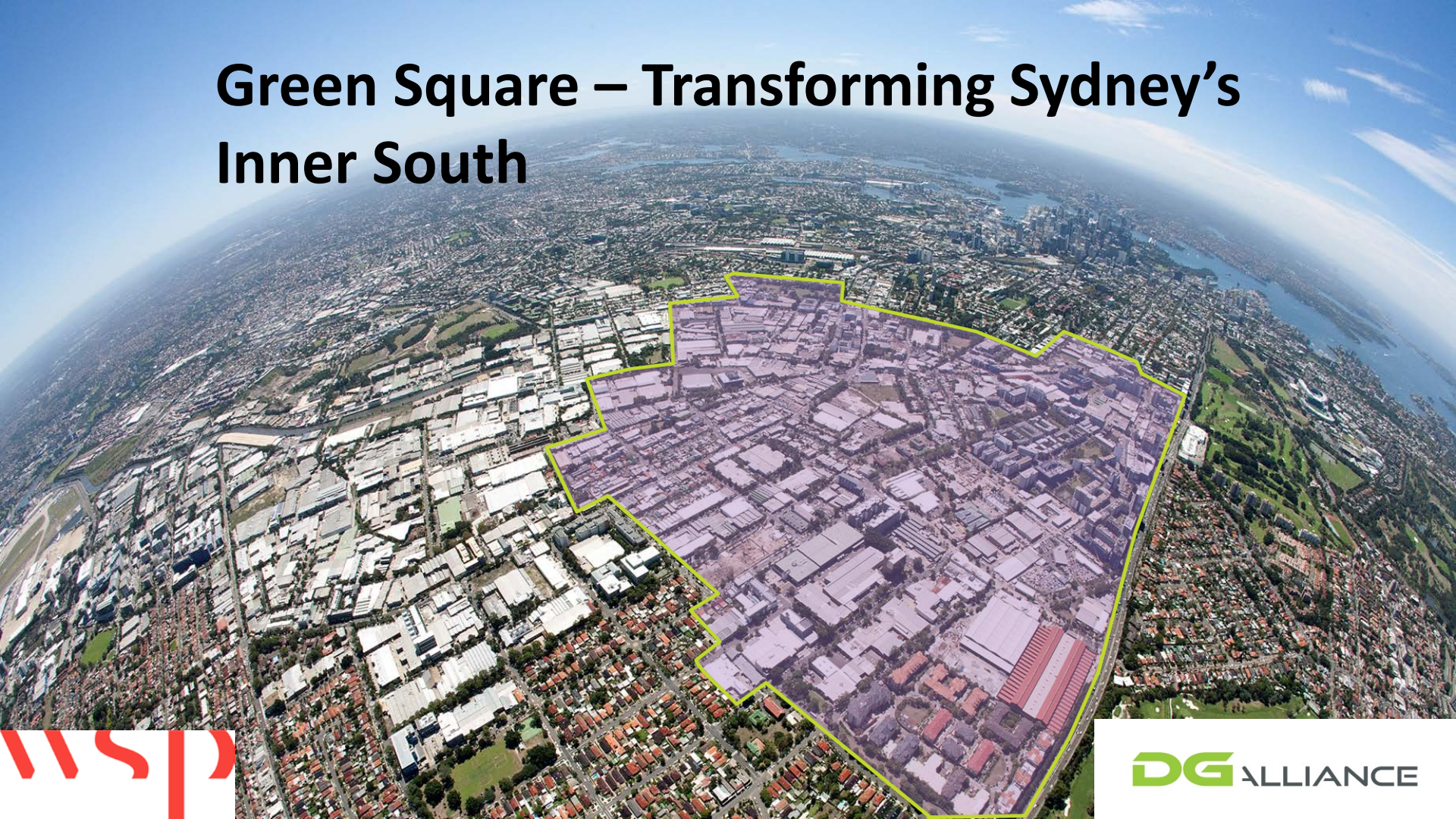
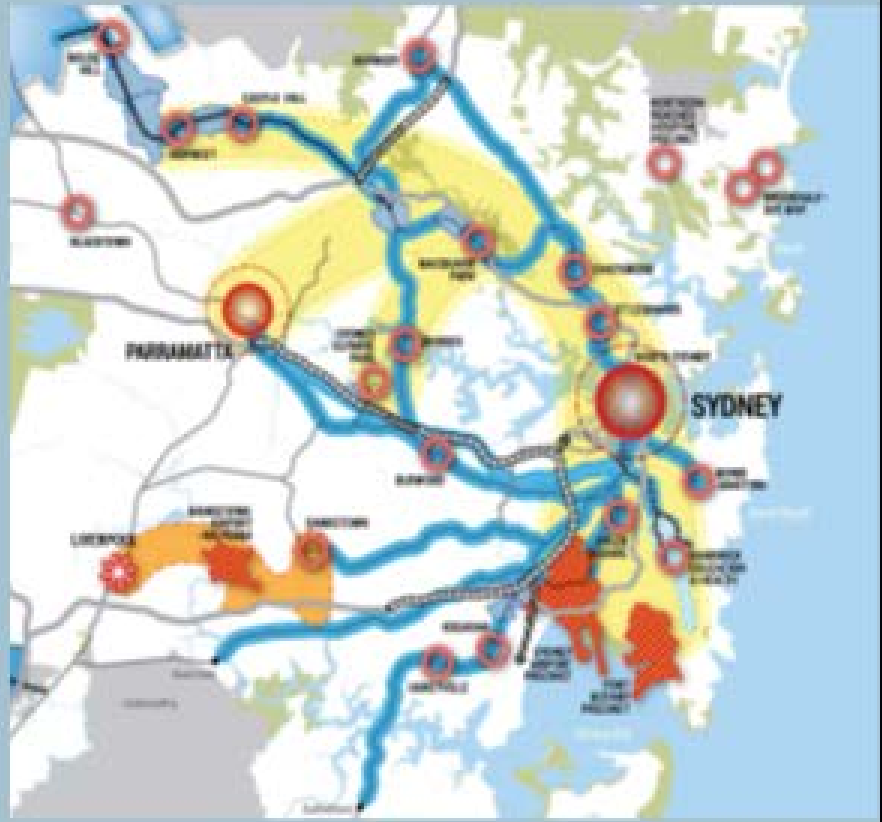
Green Square – Transforming Sydney's Inner South



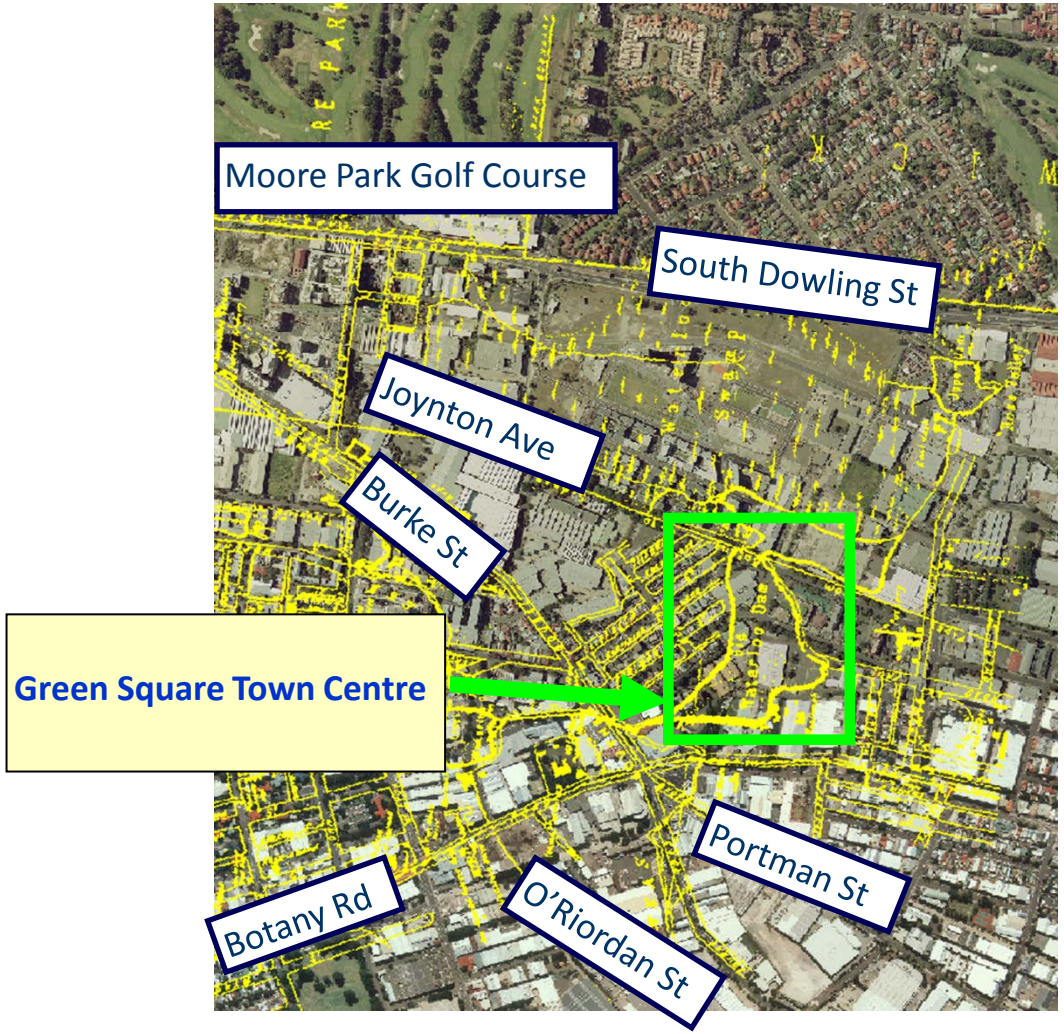
Green Square Snapshot

- $13 billion construction cost
- 30,500 new dwellings
- 21,000 jobs
- Highest population density in Australia – average 22,000 persons / km ^{2}
- 9,900 dwellings in construction or assessment



Historical context:

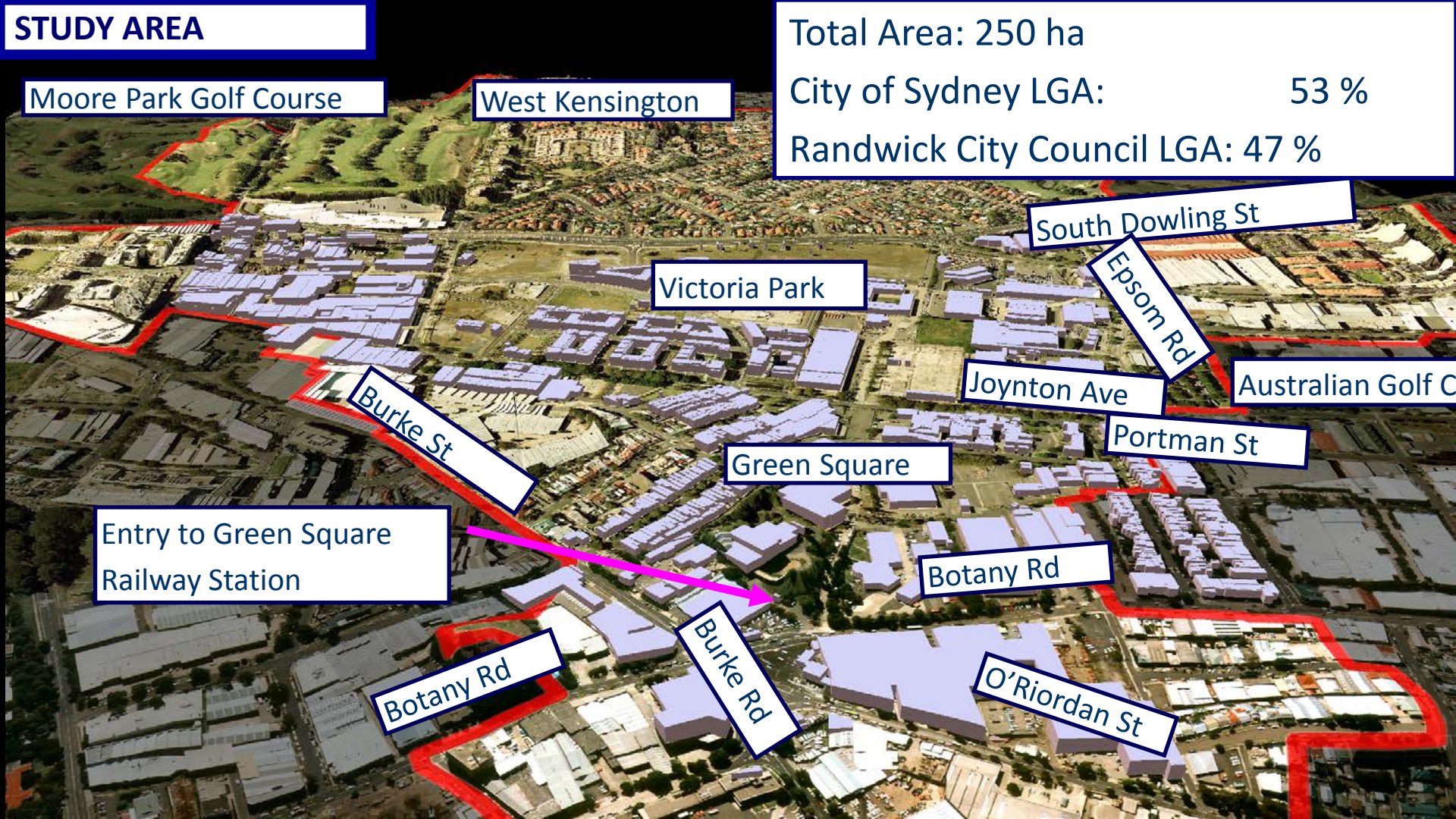
catchment conditions
circa 1880

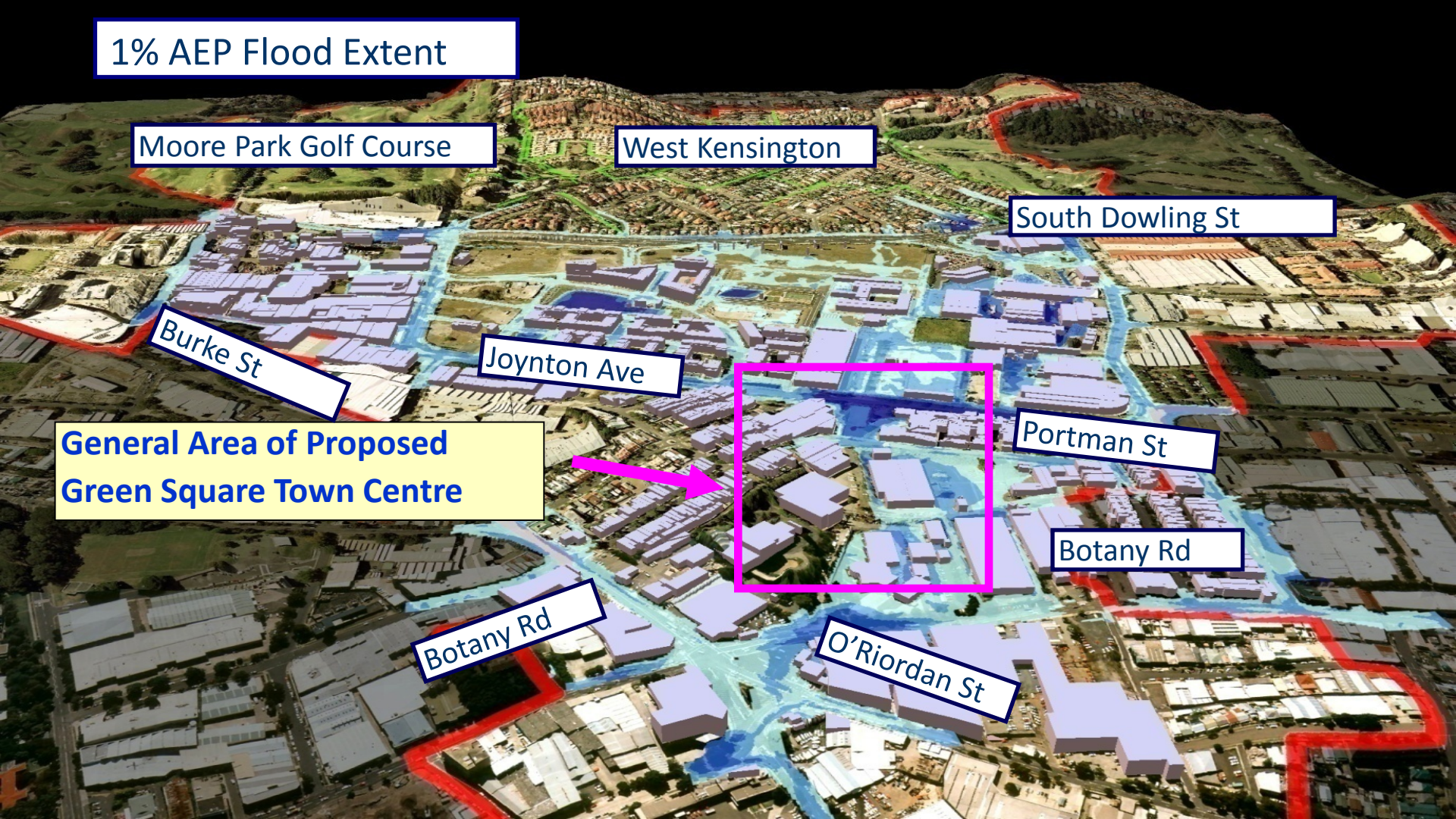


Wide Range of Existing Flood Problems

- Many legacy issues arising from the catchment history
- Trunk drainage systems disjointed and under-capacity
- Upgrading is difficult;
  - due to fragmented ownership,
  - expense,
  - conflicts with other infrastructure

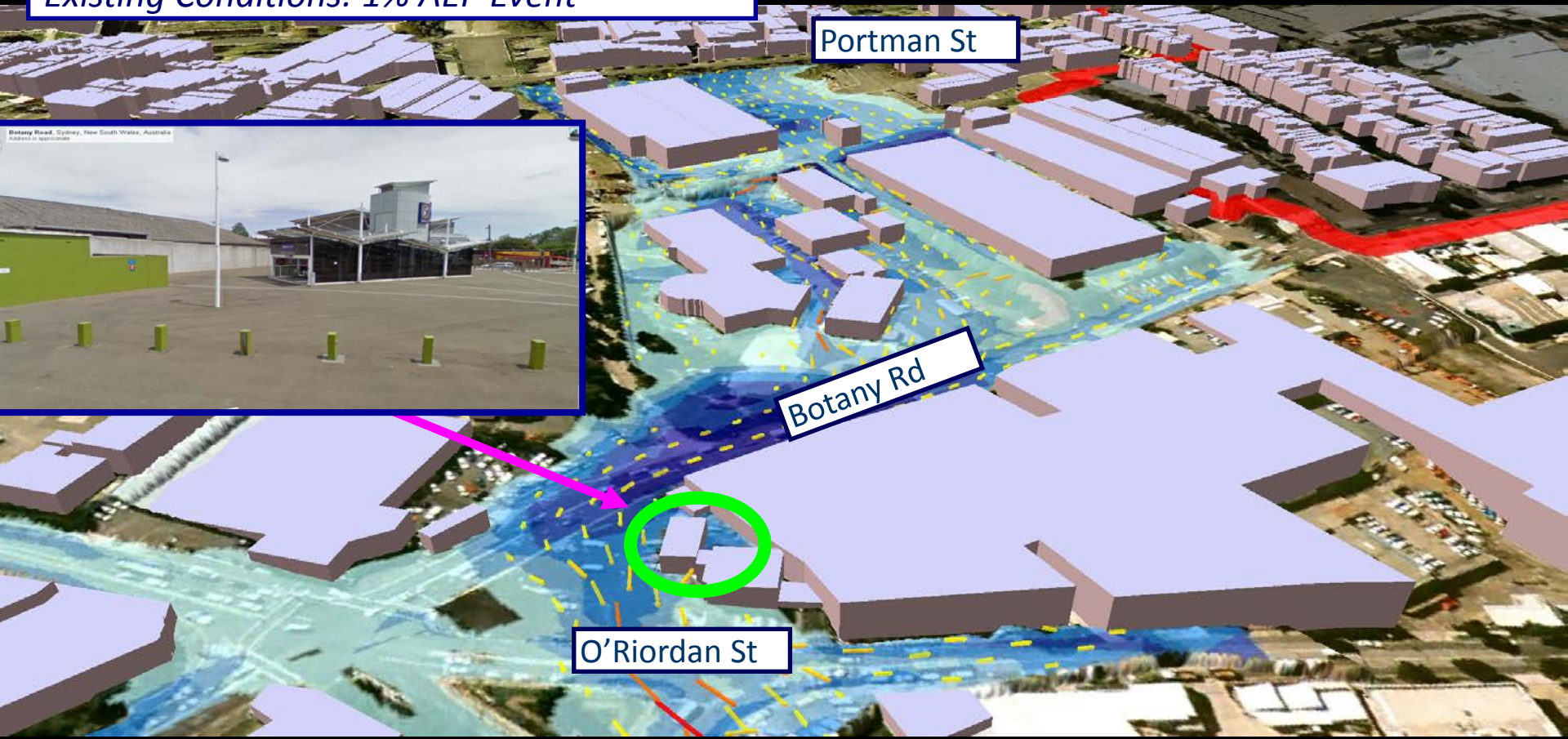
Joynton Ave: Feb 2001 (minor storm event)


STUDY AREA
Total Area: 250 ha
City of Sydney LGA: 53 %
Randwick City Council LGA: 47 %
Moore Park Golf Course
West Kensington
Victoria Park
South Dowling St
Epsom Rd
Joynton Ave
Australian Golf C
Burke St
Portman St
Green Square
Entry to Green Square
Railway Station
Botany Rd
Botany Rd
Burke Rd
O'Riordan St


1% AEP Flood Extent
Moore Park Golf Course
West Kensington
South Dowling St
Burke St
Joynton Ave
General Area of Proposed
Green Square Town Centre
Portman St
Botany Rd
Botany Rd
O'Riordan St

PROPOSED GREEN SQUARE TOWN CENTRE SITE

Existing Conditions: 1% AEP Event



Drying Green Alliance

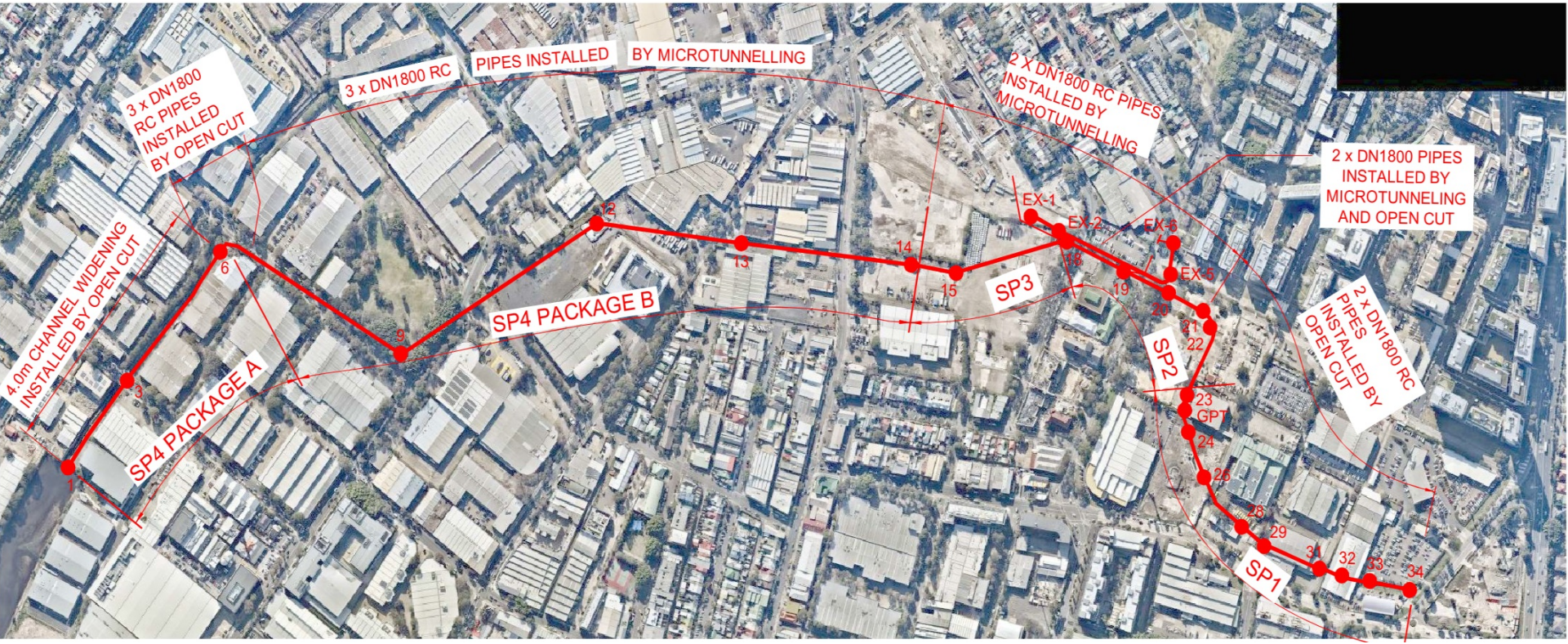
- **Sydney Water** – trunk drain asset owner
- **City of Sydney** – local drain asset owner
- **UGL** - constructor
- **Seymour Whyte** - constructor
- **WSP Parsons Brinckerhoff** - designer
- **RPS Manidis Roberts** – environment and communications

Site context

- Heavily built up commercial, residential and industrial area just south of Sydney CBD
- Major arterial roads
- Low lying ground with high groundwater
  - Unregulated fills
  - Old lake (Waterloo Swamp)
- Numerous and major existing utilities in
  - Joynton Ave
  - Portman St
  - Botany Rd
  - O'Riordan Street
  - Maddox Street
  - Huntley Street
- Numerous adjacent property owners

Project scope

- 2.5m km long twin and triple DN1800 pipes
- Installation by micro-tunnelling up to 9m below ground
- Open cut sections upstream and downstream
- Twenty local flow inlet and transition structures
- 2 x in-line gross pollutant traps
- DN840 water main relocation
- Existing trunk drain diversion
- Huntley St bridge



Green Square Stormwater Drain (GSSD) Project area

Hydraulics

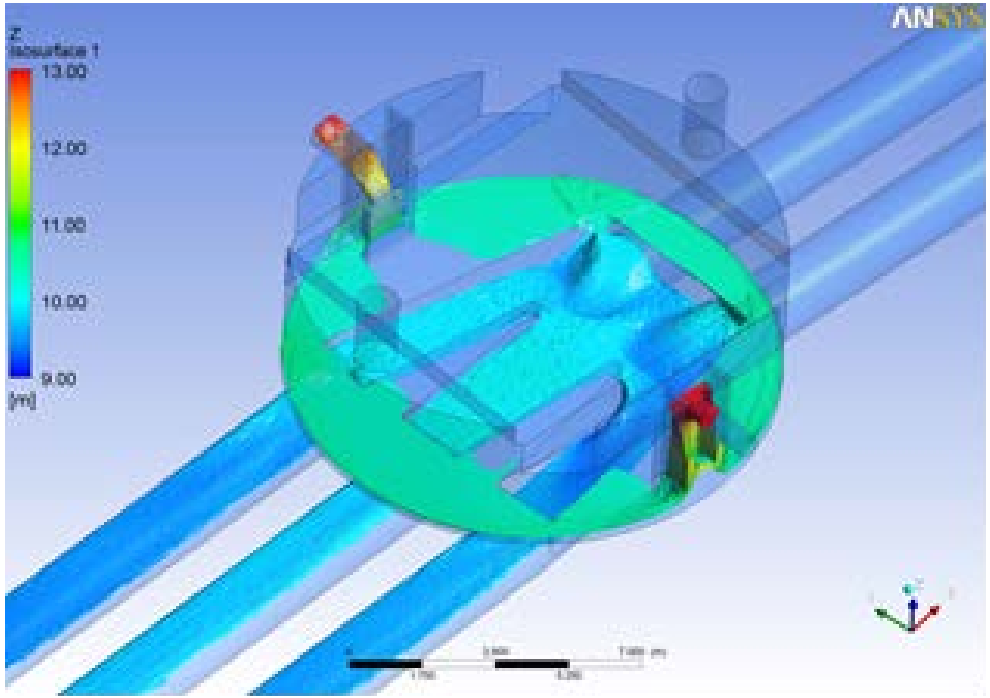
- GSSD operates under pressure in design event
- Flow capacity 30 m^3/s
- HGL maintained below ground
- Design to manage air transport and minimise blow back potential
- Modelling to minimise hydraulic head loss

Design

- TUFLOW modelling in conjunction with hydraulic grade line analysis determined drain size
- CFD and physical modelling optimised structures and verified theoretical head loss calculations
- Key horizontal and vertical alignment constraints
  - Existing buildings and underground infrastructure (Suttons, Maddox St Ausgrid)
  - Main Southern sewer in O'Riordan Street
  - New residential developments under construction (Meriton)
  - Future Green Square Town Centre (coordination and consultation)
  - Proposed aquatic centre

Longitudinal section of GSSD

Hydraulic modelling - CFD

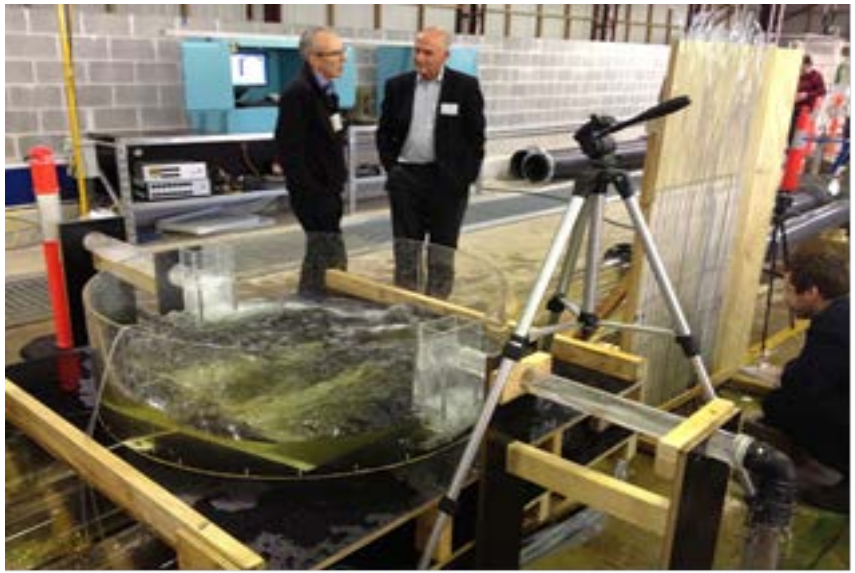


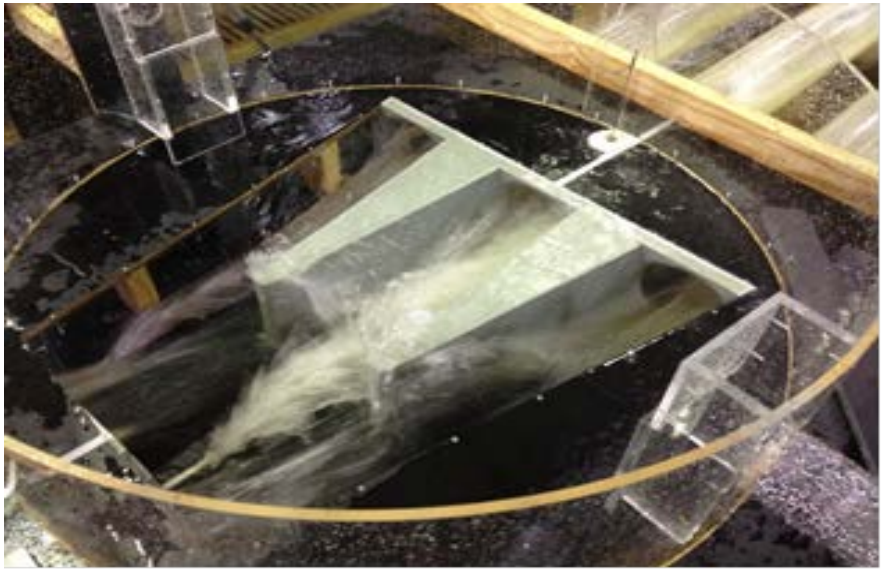
Structure 14 CFD model

- Allowed structure designs to be optimised quickly
- Provided configuration for flow balancing
- Input to HGL analysis (head loss factors)
- Input to physical model build

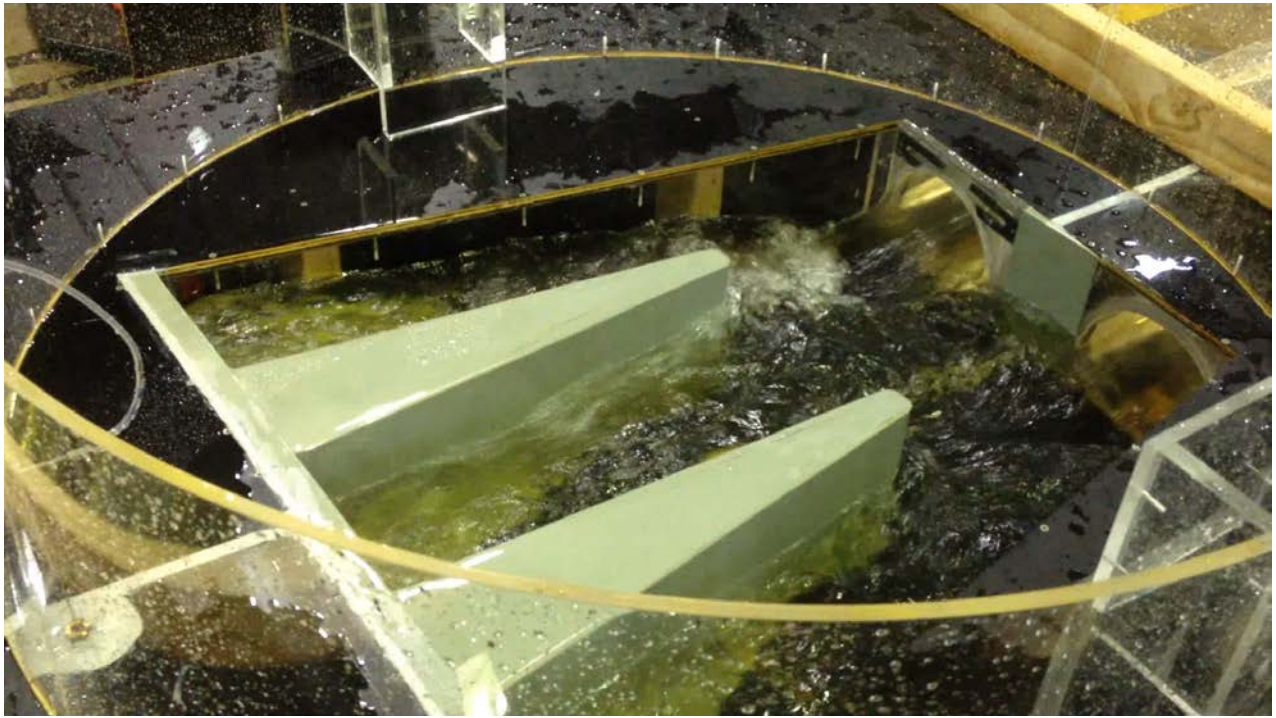
Hydraulic modelling - physical

- Confirmation of head loss from CFD modelling
- Assessment of flow and air transport in part to full flow transition
- Flow balancing



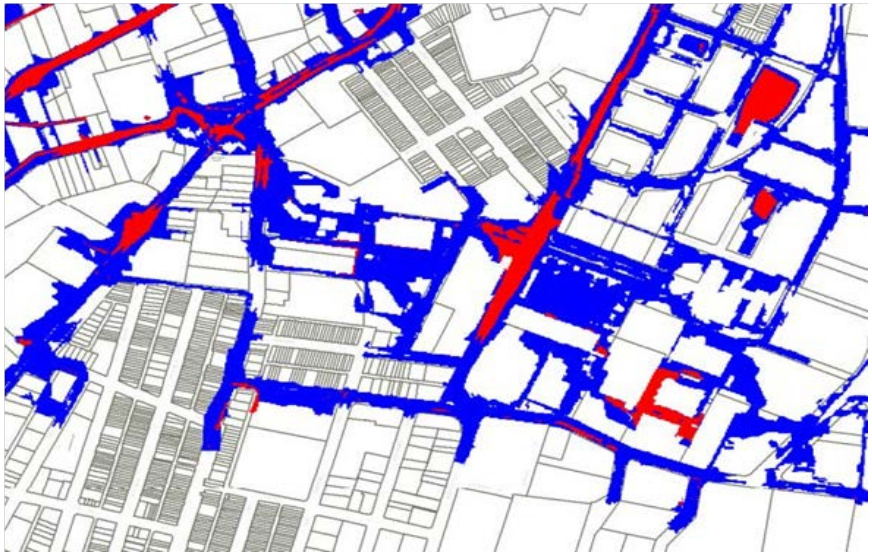


Physical model of Structure 14, two pipes into three

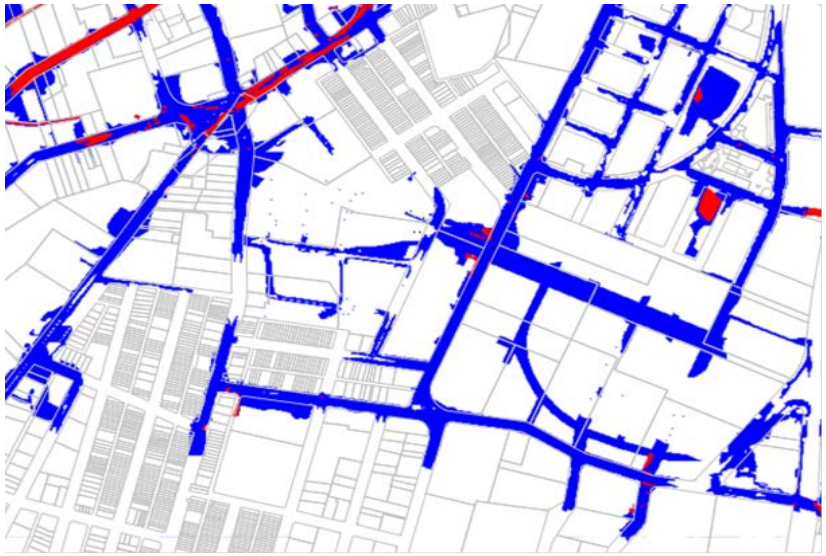


Hydraulic modelling - TUFLOW

- Reduced flood hazard at Botany Rd Interchange
- Flood depth At Joynton Ave reduced from 2.0m to 0.3m



Flood hazard before GSSD

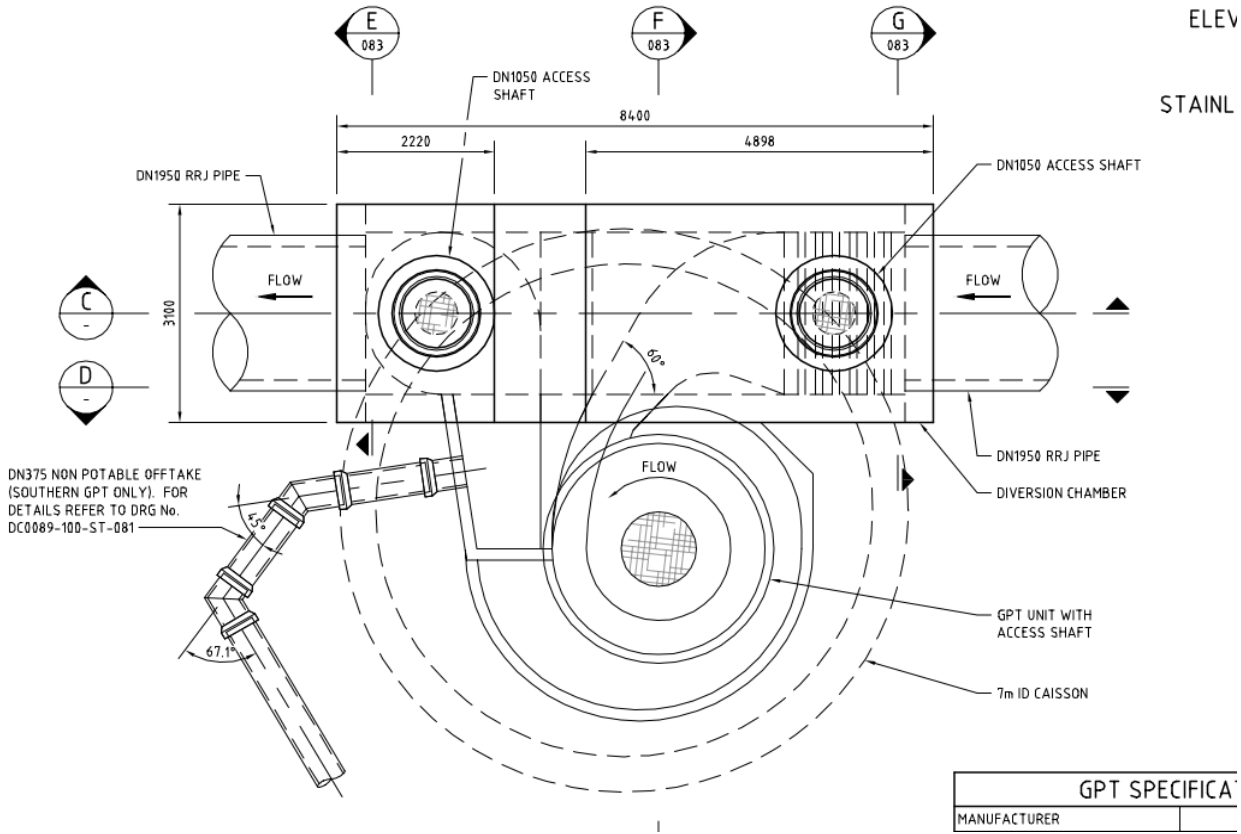


Flood hazard after GSSD

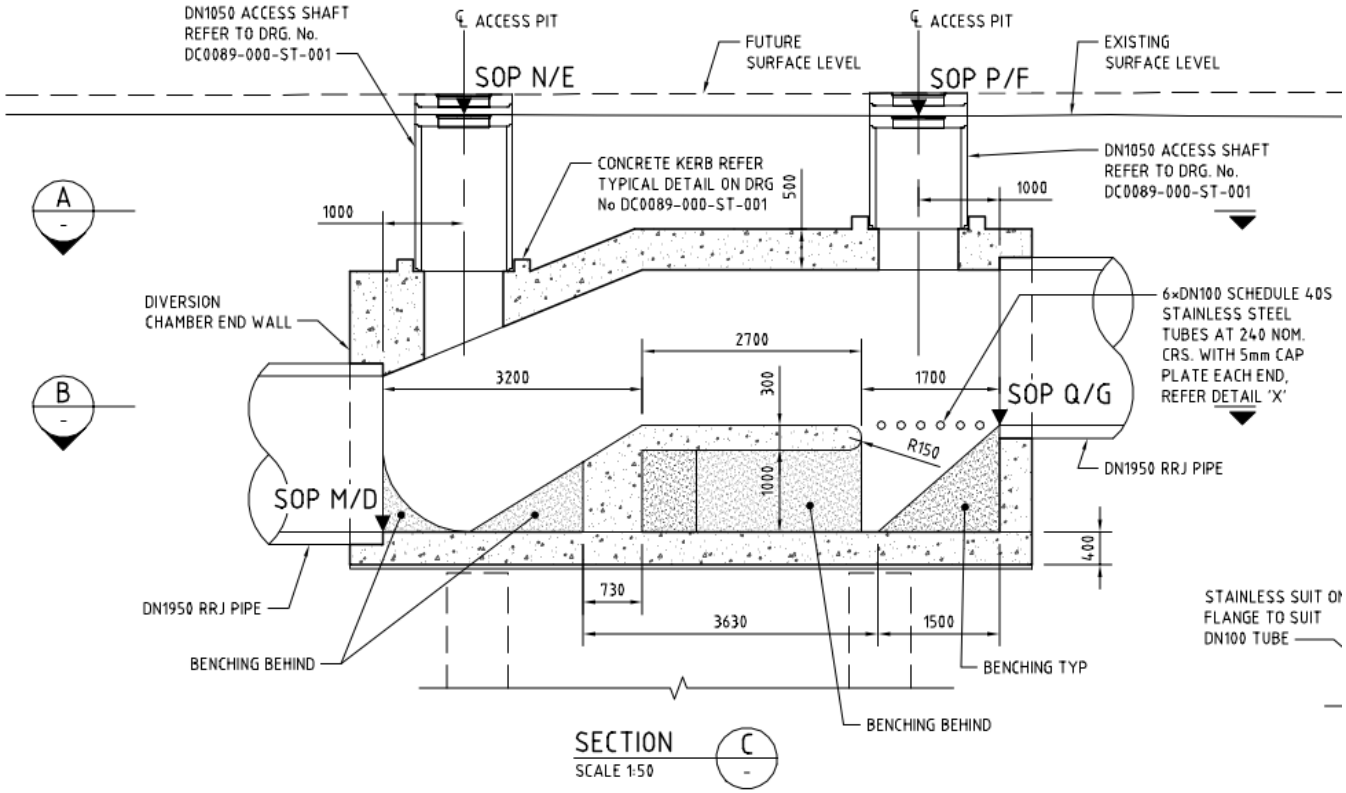
Gross pollutant traps

- Improve overall water quality discharging to Alexandra Canal
- Treat 3-month ARI flow in GSSD (1.5 m^3/s each)
- Proprietary in-line vortex type
- Diversion structure drop to reduce head loss

GPT plan


E
083
F
083
G
083
ELEV
STAINL
DN1050 ACCESS SHAFT
8400
2220
4898
DN1950 RRJ PIPE
DN1050 ACCESS SHAFT
C
D
3100
FLOW
FLOW
60°
DN1950 RRJ PIPE
DIVERSION CHAMBER
FLOW
DN375 NON POTABLE OFFTAKE (SOUTHERN GPT ONLY). FOR DETAILS REFER TO DRG No. DC0089-100-ST-081
45°
67.1°
GPT UNIT WITH ACCESS SHAFT
7m ID CAISSON
GPT SPECIFICA
MANUFACTURER

GPT section


DN1050 ACCESS SHAFT
REFER TO DRG. No.
DC0089-000-ST-001
℄ ACCESS PIT
SOP N/E
FUTURE
SURFACE LEVEL
℄ ACCESS PIT
SOP P/F
EXISTING
SURFACE LEVEL
CONCRETE KERB REFER
TYPICAL DETAIL ON DRG
No DC0089-000-ST-001
500
1000
1000
DN1050 ACCESS SHAFT
REFER TO DRG. No.
DC0089-000-ST-001
A
-
B
-
DIVERSION
CHAMBER END WALL
6×DN100 SCHEDULE 40S
STAINLESS STEEL
TUBES AT 240 NOM.
CRS. WITH 5mm CAP
PLATE EACH END,
REFER DETAIL 'X'
2700
3200
300
1700
SOP Q/G
R150
1000
DN1950 RRJ PIPE
SOP M/D
400
730
3630
1500
DN1950 RRJ PIPE
BENCHING BEHIND
BENCHING TYP
BENCHING BEHIND
STAINLESS SUIT OI
FLANGE TO SUIT
DN100 TUBE
SECTION
C
-
SCALE 1:50

Maddox St to Huntley St

- Original design was large RCBC
- Removal of existing restrictive box culvert
- Replacement with bridge and channel widening over 300m - reducing local flooding
- Shared path alongside channel to provide future connectivity with CBD

Huntley Street channel widening and shared path

Huntley Street bridge and shared path crossing

Micro-tunnelling benefits

- Minimum impact on existing roads and properties (no open cut)
- Minimum impact on more than 120 utilities crossing GSSD
- Minimum environmental impact (spoil and dewatering)
- Minimum community impact (no open cut)
- Cost effective hydraulic solution

Micro-tunnel installation – DN1800 pipe

Structure 14 construction

Structure 14 internal benching completion