Table C1: Australian Heritage Database Records (DotE, 2016b)

Place Name	Location	Status	List
Marrickville Post Office	274A Marrickville Road, Marrickville	Listed place	Commonwealth Heritage List

Table C2: Items listed under the NSW Heritage Act (OEH, 2016b)

Item name	Address	Suburb	Listing No.
Alexandra Canal		Alexandria	01621
Cooks River Sewage Aqueduct	Pine Street	Undercliffe	01322
Cranbrook Group	10, 14 Australia Street	Camperdown	00418
Egyptian Room Scottish Temple	23-35 New Canterbury Road	Petersham	00118
Former Coptic Church	24A Railway Road	Sydenham	IHO 136
Lewisham Railway viaducts over Long Cove Creek	Great Southern and Western Railway	Lewisham/ Summer Hill	01043
Lewisham Sewage Aqueduct	Grosvenor Crescent East	Summer Hill	01326
Marrickville Railway Station group	Bankstown railway	Marrickville	01186
Marrickville Town Hall (former)	96-106 Illawarra Road	Marrickville	00573
Milford Haven	125 Unwins Bridge Road	Tempe	00518
Petersham Railway Station group	Terminus Street	Petersham	01223
Petersham Service Reservoir & Site	New Canterbury Road	Petersham	01331
Pressure Tunnel and Shafts		Potts Hill	01630
Sewage Pumping Station 271	Carrington Road	Marrickville	01342
Sewer Vent	The Boulevarde	Lewisham	01640
Sewer Vent and Cottage	125 Corunna Road	Stanmore	01635
Sewer Vent and Cottages	24, 26 Premier Street	Marrickville	01636
St Peters Railway Station Group	Princes Highway (Opposite Sydney Park Rd)	St Peters	01250
St. Peter's Anglican Church	187-209 Princes Highway	St. Peters	00032
St. Stephen's Anglican Church and Cemetery	187 - 189 Church Street	Newtown	00462
Stanmore House	88 Enmore Road	Enmore	00662
Stanmore Railway Station Group	Great Southern and Western Railway	Stanmore	01251
Sydenham Pit & Drainage Pumping Station 1	Garden Street	Marrickville	01644
Sydenham Railway Station group	Illawarra railway	Sydenham	01254
Tempe Railway Station Group	Illawarra railway	Tempe	01266
Timber House	34 Belmore Street	Enmore	LC
Timber Slab Cottage	44 Barden Street	Tempe	01412

Table C3: Items listed by State Agencies under Section 170 of the Heritage Act (OEH, 2016b)

Item name	Address	Suburb
Alexandra Canal	Adjacent to Burrows Road	Alexandria, St. Peters, Mascot, Tempe
City Tunnel	Potts Hill Reservoir to Waterloo Pumping Station	Potts Hill To Waterloo
City Tunnel	Potts Hill Reservoir to Waterloo Pumping Station	Potts Hill To Waterloo
Cooks River Container Terminal	20 Canal Road	St Peters
Cooks River Container Terminal: Electric Overhead Travelling Crane	20 Canal Road	St Peters
Cooks River Container Terminal: Lay Down Points Lever	20 Canal Road	St Peters
Cooks River Container Terminal: McS Hr T Administration Building	20 Canal Road	St Peters
Cooks River Container Terminal: Pre Cast Concrete Hut 1	20 Canal Road	St Peters
Cooks River Container Terminal: Pre Cast Concrete Hut 2	20 Canal Road	St Peters
Cooks River Sewage Aqueduct	Pine Street	Undercliffe
Dulwich Hill Railway Station Group	Wardell Road	Dulwich Hill
Electricity Substation No. 111	Shepherd Street	Marrickville
Electricity Substation No. 142	111 Victory Lane	Camperdown
Electricity Substation No. 1446	33A College Street	Newtown
Electricity Substation No. 1447 (Former)	30 Brighton Street	Petersham
Electricity Substation No. 1458	208 Denison Road	Dulwich Hill
Electricity Substation No. 1493	Metropolitan Road	Enmore
Electricity Substation No. 1508	123 Probert Street	Newtown
Electricity Substation No. 151	Calvert Street	Marrickville
Electricity Substation No. 154	Marrickville Avenue	Marrickville
Electricity Substation No. 169	127A Wardell Road	Dulwich Hill
Electricity Substation No. 200	Princes Hwy	St Peters
Electricity Substation No. 200	589A Princes Highway	Tempe
Electricity Substation No. 221	2B Church Street	Marrickville
Electricity Substation No. 238	49A Ewart Street	Dulwich Hill
Electricity Substation No. 251	30 Chester Street	Petersham
Electricity Substation No. 283	Henson Street	Marrickville West
Electricity Substation No. 36	11 Union Street	Tempe
Electricity Substation No. 42 (Former)	58 Fitzroy Street	Marrickville
Electricity Substation No. 43	204 Unwins Bridge Road	Sydenham
Electricity Substation No. 549	Princes Highway	St Peters
Electricity Substation No. 96	Hercules Street	Dulwich Hill
Gladstone Hall	114 Ewart Street	Dulwich Hill
House - 28-44 Campbell Street, St Peters	28-44 Campbell Street	St. Peters
House - 82 Campbell Street, St Peters	82 Campbell Street	St. Peters

Item name	Address	Suburb
Lewisham (Old Canterbury Rd) Underbridge	Railway Location, Main Suburban Line 6.377km Old Canterbury Road	Lewisham
Lewisham (Parramatta Road) Underbridge	Railway location, Dulwich Hill to Rozelle Goods Line 10.489 kms Parramatta Road	Lewisham
Lewisham Railway Sub-station	Alfred Street	Lewisham
Lewisham Sewage Aqueduct	Grosvenor Crescent East	Lewisham
Locomotive, Diesel Shunting 7301	Chullora Railway Workshops	Chullora
Locomotive, Diesel Shunting 7301	Chullora Railway Workshops	Chullora
Marrickville (Meek's Road) Railway Sub-station	Meeks Rd/ Way Street	Marrickville
Marrickville Fire Station	309 Marrickville Road	Marrickville
Marrickville Railway Station Group	Illawarra Road	Marrickville
Newtown Courthouse	Australia Street	Newtown
Newtown Fire Station	214 Australia Street	Newtown
Newtown Pedestrian Railway Subway	Between Trafalgar & Bedford Street	Newtown
Petersham Police Station	2-4 New Canterbury Road, Corner Shaw Street	Petersham
Petersham Railway Station Group	Terminus Street	Petersham
Petersham Reservoir (Covered) (WS 0089)	Canterbury Road	Petersham
Petersham Reservoir (Elevated) (WS 0204)	Canterbury Road	Petersham
Records Repository	134 Lennox Street	Newtown
Sewage Pumping Station No 271 (SP0271)	Carrington Road	Marrickville
Sewage Pumping Station No 68 (SP0068)	Wharf Street	Marrickville
Sewer Vent	The Boulevarde	Lewisham
Sewer Vent and Cottage	125 Corunna Road	Stanmore
Sewer Vent and Cottages	24 and 26 Premier Street	Marrickville
Sheas Creek Bridge	Ricketty Street	St. Peters
St Peters Railway Station Group	Princes Highway (Opposite Sydney Park Rd)	St Peters
Stanmore (Liberty St) Underbridge	Railway location, Main Suburban Line 3.957km Liberty Street	Stanmore
Stanmore Railway Station Group	Trafalgar Street	Stanmore
Sydenham (Illawarra Line) Underbridge		Sydenham
Sydenham Pit & Drainage Pumping Station 1	Garden Street	Marrickville
Sydenham Railway Station Group	Gleeson Avenue	Sydenham
Tempe Railway Station Group	Griffiths Street	Tempe

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

D

GROUND TRUTHING LOCATION
SUMMARY

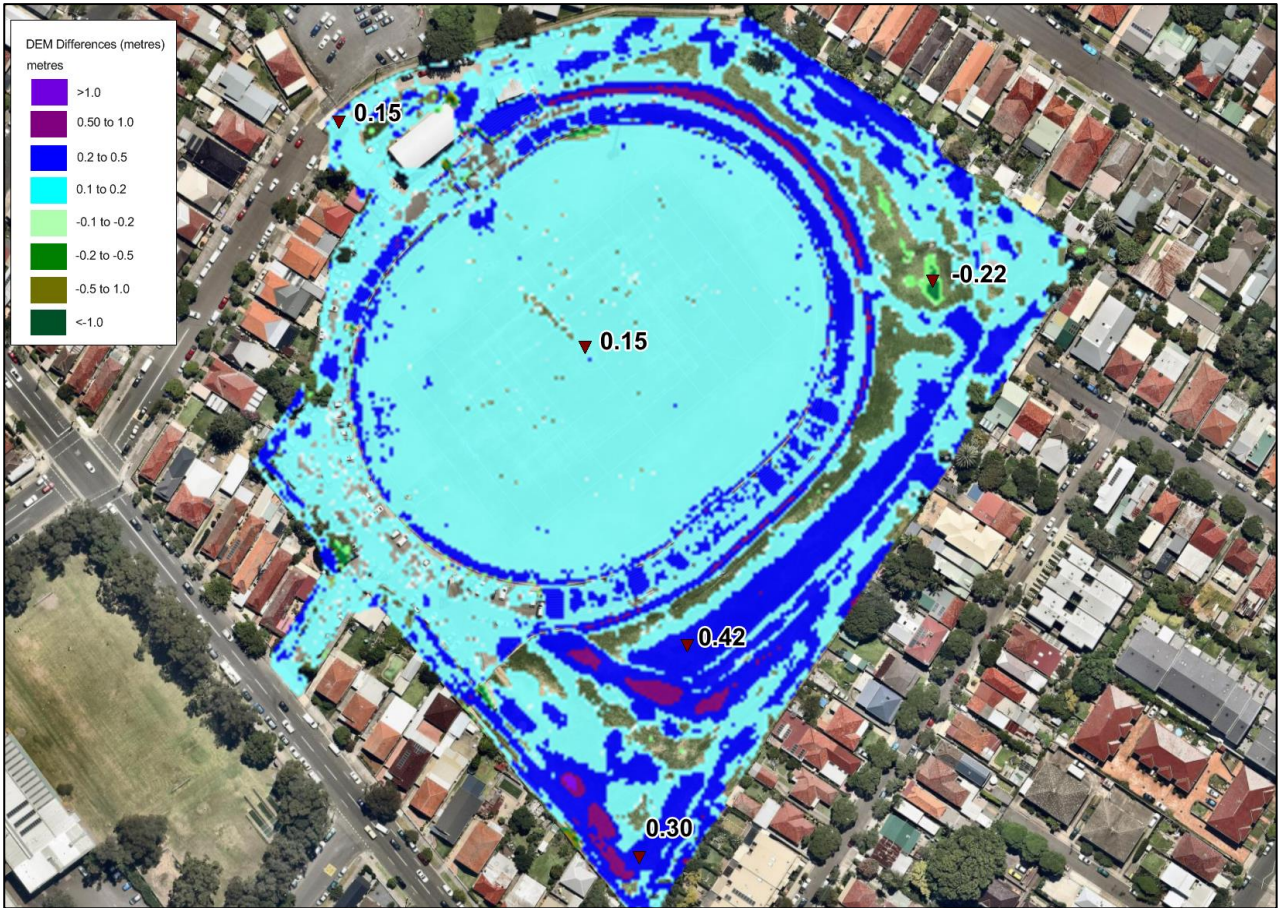


Figure D1 - Henson Park –Updated ALS Data Less Ground Survey

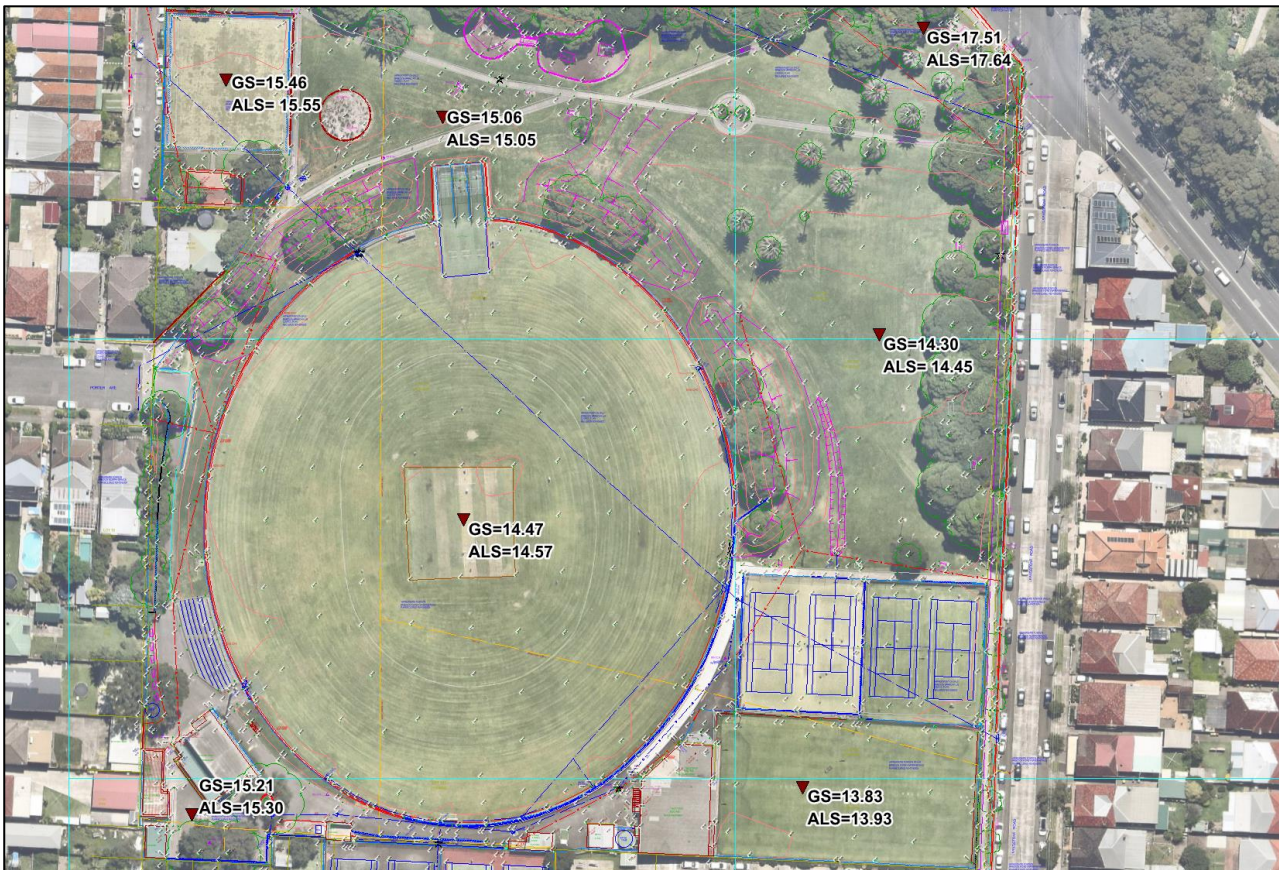


Figure D2 - Marrickville Oval – Comparing Ground Survey to Updated ALS Data



Figure D3 - Wicks Park – Comparing Ground Survey to Updated ALS Data



Figure D4 - Mackey Park – Comparing Ground Survey to Updated ALS Data



Figure D5 - Arthur Street – Comparing Ground Survey to Updated ALS Data



Figure D6 - College Lane Petersham – Comparing Ground Survey to ALS Data

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

E

PUMP STATION INFORMATION

CONTINGENCY PLAN

DRAINAGE PUMPING STATION 1

SYDENHAM STORMWATER STORAGE PIT

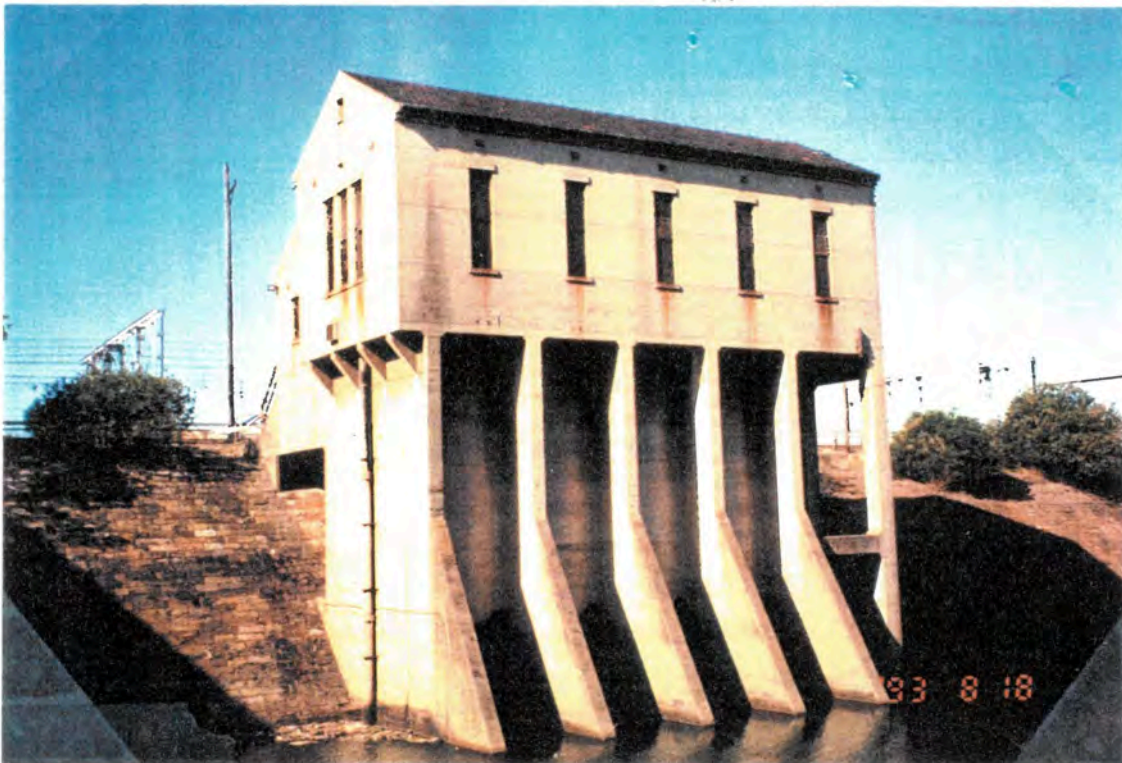


TABLE OF CONTENTS

PAGE

SECTION 1 – CONTINGENCY PLAN		
1.1	TYPE OF FAILURE – ACTION PRIORITY	3
SECTION 2 – BACKGROUND		
2.1	GENERAL INFORMATION	5
2.2	MARRICKVILLE VALLEY LOW LEVEL CATCHMENT AREA DETAILS	5
2.3	PUMPING STATION / DISCHARGE FLUME DETAILS	5
2.4	DETAILS - MAIN PUMPS	6
2.5	DETAILS - SUMP PUMP	6
SECTION 3 - STATION OPERATING PHILOSOPHY		
3.1	PUMP OPERATION	8
3.2	STATION ALARMS MONITORED BY THE SYSTEM OPERATION CENTRE	8
SECTION 4 – TYPES OF FAILURE		
4.1	PUMP FAILURE	9
4.2	POWER SUPPLY FAILURE	9
4.3	DISCHARGE FLUME FAILURE	9
4.4	BLOCKAGE OF TRASH RACKS	9
4.5	TELEMETRY FAILURE	9
4.6	ADDITIONAL REASONS FOR PUMPING STATION FAILURE	9
SECTION 5 – POSSIBLE EXTENT OF FLOODING		
5.1	OVERFLOW INFORMATION	10
5.2	RAINFALL INTENSITY	10
5.3	PROPERTIES WHICH MAY BE AFFECTED BY FLOODING	11
5.4	EMERGENCY TELEPHONE NUMBERS	14
APPENDICES		
APPENDIX 1	MARRICKVILLE VALLEY STORMWATER CATCHMENT PLAN	
APPENDIX 2	DIAGRAM SHOWING THE LAYOUT OF DPS 1	
APPENDIX 3	DIAGRAM SHOWING PUMP DUTY LEVELS AND ALARM LEVELS	
APPENDIX 4	PLAN SHOWING EXTENT OF FLOODING	

SECTION 1 - CONTINGENCY PLAN FOR STATION FAILURE DURING WET WEATHER

1.1 TYPE OF FAILURE - ACTION PRIORITY

Pump Failure	1. Systems Operation Centre contacts Network Services
	2. Network Services contacts Network Manager
	3. Monitor water level in pit and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Power Supply Failure	1. Systems Operation Centre contacts Network Services and Mechanical / Electrical Southern
	2. Network Services or Mechanical / Electrical Southern contacts Network Manager
	3. Monitor water level in pit and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Discharge Flume Failure	1. Contact Network Manager
	2. Monitor water level in pit and rainfall intensity
	3. Contact Emergency Services when overflow level reached
Blockage of Trash Racks	1. Contact Network Manager
	2. Monitor water level in pit and rainfall intensity
	3. Contact Emergency Services when overflow level reached
Telemetry Failure	1. Contact Network Manager
	2. Monitor water level in pit and rainfall intensity
	3. Contact Emergency Services when overflow level reached
Fire	1. Contact Fire Brigade
	2. Contact Network Manager
	3. Monitor water level in pit and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Gas	1. Contact AGL
	2. Contact Network Manager
	3. Monitor water level in pit and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Structural Failure	1. Contact Network Manager
	2. Monitor water level in pit and rainfall intensity
	3. Contact Emergency Services when overflow level reached

Minor Pollution	1. Contact Network Manager
	2. Contact Waste Water Source Control
	3. Monitor water level in pit and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Toxic Pollution	1. Contact Fire Brigade
	2. Contact Network Manager
	3. Monitor water level in pit and rainfall intensity
	4. Contact Emergency Services when overflow level reached

SECTION 2 - BACKGROUND

2.1 GENERAL INFORMATION

Drainage Pumping Station (DPS) 1 is located at Sydenham Stormwater Storage Pit off Railway Pde. Marrickville (UBD 17 - J9 / 33rd Edition).

The pumping station and storage pit were constructed by the Public Works Department between 1938 and 1941 and are listed on Sydney Water’s draft heritage list. They form an integral part of the Marrickville Valley stormwater drainage system.

A plan of the Marrickville Valley stormwater drainage catchment is attached as Appendix 1.

The storage pit acts as a detention basin receiving flows from the Marrickville Valley Low Level Area. During high intensity storms overland flow from the whole of the Marrickville Valley stormwater drainage system also drains to the pit. The pit has a capacity of approximately 100,000m³.

Stormwater entering the sump below the station is screened by trash racks, which are designed to remove litter and other debris. The pumping station has three main pumps which elevate stormwater from the sump to the adjacent high level system known as the Main (or Eastern) Channel. Each discharge flume is fitted with a non return flap to prevent stormwater from the Main (or Eastern) Channel entering the pump wells.

A sump pump located in a dry well at the northern end of the station is used for dewatering the sump for maintenance purposes.

A diagram of the layout of the station is attached as Appendix 2.

2.2 MARRICKVILLE VALLEY LOW LEVEL CATCHMENT AREA DETAILS

Area	86ha.
Residential	58%
Special purpose	16%
Industrial	18%
Open space	4%
Commercial	4%

2.3 PUMPING STATION / DISCHARGE FLUME DETAILS

No. of pumps	3 x main pumps (Units No. 1, 2 and 3) 1 x sump pump (Unit 4)
No. of discharge flumes	3
Size	2.74m. x 1.52m. box
Length	15.5m.
Material	Reinforced concrete
Receiving system	Marrickville Valley Eastern Channel

2.4 DETAILS - MAIN PUMPS

2.4.1 MECHANICAL DETAILS

Type	Vertical centrifugal
Manufacturer	Metropolitan Vickers Electrical Co. Manchester and Sheffield - England
Weight	2.7 tonnes
Capacity	1.25Kl. per second
Wet well confined space category	Category 2

2.4.2 ELECTRICAL DETAILS

Rating	150kW, 365rpm, 415 volt, 3 phase
Starter	Auto Transformer
Starting current	200 Amps (approx.)
Provision for generator	No
No. of power supplies	1
No. of PLC's	1
Control	RTU linked to Head Office System Operation Centre
Duty	“A” and “B” (alternatively)

2.5 DETAILS - SUMP PUMP

2.5.1 MECHANICAL DETAILS

Type	Self priming centrifugal
Manufacturer	Gorman Rupp
Model	T6A3-B
Weight	364kg.
Capacity	60l. per second
Dry well confined space category	Category 3

2.5.2 ELECTRICAL DETAILS

Rating	18.5kW, 1250rpm, 415 volt, 3 phase
Starter	Star Delta
Starting current	300 Amps
Provision for generator	No
No. of power supplies	1
Control	Manual control only

SECTION 3 - STATION OPERATING PHILOSOPHY

3.1 PUMP OPERATION

The station has 3 main pumps, with 2 pumps on operational duty and 1 pump on emergency standby duty.

The duty pump is selected by a Remote Terminal Unit (RTU) alternately. This shall occur automatically at each new operation. A Vega hydrostatic level control transmitter located on the southern side of the station controls the automatic operation of the pumps.

The following table details pump operating levels. The levels refer to a height above the floor of the storage pit.

DUTY	CUT IN	CUT OUT
A DUTY (Normal duty)	0.88m.	0.56m.
B DUTY (Emergency duty)	1.28m.	0.64m.

If the normal duty pump (Duty A) fails, an automatic changeover function to the emergency duty pump (Duty B) exists.

If the storage level rises to 1.28m. above the floor level of the pit and neither pump is operating due to a failure of the normal control circuit an emergency control function will activate whichever pump is capable of operation.

This pump will stop when the emergency cutout level is reached.

After the emergency duty cut-out level has been reached and the fault which disabled the normal control circuit clears, the circuit shall automatically reset itself and resume normal control over the pumping units.

Manual control of pumps can be implemented in the event of failure of all automatic control functions.

3.2 STATION ALARMS MONITORED BY THE SYSTEM OPERATION CENTRE

3.2.1 WELL ABOVE TOP WATER LEVEL

This alarm indicates that the storage level in the pit is nearing capacity and is set at 6.0m above the floor of the pit.

3.2.2 CANAL FLOOD INTERLOCK OPERATED MODE

This alarm indicates that the main pumps have automatically stopped when the Marrickville Valley Eastern Channel begins to discharge into the pit via the 4 siphonic overflows located near the north eastern corner of the pit.

A diagram of the duty levels and alarm levels is attached as Appendix 3.

SECTION 4 - TYPES OF FAILURE

4.1 PUMP FAILURE

Mechanical failure of the main pumps during a storm event may cause flooding in Marrickville.

The use of portable pumps after a failure is not considered an alternative because they could not achieve the capacity of the main pumps.

4.2 POWER SUPPLY FAILURE

In the event of failure of the power supply to the station it is possible to provide emergency power via a transportable generator set.

However this is not considered an option because of the time delay in locating a transportable generator set at the station. Additionally no provision exists at the station for the change over from mains supply to supply from a transportable generator set

4.3 DISCHARGE FLUME FAILURE

Failure of one or more of the discharge flumes is unlikely.

4.4 BLOCKAGE OF TRASH RACKS

Accumulation of rubbish against the trash racks may reduce the efficiency of the station. However this type of failure can be avoided if the current cleaning regime is maintained.

4.5 TELEMETRY FAILURE

Telemetry failure will affect automatic operation of the pumps. However manual control can override automatic operation.

4.6 ADDITIONAL REASONS FOR PUMPING STATION FAILURE

Fire, gas, structural failure, minor or toxic pollution may affect the operation of the pumping station. An assessment of alternatives of bringing the pumping station back on line can be made after Emergency Services have approved entry to the station.

SECTION 5 –POSSIBLE EXTENT OF FLOODING

5.1 OVERFLOW INFORMATION

The Marrickville Valley Low Level Area may begin to flood if any of the following events occur during a high intensity rainfall event:-

- Pump failure at DPS 1.
- The inflow rate is greater than the capacity of the storage pit and pumping system.
- The automatic shut down of the pumping station if the Eastern Channel is overflowing into the pit (See section 3.2.2).

Properties located in the following streets at Marrickville may be affected by flooding :- Barclay St, Buckley St, Carrington Rd, Lilian Fowler Pl, Marrickville Rd, Meeks Rd, Railway Pde, Shirlow St, Sloane St, Sydenham Rd, Sydney St. and Vincent St.

A plan showing the possible extent of flooding and properties that may be affected is attached as Appendix 4.

5.2 RAINFALL INTENSITY

The following table details the time from the beginning of rainfall during a 1 in 100 year storm event until the flooding peak in the Marrickville Low level Area and the time from the beginning of rainfall until Sydenham Pit reaches capacity. The table assumes pump failure at DPS 1 for the duration of the storm event.

Flood levels will peak at 2.5m. AHD. This is the level at which floodwater starts spilling back into the Eastern Channel at the eastern side of Frazer Park near the Illawarra Railway Line. (See Sydenham Pit DPS 1 – Risk of pump Failure – Flood Investigation Report – Systems Services, Sydney Water – 1997)

100 yr. ARI storm event duration	Marrickville Low level Area	Sydenham Pit
	Time to flooding (hr:min)	Time to flooding (hr:min)
1 hour	0.46	1:13
2 hour	3:01	3.03
6 hour	20:18	20:15
9 hour	19.05	19.02

5.3 PROPERTIES WHICH MAY BE AFFECTED BY FLOODING

The following tables may be used for the issue of flood warnings by Emergency Services. A plan showing the possible extent of flooding and properties that may be affected is attached as Appendix 4.

STREET NAME	HOUSE No.	LANDUSE
Barclay St.	1	Industrial
	3	Industrial
	5	Industrial
	7	Industrial
	9	Industrial
	11	Industrial
	13	Industrial
	17	Industrial
	19	Industrial

Lilian Fowler Pl.	8	Industrial
	10-14	Industrial
	18-22	Industrial
	24-26	Industrial

Marrickville Rd.	27	Industrial
	31	Industrial
	33-35	Commercial
	37	Residential
	39	Industrial
	41	Industrial
	43	Industrial
	45-49	Industrial
	51	Industrial
	53	Industrial
	55-63	Industrial
	65	Industrial
	67	Industrial
	69-71	Industrial
	81	Commercial
	83	Industrial
	85	Commercial
87	Residential	
89	Vacant	
91	Residential	
95	Commercial	
107	Commercial	

Meeks Rd.	5	Industrial
	7	Industrial
	9	Industrial
	11	Industrial
	13	Industrial

STREET NAME	HOUSE No.	LANDUSE
Buckley St.	4	Industrial
	6	Industrial
	8-12	Industrial
	14	Industrial
	16	Industrial
	18	Industrial
	20	Industrial
	22-24	Industrial
	26-28	Industrial
	30	Industrial
	34	Industrial
	36	Industrial
	40	Industrial
	42	Industrial
	50	Industrial
	52	Industrial
	Buckley Ln.	1
3		Industrial
5		Industrial
9		Industrial
13-15		Industrial
17-19		Industrial
21-25		Industrial
27		Industrial
29		Industrial
33		Industrial
47-49		Industrial
61	Industrial	

Buckley Ln.	18	Industrial
-------------	----	------------

Carrington Rd.	4	Industrial
	6	Industrial
	10	Industrial

Railway Pde.	51	Commercial
	55	Industrial
	57	Industrial
	59	Industrial
	61	Industrial
	65	Industrial
	67-69	Industrial
71-73	Industrial	

STREET NAME	HOUSE No.	LANDUSE
Meeks Rd. (cont.)	15-21	Industrial
	23-27	Industrial
	4-6	Industrial
	10	Industrial
	12	Industrial
	14	Industrial
	16-18	Industrial
	20	Industrial
	24	Industrial
	28-30	Industrial
	32-40	Elec. S/Stat.
	42-46	Industrial
	48-54	Industrial

STREET NAME	HOUSE No.	LANDUSE
Sloane St.	2-4	Industrial
	6	Industrial
	8	Industrial
	10	Industrial
	14	Industrial
	16	Industrial
	18	Industrial
	20	Industrial
	22	Industrial
	24	Industrial
	26	Industrial
	28-32	Industrial
	34	Industrial
	36	Industrial
	38	Industrial
	40	Industrial

STREET NAME	HOUSE No.	LANDUSE
Sydenham Rd.	2	Industrial
	6	Industrial
	10	Industrial
	12-18	Industrial
	20-22	Industrial
	24-26	Industrial
	34	Industrial
	36	Commercial
	38	Industrial
	42	Industrial
	44	Industrial
	46	Industrial
	52	Commercial
	54	Industrial
	56	Industrial
	64-70	Industrial
72	Commercial	

STREET NAME	HOUSE No.	LANDUSE
Railway Pde. (cont.)	75-77	Industrial
	79	Industrial
	81	Industrial
	87	Industrial
	89	Industrial
	91	Industrial
	93	Industrial
	99	Commercial
	101	Industrial
	103	Commercial

Saywell St.	8	Industrial
-------------	---	------------

STREET NAME	HOUSE No.	LANDUSE
Shirlow St.	1	Industrial
	3	Industrial
	5	Industrial
	7	Industrial
	11	Industrial
	13	Industrial
	15	Industrial
	17	Residential
	21	Industrial
	23	Industrial
	27	Industrial
	29	Industrial
	31	Commercial
	33	Industrial
	35	Industrial
	37	Industrial

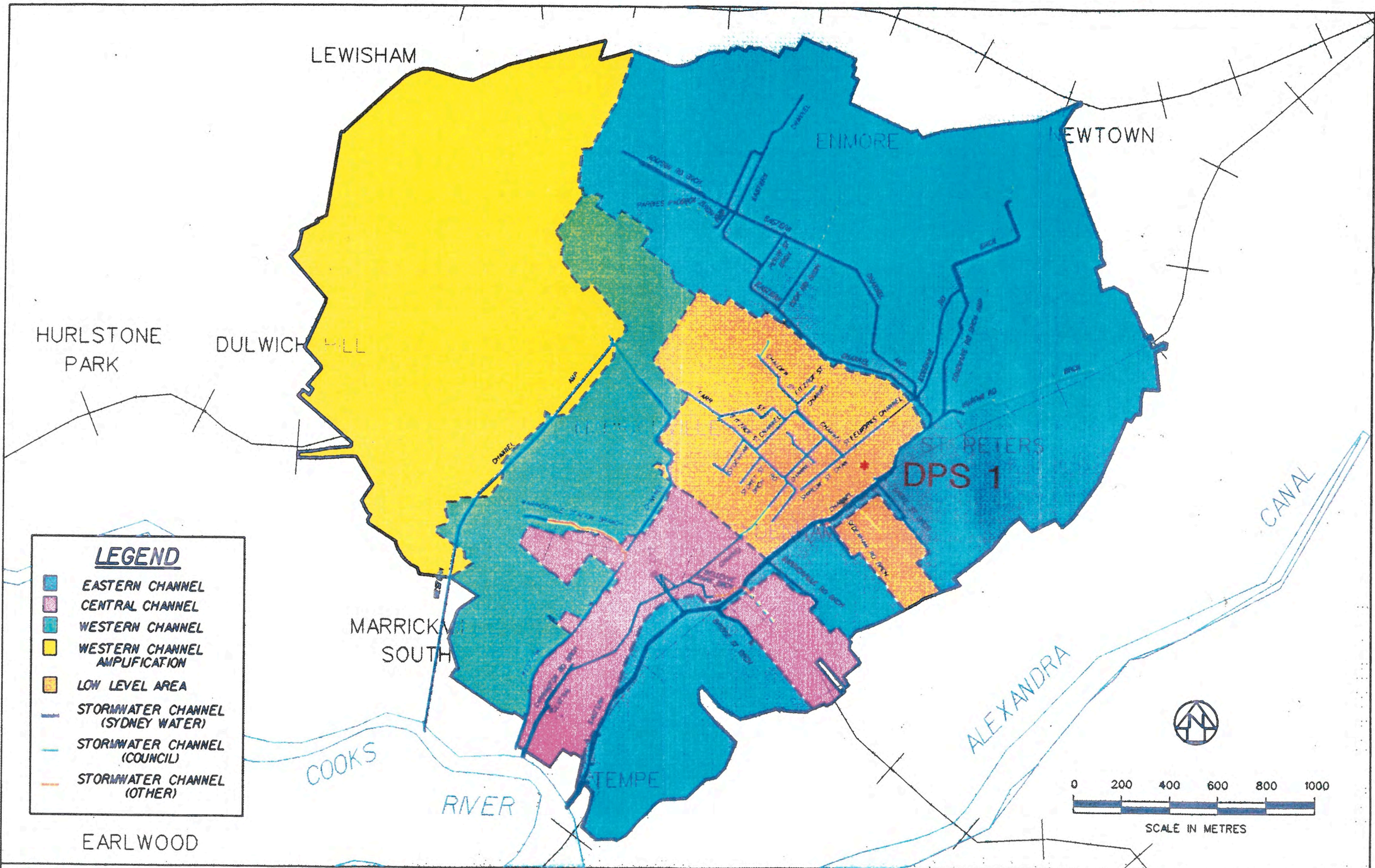
STREET NAME	HOUSE No.	LANDUSE
Sydney St.	1	Industrial
	7	Industrial
	9	Industrial
	11-13	Industrial
	15	Commercial
	17	Industrial
	19	Industrial
	21	Industrial
	23	Residential
	25	Industrial
	27	Industrial
	29	Industrial
	33-35	Industrial
	37-39	Industrial
	41	Industrial
	45	Industrial
47	Industrial	
49	Commercial	

STREET NAME	HOUSE No.	LANDUSE
Sydenham Rd.	74-76	Industrial
(cont.)	78-80	Commercial
	82-84	Industrial
	86	Industrial
	88	Industrial
	90	Industrial
	49	Industrial
	51	Industrial
	53	Industrial
	55	Industrial
	57	Industrial
	59	Industrial
	61	Industrial
	63	Commercial

Vincent St.	2	Industrial
	8	Industrial
	10-24	Industrial
	26	Industrial
	28	Residential

STREET NAME	HOUSE No.	LANDUSE
Sydney St.	51	Industrial
(cont.)	53	Industrial
	12	Industrial
	14	Industrial
	16	Industrial
	18-24	Industrial
	26	Industrial
	28	Commercial
	30	Industrial
	32	Industrial
	36	Industrial
	38	Industrial
	40-44	Industrial
	46	Industrial
	48	Industrial
	50	Industrial
	52	Residential

APPENDICES



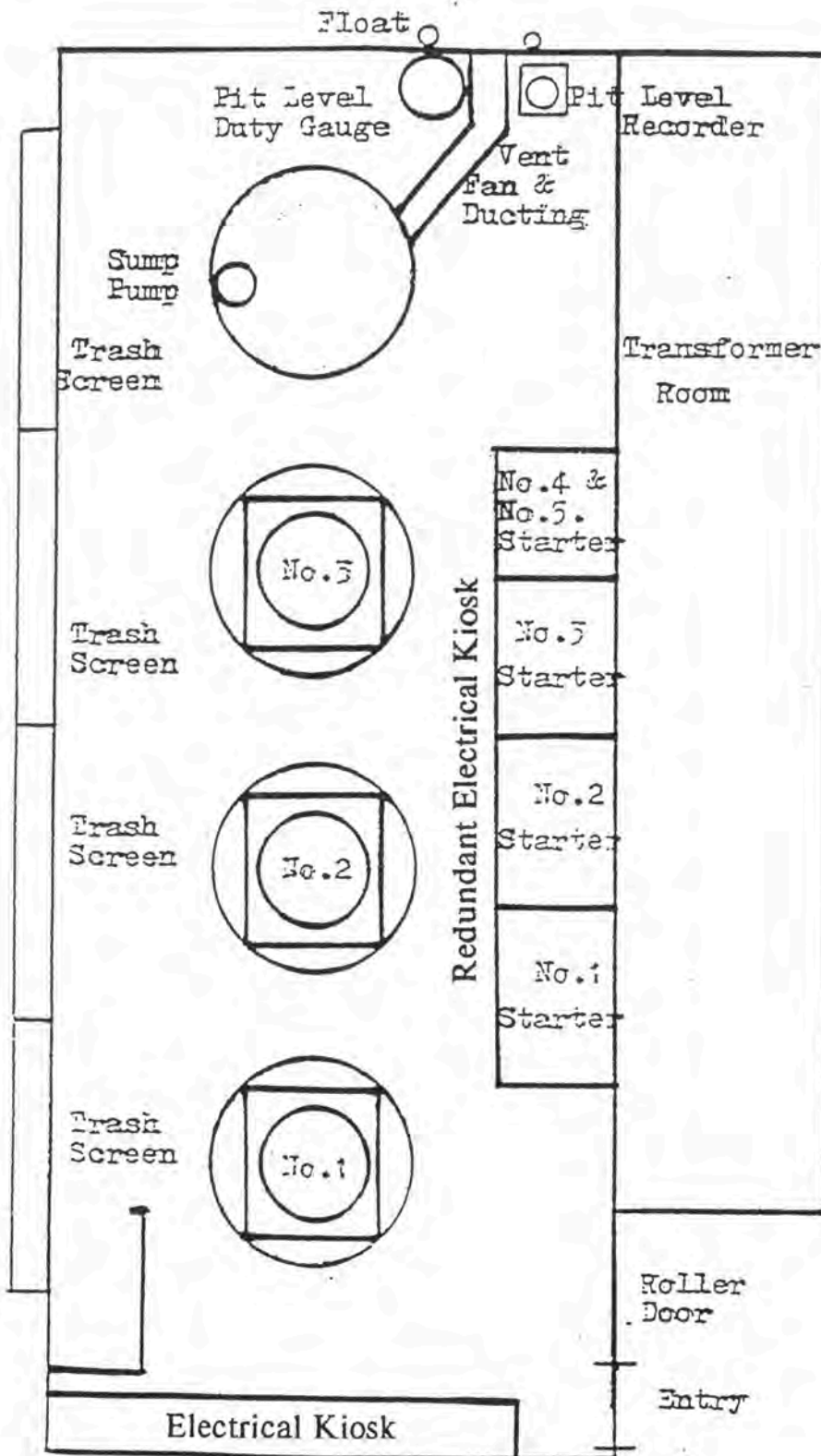
Sydney
WATER

SYDNEY WATER CORPORATION LIMITED
ACN 063 279 649

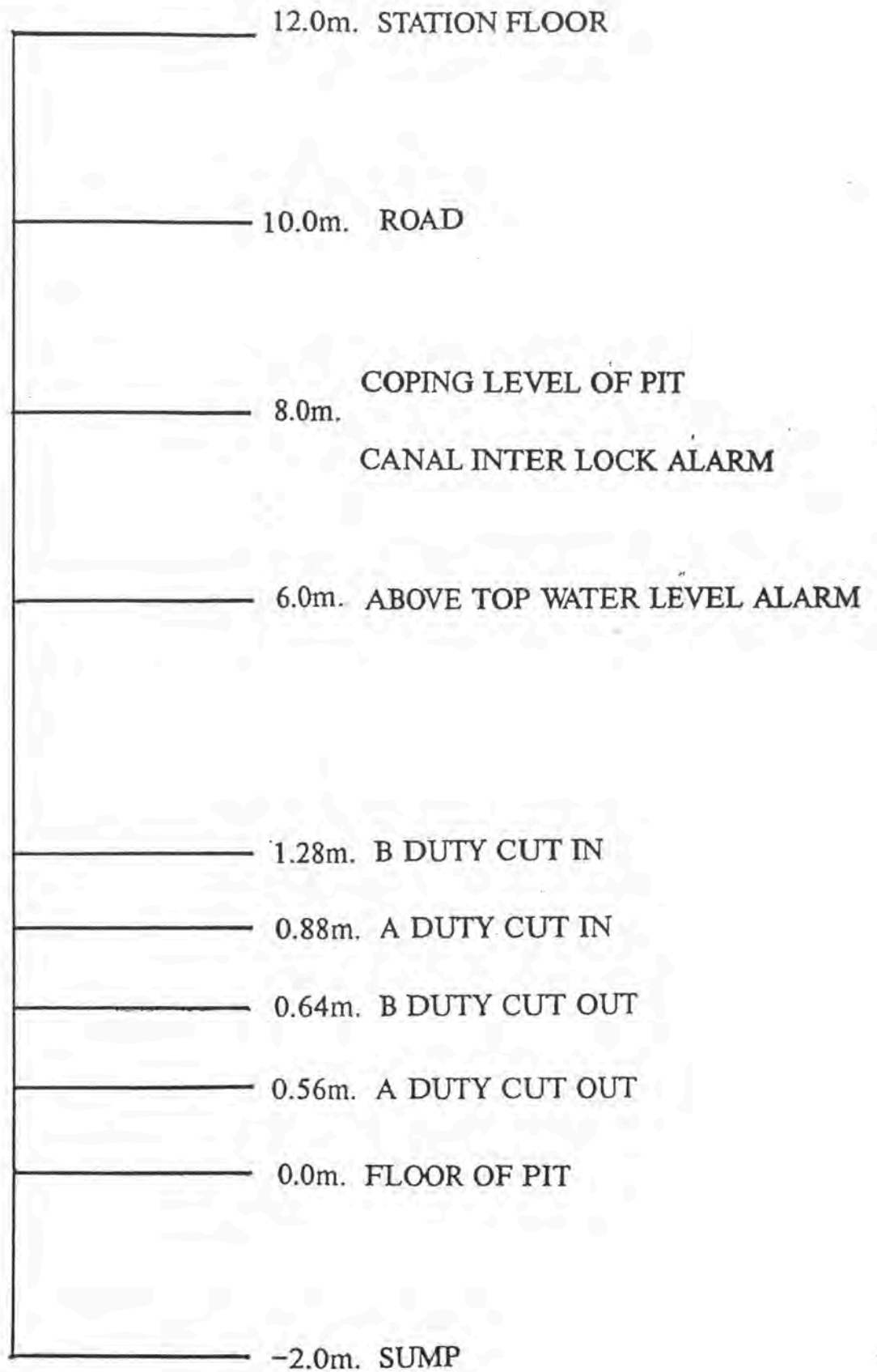
UTILITIES PLANNING SERVICES

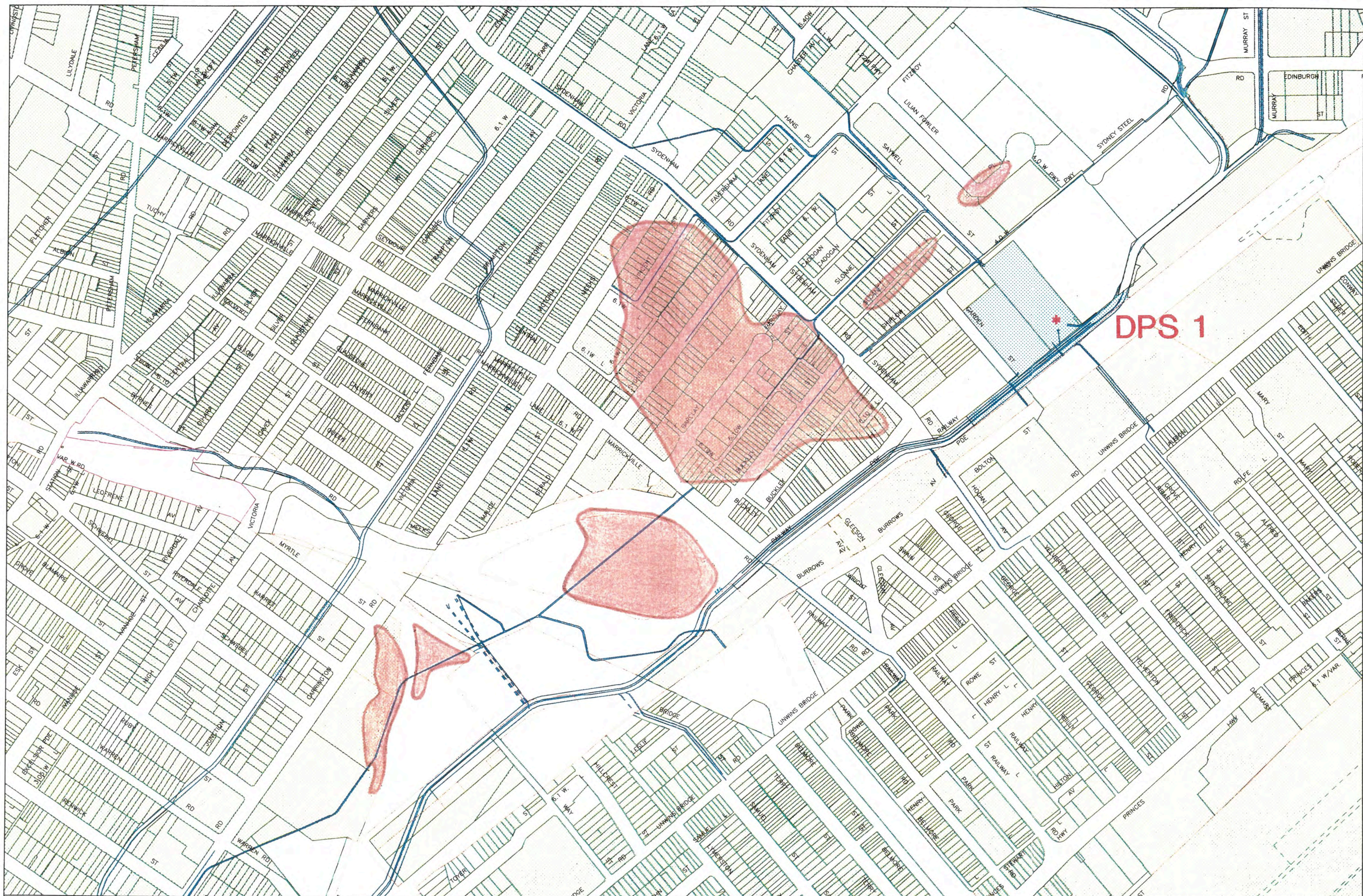
APPENDIX 1 - MARRICKVILLE VALLEY STORMWATER CATCHMENT PLAN

APPENDIX 2 - LAYOUT OF DPS 1



APPENDIX 3 - DUTY LEVELS AND ALARM LEVELS





DPS 1 and DPS 2
 CONTINGENCY PLAN
 ISG Zone 56/1 Central Co-ord: 314987 1245924

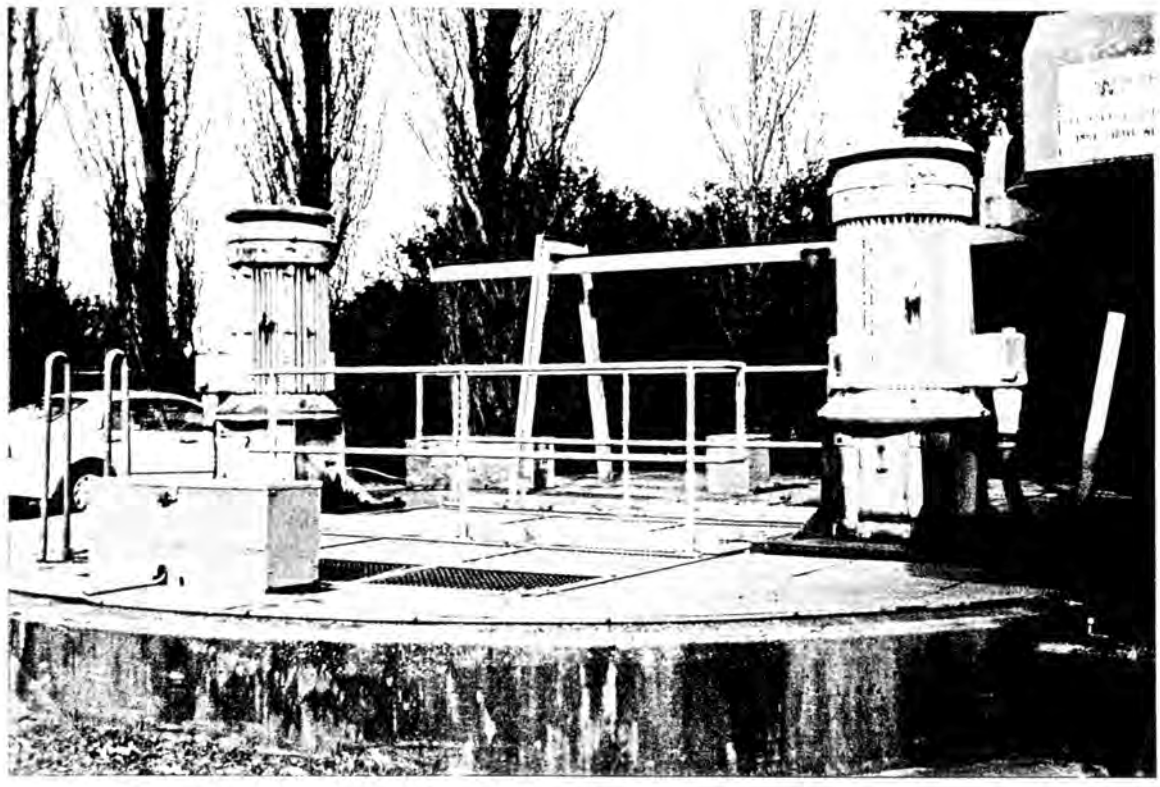
Produced By: Jim Walsh
 Date of Production: 15/03/1999
 Scale: 1:5000

APPENDIX 4 - EXTENT OF FLOODING

CONTINGENCY PLAN

DRAINAGE PUMPING STATION 2

MACKEY PARK – MARRICKVILLE SOUTH



Prepared by Systems Services – Distribution November 1999

TABLE OF CONTENTS

PAGE

SECTION 1 – CONTINGENCY PLAN		
1.1	TYPE OF FAILURE – ACTION PRIORITY	3
1.2	OVERFLOW LEVEL	4
SECTION 2 – DRAINAGE PUMPING STATION 2		
2.1	GENERAL INFORMATION	5
2.2	MARRICKVILLE VALLEY CENTRAL CHANNEL - CATCHMENT AREA DETAILS	5
2.3	PUMPING STATION / RISING MAIN DETAILS	5
2.4	DETAILS - MAIN PUMPS – (PUMP No.1 and PUMP No.2)	6
2.5	DETAILS - SUMP PUMP – (PUMP No.3)	6
2.6	BAR SCREEN DETAILS	7
SECTION 3 - STATION OPERATING PHILOSOPHY		
3.1	PUMP OPERATION	8
3.2	ABOVE TOP WATER LEVEL ALARM	8
SECTION 4 – TYPES OF FAILURE		
4.1	PUMP FAILURE	9
4.2	POWER SUPPLY FAILURE	9
4.3	RISING MAIN FAILURE	9
4.4	BLOCKAGE AT BAR SCREENS	9
4.5	TELEMETRY FAILURE	9
4.6	ADDITIONAL REASONS FOR PUMPING STATION FAILURE	9
SECTION 5 – PROPERTIES AFFECTED BY FLOODING		
5.1	OVERFLOW INFORMATION	10
5.2	RAINFALL INTENSITY	10
5.3	EVACUATION PLANNING	11
5.4	EMERGENCY TELEPHONE NUMBERS	12
APPENDICES		
APPENDIX 1	MARRICKVILLE VALLEY STORMWATER CATCHMENT PLAN	
APPENDIX 2	DIAGRAM SHOWING THE LAYOUT OF DPS 2	
APPENDIX 3	BAR SCREEN DETAILS	
APPENDIX 4	DIAGRAM SHOWING PUMP DUTY LEVELS AND OVERFLOW LEVELS	
APPENDIX 5	PLAN SHOWING PROPERTIES AFFECTED BY FLOODING	

SECTION 1 - CONTINGENCY PLAN FOR STATION FAILURE

1.1 TYPE OF FAILURE - ACTION PRIORITY

Pump Failure	1. Systems Operation Centre contacts Network Services
	2. Network Services contacts Network Manager
	3. Monitor water level in wet well and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Power Supply Failure	1. Systems Operation Centre contacts Network Services and Mechanical / Electrical Southern
	2. Network Services or Mechanical / Electrical Southern contacts Network Manager
	3. Monitor water level in wet well and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Rising Main Failure	1. Contact Network Manager
	2. Monitor water level in wet well and rainfall intensity
	3. Contact Emergency Services when overflow level reached
Blockage of Bar Screens	1. Contact Network Manager
	2. Monitor rainfall intensity
	3. Contact Emergency Services if required
Telemetry Failure	1. Contact Network Manager
	2. Monitor water level in wet well and rainfall intensity
	3. Contact Emergency Services when overflow level reached
Fire	1. Contact Fire Brigade
	2. Contact Network Manager
	3. Monitor water level in wet well and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Gas	1. Contact AGL
	2. Contact Network Manager
	3. Monitor water level in wet well and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Structural Failure	1. Contact Network Manager
	2. Monitor water level in wet well and rainfall intensity
	3. Contact Emergency Services when overflow level reached

Minor Pollution	1. Contact Network Manager
	2. Contact Waste Water Source Control
	3. Monitor water level in wet well and rainfall intensity
	4. Contact Emergency Services when overflow level reached
Toxic Pollution	1. Contact Fire Brigade
	2. Contact Network Manager
	3. Monitor water level in wet well and rainfall intensity
	4. Contact Emergency Services when overflow level reached

1.2 OVERFLOW LEVEL

This level is reached when storage level in the wet well reaches the invert of the inlet structure ie. 5.4m. above floor level.

SECTION 2 - DRAINAGE PUMPING STATION 2

2.1 GENERAL INFORMATION

Drainage Pumping Station (DPS) 2 is located off Carrington Rd. at Marrickville Sth. in Mackey Park (UBD 274 – Q1 / 33rd. Edition). The station was commissioned in 1960 and forms an integral part of the Marrickville Valley Central Channel stormwater drainage system.

A diagram of the Marrickville Valley drainage sub-systems is attached as Appendix 1.

Between 1959 and 1960 the Marrickville Valley Central Channel was amplified by the construction of a new stormwater channel in Carrington Rd. The new stormwater intercepted the original Marrickville Valley Central Channel and diverted the flow to DPS 2. The interception is in Carrington Rd. opposite Carey St

The pumping station discharges stormwater flows to the Cooks River via 2 x 800mm. rising mains.

The section of the original Marrickville Valley Central Channel downstream of the interception operates as an overflow for the pumping station.

A diagram of the layout of the station is attached as Appendix 2.

2.2 MARRICKVILLE VALLEY CENTRAL CHANNEL - CATCHMENT AREA DETAILS

Area	61ha.
Residential	28%
Special purpose	28%
Industrial	27%
Open space	17%
Commercial	1%

2.3 PUMPING STATION / RISING MAIN DETAILS

Wet well capacity	Approx. 230m ³ .
Wet well confined space category	Category 2
Rising main size	800mm.
No. of	2
Rising main length	236m.
Rising main material	M.S.C.L.
Receiving system	Cooks River

2.4 DETAILS - MAIN PUMPS – (PUMP No. 1 and PUMP No. 2)

2.4.1 MECHANICAL DETAILS

Manufacturer	Kelly and Lewis
Type	Vertical 710mm. centrifugal mixed flow diffuser
Weight	1.4 tonnes
Capacity	1.42Kl. per second
Head	7.62m.
Duty	“B” and “C” (alternatively)

2.4.2 ELECTRICAL DETAILS

Motor	Siemens - Schuckert
Motor Type	Squirrel cage
Weight	3.3 tonnes
Rating	160kW, 585rpm, 415 volt, 3 phase
Starter	Auto Transformer
Starting current	1500 Amps
Provision for generator	No
No. of power supplies	1
No. of PLC's	1
Controls	RTU linked to Head Office System Operation Centre

2.5 DETAILS - SUMP PUMP – (PUMP No. 3)

2.5.1. MECHANICAL DETAILS

Manufacturer	Flygt
Model	CP3127.180 MT (Submersible)
Weight	142kg.
Capacity	46l. per second
Head	8.27m.
Duty	“A”

2.5.2 ELECTRICAL DETAILS

Motor	Flygt 21 12 4AL
Motor Type	Squirrel cage
Rating	5.9kW, 1445 rpm, 415 volt, 3 phase
Starter	DOL
Starting current	64 Amps
Provision for generator	No
No. of power supplies	1
Controls	RTU linked to Head Office System Operation Centre

2.6 BAR SCREEN DETAILS

A mechanical bar screen and conveyor belt cleaning system was installed at the inlet structure to the station in 1992. The system was designed to reduce the maintenance costs and down time of the station pumps. The system proved unreliable and required constant maintenance. In the long term it became financially unacceptable to maintain the system and the operation of it was ceased.

Stormwater flow entering the station is now screened as per the original design when the station was constructed. Details of the screening method are attached as Appendix 3.

SECTION 3 – STATION OPERATING PHILOSOPHY

3.1 PUMP OPERATION

All 3 pumps can be operated while the station is in auto or manual mode. Level sensors in the wet well control the pumps while the station is in auto mode. The levels are expressed as a height above the invert of the wet well. A diagram of the duty levels and overflow levels is attached as Appendix 4.

When the water level rises to the first pre-determined level, ie. 1.14m, the sump pump or Duty A will start. The pump will stop when the water level recedes to 0.53m.

If the level continues to rise to the second predetermined level, ie. 4.33m, one of the main pumps or Duty B will start.

Note that the sump pump automatically stops when one of the main pumps starts.

If the level continues to rise to the third predetermined level, ie. 5.0m, the second main pump or Duty C starts. Pump shutdown operates in the reverse order as the water level lowers.

The station will begin to overflow if the storage level rises above the invert of the inlet structure ie. 5.4m. At 5.7m. an emergency duty overrides normal duty. This duty continues until the storage level returns to 2.0m.

Note that the PLC automatically sequences the 2 main pumps thus allowing equal running time for each unit.

For maintenance purposes any of the pumps can be taken out of service through an isolation circuit.

The following table details pump operating levels.

DUTY	PUMP	CUT IN	CUT OUT
A DUTY	SUMP PUMP	1.14m.	0.53m.
B DUTY	No. 1 or No. 2 PUMP	4.33m.	1.82m.
C DUTY	No. 1 and No. 2 PUMP	5.0m.	2.0m.
EMERGENCY DUTY	No. 1 and No. 2 PUMP	5.7m.	1.82m.

3.2 ABOVE TOP WATER LEVEL ALARM

This is an overflow alarm and is monitored by the Systems Operation Centre. It indicates that the storage level in the wet well is higher than the invert of the inlet structure and that the wet well has started to overflow.

The overflow level is 5.4m. above the invert of the wet well. The alarm level is 5.7m. above the invert of the wet well.

SECTION 4 - TYPES OF FAILURE

4.1 PUMP FAILURE

Mechanical failure of 1 or both of the main pumps during a storm event may cause flooding in Marrickville South.

The use of portable pumps after a failure is not considered an alternative because they could not achieve the capacity of the main pumps.

4.2 POWER SUPPLY FAILURE

In the event of failure of the power supply to the station it is possible to provide emergency power via a transportable generator set.

However this is not considered an option because of the time delay in locating a transportable generator set at the station. Additionally no provision exists at the station for the change over from mains supply to supply from a transportable generator set

4.3 RISING MAIN FAILURE

Failure of one or both of the rising mains is unlikely.

4.4 BLOCKAGE AT BAR SCREENS

A blockage or a restriction of flow through the bar screens may result in flooding within the catchment.

Cleaning of the screens during a storm event may remove some blockage material. However if the current screen cleaning programme ie. on a weekly basis or after 10mm. of rainfall is maintained then the possibility of blockage or restriction during a storm event will be reduced.

4.5 TELEMETRY FAILURE

Telemetry failure will affect automatic operation of the pumps. However manual control can override automatic operation.

4.6 ADDITIONAL REASONS FOR PUMPING STATION FAILURE

Fire, gas, structural failure, minor or toxic pollution may affect the operation of the pumping station. An assessment of alternatives of bringing the pumping station back on line can be made after Emergency Services have approved entry to the station.

SECTION 5 – PROPERTIES AFFECTED BY FLOODING

5.1 OVERFLOW INFORMATION

The Marrickville Valley Central Channel catchment area may begin to flood if either of the following events occur during a high intensity storm event :-

- Pump failure at DPS 2.
- The inflow rate is greater than the capacity of the pumping system.

Properties in Marrickville South located in Carrington Rd, Cary St, and Renwick St. may be affected by flooding. A plan showing properties that may be affected by flooding is attached as Appendix 5.

5.2 RAINFALL INTENSITY

The following table details the worst flood elevation that may occur in the Mackey Park area irrespective of storm duration. (See Mackey Park DPS 2 - Risk of Pump Failure – Flood Investigation Report – Systems Services, Sydney Water - June 1998)

100 yr. ARI duration	Flood level (m. A.H.D.)	Time to peak (hr:min)
DPS 2 – Pump failure	2.53	1.32

The table indicates that flood levels may peak at 2.53m. AHD. The lowest elevation in the area is approx. 1.2m. AHD in Renwick St.

5.3 EVACUATION PLANNING

The following tables identify properties that may be affected by flooding and should be used for evacuation planning.

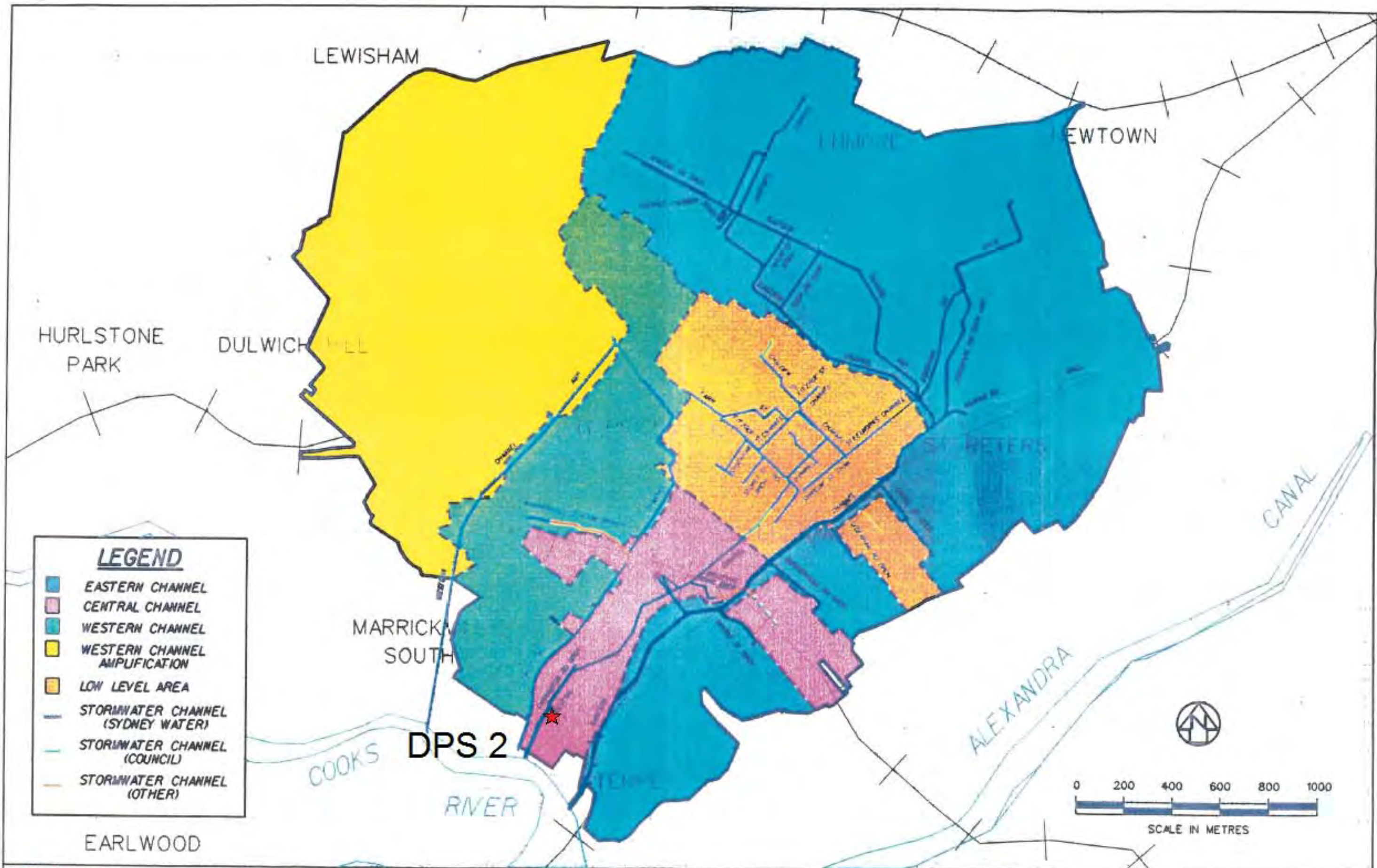
A plan showing properties that may be affected by flooding is attached as Appendix 5.

STREET NAME	HOUSE No.	LANDUSE
CARY ST.	97A	INDUSTRIAL
	97B	RESIDENTIAL
	99A	RESIDENTIAL
	99B	RESIDENTIAL
	101A	RESIDENTIAL
	101B	RESIDENTIAL
	103A	RESIDENTIAL
	103B	RESIDENTIAL

STREET NAME	HOUSE No.	LANDUSE
RENWICK ST.	106	INDUSTRIAL
	110	INDUSTRIAL
	142	INDUSTRIAL
	144	COMMERCIAL
	146	COMMERCIAL
	152	INDUSTRIAL
	154-164	INDUSTRIAL

STREET NAME	HOUSE No.	LANDUSE
CARRINGTON RD.	47	INDUSTRIAL
	49	INDUSTRIAL
	51-55	INDUSTRIAL
	57	INDUSTRIAL
	16	INDUSTRIAL
	20-28	INDUSTRIAL
	30	INDUSTRIAL
	32	RESIDENTIAL
	36	RESIDENTIAL
	38	RESIDENTIAL

APPENDICES



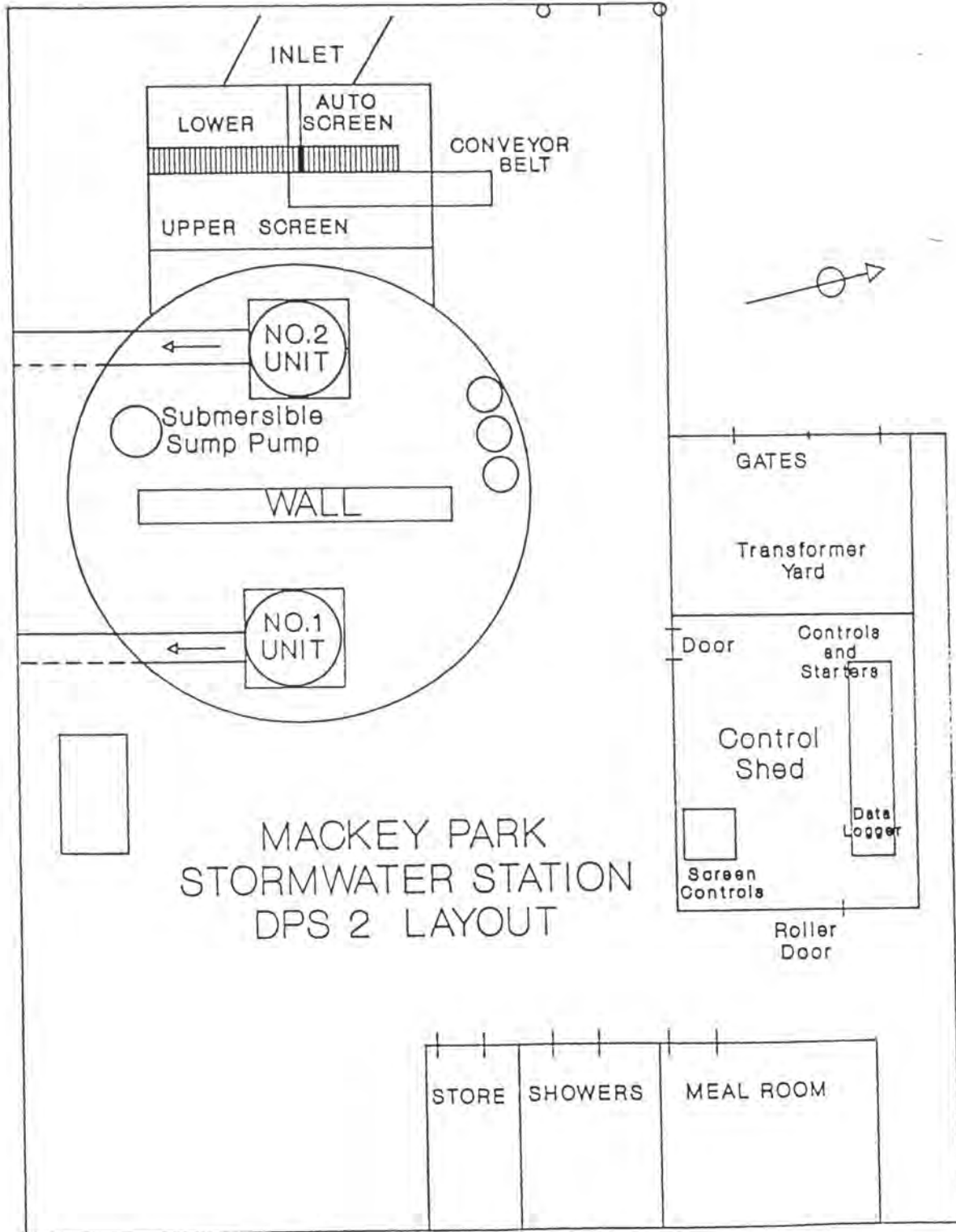
Sydney
WATER

SYDNEY WATER CORPORATION LIMITED
474 053 279 648

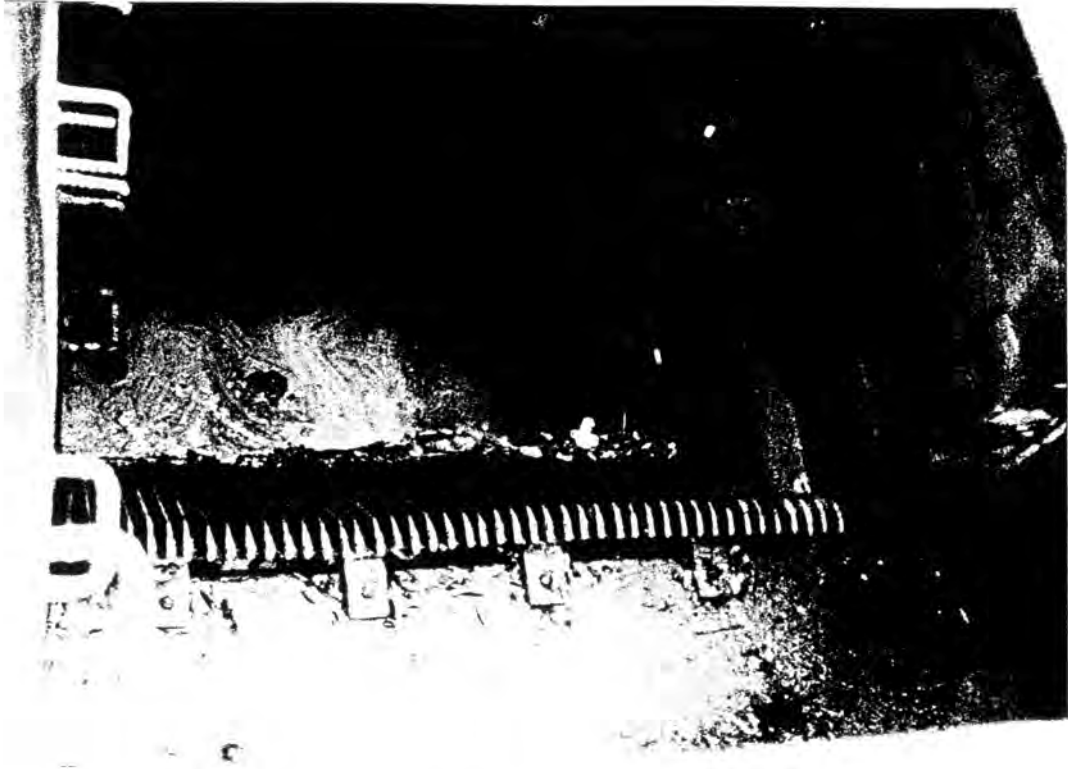
UTILITIES PLANNING SERVICES

APPENDIX 1 - MARRICKVILLE VALLEY STORMWATER CATCHMENT PLAN

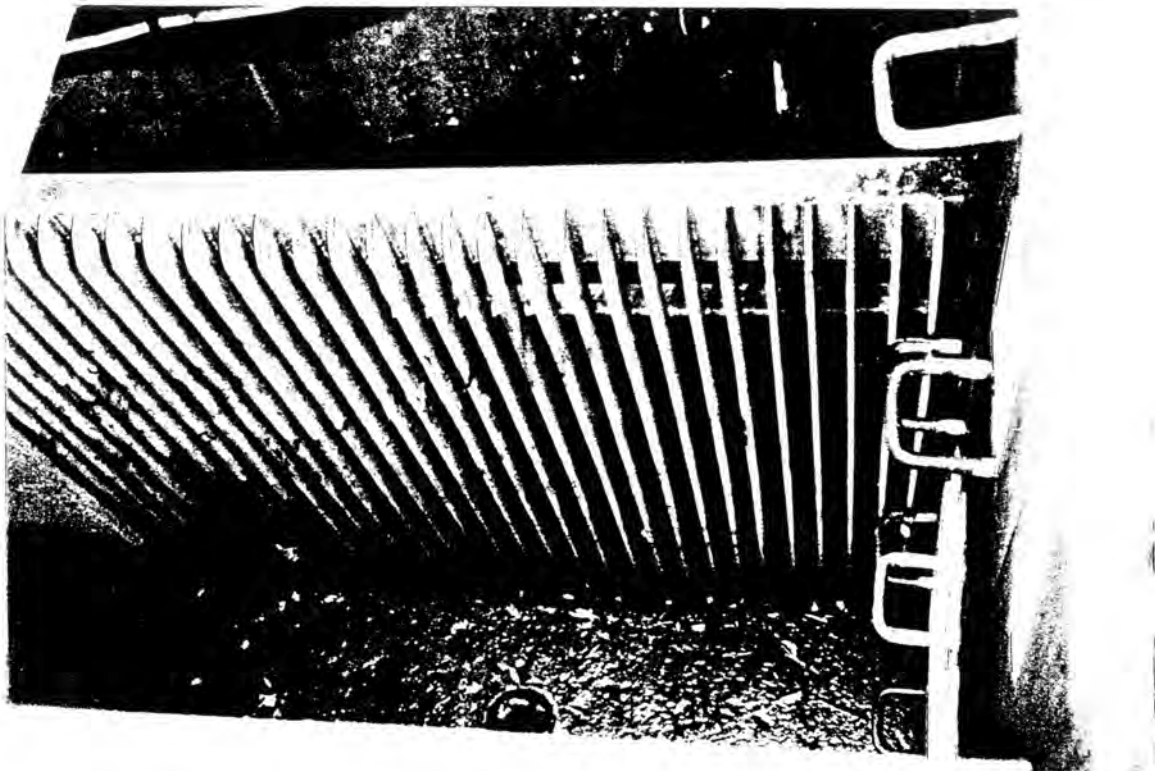
APPENDIX 2 - DIAGRAM SHOWING THE LAYOUT OF DPS 2



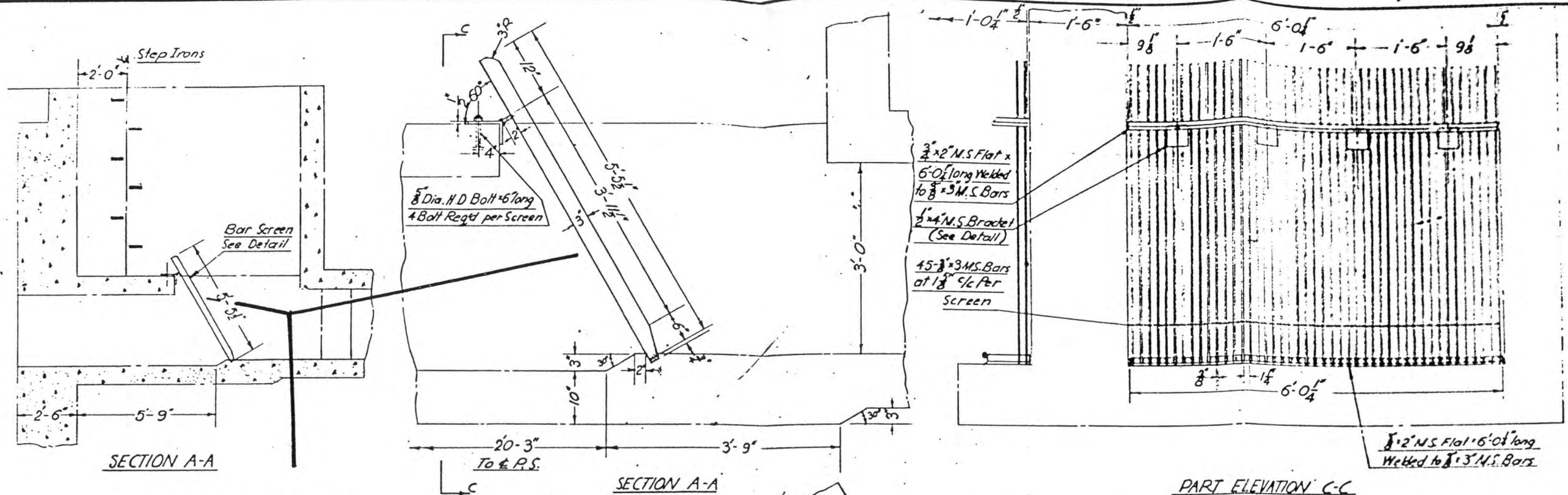
APPENDIX 3 – BAR SCREEN DETAILS



PHOTOGRAPH No. 1 - LOWER SCREEN



PHOTOGRAPH No. 2 - UPPER SCREEN



SECTION A-A

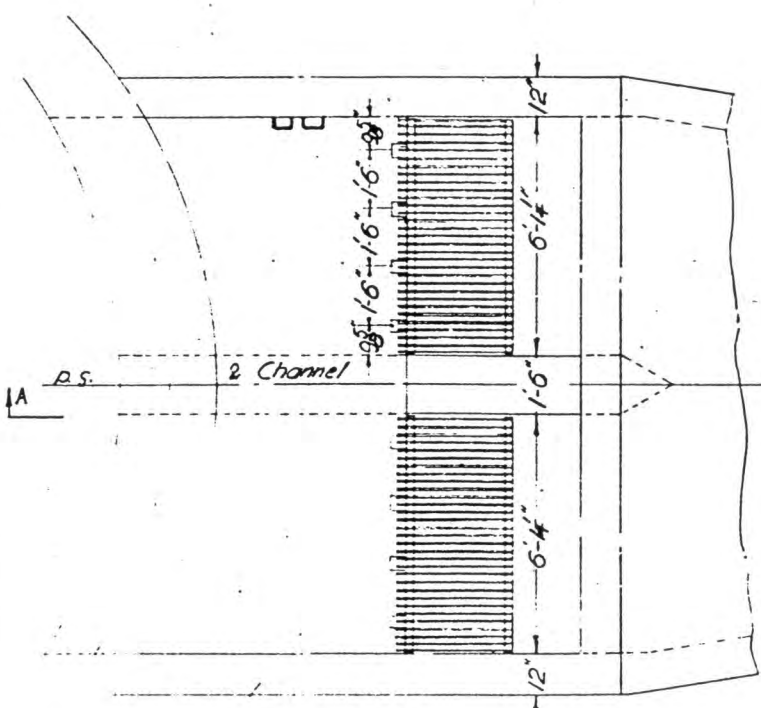
SECTION A-A

PART ELEVATION C-C

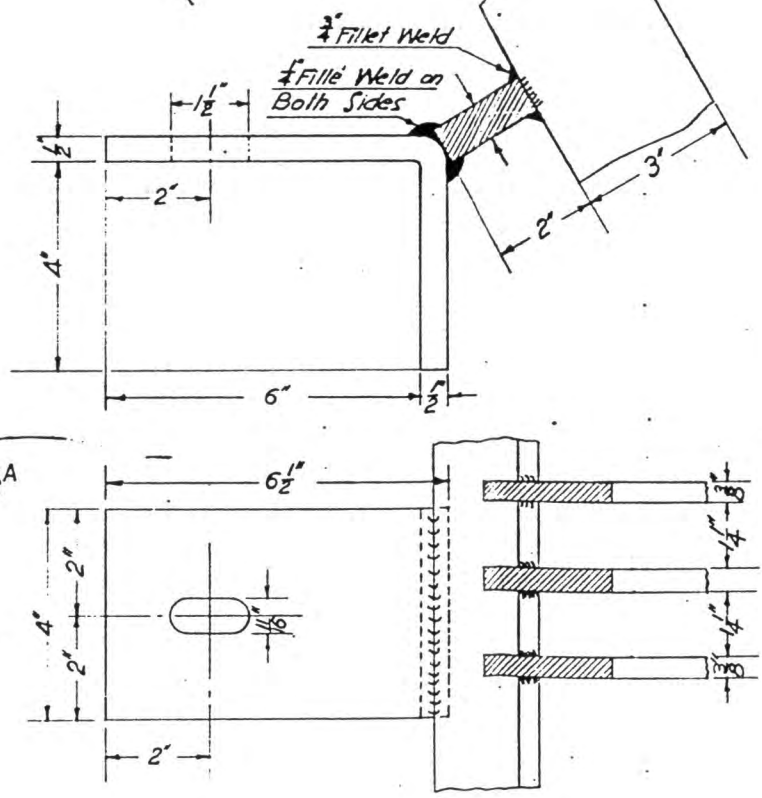
SEE PHOTOGRAPH No. 1

BAR SCREEN - 2 Req'd
SCALE 1" = 1'-0"

ALL STEEL WORK TO BE GALVANISED BY
DOUBLE DIPPING AFTER MANUFACTURE
BY CONTRACTOR



SCALE: 3/8" = 1'-0"



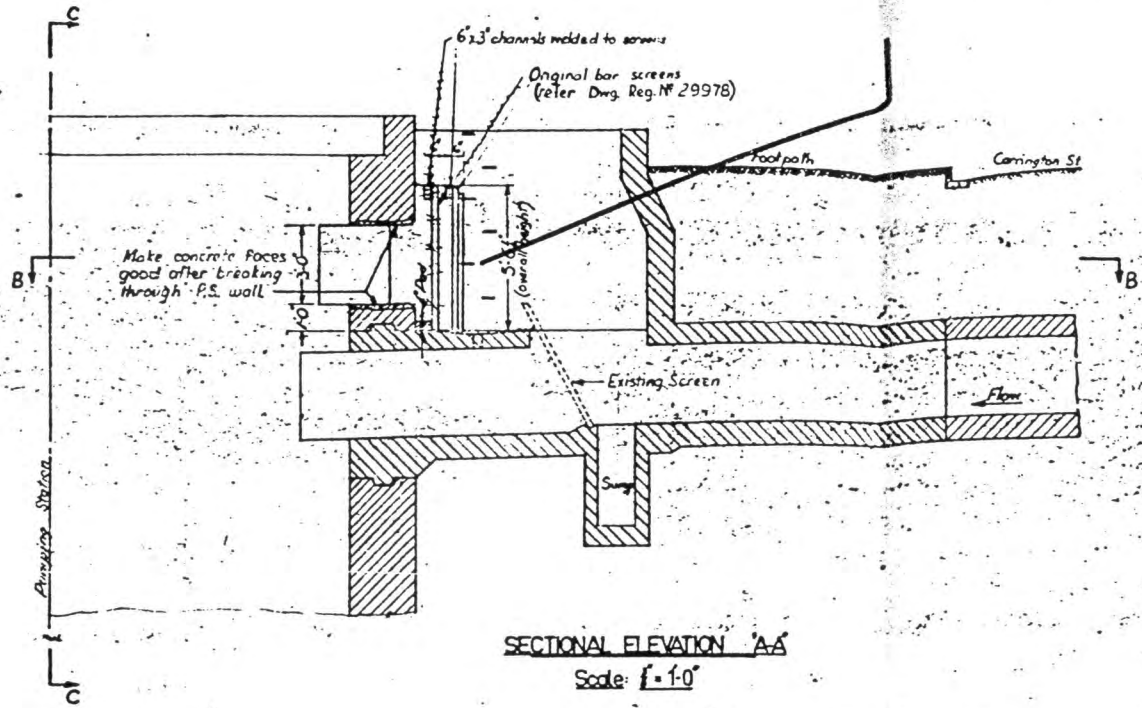
DETAIL OF 1/2" x 4" M.S. BRACKET
4 Brackets Req'd Per Screen
SCALE: Half Size

M.H. 11-12-54
Chief Mech Eng

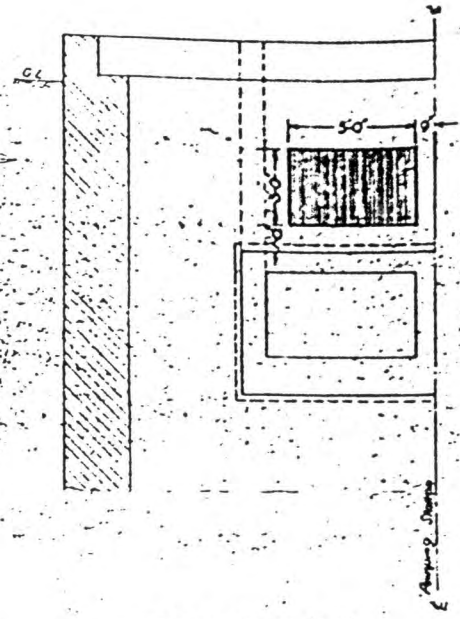
METROPOLITAN WATER SEWERAGE AND DRAINAGE BOARD SYDNEY, N.S.W. C2			
MARRICKVILLE DRAINAGE MACKAY PARK STORM WATER PUMPING STATION DETAILS OF BAR SCREENS			
CONTRACT OR JOB No.	FILE No.	SCALES As Shown	
DESIGNED	DRAWN G.G.	CHECKED	REG. No. 31721
EXAMINED			ISSUE DRAWING No.
RECOMMENDED		APPROVED	

DATE OF NEGATIVE	LETTER	DETAIL OF AMENDMENT	MADE BY	DATE

SEE PHOTOGRAPH No. 2

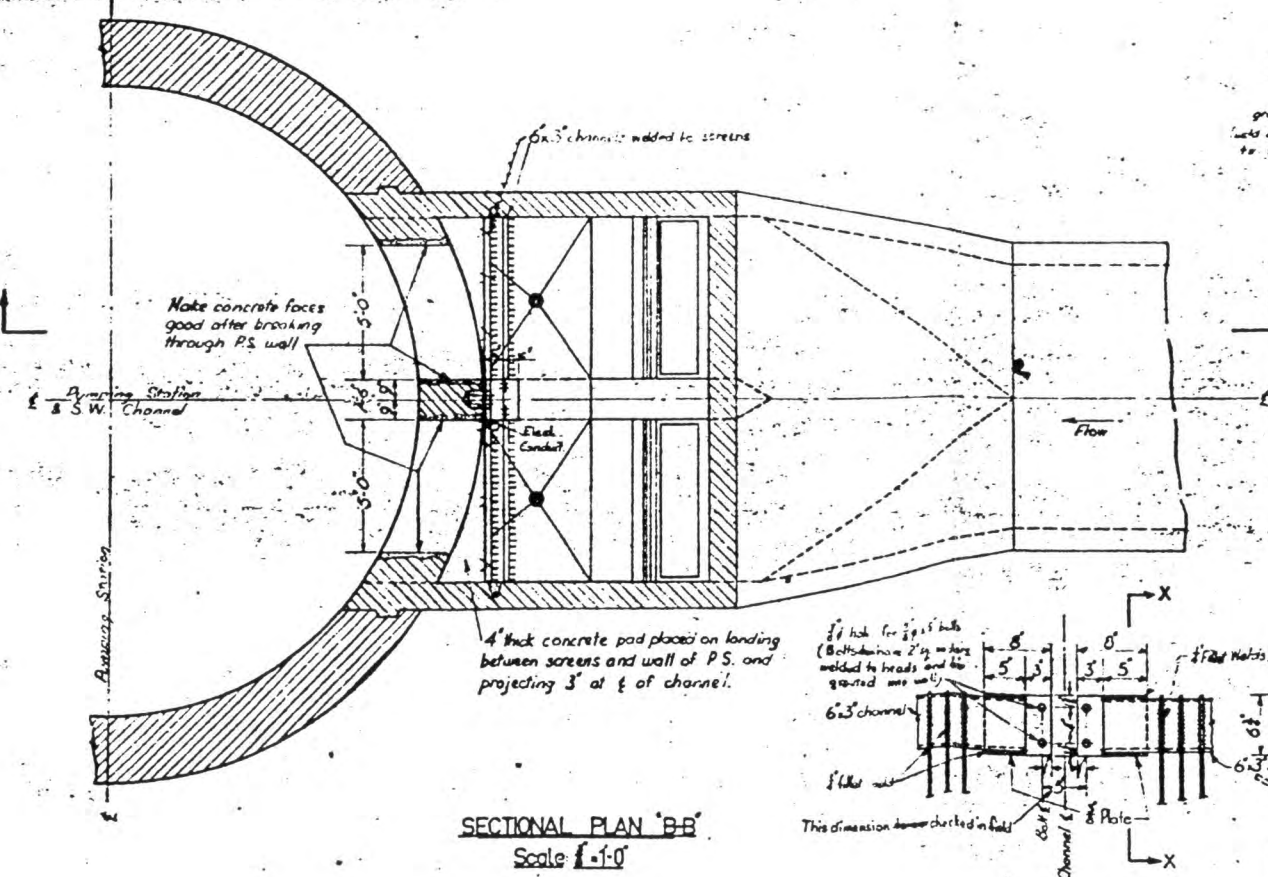


SECTIONAL ELEVATION 'AA'
Scale: 1/2"=1'-0"

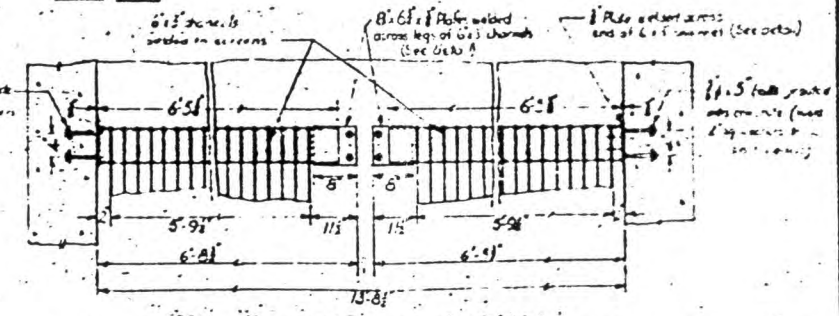


HALF SECTION 'C-C'
Scale: 1/2"=1'-0"

DETAILS OF ENDS OF CHANNELS
Scale: 1/2"=1'-0"

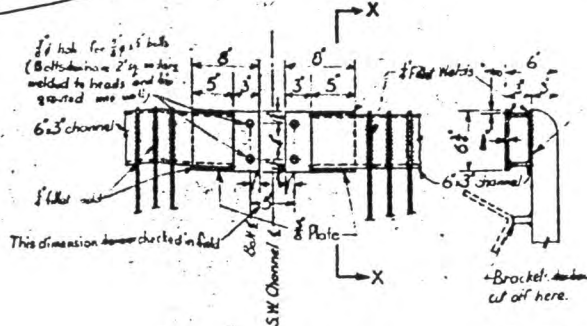


SECTIONAL PLAN 'B-B'
Scale: 1/2"=1'-0"



DETAILS OF SCREENS
Scale: 1/2"=1'-0"

- NOTE
1. After fabrication the screens shall be thoroughly cleaned and painted with a good quality paint. All new steel work shall be painted with a good quality paint.
 2. Screens shall be set in the P.S. ground level. The screens shall be fixed in the position as shown on the drawing.
 3. All work shall be done in accordance with the specification.
 4. All concrete surfaces shall be finished with a good quality concrete.
 5. Concrete Class 7045.



DETAIL OF CENTRE JOINT
Scale: 1/2"=1'-0"

SECTION 'X-X'

DATE OF REVISION	REVISION	DETAIL OF AMENDMENT	MADE BY	DATE

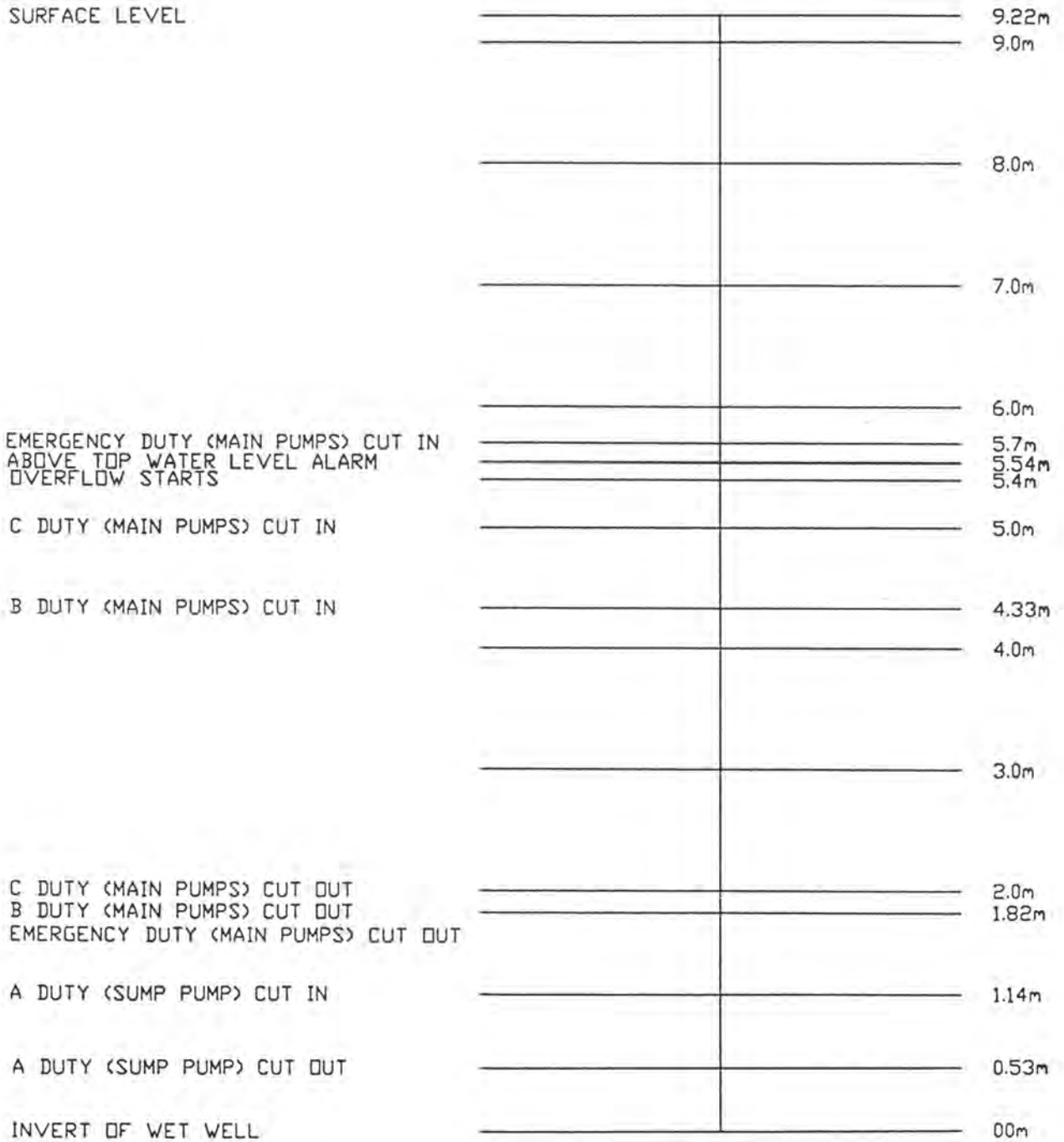
N/O 28467

A.W. G. 6/12/61
Engineer, Sewerage & Drainage

METROPOLITAN WATER SEWERAGE AND DRAINAGE BOARD SYDNEY, N.S.W.	
MARRICKVILLE VALLEY CENTRAL S.W.C. MACKAY PARK PUMPING STATION ARRANGEMENT OF OVERFLOWS	
CONTRACT OR JOB NO. 28467	PLAN NO. 66224
SCALE 1/2"=1'-0"	NO. 33847
DRAWN BY I.J.M.	CHECKED BY H.B. S.N. 61
EXAMINED BY [Signature]	APPROVED BY [Signature]
RECOMMENDED BY [Signature]	APPROVED BY [Signature]

81004

APPENDIX 4 - DIAGRAM SHOWING PUMP DUTY LEVELS AND OVERFLOW LEVELS



APPENDIX 5 – PLAN SHOWING PROPERTIES AFFECTED BY FLOODING



DPS 2
 CONTINGENCY PLAN
 ISG Zone 56/1 Central Co-ord: 314303 1245077

Produced By: Gary Morris
 Date of Production: 15/07/1999
 Scale: 1:2759

Plot Theme: None
 Plot Request: None

Copyright Reserved Sydney Water 1999
 No warranty is given that this is complete or accurate.
 SYDNEY WATER CORPORATION



Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

F

CONSULTATION MATERIALS

Managing flood risk in your neighbourhood

Marrickville Valley Catchment



Tell us about your experience of floods and ideas for managing them.

Council is preparing a floodplain risk management plan for the Marrickville Valley catchment. This will help protect people and property through better planning, emergency management and infrastructure works.

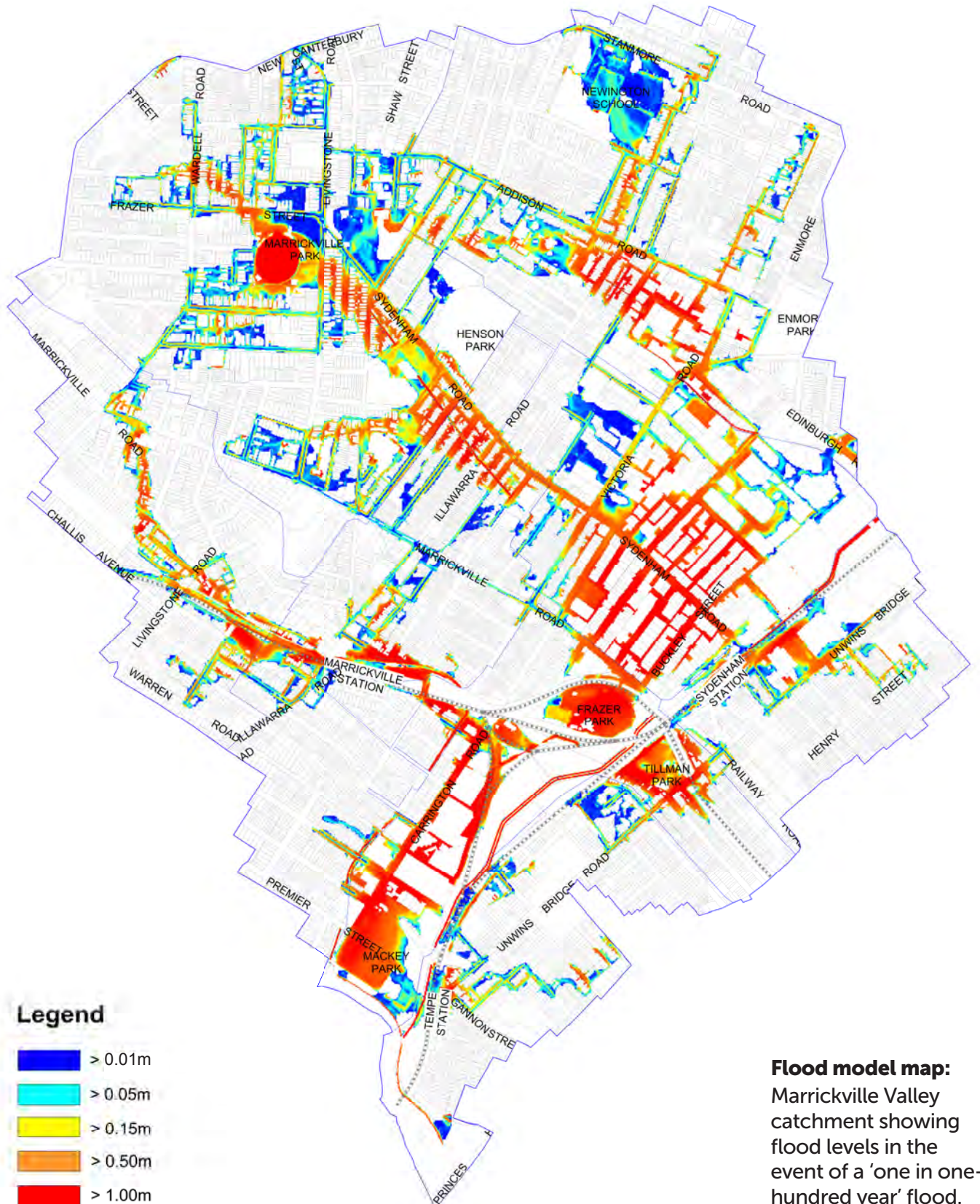
Residents, land owners and business operators in the Marrickville Valley are invited to share your experiences of past storm events and ideas for managing flood risks.

Complete a **short survey**, add to the **interactive map**, and send Council any **images** you have taken of local flooding.

Marrickville Valley catchment area

Marrickville Valley includes parts or all of Petersham, Stanmore, Enmore, Newtown, St Peters, Tempe, Marrickville and Dulwich Hill. The valley floor was originally a freshwater wetland known as Gumbramorra Swamp that drained in a southerly direction towards the Cooks River. The catchment now drains into the Cooks River via four outfalls; the Eastern, Central and Western Channels, and the Malakoff Street Tunnel.

In 2010 Council studied a range of storm events for the *Marrickville Valley Flood Study* adopted by Council in 2013. The study identified a number of areas which are likely to experience flooding, and in some cases widespread inundation in a significant storm event. These include the Marrickville Industrial Area and many residential streets.



What is a flood model?



Expert consultants create a computer-generated model of the area. The model shows the impact of storm events ranging from heavy rainfall to the most extreme flood.

This includes:

- where the water will run
- how the existing drainage system will cope
- whether property damage is likely to occur

Council's consultants Cardno will use the photo and video evidence as well as stories from residents to test the model and verify its accuracy.

Timeline



Council will prioritise flood management options and implement as funding allows. Implementation may need external funding, such as through state government grants.

The Plan

There are three main ways to manage flood risk:

- controls on development
- helping people at risk (e.g. flood warning systems)
- changing the behaviour of the flood itself (e.g. upgrade of stormwater systems).

The plan will assess how much each option

- reduces flood risk and losses
- costs to implement
- benefits or impacts society and the environment.

A list of prioritised options will be developed for the catchment. Options may need external funding to implement, such as through state government grants.



Get involved

Your knowledge of flooding in the Marrickville Valley is valuable to the preparation of this plan.

Local residents and business operators can help by providing information on flooding in the area over the last five years and evidence of the extent of flooding from your images.

Visit www.yoursaymarrickville.com.au

- Complete a brief survey
- Add to the interactive map
- Share photos or links to videos.

If you don't have access to a computer please phone Council for a paper survey.

The information you provide will be used to develop the plan and help identify options for managing future flood risk.

There will be other opportunities for you to comment as the plan progresses. We will keep you updated on Your Say Marrickville.

Have your say by Monday 16 November 2015.

Contact Us

For more information or assistance about the Marrickville Valley floodplain plan please contact:

Ryan Hawken

P: 02 9335 2246

E: ryan.hawken@marrickville.nsw.gov.au

This project is supported by the NSW Government's Floodplain Management Program.

59915195 L001

Contact : Shefali Chakrabarty

27 October 2015



NAME

DEPARTMENT

ORGANISATION

Cardno (NSW/ACT) Pty Ltd

ABN 95 001 145 035

Level 9, The Forum

203 Pacific Highway

St Leonards New South Wales 2065

PO Box 19

St Leonards New South Wales 1590

Australia

Telephone: 02 9496 7700

Facsimile: 02 9439 5170

International: +61 2 9496 7700

Web: www.cardno.com.au

Dear **NAME**,

MARRICKVILLE VALLEY FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

We are writing to inform you that Cardno has been engaged by Marrickville Council to undertake the Marrickville Valley Floodplain Risk Management Study and Plan.

The study area is provided in the attached figure.

The aim of the Floodplain Risk Management Study and Plan is to undertake a comprehensive assessment of potential flood mitigation options for the study area, in order to minimise risk to life and property damage during flood events.

The Floodplain Risk Management Study will involve:

- Consultation with community and stakeholders;
- An assessment of the existing flood risks and damages;
- A review of current Council policy and planning documents;
- A review of current emergency response practises; and,
- An assessment of structural, property and emergency management options to mitigate flood risk and damages.

After the Floodplain Risk Management Study has been completed, the preferred options will be developed into the Floodplain Risk Management Plan which will provide a structure for the implementation of the recommended options from the Study.



Australia • Belgium • Indonesia • Kenya • New Zealand • Papua New Guinea
United Kingdom • United Arab Emirates • United States • Operations in 60 countries

15 May 2016

The Floodplain Risk Management Plan represents the penultimate stage of the Floodplain Risk Management Process as outlined in the NSW Floodplain Development Manual (NSW Government, 2005). The final stage of the process will be the implementation by Council of the Floodplain Risk Management Plan.

We would be grateful for your input into the development of the Floodplain Risk Management Study and Plan, in particular with respect to any comments or observations you have of flooding within the study area, and if / how historical flooding has impacted:

- Conducting business / activities within the region;
- Your operations within the region; and / or
- Any assets you have in the region.

We would also welcome information you can provide on any current flood management processes you implement, or any flood related issues that you currently experience, within the Marrickville Valley catchment area.

In addition, we would also appreciate your assistance in identifying (and providing where possible) any additional information that you may have of current or future works that may affect the flooding behaviour of the Marrickville Valley catchment.

For further information and any queries please do not hesitate to contact either myself on 02 9024 7001 or at shefali.chakrabarty@cardno.com.au or Ryan Hawken at 02 9335 2246 or at ryan.hawken@marrickville.nsw.gov.au.

Yours faithfully,



Shefali Chakrabarty


for **Cardno (NSW/ACT) Pty Ltd**

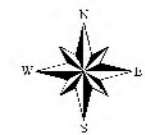
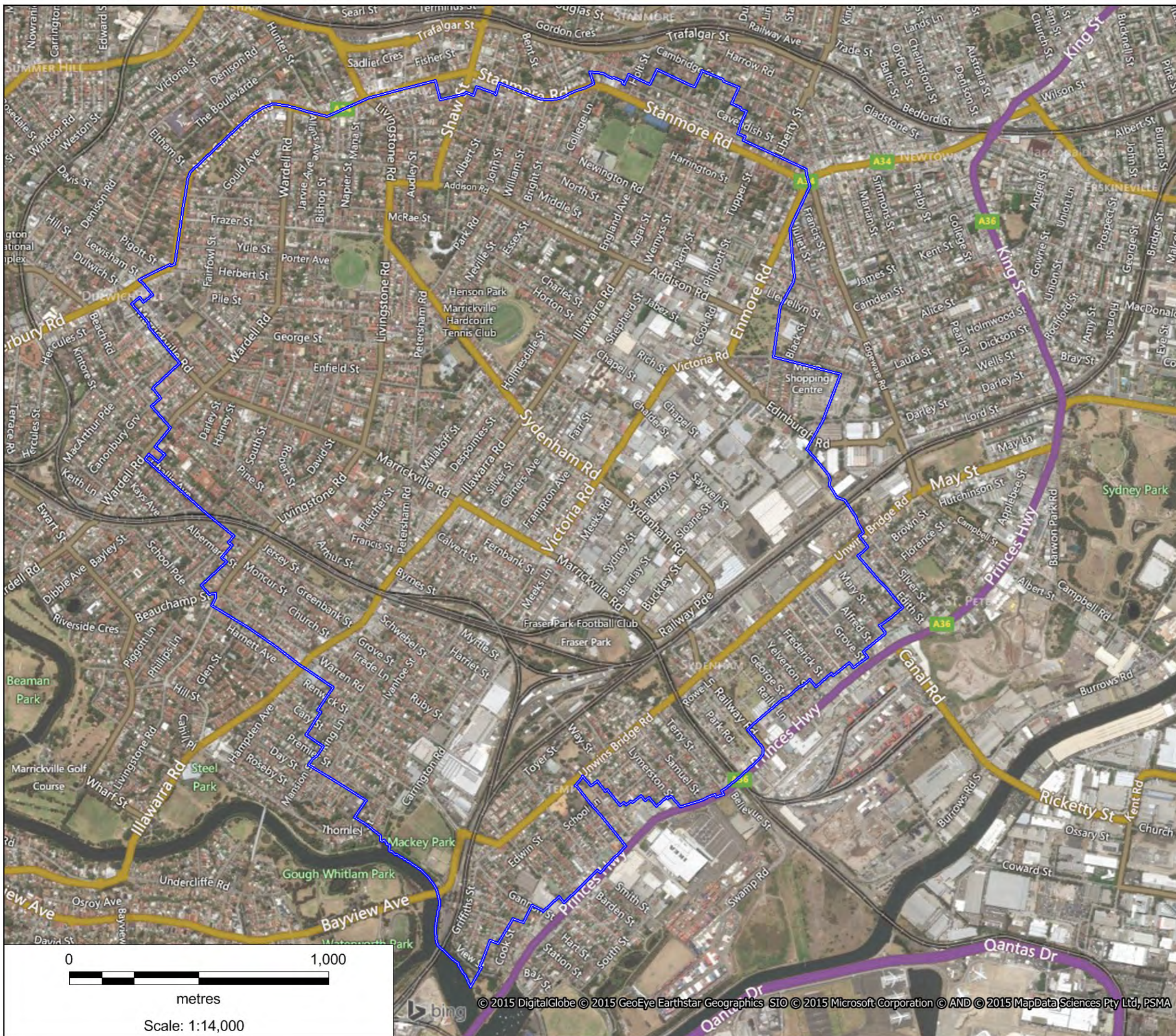
Attachment

- Figure – Marrickville Valley Study Area

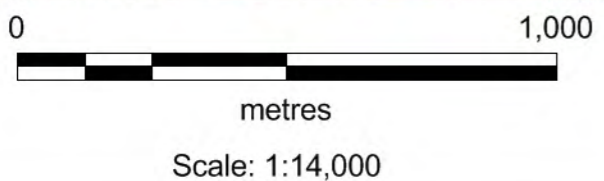
Figure Study Area

Marrickville Valley FRMSP

LEGEND
 Study Area



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: September 2015
 Project: 59915195
 Coordinate System: MGA Zone 56
 Map Scale at A3



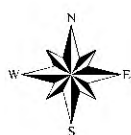
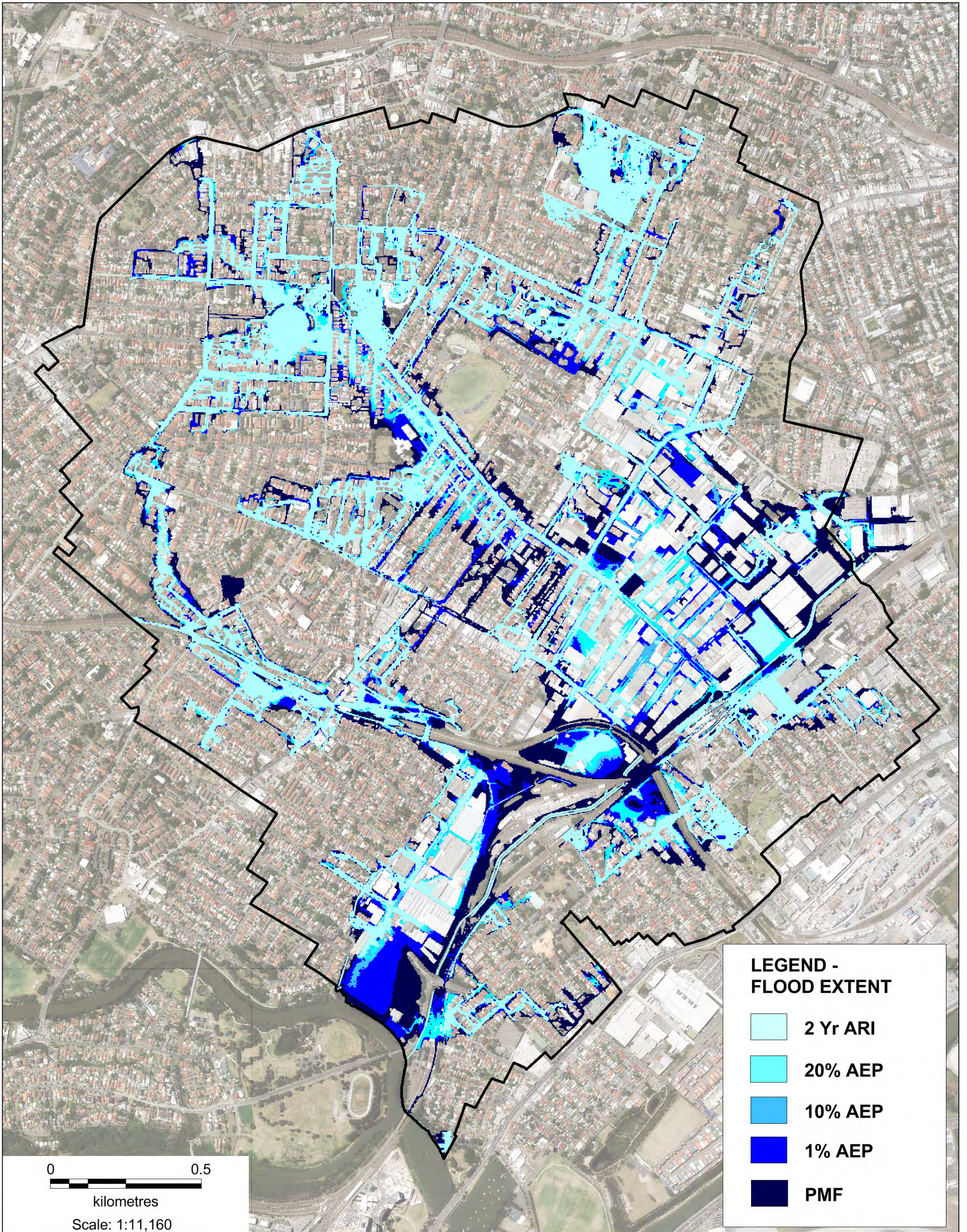
No	Raised by	Survey Questions					Council Response	
		To what extent do you support the draft plan to mitigate flooding in the Marrickville Valley?	Your comments about the options in the draft plan that you SUPPORT and why	Your comments about the options in the draft plan that you DON'T SUPPORT and why	Are there any flood affected areas that haven't been addressed in the plan?	Do you have any other comments on the study and plan?		
1	Survey	Strongly support			Mary Street, St Peters	I like the plan.	The flood modelling indicates that water depths in Mary Street, St Peters are shallow and that the drainage systems in this area are adequate.	
2	Survey	Neither support or oppose	It's a start		I can't see any reference to my property which has been identified as flood risk. Please provide to me. Also there is much development and proposed development 'downstream' e.g. 120C Old Canterbury Rd. How thoroughly has Council assessed these impacts as potential flood risks?	Make information more accessible and available to the community e.g. articles in local newspaper that go beyond tiny print in Council section	Weston Street is outside the Marrickville Valley and is therefore not within the scope of this study. A study of this area is currently underway and further consultation with residents will be undertaken in due course. Council's DCP and state legislation controls development to ensure that no development has an adverse impact on flooding.	
3	Survey	Support	Most of the measures seem sensible	Not ALL options are canvassed.	None that I am aware of.	Why has dredging or otherwise increasing the capacity of the Cooks River been ignored completely?	Dredging to increase the capacity of the Cooks River is outside the scope of this study. The Cooks River FRMSP (WMA 2015) discusses dredging of the Cooks River in detail and determined that it is not a viable option due to the environmental impacts and cost.	
4	Survey	Support	Most of the plan seems OK.	Not all options are covered	Don't know.	There is nothing about dredging or improving flow in the Cooks River.	Dredging to increase the capacity of the Cooks River is outside the scope of this study. The Cooks River FRMSP (WMA 2015) discusses dredging of the Cooks River in detail and determined that it is not a viable option due to the environmental impacts and cost.	
5	Survey	Support	As a resident of Lawson Avenue (which regularly suffers very bad flooding), I support the proposal to upgrade the pipes into Marrickville Park and to regrade Lawson Avenue so that excess water falls into the park. I hope that these measures will be adequate. I also support the proposal (1.4 on the map) to create a new opening in the mound to allow water to flow to the oval.				These options have been discussed and incorporated in the plan and prioritised against all other options. Due to the condition of the road, road renewal in Lawson Avenue is planned to be undertaken in 2018/19. Given the flooding in Lawson Avenue, Council is taking the opportunity to try and reduce the flooding of properties in the street through regarding the road and upgrading stormwater inlets.	
6	Survey	Strongly support	Lawson Avenue Marrickville regularly floods in heavy rain (at least yearly, to a depth of 1/2 metre or more). I assume that changes proposed (regarding street and large pipes) would prevent this happening, if that is the case I strongly support these changes being made as soon as possible..				These options have been discussed and incorporated in the plan and prioritised against all other options. Due to the condition of the road, road renewal in Lawson Avenue is planned to be undertaken in 2018/19. Given the flooding in Lawson Avenue, Council is taking the opportunity to try and reduce the flooding of properties in the street through regarding the road and upgrading stormwater inlets.	
7	Survey	Strongly support	FM1.1 and FM1.2 - definitely needed for the residents of Lawson Ave, people driving along Frazer St, and in light of the new park upgrade. This is a safety issue.	None	No	No	These options have been discussed and incorporated in the plan and prioritised against all other options.	
8	Survey	Strongly support	I strongly support regrading Lawson Avenue so that it falls the other way. With the grading at the moment it is set up so all the water falls to a single storm water grate which cannot cope with the amount of water, resulting in flooding to the gardens and every time there is heavy rain fall, and 2-3 times a year under the houses on Lawson Avenue. Regrading should fix this issue				These options have been discussed and incorporated in the plan and prioritised against all other options. Due to the condition of the road, road renewal in Lawson Avenue is planned to be undertaken in 2018/19. Given the flooding in Lawson Avenue, Council is taking the opportunity to try and reduce the flooding of properties in the street through regarding the road and upgrading stormwater inlets.	
9	Email	Raised concerns about impacts to the Croquet Club grounds as a result of Option 1.3 - Regrading Lawson Avenue to direct flow into the park. The Club would be most concerned if the Croquet Clubs ground were to become an overland flow path for water runoff from Lawson Ave. This could easily erode the timber baulks that support the croquet lawn.						Council is planning to upgrade the stormwater inlets in Lawson Avenue and regrade the road to better direct water to the stormwater inlets and away from private property. In large events water will continue to flood the croquet lawn and park as it does now. This typically happens in major storms a few times per year and the timber baulks would be able to support the short periods of inundation experienced as they have done in the past. The design of this solution will consider the discharge of this water and its impacts on the Croquet Club.

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

G

DESIGN FLOOD FIGURES –
UPDATED EXISTING SCENARIO

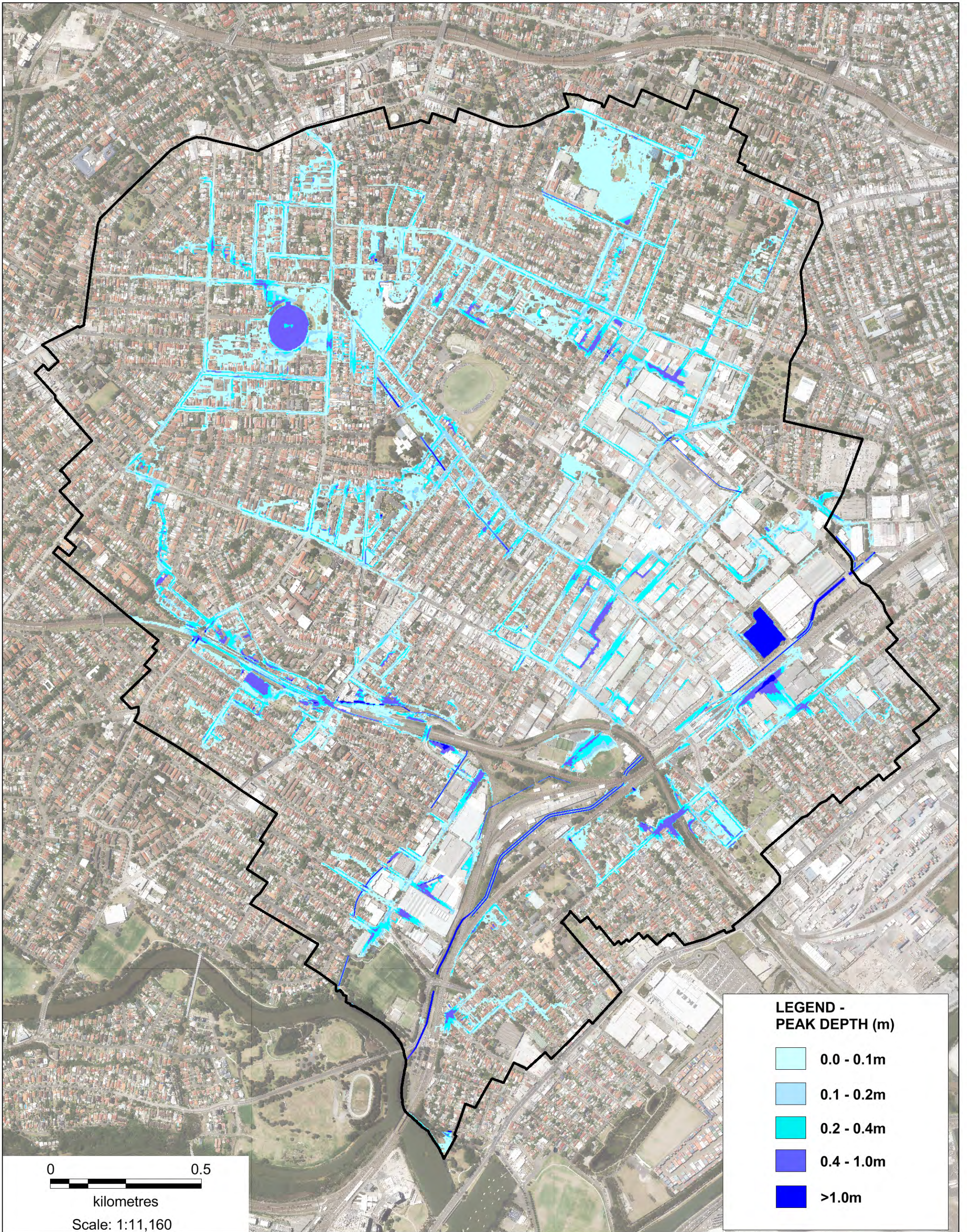


Flood Extents

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56



**LEGEND -
PEAK DEPTH (m)**

- 0.0 - 0.1m
- 0.1 - 0.2m
- 0.2 - 0.4m
- 0.4 - 1.0m
- >1.0m

0
0
0.5

kilometres
Scale: 1:11,160

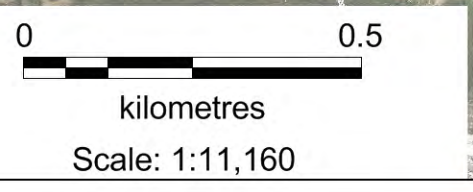
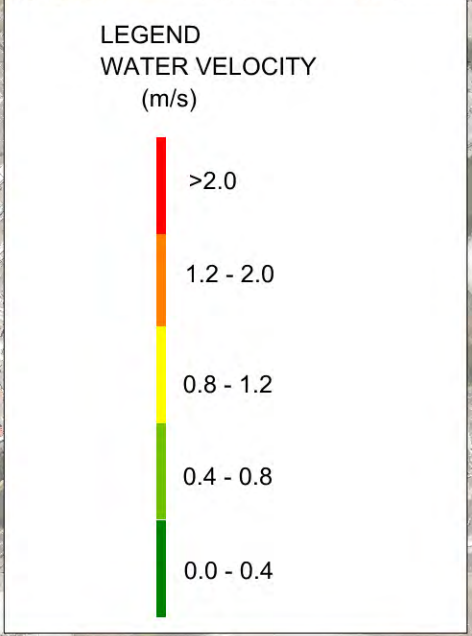
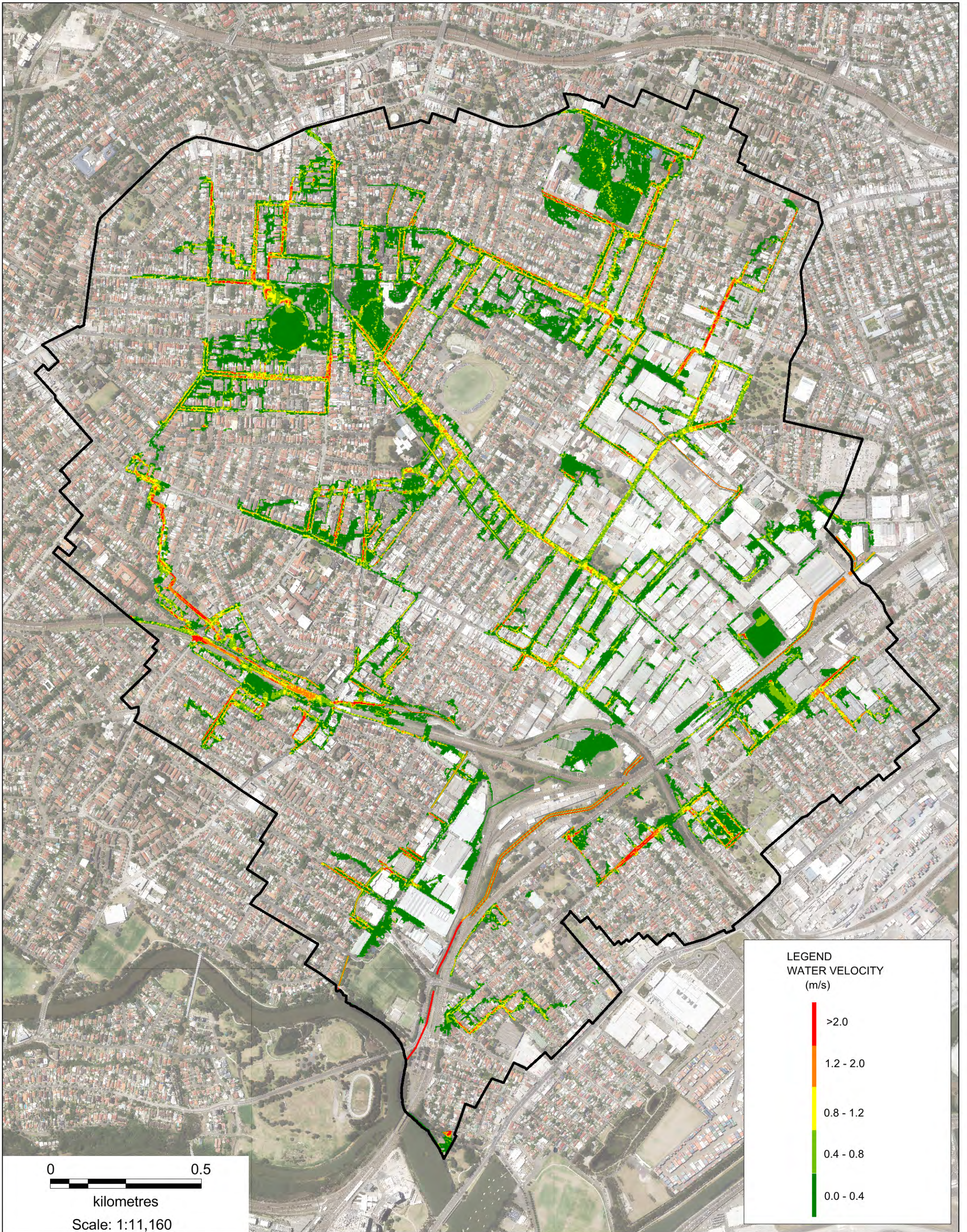


2 Year ARI Flood Depth

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56

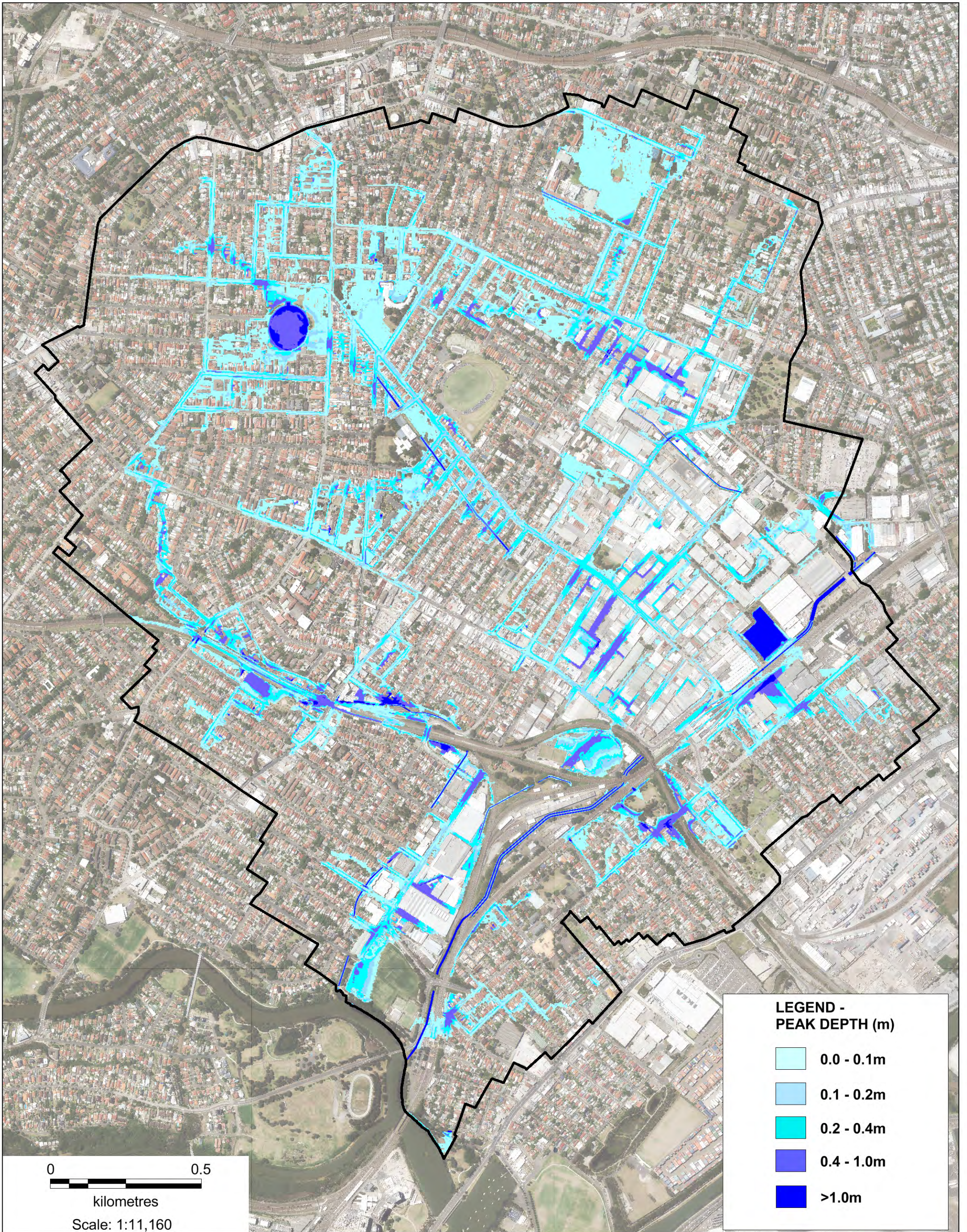


2 Year ARI Flood Velocity



MARRICKVILLE VALLEY FRMS&P



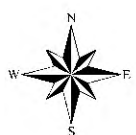
Map Produced by Cardno NSW/ACT Pty Ltd
 Date: January 2017
 Project: 59915195
 Coordinate System: MGA Zone 56



**LEGEND -
PEAK DEPTH (m)**

-  0.0 - 0.1m
-  0.1 - 0.2m
-  0.2 - 0.4m
-  0.4 - 1.0m
-  >1.0m

0 0.5
kilometres
Scale: 1:11,160

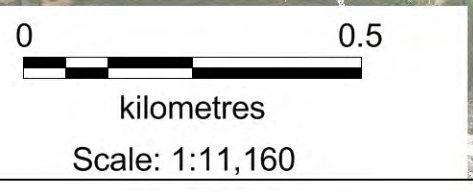
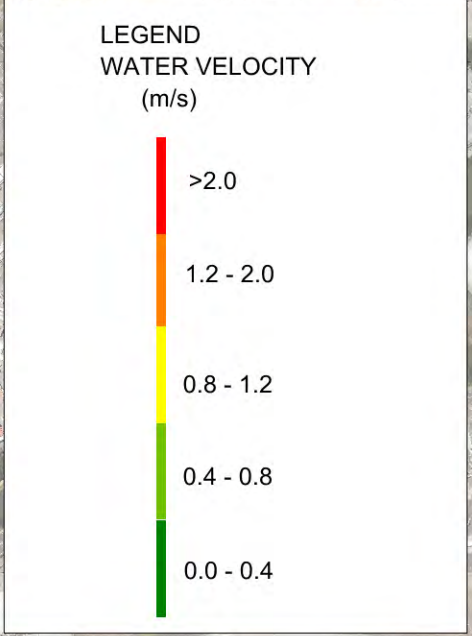
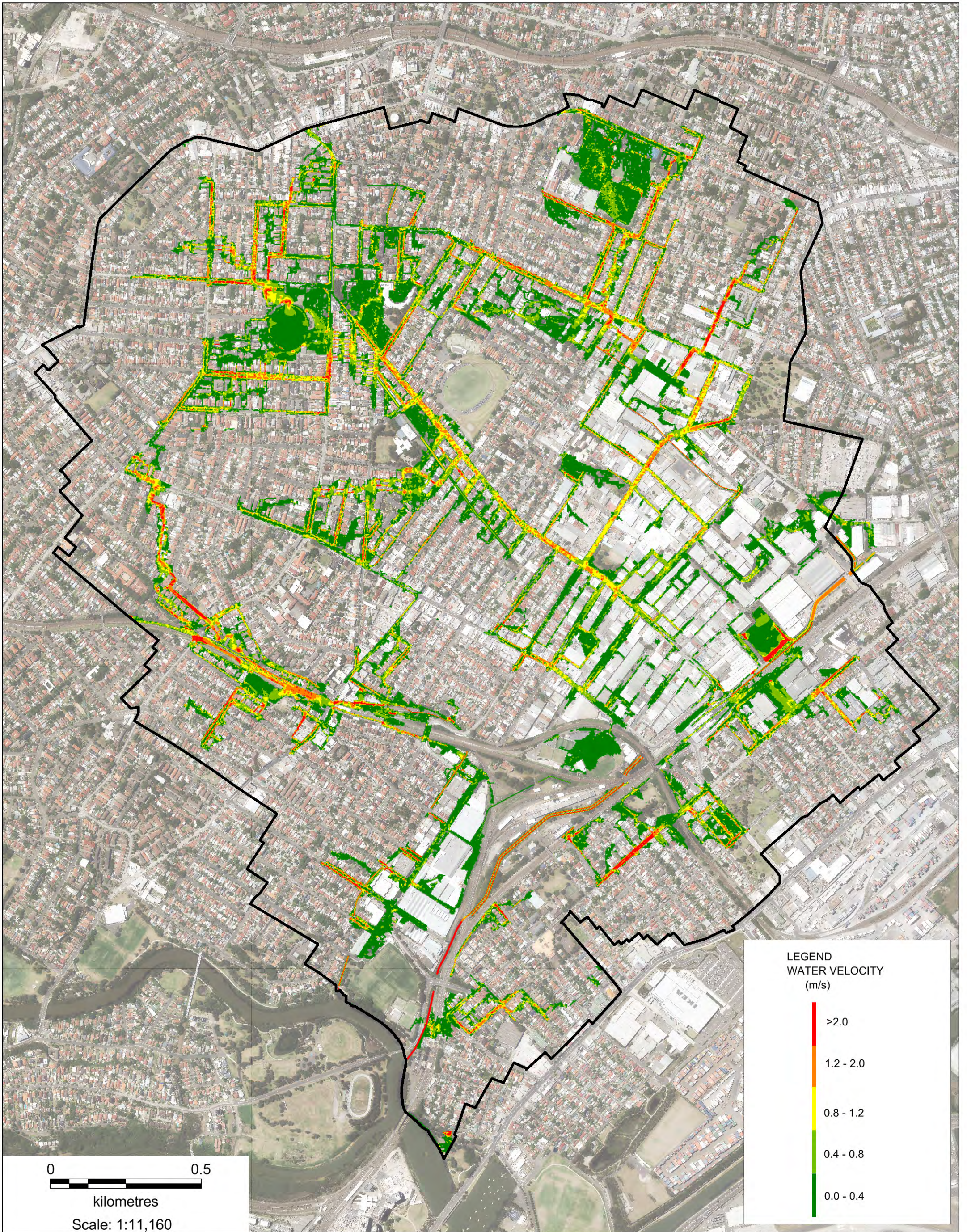


20% AEP Flood Depth

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56

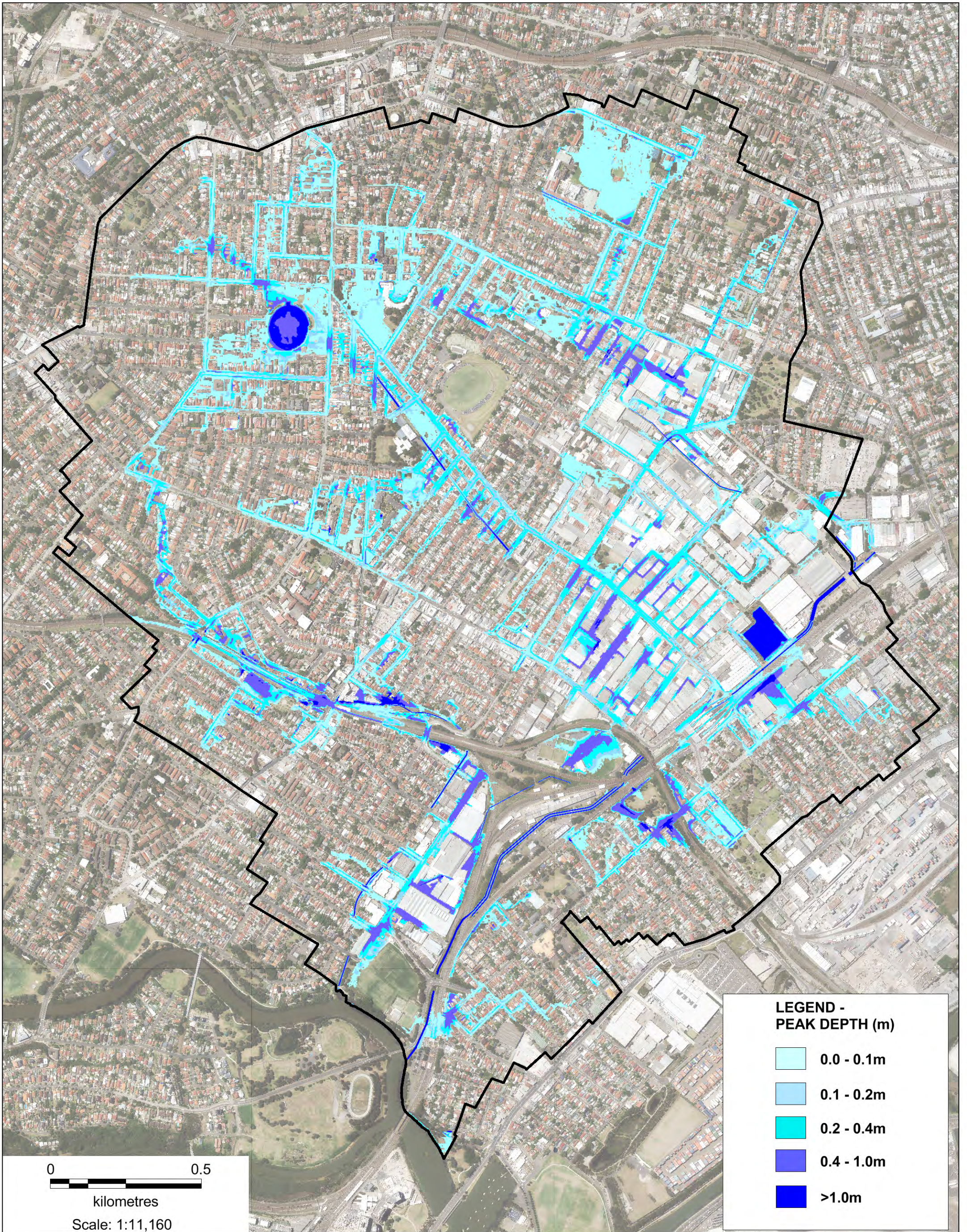


20% AEP Flood Velocity





MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56



**LEGEND -
PEAK DEPTH (m)**

	0.0 - 0.1m
	0.1 - 0.2m
	0.2 - 0.4m
	0.4 - 1.0m
	>1.0m

0 0.5
kilometres
Scale: 1:11,160

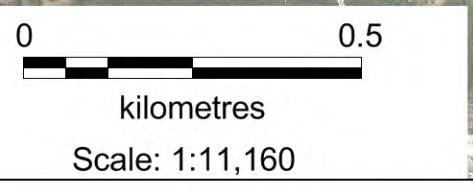
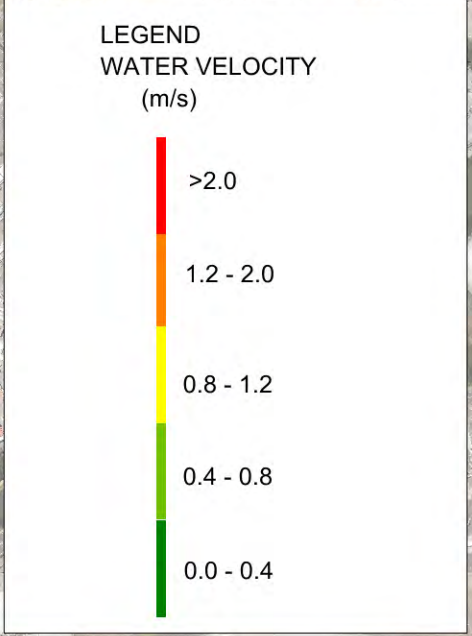
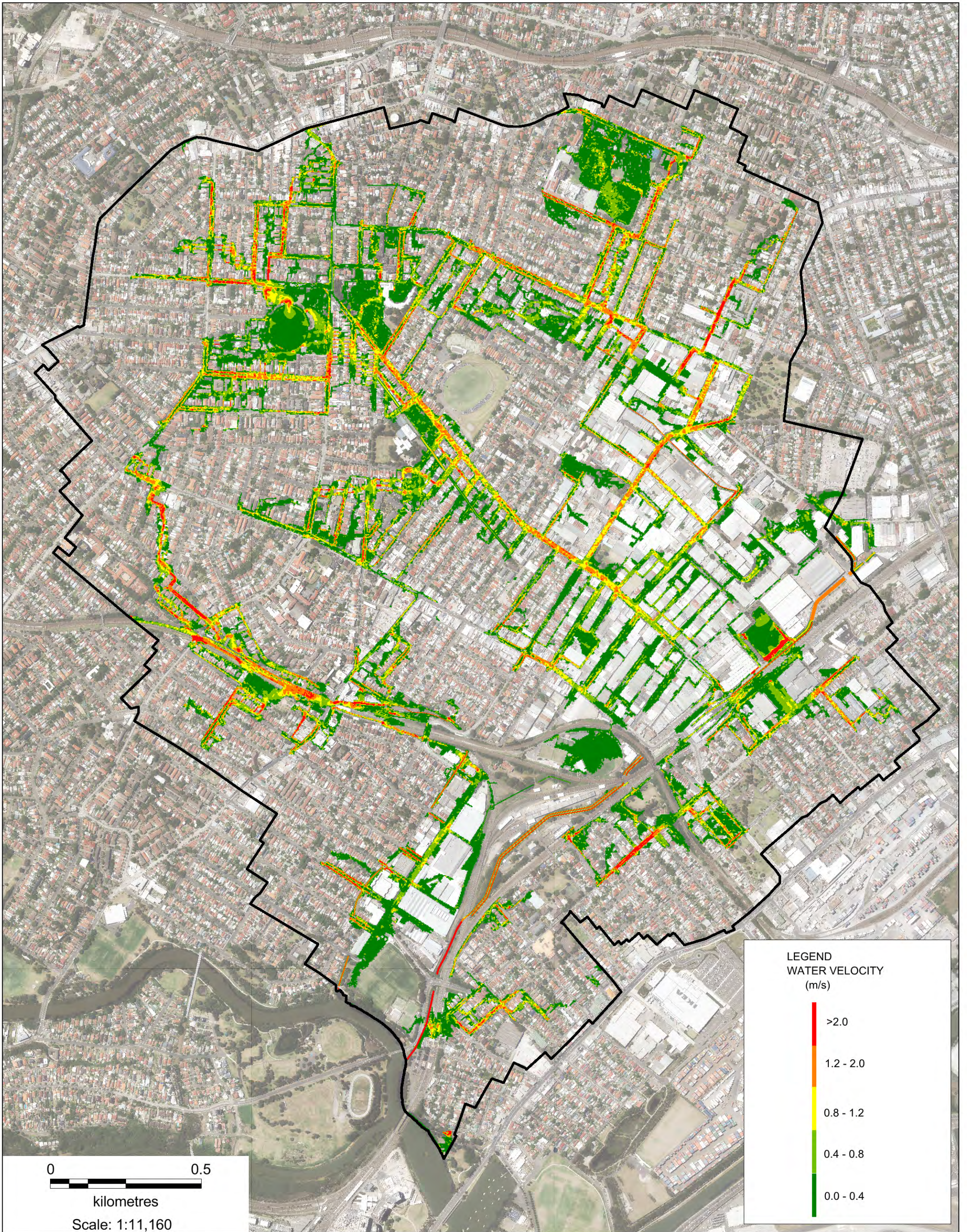


10% AEP Flood Depth

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56

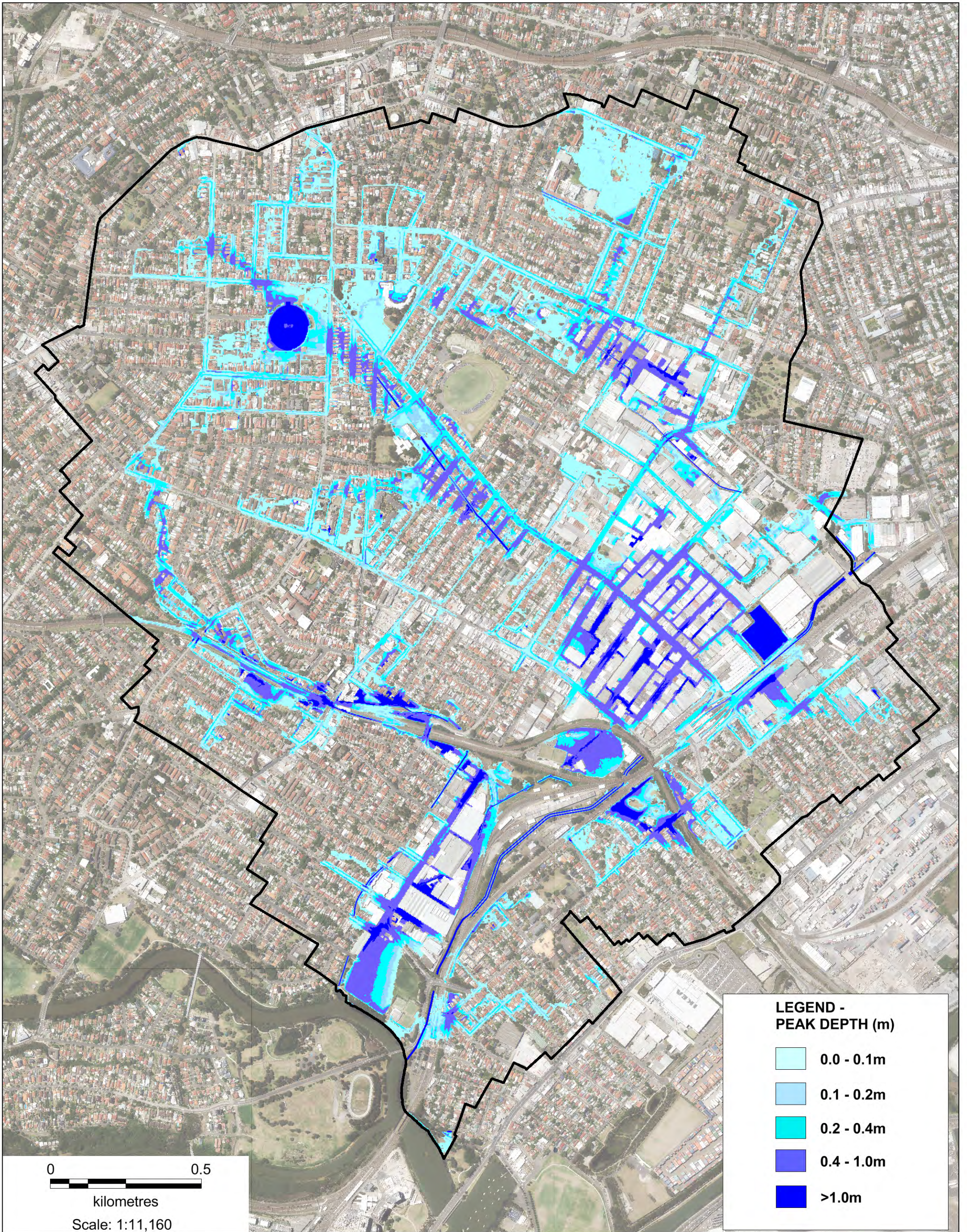


10% AEP Flood Velocity

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56



**LEGEND -
PEAK DEPTH (m)**

- 0.0 - 0.1m
- 0.1 - 0.2m
- 0.2 - 0.4m
- 0.4 - 1.0m
- >1.0m

0
0
0.5

kilometres
Scale: 1:11,160

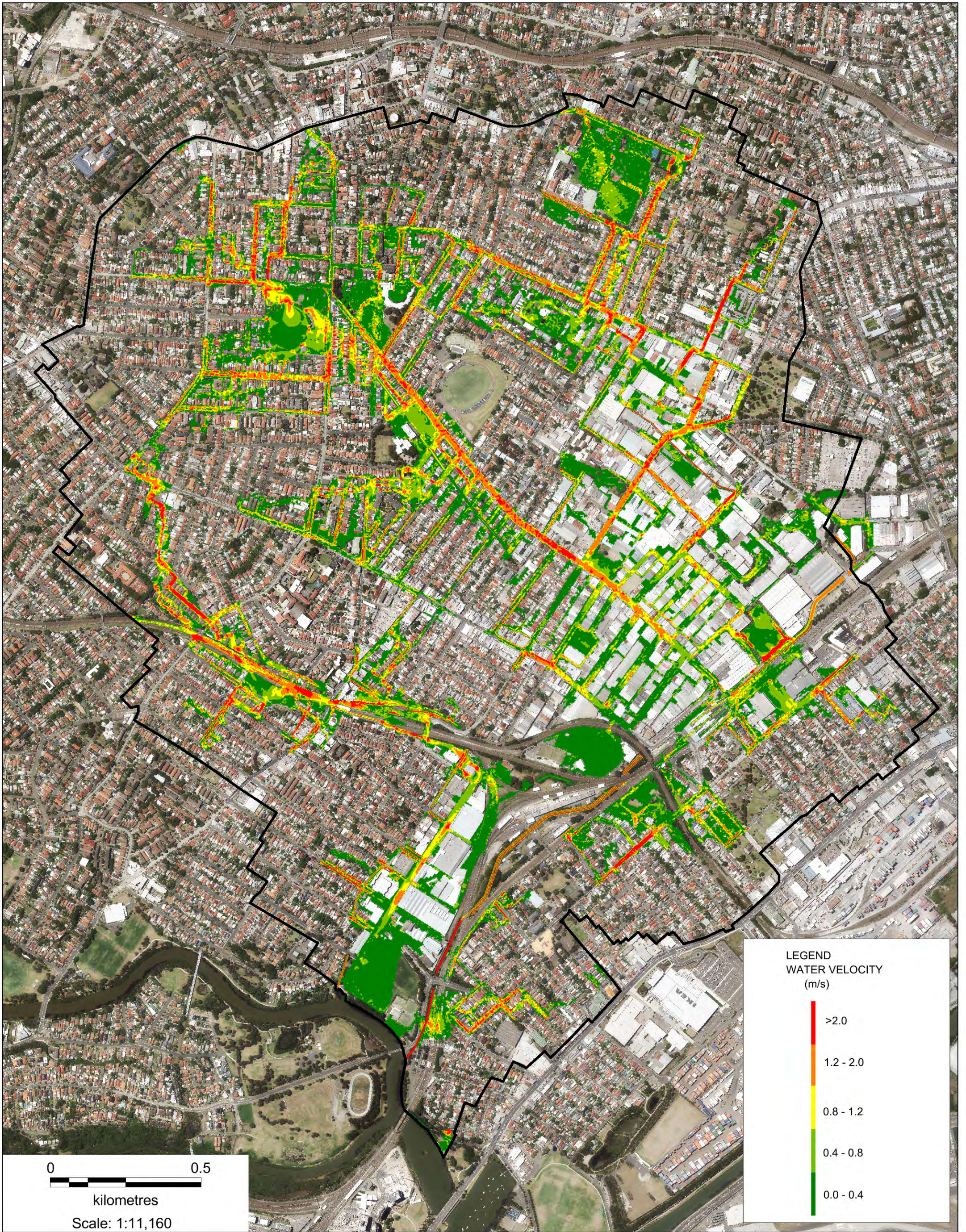


1% AEP Flood Depth

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56

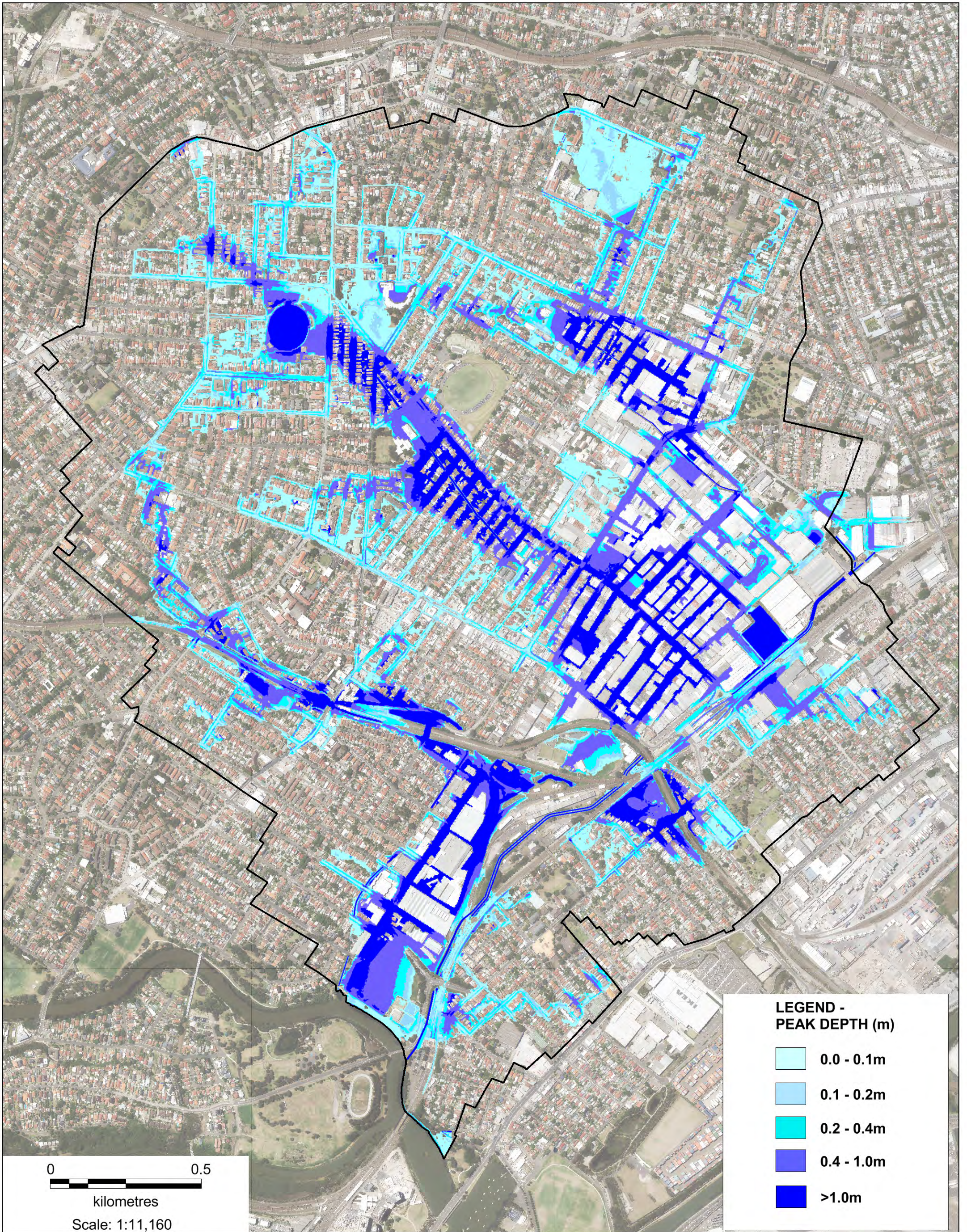


1% AEP Flood Velocity

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56



**LEGEND -
PEAK DEPTH (m)**

- 0.0 - 0.1m
- 0.1 - 0.2m
- 0.2 - 0.4m
- 0.4 - 1.0m
- >1.0m

0
0
0.5

kilometres
Scale: 1:11,160

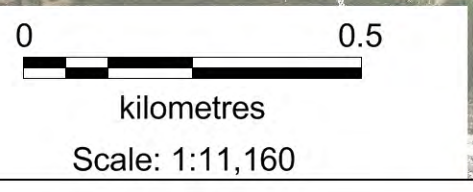
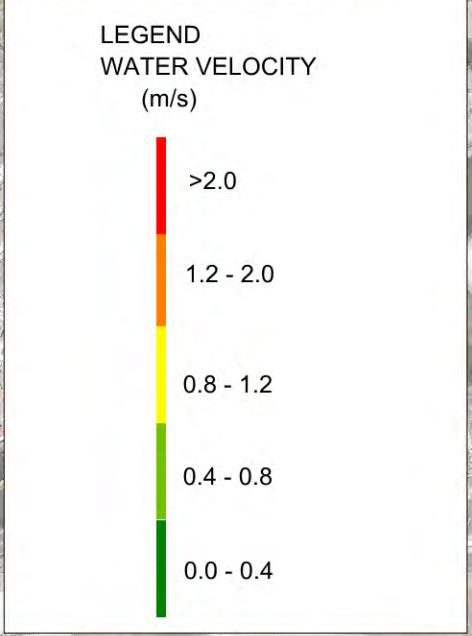
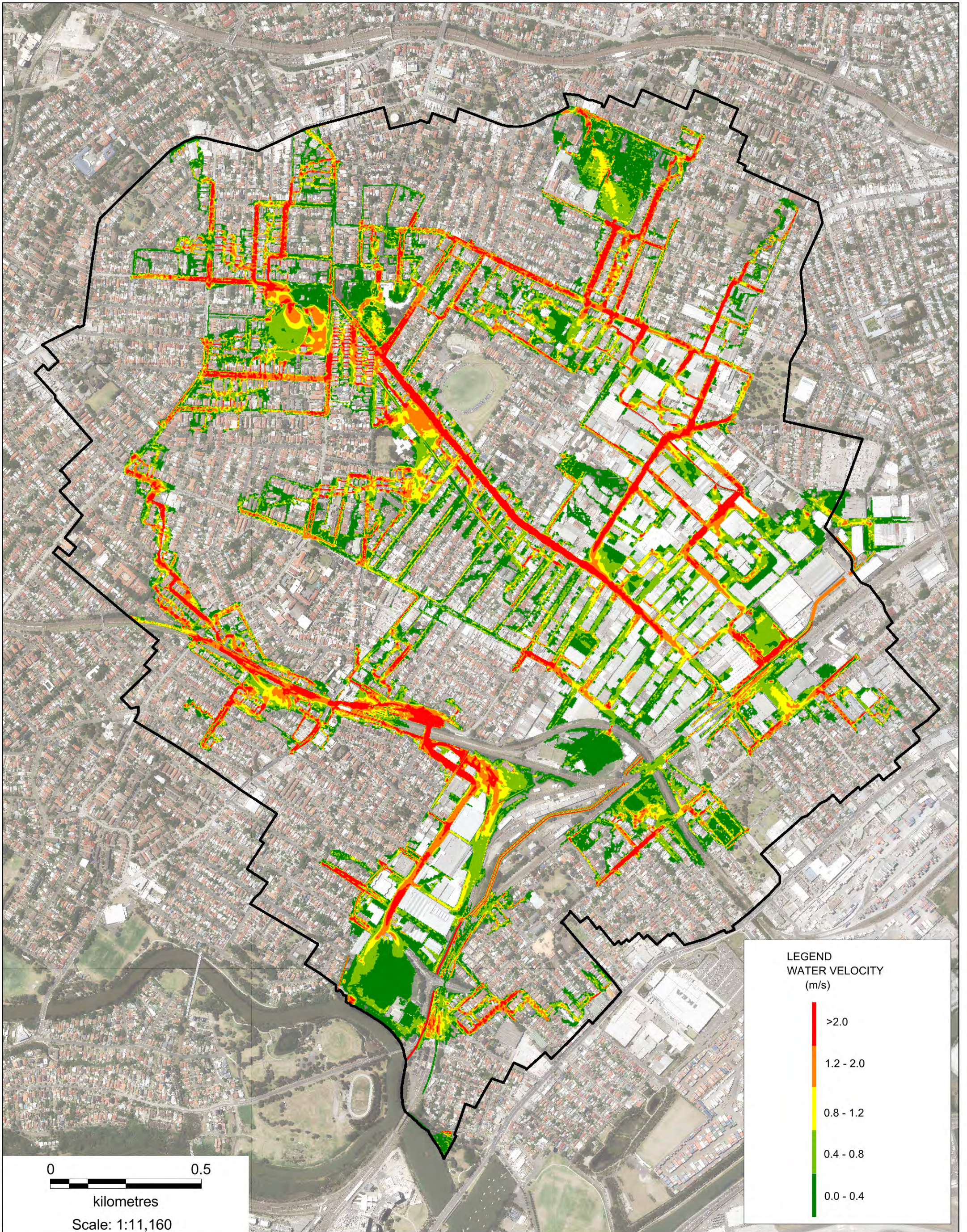


PMF Flood Depth

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56



PMF Flood Velocity

MARRICKVILLE VALLEY FRMS&P



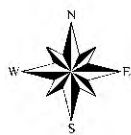
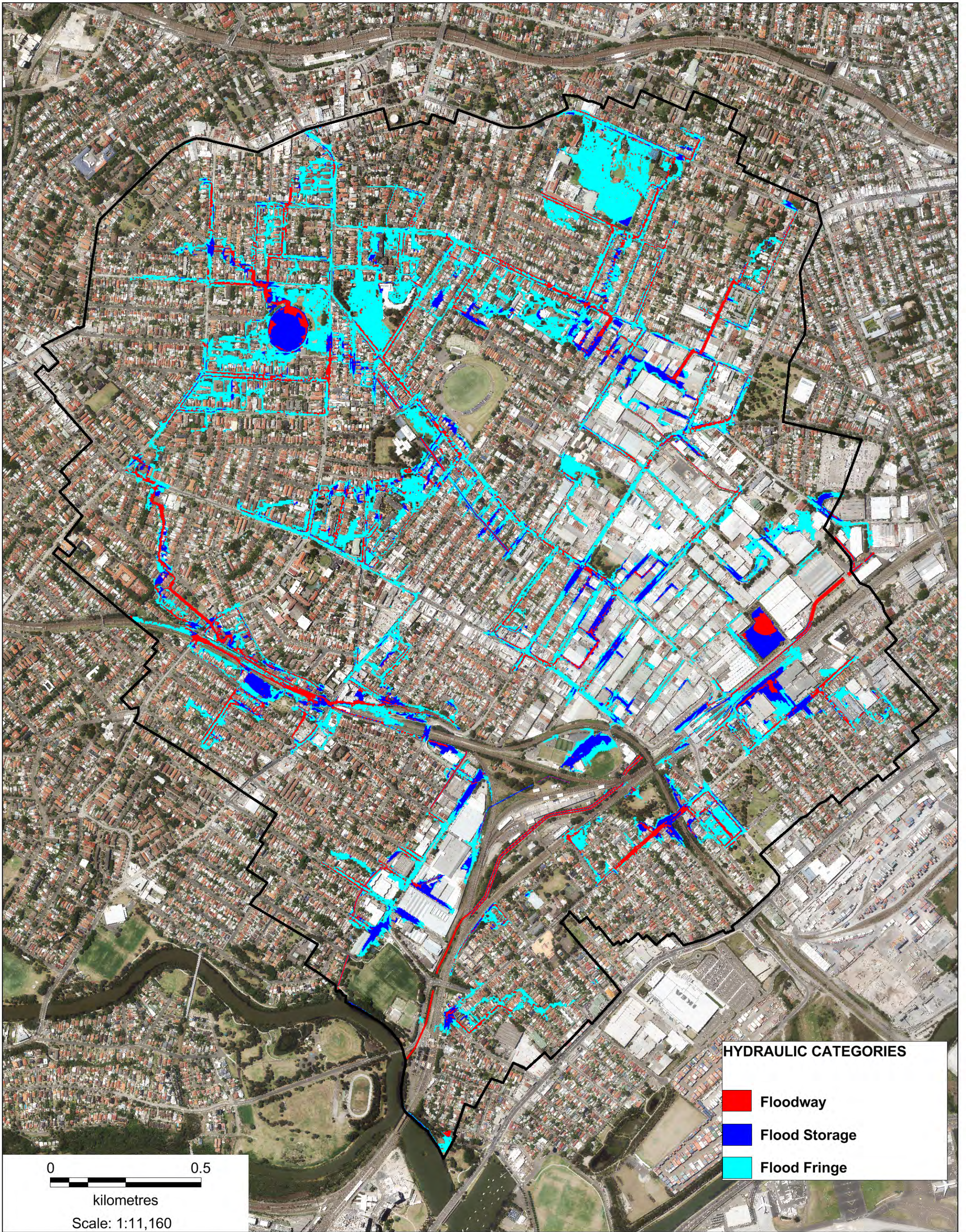
Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

H

HYDRAULIC CATEGORISATION

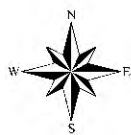
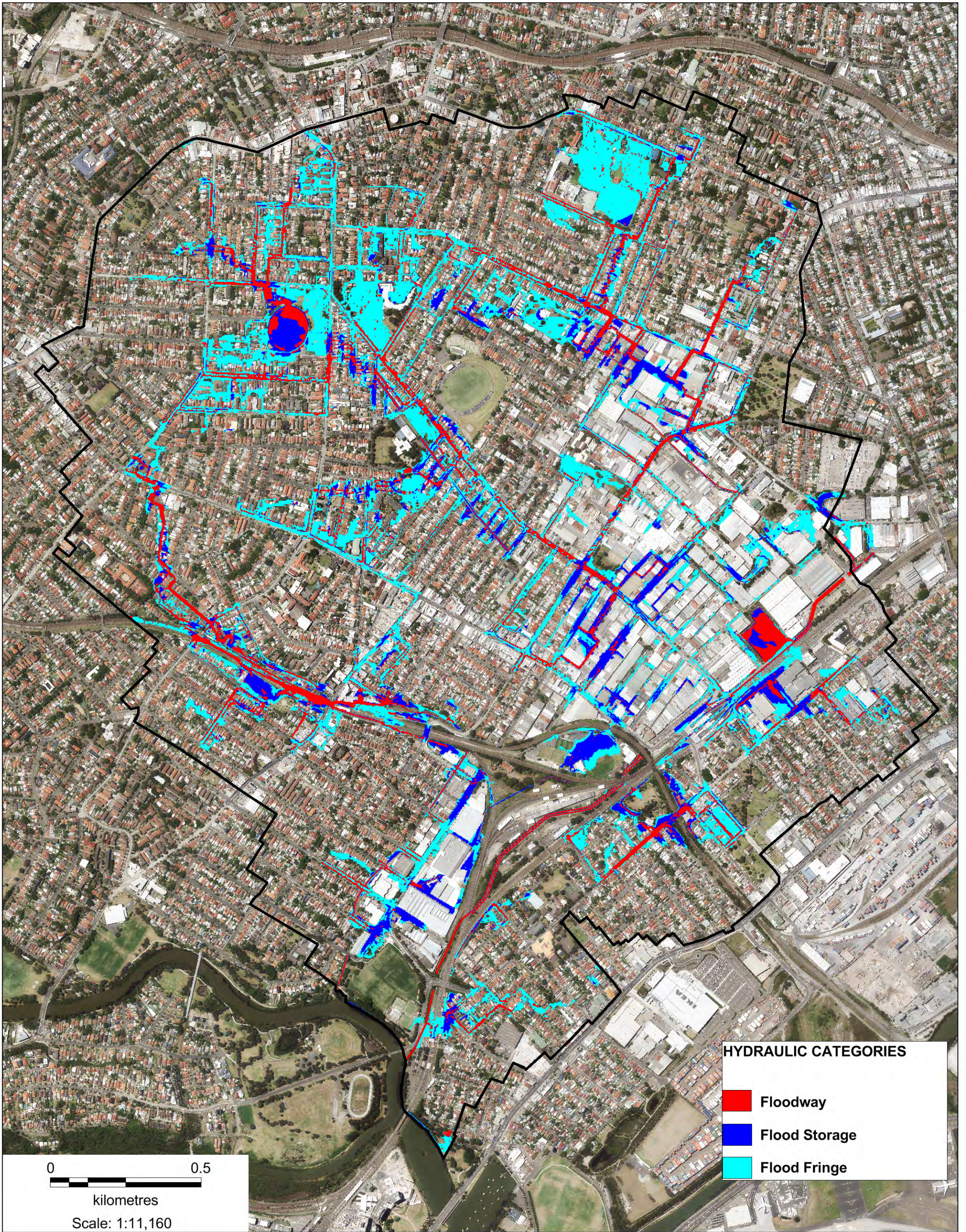


2 Year ARI Hydraulic Categories

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56

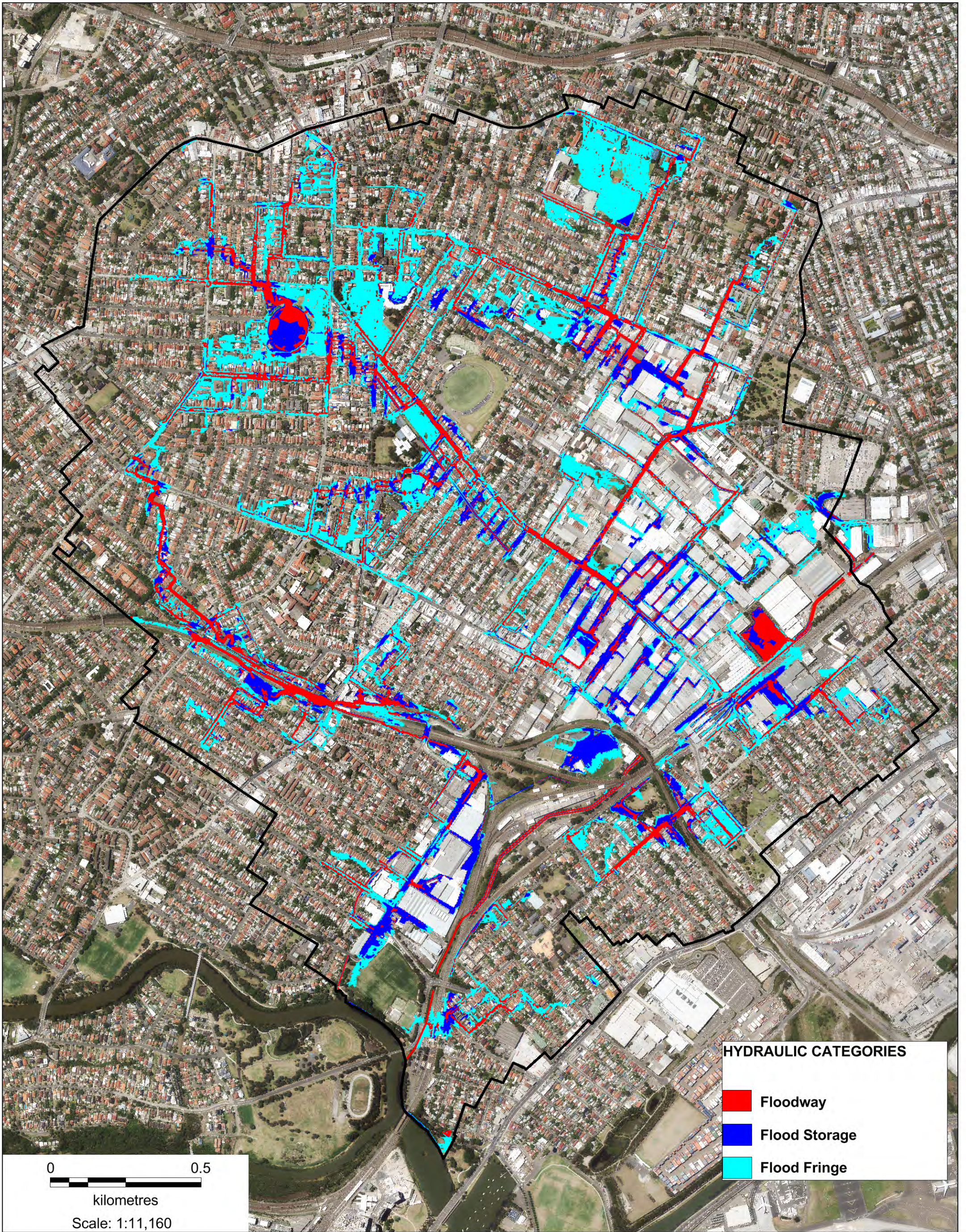


20% AEP Hydraulic Categories

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56

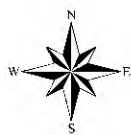
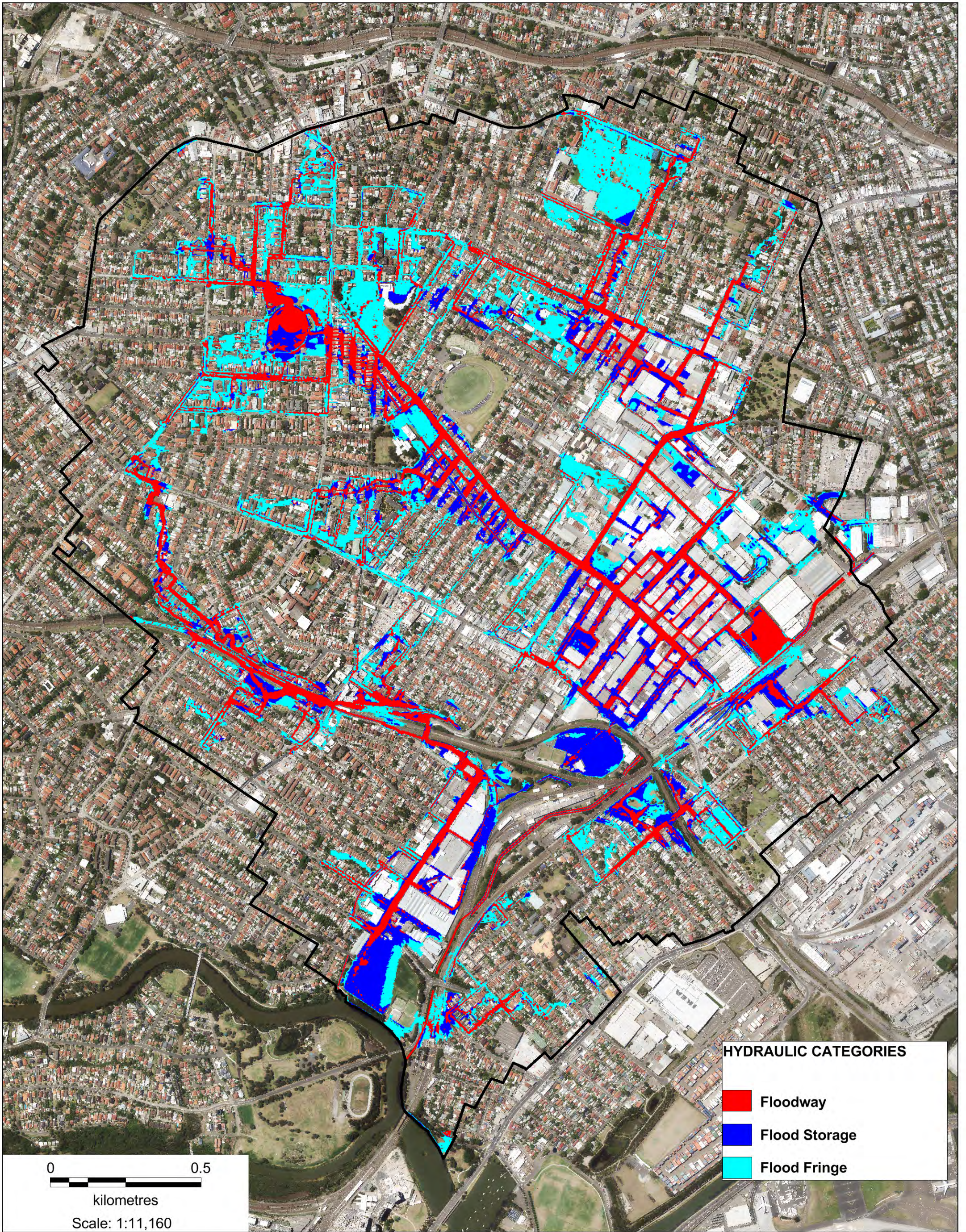


10% AEP Hydraulic Categories

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56

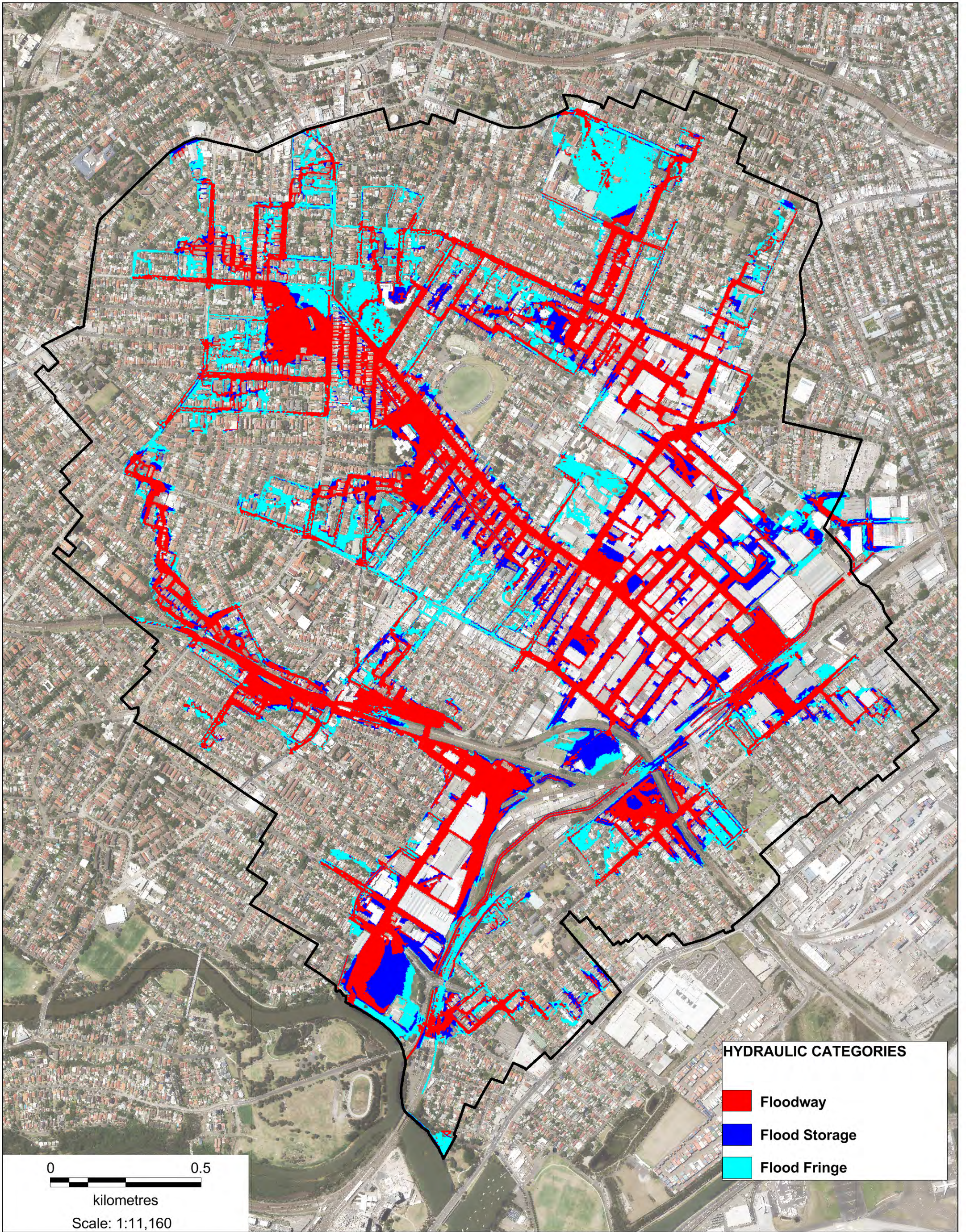


1% AEP Hydraulic Categories




MARRICKVILLE VALLEY FRMS&P

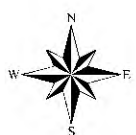


Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56



HYDRAULIC CATEGORIES

-  Floodway
-  Flood Storage
-  Flood Fringe



PMF Hydraulic Categories

MARRICKVILLE VALLEY FRMS&P



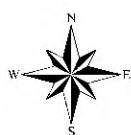
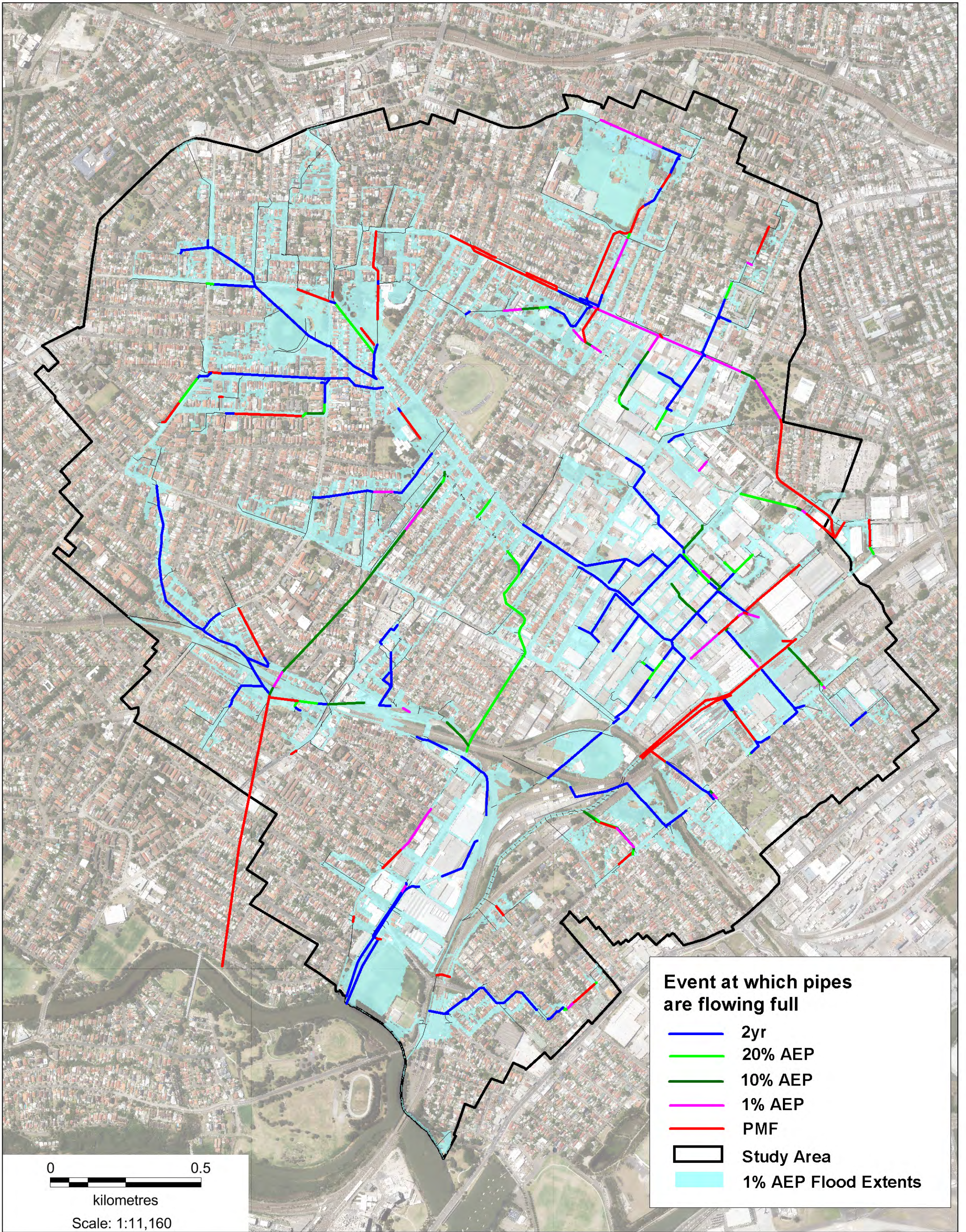
Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

I

PIPE CAPACITY ANALYSIS

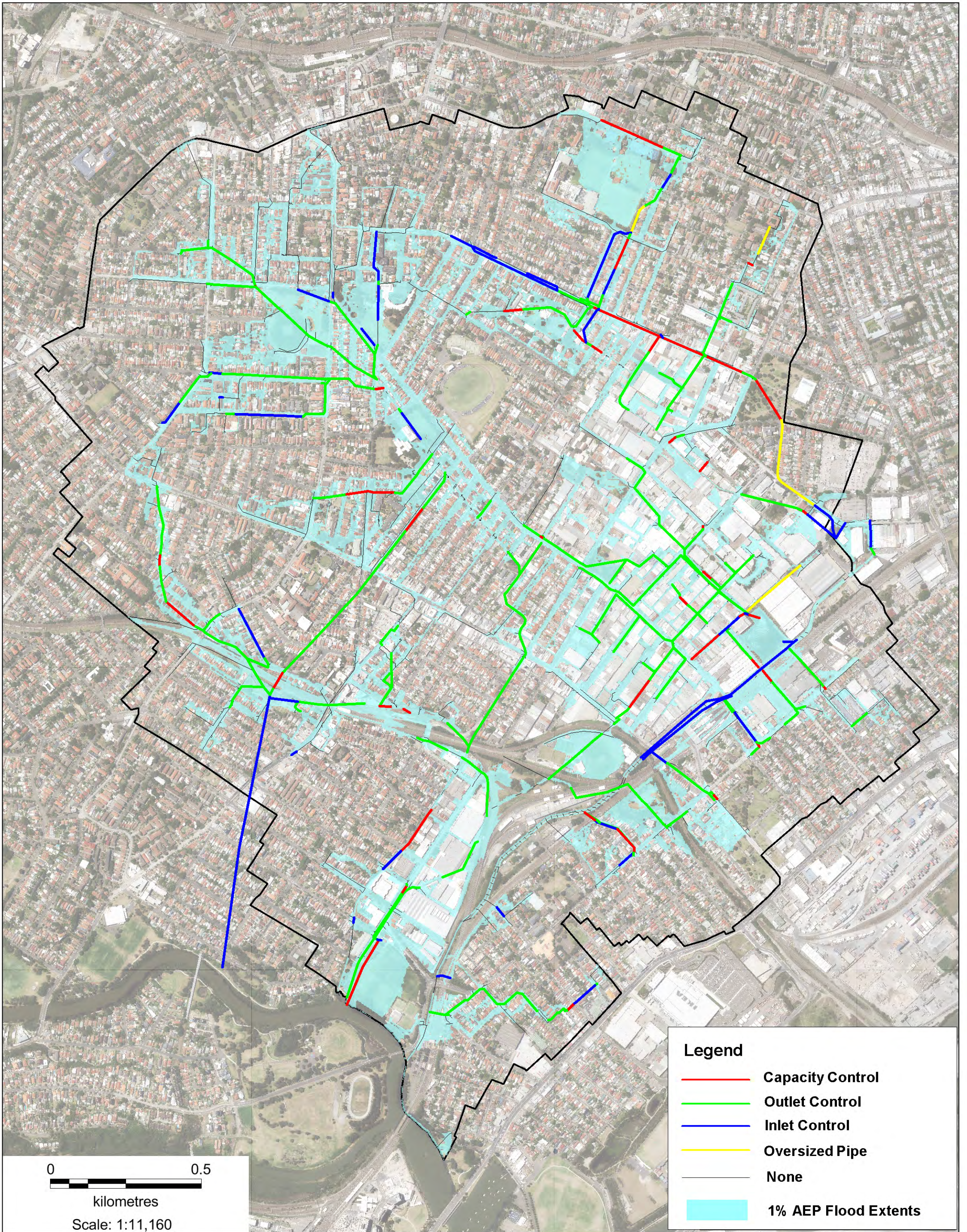


Pipe Capacities

MARRICKVILLE VALLEY FRMS&P



Map Produced by Cardno NSW/ACT Pty Ltd
Date: February 2017
Project: 59915195
Coordinate System: MGA Zone 56



Legend

- Capacity Control
- Outlet Control
- Inlet Control
- Oversized Pipe
- None
- 1% AEP Flood Extents



Pipe Capacities
MARRICKVILLE VALLEY FRMS&P


 Map Produced by Cardno NSW/ACT Pty Ltd
 Date: February 2017
 Project: 59915195
 Coordinate System: MGA Zone 56

59915195 Marrickville Valley FRMSP Pipe Capacity Analysis for pipes >600mm dia

MODEL NAME	LENGTH	US INVERT	DS INVERT	WIDTH	HEIGHT	PIPE SIZE	SLOPE	MANNINGS (n)	NOMINAL CAPACITY	MAX MODELLED FLOW	NOMINAL ARI RETURN FLOW THAT PIPE CAN CONVEY	MODELLED FLOWS					MODELLED EVENT AT WHICH PIPE RUNNING FULL	CONTROL CATEGORY
												PMF	100yr	10yr	5yr	2yr		
STC14811	7.5	9.6	9.6	0.8	0	750	0.005306	0.015	0.70	1.21	less than 2yr	1.208	1.142	1.142	1.142	1.142	2yr	Capacity
STC14812	11.3	9.6	9.4	0.8	0	750	0.014139	0.015	1.15	1.80	less than 2yr	1.796	1.796	1.796	1.774	1.774	2yr	Capacity
STC14404	73.8	9.4	7.4	0.8	0	750	0.026919	0.015	1.58	1.50	100yr	1.495	1.445	1.443	1.443	1.443	100yr	Capacity
STC14405	23.5	7.4	6.8	1.1	0	1050	0.028205	0.015	3.97	1.49	100yr	1.492	1.449	1.433	1.429	1.409	2yr	Outlet
STC14425	78.2	6.8	6.4	1.1	0	1050	0.005	0.015	1.67	1.38	100yr	1.377	1.337	1.337	1.337	1.336	2yr	Outlet
STC14819	14.8	6.4	6.3	1.1	0	1050	0.005405	0.015	1.74	1.45	100yr	1.453	1.441	1.441	1.441	1.408	2yr	Outlet
STC14813	71.3	6.3	5.9	1.1	0	1050	0.005412	0.015	1.74	1.98	2yr to 5yr	1.979	1.797	1.796	1.78	1.728	2yr	Outlet
STC14831	18.0	4.0	4.0	2.8	2.435	2820	0.005	0.015	24.37	13.24	100yr	13.24	13.049	12.766	11.253	9.767	5yr	Outlet
STC15960b	90.0	3.7	3.5	2.9	2.591	2896	0.005	0.015	27.45	21.95	100yr	21.954	20.11	18.214	15.99	11.929	100yr	Capacity
STC15960c	259.3	3.5	2.3	2.9	2.896	2896	0.005	0.015	31.88	22.11	100yr	22.107	19.776	18.327	15.92	11.898	10yr	Outlet
STC15960d	229.0	2.3	2.0	2.9	2.896	2896	0.005	0.015	31.88	21.79	100yr	21.79	19.775	18.805	15.696	11.798	10yr	Outlet
STC15960e	133.2	2.0	1.8	2.9	2.896	2896	0.005	0.015	31.88	21.95	100yr	21.945	19.782	18.152	15.595	11.747	10yr	Outlet
STC15960f	60.3	1.8	1.7	2.9	2.896	2896	0.005	0.015	31.88	22.35	100yr	22.352	19.837	18.049	15.56	11.738	100yr	Capacity
STC15961	22.5	1.7	1.6	3.3	2.896	3277	0.005293	0.015	38.63	22.96	100yr	22.96	19.786	18.055	15.547	11.737	10yr	Outlet
STC15961b	518.9	1.6	0.6	3.3	2.896	3277	0.005	0.015	37.54	27.12	100yr	27.12	22.531	20.779	18.17	14.247	None	Inlet
STC15961a	398.5	0.6	-0.4	3.3	2.896	3277	0.005	0.015	37.54	26.21	100yr	26.206	22.506	20.257	17.91	14.141	None	Inlet
STC11714	77.0	2.1	2.0	2.6	1.7	2640	0.005	0.015	13.63	4.84	100yr	4.844	4.516	4.516	3.971	3.267	5yr	Outlet
STC11924	244.1	2.0	1.7	3.1	2	3050	0.005	0.015	20.55	5.39	100yr	5.394	4.562	4.379	4.186	3.231	5yr	Outlet
STC15693	39.8	1.7	1.5	3.1	2	3050	0.005	0.015	20.55	6.01	100yr	6.013	6.013	6.013	5.726	3.192	5yr	Outlet
STC15693a	20.9	1.5	1.5	4.9	1.8	4880	0.005	0.015	31.31	19.86	100yr	19.86	17.127	16.518	12.669	8.012	5yr	Outlet
STC15700	21.0	1.4	1.3	4.9	1.805	4875	0.005	0.015	31.40	13.66	100yr	13.664	13.664	13.664	12.336	7.852	100yr	Capacity
STC15697	113.5	1.3	1.3	5.0	1.88	4950	0.005	0.015	33.97	13.66	100yr	13.665	13.655	13.655	12.348	7.88	100yr	Capacity
STC10755	35.2	1.3	1.3	5.0	1.88	5030	0.005	0.015	34.62	13.65	100yr	13.645	13.645	13.645	12.355	7.904	100yr	Capacity
STC15699	72.0	1.3	1.2	5.0	1.88	5030	0.005	0.015	34.62	13.54	100yr	13.537	13.537	13.537	12.283	7.902	None	Inlet
STC12038	12.7	1.2	1.1	5.0	1.88	5030	0.005842	0.015	37.42	13.56	100yr	13.558	13.558	13.558	12.367	8.001	None	Inlet
STC11802a	17.7	1.0	1.0	5.0	1.88	5030	0.005	0.015	34.62	13.51	100yr	13.505	13.269	13.151	12.711	8.331	None	Inlet
STC12056	13.3	2.7	2.7	3.1	1.75	3050	0.005	0.015	17.01	6.54	100yr	6.539	4.355	4.019	4.019	2.952	5yr	Outlet
STC12055	12.6	2.4	2.4	2.6	1.7	2640	0.005	0.015	13.63	4.86	100yr	4.858	3.911	3.688	3.631	3.011	5yr	Outlet
STC11736	18.0	2.2	2.2	2.6	1.7	2640	0.005	0.015	13.63	4.74	100yr	4.742	3.963	3.82	3.718	3.09	5yr	Outlet
STC11907	17.5	2.2	2.2	2.6	1.7	2640	0.005	0.015	13.63	4.75	100yr	4.753	3.971	3.855	3.724	3.097	5yr	Outlet
STC15415	13.5	2.2	2.2	2.6	1.7	2640	0.005	0.015	13.63	4.77	100yr	4.765	3.979	3.904	3.73	3.105	5yr	Outlet
STC12052a	39.1	2.2	2.1	2.6	1.7	2640	0.005	0.015	13.63	4.78	100yr	4.778	4.038	4.038	3.751	3.118	5yr	Outlet
STC12052	16.8	2.1	2.1	2.6	1.7	2640	0.005	0.015	13.63	4.79	100yr	4.793	4.065	4.065	3.747	3.131	5yr	Outlet
STC11859	55.2	4.5	4.2	0.6	0	600	0.005076	0.015	0.38	0.47	100yr	0.473	0.352	0.262	0.236	0.165	5yr	Outlet
STC11858	16.4	4.2	4.2	0.6	0	600	0.005	0.015	0.38	1.04	5yr to 10yr	1.038	0.727	0.414	0.369	0.236	5yr	Outlet
STC11845	20.7	10.6	10.4	0.6	0	600	0.008394	0.015	0.49	0.29	100yr	0.292	0.253	0.224	0.213	0.207	2yr	Outlet
STC11842	42.7	10.4	10.0	0.8	0	750	0.009236	0.015	0.93	0.25	100yr	0.248	0.191	0.181	0.181	0.177	2yr	Outlet
STC11841	4.6	10.0	10.0	0.8	0	750	0.006978	0.015	0.81	0.32	100yr	0.319	0.253	0.253	0.253	0.248	2yr	Outlet
STC12074	7.2	10.0	9.9	0.8	0	750	0.006366	0.015	0.77	0.29	100yr	0.287	0.275	0.274	0.274	0.274	2yr	Outlet
STC11838	9.1	9.9	9.8	0.8	0	750	0.01543	0.015	1.20	0.29	100yr	0.289	0.289	0.287	0.287	0.284	2yr	Outlet
STC11727	60.6	7.9	6.3	0.6	0	600	0.0268	0.015	0.87	0.51	100yr	0.514	0.514	0.514	0.514	0.512	2yr	Outlet
STC15244	49.7	6.3	4.8	0.6	0	600	0.030602	0.015	0.93	0.62	100yr	0.616	0.575	0.575	0.575	0.572	2yr	Outlet
STC11720a	58.9	4.8	3.4	0.6	0	600	0.023921	0.015	0.82	0.57	100yr	0.569	0.569	0.569	0.569	0.569	2yr	Outlet
STC12023	5.3	3.4	3.4	0.6	0	600	0.006	0.015	0.41	0.57	less than 2yr	0.568	0.568	0.568	0.568	0.568	2yr	Capacity
STC11783a	12.0	3.4	3.3	0.6	0	600	0.005266	0.015	0.39	0.52	less than 2yr	0.521	0.521	0.521	0.521	0.521	2yr	Capacity
STC12029	20.1	16.9	16.0	0.6	0.6	600	0.045901	0.015	1.45	0.33	100yr	0.327	0.199	0.132	0.113	0.079	None	Inlet
STC11843	3.4	10.4	10.4	0.8	0	750	0.005	0.015	0.68	0.31	100yr	0.309	0.202	0.202	0.202	0.202	2yr	Outlet
STC12009	13.0	7.9	7.1	0.9	0.3	900	0.060045	0.015	1.03	0.19	100yr	0.193	0.193	0.193	0.193	0.193	2yr	Outlet
STC11818	33.3	6.9	6.3	0.6	0	600	0.019898	0.015	0.75	0.26	100yr	0.262	0.24	0.225	0.207	0.165	2yr	Outlet
STC11721	25.2	6.3	5.4	0.6	0	600	0.035713	0.015	1.01	0.38	100yr	0.38	0.378	0.378	0.378	0.375	2yr	Outlet
STC11721a	12.6	5.2	5.1	0.6	0	600	0.008041	0.015	0.48	0.39	100yr	0.389	0.389	0.389	0.389	0.377	2yr	Outlet
STC11720	42.2	4.8	3.7	0.6	0	600	0.025732	0.015	0.85	0.37	100yr	0.371	0.371	0.371	0.371	0.358	2yr	Outlet
STC11783b	27.1	3.7	3.3	0.6	0	600	0.015327	0.015	0.66	0.37	100yr	0.367	0.367	0.367	0.367	0.351	2yr	Outlet
STC11826	7.4	8.7	8.6	0.8	0	750	0.00719	0.015	0.82	0.61	100yr	0.607	0.54	0.54	0.509	0.409	2yr	Outlet
STC12013	19.2	8.6	8.3	0.8	0	750	0.01654	0.015	1.24	0.60	100yr	0.596	0.527	0.527	0.506	0.408	5yr	Outlet
STC11825	7.3	9.1	8.9	0.6	0	600	0.030082	0.015	0.92	0.16	100yr	0.162	0.162	0.069	0.062	0.049	2yr	Outlet
STC11824	9.4	8.9	8.7	0.6	0	600	0.0235	0.015	0.82	0.27	100yr	0.272	0.264	0.192	0.173	0.147	2yr	Outlet
STC10740	12.4	-0.1	-0.2	2.5	1.7	2500	0.008972	0.015	17.04	0.47	100yr	0.465	0.332	0.21	0.165	0.162	2yr	Outlet
STC10739	5.6	-0.2	-0.2	2.5	1.7	2500	0.006453	0.015	14.45	0.58	100yr	0.579	0.477	0.31	0.246	0.183	2yr	Outlet
STC10815	103.2	-0.4	-0.4	0.8	0	800	0.005	0.015	0.81	2.84	less than 2yr	2.841	2.841	2.841	2.841	2.841	2yr	Capacity
STC10737	135.6	-0.4	-0.4	0.8	0	750	0.005	0.015	0.68	2.84	less than 2yr	2.841	2.841	2.841	2.841	2.841	2yr	Capacity
STC10761	4.9	1.2	1.0	0.6	0	600	0.043034	0.015	1.10	0.45	100yr	0.446	0.225	0.138	0.129	0.108	2yr	Outlet
STC11807	125.5	3.4	2.8	0.6	0	600	0.005	0.015	0.38	0.42	100yr	0.422	0.043	0.036	0.036	0.028	2yr	Outlet
STC14524a	113.4	12.8	11.8	1.1	0	1050	0.009085	0.015	2.26	1.75	100yr	1.748	1.671	1.644	1.644	1.638	2yr	Outlet
STC15603	8.6	11.8	11.7	1.1	0	1050	0.01048	0.015	2.42	1.86	100yr	1.861	1.861	1.857	1.857	1.857	2yr	Outlet
STC15604	27.0	11.7	11.4	1.1	0	1050	0.011124	0.015	2.50	1.89	100yr	1.888	1.888	1.888	1.888	1.888	2yr	Outlet
STC15605	43.5	11.4	11.0	1.1	0	1050	0.00828	0.015	2.15	1.95	100yr	1.954	1.954	1.954	1.954	1.954	2yr	Outlet

STC15414	31.9	7.7	7.4	1.2	0	1200	0.009343	0.015	3.27	1.72	100yr	1.724	1.183	1.176	1.164	1.044	2yr	Outlet
STC14210	16.5	7.4	6.9	1.2	0	1200	0.029612	0.015	5.81	2.47	100yr	2.469	1.517	1.452	1.452	1.221	2yr	Outlet
STC14018	23.5	6.8	5.1	1.2	0	1200	0.07283	0.015	9.12	3.15	100yr	3.152	2.854	2.633	2.589	2.4	100yr	Capacity
STC14016	229.6	5.1	4.6	2.6	2.13	2600	0.005	0.015	18.27	5.04	100yr	5.043	4.905	4.085	3.968	3.668	100yr	Capacity
STC14038	139.1	4.6	4.3	2.8	2.13	2750	0.005	0.015	19.65	7.08	100yr	7.079	7.079	4.589	4.397	4.001	100yr	Capacity
STC14054	14.8	4.3	4.2	2.8	2.13	2750	0.005	0.015	19.65	7.18	100yr	7.184	7.184	4.746	4.541	4.12	100yr	Capacity
STC14053	133.8	4.2	3.9	3.2	2.13	3200	0.005	0.015	23.85	8.94	100yr	8.943	8.943	6.245	5.929	5.381	100yr	Capacity
STC14004	30.7	3.9	3.8	3.2	2.13	3200	0.005	0.015	23.85	9.45	100yr	9.452	9.452	6.419	6.131	5.579	10yr	Outlet
STC14004a	17.1	3.8	3.8	3.2	2.13	3200	0.005	0.015	23.85	9.07	100yr	9.074	9.074	6.473	6.218	5.641	10yr	Outlet
STC14102	159.4	3.8	3.5	3.2	2.13	3200	0.005	0.015	23.85	8.69	100yr	8.687	8.687	6.858	6.858	5.98	100yr	Capacity
STC15233	19.7	3.5	3.4	3.2	2.13	3200	0.005	0.015	23.85	8.15	100yr	8.148	7.96	6.75	6.502	5.879	None	Oversized pipe
STC14238	158.4	3.4	3.0	3.2	2.13	3200	0.005	0.015	23.85	8.06	100yr	8.056	7.793	6.68	6.434	5.808	None	Oversized pipe
STC14040	16.1	3.0	3.0	3.2	2.13	3200	0.005	0.015	23.85	8.05	100yr	8.047	7.683	6.615	6.363	5.741	None	Oversized pipe
STC15232	14.6	3.0	3.0	4.0	1.83	3960	0.005	0.015	24.99	8.04	100yr	8.044	7.667	6.604	6.349	5.73	None	Oversized pipe
STC14003	136.6	3.0	2.7	4.0	1.83	3960	0.005	0.015	24.99	8.04	100yr	8.04	7.587	6.539	6.272	5.665	None	Oversized pipe
STC14246	58.7	2.7	2.5	4.0	1.83	3960	0.005	0.015	24.99	7.86	100yr	7.861	7.729	6.696	6.429	5.844	None	Inlet
STC15231	18.2	2.5	2.5	4.0	1.83	3960	0.005	0.015	24.99	7.82	100yr	7.822	7.728	6.69	6.415	5.831	None	Inlet
STC15224b	29.7	2.5	2.4	2.3	1.83	2286	0.005	0.015	12.56	8.06	100yr	8.059	8.059	7.034	6.71	6.05	None	Inlet
STC15224c	19.9	2.4	2.4	2.3	1.83	2286	0.005	0.015	12.56	8.07	100yr	8.066	8.066	7.032	6.694	6.049	None	Inlet
STC15224d	5.8	2.4	2.4	2.3	1.83	2286	0.005	0.015	12.56	8.07	100yr	8.071	8.071	7.032	6.684	6.049	None	Inlet
STC15225	5.5	2.4	2.3	2.3	1.83	2286	0.005	0.015	12.56	8.07	100yr	8.074	8.074	7.032	6.678	6.05	None	Inlet
STC14694	2.9	18.9	18.1	0.7	0.45	700	0.26934	0.015	2.90	0.18	100yr	0.184	0.135	0.135	0.135	0.135	2yr	Outlet
STC14782	23.4	21.3	20.3	0.9	0	900	0.042993	0.015	3.25	0.65	100yr	0.645	0.287	0.244	0.233	0.214	None	Inlet
STC14497	32.2	20.3	19.3	0.8	0	750	0.032022	0.015	1.73	0.62	100yr	0.617	0.445	0.402	0.391	0.37	None	Inlet
STC14619	9.8	27.0	26.7	0.6	0	600	0.025534	0.015	0.85	0.62	100yr	0.623	0.199	0.113	0.091	0.051	None	Inlet
STC14620	82.9	26.7	23.7	0.6	0	600	0.036665	0.015	1.02	0.68	100yr	0.681	0.205	0.112	0.089	0.051	None	Inlet
STC14621	94.2	23.7	21.6	0.8	0.9	750	0.022624	0.015	2.35	0.81	100yr	0.807	0.255	0.14	0.109	0.065	5yr	Outlet
STC15608	12.6	21.6	21.2	0.8	0	750	0.02941	0.015	1.65	0.59	100yr	0.59	0.267	0.147	0.114	0.074	2yr	Outlet
STC14629	16.7	20.9	20.7	0.9	0	900	0.011121	0.015	1.65	0.67	100yr	0.667	0.649	0.649	0.649	0.636	2yr	Outlet
STC10851	17.2	-0.4	-0.4	1.5	1.37	1520	0.005	0.015	4.97	2.34	100yr	2.335	1.712	1.187	1.035	0.926	2yr	Outlet
STC10817	9.5	0.0	0.0	1.5	1.22	1520	0.005	0.015	4.25	1.53	100yr	1.527	0.994	0.806	0.79	0.736	2yr	Outlet
STC10762	13.4	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.51	100yr	1.508	0.991	0.802	0.787	0.734	2yr	Outlet
STC10761b	18.8	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.54	100yr	1.538	1.001	0.802	0.787	0.736	2yr	Outlet
STC10848	18.1	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.57	100yr	1.574	1.023	0.818	0.802	0.749	2yr	Outlet
STC10850	11.5	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.52	100yr	1.516	1.017	0.799	0.78	0.722	2yr	Outlet
STC10849	42.3	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.48	100yr	1.483	1.017	0.791	0.772	0.719	2yr	Outlet
STC10852	16.2	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.46	100yr	1.462	1.029	0.802	0.765	0.719	2yr	Outlet
STC10735	13.1	-0.4	-0.4	1.5	1.37	1520	0.005	0.015	4.97	2.18	100yr	2.184	1.582	1.187	1.035	0.924	2yr	Outlet
STC10824a	2.2	1.0	1.0	4.0	0.9	4000	0.005	0.015	8.70	0.38	100yr	0.376	0.202	0.195	0.182	0.181	2yr	Outlet
STC15674	24.1	0.8	0.7	0.8	0	750	0.005	0.015	0.68	1.04	10yr to 100yr	1.038	0.993	0.617	0.546	0.371	2yr	Outlet
STC10822a	2.3	0.6	0.5	0.9	0	900	0.005	0.015	1.11	0.84	100yr	0.84	0.82	0.584	0.51	0.423	2yr	Outlet
STC10822	19.0	0.5	0.5	0.9	0	900	0.005	0.015	1.11	0.82	100yr	0.822	0.817	0.583	0.509	0.423	2yr	Outlet
STC10731	103.7	0.5	0.1	0.9	0	900	0.005	0.015	1.11	0.86	100yr	0.855	0.816	0.584	0.509	0.424	2yr	Outlet
STC15920	9.7	0.1	0.1	1.5	1.22	1520	0.005	0.015	4.25	2.49	100yr	2.492	2.265	2.265	2.243	1.741	2yr	Outlet
STC15921	95.6	0.1	0.0	1.5	1.22	1520	0.005	0.015	4.25	1.62	100yr	1.619	1.395	1.395	1.395	1.191	2yr	Outlet
STC15921a	72.0	0.0	0.0	1.5	1.22	1520	0.005	0.015	4.25	1.58	100yr	1.58	1.207	1.172	1.172	1.112	2yr	Outlet
STC10843	10.0	1.5	1.4	1.4	0.7	1400	0.005	0.015	1.75	1.17	100yr	1.167	0.946	0.369	0.229	0.05	2yr	Outlet
STC10842	11.6	1.4	1.4	1.4	0.7	1400	0.005	0.015	1.75	1.14	100yr	1.138	0.949	0.367	0.228	0.047	2yr	Outlet
STC10794	18.7	1.4	1.2	1.4	0.7	1400	0.009515	0.015	2.42	1.32	100yr	1.318	1.031	0.739	0.67	0.272	2yr	Outlet
STC10780	4.4	3.1	2.8	0.8	0.225	750	0.068063	0.015	0.57	0.09	100yr	0.088	0.063	0.062	0.062	0.061	2yr	Outlet
STC10859	11.0	2.8	2.4	0.8	0.23	800	0.035517	0.015	0.46	0.09	100yr	0.085	0.083	0.083	0.083	0.083	2yr	Outlet
STC10858	3.2	2.4	2.3	0.8	0.23	800	0.034417	0.015	0.45	0.14	100yr	0.14	0.128	0.128	0.128	0.126	2yr	Outlet
STC10778	22.5	2.3	2.2	0.7	0	675	0.00559	0.015	0.54	0.40	100yr	0.397	0.287	0.258	0.258	0.258	2yr	Outlet
STC10777	50.1	2.2	1.9	0.6	0	600	0.005234	0.015	0.39	0.26	100yr	0.263	0.256	0.249	0.249	0.249	2yr	Outlet
STC10854	12.3	1.9	1.4	0.6	0	600	0.039904	0.015	1.06	0.29	100yr	0.285	0.261	0.26	0.26	0.26	2yr	Outlet
STC10855	12.5	1.4	1.3	0.9	0	900	0.009685	0.015	1.54	1.25	100yr	1.247	1.207	1.202	1.147	0.954	2yr	Outlet
STC15251	13.3	1.3	1.2	0.9	0	900	0.011613	0.015	1.69	1.18	100yr	1.183	1.132	1.087	1.087	1.087	2yr	Outlet
STC10835	49.3	0.8	0.5	0.9	2	900	0.005474	0.015	4.07	1.54	100yr	1.535	1.188	1.138	1.113	1.061	2yr	Outlet
STC10676	23.8	0.5	0.5	1.5	2	1500	0.005	0.015	8.04	1.86	100yr	1.855	1.642	1.39	1.253	1.206	2yr	Outlet
STC10781	3.2	2.9	2.8	0.8	0.23	800	0.035545	0.015	0.46	0.11	100yr	0.107	0.083	0.083	0.083	0.083	2yr	Outlet
STC10836	4.2	1.8	1.4	0.6	0	600	0.082408	0.015	1.53	0.35	100yr	0.345	0.265	0.242	0.239	0.234	2yr	Outlet
STC14507	7.6	0.0	0.0	0.7	0	675	0.005	0.015	0.52	0.00	100yr	0.001	0.001	0.001	0.001	0.001	None	Inlet
STC15705	23.8	0.0	0.0	1.5	0.76	1520	0.005	0.015	2.18	0.01	100yr	0.006	0.002	0.002	0.002	0.001	2yr	Outlet
STC10898	8.9	16.7	16.4	0.9	0.4	900	0.034292	0.015	1.19	0.39	100yr	0.388	0.374	0.374	0.374	0.353	5yr	Outlet
STC10937	33.7	12.6	11.8	1.2	0.45	1200	0.023538	0.015	1.65	1.07	100yr	1.066	0.708	0.566	0.529	0.446	100yr	Capacity
STC10893	5.9	11.8	11.7	2.4	0.5	2400	0.028205	0.015	4.70	1.06	100yr	1.064	0.687	0.552	0.526	0.445	5yr	Outlet
STC10875b	4.1	11.1	11.0	2.4	0.5	2400	0.02412	0.015	4.35	0.72	100yr	0.719	0.64	0.527	0.473	0.453	2yr	Outlet
STC10875a	27.7	11.0	10.4	2.4	0.5	2400	0.024019	0.015	4.34	0.68	100yr	0.683	0.64	0.526	0.471	0.448	2yr	Outlet
STC10868	6.5	10.4	10.2	2.4	0.5	2400	0.024066	0.015	4.34	0.68	100yr	0.679	0.64	0.525	0.471	0.408	2yr	Outlet
STC10869	6.7	10.2	10.1	0.8	0.45													

STC14954	13.3	2.6	2.6	0.8	0	750	0.005	0.015	0.68	0.83	less than 2yr	0.833	0.833	0.833	0.831	0.773	2yr	Capacity
STC15153	52.4	2.1	1.6	0.8	1.2	760	0.00962	0.015	2.30	1.29	100yr	1.292	1.174	1.127	1.113	0.965	2yr	Outlet
STC14951	14.1	1.6	1.4	0.8	1.2	760	0.016916	0.015	2.99	1.25	100yr	1.252	1.179	1.127	1.113	0.965	2yr	Outlet
STC14950	73.5	1.3	0.7	0.8	1.2	760	0.008236	0.015	2.09	1.53	100yr	1.53	1.396	1.382	1.33	1.105	2yr	Outlet
STC14949	11.5	0.7	0.6	1.1	1.2	1050	0.007208	0.015	3.05	1.72	100yr	1.723	1.355	1.352	1.307	1.304	2yr	Outlet
STC14953	10.4	2.8	2.6	0.6	0	600	0.018044	0.015	0.71	0.48	100yr	0.484	0.442	0.323	0.24	0.139	2yr	Outlet
STC14961	13.0	-0.7	-0.8	0.9	0	900	0.009984	0.015	1.57	1.25	100yr	1.246	1.246	1.246	1.101	0.666	2yr	Outlet
STC14960	55.9	-0.8	-1.0	0.9	0	900	0.005	0.015	1.11	1.44	2yr to 5yr	1.443	1.4	1.381	1.189	0.829	2yr	Outlet
STC14965	11.4	-1.0	-1.1	1.2	0	1200	0.010042	0.015	3.39	2.22	100yr	2.22	2.114	2.114	1.89	1.022	10yr	Outlet
STC14958	48.3	0.7	-0.6	0.6	0	600	0.027511	0.015	0.88	0.43	100yr	0.434	0.267	0.267	0.245	0.176	5yr	Outlet
STC14884	8.6	0.1	-0.1	0.8	0	750	0.024677	0.015	1.52	0.38	100yr	0.383	0.383	0.383	0.304	0.052	10yr	Outlet
STC14987	35.9	-0.1	-0.2	0.8	0	750	0.005	0.015	0.68	0.86	5yr to 10yr	0.861	0.861	0.861	0.448	0.218	10yr	Capacity
STC15185	5.0	-0.2	-0.5	0.8	0	750	0.048712	0.015	2.13	0.89	100yr	0.893	0.893	0.893	0.448	0.217	10yr	Outlet
STC15099	38.3	-0.5	-0.7	0.9	0	900	0.005	0.015	1.11	1.31	100yr	1.312	1.076	1.076	0.477	0.361	10yr	Outlet
STC14886	98.5	-3.4	-3.8	3.1	1.37	3050	0.005	0.015	11.95	5.82	100yr	5.815	5.815	3.984	3.124	3.124	2yr	Outlet
STC14989	4.0	0.5	0.4	0.6	0	600	0.01008	0.015	0.53	0.51	100yr	0.513	0.513	0.513	0.303	0.043	10yr	Outlet
STC14885	37.8	0.4	0.1	0.8	0	750	0.007571	0.015	0.84	0.43	100yr	0.427	0.427	0.427	0.303	0.042	10yr	Outlet
STC15091	37.3	0.6	0.1	0.6	0	600	0.013418	0.015	0.62	0.29	100yr	0.288	0.288	0.161	0.15	0.128	100yr	Capacity
STC14976	42.6	0.1	-0.5	0.6	0	600	0.013909	0.015	0.63	0.54	100yr	0.54	0.54	0.332	0.298	0.234	10yr	Outlet
STC15284	44.4	0.0	-0.3	0.6	0	600	0.005971	0.015	0.41	0.45	5yr to 10yr	0.451	0.449	0.423	0.201	0.176	2yr	Outlet
STC15202	30.5	0.6	0.6	1.5	1.05	1500	0.005	0.015	3.39	0.76	100yr	0.761	0.761	0.295	0.258	0.198	100yr	Capacity
STC15201	36.4	0.6	0.6	1.5	1.05	1500	0.005	0.015	3.39	1.03	100yr	1.028	1.028	0.354	0.311	0.233	100yr	Capacity
STC14898	38.4	0.6	0.5	1.5	1.05	1500	0.005	0.015	3.39	1.27	100yr	1.269	1.269	0.436	0.382	0.284	None	Inlet
STC14892	46.1	-1.4	-1.9	0.8	0	750	0.009926	0.015	0.96	0.50	100yr	0.503	0.503	0.503	0.498	0.46	2yr	Outlet
STC14997	8.4	-1.9	-2.0	0.8	0	750	0.00667	0.015	0.79	0.74	100yr	0.741	0.729	0.529	0.515	0.49	2yr	Outlet
STC15188	22.0	-2.6	-2.8	1.7	1.37	1670	0.008318	0.015	7.25	2.48	100yr	2.48	2.48	2.056	1.316	1.316	2yr	Outlet
STC14887	45.8	-2.7	-3.1	2.3	1.37	2286	0.007054	0.015	9.96	3.42	100yr	3.415	3.415	3.266	2.623	2.623	2yr	Outlet
STC14888	77.7	-3.1	-3.4	2.3	1.37	2286	0.005	0.015	8.39	3.47	100yr	3.473	3.473	3.39	2.76	2.76	2yr	Outlet
STC15156	44.8	0.1	-0.1	0.6	0	600	0.005292	0.015	0.39	0.33	100yr	0.333	0.325	0.325	0.325	0.324	2yr	Outlet
STC14912	7.1	-0.1	-0.1	0.6	0	600	0.00564	0.015	0.40	0.36	100yr	0.36	0.35	0.35	0.35	0.349	2yr	Outlet
STC14911	7.5	-0.1	-0.2	0.6	0	600	0.005449	0.015	0.39	0.35	100yr	0.349	0.349	0.349	0.349	0.34	2yr	Outlet
STC14910	104.8	-0.2	-0.8	0.6	0	600	0.005544	0.015	0.40	0.49	less than 2yr	0.488	0.488	0.488	0.488	0.483	2yr	Capacity
STC15207	40.0	-0.8	-0.9	1.2	1.05	1200	0.005	0.015	2.54	0.52	100yr	0.515	0.515	0.514	0.508	0.508	5yr	Outlet
STC14908	48.8	-0.9	-1.1	1.2	1.05	1200	0.005	0.015	2.54	1.22	100yr	1.22	1.22	1.134	0.764	0.727	5yr	Outlet
STC14907	49.0	-1.1	-2.5	1.1	1.37	1140	0.028376	0.015	8.05	1.89	100yr	1.689	1.689	1.606	0.897	0.897	2yr	Outlet
STC14906	83.1	-0.4	-0.8	0.8	0	750	0.005	0.015	0.68	0.56	100yr	0.561	0.384	0.384	0.336	0.336	2yr	Outlet
STC15206	29.1	-0.8	-0.9	0.8	0	750	0.005	0.015	0.68	0.43	100yr	0.432	0.395	0.395	0.327	0.3	2yr	Outlet
STC14902	27.4	-0.9	-1.2	0.8	0	750	0.010595	0.015	0.99	0.49	100yr	0.487	0.487	0.487	0.422	0.392	2yr	Outlet
STC15205	21.9	-1.2	-1.4	0.8	0	750	0.012137	0.015	1.06	0.56	100yr	0.556	0.556	0.556	0.422	0.437	2yr	Outlet
STC15017	9.9	-0.3	-0.4	0.7	0	675	0.010971	0.015	0.76	0.49	100yr	0.494	0.449	0.432	0.337	0.268	5yr	Outlet
STC15123	33.8	-0.4	-0.8	0.7	0	675	0.01088	0.015	0.76	0.69	100yr	0.692	0.692	0.657	0.347	0.282	2yr	Outlet
STC15122	7.4	-0.8	-0.9	0.7	0	675	0.01473	0.015	0.88	0.70	100yr	0.702	0.702	0.658	0.338	0.285	2yr	Outlet
STC14901	22.7	0.7	0.7	1.5	1.05	1500	0.005	0.015	3.39	0.37	100yr	0.367	0.267	0.209	0.195	0.169	100yr	Capacity
STC14900	34.2	0.7	0.6	1.5	1.05	1500	0.005	0.015	3.39	0.51	100yr	0.509	0.509	0.274	0.237	0.184	100yr	Capacity
STC15140	12.2	1.4	1.3	0.6	0.2	600	0.008178	0.015	0.13	0.11	100yr	0.109	0.101	0.092	0.092	0.092	2yr	Outlet
STC15138	44.9	0.4	0.2	0.6	0	600	0.005407	0.015	0.39	0.18	100yr	0.183	0.159	0.156	0.156	0.155	2yr	Outlet
STC14922	34.6	-0.2	-0.2	0.9	0	900	0.005	0.015	1.11	0.34	100yr	0.344	0.312	0.309	0.295	0.29	2yr	Outlet
STC15212	120.2	-0.2	-0.5	0.9	0	900	0.005	0.015	1.11	0.67	100yr	0.672	0.557	0.557	0.557	0.534	2yr	Outlet
STC14894	70.5	-0.5	-0.7	0.8	0.9	750	0.005	0.015	1.10	0.56	100yr	0.558	0.558	0.558	0.558	0.534	2yr	Outlet
STC15193	34.8	-0.7	-0.8	0.8	0.9	750	0.005	0.015	1.10	0.95	100yr	0.947	0.947	0.947	0.851	0.677	2yr	Outlet
STC14890	27.2	-1.1	-1.3	1.1	1.2	1050	0.00548	0.015	2.66	1.14	100yr	1.14	1.14	1.14	1.14	1.029	2yr	Outlet
STC15053	81.5	-1.3	-2.2	1.1	1.2	1050	0.011611	0.015	3.87	1.27	100yr	1.274	1.274	1.274	1.274	1.174	2yr	Outlet
STC14998	5.1	-2.2	-2.3	1.1	1.2	1050	0.009719	0.015	3.54	1.30	100yr	1.298	1.298	1.298	1.298	1.199	2yr	Outlet
STC15424	25.4	-2.3	-2.5	1.1	1.2	1050	0.011051	0.015	3.78	1.43	100yr	1.427	1.427	1.427	1.371	1.256	2yr	Outlet
STC15211	36.7	0.2	-0.1	0.6	0	600	0.006821	0.015	0.44	0.27	100yr	0.265	0.202	0.202	0.202	0.191	2yr	Outlet
STC14913	8.4	0.9	0.8	0.6	0.2	600	0.008362	0.015	0.13	0.18	100yr	0.178	0.101	0.101	0.1	0.086	2yr	Outlet
STC14914	146.9	-0.4	-0.8	0.8	0	750	0.005	0.015	0.68	0.44	100yr	0.44	0.44	0.404	0.393	0.381	2yr	Outlet
STC14929	4.8	0.9	0.0	0.9	0.225	900	0.191087	0.015	1.19	0.17	100yr	0.172	0.172	0.172	0.172	0.172	2yr	Outlet
STC14271	14.5	5.3	5.0	0.6	0	600	0.018249	0.015	0.72	0.33	100yr	0.327	0.273	0.154	0.154	0.154	2yr	Outlet
STC14039	30.8	5.0	4.8	0.6	0	600	0.007138	0.015	0.45	0.48	100yr	0.483	0.293	0.2	0.189	0.173	2yr	Outlet
STC14106	85.1	4.8	4.1	1.2	0	1200	0.008307	0.015	3.08	0.68	100yr	0.68	0.321	0.194	0.194	0.194	2yr	Outlet
STC14237	77.4	4.1	3.6	1.2	0	1200	0.006101	0.015	2.64	1.54	100yr	1.543	1.543	1.543	1.543	1.487	5yr	Outlet
STC13969	188.4	2.8	2.7	3.1	1.52	3050	0.005	0.015	13.90	8.85	100yr	8.854	8.395	7.928	7.651	6.48	5yr	Outlet
STC15151	23.3	2.7	2.6	3.1	1.52	3050	0.005	0.015	13.90	8.63	100yr	8.632	8.392	7.929	7.603	6.487	10yr	Outlet
STC13968a	17.2	2.6	2.6	3.1	1.52	3050	0.005	0.015	13.90	8.72	100yr	8.718	8.39	7.928	7.609	6.517	100yr	Capacity
STC13968	122.5	2.6	2.3	3.1	1.52	3050	0.005	0.015	13.90	10.08	100yr	10.082	9.086	8.483	8.148	6.993	None	Inlet
STC14356	5.5	7.7	7.7	0.9	0	900	0.007311	0.015	1.34	0.23	100yr	0.231	0.161	0.139	0.138	0.124	2yr	Outlet
STC14057	11.1	7.7	5.8	0.9	0	900	0.170802	0.015	6.48	2.03	100yr	2.034	1.677	1.581	1.547	1.423	2yr	Outlet
STC14369	59.1	13.1	11.5	0.8	0	750	0.027331	0.015	1.60	0.61	100yr	0.605	0.604	0.601	0.592	0.573	5yr	Outlet
STC14247	58.7	11.5	9.7	0.8	0	750	0.030836	0.015	1.69	0.82	100yr	0.819</						

STC11607	46.8	21.1	20.6	0.8	0	750	0.010901	0.015	1.01	0.79	100yr	0.793	0.793	0.731	0.721	0.721	2yr	Outlet
STC11630	18.1	20.6	20.5	0.8	0	750	0.00905	0.015	0.68	0.89	less than 2yr	0.889	0.863	0.829	0.813	0.807	2yr	Capacity
STC11706	18.1	20.5	20.4	0.8	0	750	0.005523	0.015	0.72	0.83	less than 2yr	0.828	0.803	0.79	0.784	0.771	2yr	Capacity
STC11664	5.9	17.8	17.7	0.7	0.3	650	0.018661	0.015	0.39	0.42	100yr	0.42	0.2	0.139	0.121	0.091	2yr	Outlet
STC11625	12.2	16.2	16.1	0.6	0	600	0.005	0.015	0.38	0.45	100yr	0.446	0.217	0.217	0.205	0.198	2yr	Outlet
STC11622	21.7	16.1	15.7	0.6	0	600	0.017548	0.015	0.70	0.34	100yr	0.34	0.305	0.277	0.272	0.265	2yr	Outlet
STC11621	5.9	15.7	15.6	0.8	0	750	0.020184	0.015	1.37	0.43	100yr	0.426	0.302	0.279	0.268	0.243	2yr	Outlet
STC11662	9.0	15.6	15.6	0.8	0	750	0.006673	0.015	0.79	0.33	100yr	0.332	0.255	0.247	0.243	0.229	2yr	Outlet
STC11590	10.2	15.6	15.4	0.8	0	750	0.011745	0.015	1.05	0.36	100yr	0.36	0.295	0.283	0.278	0.263	2yr	Outlet
STC11685	19.7	15.4	15.3	0.8	0	750	0.006616	0.015	0.78	0.46	100yr	0.457	0.329	0.297	0.288	0.274	2yr	Outlet
STC11589	21.1	15.8	15.6	0.8	0	750	0.011351	0.015	1.03	0.74	100yr	0.735	0.733	0.732	0.732	0.732	2yr	Outlet
STC11705	8.8	15.6	15.3	0.8	0	750	0.028496	0.015	1.63	0.82	100yr	0.824	0.824	0.824	0.824	0.824	2yr	Outlet
STC11600	25.8	16.4	15.2	0.8	0.3	800	0.04806	0.015	0.80	0.43	100yr	0.432	0.335	0.249	0.235	0.232	2yr	Outlet
STC11588	11.6	15.3	15.2	0.8	0	750	0.008634	0.015	0.90	0.83	100yr	0.826	0.826	0.826	0.826	0.826	2yr	Outlet
STC11658	6.6	19.5	19.3	0.6	0.3	600	0.03937	0.015	0.51	0.16	100yr	0.158	0.075	0.057	0.052	0.043	2yr	Outlet
STC11586	7.3	20.7	20.5	0.6	0.3	600	0.02754	0.015	0.43	0.37	100yr	0.373	0.314	0.264	0.256	0.199	5yr	Outlet
STC11651	1.6	19.3	19.1	0.6	0.3	600	0.140671	0.015	0.97	0.37	100yr	0.372	0.311	0.258	0.246	0.199	None	Inlet
STC11699	7.0	19.1	18.7	0.6	0.3	600	0.057247	0.015	0.62	0.37	100yr	0.371	0.307	0.255	0.24	0.198	None	Inlet
STC11648	5.1	16.7	16.5	0.6	0.325	600	0.035629	0.015	0.55	0.37	100yr	0.37	0.304	0.251	0.235	0.196	100yr	Capacity
STC11697	12.3	16.5	16.0	0.6	0.3	600	0.042358	0.015	0.53	0.37	100yr	0.37	0.298	0.249	0.232	0.195	None	Inlet
STC11604a	5.2	16.0	15.8	0.6	0.3	600	0.040404	0.015	0.52	0.37	100yr	0.369	0.295	0.247	0.23	0.194	100yr	Capacity
STC11642	10.5	13.5	12.9	0.6	0	600	0.057363	0.015	1.27	0.36	100yr	0.356	0.339	0.336	0.335	0.334	2yr	Outlet
STC11694	17.7	12.9	12.5	0.6	0	600	0.022054	0.015	0.79	0.35	100yr	0.349	0.335	0.334	0.333	0.33	2yr	Outlet
STC11693	53.2	12.5	11.9	0.6	0	600	0.0109	0.015	0.56	0.49	100yr	0.487	0.477	0.475	0.474	0.468	2yr	Outlet
STC11692	71.5	11.9	8.6	0.6	0	600	0.045205	0.015	1.13	0.60	100yr	0.601	0.59	0.584	0.58	0.546	2yr	Outlet
STC15536	74.9	12.2	11.2	0.6	0	600	0.013671	0.015	0.62	0.49	100yr	0.486	0.486	0.482	0.425	0.322	2yr	Outlet
STC11593	52.6	20.4	19.8	0.8	0	750	0.011417	0.015	1.03	0.82	100yr	0.818	0.785	0.784	0.777	0.764	2yr	Outlet
STC11689	67.1	19.8	16.4	0.8	0	750	0.0511	0.015	2.18	0.96	100yr	0.961	0.901	0.888	0.875	0.868	2yr	Outlet
STC11578	119.2	16.4	16.2	0.8	0	750	0.005	0.015	0.68	0.88	less than 2yr	0.878	0.876	0.872	0.871	0.868	2yr	Capacity
STC11688	5.8	16.2	15.8	0.8	0	750	0.071301	0.015	2.58	0.73	100yr	0.732	0.732	0.732	0.732	0.732	2yr	Outlet
STC11583	33.3	8.6	1.6	1.2	0	1200	0.211808	0.015	15.55	2.87	100yr	2.874	2.803	2.778	2.763	2.715	2yr	Outlet
STC11577	6.0	22.7	22.5	0.8	0	750	0.036476	0.015	1.84	0.76	100yr	0.758	0.706	0.706	0.706	0.706	2yr	Outlet
STC11575	39.3	14.2	12.6	1.1	0	1050	0.041972	0.015	4.85	1.02	100yr	1.022	1.022	1.022	1.022	1.022	2yr	Outlet
STC11573	18.2	12.6	12.0	1.1	0	1050	0.03295	0.015	4.30	1.95	100yr	1.945	1.886	1.876	1.876	1.87	2yr	Outlet
STC11574	46.7	11.2	10.2	1.1	0	1050	0.021406	0.015	3.46	2.14	100yr	2.137	2.083	2.075	2.07	2.056	2yr	Outlet
STC11570	52.7	12.0	11.2	1.1	0	1050	0.014236	0.015	2.82	1.95	100yr	1.945	1.887	1.878	1.878	1.871	2yr	Outlet
STC15468	62.9	10.2	8.6	1.1	0	1050	0.024689	0.015	3.72	2.28	100yr	2.275	2.217	2.205	2.203	2.188	2yr	Outlet
STC11704	52.8	15.2	14.2	0.8	0	750	0.018956	0.015	1.33	1.02	100yr	1.016	1.016	1.016	1.016	1.012	2yr	Outlet
STC10600	28.3	5.4	5.0	0.6	0	600	0.016232	0.015	0.68	0.46	100yr	0.461	0.386	0.352	0.35	0.332	2yr	Outlet
STC10668	7.3	5.0	4.9	0.6	0	600	0.01237	0.015	0.59	0.38	100yr	0.382	0.357	0.341	0.341	0.329	2yr	Outlet
STC10666	21.4	4.9	4.7	0.6	0	600	0.011234	0.015	0.56	0.39	100yr	0.388	0.354	0.346	0.342	0.33	2yr	Outlet
STC10646	3.8	4.7	4.7	0.6	0	600	0.007968	0.015	0.48	0.30	100yr	0.301	0.272	0.255	0.245	0.239	2yr	Outlet
STC10645	3.3	4.7	4.3	0.6	0	600	0.113726	0.015	1.79	0.36	100yr	0.362	0.362	0.309	0.277	0.2	2yr	Outlet
STC10682	2.0	4.3	3.9	0.6	0	600	0.205317	0.015	2.41	0.28	100yr	0.277	0.236	0.189	0.171	0.142	2yr	Outlet
STC16049	12.7	3.7	3.2	1.0	0.9	1000	0.039518	0.015	4.57	0.25	100yr	0.252	0.213	0.118	0.096	0.05	100yr	Capacity
STC10636	14.4	3.2	3.1	0.8	0.84	810	0.008343	0.015	1.45	0.63	100yr	0.625	0.625	0.471	0.467	0.419	5yr	Outlet
STC10595	13.1	2.9	2.7	0.6	0	600	0.016749	0.015	0.69	0.28	100yr	0.284	0.219	0.209	0.203	0.179	2yr	Outlet
STC10680	14.9	2.7	2.4	0.6	0	600	0.021451	0.015	0.78	0.20	100yr	0.195	0.195	0.192	0.19	0.174	2yr	Outlet
STC10633	23.5	2.9	2.4	0.6	0.3	600	0.020892	0.015	0.37	0.09	100yr	0.094	0.069	0.069	0.069	0.069	2yr	Outlet
STC10594	10.5	3.1	3.1	0.6	0	600	0.005	0.015	0.38	0.17	100yr	0.165	0.165	0.159	0.149	0.128	2yr	Outlet
STC10593	4.9	3.1	3.0	0.6	0	600	0.023349	0.015	0.81	0.18	100yr	0.176	0.16	0.156	0.148	0.13	2yr	Outlet
STC10625	33.0	3.0	2.7	0.6	0	600	0.007274	0.015	0.45	0.14	100yr	0.142	0.136	0.132	0.128	0.122	2yr	Outlet
STC10624	10.8	2.7	2.7	0.7	0	675	0.005	0.015	0.52	0.19	100yr	0.193	0.129	0.126	0.126	0.12	2yr	Outlet
STC10623	12.8	2.7	2.6	0.7	0	675	0.005	0.015	0.52	0.22	100yr	0.224	0.129	0.129	0.129	0.126	2yr	Outlet
STC10622	4.7	2.6	1.9	0.7	0	675	0.154315	0.015	2.86	0.35	100yr	0.346	0.272	0.272	0.27	0.27	2yr	Outlet
STC10664	6.4	2.4	1.9	0.6	0	600	0.078336	0.015	1.49	0.69	100yr	0.689	0.415	0.398	0.382	0.342	2yr	Outlet
STC10590	3.7	5.6	5.6	0.6	0	600	0.008005	0.015	0.48	0.22	100yr	0.215	0.093	0.051	0.045	0.039	5yr	Outlet
STC10618	20.6	5.6	5.4	0.6	0	600	0.009225	0.015	0.51	0.40	100yr	0.402	0.298	0.239	0.238	0.222	2yr	Outlet
STC10617	13.2	4.9	4.7	0.6	0	600	0.009067	0.015	0.51	0.40	100yr	0.401	0.401	0.401	0.401	0.374	2yr	Outlet
STC10616	19.7	4.3	4.3	0.6	0	600	0.005	0.015	0.38	0.43	less than 2yr	0.431	0.431	0.431	0.431	0.431	2yr	Capacity
STC16017	9.4	4.0	3.6	0.6	0	600	0.045692	0.015	1.14	0.24	100yr	0.235	0.194	0.174	0.146	0.12	2yr	Outlet
STC10585	75.6	3.6	3.5	0.6	0	600	0.005	0.015	0.38	0.42	100yr	0.415	0.297	0.259	0.24	0.224	2yr	Outlet
STC10678	3.0	3.4	3.2	0.6	0	600	0.066148	0.015	1.37	0.28	100yr	0.283	0.283	0.247	0.228	0.209	5yr	Outlet
STC10584	70.4	3.5	3.4	0.6	0	600	0.005	0.015	0.38	0.32	100yr	0.317	0.291	0.256	0.233	0.214	2yr	Outlet
STC10589	96.1	4.3	3.8	0.6	0	600	0.0052	0.015	0.38	0.41	100yr	0.414	0.379	0.304	0.28	0.236	None	Inlet
STC10582	31.3	3.8	2.5	0.6	0	600	0.040942	0.015	1.08	0.41	100yr	0.414	0.379	0.303	0.279	0.234	None	Inlet
STC10608	3.7	2.7	2.4	0.9	0.61	910	0.087009	0.015	3.51	0.83	100yr	0.825	0.474	0.26	0.179	0.161	5yr	Outlet
STC10592	101.6	1.9	1.9	0.7	0	675	0.005	0.015	0.52	0.56	100yr	0.56	0.5	0.5	0.497	0.494	2yr	Outlet
STC10578	19.7	1.9	1.8	0.7	0	675	0.005	0.015	0.52	0.51	100yr	0.511	0.511	0.511	0.509	0.502	2yr	Outlet
STC10581	50.9	2.5	1.6	0.9	0.61	910	0.017069	0.015	1.56	0.72	100yr							

STC15679	119.1	7.7	3.3	1.5	0.9	1500	0.03697	0.015	7.43	3.07	100yr	3.069	2.79	2.781	2.551	2.102	10yr	Outlet
STC11713	89.8	9.5	8.3	0.8	0	750	0.013035	0.015	1.10	0.19	100yr	0.189	0.168	0.166	0.163	0.159	None	Inlet
STC15680	64.2	8.3	7.8	1.1	0	1050	0.007789	0.015	2.09	0.76	100yr	0.759	0.669	0.669	0.657	0.579	5yr	Outlet
STC11651a	16.4	20.5	19.3	0.6	0.3	600	0.073666	0.015	0.70	0.37	100yr	0.373	0.312	0.258	0.249	0.199	None	Inlet
STC11649a	33.5	18.7	16.7	0.6	0.3	600	0.058588	0.015	0.63	0.37	100yr	0.371	0.304	0.252	0.236	0.197	None	Inlet
STC11604b	49.3	15.8	13.8	0.6	0.3	600	0.041408	0.015	0.53	0.37	100yr	0.369	0.294	0.247	0.23	0.194	None	Inlet
STC10965	38.6	6.8	3.8	0.9	0	900	0.077303	0.015	4.36	0.22	100yr	0.217	0.152	0.134	0.129	0.119	None	Inlet
STC15673	65.6	1.2	1.0	1.5	1	1500	0.005	0.015	3.17	1.36	100yr	1.361	1.065	0.79	0.722	0.352	2yr	Outlet
STC14441a	7.4	23.5	22.9	0.6	0.2	600	0.087293	0.015	0.42	0.11	100yr	0.107	0.101	0.078	0.078	0.078	2yr	Outlet
STC14559a	232.8	22.9	15.8	0.6	0.2	600	0.030367	0.015	0.25	0.18	100yr	0.182	0.176	0.176	0.176	0.176	None	Inlet
STC10846a	56.6	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.56	100yr	1.561	1.02	0.815	0.8	0.748	2yr	Outlet
STC10846	12.6	0.4	0.3	1.8	1.25	1800	0.008018	0.015	6.91	0.42	100yr	0.422	0.244	0.172	0.163	0.163	2yr	Outlet
STC10741	58.0	0.3	0.0	1.8	1.25	1800	0.005	0.015	5.46	0.45	100yr	0.453	0.311	0.193	0.154	0.154	2yr	Outlet
STC10742a	33.3	0.0	-0.1	1.8	1.25	1800	0.005	0.015	5.46	0.45	100yr	0.452	0.311	0.194	0.151	0.148	2yr	Outlet
STC15909	63.1	-0.1	-0.4	1.5	0.8	1500	0.005227	0.015	2.36	2.93	100yr	2.933	0.643	0.643	0.643	0.643	2yr	Outlet
STC14990a	7.3	-3.8	-3.9	3.1	1.37	3070	0.005	0.015	12.05	7.74	100yr	7.741	4.097	3.156	3.156	3.156	2yr	Outlet
STC15162	120.7	-3.9	-4.2	3.1	1.37	3050	0.005	0.015	11.95	4.46	100yr	4.461	3.797	3.689	3.264	3.264	2yr	Outlet
STC14625	25.3	21.2	20.9	0.8	0	750	0.011879	0.015	1.05	0.74	100yr	0.736	0.736	0.736	0.73	0.712	2yr	Outlet
STC10544	15.7	3.7	3.6	2.4	1	2400	0.006379	0.015	6.38	0.23	100yr	0.227	0.207	0.112	0.034	0.007	None	Inlet
STC10539	15.9	2.8	2.7	2.5	1.3	2450	0.005	0.015	8.48	1.15	100yr	1.145	0.674	0.309	0.176	0.065	None	Inlet
STC10540	7.6	2.7	2.6	2.5	1.3	2450	0.015782	0.015	15.07	1.31	100yr	1.313	0.835	0.437	0.26	0.078	None	Inlet
STC10538	35.8	2.9	2.8	2.5	1.3	2450	0.005	0.015	8.48	0.89	100yr	0.885	0.423	0.073	0.073	0.041	None	Inlet
STC10537	18.6	3.0	2.9	2.5	1.3	2450	0.00538	0.015	8.80	0.63	100yr	0.633	0.249	0.033	0.033	0.018	None	Inlet
STC10532	14.1	3.4	3.0	2.5	1.3	2450	0.031231	0.015	21.20	0.33	100yr	0.325	0.248	0.006	0.006	0.004	None	Inlet
STC15776	44.1	3.6	2.3	2.4	1	2400	0.027345	0.015	13.21	0.68	100yr	0.682	0.594	0.436	0.353	0.313	None	Inlet
STC10468a	23.1	2.6	2.3	2.5	1.3	2450	0.014799	0.015	14.59	1.81	100yr	1.806	1.033	0.468	0.257	0.094	5yr	Outlet
STC15147b	80.7	1.9	1.8	2.9	2.06	2895	0.005	0.015	20.04	11.51	100yr	11.51	8.735	8.735	8.352	7.677	None	Inlet
STC10574	73.8	1.8	1.7	2.9	2.06	2895	0.005	0.015	20.04	17.43	100yr	17.433	14.374	14.374	13.744	11.568	None	Inlet
STC10742	50.7	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	1.50	100yr	1.503	1.06	0.828	0.762	0.721	2yr	Outlet
STC10733	68.7	-0.4	-0.4	1.5	1.22	1520	0.005	0.015	4.25	2.03	100yr	2.034	1.447	1.092	0.956	0.908	2yr	Outlet
STC10756a	1.9	-0.2	-0.3	2.5	1.7	2500	0.015641	0.015	22.50	0.58	100yr	0.58	0.477	0.31	0.246	0.199	2yr	Outlet
STC15866	11.4	-0.4	-0.4	3.0	0.914	3048	0.005	0.015	6.54	0.07	100yr	0.067	0.067	0.067	0.067	0.067	2yr	Outlet
STC15675	57.5	0.7	0.6	1.5	0.7	1500	0.005	0.015	1.90	1.03	100yr	1.026	0.991	0.617	0.546	0.371	2yr	Outlet
STC15689	24.7	3.0	2.8	2.1	2.591	2057	0.005559	0.015	18.28	22.65	10yr to 100yr	22.648	19.545	12.162	8.845	5.436	100yr	Capacity
STC15692	105.3	2.1	1.5	2.1	2.591	2057	0.005484	0.015	18.16	16.91	100yr	16.905	13.981	12.986	9.238	5.652	10yr	Outlet
STC12031	37.2	3.3	3.2	1.5	0.9	1500	0.005	0.015	2.73	5.78	less than 2yr	5.784	5.784	5.708	5.56	5.11	2yr	Capacity
dummy_chan_p	33.9	-4.2	-5.3	2.0	3	2000	0.032427	0.015	51.24	20.09	100yr	20.089	16.04	12.672	12.672	10.53	100yr	Capacity
STC15791	68.5	12.2	10.6	0.6	0	600	0.021971	0.015	0.79	0.35	100yr	0.351	0.045	0.011	0.006	0.004	None	Inlet
STC10616a	52.0	4.3	4.0	0.6	0	600	0.005	0.015	0.38	0.05	100yr	0.054	0.052	0.048	0.047	0.047	2yr	Outlet
STC15996	183.0	16.9	13.2	0.6	0	600	0.020003	0.015	0.75	0.02	100yr	0.022	0.005	0.004	0.003	0.003	None	Inlet
STC16000	34.9	13.2	12.2	0.6	0	600	0.028262	0.015	0.89	0.19	100yr	0.186	0.164	0.164	0.131	0.131	2yr	Outlet
STC10957	9.8	2.9	2.8	0.9	0	900	0.011277	0.015	1.67	1.06	100yr	1.063	1.063	1.063	1.063	1.039	2yr	Outlet
STC10880	80.3	2.8	2.2	0.9	0	900	0.007238	0.015	1.33	1.06	100yr	1.06	1.06	1.058	1.058	1.058	2yr	Outlet
STC10908	11.3	2.2	1.9	0.8	0	750	0.022168	0.015	1.44	1.25	100yr	1.254	1.141	1.141	1.141	1.141	2yr	Outlet
STC15410	44.8	2.0	0.5	0.6	1	600	0.033519	0.015	2.40	1.53	100yr	1.526	1.004	0.532	0.405	0.196	None	Inlet
STC10837	5.1	2.0	1.9	0.6	0	600	0.015747	0.015	0.67	0.09	100yr	0.087	0.069	0.062	0.061	0.059	2yr	Outlet
pMK_121a	61.4	11.7	10.4	0.8	0	750	0.021085	0.015	1.40	0.81	100yr	0.81	0.706	0.64	0.64	0.64	2yr	Outlet
STC14649	7.8	14.0	13.8	0.6	0	600	0.016763	0.015	0.69	0.05	100yr	0.046	0.046	0.028	0.028	0.028	2yr	Outlet
STC15802	8.4	14.8	14.8	0.6	0	600	0.009507	0.015	0.52	0.45	100yr	0.453	0.325	0.292	0.253	0.175	2yr	Outlet
STC14564	4.2	14.7	12.4	0.6	0	600	0.561548	0.015	3.99	0.43	100yr	0.427	0.09	0.09	0.09	0.064	2yr	Outlet
STC14317	46.5	6.0	5.5	0.6	0	600	0.009996	0.015	0.53	0.26	100yr	0.259	0.101	0.086	0.086	0.086	2yr	Outlet
STC15606	13.4	12.0	11.7	0.8	0	750	0.022382	0.015	1.44	0.55	100yr	0.551	0.551	0.493	0.493	0.493	2yr	Outlet
STC14005	6.3	9.7	9.7	0.8	0	750	0.007495	0.015	0.84	0.70	100yr	0.704	0.704	0.701	0.687	0.686	2yr	Outlet
STC10949	2.7	12.1	11.7	1.2	0.5	1200	0.141686	0.015	4.74	0.05	100yr	0.048	0.039	0.039	0.011	0.001	5yr	Outlet
STC10936	3.2	12.0	11.7	1.2	0.5	1200	0.102661	0.015	4.03	0.07	100yr	0.067	0.04	0.032	0.026	0.008	5yr	Outlet
STC14491	7.0	11.0	10.8	0.8	0.45	750	0.022055	0.015	0.90	1.15	2yr to 5yr	1.147	1.113	1.007	0.943	0.823	2yr	Outlet
STC15786	70.4	4.1	3.8	0.9	0	900	0.005	0.015	1.11	0.76	100yr	0.756	0.704	0.572	0.482	0.353	None	Inlet
STC15786a	84.9	4.3	4.1	0.9	0	900	0.005	0.015	1.11	1.25	100yr	1.253	0.724	0.584	0.49	0.359	100yr	Capacity
STC16016	12.9	5.0	4.0	0.6	0	600	0.07542	0.015	1.46	0.42	100yr	0.416	0.229	0.163	0.145	0.115	10yr	Outlet
STC16015	17.9	5.3	5.0	0.6	0	600	0.015663	0.015	0.67	0.42	100yr	0.422	0.252	0.164	0.146	0.115	100yr	Capacity
STC14524	24.9	13.1	12.8	1.1	0	1050	0.009255	0.015	2.28	1.78	100yr	1.78	1.648	1.635	1.627	1.627	2yr	Outlet
STC15866A	5.2	-0.4	-0.4	3.0	0.914	3048	0.005	0.015	6.54	0.00	100yr	0.001	0.001	0.001	0.001	0.001	None	Inlet
STC15354	118.5	-0.4	-0.4	1.5	1.37	1520	0.005	0.015	4.97	2.34	100yr	2.344	1.712	1.187	1.035	0.91	2yr	Outlet

Marrickville Valley Floodplain Risk
Management Study and Plan

APPENDIX

J

PRELIMINARY FLOOD MODIFICATION
OPTIONS

Drainage Line/Area	ID	Modification Type	Estimated Cost*	Number of directly and indirectly benefitted flood affected properties**	Cost per flood affected property	Rank	Constraints	Option to be modelled (Y/N)	Comment/Justification
Wardell Rd, Frazer Rd, Lawson Ave	FM1.1	Install new 1200mm diameter pipe to re-direct flows from Morton Ave to Frazer St and install a new 1.5m X 1.5m box culvert from the low point along Frazer St to a new surcharge pit in Marrickville Oval. Additional sag inlet pits to get flows into the pipes.	\$1,300,000	49	\$26,500	37	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit	Y	Large number of properties to benefit and likely high CBR due to damages reductions once modelling results available. Strong community concerns and frequent flooding experiences
	FM1.2	Divert Flows from Wardell Rd down Bishop St to basin via a 600mm diameter pipes	\$1,150,000	41	\$28,000	38	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit	Y	Large number of properties to benefit and likely high CBR due to damages reductions once modelling results available. Strong community concerns and frequent flooding experiences
	FM1.3	Regrade the road to cross fall away from houses towards park	\$150,000	6	\$25,000	34	No major constraints	N	This will be undertaken under Council's current capital works program for 2017/18
	FM1.4	Create a new opening and remove adjacent mound to allow overland flow from Lawson St onto oval	\$150,000	5	\$30,000	39	Environmental constraints – existing trees around the area Low ranking on prelim cost/benefit	N	
	FM1.5	Upgrade the existing 1050mm and 1200mm diameter pipe on Frazer St near Bishop and partially underneath the Oval to a 1650mm diameter pipe. Install a surcharge pit at the intersection of the upgraded 1650mm diameter pipe and existing 1200mm diameter pipe.	\$1,000,000	7	\$154,000	68	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit	N	
Pile St, Livingstone Rd and Marrickville Oval	FM2.1	Install orifice plate on basin outlet to maximise basin flood attenuation for up to the 20% AEP event	\$50,000	66	\$1,000	1	No major constraints	Y	
	FM2.2	Duplicate pipe in Pile St and George St Upgrade via 450mm and 600mm diameter pipes	\$1,700,000	21	\$83,000	59	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Land ownership – permissions from private property owners Potential worsening of impacts to adjacent areas	N	
	FM2.3	Divert George Street catchment from Livingstone Road sag to Centennial St via 600mm diameter pipes	\$900,000	43	\$21,000	27	No major constraints	Y	
	FM2.4	Divert Flows from Wardell Rd and Pile St down Porter Ave to Basin via 600mm diameter pipes	\$1,000,000	17	\$60,500	54	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit	N	
Northcote St and Sydenham Rd	FM3.1	Divert flows from Jarvie Park to Malakoff Tunnel with a new minimum 1050mm diameter pipe, upgrade drainage in Petersham Rd to 750mm diameter pipe and Northcote St to 450mm diameter pipe	\$975,000	57	\$17,000	19	Authority negotiations - Connection to Sydney Water network	Y	
	FM3.2	Duplicate the open western channel by installing new pits and 1200mm diameter pipe along Sydenham to divert flows from the intersection of Sydenham Rd and Petersham Rd to Malakoff Tunnel.	\$2,340,000	108	\$21,500	28	Authority negotiations - Connection to Sydney Water network Likely to be large number of utilities	Y	This option provides opportunity for funding from RMS. Large number of properties benefitted
	FM3.3	New drainage in Sydenham Road and connect to Western Channel via 600mm diameter pipes	\$975,000	60	\$16,500	17	Authority negotiations - Connection to Sydney Water network Likely to be large number of utilities Potential worsening of impacts to adjacent areas	Y	This option provides opportunity for funding from RMS. Large number of properties benefitted
	FM3.4	Increase inlet capacity on Despointes St with 450mm diameter pipes, Silver St with 450mm diameter pipes and Sydenham Road near Garners Ave with 600mm diameter pipes	\$300,000	43	\$7,000	4	No major constraints	Y	
	FM3.5	Provide underground detention of approx. 2000m3 of storage volume in the open space through bunding or excavation with approx. surface area of 5000m2.	\$800,000	14	\$58,000	53	Low ranking on prelim cost/benefit Land ownership – permissions from Department of Education Maintenance issues/costs	N	
Livingstone Rd and Addison Rd	FM4.1	New drainage system down Livingstone Road via 450mm diameter pipe	\$1,100,000	47	\$23,500	32	Capital Cost unlikely to be feasible Environmental constraints – threatened fauna identified near Addison Rd Potential worsening of impacts to adjacent areas	N	
Neville St, Surrey St and Illawarra Rd	FM5.1	New drainage from Park Road down Surrey St via 450mm diameter pipes, Charles St via 600mm diameter pipes to channel in Illawarra Rd via 750mm diameter pipes	\$1,950,000	47	\$42,000	49	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Land ownership – permissions from private property owners	N	
	FM5.2	Demolish brick wall and structures built over drainage easement between Park and Neville Streets and up size pipe to 450mm and/or construct 1.2m wide overland flow channel .	\$200,000	11	\$18,000	23	Land ownership – permissions from private property owners Environmental constraints – heritage properties along Park Rd	Y	
	FM5.3	Upgrade drainage in Addison Rd between Park Rd and Gordon Lane via 600mm diameter pipes	\$870,000	54	\$16,000	16	Authority negotiations - Connection to Sydney Water network	Y	Combined modelling of Option 5.3 and 5.4
	FM5.4	New raised thresholds at Park St, Neville St and Essex St	\$350,000	49	\$7,000	4	Potential worsening of impacts to adjacent areas		
	FM5.5	Provide underground detention of approx. 500m3 of storage volume in the open space through either bunding or excavation with surface area of approx. 1000m2.	\$1,500,000	17	\$87,000	61	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Maintenance issues/costs Environmental constraints – heritage and threatened fauna identified in the area Land ownership – permissions from private owners	N	
	FM5.6	Increase inlet capacity in Illawarra, York and Shephard Streets via 450mm diameter pipes	\$500,000	32	\$15,500	15	No major constraints	Y	
	FM5.7	Install a new 1200mm diameter pipe and reconfigure connection to Eastern Channel	\$200,000	14	\$15,000	13	Land ownership – permissions from private property owners Likely Property Acquisition required	N	There was connection in the past which was disconnected
	FM5.8	Upgrade Eastern Channel section between Illawarra Rd and Meeks Lane to 4000mm x 3000mm rectangular section	\$2,000,000	14	\$145,500	67	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Likely Property Acquisition required Authority negotiations - Connection to Sydney Water network	N	Acquisition of number of properties may be required
Addison Rd, Newington Rd and Browns Ave	FM6.1	Upgrade drainage in Newington Rd to 600mm diameter pipes	\$550,000	92	\$6,000	3	No major constraints	Y	
	FM6.2	Upgrade drainage in Stanmore Road and Merchant Street to 600mm diameter pipes	\$195,000	6	\$35,500	42	Low ranking on prelim cost/benefit	N	
	FM6.3	Divert flows from Stanmore Rd into 500m3 detention under school oval via 450mm diameter pipe to the basin inlet, and 375mm diameter pipe from the basin outlet	\$2,500,000	21	\$117,500	63	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Maintenance issues/costs Land ownership – permissions from Department of Education	N	Council to undertake discussions with the Department of Education
	FM6.4	Install new inlets and 600mm diameter pipes along England Ave, Agar St and Wemyss St	\$455,000	23	\$20,000	26	No major constraints	Y	

Drainage Line/Area	ID	Modification Type	Estimated Cost*	Number of directly and indirectly benefitted flood affected properties**	Cost per flood affected property	Rank	Constraints	Option to be modelled (Y/N)	Comment/Justification
Marrickville Industrial Area (MIA) - Addison Rd and Enmore Rd	FM7.1	Upgrade drainage and additional inlet capacity near Smith St, Enmore Rd and Cook Rd. Install 600mm diameter pipes along Enmore and Cook Rds, and 1800mm x 600mm box culvert along Smith St.	\$1,000,000	25	\$40,000	46	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	Y	Combined modelling of Option 7.1 and 7.5 To be undertaken as alternative to Option 7.4
	FM7.2	Industry partnership with large 'super roofs' to store and use water	\$250,000	17	\$14,500	11	Maintenance issues/costs Land ownership – permissions from private owners	N	Could be undertaken as part of future rezoning. Possible non-structural measure.
	FM7.3	New drainage up Fotheringham St via 600mm diameter pipes	\$850,000	12	\$72,500	57	Low ranking on prelim cost/benefit	N	
	FM7.4	Duplicate under capacity trunk under Enmore Park from Addison at Philpott to Leicester to 3.2m x 2.0m box culvert	\$4,000,000	102	\$39,000	45	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Environmental constraints – Enmore park is identified as heritage land Likely to be large number of utilities	Y	Large number of properties to benefit and likely high CBR due to damages reductions once modelling results available. To be undertaken only if pipe capacity assessment identifies existing pipe to be undercapacity
	FM7.5	Duplicate existing 600mm diameter pipe and new pits in Denby St and threshold on Denby St at Addison Rd	\$500,000	12	\$42,500	50	Low ranking on prelim cost/benefit	-	
Crawford Pl, Livingstone Rd, Arthur St and Moyes St	FM8.1	New drainage in Arthur Street and connect to Malakoff tunnel via 600mm diameter pipe	\$520,000	10	\$50,500	51	Low ranking on prelim cost/benefit	Y	Combined modelling of Option 8.1 and 8.2
	FM8.2	New drainage in Robert Street via 600mm diameter pipe	\$400,000	18	\$22,500	31	No major constraints		
	FM8.3	Upgrade and Extend drainage in Crawford Pl and Hollands Ave via 600mm and 750mm diameter pipes	\$1,950,000	64	\$30,500	40	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Likely to be large number of utilities	N	
Marrickville Rd and Illawarra Rd	FM9.1	New drainage in Marrickville Road and connect to Malakoff tunnel via 600mm diameter pipes	\$1,430,000	67	\$21,500	28	Capital Cost unlikely to be feasible Authority negotiations - Connection to Sydney Water network Likely to be large number of utilities	Y	Large number of properties to benefit and likely high CBR due to damages reductions once modelling results available.
	FM9.2	Upgrade drainage in Illawarra Rd and connect to Malakoff Tunnel via 600mm diameter pipes	\$1,235,000	19	\$67,000	56	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network Land ownership – permissions from RailCorp	N	
	FM9.3	Divert flows from McNeilly Park to Malakoff Tunnel by installing a new 1200mm diameter pipe and large inlet pit	\$775,000	25	\$30,500	40	Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	N	
Marrickville Industrial Area (MIA) Marrickville Rd, Meeks Rd, Myrtle St	FM10.1	Divert Marrickville Rd flows down Barclay Street to Sydenham Detention Basin via 600mm diameter pipes	\$1,040,000	60	\$17,500	21	Capital Cost unlikely to be feasible Potential worsening of impacts to adjacent areas	Y	Possible funding opportunity from Sydney Water
	FM10.2	Divert Myrtle Street Channel to existing pump station (and pump to Eastern Channel)	\$455,000	4	\$130,000	65	Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	Y	High hazard area Combined modelling of Option 10.2, 10.3 and 10.5 To be undertaken if Option 10.4 not feasible
	FM10.3	Upgrade drainage in Carrington Rd and connect to pipe in rail land via 450mm diameter pipe	\$715,000	6	\$130,000	65	Low ranking on prelim cost/benefit Land ownership – permissions from RailCorp		
	FM10.4	Divert flows from rail and Charlotte Ave into Western Channel via 900mm diameter pipe	\$675,000	6	\$122,500	64	Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	Y	Preferred option
	FM10.5	Optimise arrangement to divert additional flows to utilise current SPS 271 pump station capacity	\$5,000,000	75	\$66,500	55	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	-	High hazard area Combined modelling of Option 10.2, 10.3 and 10.5 To be undertaken if Option 10.4 not feasible
Unwins Bridge Rd and Tilman Park	FM11.1	Construct overland flow Path from Unwins around edge of park to rail culvert	\$450,000	40	\$11,500	7	No major constraints	Y	Combined modelling of Option 11.1 and 11.2
	FM11.2	Construct overland flow path from childcare centre around edge of park to rail culvert	\$300,000	21	\$14,500	11	Land ownership – permissions from private owners		
	FM11.3	Upgrade drainage in Unwins Bridge Rd and Terry St via 600mm diameter pipes to connect to existing twin 900mm diameter pipes	\$585,000	49	\$12,000	8	No major constraints	Y	
	FM11.4	Upgrade drainage in Unwins Bridge Rd at Bridge Street via 450mm diameter pipe	\$325,000	34	\$9,500	6	No major constraints	Y	
	FM11.5	Duplicate the existing 900mm diameter pipe underneath Tillman Park and discharge the flows into Eastern Channel	\$600,000	6	\$96,000	62	Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	N	The existing pipe is a twin pipe which hasn't been represented correctly in the model
Carrington Rd	FM12.1	Upgrade drainage in Cary St and Premier St to install 750mm diameter pipes	\$1,000,000	18	\$55,500	52	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit	Y	Combined modelling of Option 12.1 and 12.2
	FM12.2	Upgrade drainage in Renwick to install 750mm diameter pipes	\$750,000	18	\$41,500	48	Low ranking on prelim cost/benefit		
	FM12.3	Industry partnership with large 'super roofs' to store and use water and or discharge to eastern channel	\$250,000	14	\$18,500	24	Maintenance issues/costs Land ownership – permissions from private owners	N	Could be undertaken as part of future rezoning. Possible non-structural measure.
	FM12.4	Remove checkboards in central channel, install GPT and backflow prevention and optimise pump station operation	\$300,000	26	\$12,000	8	Authority negotiations - works in Sydney Water network	Y	Combined modelling of Option 12.4 and 12.5
	FM12.5	Raise channel wall to stop overflows in Cary street	\$200,000	8	\$25,000	34	Authority negotiations - works in Sydney Water network		
	FM12.6	Raise road level of Carrington Road near Cary to allow water to drain to park	\$1,000,000	2	\$500,000	69	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	N	
	FM12.7	Provide detention of 10,000m3 of storage volume underneath the park, surface area of approx. 1000m2 and use the existing pump station to transfer high flows to the underground storage	\$2,000,000	24	\$83,500	60	Capital Cost unlikely to be feasible Low ranking on prelim cost/benefit Environmental constraints – Mackey Park is identified as contaminated land Authority negotiations - Connection to Sydney Water network	N	

Drainage Line/Area	ID	Modification Type	Estimated Cost*	Number of directly and indirectly benefitted flood affected properties**	Cost per flood affected property	Rank	Constraints	Option to be modelled (Y/N)	Comment/Justification
Unwins Bridge Rd and Tramway Ave	FM13.1	Upgrade drainage in Gannon St and Edwin St to 600mm diameter pipes	\$390,000	10	\$40,000	46	Low ranking on prelim cost/benefit	Y	Combined modelling of Option 13.1, 13.2 and 13.5
	FM13.2	Upgrade drainage in Griffiths St to 600mm diameter pipes	\$200,000	8	\$25,000	34	No major constraints		
	FM13.3	Industry partnership with Sydney Buses to store and use water (bus cleaning?)	\$350,000	10	\$36,000	43	Maintenance issues/costs Land ownership – permissions from Sydney Buses	N	Possible non-structural measure.
	FM13.4	Industry partnership with School to store and use water (toilets and garden?)	\$150,000	7	\$22,000	30	Maintenance issues/costs Land ownership – permissions from Department of Education	N	Possible non-structural measure.
	FM13.5	Upgrade drainage in Brooklyn St and Union St to install 375mm - 450mm diameter pipes	\$50,000	3	\$16,500	17	No major constraints	-	Combined modelling of Option 13.1, 13.2 and 13.5
Sutherland St and Unwins Bridge Rd	FM14.1	Upgrade the existing 675mm diameter pipe to a 1200mm diameter pipe or duplicate the pipe underneath Bolton St and railway line	\$900,000	12	\$76,500	58	Low ranking on prelim cost/benefit Authority negotiations - Connection to Sydney Water network	Y	Possible funding opportunity from SydneyMetro
	FM14.2	Council harvest and store stormwater for truck washdown, ops use (watering, vac truck etc) and toilets	\$350,000	15	\$24,000	33	Maintenance issues/costs	N	Possible non-structural measure.
Marrickville Industrial Area (MIA) - Victoria Rd and Sydenham Rd	FM15.1	Upgrade and extend drainage in Victoria Road South of Sydenham Rd and Victoria Lane to 600mm diameter pipes and Victoria Lane and Meeks Road to 600mm diameter pipes	\$715,000	39	\$18,500	24	No major constraints	Y	Combined modelling of Option 15.1 and 15.2
	FM15.2	Upgrade and extend Drainage in Victoria Road north of Sydenham Rd to 600mm diameter pipes	\$650,000	43	\$15,000	13	No major constraints		
	FM15.3	Divert Buckley St and Wilkinson Ln into Shirlow St trunk via 750mm and 900mm diameter pipes	\$450,000	32	\$14,000	10	No major constraints	Y	
	FM15.5	Upgrade drainage in Faversham St to 600mm diameter pipes	\$360,000	21	\$17,000	19	No major constraints	Y	
	FM15.6	Upgrade drainage in Lilian Fowler Place to 600mm diameter pipes	\$180,000	5	\$36,000	43	Low ranking on prelim cost/benefit	N	
	FM15.7	Upgrade drainage in Sydney Street with 600mm diameter pipe and Vincent Street with 900mm diameter pipe	\$1,000,000	57	\$17,500	21	No major constraints	Y	
	FM15.8	Optimise operational arrangement of DPS1 to divert more flows to Eastern Channel	\$250,000	175	\$1,500	2	Authority negotiations - works in Sydney Water network	N	

* These costs are approximate only and excludes land acquisitions, contingencies and GST. Detailed costing will be undertaken for the final options selected for modelling.

** These number have been estimated based on expected benefit for the 2yr event. Modelling of final options will be undertaken to identify the exact number of properties benefitting.