FLOOD ASSESSMENT AND STORMWATER MANAGEMENT REPORT

Wee Hur Redfern Student Village, 13-23 Gibbons Street, Redfern, NSW 2016

REPORT FOR CITY OF SYDNEY COUNCIL AND NSW DEPARTMENT OF PLANNING & ENVIRONMENT

JHA

CONSULTING ENGINEERS

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

JHA has been engaged by The Trust Company (Australia) Limited ATF WH Gibbons Trust to provide stormwater and drainage services, flood analysis and including preparing this report. This flood assessment and stormwater management report with attached stormwater concept plans form part of the submission for Development Application.

The proposed development is to construct a new student accommodation known as Wee Hur Redfern Student Village located at 13-23 Gibbons Street, Redfern, NSW 2016. The site is identified as Lot SP60485 with an area of 1365 m2 (refer Survey and Strata Plan in Appendix B01). The existing site consist of a 4 to 5 Storey brick residential building with basement parking nearly covering the entire site. It is proposed the existing building will be demolished with the basement partly retained.

The adjacent site at the east of this development is a BP service station. Across Margaret Street to the south is a 3 to 5 storey residential flat building fronting Gibbons Street and a church building fronting Regent Street. At the west of the site across Gibbons Street is Gibbons Street Reserve. The adjacent site at the north is the former City of Sydney Council deport.

The approving authority of this development is City of Sydney Council and NSW Department of Planning & Environment. The proposed development is classified as State Significant Development as it has a project value of more than $10million. This stormwater report addresses the site stormwater and flood issues with reference to the following documents.

1) City of Sydney Council – Interim Floodplain Management Policy and Sydney Local Environmental Plan 2012 item 7.15 Flood planning.
2) Secretary's Environmental Assessment Requirements (SEARs Application Number SSD 9194 in Appendix B) item 14- Drainage and flooding.

Generally, this report intention is to determine that this development:

(a) is compatible with the flood hazard of the land, and

(b) is not likely to significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and

(c) incorporates appropriate measures to manage risk to life from flood, and

(d) is not likely to significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and

(e) is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

Besides, this report also addresses the proposed stormwater quantity treatment (On-site Detention) and stormwater quality treatment (Water Sensitive Urban Design- WSUD).

This report together with attached certified stormwater concept plans and calculations are prepared by experience Chartered Professional Civil Engineer from JHA registered with NER.

1.2 LIMITATIONS OF THIS REPORT

This report only serves the purpose of what it was intended to address the stormwater, flood and drainage issues based on the information that is available at the time of preparing this report. This report is not intended for use as a scope of works for tender or other unrelated purposes. Data extracted from this report shall not be used for any construction work.

2 THE ALEXANDRA CANAL CATCHMENT AND FLOOD CONDITIONS

The proposed development site is located within the Alexandra Canal catchment for which City of Sydney Council have conducted several flood studies as follows:

1) Alexandra Canal Catchment Flood Study – Report Final, Project W4785 prepared by Cardno
2) Alexandra Canal Floodplain Risk Management Study and Plan, Project W4948 prepared by Cardno
3) 11 Gibbons Street, Redfern Site Flood Assessment, prepared by WMA water Pty Ltd. This property is situated just north of this proposed development.

For the purpose of stormwater management and flood assessment, we need to examine the entire catchment which is much larger than the proposed development site area; with a focus on the site stormwater and drainage features. The Alexandra Canal catchment area is approximately 1,141 ha and includes the suburbs of Alexandria, Rosebery, Erskineville, Beaconsfield, Zetland, Waterloo, Redfern, Newtown, Eveleigh, Surry Hills and Moore Park. The majority of the catchment is fully developed (consist of housing, commercial and industrial) with some large open spaces. The trunk drainage system is mostly owned by Sydney Water Corporation, while the smaller feeding drainage systems owned by Councils. In this regard, Sydney Water has determined that this proposed development require On-Site Detention (OSD) volume of 24 m3 and Permissible Site Discharge (PSD) of 48 l/s.

The extent of the flood study with the existing pits and pipes system is shown in Appendix A01 (an extract of Figure 4.3 from Alexandra Canal Flood Study). Wee Hur site is located near the upstream end of the Alexandra Catchment with Council's existing street drainage network of pits and pipes along Gibbons Street, Margaret Street and William Lane. The site elevation RL is between 20m to 30m as shown in Appendix A02.

During the major storm event 100 years ARI, the flood study results Appendix A03 indicate the site is not inundated. William lane at the north-east corner is flooded. Flood water is prevented to enter the premises due to the elevated courtyard at RL24.72 which is about 700mm higher than the street level of William Lane at approximately RL24.02 (Refer to Appendix B02 Survey drawing). Retaining wall was built across William Lane causing stormwater to be "tank" at this low point (Refer to photos at Appendix C04). There are two existing kerb lintel pits at both sides of William lane near the site's north-east corner with underground pipe sizes of 225mm diameter (Refer Appendix C04). The eastern kerb inlet pit diverts the trapped stormwater to a pit at Regent Street via underground pipe of 300mm diameter running eastward across the BP Station. The peak flood depth of this location shown in Appendix A04 is in the region 0.5m-0.69m (cyan colour). Due to the low velocity, this location is designated as Low Hazard as shown in Appendix A05.

During the extreme storm event of probable maximum flood (PMF), the flood study results Appendix A06 indicate flood occur surrounding the buildings. The peak flood depth generally is in the region of 0.1m-0.3m (orange colour) as shown in Appendix A07. Gibbons Street, Margaret Street, William lane and part of the BP Station are inundated. Part of the retaining wall at the north-east corner have collapse (refer to photo at Appendix C05) and flood water could flow from William Lane into the compound of the BP Station. The flood water depth at the eastern kerb inlet pit could reached 0.7-0.99m. However due to relatively low velocity of flow, the entire site is still designated as Low Hazard as shown in Appendix A08.

The NSW Floodplain Development Manual (2005) defines flood prone land to be one of the following 3 hydraulic categories:

a) Floodway – Areas that convey a significant portion of the flow. These are areas that, even if partially blocked, would cause significant increase in flood levels or a significant redistribution of flood flows, which may adversely affect other areas.

b) Flood Storage – Areas that are important in the temporary storage of the floodwater during the passage of the flood. If the area is substantially removed by levees or fill it will result in elevated water levels and/or elevated discharges. Flood storage areas, if completely blocked would cause peak flood levels to increase by 0.1m and/or would cause the peak discharge to increase by more than 10 percent.

c) Flood Fringe – Remaining area of flood prone land after Floodway and Flood Storage areas have been defined. Blockage or filling of this area will not have any significant effect on the flood pattern or flood levels.

The site is designated as flood fringe in the 100 years ARI event as shown in Appendix A09. During the PMF event, due to the relatively higher flow velocity of flood water on the street; Gibbons St, Margaret St and Willian Lane are designated as floodway (blue colour). As flood water have inundated the courtyard and part of the BP station compound; these areas are designated as flood storage (green colour).

The NSW Office of Environment and Heritage (formerly Department of Environment, Climate Change and Water (DECCW)) guideline, Practical Consideration of Climate Change (2007), provides advice for consideration of climate change in flood investigations. The guideline recommends sensitivity analysis is conducted for:

- Sea level rise – for low, medium, and high level impacts up to 0.9m
- Rainfall intensities – for 10%, 20%, and 30% increase in peak rainfall and storm volume

In the Alexandra report, models were run for 100 years ARI 90 minutes storm for the increased rainfall intensities of 10%, 20% and 30% with an elevated tailwater level of 2.9m AHD to Alexandra Canal. Appendix A11, A12 and A13 indicate the difference in peak water level compared to the base 100 years ARI 90 minutes event of rainfall increment of 10%, 20% and 30% respectively. For the 10% increment Appendix A11 indicate no raise in flood level. For the 20% (A12) and 30% (A13) increment indicate (pink region) an increase of 10mm to 20mm flood level. In this regard, with appropriate adoption of Council's policy of recommended 500mm freeboard above the flood level of 100 years ARI, climate change risk is deemed to be taken care of for this project.

3 THE PRE-DEVELOPMENT SITE AND FLOOD CONDITIONS

The existing site terrain generally slope from north-west to south-east, refer to Appendix B02 (Survey drawings from LTS) and Appendix C. The existing site consist of a 5-storey brick building facing Gibbons Street, a 4-storey building facing Margaret Street, two 4-storey building facing the BP station and a paved courtyard at RL24.72 with 3 steps leading down to William Lane at the north. There is existing boundary fences (0.6m high brickwall with metal grille) at the boundary along the entire Gibbons Street, along Margaret St with an access driveway to underground carpark and a retaining wall across William Lane. Existing building ground floor finished level is at approximately RL24.85, in which pedestrian generally required to walk up 6 concrete steps from the footpath level at approximately RL23.60 to enter the premises (Refer to Appendix C03).

Results derived from Alexandra Canal Flood study and Flood Assessment Report of 11 Gibbons Street (neighbour property situated at the north of this development) by WMA indicate that the existing buildings is not inundated during the Major Storm of 100 years ARI. From the Flood Assessment Report of 11 Gibbons Street, the flow along Gibbons Street is shallow with 150mm deep in the 1% AEP event and 200mm in the PMF event. The trapped low point of William lane could pond to a depth of 0.8m in the 1% AEP event. The dead end lane is drained via a 300mm underground pipe eastward toward Regent Street. When runoff exceeds the capacity of this pipe, stormwater ponds in William Lane until overflow via the compound of BP Station toward Margaret Street (Refer Appendix C05). Given the depth of ponding, William Lane is considered as subject to “mainstream flooding”. The 1% AEP Peak level (mAHD) of this low point of William Lane is estimated at RL24.82 from the report.

However, the flood level data derived from the above mentioned reports are insufficient to provide the determination of the design flood level for this development. As such, a smaller scale flood analysis focus on the site pre and post development condition was carried out with the similar modelling methodology and design procedure of those reports mentioned above. The Hec Ras Version 5.05 (Hydrologic Engineering Center – River Analysis System) has the 2D flood analysis capabilities and was used for flood analysis for this development. However, the previous flood study of Alexandra Canal utilizes the SOBEK software. Similar to previous flood study methodology, aerial laser scanning (ALS) ground levels surveyed in 2007 and 2008 was downloaded from NSW Government websites for this development area and encompassed all the upstream catchment areas. Generally, the accuracy of the ALS data is +/- 0.15m to one standard deviation on hard surfaces. We have also incorporated local survey data particularly the existing kerb and gutter and footpath levels. We visit the site and took several photos to ensure the data correlate to the terrain on the ground.

Direct rainfall method was used similar to the report’s modelling methodology. The critical duration for the major storm (100 years ARI) and PMF were taken from the reports as follows:

Average Recurrence Interval	Critical Durations
1 year to 100 year	60 to 180 minutes
PMF	15 to 45 minutes

Rainfall data for the 100 years ARI corresponding to various critical durations we generated from DRAINS software database (in mm/hr) and converted to format mm per 5 minutes as precipitation. As the upstream terrain is general fully developed and we take a conservative approach of zero loss to infiltration and interception. For the PMF rainfall, we adopt the GSDM (Generalised Short-Duration Method) PMP estimation method based on Commonwealth Bureau of Meteorology guidebook “The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method). Due to the relatively small size of the site compare to the Alexandra Canal catchment, we adopt the point values which is very conservative. It is expected the flood analysis results for PMF will be more severe than values from the previous results.

The 2D flow areas consist of 20,520 cells cover the site area from Margaret St (lowest boundary) to Lawson St (highest boundary) as shown in Appendix D01. HEC RAS takes a very different approach from other software in 2D flow area modelling. The cells can have 3, 4, and 5 up to 8 sides. Each cell is not a simple plane, but a detailed elevation volume/area relationship that represents the details of the underlying terrain. Each cell faces are detailed cross sections, which get processed into detailed elevation versus area, wetted perimeter and roughness. This approached allows the modeller to use larger cell size and still accurately represent the underlying terrain. As such, Hec Ras will "figure out" where the boundary of the catchment automatically during the direct rainfall analysis without the manual delineation that could be inaccurate.

Appendix D02 shows the contours of the ALS terrain at interval of 0.2m; in which the North-West corner of the site at RL24.80 matching the ground survey level at the footpath at RL24.79 as shown in Appendix B02. The trapped low point at the North-East corner of the site with contour of 24.20 also matching the survey data.

Appendix D03, D04 and D05 show the results of maximum flood depth for the 100 Years ARI for the critical durations of 60min, 90min and 120min respectively. The highest flood depth is found to be 0.840m at the William Lane low point during the 100Y 90min duration storm which is consistence with the Alexandra Canal Flood Analysis results. Appendix D06, D07 and D08 show the results of the maximum flood water surface elevation for the 100 Years ARI for the critical durations of 60, 90 and 120 minutes. The highest flood surface level at the William Lane low point is found to be RL24.89 for the 100 Years ARI for the 90 minutes critical duration. This result is just 70mm higher than the results obtained by another consultant using a different software. The small increase in flood levels could be due to the following assumptions or methodology that may differ from the previous flood study:

i) Existing pits and pipes are assumed to be fully blocked

ii) No allowance for soil infiltration losses as the upstream catchment is full developed.

In this regard, we can declare the Hec Ras model is calibrated to the results of those Flood Analysis that were accepted and approved by Council.

4 THE POST-DEVELOPMENT SITE AND FLOOD CONDITIONS

4.1 FLOOD ANALYSIS RESULTS

The proposed development is a tower of 18 storey high building with the roof reaching RL87.5 (refer to Appendix E01). Appendix E02 shows the layout of the proposed public domain laneway along the eastern boundary with the BP petrol station. A perspective view of the laneway as shown in Appendix E03, indicating that the laneway serves as a pass-thru for pedestrian and occasionally for vehicles. The laneway generally slopes gently (about 2.0 %) from the northern boundary to the southern boundary. The existing retaining wall at the northern boundary that cause stormwater ponding will be removed. During minor storm, it is expected the existing 300mm diameter underground pipe will divert the flow toward Regent St. During the major storm (100 years ARI), flood water will not be "trapped" as in the pre-development condition; could now escape and flow south toward Margaret Street.

The post development terrain of the site is modelled using 12D Model software and imported into HecRAS. HecRAS GIS tools (Ras Mapper) is capable to merge the site terrain into the ALS catchment terrain. Flood analysis was carried out with the same methodology and rainfall data as mentioned above within the same predevelopment model. Appendix F01 shows the contours of the post development terrain.

During the 60min duration 100 years ARI storm (refer Appendix F02), the maximum depth for flood at the low point at William Street reduced from 0.835m to 0.423m. The flood surface water elevation is at RL24.491 as shown in Appendix F03. The maximum velocity reached 1.287 m/s at the downstream end of laneway as shown in Appendix F04.

During the 90min duration 100 years ARI storm (refer Appendix F05), the maximum depth for flood at the low point at William Street reduced from 0.840m to 0.427m. The flood surface water elevation is at RL24.508 as shown in Appendix F06. The maximum velocity reached 1.269 m/s at the downstream end of laneway as shown in Appendix F07. Since the 100 Years ARI 90min duration is the critical storm, profile of the flood surface water elevation is plotted along Gibbons St, Margaret St and William St with their layout as shown in Appendix F08, F09 and F10 respectively. The corresponding profiles are plotted as shown in Appendix F11, F12 and F13 respectively. The profile of flood water along William lane as shown in Appendix F13 shows that the flood depth is slightly less than 250mm at the north, gradually reduce to a depth of 200mm at the south. The depth did not exceed the safe limit of 0.3m for major storm. The velocity x safe depth is calculated as 1.269x0.25=0.32 which did not exceed the safe limit of 0.4 for the major storm.

During the 120min duration 100 years ARI storm (refer Appendix F14), the maximum depth for flood at the low point at William Street reduced from 0.839m to 0.407m. The flood surface water elevation is at RL24.447 as shown in Appendix F15. The maximum velocity reached 1.150 m/s at the downstream end of laneway as shown in Appendix F16.

During the 15min duration PMF storm event (refer Appendix G01), the maximum depth for flood at the low point at William Street increase to 1.014m. The flood surface water elevation is at RL25.082 as shown in Appendix G02. The maximum velocity reached 2.512 m/s at the downstream end of laneway as shown in Appendix G03.

During the 30min duration PMF storm event (refer Appendix G04), the maximum depth for flood at the low point at William Street increase to 1.24m. The flood surface water elevation is at RL25.32 as shown in Appendix G05. The maximum velocity reached 3.025 m/s at the downstream end of laneway as shown in Appendix G06. As this is the critical PMF storm, both the depth and (velocity x depth) have exceeded the safe limits of major storm. These situations are also consistent with the previous flood study that during PMF event, the road and site are designated as floodway and flood storage respectively.

During the 45min duration PMF storm event (refer Appendix G07), the maximum depth for flood at the low point at William Street increase to 1.24m. The flood surface water elevation is at RL25.316 as shown in Appendix G08. The maximum velocity reached 2.989 m/s at the downstream end of laneway as shown in Appendix G09.

4.2 FLOOD PLANNING LEVELS

City of Sydney Council has a responsibility to manage flood affected properties to ensure that:

- Any new development will not experience undue flood risk; and
- Any existing development (neighbourhood) will not be adversely flood affected through increased damaged or hazard as a result of the proposed new development.

The previous chapter flood analysis demonstrated that the proposed new development did not increase flood level or increase flood risk compare to its pre-development situations. In fact, flood level is reduced as much as 400mm due to the proposed removal of the "tanking" existing retaining wall at the northern William Lane and convert into a pass-thru public domain laneway. Due to such improvement, during the 100 years ARI flood situation for the post-development site, we could classify the Gibbons Street as "outside floodplain" and the Public Domain laneway at "local drainage flooding". However, these may be subjected to the discretion of the local Authorities.

Nevertheless, the development shall comply with the floor level requirements as specified in the "City of Sydney Interim Floodplain Management Policy" as show in Appendix H01 and H02 (chapter 5-Flood Planning Levels). A flood planning level refers to the permissible minimum building floor levels. Below-ground basement/parking shall refer to the minimum level at each access points such as staircase, elevator or vehicle entrance.

A 3D representation of the flood water surface elevation at the critical 100 years ARI duration 90min storm is constructed in 12D using several crucial spot flood levels exported out from HecRas in shapefiles format (refer to Appendix H03). The results is overlaid with the ground floor layout as shown in Drawing C301 with proposed finished floor planning levels (Refer to Appendix H04). The proposed floor planning levels are conservative in which we are proposing 500mm freeboard of the habitable areas above flooding from Gibbons Street (classified outside floodplain); 300mm freeboard for business areas and 100mm freeboard for non-habitable areas. Along the eastern boundary, we proposed an overland flow path channel with layout and profile are shown in Appendix H04 and H06 respectively. The width of the channel at 800mm will be revise to suite the requirement of the landscape and laneway specifications. During the minor storm event, stormwater is captured by the existing pits and diverted to Regent St via underground 300mm diameter pipe. For minor flood event, stormwater exceeded the capacity of the underground pipe will escape and flow along the proposed channel without entering the houses upstream. For larger flood event, the rising flood water in the channel will rise and spread out to a larger terrain as indicated in Appendix H06 prior to entering the substations at FPL of RL24.61. At 100 years ARI flood event, stormwater did not enter the substations.

We proposed the Flood planning levels (FPL) as shown below (Refer Appendix H05)

Item	GroundFloor Rooms / Entry Point	1% AEP Flood Surface Levels (m)	Classification	Freeboard (mm)	Minimum	Proposed FPL	Comment
1	NorthWest Access Door to Corridor	24.75	Outside Floodplain	100	24.85	24.85	Meet requirement above flood level
2	Retail Unit Entrance	24.7	Outside Floodplain	300	25.00	25.00	Commercial Requirement
3	Office, Meeting and WC	24.55	Outside Floodplain	500	25.05	25.05	Residential Requirement
4	Reception	24.55	Outside Floodplain	500	25.05	25.05	Residential Requirement
5	Common and Quiet Area	24.3	Outside Floodplain	500	24.80	24.80	Without slab setdown, adopted RL25.05
6	Lounge	24.05	Local Drainage	500	24.55	24.55	Without slab setdown, adopted RL25.05
7	Games Area	24.4	Outside Floodplain	500	24.90	24.90	Without slab setdown, adopted RL25.05
8	Access to Fire Pumps,MSB,Meter	24.5	Local Drainage	100	24.60	24.65	Meet requirement above flood level
9	Substation 1 North Access	24.4	Local Drainage	100	24.50	24.61	Meet requirement above flood level
10	Substation 1 South Access	24.3	Local Drainage	100	24.40	24.61	Meet requirement above flood level
11	Substation 2 North Access	24.3	Local Drainage	100	24.40	24.61	Meet requirement above flood level
12	Substation 2 South Access	24.2	Local Drainage	100	24.30	24.61	Meet requirement above flood level
13	Corridor to Lift, Stair, Basement	24.4	Outside Floodplain	500	24.90	24.90	Without slab setdown, adopted RL25.05
14	Corridor around Fire Control	24.45	Outside Floodplain	100	24.55	24.70	100mm higher than existing kerb RL24.60
15	Access Corridor to Fire Control	24.2	Local Drainage	100	24.30	24.576	Gradually slope up to RL24.70
16	Access Corridor to Bike Repair	24.15	Local Drainage	100	24.25	24.488	Meet requirement above flood level
17	Double Door Access to Lounge	24	Local Drainage	100	24.10	24.280	Step up to interior floor at RL25.05

5 STORMWATER DESIGN

5.1 STORMWATER QUANTITY TREATMENT

Sydney Water Corporation calculated the required Site Storage Requirement at 24m3 and Permissible Site Discharge at 48 litre/sec. A snapshot of Sydney Water email of SSR and PSD and the orifice calculation are shown in Appendix J01. The on-site detention tank (OSD) is situated approximately at the south-east corner of the building. The OSD tank layout is shown in drawing C101 (Appendix J02) and cross-sections at C103 (Appendix J03). The shape of the OSD tank is trapezoidal with internal length 11.3m, average width 2.89m and depth 1.75m. The estimated depth of water for the 100 years ARI storm event is 900mm. The orifice is calculated to be 150mm diameter which allow stormwater discharge at a maximum rate of 42.7 l/s (less than 48). The invert of the orifice is at RL 23.0m and top water level is at RL 23.90. The outlet UPVC pipe is 225mm diameter with invert level IL 22.914. The discharge from the OSD will be drained to a collection (for the permeable laneway pavement) and eventually discharged into the existing Kerb Inlet Pit at Margaret Street. The longitudinal section of this drainage pits and pipes are shown in drawing C102 (Appendix J04).

The building's flat roof is generally delineated into two catchments, approximately half will drain East and the other draining West. The western roof catchment will collect stormwater, drain via downpipes and discharge into a bio-retention basin (known as Raingarden). During the minor storm event, the raingarden will provide the stormwater quality treatment in accordance to the Council policy. During the major storm event, the large overflow will be discharge into the OSD tank. Similarly, the Eastern roof catchment will collect stormwater, drain via downpipes and underground pipes along the public domain laneway. Discharge from the Eastern catchment will undergo quality treatment using two Stormfilters before entering the OSD tank.

In the event of extreme storm, the stormwater is expected to well up from the access grates of the OSD's overflow chamber and discharge out to Margaret Street safely without any possibility of stormwater overflow from the OSD tank internal access covers into the building.

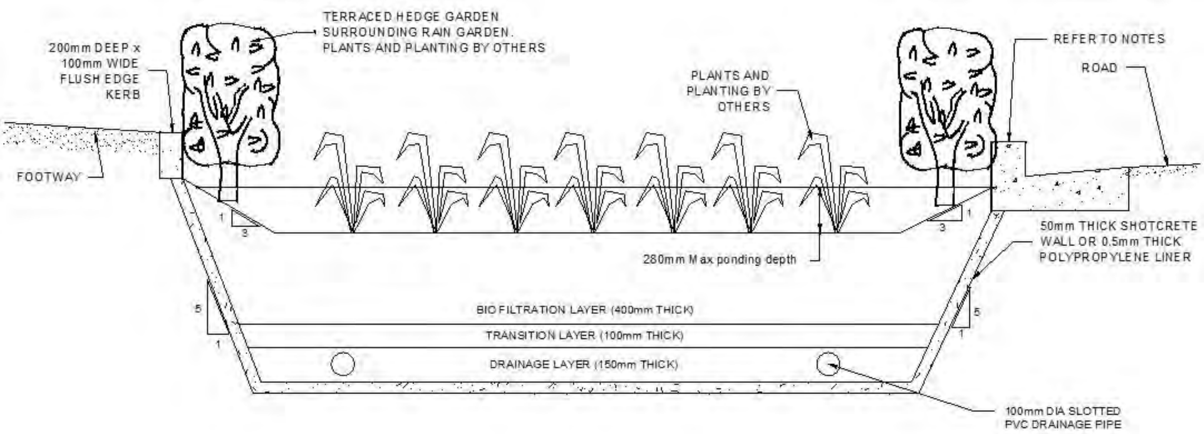
5.2 STORMWATER QUALITY TREATMENT

We refer to the City of Sydney WSUD Technical Guidelines Oct 2014 for the design and MUSIC modelling (Model for Urban Stormwater Improvement Conceptualisation) for the stormwater quality treatment of this development. Based on Figure 1: "City of Sydney soils, with roads and suburb boundaries", the site is found to possess soil in category Tuggerah (code tg); the Aeolian soil with deep podzols on dunes and Humus Podzol intergrades on swales. Soil of this type is found to be suitable for infiltration.

Acid sulphate soils (ASS) must be taken into consideration in designing for stormwater quality treatment. The ASS mapping for City of Sydney is shown in Figure 2 of the Technical Guidelines. The site is found to be classified as Class 5 area that may be appropriate for infiltration.

In this project, we propose to use bio-retention system and stormfilter (a product from Stormwater360) for the stormwater quality treatment to satisfy the WSUD (Water Sensitive Urban Design) requirements. Bioretention systems also known as Raingardens, are commonly constructed in Sydney. Raingarden is vegetated soil filters. Stormwater runoff is treated by draining vertically through a vegetated filter media typically a sandy loam layer of about 400mm thick. The temporary ponding water depth is about 100-300mm (200mm depth selected in this design). Vegetation plays a key role in bioretention systems. The surface is densely planted with ground level grasses, sedges and also some selected shrub species. The agitation of the surface of the bioretention caused by movement of the vegetation and the growth and die off of root systems helps to prevent sediments from clogging the filtration media. Beneath the surface, vegetation provides a substrate for biofilm growth within the upper layer of the filter media. Vegetation facilitates the transport of oxygen to the soil and enhances soil microbial communities which enhance biological transformation of pollutants.

In this project the raingarden is proposed with a liner due to its proximity to the habitable rooms at the basement. The City of Sydney Council standard detail is shown below

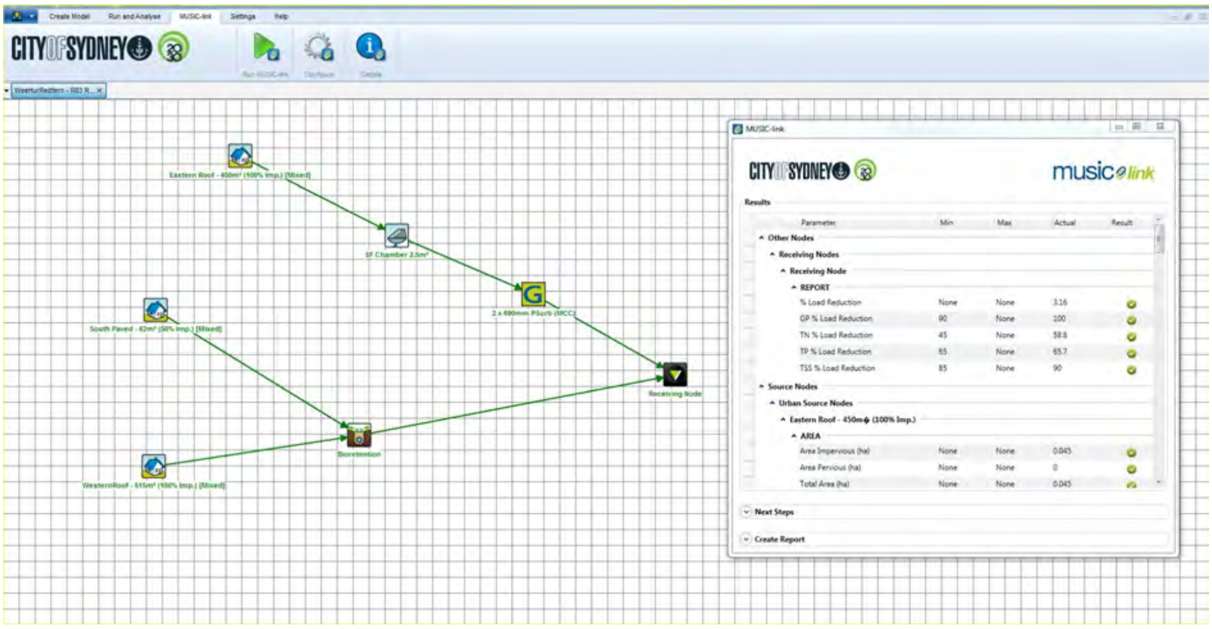


The information for the Stormfilter system can be found at https://www.stormwater360.com.au/products/stormwater-management/filtration/prod/stormfilter. The stormfilter cleans stormwater through a patented passive filtration system, effectively removing pollutants to meet stormwater quality targets. The system uses rechargeable self-cleaning media-filled cartridges to absorb and retain the most challenging pollutants from stormwater including total suspended solids, hydrocarbons, nutrients, soluble heavy metals, and other common pollutants. The siphon actuated, high surface area cartridges draw stormwater evenly through the filter media, providing efficient, effective stormwater treatment, while the self-cleaning hood prevents surface binding, ensure maximum media contact, and prolongs cartridge life. In this project, we proposed the PhosphoSorb Filter Media that is designed to target high levels of phosphorus pollutants. Detail and location of the proposed stormfilter system within the OSD tank is shown in drawing C103 (Appendix J03).

The public domain laneway catchment is situated relatively low compare to the OSD tank location inside the building. The laneway also serves as the overland flow path during the flood. As such, flood water shall not be diverted into either the Raingarden or the OSD tank. The raingarden and OSD tank are not capable to contain the large amount of flood water and may be damaged by the flood water.

We proposed the laneway to be paved with Stoneset permeable pavement. During the minor storm event, the stormwater will be infiltrated into the pavement, filtered by the sand layer underneath of about 500mm thick and discharge via subsoil pipes (90mm diameter) into a collection pit (Refer to A9 of(Appendix J02)and finally discharge into existing Kerb Inlet Pit at Margaret Street. With reference to item 3.5 of the Council Guildelines "Permeable Paving"; this type of paving is useful as a source control device, to reduce peak flows, velocities and pollutants loads from paved surface. The proposed laneway is typically used for footpath with very low traffic load and very small slope is suitable for its intended purposes. As such, the laneway catchment is deemed to be permeable and self-cleaning and shall not be included in the MUSIC modelling.

City of Sydney Council provide the MUSIC link for use as a template for this design. Parameters for the storm event and pollutants data are prefilled within the template. The model with the treatment train and results are as shown below:



Percentage load reduction for the gross pollutant, total nitrogen, total phosphorus and total suspended solids are calculated and found to be compliance to City of Sydney requirements as shown above. The electronic version of MUSIC model shall be submitted together with this report for approval.

5.3 STORMWATER MAINTENANCE SCHEDULE

Stormwater device require maintenance to ensure they function as expected. The schedule of stormwater maintenance is shown in Appendix K01. Maintenance and replacement of storm-filter cartridges shall be carried out in accordance to the manufacturer's specification. Contact detail is mentioned in the previous chapter 5.2. The plants for the Raingarden are generally low maintenance with require no fertilizer or frequent watering. In the event of drought, temporary irrigation may be necessary.

6 DISCUSSION AND CONCLUSION

The flood studies done by other consultants such as Cardno and WMA provide preliminary information on the flood situation of the site. The site is classified as flood fringe and low hazard for the 1 % AEP storm event. The flood assessment of the neighbouring Northern properties indicates that during the 1% AEP storm event, the flood flow along Gibbons street is classified as “outside floodplain” and the flood flow along William Lane is classified as “mainstream” due to the depth of accumulated flood water by the retaining wall. However, the proposed development will remove the wall and replace with a pass-thru public domain laneway, allowing flood water to flow freely south toward the Margaret Street. We have analysed the flood situation using Hec Ras Version 5.05 and downloaded similar terrain data from NSW government websites. Results of predevelopment tally with previous flood study and hence calibrated.

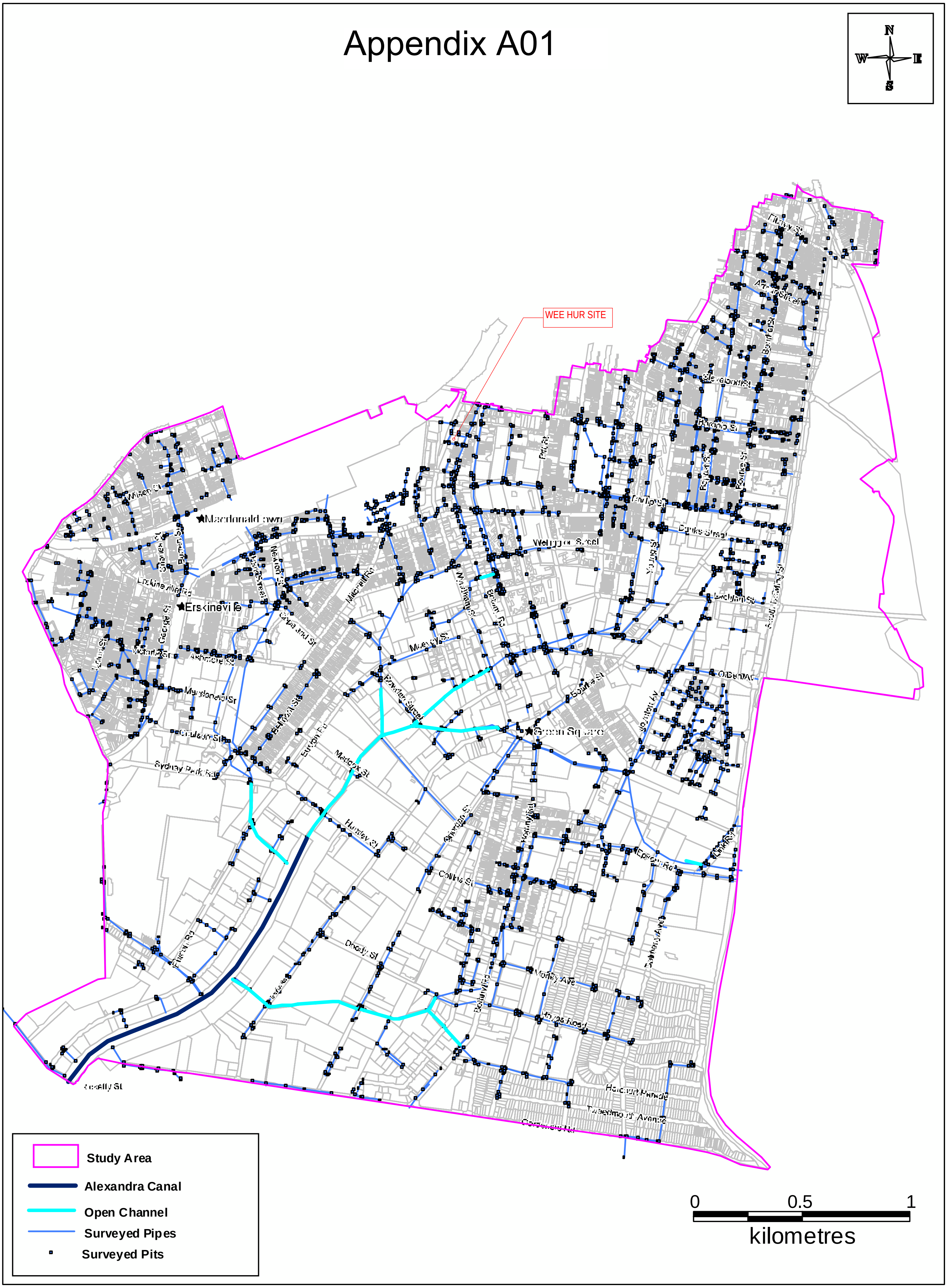
The post development flood situation in William Lane is mitigated and depth of flood reduced by about 400mm. We could consider the 200-250mm depth flood flow along the laneway as “local drainage”. The proposed flood planning is tabulated in the previous chapter which compliance to the Authorities requirements. Due to Architectural requirement that some of the floor slab are in one piece without set-down, the proposed RL are set in accordance to the highest part of the slab. As such, the proposed flood planning levels are flood safe and compliance.

The site drainage and stormwater treatment system are also addressed in this report. The quantity treatment is via on-site detention tank of volume 24m3 calculated by Sydney Water. The tank is situated partly underneath the ground floor with the overflow chamber overflow safely into the laneway toward the existing kerb inlet pits at Margaret Street. The quality treatment (WSUD) is via Raingarden and Stormfilters. Together these treatment train as modelled using MUSIC are able to meet the stormwater pollution target stipulated by City of Sydney Council. The MUSIC link model is included in this submission.

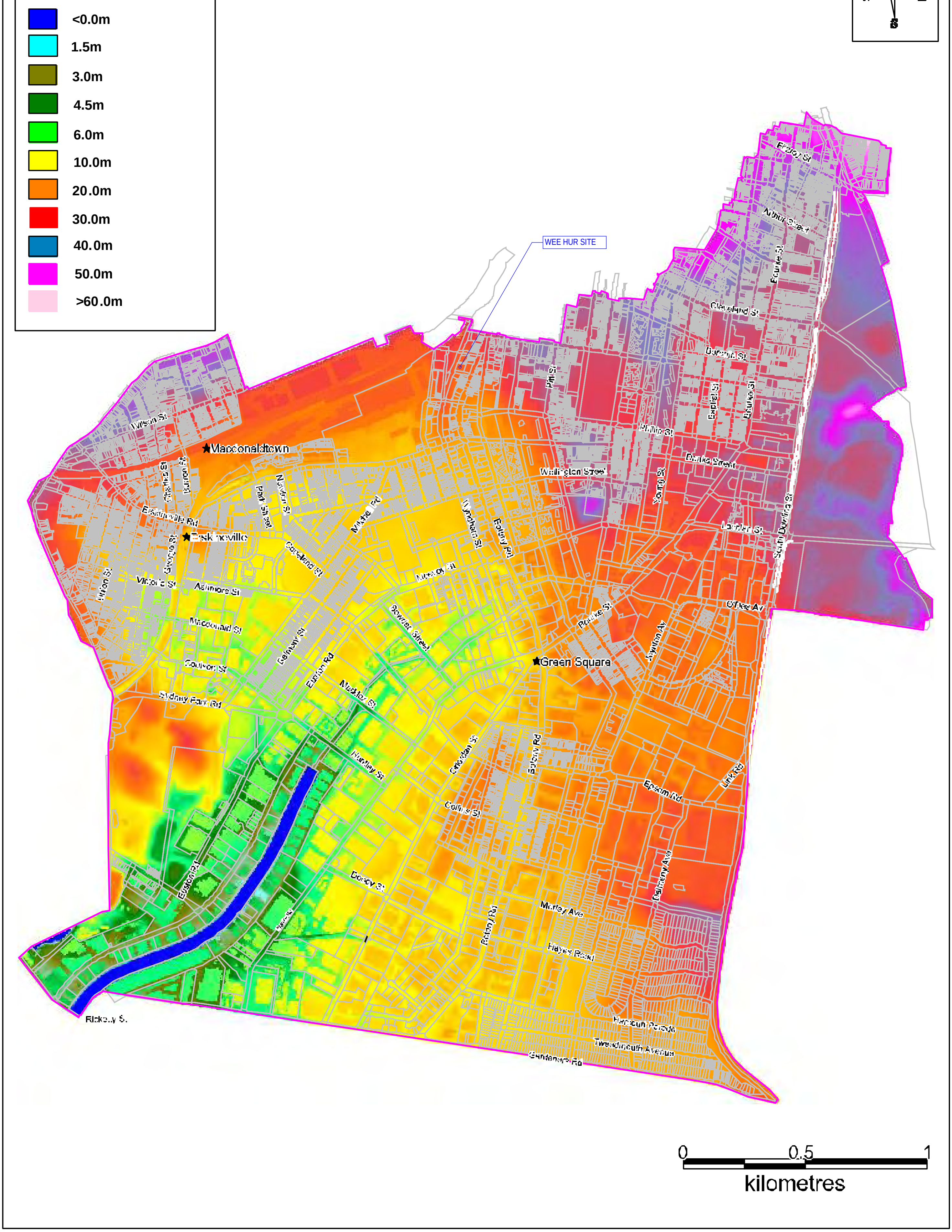
The laneway is constructed with permeable Stoneset paving. During the minor storm event, stormwater will be infiltrated into the sand layer beneath, filtered and discharge via subsoil pipes to the existing pit at Margaret Street. It is considered that pollution from this area is treated at source and runoff will not drain into Raingarden and OSD tank. As described in previous chapter the laneway also serves as floodway, it is necessary to prevent large overland flow to damage the raingarden and OSD tank’s stormfilter chamber.

7 APPENDICES

Appendix A01



Appendix A02



Cardno

ALEXANDRA CANAL CATCHMENT FLOOD STUDY

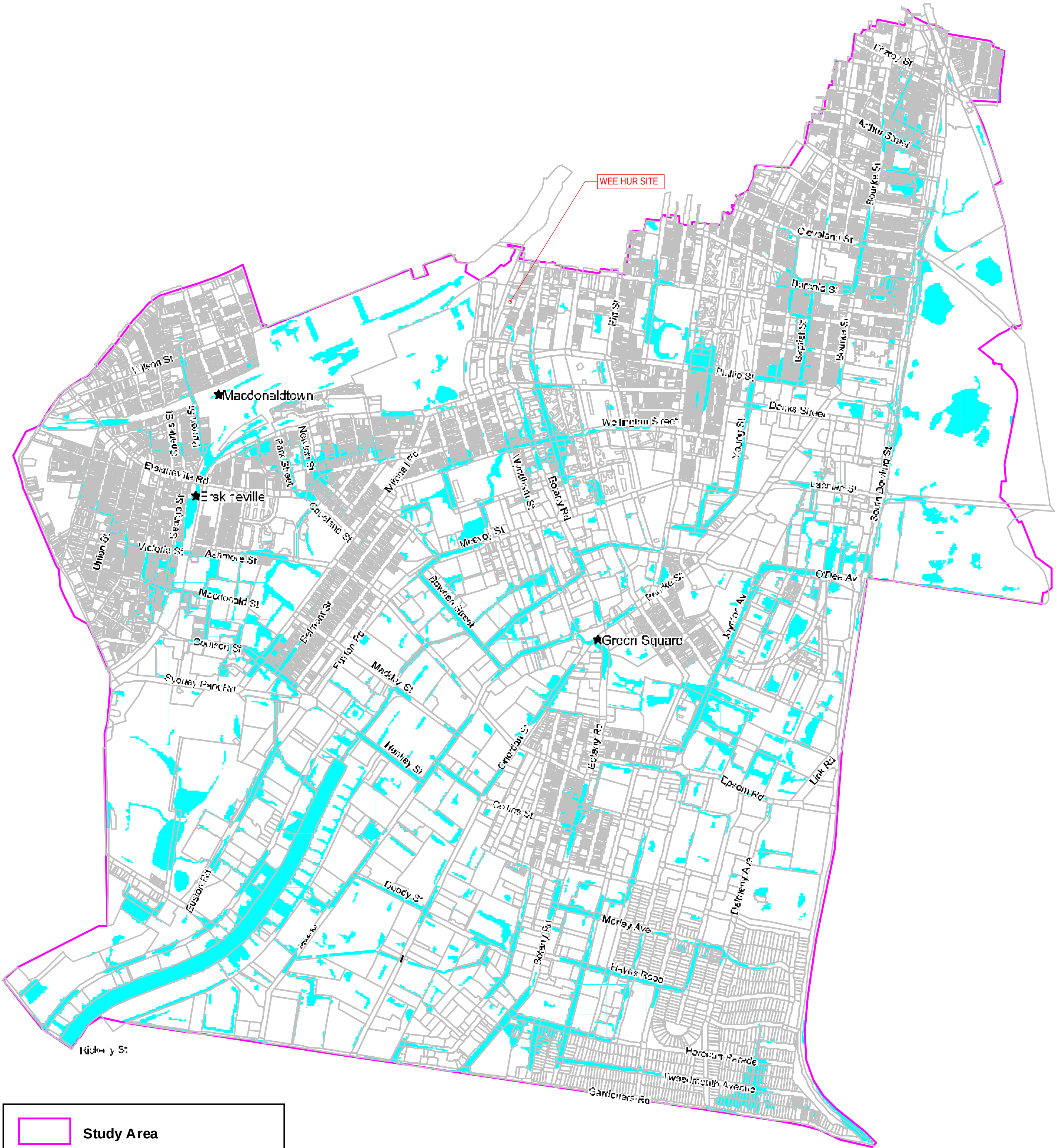
W4785

Final

Figure 4.6

2D Elevation Grid

Appendix A03



Note: Results filtered to show areas where depth >=0.15m or velocity-depth product >=0.1m2/s (as described in Section 6.1).

Cardno

ALEXANDRA CANAL CATCHMENT FLOOD STUDY

Figure 6.6

Flood Extents - 100yr ARI

W4785

Final

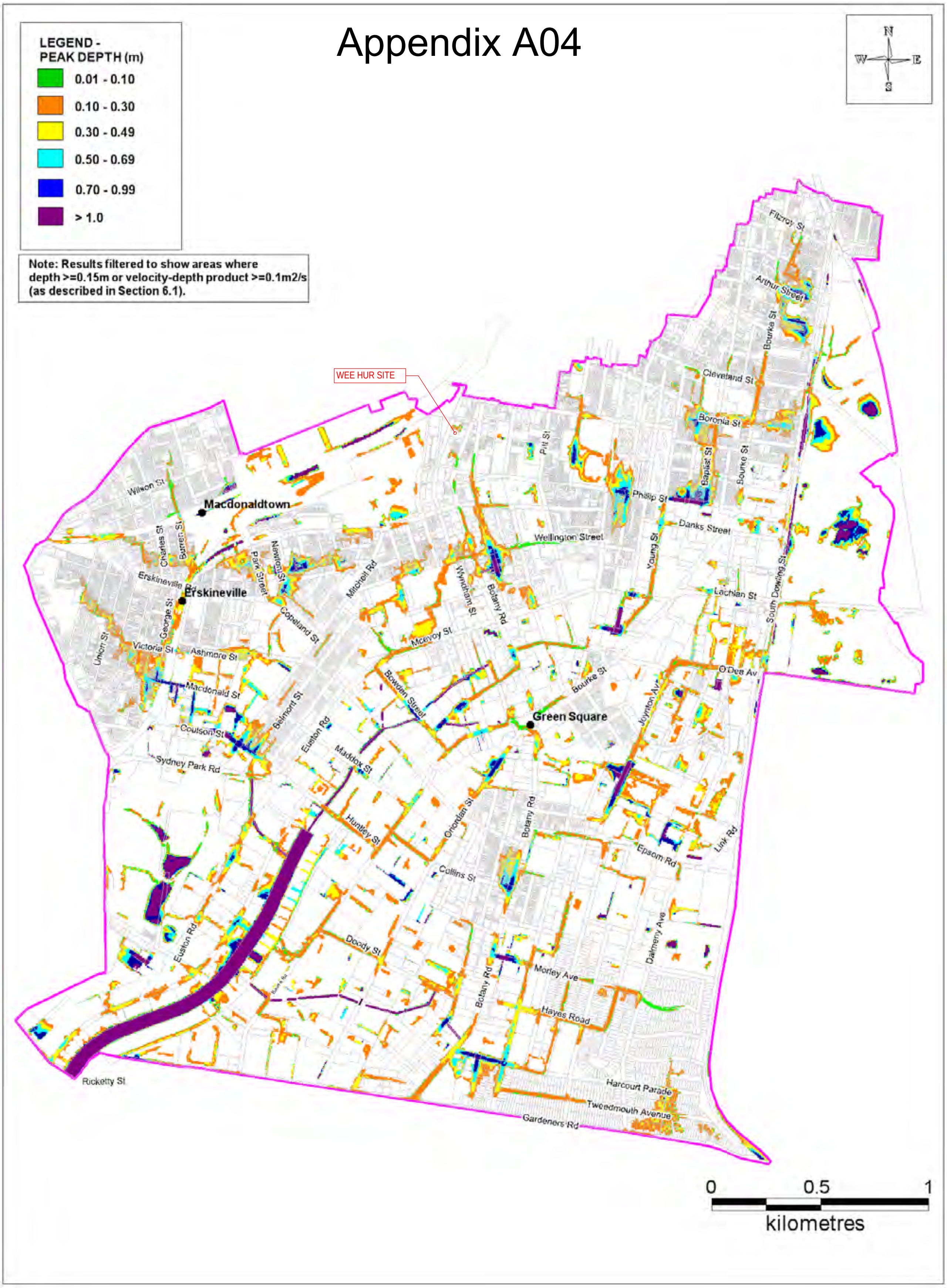


Figure 2-2 100 Year ARI Peak Flood Depths

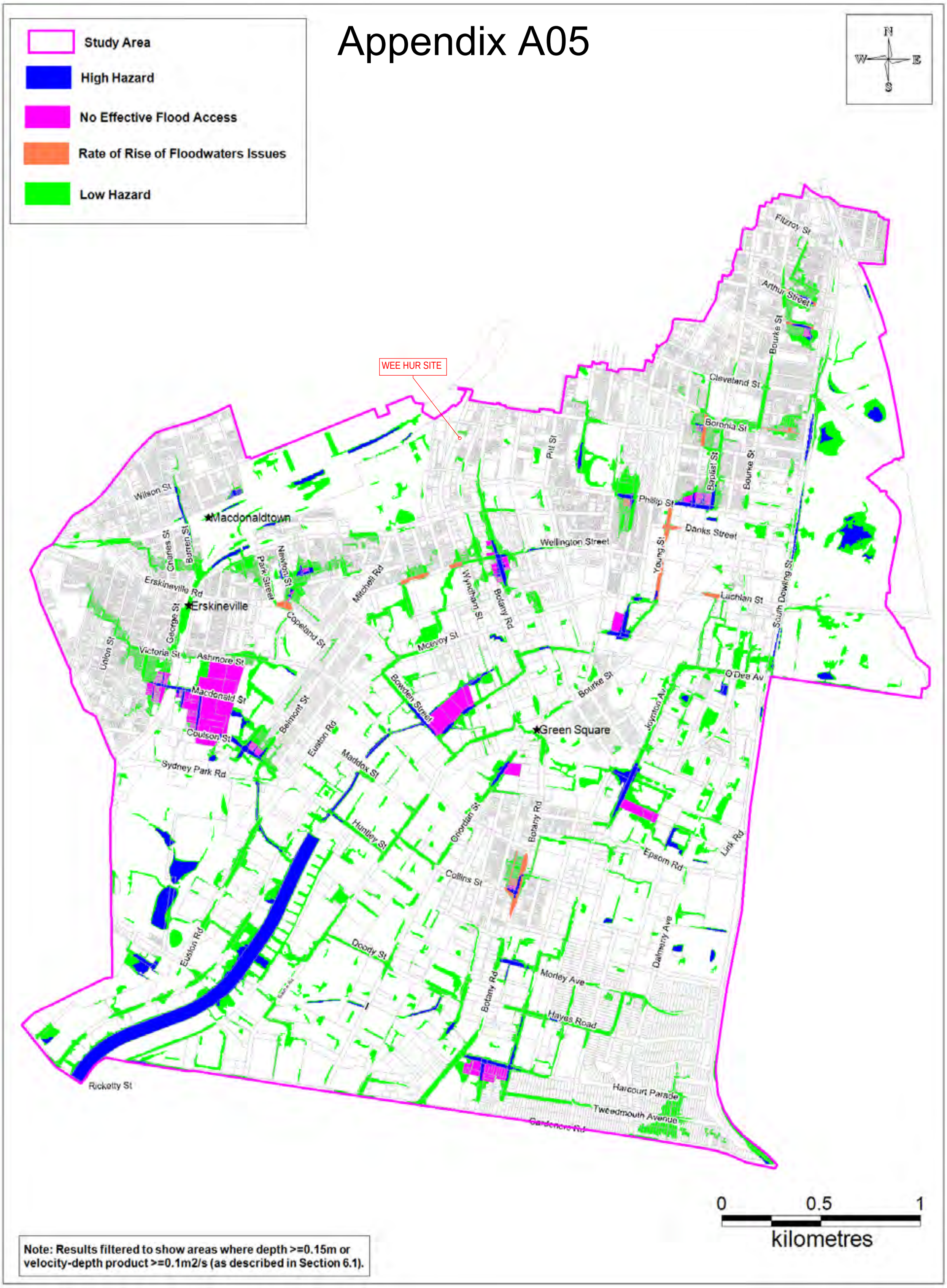
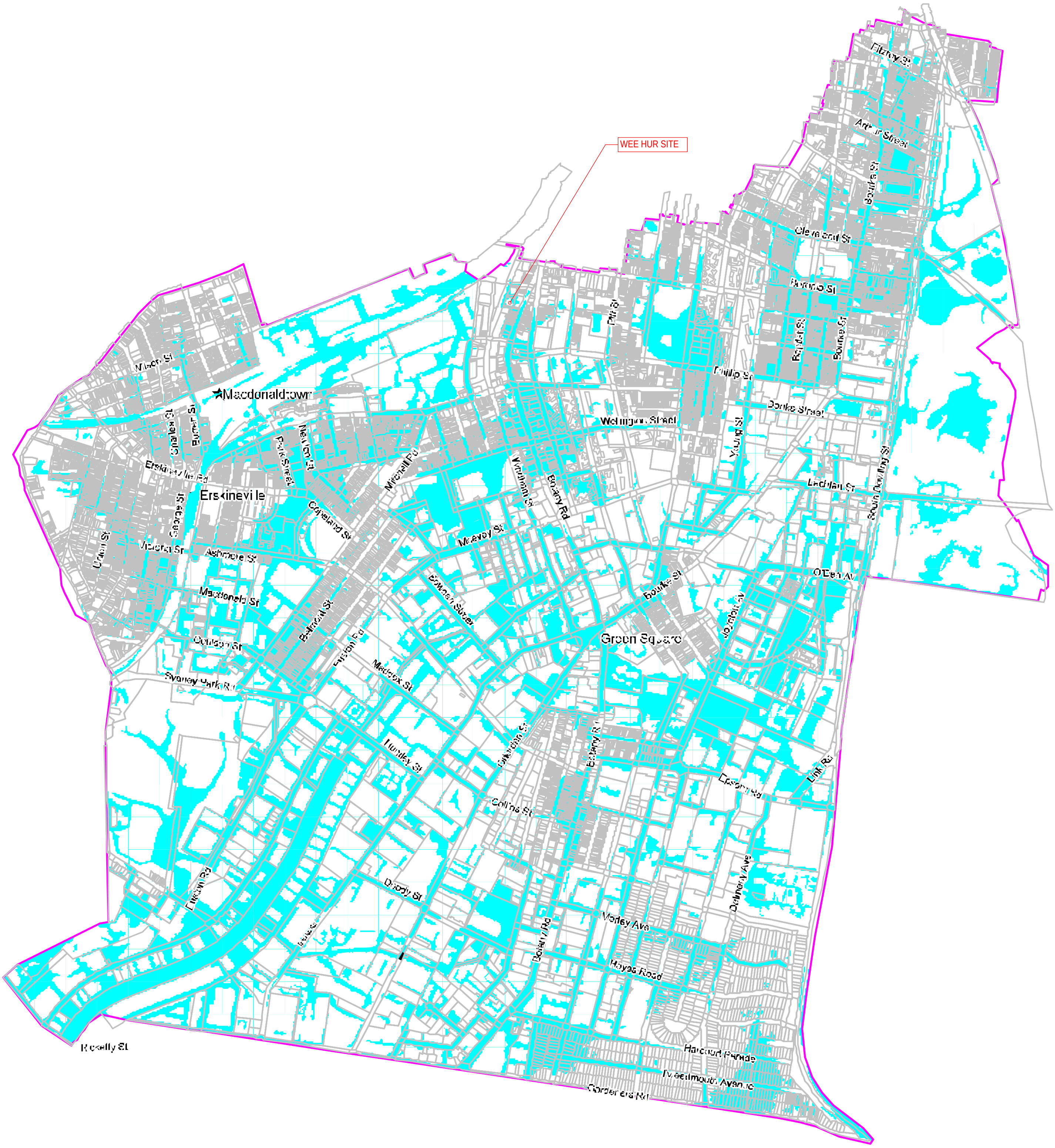


Figure 2-4 100 Year ARI Flood Hazard

Appendix A06



Study Area

PMF Extent

0 0.5 1
kilometres

Note: Results filtered to show areas where depth >=0.15m or velocity-depth product >=0.1m2/s (as described in Section 6.1).

Cardno

ALEXANDRA CANAL CATCHMENT FLOOD STUDY

Figure 6.7

Flood Extents - PMF

W4785

Final

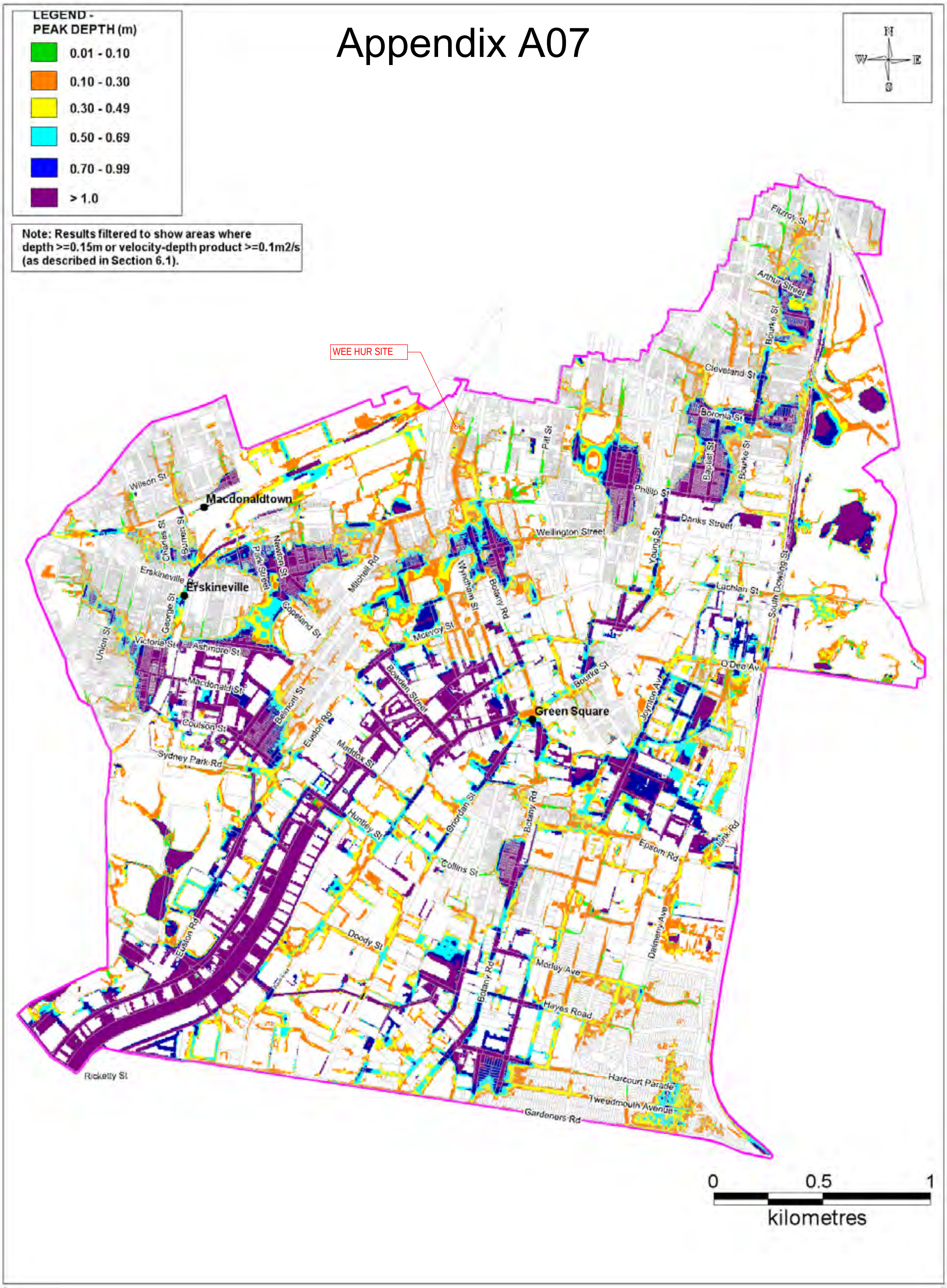


Figure 2-3 PMF Peak Flood Depths

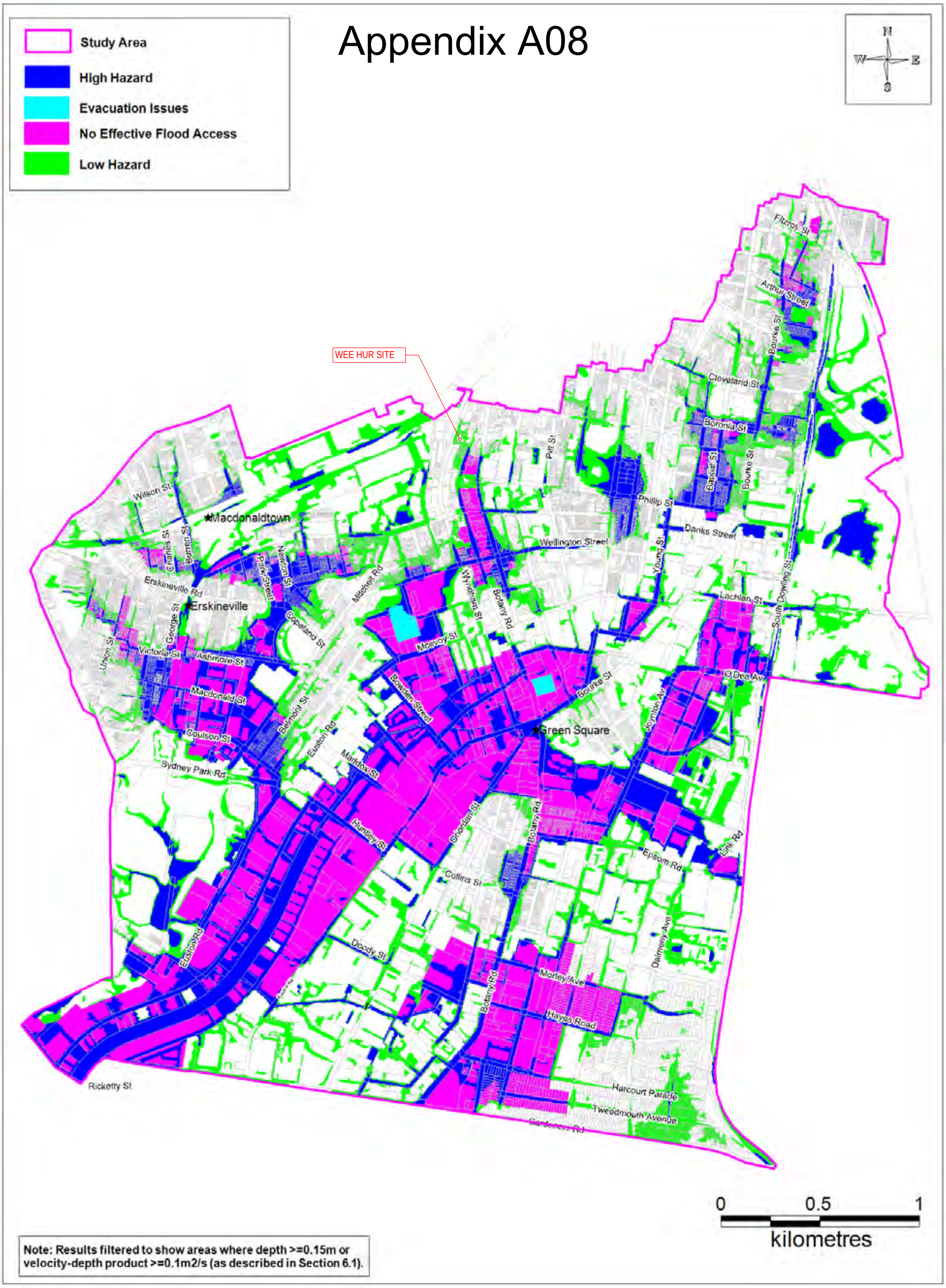


Figure 2-5 PMF Flood Hazard

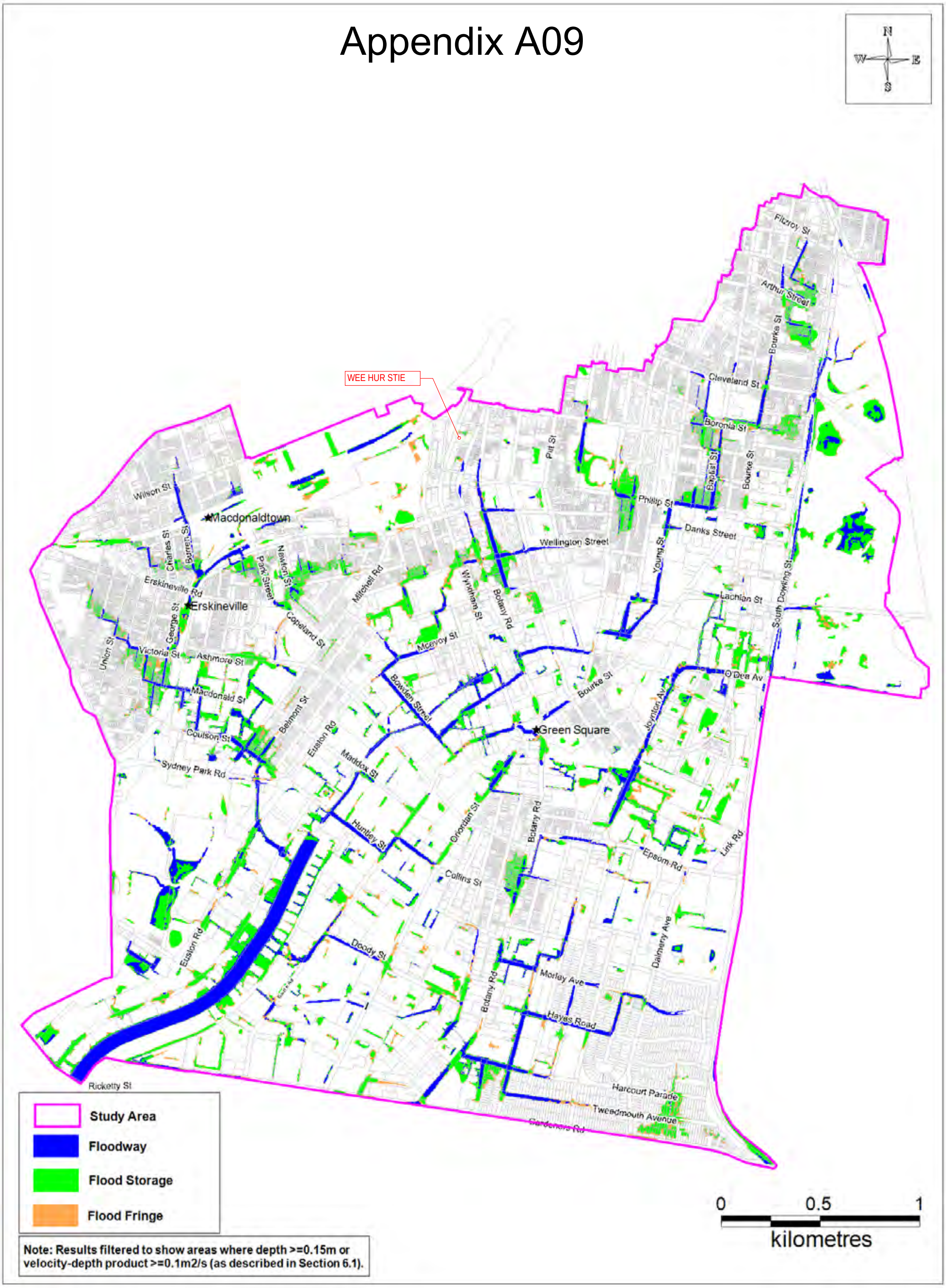


Figure 5-12 Hydraulic Categories – 100 Year ARI

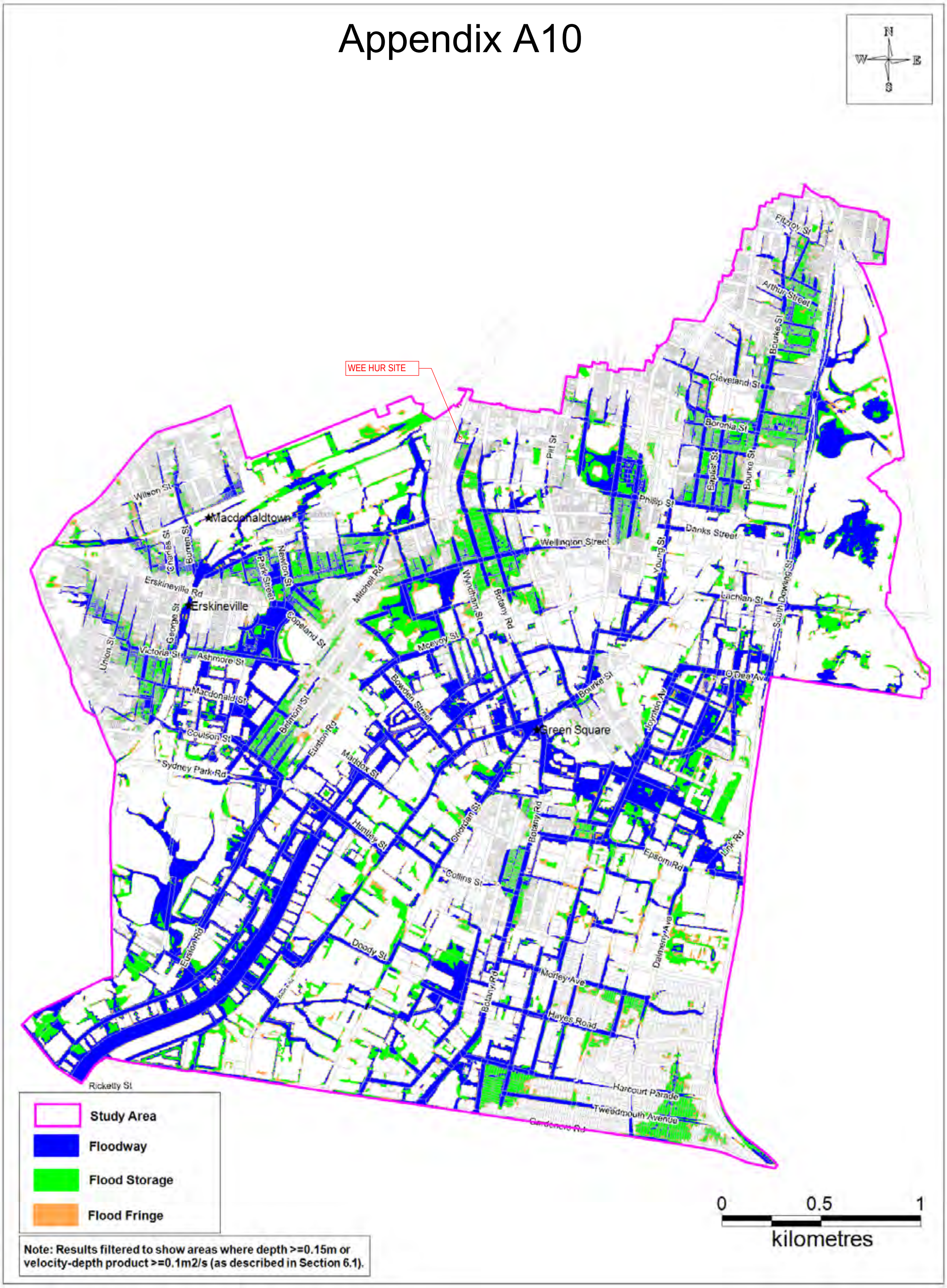
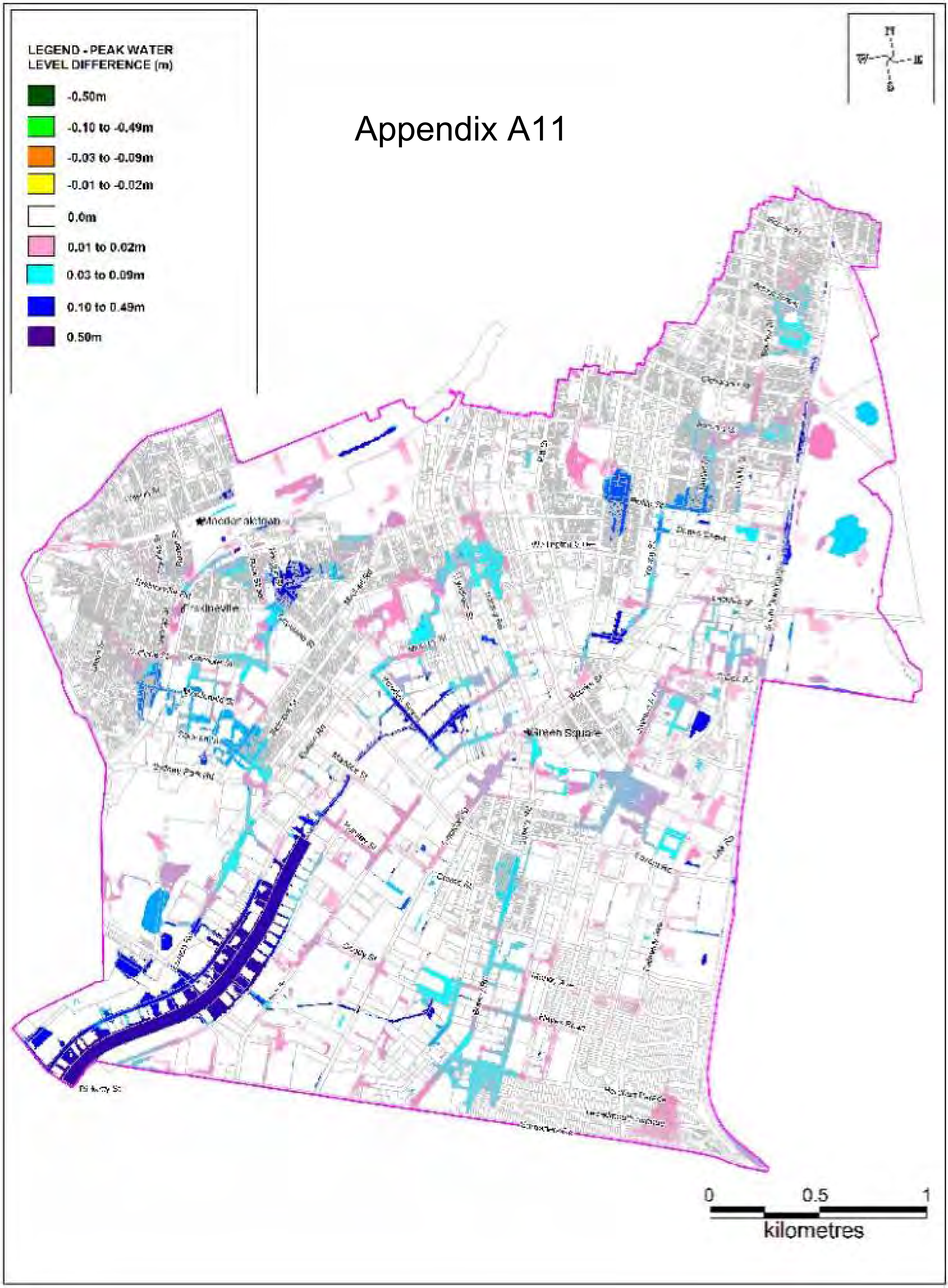


Figure 5-11 Hydraulic Categories – PMF

Appendix A11



Cardno

W4785

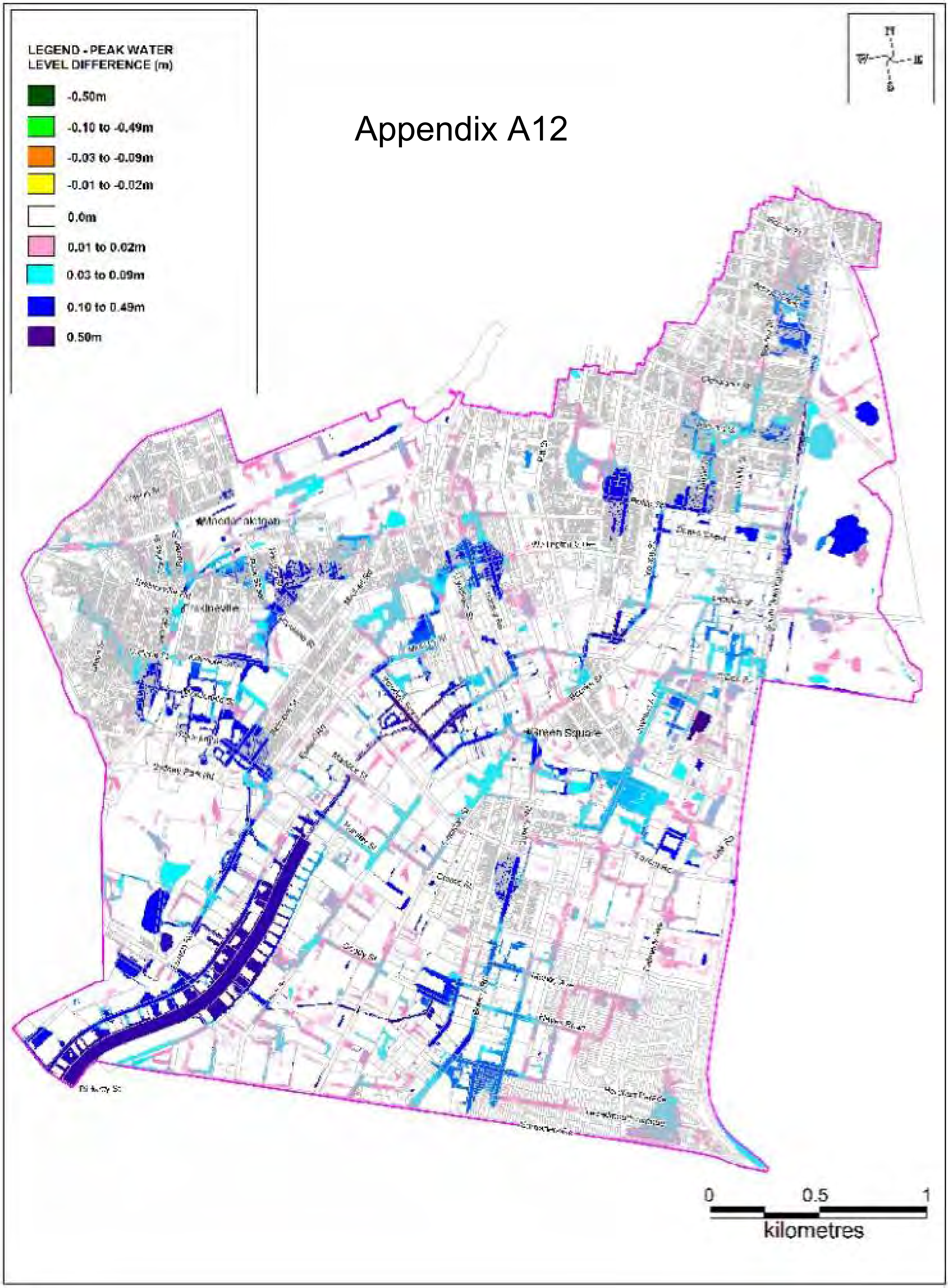
ALEXANDRA CANAL CATCHMENT FLOOD STUDY

Final

Figure 8.1

Climate Change
100yr ARI Rainfall Plus 10%

Appendix A12



ALEXANDRA CANAL CATCHMENT FLOOD STUDY

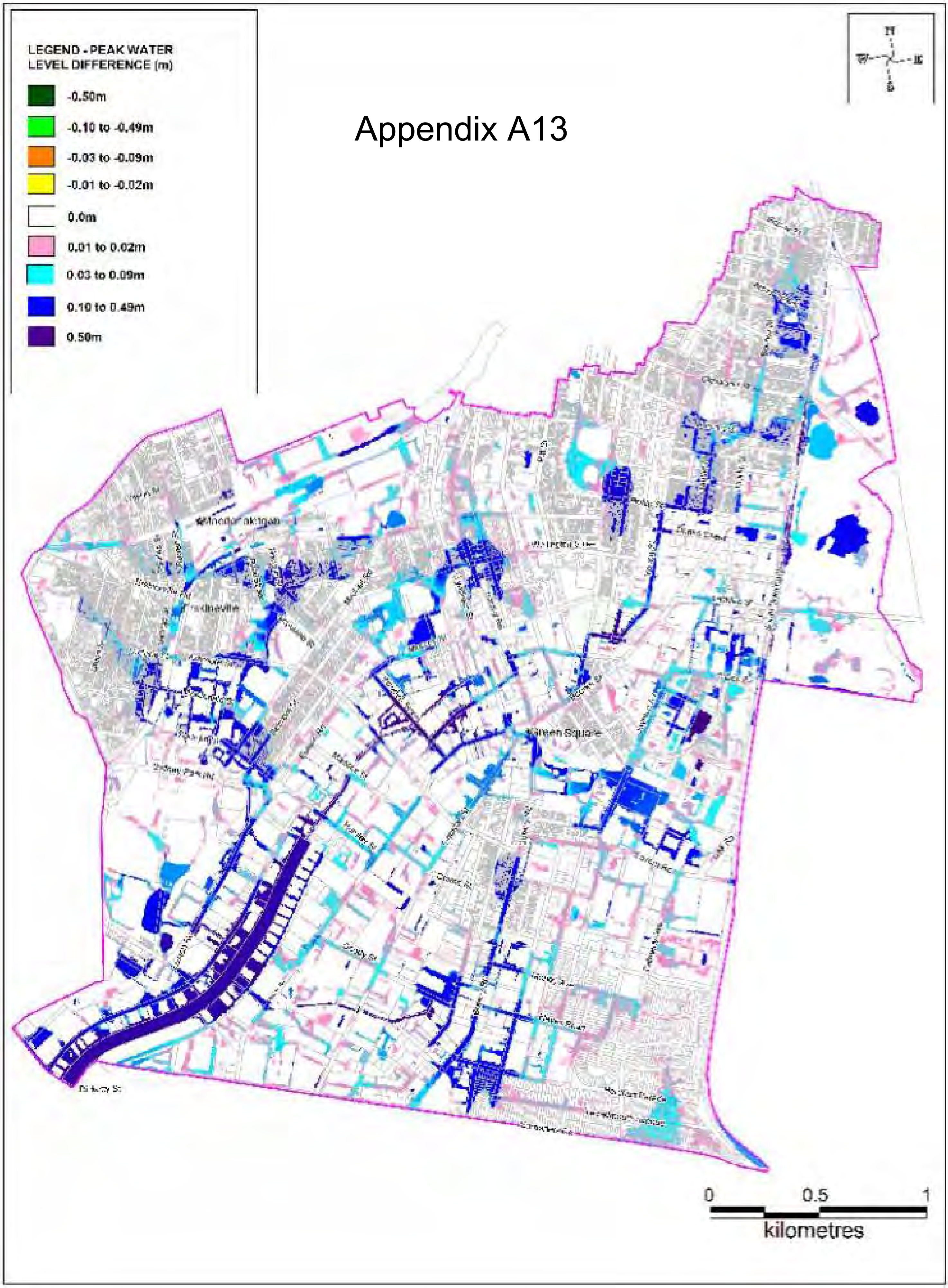
Final

Figure 8.2

Climate Change
100yr ARI Rainfall Plus 20%

W4785

Appendix A13



ALEXANDRA CANAL CATCHMENT FLOOD STUDY

Final

Figure 8.3

Climate Change
100yr ARI Rainfall Plus 30%

Cardno

W4785

Appendix B01

LEGEND

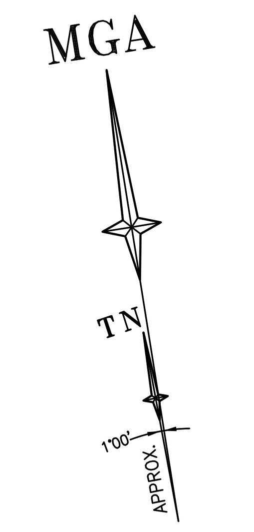
BENCH MARK	▲
TELSTRA PIT	TEL
ELECTRIC LIGHT POLE	ELP
POWER POLE	● PP
PIT WITH METAL LID	□ MLID
STREET SIGN	⊠ SS
BOLLARD	○ BOL
GRATED INLET PIT	GIP
SEWER VENT	SEV
SEWER MANHOLE	○ SMH
HYDRANT	HYD
GAS VALVE	⊠ GAS
VEHICLE CROSSING	(VC)
PRAM CROSSING	(PC)
WINDOW	W
DOOR	D
HEAD/SILL	H/S
GAS (DBYD)	G
TELSTRA (DBYD)	T
OPTICAL FIBRE (DBYD)	OF
WATER (DBYD)	W
STORMWATER (DBYD)	SW
SEWER (DBYD)	S
ELECTRICITY (OVERHEAD)	P
ELECTRICITY (U'GROUND) (DBYD)	E
ELECTRICITY (HIGH VOLTAGE) (DBYD)	HV

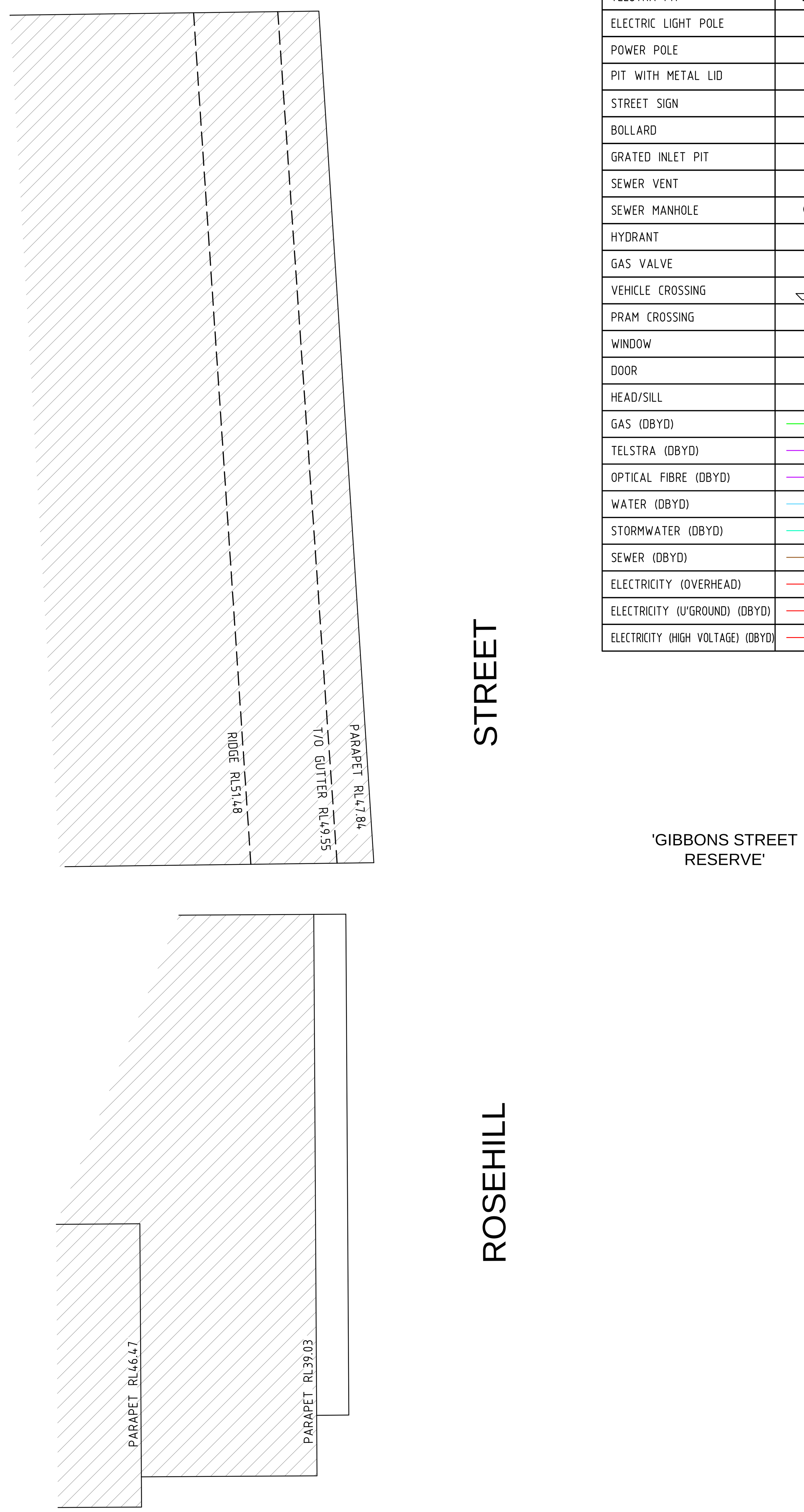
NOTES

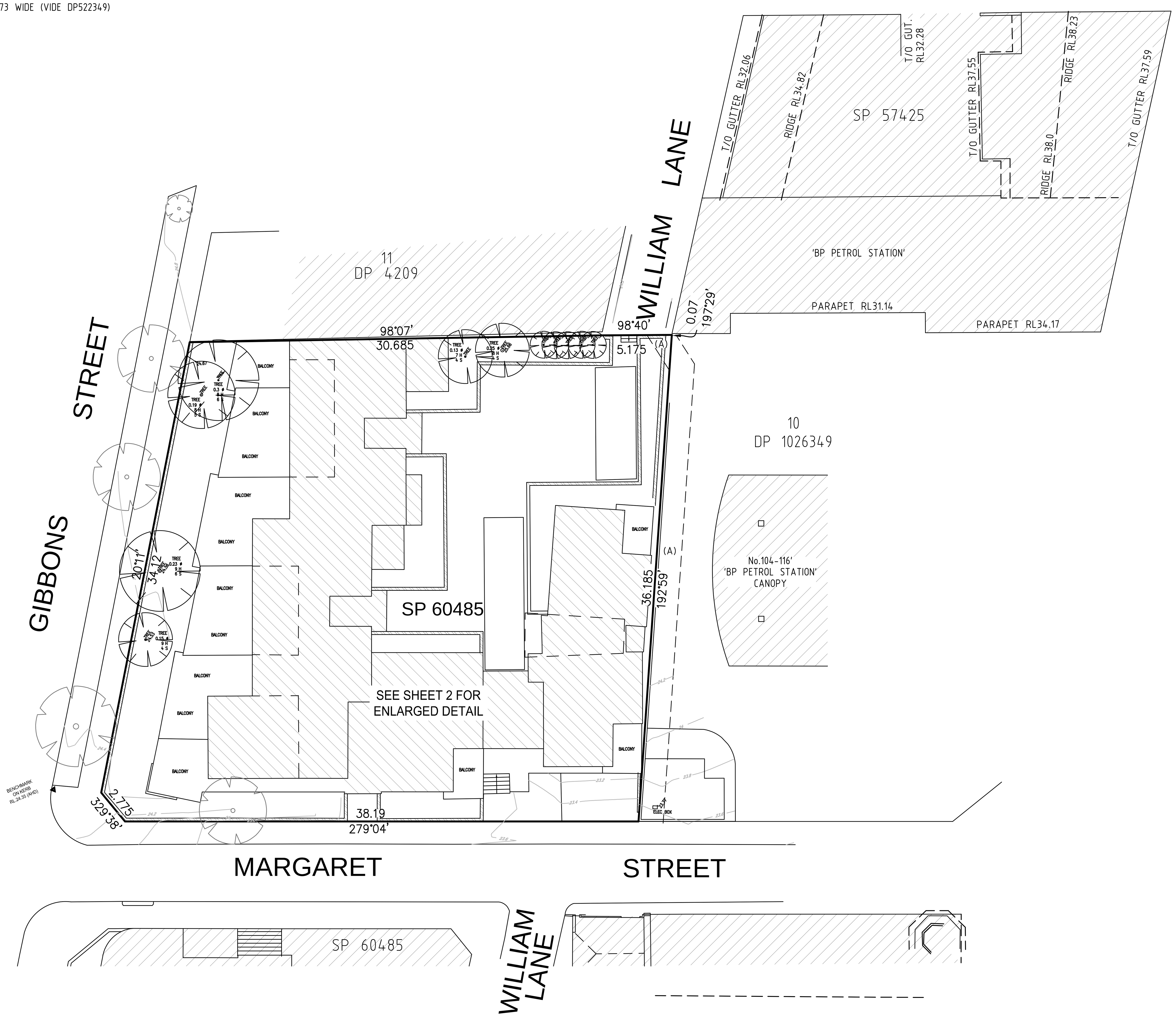
1. THE BOUNDARIES HAVE NOT BEEN MARKED
2. ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY NSW LAND REGISTRY SERVICES AND ARE SUBJECT TO FINAL SURVEY
3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM **BM IN KERB FROM LINKER SURVEY** R.L. **24.35** (A.H.D.) IN PLAN REFERENCE 170638
4. CONTOUR INTERVAL **0.2 m**
5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
6. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
7. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
8. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
9. 8/.4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
10. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH
11. BUILDING OUTLINE DATA USED FROM LINKER SURVEY PLAN REFERENCE 170638

EASEMENTS

(A) EASEMENT TO DRAIN WATER 1.73 WIDE (VIDE DP522349)







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REFER TO NOTES AND LEGEND

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SCALE 1:200 @ A1

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

....
Registered Surveyor NSW

LTS LOCKLEY
Registered Surveyors NSW
www.ltsl.com.au

Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client THE TRUST COMPANY AUSTRALIA (LIMITED) ATF WH GIBBONS TRUST

Drawing title
PLAN OF DETAIL AND LEVELS OVER SP60485 KNOWN AS 13-23 GIBBONS STREET, REDFERN

datum	AHD
site Area	1365m²
LGA	SYDNEY
reference number	50422 001DT
scale	1:200 @A1
date of survey	26/07/18
SHEET	1 OF 3

Appendix B02

Revision	Date	Description	Reference
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C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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Registered Surveyors NSW
www.ltsl.com.au

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810 Pacific Highway
Gordon NSW 2072
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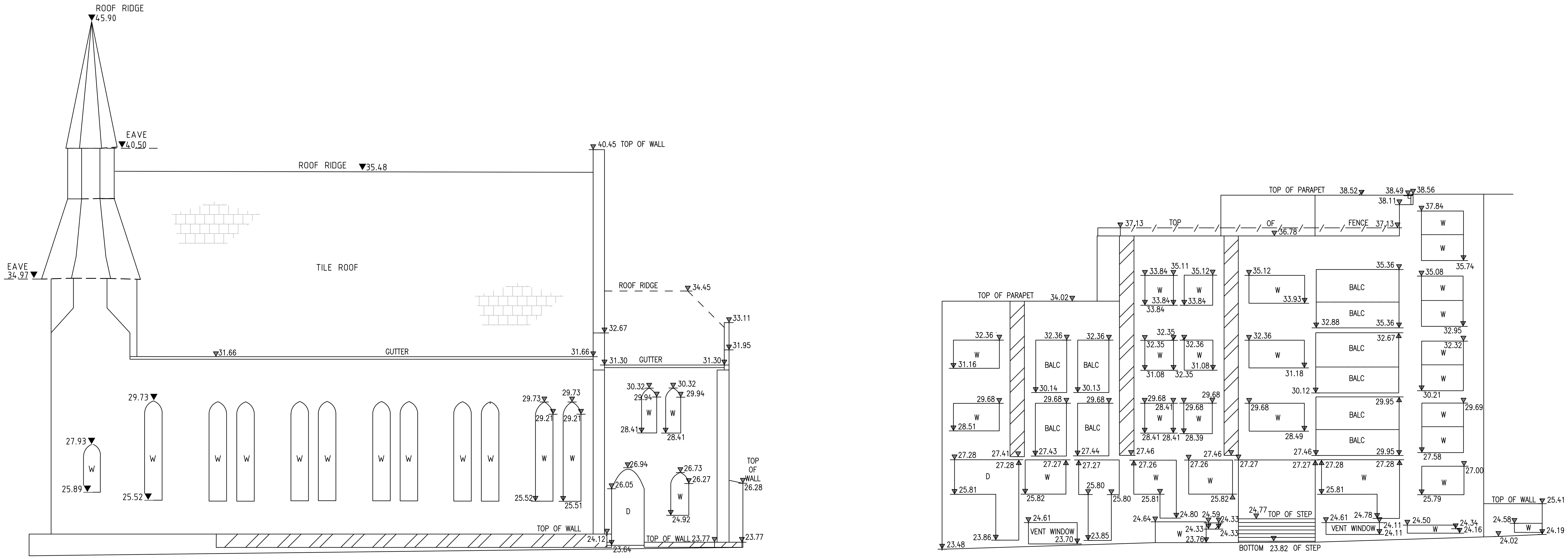
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client THE TRUST COMPANY AUSTRALIA (LIMITED) ATF WH GIBBONS TRUST

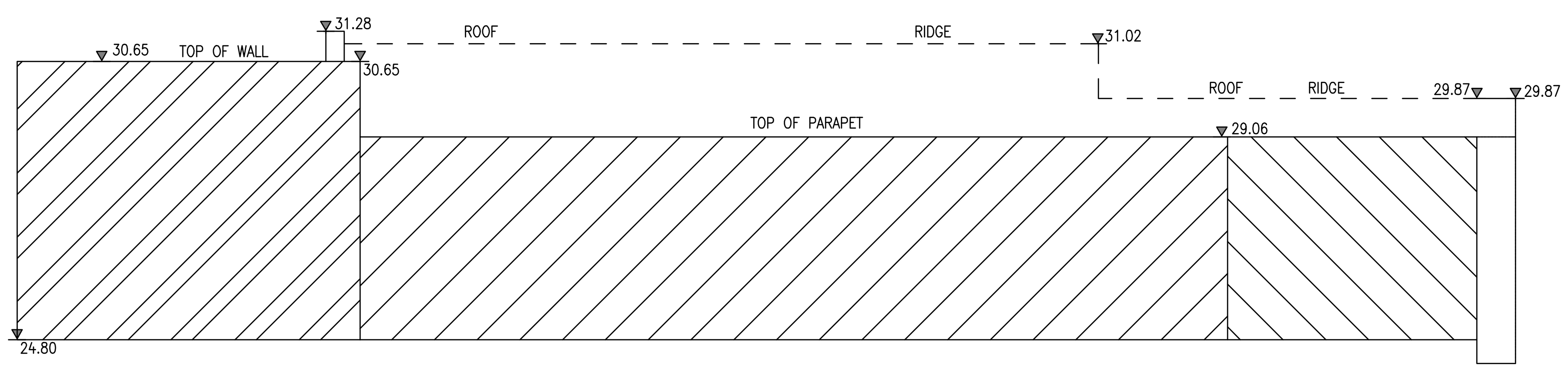
Drawing title
PLAN OF DETAIL AND LEVELS OVER SP60485 KNOWN AS 13-23 GIBBONS STREET, REDFERN

datum AHD
site Area 1365mİ
LGA SYDNEY
reference number 50422 001DT
scale 1:100 @A1
date of survey 26/07/18
SHEET 2 OF 3

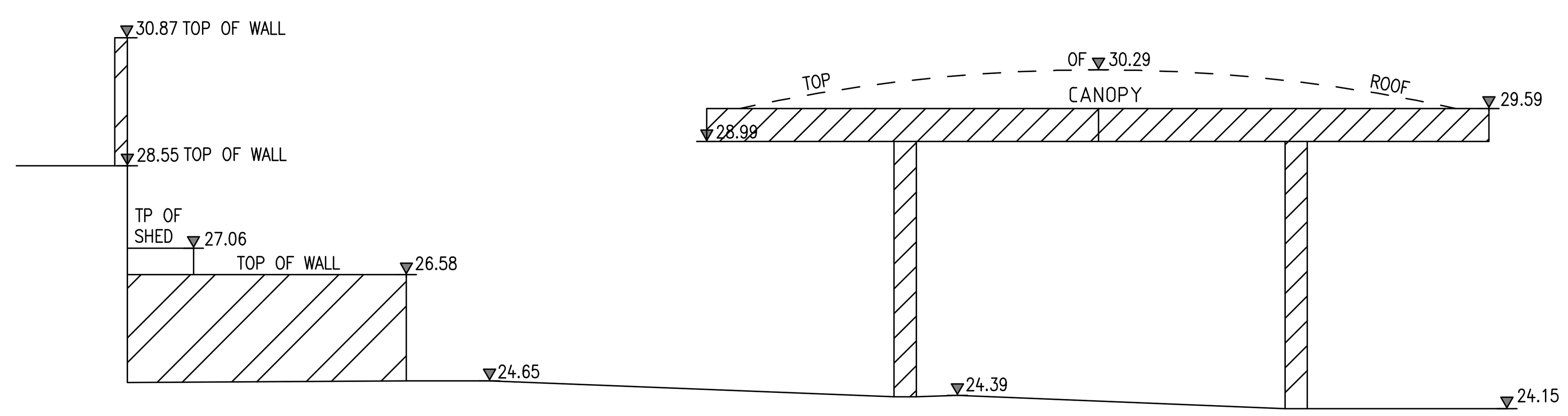
Appendix B03



NORTH ELEVATION No 1 MARGARET STREET AND No 118 REGENT STREET – REDFERN



SOUTH ELEVATION No 11 GIBBONS STREET-REDFERN



WEST ELEVATION No 104-116 REGENT STREET-REDFERN

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REFER TO NOTES AND LEGEND

0 2 3 4 6 8 10
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C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

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LTS LOCKLEY
Registered Surveyors NSW
www.ltsl.com.au

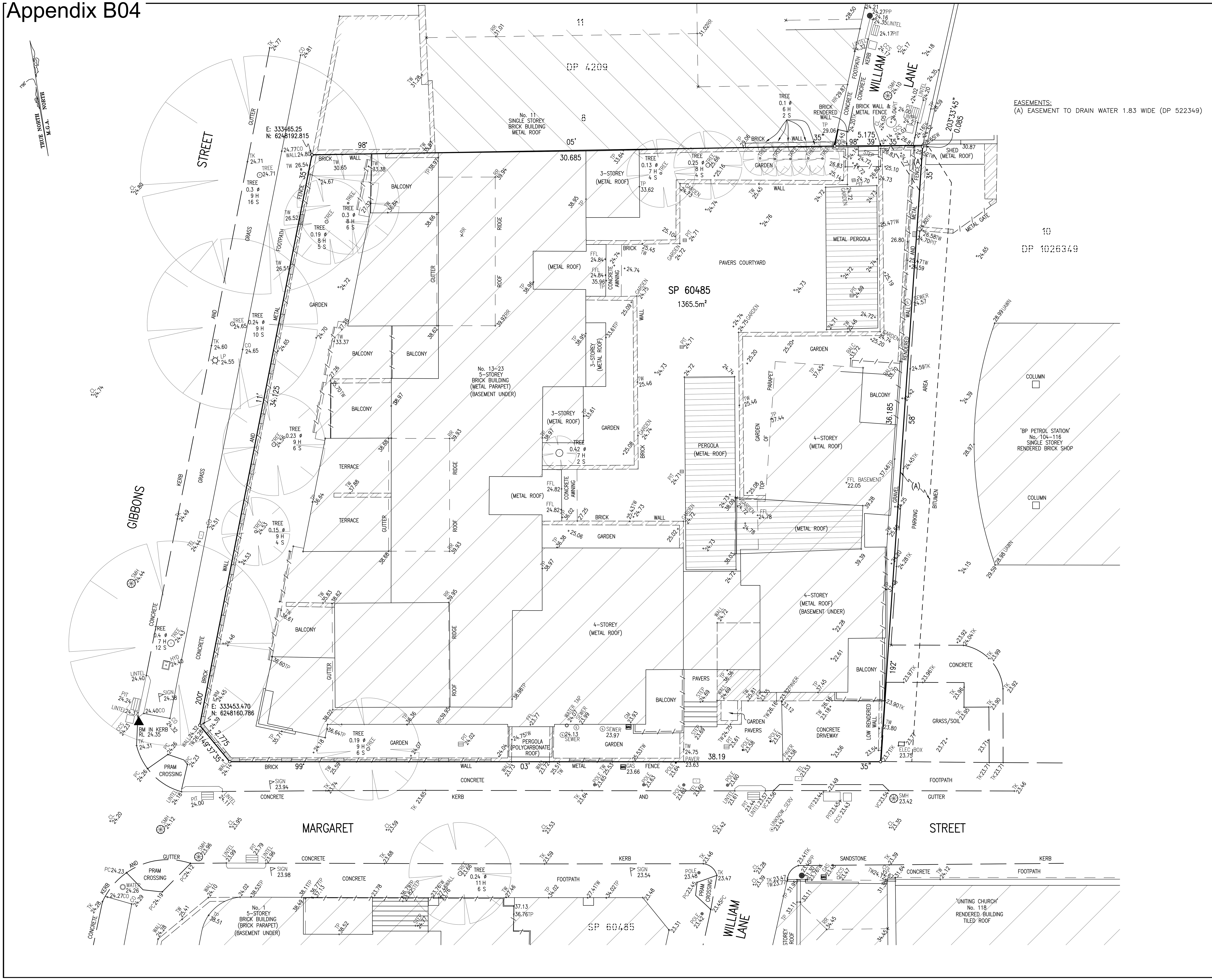
Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client THE TRUST COMPANY AUSTRALIA (LIMITED) ATF WH GIBBONS TRUST

Drawing title
PLAN OF DETAIL AND LEVELS OVER SP60485 KNOWN AS 13-23 GIBBONS STREET, REDFERN

datum AHD
site Area 1365m²
LGA SYDNEY
reference number 50422 001DT
scale 1:100 @A1
date of survey 26/07/18
SHEET 3 OF 3

Appendix B04



ISSUE	DATE	AMENDMENT	BY

TYPICAL NOTES:

1. ORIGIN OF LEVELS SSM 38398, R.L.18.680 (A.H.D.)
2. BEARINGS ARE ON MGA NORTH
3. NO BOUNDARY SURVEY HAS BEEN UNDERTAKEN.
4. BEARINGS & DISTANCES HAVE BEEN COMPILED FROM TITLE AND/OR DEED INFORMATION SUPPLIED BY DEPARTMENT OF LANDS NSW.
5. RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
6. SERVICES SHOWN ARE BASED ON VISIBLE SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY AND THE RELEVANT SERVICE DIAGRAMS OF THE VARIOUS AUTHORITIES. ALL SERVICE MUST BE VERIFIED ON SITE PRIOR TO ANY WORK BEING UNDERTAKEN. LINKER SURVEYING PTY LTD BEAR NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE SERVICES SHOWN HEREON.
7. RIDGE, EAVE & GUTTER HEIGHTS HAVE BEEN OBTAINED BY AN INDIRECT METHOD AND ARE ACCURATE FOR PLANNING PURPOSES ONLY.
8. ADJOINING BUILDINGS AND DWELLINGS HAVE BEEN PLOTTED FOR DIAGRAMMATIC PURPOSES ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
9. THE DIAMETER (ø), SPREAD (S) & HEIGHT (H) OF EACH TREE IS INDICATIVE ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.

LEGEND OF TYPICAL CODES

AE	ARCHITECTURAL EMBELLISHMENT	MLID	METAL LID
AP	ALIGNMENT PIN	NS	NATURAL SURFACE
AWN	AWNING	OCC	STRUCTURE
BALC	BALCONY	OPT	OPTUS PIT
BAWN	BOTTOM OF AWNING	PC	PRAM CROSSING
BB	BOTTOM OF BANK	PED	PEDESTRIAN CROSSING
BCH	BOTTOM OF CHIMNEY	PERG	PERGOLA
BD	BOTTOM OF DOOR	PM	PERMANENT MARK
BDY	BOUNDARY	PP	POWER POLE
BF	BOTTOM OF FENCE	RCK	ROCK
BHR	BOTTOM OF HANDRAIL	RG	ROOF GUTTER
BIT	BITUMEN	RLWY	RAILWAY
BK	BOTTOM OF KERB	RM	REFERENCE MARK
BLD	BUILDING	RR	ROOF RIDGE
BM	BENCH MARK	RSN	CONCRETE NAIL
BOL	BOLLARD	SEW	SEWER
BR	BOTTOM OF ROCK	SHR	SHRUB
BRK	BRICK	SIP	SEWER INSPECTION PIT
BRW	BOTTOM OF RETAINING WALL	SLH	SEWER LAMP HOLE
BS	BOTTOM OF STEPS	SMH	SEWER MANHOLE
BW	BOTTOM OF WALL	SP	SIGN POST
BWIN	BOTTOM OF WINDOW	SSM	STATE SURVEY MARK
CCS	COUNCIL STORMWATER	SV	STOP VALVE
CHIM	CHIMNEY	SW	STORM WATER
CL	CENTRELINE	TARCH	TOP OF ARCH
CLID	CONCRETE LID	TAWN	TOP OF AWNING
COL	COLUMN	TB	TOP OF BANK
COM	COMMUNICATIONS PIT	TBX	TELSTRA BOX
CONC	CONCRETE	TCH	TOP OF CHIMNEY
CPT	CARPORT	TD	TOP OF DOOR
D	DOOR	TEL	TELSTRA PIT
DD	DISH DRAIN	TELP	TELSTRA PILLAR
DH	DRILL HOLE	TF	TOP OF FENCE
DHW	DRILL HOLE & WINGS	TG	TOP OF GUTTER
DWY	DRIVEWAY	THR	TOP OF HANDRAIL
EB	EDGE OF BITUMEN	TI	TRAFFIC ISLAND
EBOX	ELECTRICITY BOX	TK	TOP OF KERB
EC	EDGE OF CONCRETE	TL	TRAFFIC LIGHT
ED	EDGE OF DOOR	TP	TOP OF PARAPET
EG	EDGE OF GARDEN	TR	TREE
ELEC	ELECTRICITY PIT	TRF	TOP OF ROOF
ELP	LIGHT POLE	TRK	TOP OF ROCK
EP	EDGE OF PATH	TRW	TOP OF RETAINING WALL
ER	EDGE OF ROAD	TS	TOP OF STEPS
FCE	FENCE	TW	TOP OF WALL
FL	FLOOR LEVEL	TWIN	TOP OF WINDOW
FFL	FINISHED FLOOR LEVEL	US	UNDERSIDE
FP	FENCE POST	UAWN	UNDERSIDE OF AWNING
GD	GLASS DOOR	UKS	UNKNOWN SERVICE
GL	GROUND LEVEL	USB	UNDERSIDE OF BEAM
GM	GAS METER	USC	UNDERSIDE OF CEILING
HPG	HIGH POWERED GAS	USE	UNDERSIDE OF EAVE
HR	HANDRAIL	USG	UNDERSIDE OF GUTTER
HYD	HYDRANT	V	VENT
IL	INVERT LEVEL	VER	VERANDAH
K	KERB	VC	VEHICLE CROSSING
LIN	LINTEL	W	WINDOW
LP	LAMP POST	WM	WATER METER
MH	MANHOLE		

LEGEND OF TYPICAL SERVICES

C	COMMUNICATIONS CABLE	RW	RECYCLED WATER
CSWP	CERAMIC STORMWATER PIPE	RM	RISING MAIN
E	UNDERGROUND ELECTRICITY CABLES	RMS	ROADS & MARITIME SERVICES
		S	SEWER
AE AO	UNDERGROUND ELECTRICITY & OPTUS CABLES	SO	SEWER OUTFALL
		ST	SHARED TRENCH
FS	FIRE SERVICE	SW	STORM WATER
G	GAS LINE	SW CK	STORMWATER CREEK
GE	GAS LINE & ELECTRICITY CABLES	T	TELSTRA CABLES
NBN	NATIONAL BROAD BAND CABLES	TG	TELSTRA & GAS CABLES
NG	NATURAL GAS LINE	U	UNKNOWN SERVICE
OH	OVERHEAD CABLES	VO	VOCUS CABLES
OPT	OPTUS CABLE	VR	VERIZON CABLES
PE	PRIVATE ELECTRICITY	W	WATER SUPPLY
PS	PRIVATE SEWER	WM	WATER MAIN
PW	PRIVATE WATER		

1. ALL UNDERGROUND SERVICE INFORMATION INCLUSIVE OF GENERAL POSITION AND SURFACE COVER DEPTHS NOTED ON THE PLAN ARE APPROXIMATELY ONLY.
2. ALL UNDERGROUND SERVICE INFORMATION HAS BEEN COMPILED FROM SERVICE AUTHORITY PLANS PROVIDED BY THE AUTHORITIES.
3. THE LOCATION OF SERVICES BETWEEN SURVEYED POINTS (AS INDICATED) HAVE BEEN SHOWN DIAGRAMMATICALLY ONLY USING THE SERVICE DIAGRAMS AS PROVIDED. THE EXACT LOCATION OF THESE SERVICES BETWEEN THE SURVEYED POINTS MUST BE VERIFIED PRIOR TO ANY EXCAVATION OR PILING. NO WARRANTY IS GIVEN AGAINST THE POSSIBILITY OF THE EXISTENCE OF FURTHER UNCHARTED SERVICES.
4. ALL CONTRACTORS, TRADESMEN, BUILDING & PROJECT CONSULTANTS MUST CONTACT THE VARIOUS AUTHORITIES, IN ACCORDANCE WITH STANDARD "DIAL BEFORE YOU DIG" PROCEDURES PRIOR TO UNDERTAKING ANY WORKS WITHIN THE VICINITY OF THE SERVICE LINES TO VERIFY THE POSITION OF THE SERVICE LINES.

COVER OF EXCELLENCE
Liability limited by a scheme approved under Professional Standards Legislation

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REDUCTION RATIO 1 : 100

0 1 2 3 4 5 6 7 8 9 10

LENGTHS ARE IN METRES

CLIENT: THE OWNERS

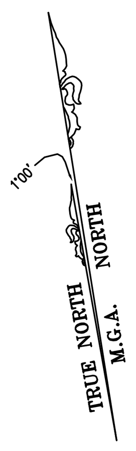
TITLE No: SP60485	REF:170638
DATUM: A.H.D.	ISSUE:1
DATE OF SURVEY: 17.07.17	ISSUE DATE:09.08.17
SURVEYOR: LS	SHEET SIZE: A1
DRAFTER: JJ	SHEET 1 OF 2 SHEETS

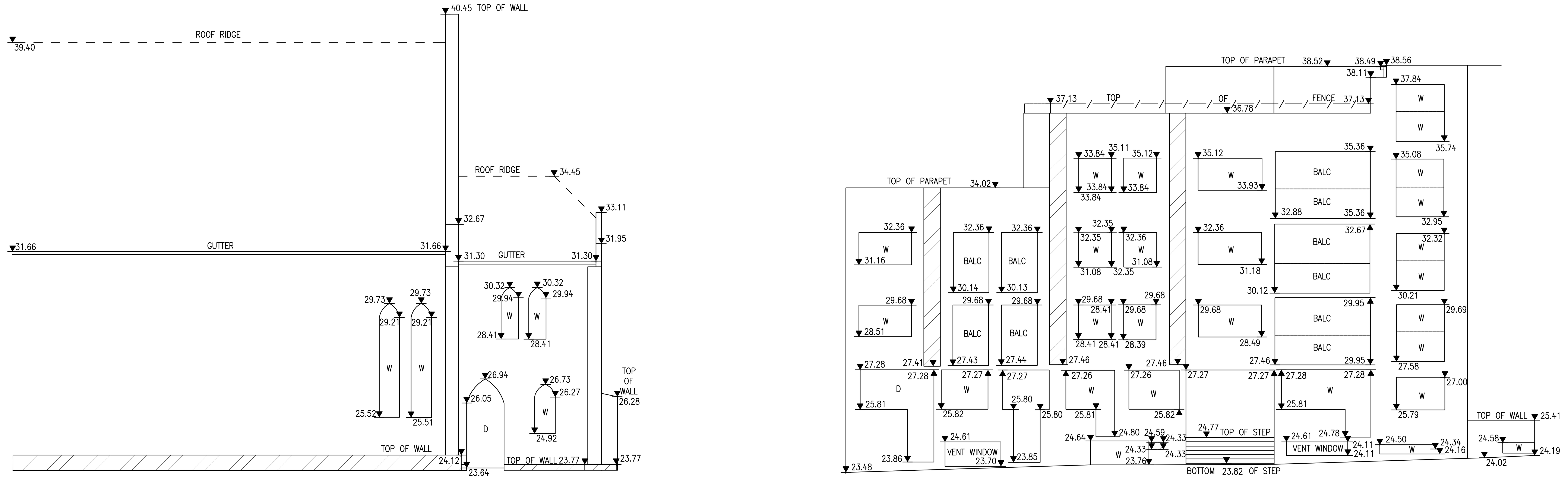
PLAN OF DETAIL, LEVELS AND ELEVATIONS AT No.13-23 GIBBONS STREET REDFERN

LINKER SURVEYING
A Veris Company
Suite 301, Level 3, 55 Holt Street
Surry Hills NSW 2010
PO Box 1807
Strawberry Hills NSW 2012
t: (02) 9212 4655
f: (02) 9212 5254
email: reception@linkersurveying.com.au
web site: www.linkersurveying.com.au

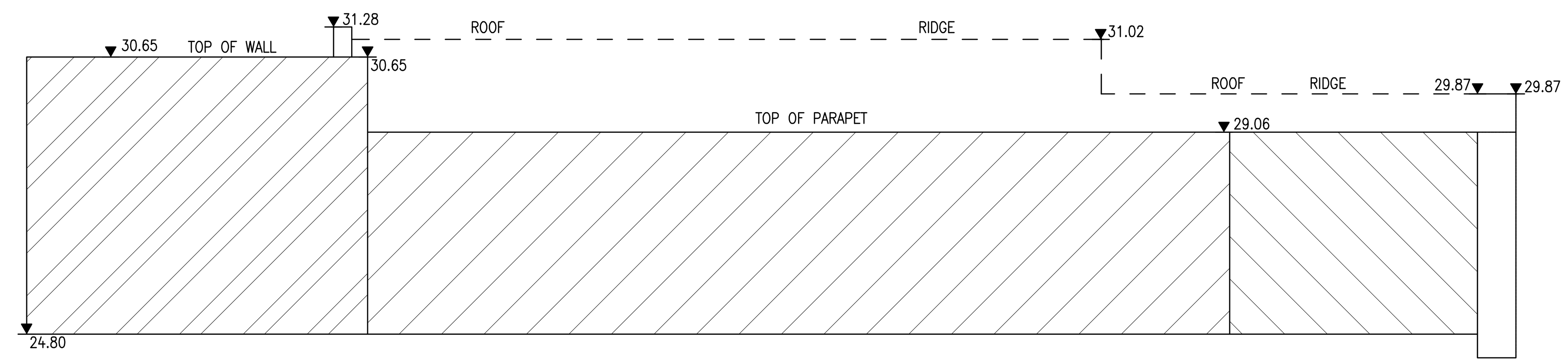
X:\17JOBS\170638 11 GIBBONS ST REDFERN\DETAIL\170638 DETAIL (FLATTENED).DWG

Appendix B06

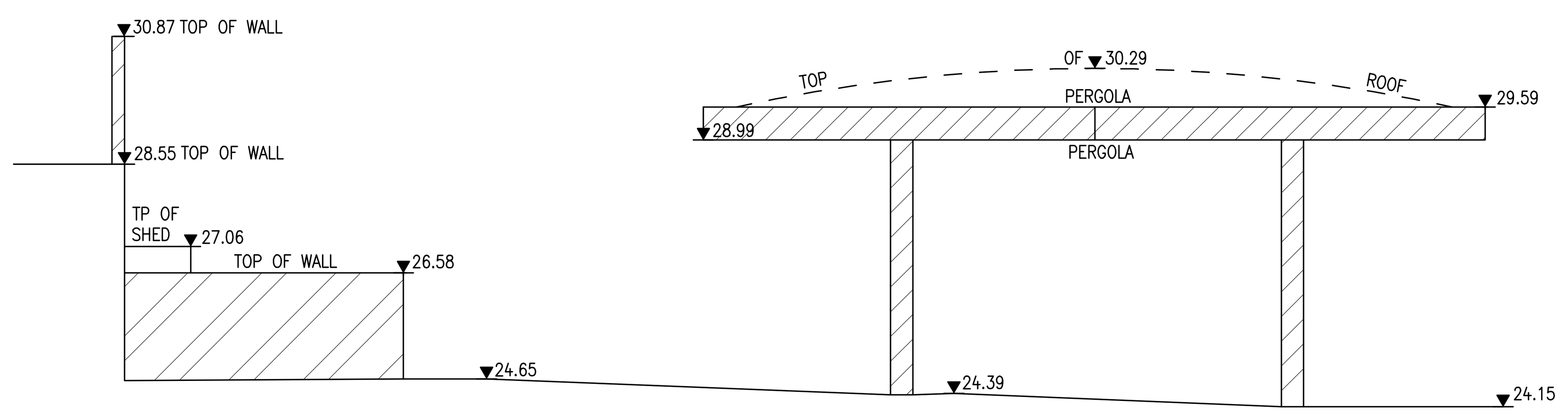




NORTH ELEVATION No 1 MARGARET STREET AND No 118 REGENT STREET – REDFERN



SOUTH ELEVATION No 11 GIBBONS STREET–REDFERN



WEST ELEVATION No 104–116 REGENT STREET–REDFERN

ISSUE	DATE	AMENDMENT	BY

TYPICAL NOTES:

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7. RIDGE, EAVE & GUTTER HEIGHTS HAVE BEEN OBTAINED BY AN INDIRECT METHOD AND ARE ACCURATE FOR PLANNING PURPOSES ONLY.
8. ADJOINING BUILDINGS AND DWELLINGS HAVE BEEN PLOTTED FOR DIAGRAMMATIC PURPOSES ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
9. THE DIAMETER (ø), SPREAD (S) & HEIGHT (H) OF EACH TREE IS INDICATIVE ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.

LEGEND OF TYPICAL CODES

AE – ARCHITECTURAL EMBELLISHMENT
AP – ALIGNMENT PIN
AWN – AWNING
BALC – BALCONY
BAWN – BOTTOM OF AWNING
BB – BOTTOM OF BANK
BCH – BOTTOM OF CHIMNEY
BD – BOTTOM OF DOOR
BDY – BOUNDARY
BF – BOTTOM OF FENCE
BHR – BOTTOM OF HANDRAIL
BIT – BITUMEN
BK – BOTTOM OF KERB
BLD – BUILDING
BM – BENCH MARK
BOL – BOLLARD
BR – BOTTOM OF ROCK
BRK – BRICK
BRW – BOTTOM OF RETAINING WALL
BS – BOTTOM OF STEPS
BW – BOTTOM OF WALL
BWIN – BOTTOM OF WINDOW
CCS – COUNCIL STORMWATER
CHIM – CHIMNEY
CL – CENTRELINE
CLID – CONCRETE LID
COL – COLUMN
COM – COMMUNICATIONS PIT
CONC – CONCRETE
CPT – CARPORT
D – DOOR
DD – DISH DRAIN
DH – DRILL HOLE
DHW – DRILL HOLE & WINGS
DWY – DRIVEWAY
EB – EDGE OF BITUMEN
EBOX – ELECTRICITY BOX
EC – EDGE OF CONCRETE
ED – EDGE OF DOOR
EG – EDGE OF GARDEN
ELEC – ELECTRICITY PIT
ELP – LIGHT POLE
EP – EDGE OF PATH
ER – EDGE OF ROAD
FCE – FENCE
FL – FLOOR LEVEL
FFL – FINISHED FLOOR LEVEL
FP – FENCE POST
GD – GLASS DOOR
GL – GROUND LEVEL
GM – GAS METER
HPG – HIGH POWERED GAS
HR – HANDRAIL
HYD – HYDRANT
IL – INVERT LEVEL
K – KERB
LIN – LINTEL
LP – LAMP POST
MH – MANHOLE
MLID – METAL LID
NS – NATURAL SURFACE
OCC – STRUCTURE
OPT – OPTUS PIT
PC – PRAM CROSSING
PED – PEDESTRIAN CROSSING
PERG – PERGOLA
PM – PERMANENT MARK
PP – POWER POLE
RCK – ROCK
RG – ROOF GUTTER
RLWY – RAILWAY
RM – REFERENCE MARK
RR – ROOF RIDGE
RSN – CONCRETE NAIL
SEW – SEWER
SHR – SHRUB
SIP – SEWER INSPECTION PIT
SLH – SEWER LAMP HOLE
SMH – SEWER MANHOLE
SP – SIGN POST
SSM – STATE SURVEY MARK
SV – STOP VALVE
SW – STORM WATER
TARCH – TOP OF ARCH
TAWN – TOP OF AWNING
TB – TOP OF BANK
TBX – TELSTRA BOX
TCH – TOP OF CHIMNEY
TD – TOP OF DOOR
TEL – TELSTRA PIT
TELP – TELSTRA PILLAR
TF – TOP OF FENCE
TG – TOP OF GUTTER
THR – TOP OF HANDRAIL
TI – TRAFFIC ISLAND
TK – TOP OF KERB
TL – TRAFFIC LIGHT
TP – TOP OF PARAPET
TR – TREE
TRF – TOP OF ROOF
TRK – TOP OF ROCK
TRW – TOP OF RETAINING WALL
TS – TOP OF STEPS
TW – TOP OF WALL
TWIN – TOP OF WINDOW
US – UNDERSIDE
UAWN – UNDERSIDE OF AWNING
UKS – UNKNOWN SERVICE
USB – UNDERSIDE OF BEAM
USC – UNDERSIDE OF CEILING
USE – UNDERSIDE OF EAVE
USG – UNDERSIDE OF GUTTER
V – VENT
VER – VERANDAH
VC – VEHICLE CROSSING
W – WINDOW
WM – WATER METER

LEGEND OF TYPICAL SERVICES

C – COMMUNICATIONS CABLE
CSWP – CERAMIC STORMWATER PIPE
E – UNDERGROUND ELECTRICITY CABLES
AE AO – UNDERGROUND ELECTRICITY & OPTUS CABLES
FS – FIRE SERVICE
G – GAS LINE
GE – GAS LINE & ELECTRICITY CABLES
NBN – NATIONAL BROAD BAND CABLES
NG – NATURAL GAS LINE
OH – OVERHEAD CABLES
OPT – OPTUS CABLE
PE – PRIVATE ELECTRICITY
PS – PRIVATE SEWER
PW – PRIVATE WATER
RW – RECYCLED WATER
RM – RISING MAIN
RMS – ROADS & MARITIME SERVICES
S – SEWER
SO – SEWER OUTFALL
ST – SHARED TRENCH
SW – STORM WATER
SW CK – STORMWATER CREEK
T – TELSTRA CABLES
TG – TELSTRA & GAS CABLES
U – UNKNOWN SERVICE
VO – VOCUS CABLES
VR – VERIZON CABLES
W – WATER SUPPLY
WM – WATER MAIN

1. ALL UNDERGROUND SERVICE INFORMATION INCLUSIVE OF GENERAL POSITION AND SURFACE COVER DEPTHS NOTED ON THE PLAN ARE APPROXIMATELY ONLY.
2. ALL UNDERGROUND SERVICE INFORMATION HAS BEEN COMPILED FROM SERVICE AUTHORITY PLANS PROVIDED BY THE AUTHORITIES.
3. THE LOCATION OF SERVICES BETWEEN SURVEYED POINTS (AS INDICATED) HAVE BEEN SHOWN DIAGRAMMATICALLY ONLY USING THE SERVICE DIAGRAMS AS PROVIDED. THE EXACT LOCATION OF THESE SERVICES BETWEEN THE SURVEYED POINTS MUST BE VERIFIED PRIOR TO ANY EXCAVATION OR PILING. NO WARRANTY IS GIVEN AGAINST THE POSSIBILITY OF THE EXISTENCE OF FURTHER UNCHARTED SERVICES.
4. ALL CONTRACTORS, TRADESMEN, BUILDING & PROJECT CONSULTANTS MUST CONTACT THE VARIOUS AUTHORITIES, IN ACCORDANCE WITH STANDARD "DIAL BEFORE YOU DIG" PROCEDURES PRIOR TO UNDERTAKING ANY WORKS WITHIN THE VICINITY OF THE SERVICE LINES TO VERIFY THE POSITION OF THE SERVICE LINES.

COVER OF EXCELLENCE
Liability limited by a scheme approved under Professional Standards Legislation

DIAL BEFORE YOU DIG www.1100.com.au The Essential First Step

REDUCTION RATIO 1 : 100
0 1 2 3 4 5 6 7 8 9 10
LENGTHS ARE IN METRES

CLIENT: THE OWNERS

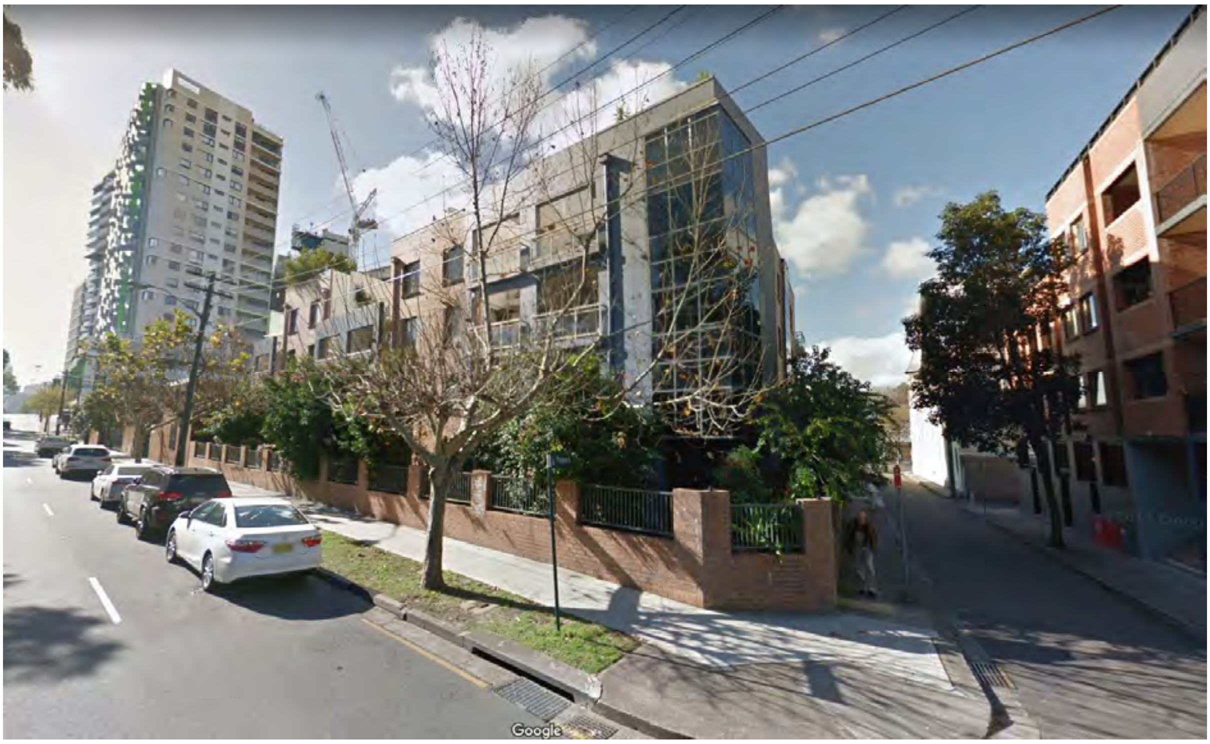
TITLE No: SP60485	REF:170638
DATUM: A.H.D.	ISSUE:1
DATE OF SURVEY: 17.07.17	ISSUE DATE:09.08.17
SURVEYOR: LS	SHEET SIZE:A1
DRAFTER: JJ	SHEET 2 OF 2 SHEETS

PLAN OF DETAIL, LEVELS AND ELEVATIONS AT No.13-23 GIBBONS STREET REDFERN

LINKER SURVEYING
Suite 301, Level 3, 55 Holt Street
Surry Hills NSW 2010
PO Box 1807
Strawberry Hills NSW 2012
t: (02) 9212 4655
f: (02) 9212 5254
email: reception@linkersurveying.com.au
web site: www.linkersurveying.com.au
veris A Veris Company

X:\17JOBS\170638 11 GIBBONS ST REDFERN\DETAIL\170638 DETAIL (FLATTENED).DWG

Appendix C01



Street View from Gibbons Street – (from Google street view)

Street View from Margaret Street – (from Google street view)

Appendix C02

View of footpath and boundary fence along Gibbons Street

View of footpath and boundary fence along Margaret Street

Appendix C03

Photo taken from Margaret Street showing driveway to underground carpark and concrete staircase to courtyard.

Photo showing existing City of Sydney Council's kerb inlet pit in front of the driveway

Appendix C04

Photo taken from William Lane with the blue painted wall of existing building as background.

Photo showing existing courtyard is about 3 steps (600mm) higher than the street level with the lowest point at the left kerb inlet pit. The retaining wall behind the black and white chequered board have collapsed.

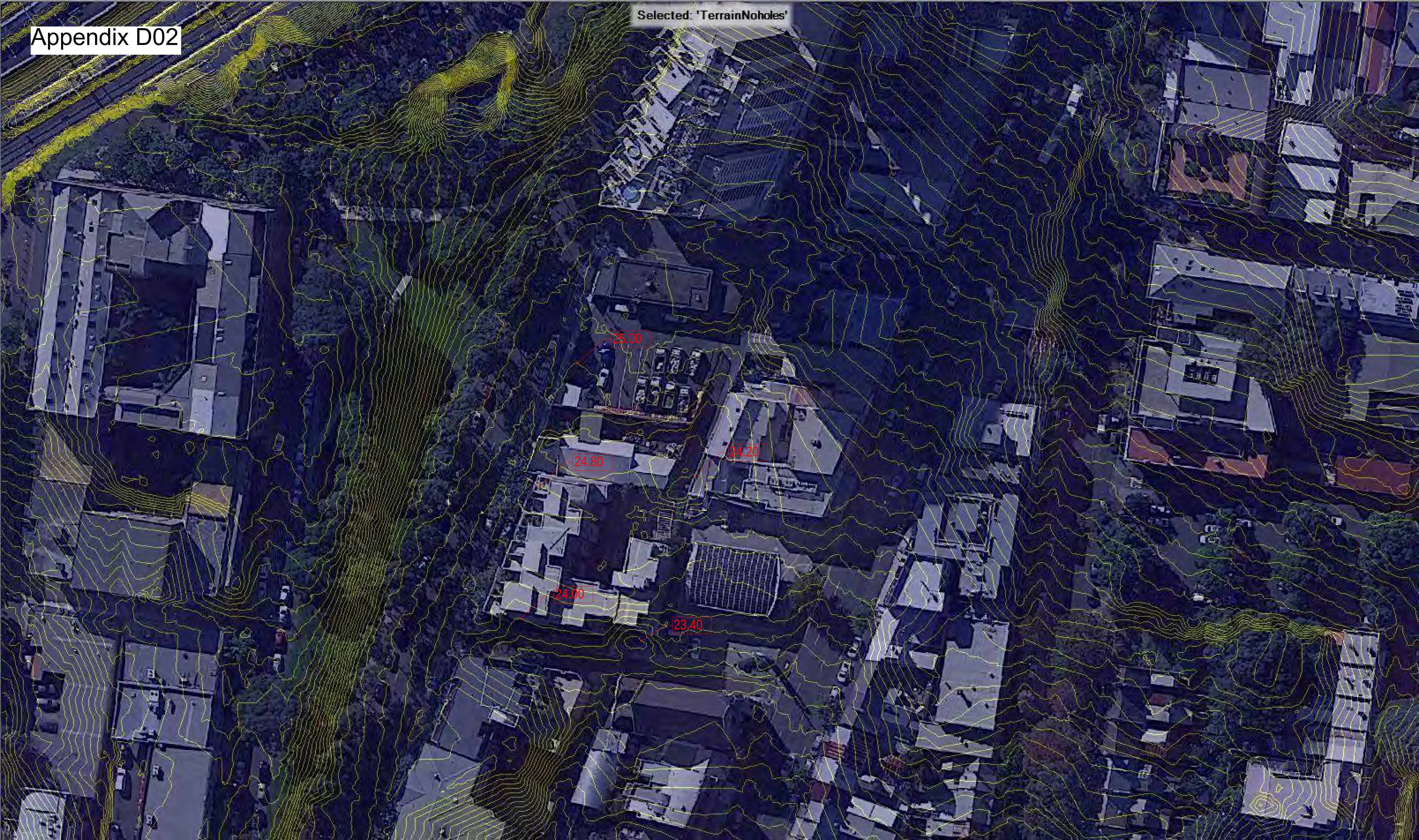
Appendix C05

Photo taken from William Lane showing damaged retaining wall.

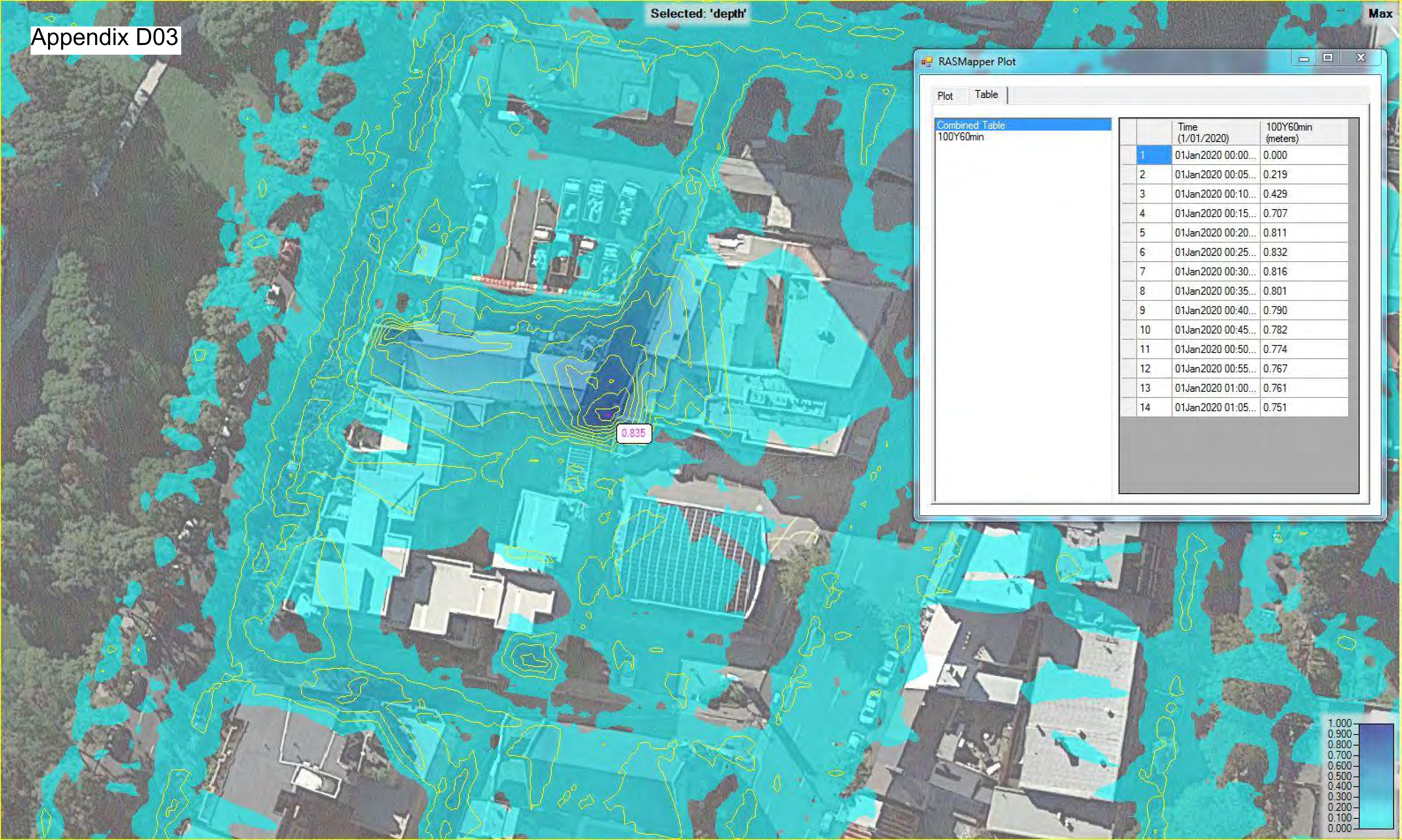
Photo showing flood flow path at the BP Station compound overflow from William Lane (at the foreground not shown).

Appendix D01

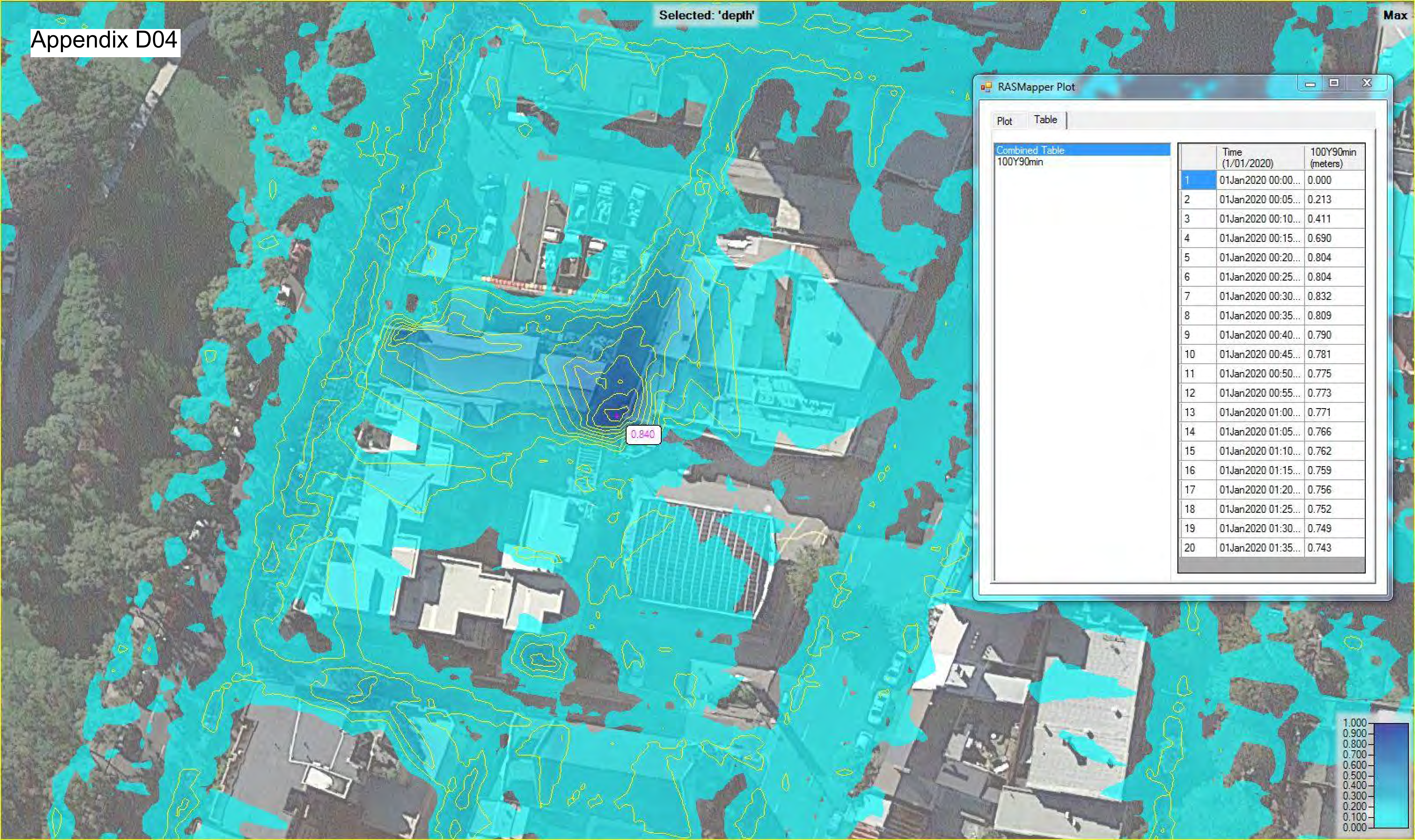
Appendix D02

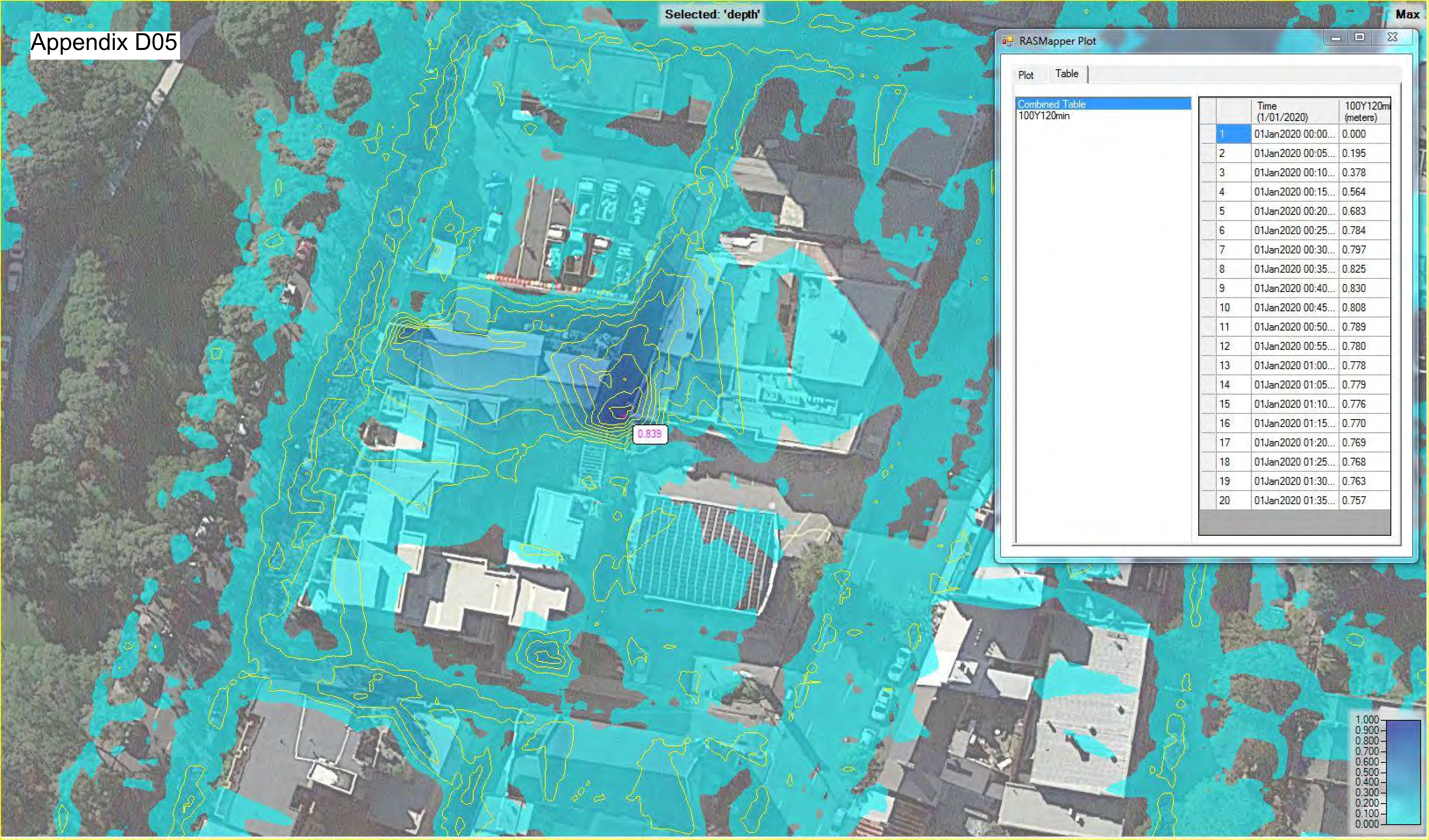


Appendix D03



Appendix D04





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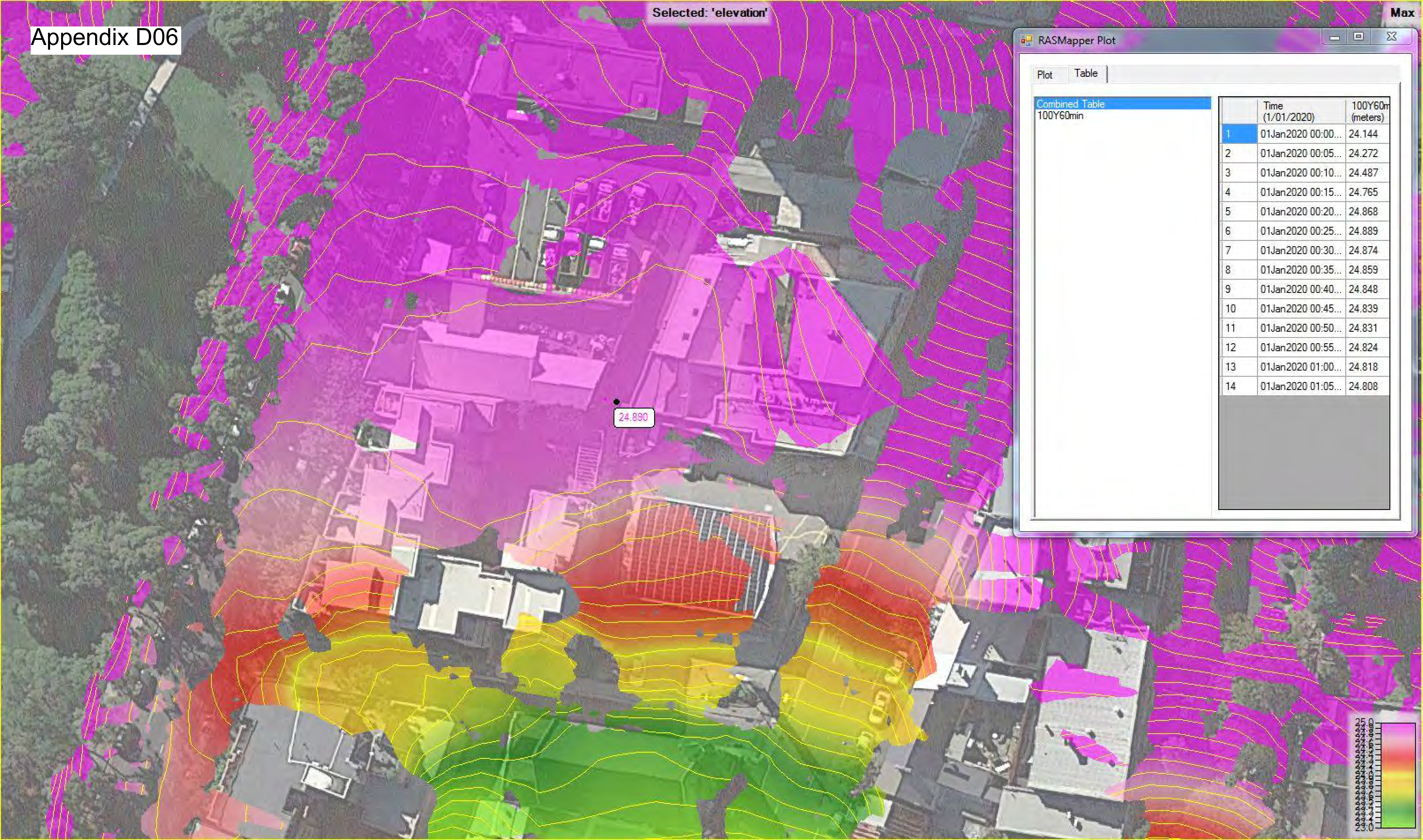
2	01Jan2020 00:05...	0.195
3	01Jan2020 00:10...	0.378
4	01Jan2020 00:15...	0.564
5	01Jan2020 00:20...	0.683
6	01Jan2020 00:25...	0.784
7	01Jan2020 00:30...	0.797
8	01Jan2020 00:35...	0.825
9	01Jan2020 00:40...	0.830
10	01Jan2020 00:45...	0.808
11	01Jan2020 00:50...	0.789
12	01Jan2020 00:55...	0.780
13	01Jan2020 01:00...	0.778
14	01Jan2020 01:05...	0.779
15	01Jan2020 01:10...	0.776
16	01Jan2020 01:15...	0.770
17	01Jan2020 01:20...	0.769
18	01Jan2020 01:25...	0.768
19	01Jan2020 01:30...	0.763
20	01Jan2020 01:35...	0.757



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1	01Jan2020 00:00...	24.144
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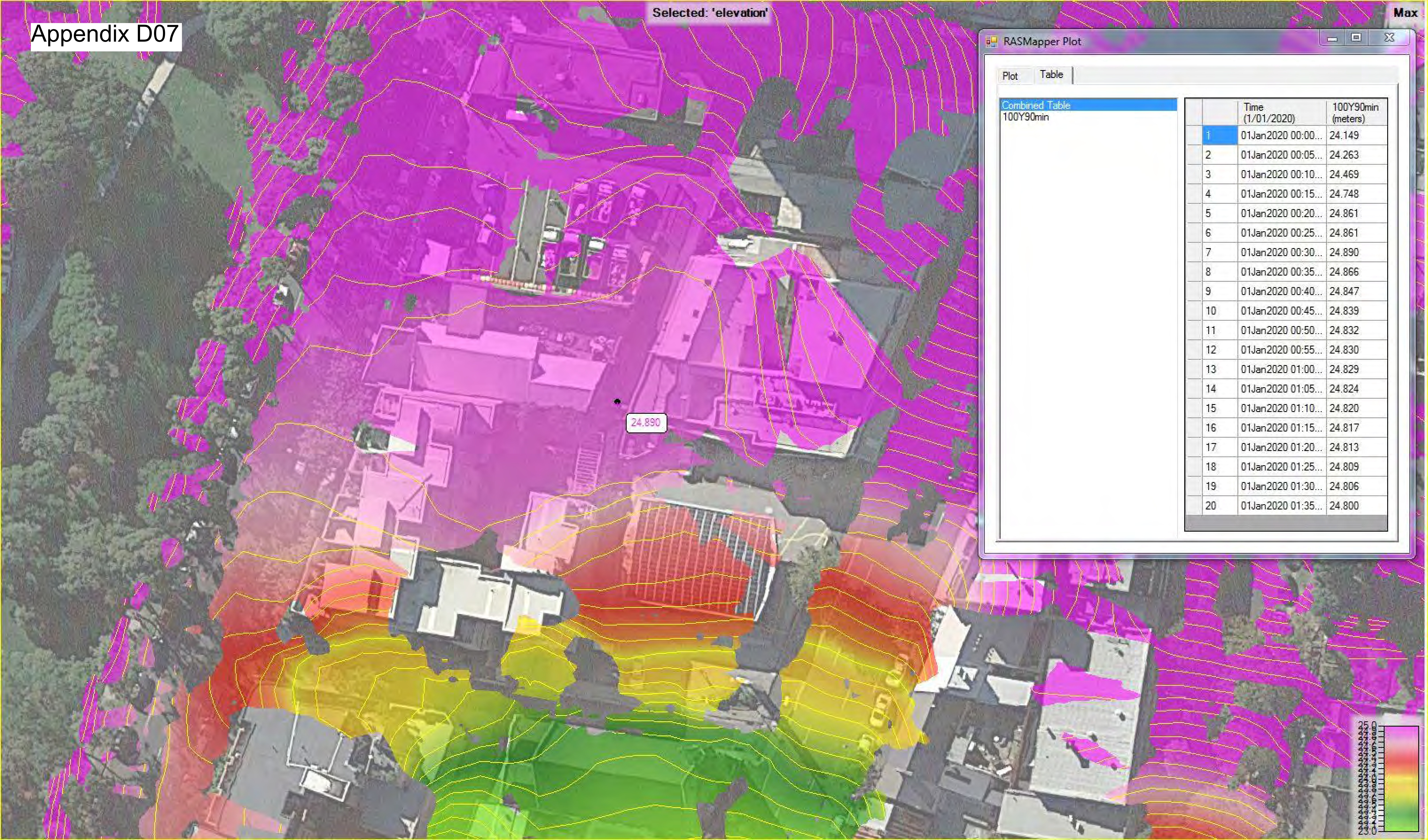
3	01Jan2020 00:10...	24.487
4	01Jan2020 00:15...	24.765
5	01Jan2020 00:20...	24.868
6	01Jan2020 00:25...	24.889
7	01Jan2020 00:30...	24.874
8	01Jan2020 00:35...	24.859
9	01Jan2020 00:40...	24.848
10	01Jan2020 00:45...	24.839
11	01Jan2020 00:50...	24.831
12	01Jan2020 00:55...	24.824
13	01Jan2020 01:00...	24.818
14	01Jan2020 01:05...	24.808



	Time (1/01/2020)	100Y90min (meters)
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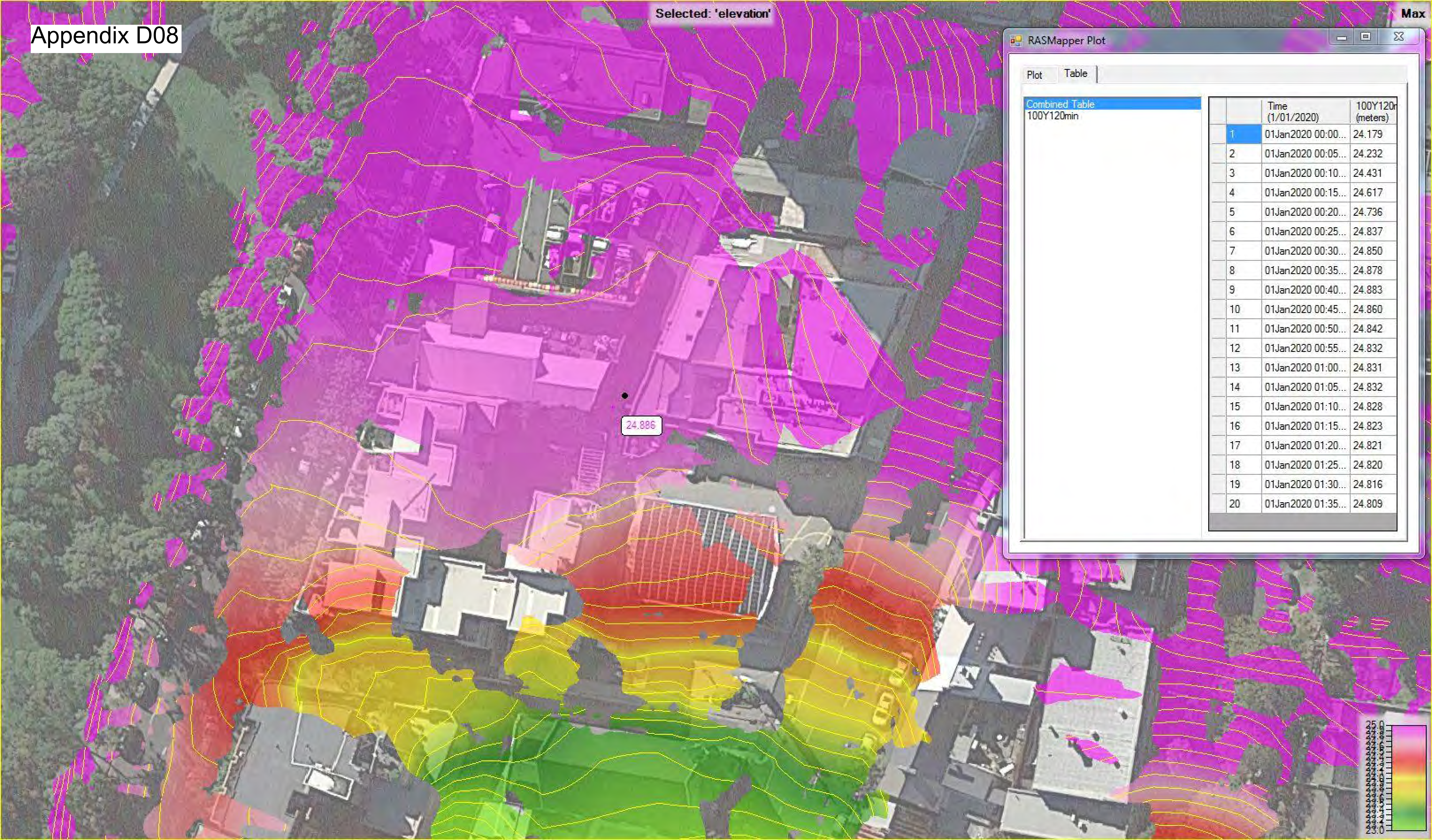
2	01Jan2020 00:05...	24.263
3	01Jan2020 00:10...	24.469
4	01Jan2020 00:15...	24.748
5	01Jan2020 00:20...	24.861
6	01Jan2020 00:25...	24.861
7	01Jan2020 00:30...	24.890
8	01Jan2020 00:35...	24.866
9	01Jan2020 00:40...	24.847
10	01Jan2020 00:45...	24.839
11	01Jan2020 00:50...	24.832
12	01Jan2020 00:55...	24.830
13	01Jan2020 01:00...	24.829
14	01Jan2020 01:05...	24.824
15	01Jan2020 01:10...	24.820
16	01Jan2020 01:15...	24.817
17	01Jan2020 01:20...	24.813
18	01Jan2020 01:25...	24.809
19	01Jan2020 01:30...	24.806
20	01Jan2020 01:35...	24.800

Appendix D08



	Time (1/01/2020)	100Y120r (meters)
1	01Jan2020 00:00...	24.179
2	01Jan2020 00:05...	24.232
3	01Jan2020 00:10...	24.431
4	01Jan2020 00:15...	24.617
5	01Jan2020 00:20...	24.736
6	01Jan2020 00:25...	24.837
7	01Jan2020 00:30...	24.850
8	01Jan2020 00:35...	24.878
9	01Jan2020 00:40...	24.883
10	01Jan2020 00:45...	24.860
11	01Jan2020 00:50...	24.842
12	01Jan2020 00:55...	24.832
13	01Jan2020 01:00...	24.831
14	01Jan2020 01:05...	24.832
15	01Jan2020 01:10...	24.828
16	01Jan2020 01:15...	24.823
17	01Jan2020 01:20...	24.821
18	01Jan2020 01:25...	24.820
19	01Jan2020 01:30...	24.816
20	01Jan2020 01:35...	24.809

Appendix E01

Revisions No.	Date	Description	Ver	App'd
1	27.11.2018	Issue to QS		
2	27.11.2018	Issue to Consultants		

Key

Client
Wee Hur

Architect
AJ+C
ALLEN JACK+COTTIER
79 Myrtle Street Chippendale NSW 2008 AUSTRALIA
ph +61 2 9311 8222 fx +61 2 9311 8200
ABN 53 003 782 250

Project
WEE HUR STUDENT HOUSING
13-23 Gibbons Street, Redfern
Proj. No. 18029

Drawing Title
Detail Elevations East

Sheet Status
NOT FOR CONSTRUCTION

Scale

Drawing No.
DA3302

Issue
2

PLOT DATE & TIME: 27/11/2018 7:58:54 PM
PLOTTED & CHECKED BY: CD
REF: D:\users\ochoa\Documents\18029_Master_O'hora.rvt

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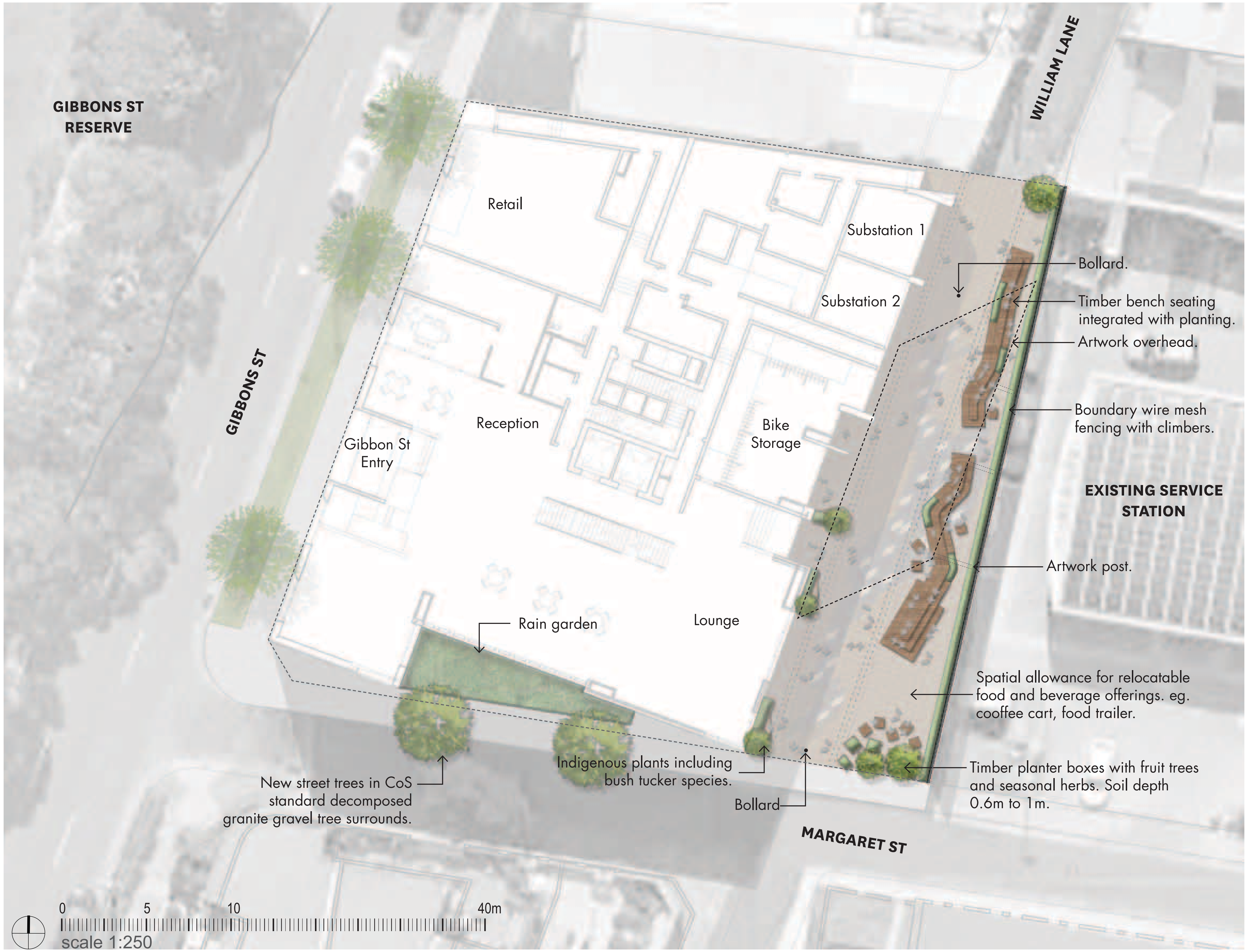
Appendix E02

LANDSCAPE PLAN - GROUND



LEGEND

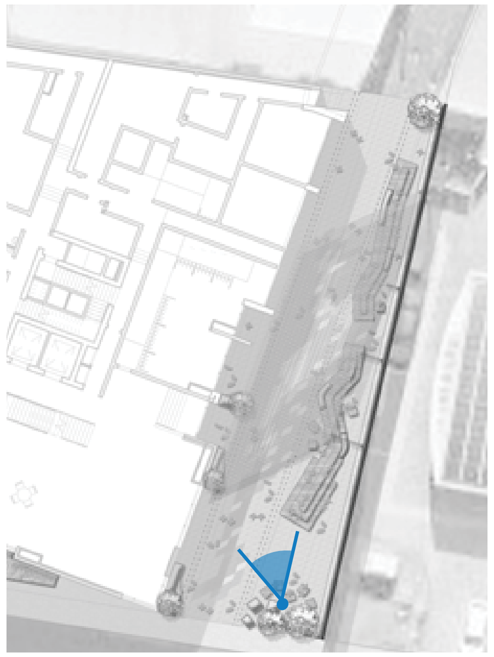
- Project boundary
- Existing grass verge to be retained.
- Existing street trees to be retained.
- Through site link - eco-trihex permeable pavement
- Concrete footpath with broom finish. To be in accordance with Cos Standard.
- Proposed garden bed
- Proposed rain garden
- Proposed trees

Notes:

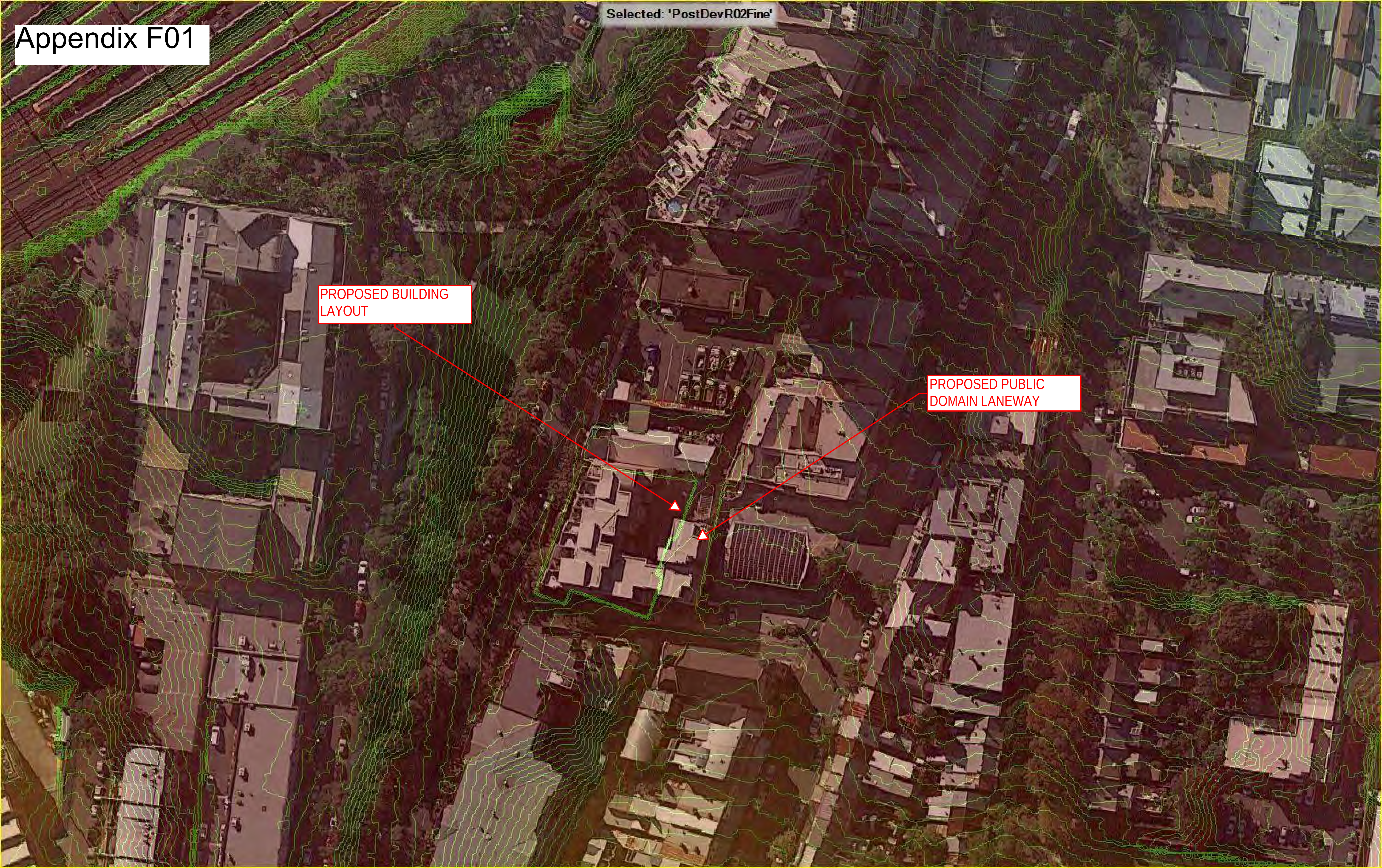
- Street frontage and footpath within Council's boundary to be upgraded/installed in accordance with Council standards.
- Refer to L-DA-20 for trees and plant species.
- Refer to Civik report for levels and flood provisions

Appendix E03

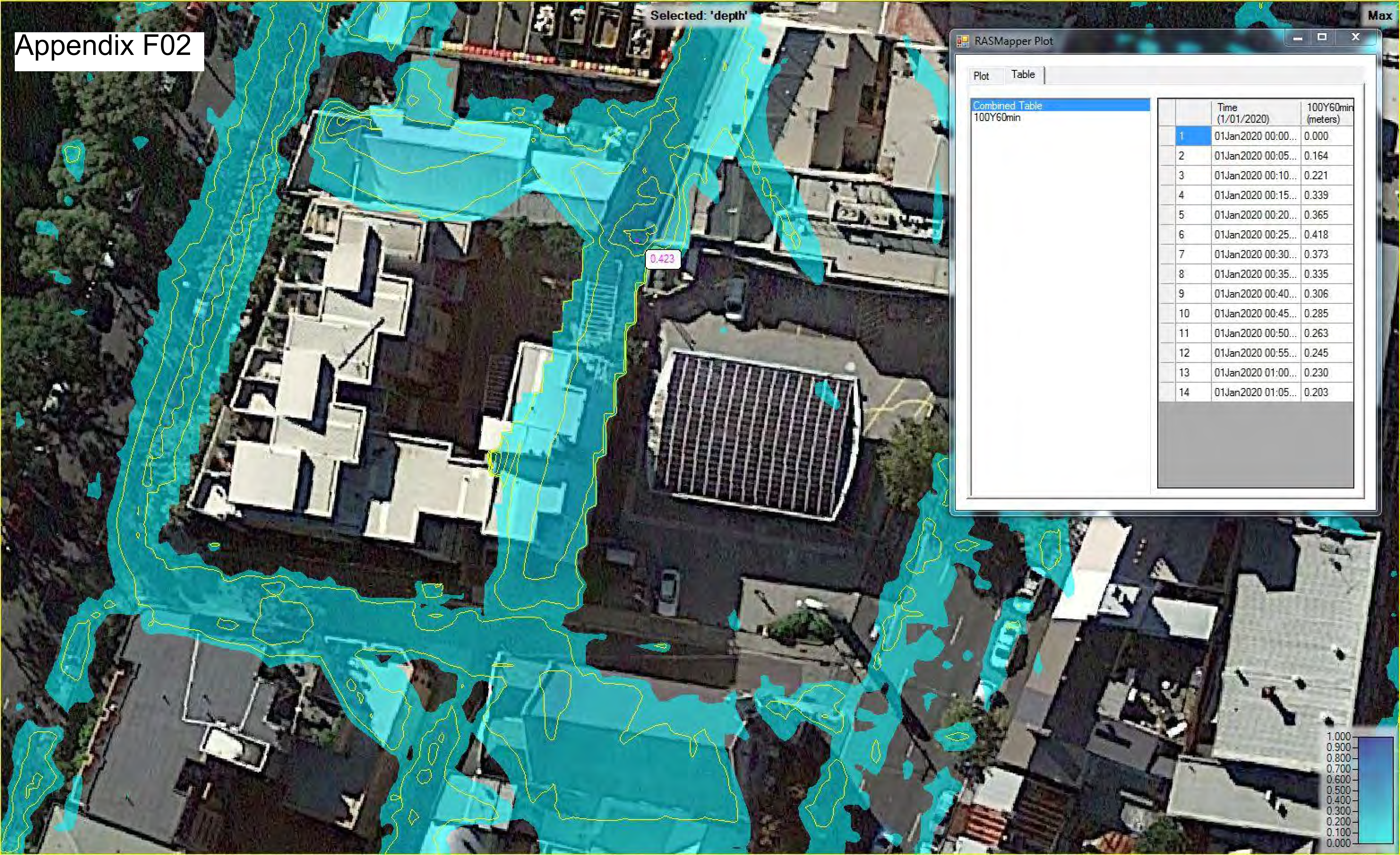
GROUND - 3D VIEWS



Appendix F01



Appendix F02



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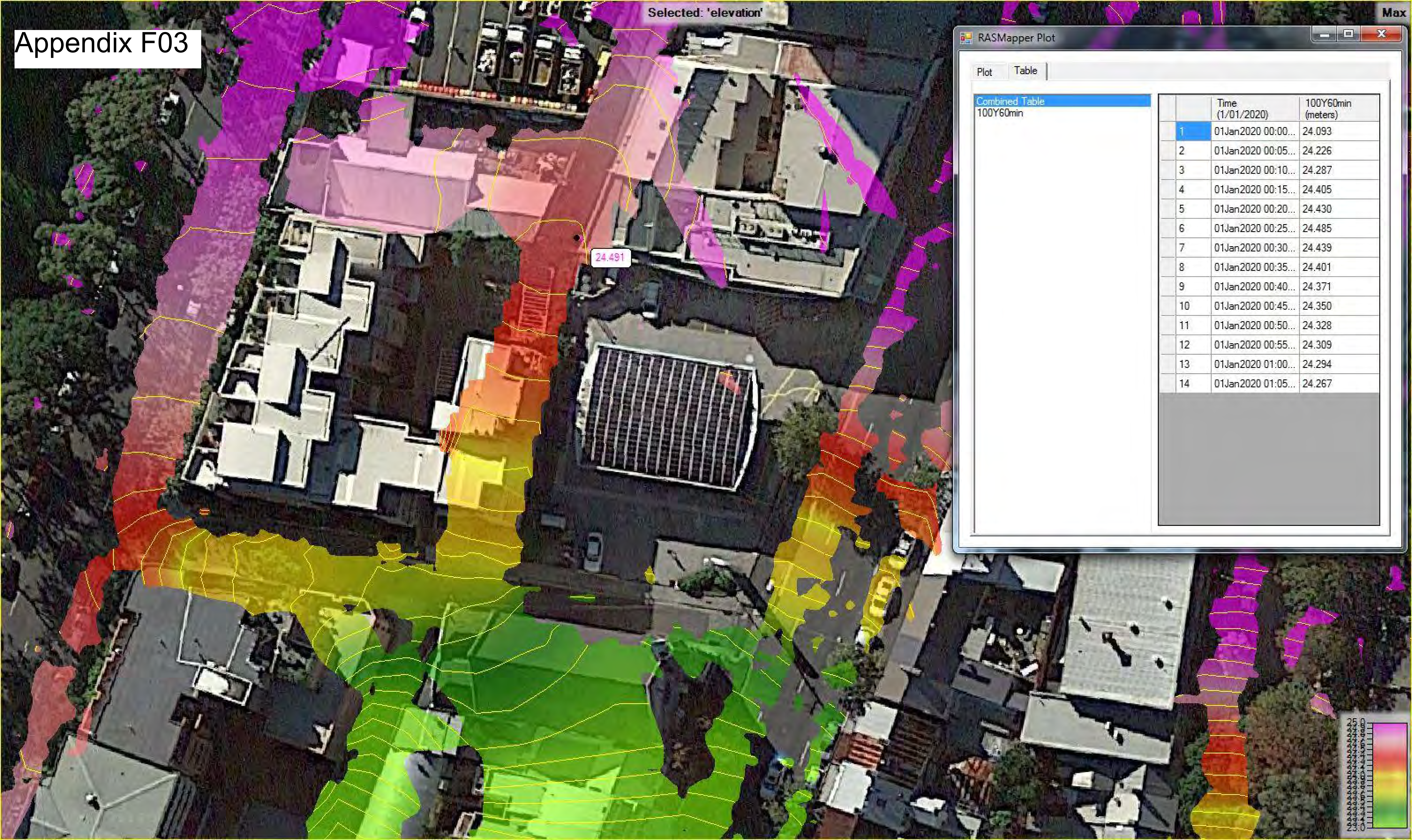
4	01Jan2020 00:15...	0.339
5	01Jan2020 00:20...	0.365
6	01Jan2020 00:25...	0.418
7	01Jan2020 00:30...	0.373
8	01Jan2020 00:35...	0.335
9	01Jan2020 00:40...	0.306
10	01Jan2020 00:45...	0.285
11	01Jan2020 00:50...	0.263
12	01Jan2020 00:55...	0.245
13	01Jan2020 01:00...	0.230
14	01Jan2020 01:05...	0.203

Appendix F03



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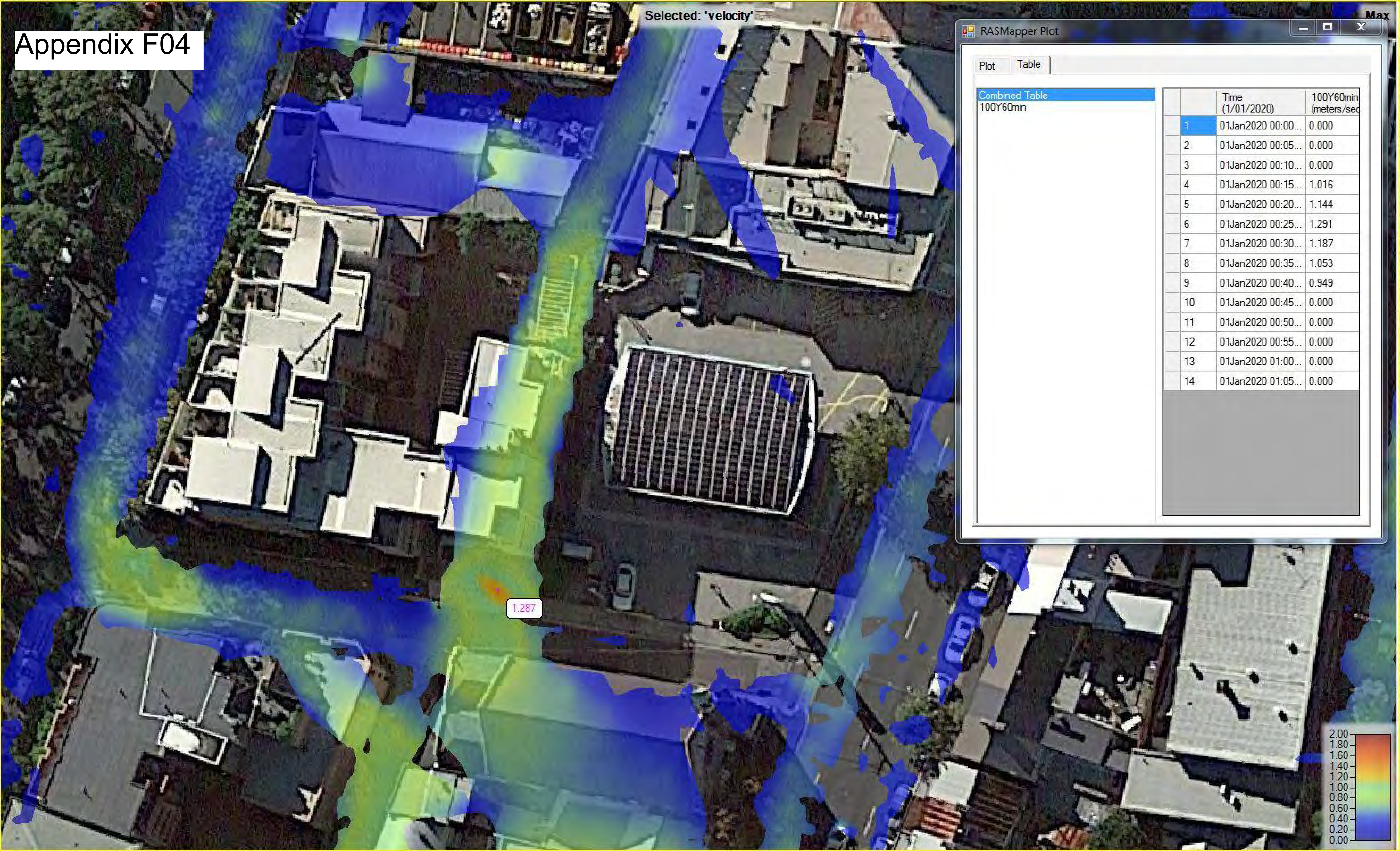
5	01Jan2020 00:20...	24.430
6	01Jan2020 00:25...	24.485
7	01Jan2020 00:30...	24.439
8	01Jan2020 00:35...	24.401
9	01Jan2020 00:40...	24.371
10	01Jan2020 00:45...	24.350
11	01Jan2020 00:50...	24.328
12	01Jan2020 00:55...	24.309
13	01Jan2020 01:00...	24.294
14	01Jan2020 01:05...	24.267

Appendix F04



	Time (1/01/2020)	100Y60min (meters/sec
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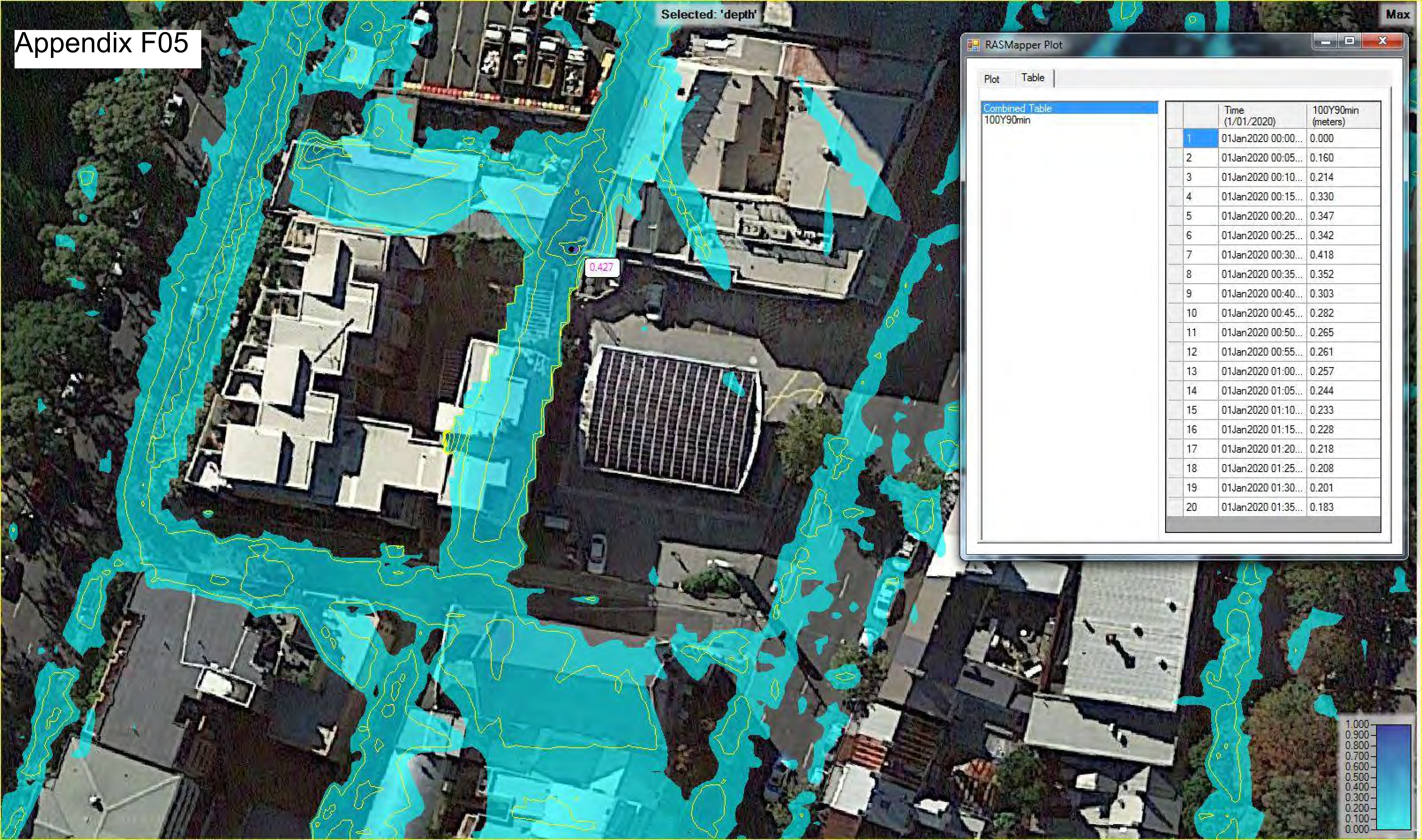
5	01Jan2020 00:20...	1.144
6	01Jan2020 00:25...	1.291
7	01Jan2020 00:30...	1.187
8	01Jan2020 00:35...	1.053
9	01Jan2020 00:40...	0.949
10	01Jan2020 00:45...	0.000
11	01Jan2020 00:50...	0.000
12	01Jan2020 00:55...	0.000
13	01Jan2020 01:00...	0.000
14	01Jan2020 01:05...	0.000

Appendix F05



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5	01Jan2020 00:20...	0.347
6	01Jan2020 00:25...	0.342
7	01Jan2020 00:30...	0.418
8	01Jan2020 00:35...	0.352
9	01Jan2020 00:40...	0.303
10	01Jan2020 00:45...	0.282
11	01Jan2020 00:50...	0.265
12	01Jan2020 00:55...	0.261
13	01Jan2020 01:00...	0.257
14	01Jan2020 01:05...	0.244
15	01Jan2020 01:10...	0.233
16	01Jan2020 01:15...	0.228
17	01Jan2020 01:20...	0.218
18	01Jan2020 01:25...	0.208
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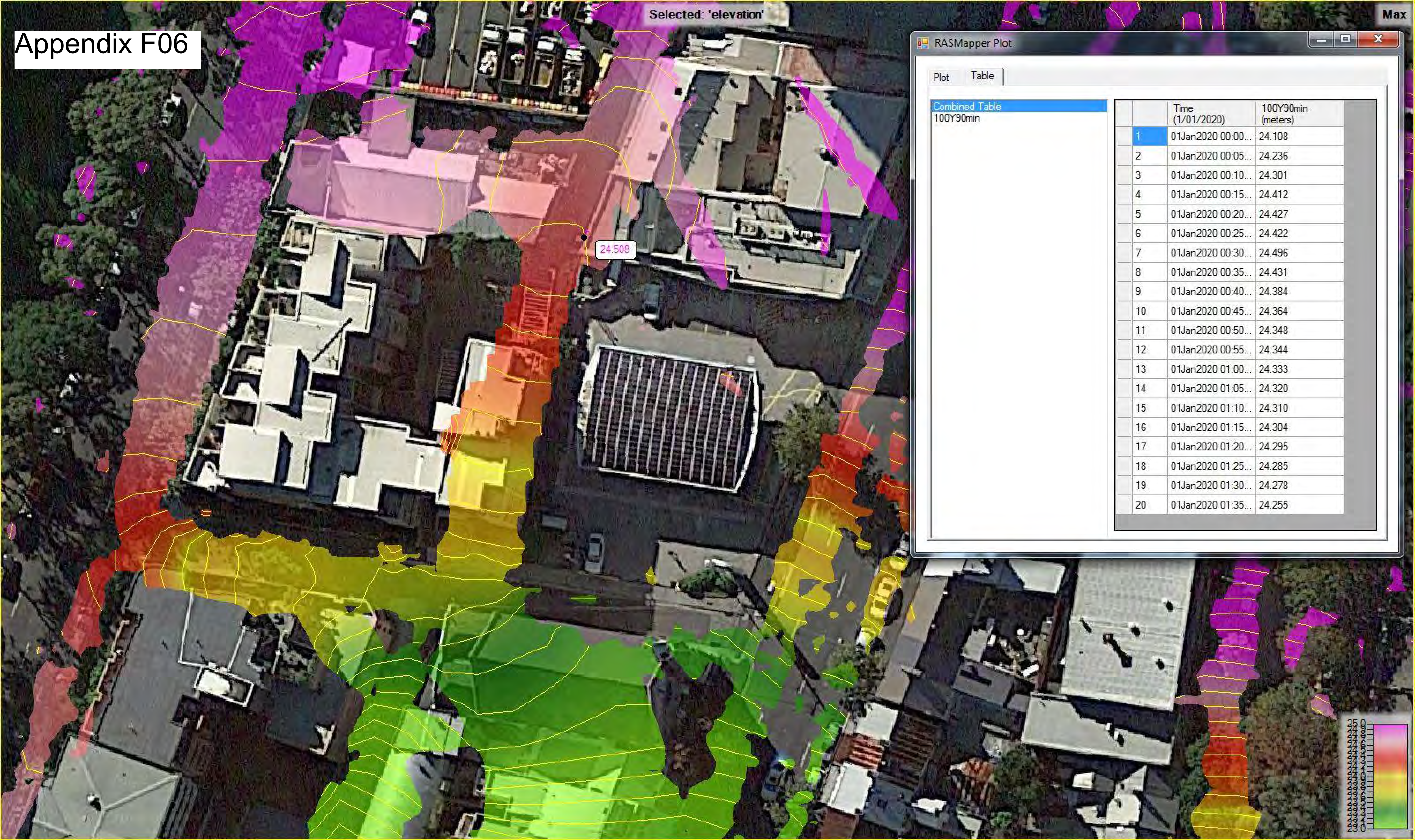
20	01Jan2020 01:35...	0.183

Appendix F06



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9	01Jan2020 00:40...	24.384
10	01Jan2020 00:45...	24.364
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16	01Jan2020 01:15...	24.304
17	01Jan2020 01:20...	24.295
18	01Jan2020 01:25...	24.285
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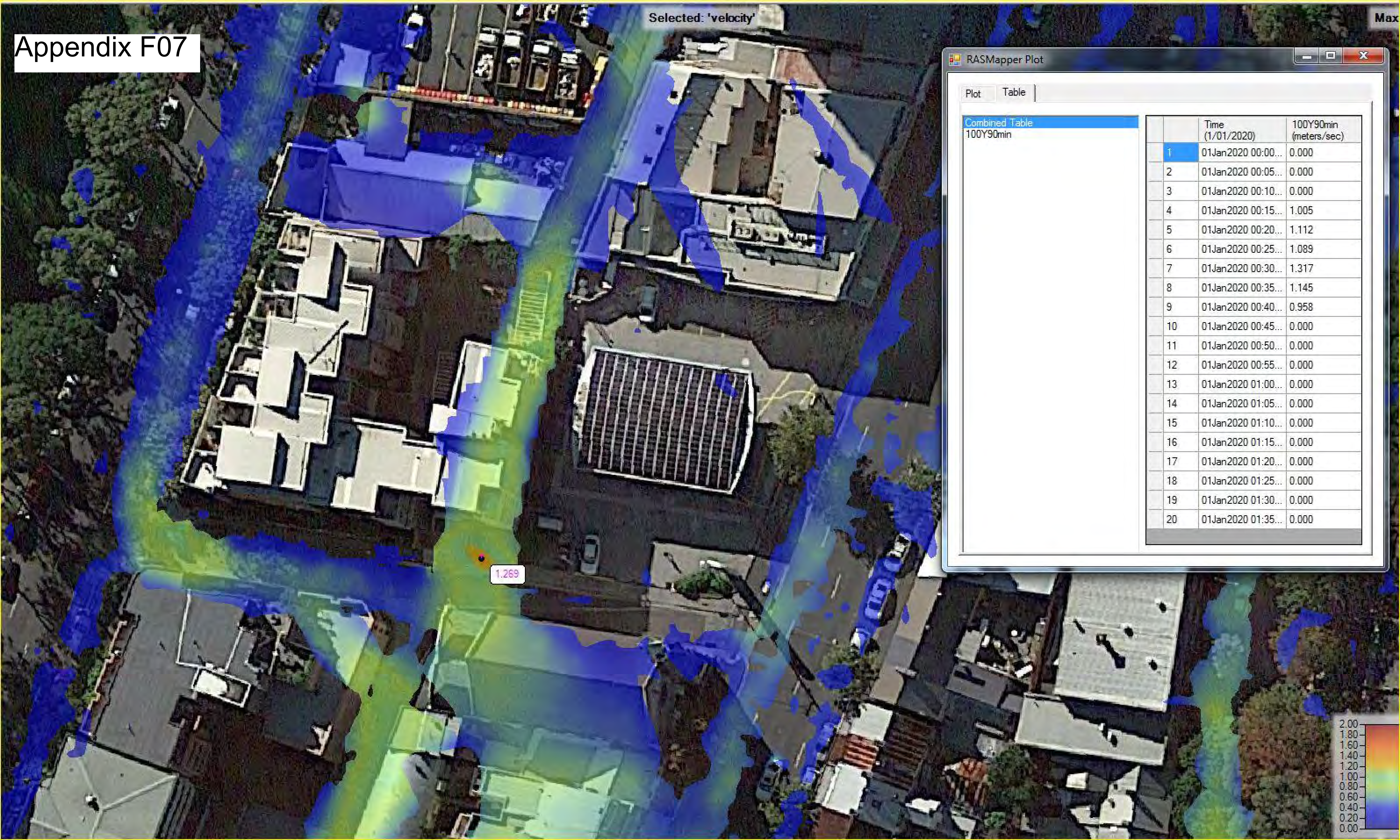
Appendix F07



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8	01Jan2020 00:35...	1.145
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11	01Jan2020 00:50...	0.000
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13	01Jan2020 01:00...	0.000
14	01Jan2020 01:05...	0.000
15	01Jan2020 01:10...	0.000
16	01Jan2020 01:15...	0.000
17	01Jan2020 01:20...	0.000
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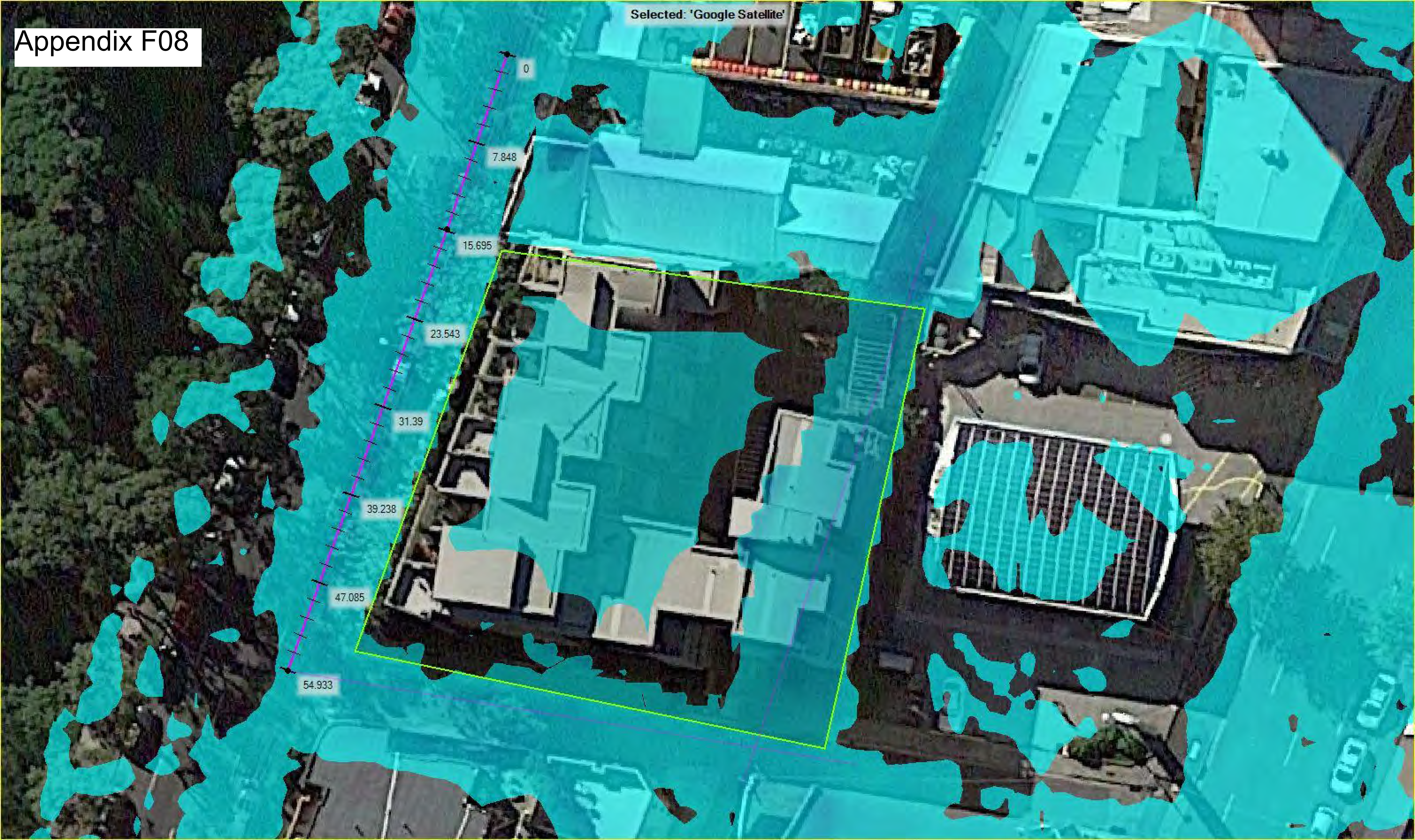
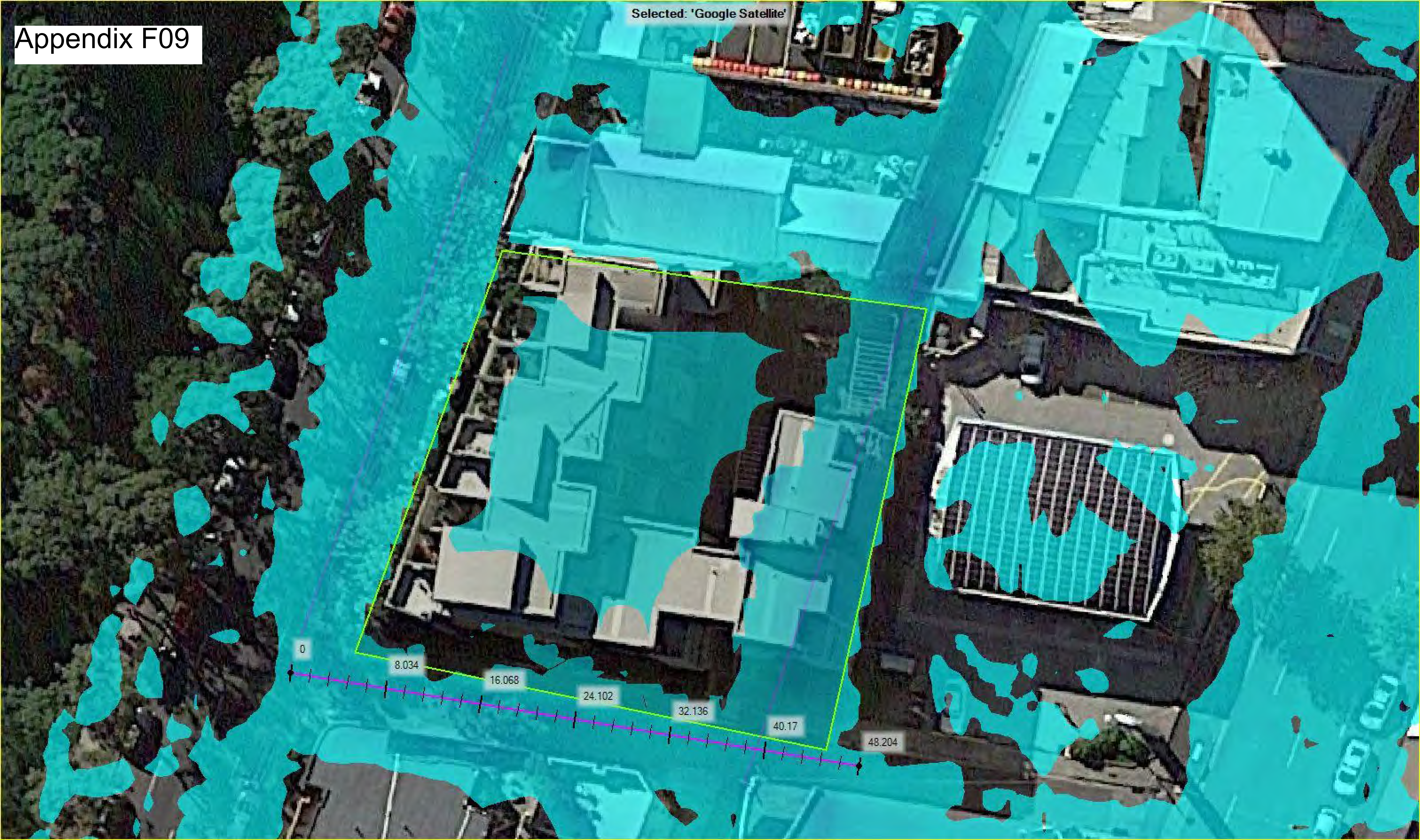
19	01Jan2020 01:30...	0.000
20	01Jan2020 01:35...	0.000

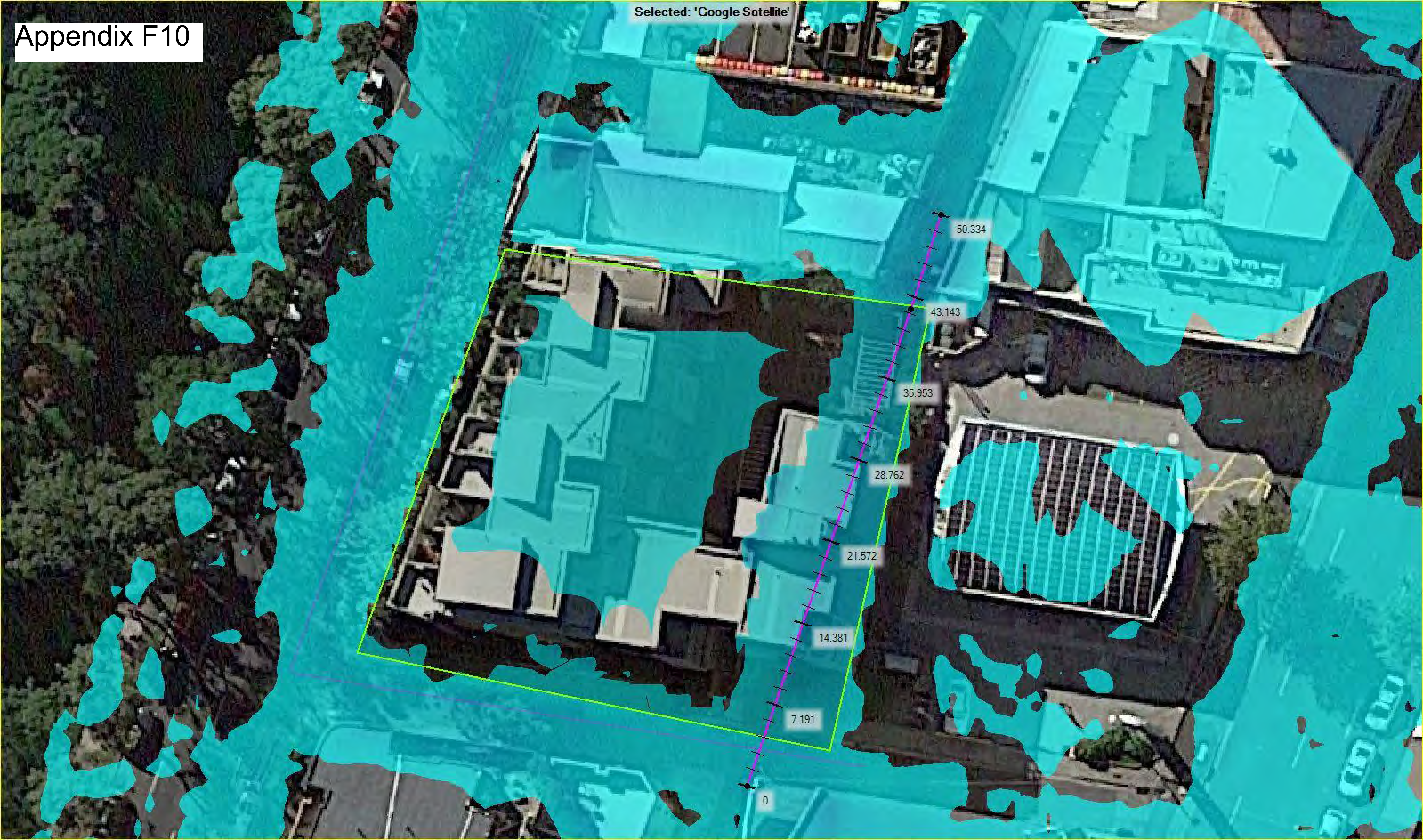
Appendix F08



Appendix F09

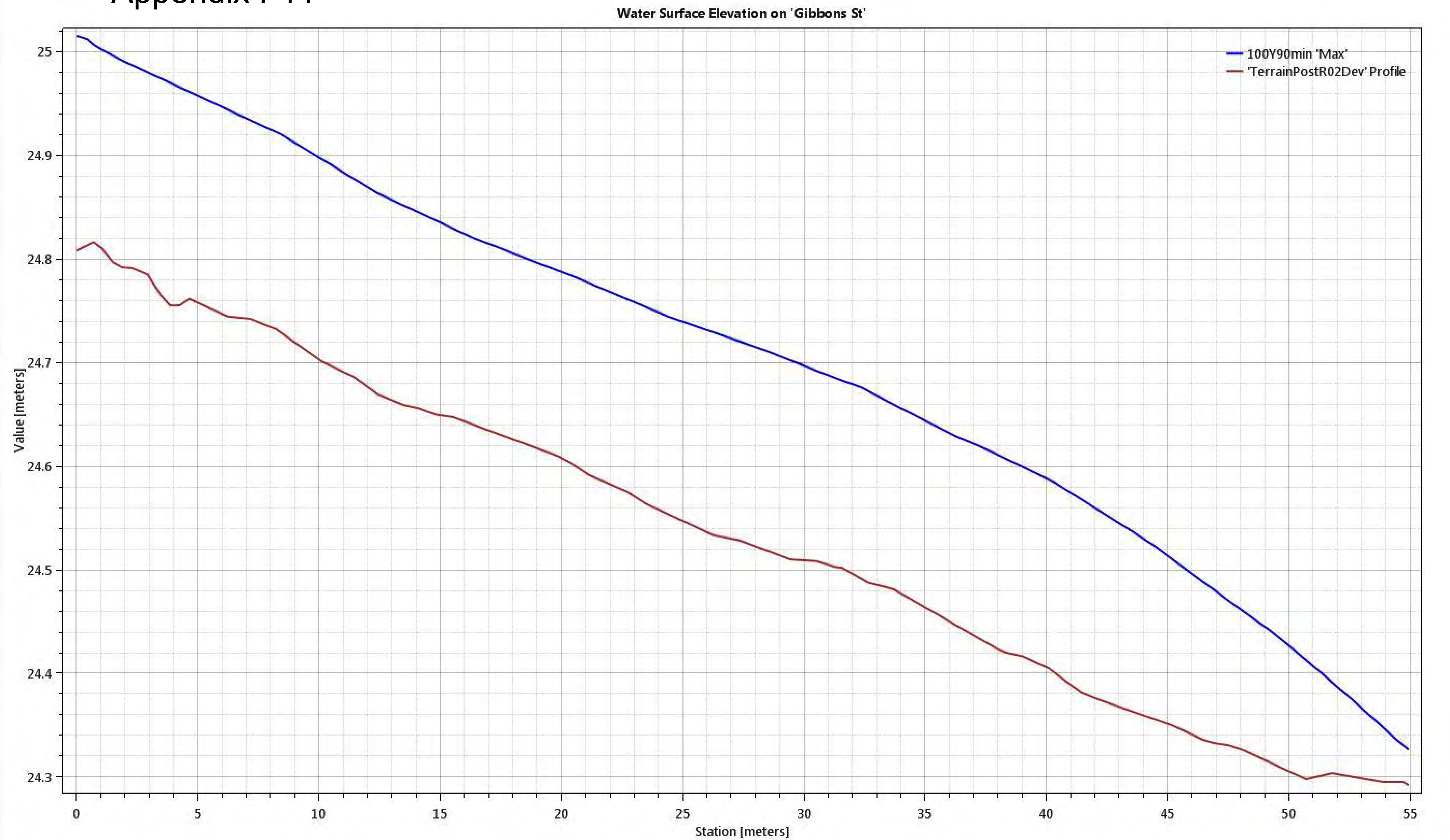


Appendix F10

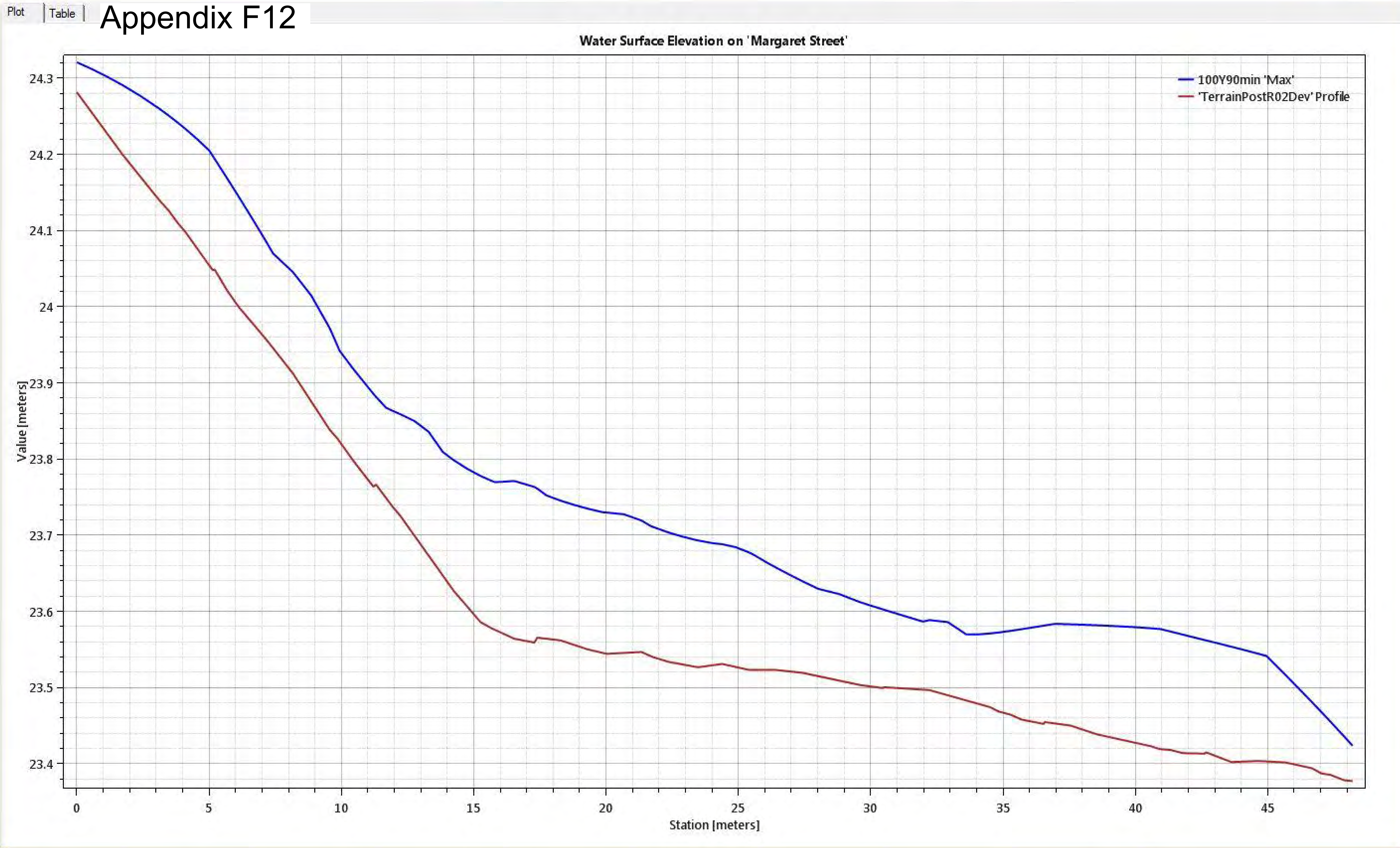


Plot | Table

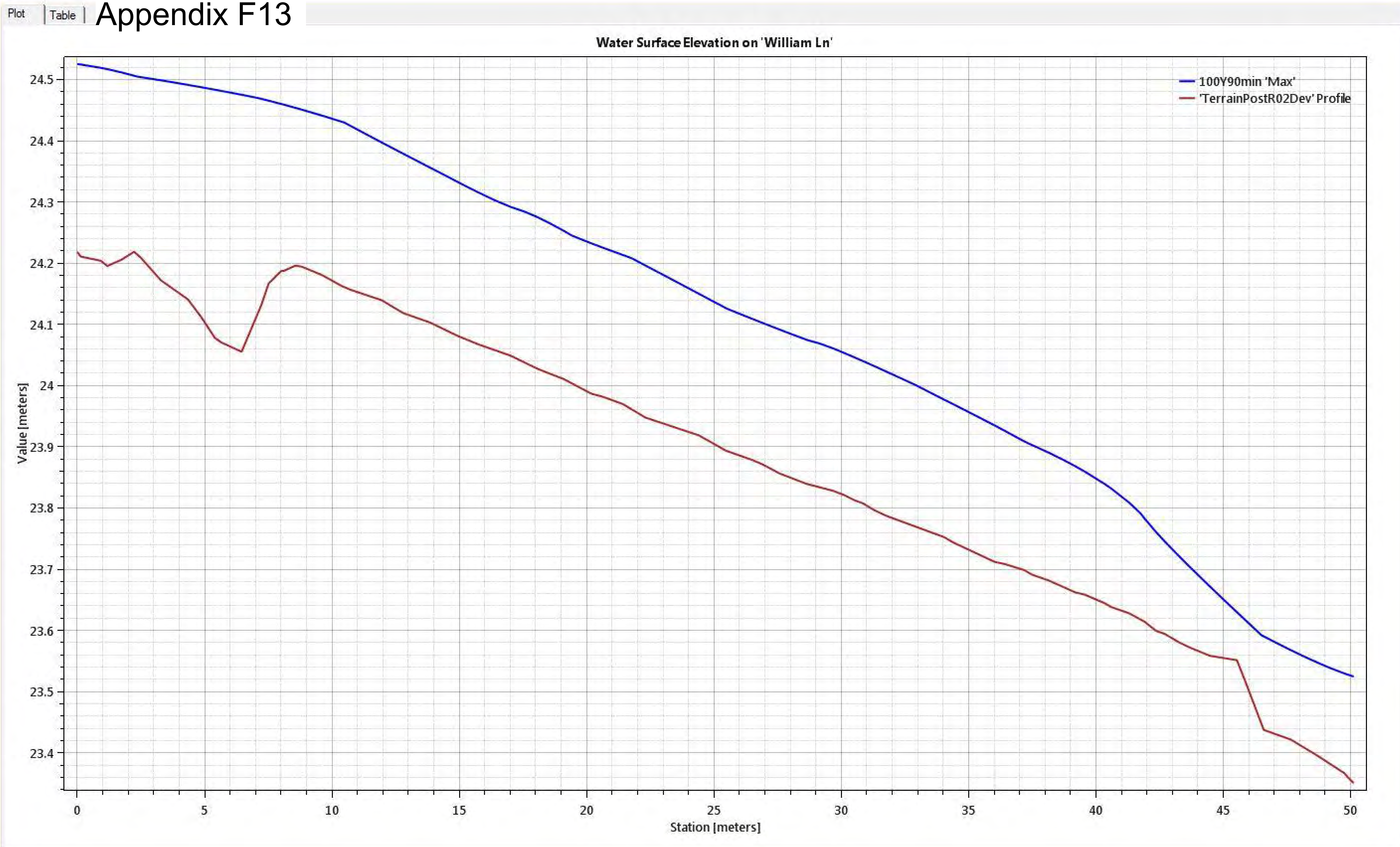
Appendix F11



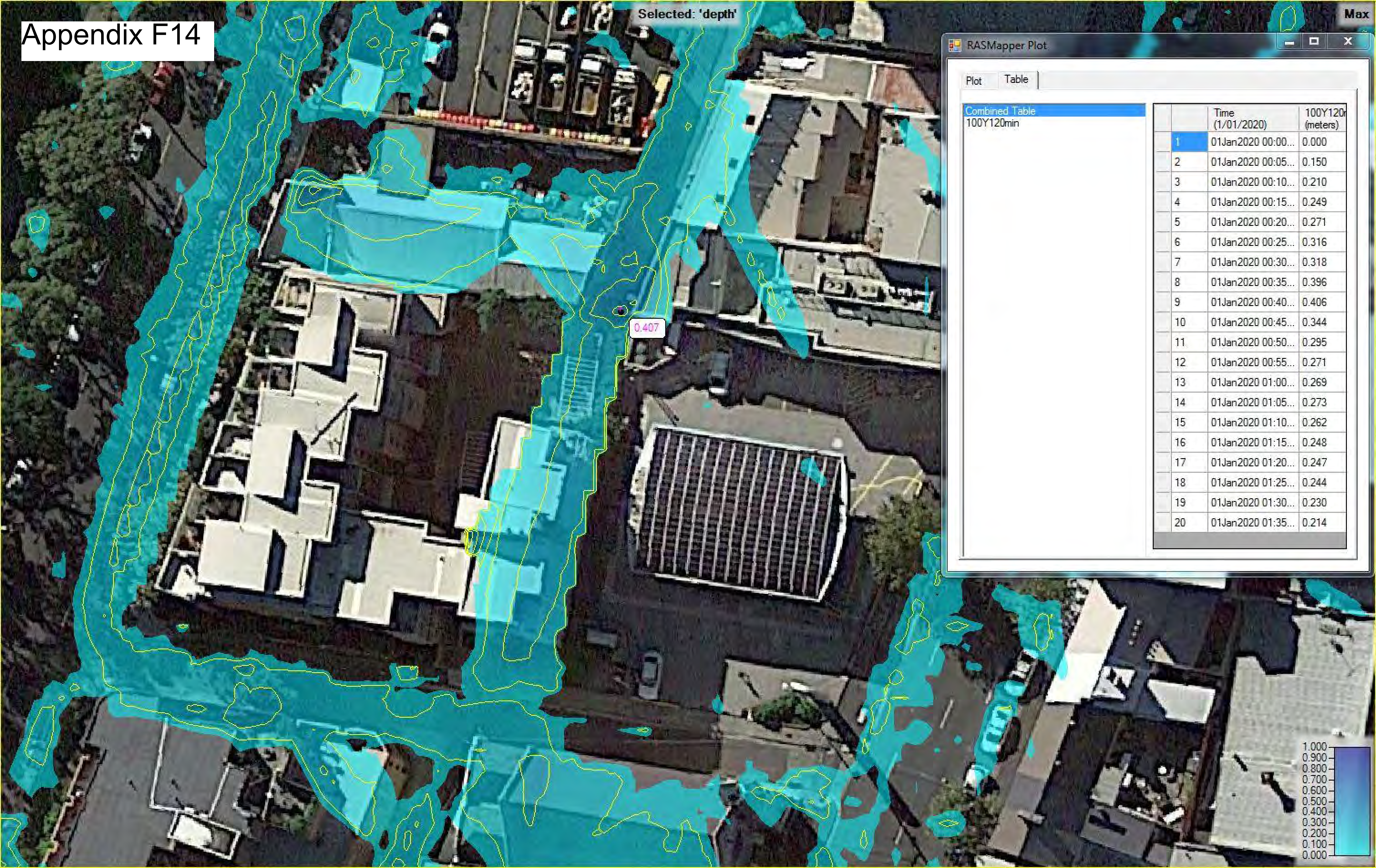
Appendix F12



Appendix F13

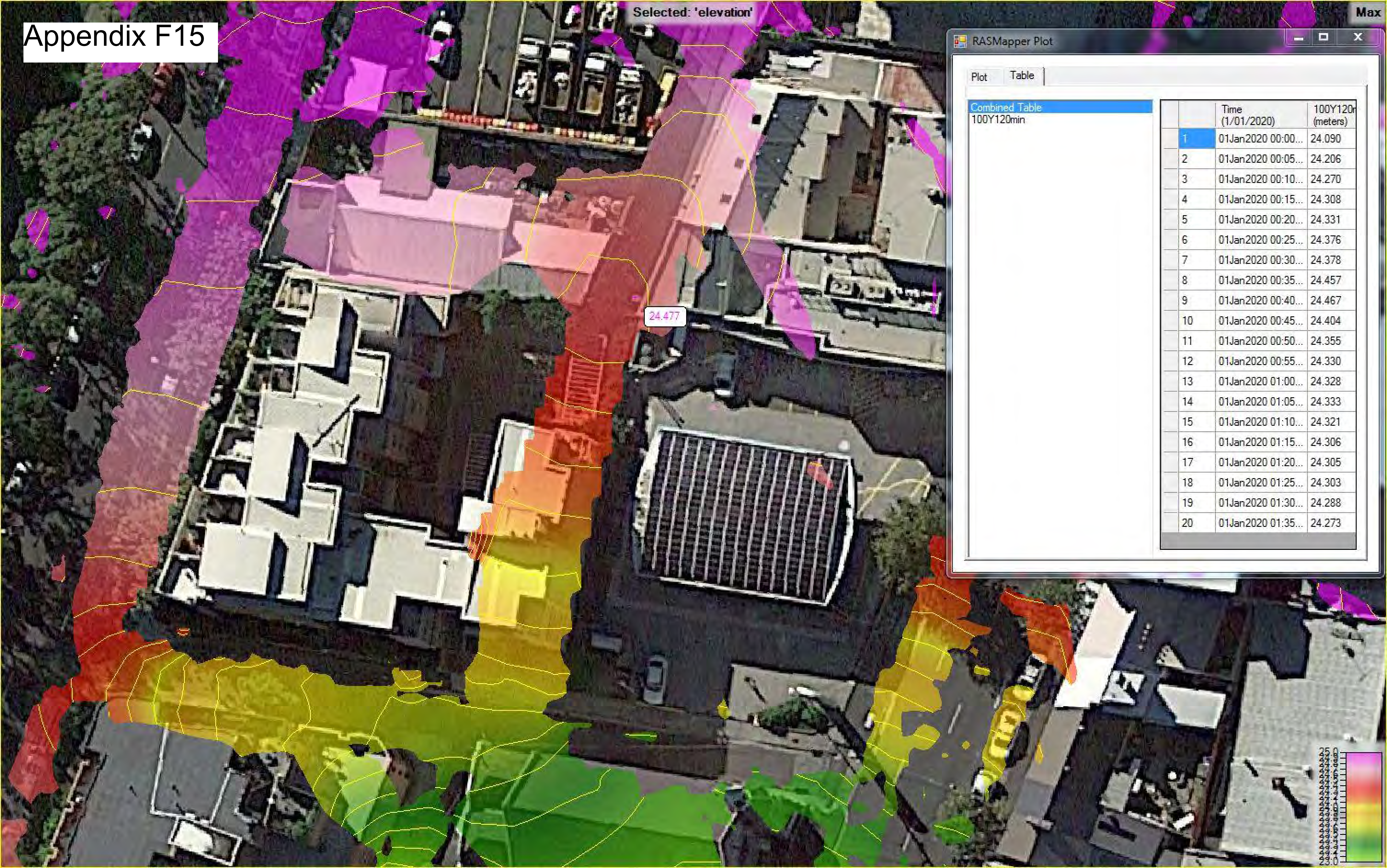


Appendix F14



	Time (1/01/2020)	100Y120r (meters)
1	01Jan2020 00:00...	0.000
2	01Jan2020 00:05...	0.150
3	01Jan2020 00:10...	0.210
4	01Jan2020 00:15...	0.249
5	01Jan2020 00:20...	0.271
6	01Jan2020 00:25...	0.316
7	01Jan2020 00:30...	0.318
8	01Jan2020 00:35...	0.396
9	01Jan2020 00:40...	0.406
10	01Jan2020 00:45...	0.344
11	01Jan2020 00:50...	0.295
12	01Jan2020 00:55...	0.271
13	01Jan2020 01:00...	0.269
14	01Jan2020 01:05...	0.273
15	01Jan2020 01:10...	0.262
16	01Jan2020 01:15...	0.248
17	01Jan2020 01:20...	0.247
18	01Jan2020 01:25...	0.244
19	01Jan2020 01:30...	0.230
20	01Jan2020 01:35...	0.214

Appendix F15



	Time (1/01/2020)	100Y120r (meters)
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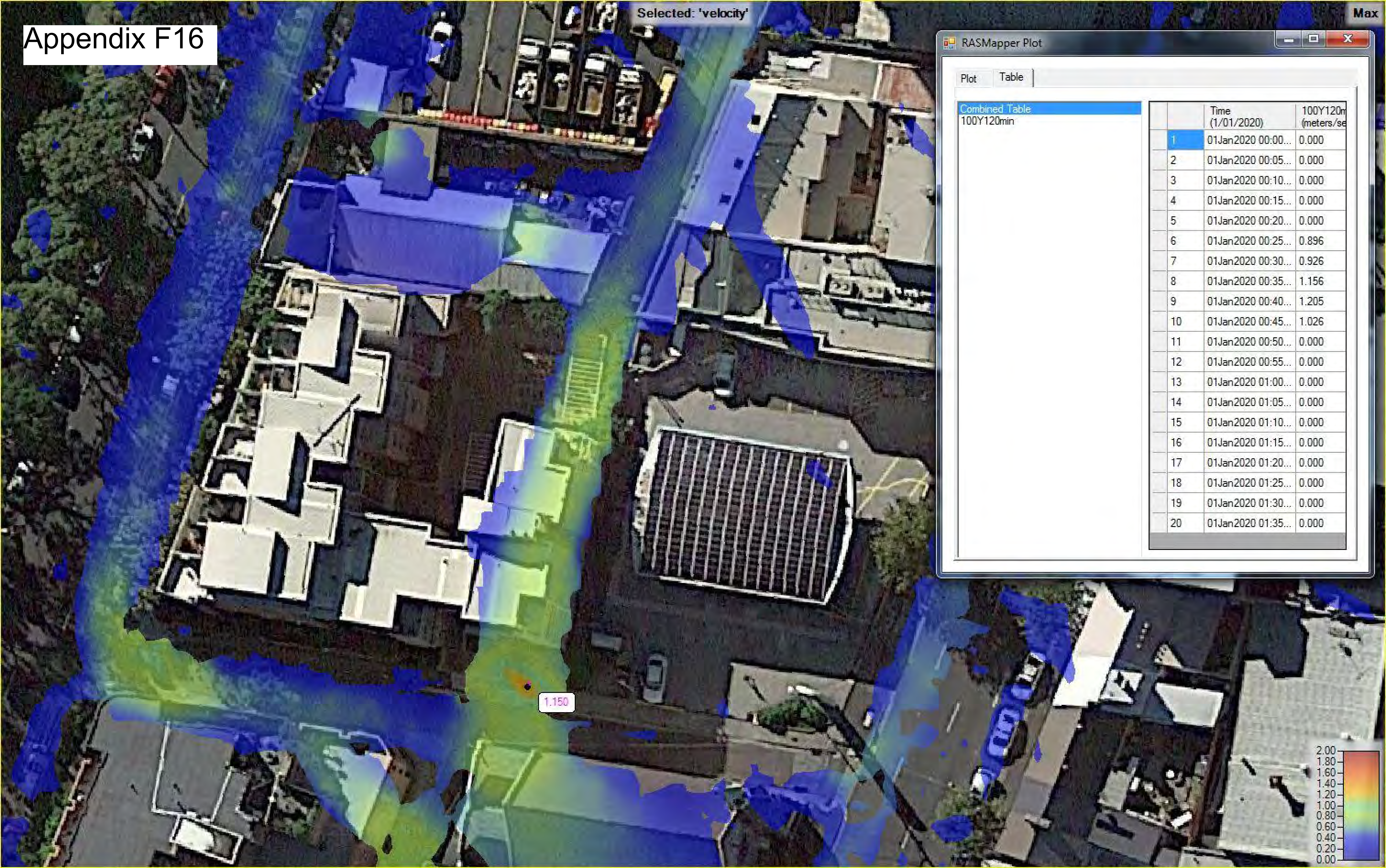
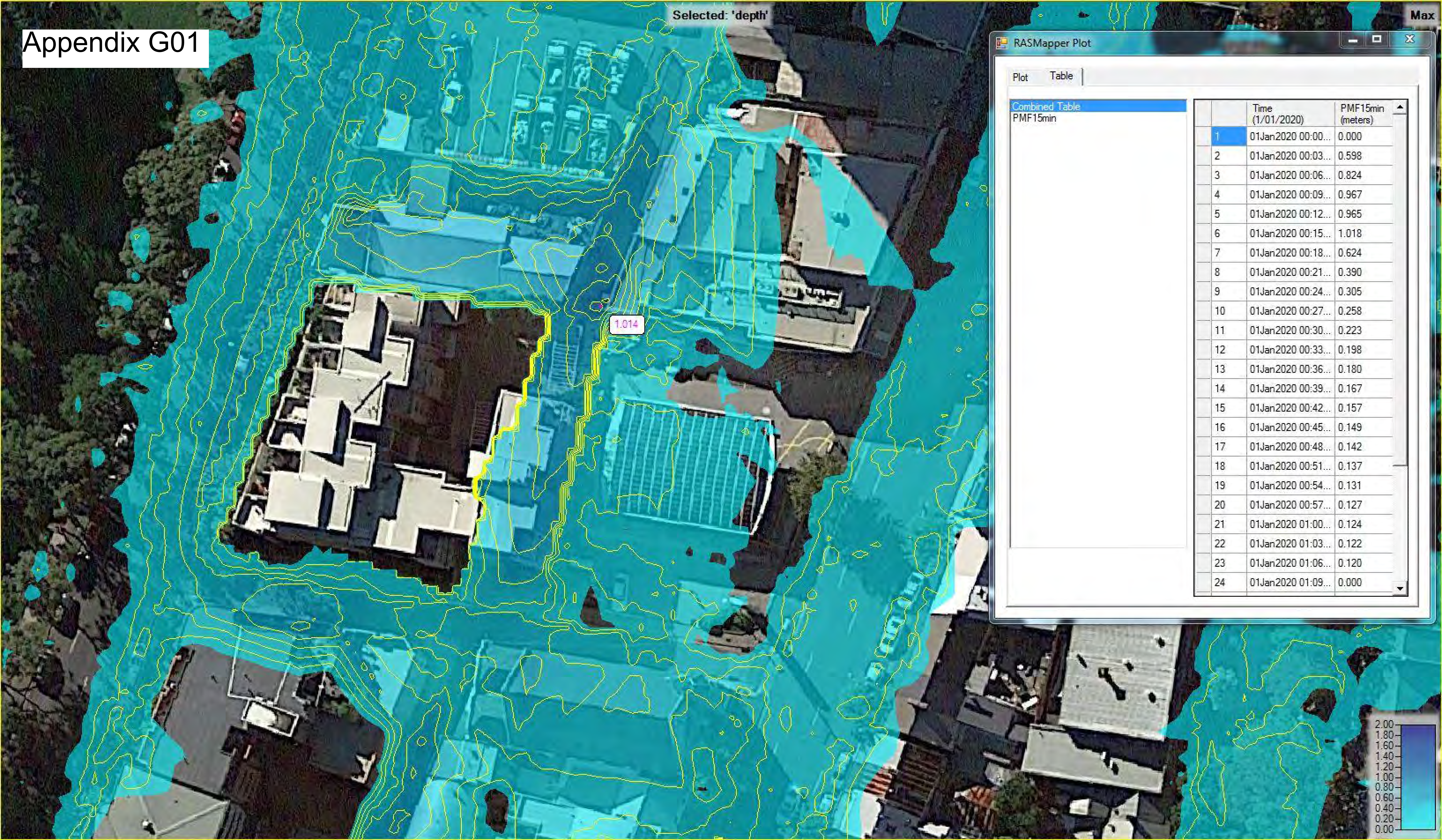
2	01Jan2020 00:05...	24.206
3	01Jan2020 00:10...	24.270
4	01Jan2020 00:15...	24.308
5	01Jan2020 00:20...	24.331
6	01Jan2020 00:25...	24.376
7	01Jan2020 00:30...	24.378
8	01Jan2020 00:35...	24.457
9	01Jan2020 00:40...	24.467
10	01Jan2020 00:45...	24.404
11	01Jan2020 00:50...	24.355
12	01Jan2020 00:55...	24.330
13	01Jan2020 01:00...	24.328
14	01Jan2020 01:05...	24.333
15	01Jan2020 01:10...	24.321
16	01Jan2020 01:15...	24.306
17	01Jan2020 01:20...	24.305
18	01Jan2020 01:25...	24.303
19	01Jan2020 01:30...	24.288
20	01Jan2020 01:35...	24.273

Appendix F16

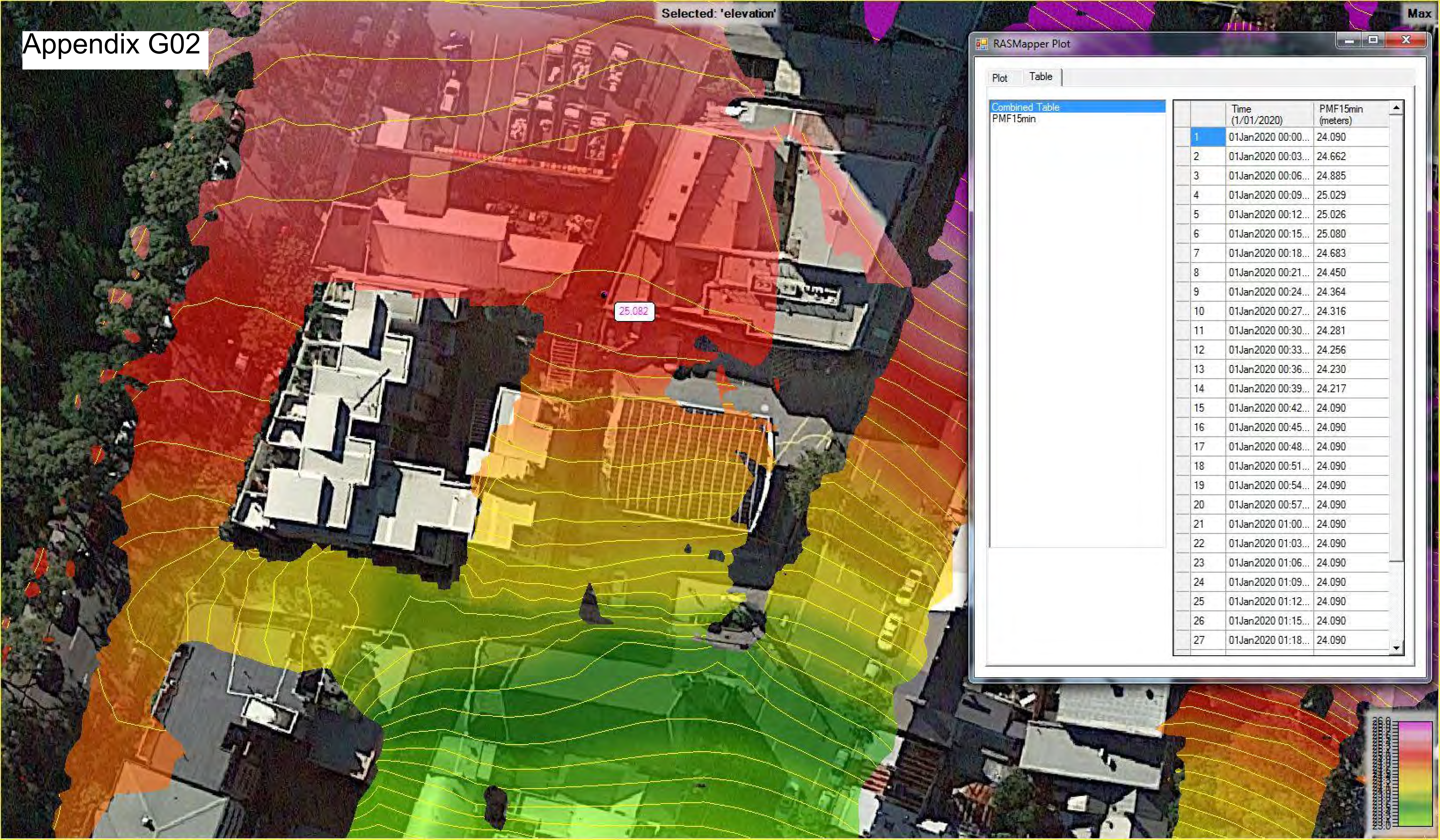


Appendix G01



	Time (1/01/2020)	PMF15min (meters)
1	01Jan2020 00:00...	0.000
2	01Jan2020 00:03...	0.598
3	01Jan2020 00:06...	0.824
4	01Jan2020 00:09...	0.967
5	01Jan2020 00:12...	0.965
6	01Jan2020 00:15...	1.018
7	01Jan2020 00:18...	0.624
8	01Jan2020 00:21...	0.390
9	01Jan2020 00:24...	0.305
10	01Jan2020 00:27...	0.258
11	01Jan2020 00:30...	0.223
12	01Jan2020 00:33...	0.198
13	01Jan2020 00:36...	0.180
14	01Jan2020 00:39...	0.167
15	01Jan2020 00:42...	0.157
16	01Jan2020 00:45...	0.149
17	01Jan2020 00:48...	0.142
18	01Jan2020 00:51...	0.137
19	01Jan2020 00:54...	0.131
20	01Jan2020 00:57...	0.127
21	01Jan2020 01:00...	0.124
22	01Jan2020 01:03...	0.122
23	01Jan2020 01:06...	0.120
24	01Jan2020 01:09...	0.000

Appendix G02



	Time (1/01/2020)	PMF15min (meters)
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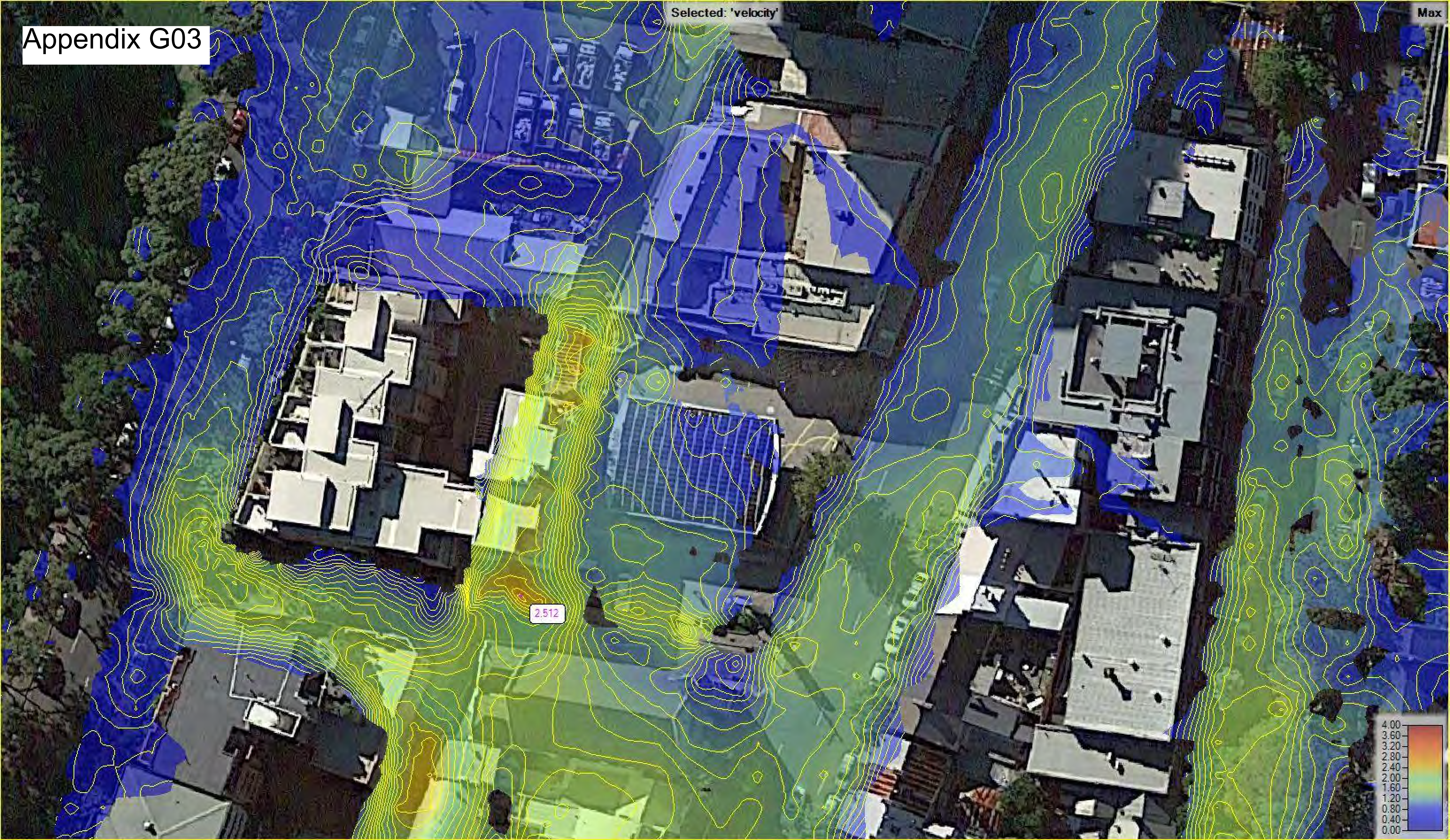
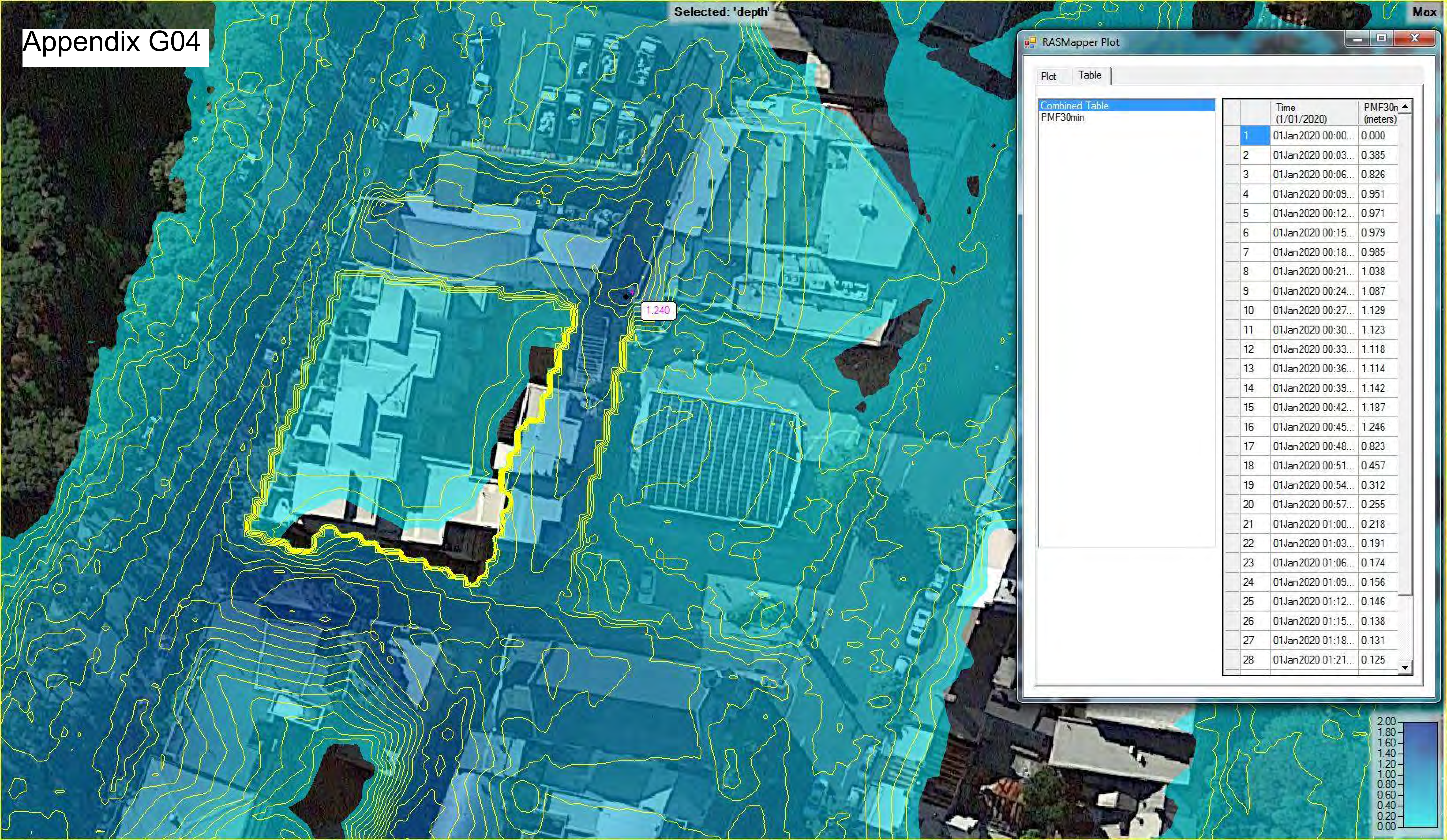
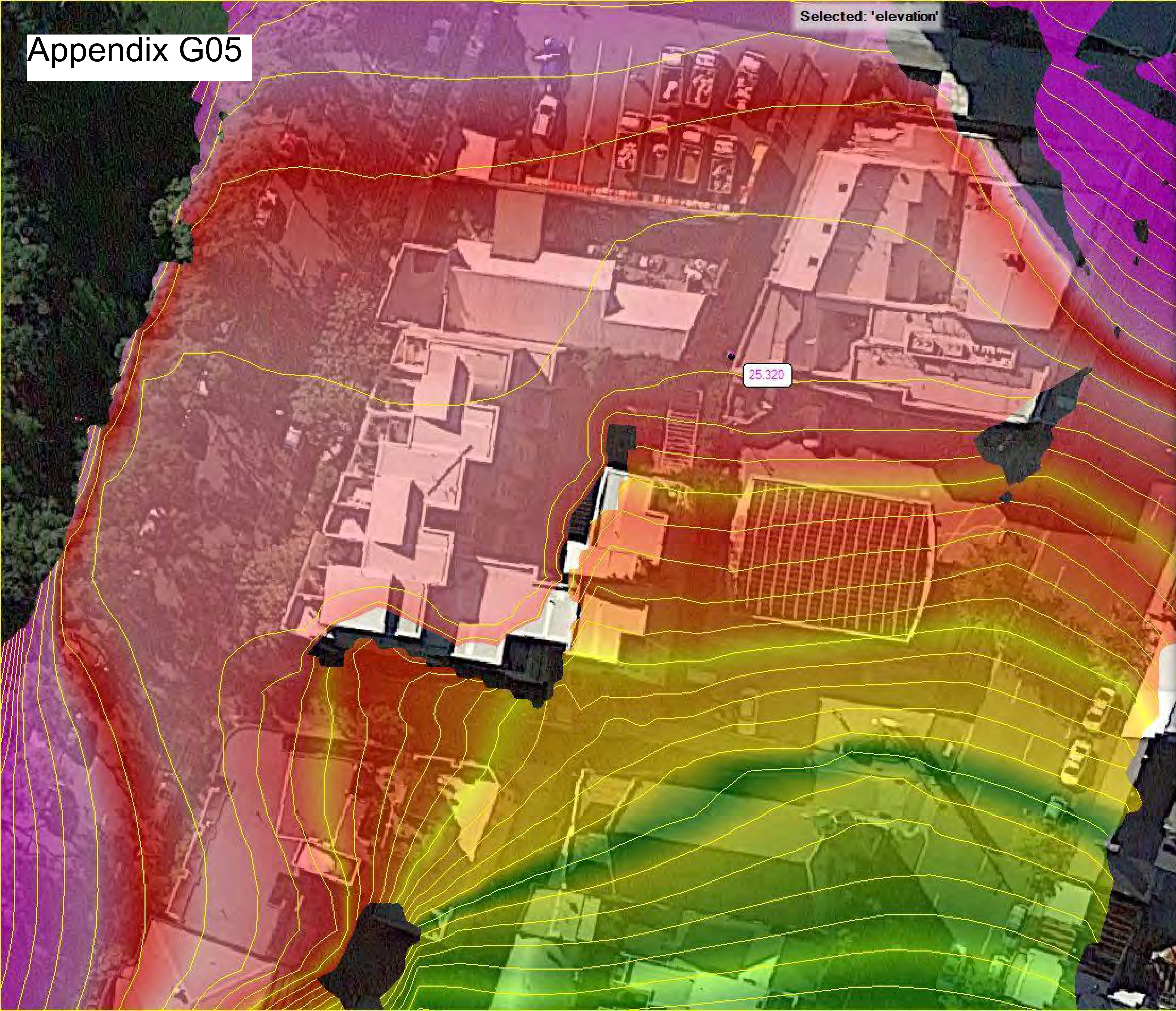
3	01Jan2020 00:06...	24.885
4	01Jan2020 00:09...	25.029
5	01Jan2020 00:12...	25.026
6	01Jan2020 00:15...	25.080
7	01Jan2020 00:18...	24.683
8	01Jan2020 00:21...	24.450
9	01Jan2020 00:24...	24.364
10	01Jan2020 00:27...	24.316
11	01Jan2020 00:30...	24.281
12	01Jan2020 00:33...	24.256
13	01Jan2020 00:36...	24.230
14	01Jan2020 00:39...	24.217
15	01Jan2020 00:42...	24.090
16	01Jan2020 00:45...	24.090
17	01Jan2020 00:48...	24.090
18	01Jan2020 00:51...	24.090
19	01Jan2020 00:54...	24.090
20	01Jan2020 00:57...	24.090
21	01Jan2020 01:00...	24.090
22	01Jan2020 01:03...	24.090
23	01Jan2020 01:06...	24.090
24	01Jan2020 01:09...	24.090
25	01Jan2020 01:12...	24.090
26	01Jan2020 01:15...	24.090
27	01Jan2020 01:18...	24.090

Appendix G03




Appendix G04
Selected: 'depth'
Max
RASMapper Plot
Plot
Table
Combined Table
PMF30min
Time (1/01/2020)
PMF30n (meters)
1 01Jan2020 00:00... 0.000
2 01Jan2020 00:03... 0.385
3 01Jan2020 00:06... 0.826
4 01Jan2020 00:09... 0.951
5 01Jan2020 00:12... 0.971
6 01Jan2020 00:15... 0.979
7 01Jan2020 00:18... 0.985
8 01Jan2020 00:21... 1.038
9 01Jan2020 00:24... 1.087
10 01Jan2020 00:27... 1.129
11 01Jan2020 00:30... 1.123
12 01Jan2020 00:33... 1.118
13 01Jan2020 00:36... 1.114
14 01Jan2020 00:39... 1.142
15 01Jan2020 00:42... 1.187
16 01Jan2020 00:45... 1.246
17 01Jan2020 00:48... 0.823
18 01Jan2020 00:51... 0.457
19 01Jan2020 00:54... 0.312
20 01Jan2020 00:57... 0.255
21 01Jan2020 01:00... 0.218
22 01Jan2020 01:03... 0.191
23 01Jan2020 01:06... 0.174
24 01Jan2020 01:09... 0.156
25 01Jan2020 01:12... 0.146
26 01Jan2020 01:15... 0.138
27 01Jan2020 01:18... 0.131
28 01Jan2020 01:21... 0.125
1.240
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00

Appendix G05



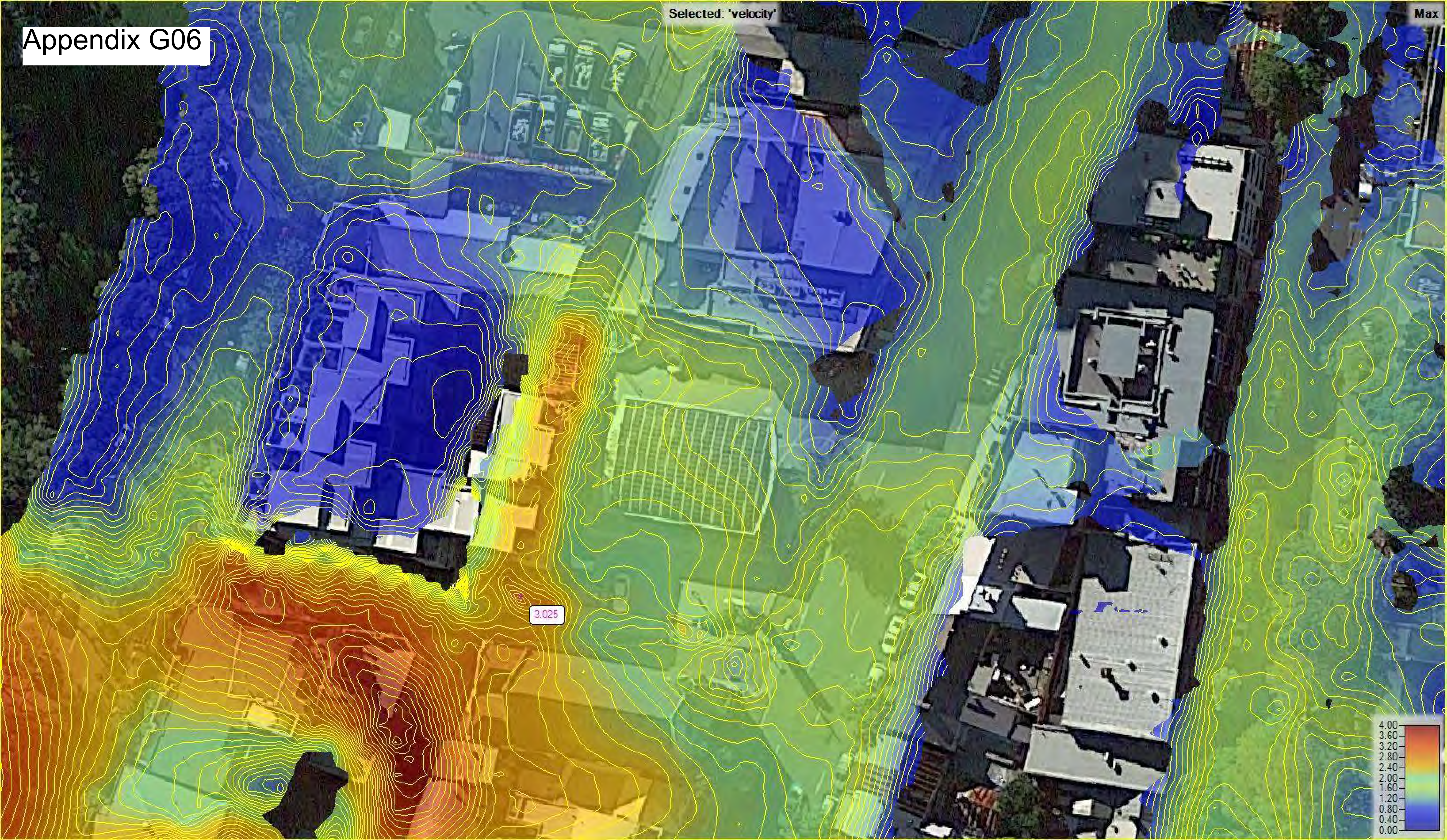
RASMapper Plot

Plot | Table

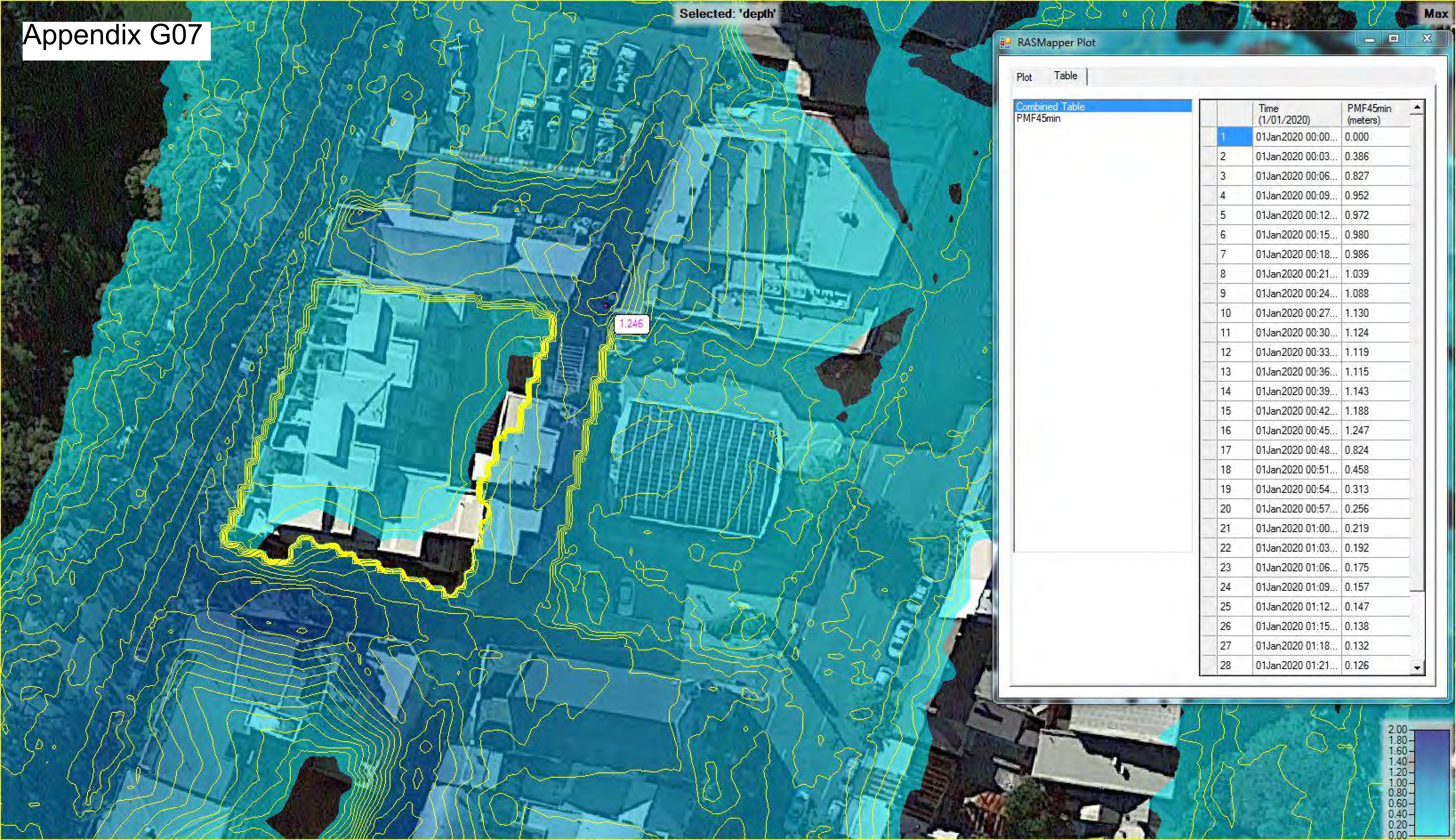
Combined Table
PMF30min

	Time (1/01/2020)	PMF30min (meters)
1	01Jan2020 00:00...	24.088
2	01Jan2020 00:03...	24.457
3	01Jan2020 00:06...	24.895
4	01Jan2020 00:09...	25.021
5	01Jan2020 00:12...	25.041
6	01Jan2020 00:15...	25.048
7	01Jan2020 00:18...	25.054
8	01Jan2020 00:21...	25.108
9	01Jan2020 00:24...	25.157
10	01Jan2020 00:27...	25.200
11	01Jan2020 00:30...	25.194
12	01Jan2020 00:33...	25.189
13	01Jan2020 00:36...	25.184
14	01Jan2020 00:39...	25.213
15	01Jan2020 00:42...	25.258
16	01Jan2020 00:45...	25.317
17	01Jan2020 00:48...	24.891
18	01Jan2020 00:51...	24.525
19	01Jan2020 00:54...	24.379
20	01Jan2020 00:57...	24.322
21	01Jan2020 01:00...	24.285
22	01Jan2020 01:03...	24.259
23	01Jan2020 01:06...	24.241
24	01Jan2020 01:09...	24.218
25	01Jan2020 01:12...	24.208
26	01Jan2020 01:15...	24.088
27	01Jan2020 01:18...	24.088
28	01Jan2020 01:21...	24.088

Appendix G06



Appendix G07



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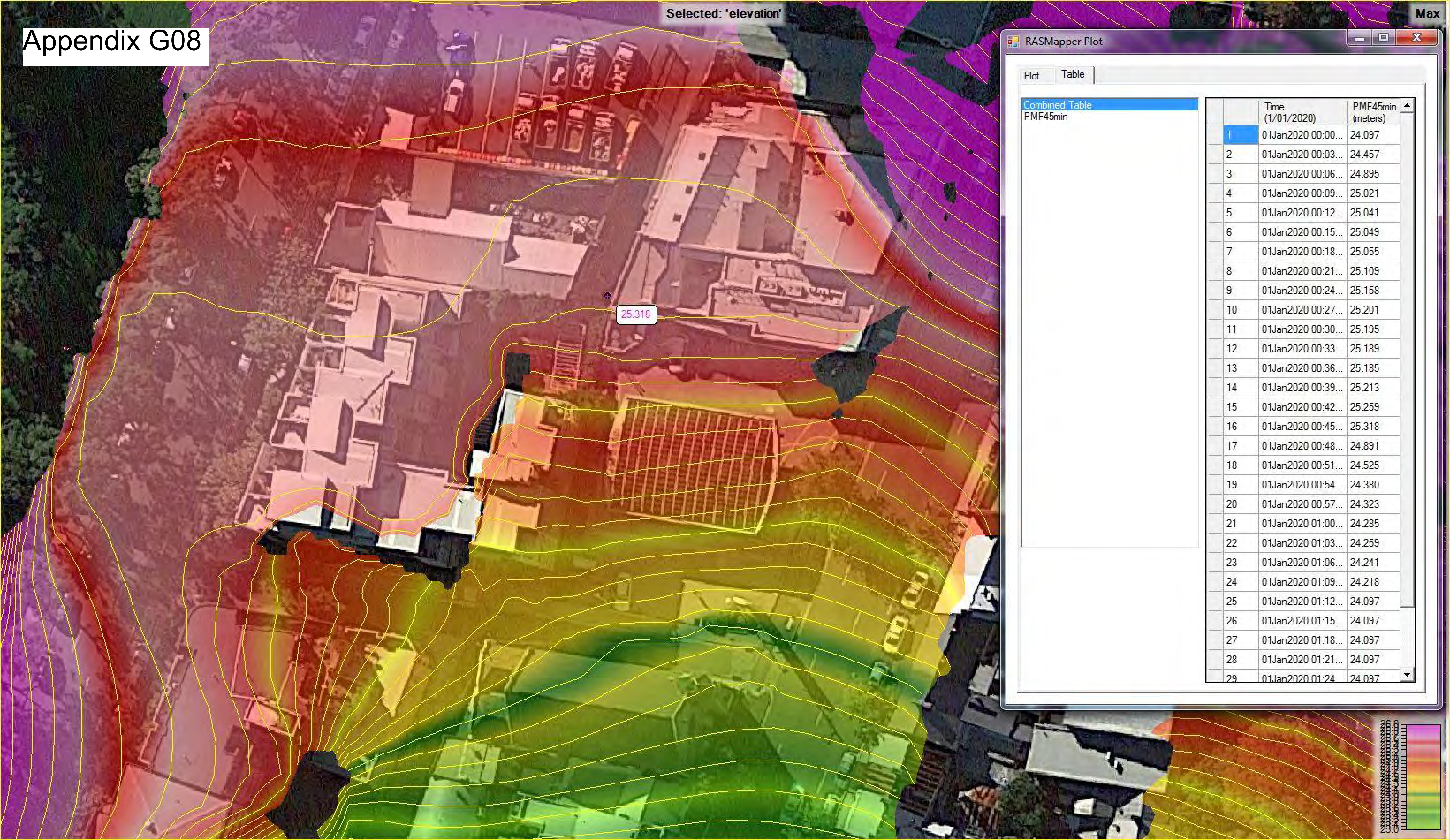
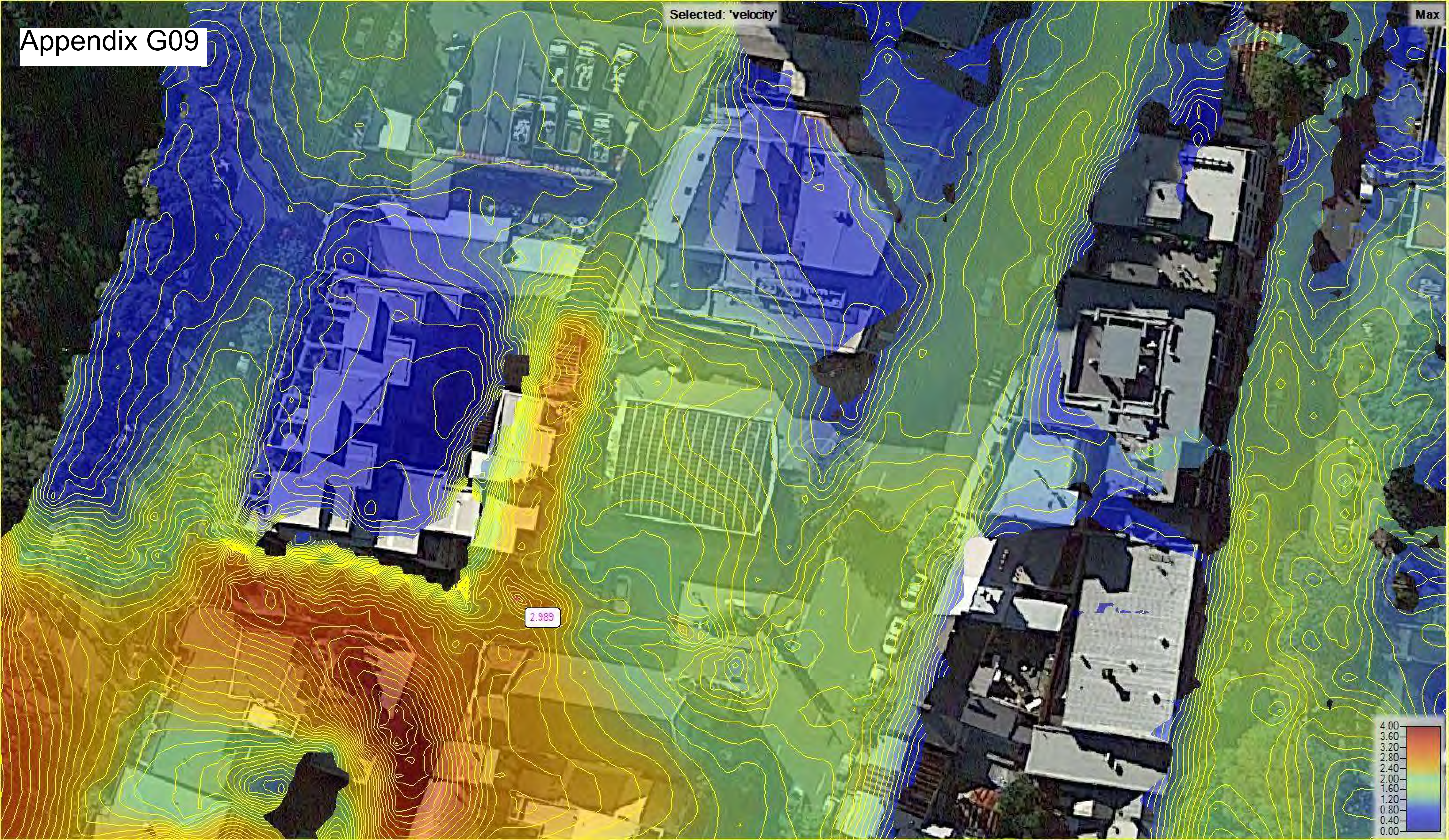
3	01Jan2020 00:06...	0.827
4	01Jan2020 00:09...	0.952
5	01Jan2020 00:12...	0.972
6	01Jan2020 00:15...	0.980
7	01Jan2020 00:18...	0.986
8	01Jan2020 00:21...	1.039
9	01Jan2020 00:24...	1.088
10	01Jan2020 00:27...	1.130
11	01Jan2020 00:30...	1.124
12	01Jan2020 00:33...	1.119
13	01Jan2020 00:36...	1.115
14	01Jan2020 00:39...	1.143
15	01Jan2020 00:42...	1.188
16	01Jan2020 00:45...	1.247
17	01Jan2020 00:48...	0.824
18	01Jan2020 00:51...	0.458
19	01Jan2020 00:54...	0.313
20	01Jan2020 00:57...	0.256
21	01Jan2020 01:00...	0.219
22	01Jan2020 01:03...	0.192
23	01Jan2020 01:06...	0.175
24	01Jan2020 01:09...	0.157
25	01Jan2020 01:12...	0.147
26	01Jan2020 01:15...	0.138
27	01Jan2020 01:18...	0.132
28	01Jan2020 01:21...	0.126

Appendix G08



	Time (1/01/2020)	PMF45min (meters)
1	01Jan2020 00:00...	24.097
2	01Jan2020 00:03...	24.457
3	01Jan2020 00:06...	24.895
4	01Jan2020 00:09...	25.021
5	01Jan2020 00:12...	25.041
6	01Jan2020 00:15...	25.049
7	01Jan2020 00:18...	25.055
8	01Jan2020 00:21...	25.109
9	01Jan2020 00:24...	25.158
10	01Jan2020 00:27...	25.201
11	01Jan2020 00:30...	25.195
12	01Jan2020 00:33...	25.189
13	01Jan2020 00:36...	25.185
14	01Jan2020 00:39...	25.213
15	01Jan2020 00:42...	25.259
16	01Jan2020 00:45...	25.318
17	01Jan2020 00:48...	24.891
18	01Jan2020 00:51...	24.525
19	01Jan2020 00:54...	24.380
20	01Jan2020 00:57...	24.323
21	01Jan2020 01:00...	24.285
22	01Jan2020 01:03...	24.259
23	01Jan2020 01:06...	24.241
24	01Jan2020 01:09...	24.218
25	01Jan2020 01:12...	24.097
26	01Jan2020 01:15...	24.097
27	01Jan2020 01:18...	24.097
28	01Jan2020 01:21...	24.097
29	01Jan2020 01:24...	24.097

Appendix G09



5 Flood Planning Levels

A Flood Planning Level refers to the permissible minimum building floor levels. For below-ground parking or other forms of below-ground development, the Flood Planning Level refers to the minimum level at each access point. Where more than one flood planning level is applicable the higher of the applicable Flood Planning Levels shall prevail.

Development		Type of flooding	Flood Planning Level
Residential	Habitable rooms	Mainstream flooding	1% AEP flood level + 0.5 m
		Local drainage flooding (Refer to Note 2)	1% AEP flood level + 0.5 m or Two times the depth of flow with a minimum of 0.3 m above the surrounding surface if the depth of flow in the 1% AEP flood is less than 0.25 m
		Outside floodplain	0.3 m above surrounding ground
	Non-habitable rooms such as a laundry or garage (excluding below-ground car parks)	Mainstream or local drainage flooding	1% AEP flood level
Industrial or Commercial	Business	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood level
	Schools and child care facilities	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood level + 0.5m
	Residential floors within tourist establishments	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m
	Housing for older people or people with disabilities	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m or a the PMF, whichever is the higher
	On-site sewer management (sewer mining)	Mainstream or local drainage flooding	1% AEP flood level
	Retail Floor Levels	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood. The proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation.
Below-ground garage/ car park	Single property owner with not more than 2 car spaces.	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m

Appendix H02

Development		Type of flooding	Flood Planning Level
	All other below-ground car parks	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m or the PMF (whichever is the higher) See Note 1
	Below-ground car park outside floodplain	Outside floodplain	0.3 m above the surrounding surface
Above ground car park	Enclosed car parks	Mainstream or local drainage flooding	1% AEP flood level
	Open car parks	Mainstream or local drainage	5% AEP flood level
Critical Facilities	Floor level	Mainstream or local drainage flooding	1% AEP flood level + 0.5m or the PMF (whichever is higher)
	Access to and from critical facility within development site	Mainstream or local drainage flooding	1% AEP flood level

Note*s*

1) The below ground garage/car park level applies to all possible ingress points to the car park such as vehicle entrances and exits, ventilation ducts, windows, light wells, lift shaft openings, risers and stairwells.

2) Local drainage flooding occurs where:

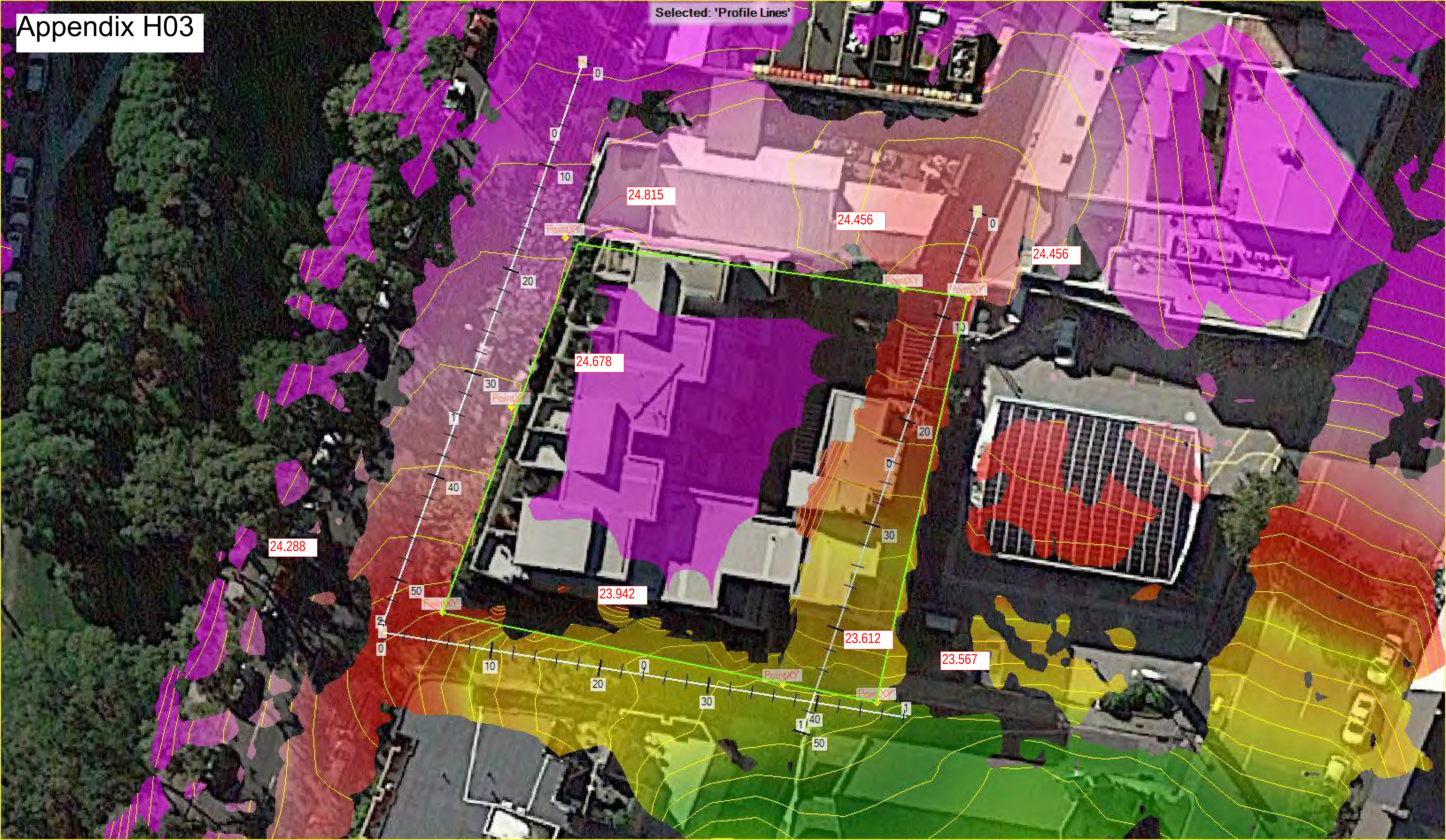
- The maximum cross sectional depth of flooding in the local overland flow path through and upstream of the site is less than 0.25m for the 1% AEP flood; and
- The development is at least 0.5m above the 1% AEP flood level at the nearest downstream trapped low point; and
- The development does not adjoin the nearest upstream trapped low point; and
- Blockage of an upstream trapped low point is unlikely to increase the depth of flow past the property to greater than 0.25m in the 1% AEP flood.

3) Mainstream flooding occurs where the local drainage flooding criteria cannot be satisfied.

4) A property is considered to be outside the floodplain where it is above the mainstream and local drainage flood planning levels including freeboard.

Sydney2030/Green/Global/Connected

Appendix H03



Appendix H04

REVISIONS / AMENDMENTS			
Rev	Date	Description	Verified
P1	02.11.18	PRELIMINARY ISSUE	J.S.
P2	22.11.18	PRELIMINARY ISSUE	J.S.
P3	11.12.18	PRELIMINARY ISSUE	J.S.
P4	19.12.18	PRELIMINARY ISSUE	J.S.

REVISIONS / AMENDMENTS			
Rev	Date	Description	Verified

All dimensions to be verified on site/s prior to commencement of on-site work and/ or off-site prefabrication. Figured dimension to be taken in preference to scaled dimensions. This drawing is copyright and remains the property of JHA Consulting Engineers. Reproduction in whole or part of these drawings without written consent constitutes an infringement of copyright.

CLIENT
WEE HUR

ARCHITECT
ALLEN JACK
COTTIER

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PROJECT
WEE HUR REDFERN STUDENT VILLAGE
13-23 GIBBONS STREET,
REDFERN, NSW 2016

TITLE
STORMWATER SERVICES
FLOOD ASSESSMENT
FLOOD WATER LEVEL CONTOUR
FINISHED GROUND FLOOR
FLOOD PLANNING LEVELS

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN J.S. SCALE @ A1
CHECKED J.S. 1:100
APPROVED J.S.
CREATED 11/18

JOB No.	DRAWING No.	REV
180391	C301	P4

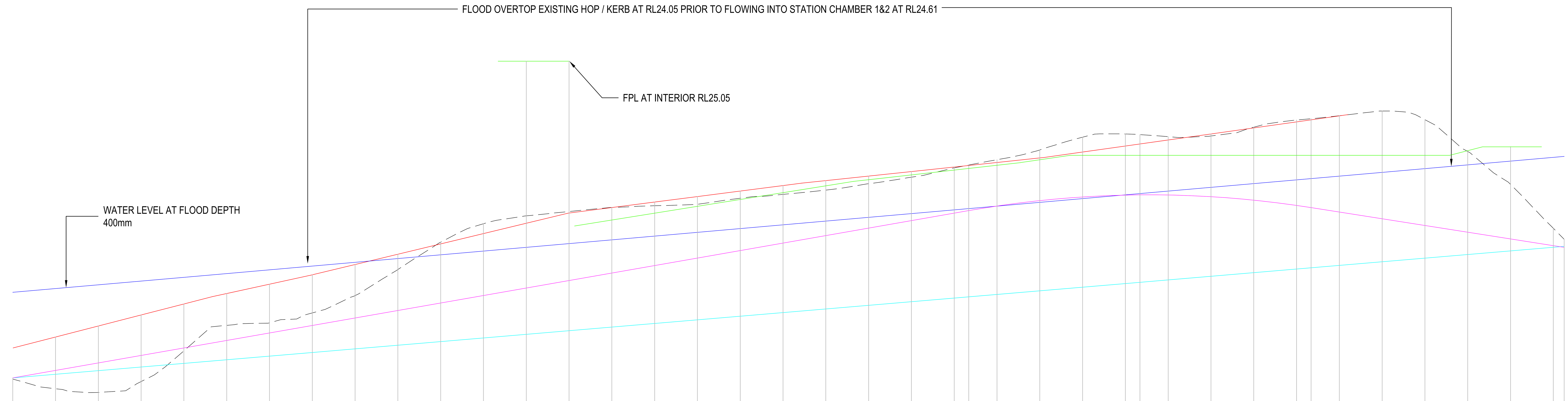
Appendix H05

PROPOSED MINIMUM FLOOD PLANNING LEVELS TO COUNCIL REQUIREMENTS

Item	GroundFloor Rooms / Entry Point	1% AEP Flood Surface Levels (m)	Classification	Freeboard (mm)	Minimum	Proposed FPL	Comment
1	NorthWest Access Door to Corridor	24.75	Outside Floodplain	100	24.85	24.85	Meet requirement above flood level
2	Retail Unit Entrance	24.7	Outside Floodplain	300	25.00	25.00	Commercial Requirement
3	Office, Meeting and WC	24.55	Outside Floodplain	500	25.05	25.05	Residential Requirement
4	Reception	24.55	Outside Floodplain	500	25.05	25.05	Residential Requirement
5	Common and Quiet Area	24.3	Outside Floodplain	500	24.80	24.80	Without slab setdown, adopted RL25.05
6	Lounge	24.05	Local Drainage	500	24.55	24.55	Without slab setdown, adopted RL25.05
7	Games Area	24.4	Outside Floodplain	500	24.90	24.90	Without slab setdown, adopted RL25.05
8	Access to Fire Pumps,MSB,Meter	24.5	Local Drainage	100	24.60	24.65	Meet requirement above flood level
9	Substation 1 North Access	24.4	Local Drainage	100	24.50	24.61	Meet requirement above flood level
10	Substation 1 South Access	24.3	Local Drainage	100	24.40	24.61	Meet requirement above flood level
11	Substation 2 North Access	24.3	Local Drainage	100	24.40	24.61	Meet requirement above flood level
12	Substation 2 South Access	24.2	Local Drainage	100	24.30	24.61	Meet requirement above flood level
13	Corridor to Lift, Stair, Basement	24.4	Outside Floodplain	500	24.90	24.90	Without slab setdown, adopted RL25.05
14	Corridor around Fire Control	24.45	Outside Floodplain	100	24.55	24.70	100mm higher than existing kerb RL24.60
15	Access Corridor to Fire Control	24.2	Local Drainage	100	24.30	24.576	Gradually slope up to RL24.70
16	Access Corridor to Bike Repair	24.15	Local Drainage	100	24.25	24.488	Meet requirement above flood level
17	Double Door Access to Lounge	24	Local Drainage	100	24.10	24.280	Step up to interior floor at RL25.05

NOTE :
The existing kerb is the Kerb/Hob along the eastern boundary with the BP Station which will form one side of the proposed Overland flow channel.
As flood level rises, the flood water in the channel will spread out to a wider terrain prior to overtop into the Substations at RL24.61.
Refer to Appendix L01 & L02 for further information

Appendix H06



HORIZONTAL CURVE DATA

VERTICAL GEOMETRY GRADE: 3.5% (0.000 – 26.339); -3.14% (26.339 – 36.253)

VERTICAL GRADE LENGTH: 26.339m; 9.914m

VERTICAL CURVE LENGTH: 8m VC

VERTICAL CURVE RADIUS: R=120.4

DATUM 22.0

CHAINAGE	HEIGHT DIFF (-up/+dn) LANEWAY V HOP	HEIGHT DIFF (-up/+dn) LANEWAY V CHANNEL	EXISTING HOP LEVEL	FLOOD PLANNING FLOOR LEVEL	DESIGN LEVEL LANEWAY	FLOOD CHANNEL BASE LEVEL	EXISTING LEVEL
0.000		0.000			23.570	23.570	23.564
1.000	-0.156	0.018	23.761		23.605	23.587	23.520
2.000	-0.173	0.036	23.813		23.640	23.604	23.502
3.000	-0.189	0.054	23.864		23.675	23.621	23.553
4.000	-0.205	0.072	23.915		23.710	23.638	23.697
5.000	-0.219	0.090	23.964		23.745	23.655	23.816
6.000	-0.228	0.108	24.008		23.780	23.672	23.827
7.000	-0.237	0.126	24.052		23.815	23.689	23.874
8.000	-0.250	0.144	24.100		23.850	23.706	23.955
9.000	-0.263	0.162	24.148		23.885	23.723	24.076
10.000	-0.276	0.180	24.196		23.920	23.740	24.205
11.000	-0.289	0.198	24.244		23.955	23.757	24.290
12.000	-0.303	0.216	24.293	25.050	23.990	23.773	24.327
13.000	-0.315	0.235	24.340	25.050	24.025	23.790	24.348
14.000	-0.306	0.253	24.366	24.308	24.060	23.807	24.366
15.000	-0.297	0.271	24.392	24.340	24.095	23.824	24.375
16.000	-0.287	0.289	24.417	24.372	24.130	23.841	24.381
17.000	-0.278	0.307	24.443	24.404	24.165	23.858	24.410
18.000	-0.269	0.325	24.469	24.436	24.200	23.875	24.428
19.000	-0.257	0.343	24.492	24.467	24.235	23.892	24.448
20.000	-0.243	0.361	24.513	24.496	24.270	23.909	24.477
21.000	-0.229	0.379	24.534	24.519	24.305	23.926	24.508
22.000	-0.216	0.397	24.556	24.541	24.340	23.943	24.551
22.339	-0.211	0.403	24.563	24.549	24.352	23.949	24.565
23.000	-0.204	0.413	24.577	24.564	24.373	23.960	24.590
24.000	-0.199	0.422	24.598	24.589	24.398	23.977	24.635
25.000	-0.210	0.422	24.625	24.610	24.416	23.994	24.695
26.000	-0.229	0.413	24.654	24.610	24.424	24.011	24.710
26.339	-0.238	0.409	24.663	24.610	24.425	24.017	24.707
27.000	-0.257	0.397	24.682	24.610	24.425	24.028	24.697
28.000	-0.293	0.372	24.710	24.610	24.417	24.045	24.700
29.000	-0.337	0.339	24.738	24.610	24.401	24.062	24.742
30.000	-0.390	0.297	24.766	24.610	24.376	24.079	24.775
30.339	-0.410	0.282	24.776	24.610	24.366	24.084	24.781
31.000	-0.449	0.250	24.794	24.610	24.345	24.096	24.795
32.000		0.201		24.610	24.314	24.113	24.817
33.000		0.153		24.610	24.282	24.130	24.777
34.000		0.104		24.632	24.251	24.146	24.628
35.000		0.056		24.650	24.219	24.163	24.474
36.000		0.008			24.188	24.180	24.269
36.253		-0.005			24.180	24.185	24.217

HORT SCALE 1: 50

VERT SCALE 1 : 10

CTRL LANE EDGE 25 XFALL

2 1 0 2 4 6 8 m

1 : 100-A1 1 : 200-A3

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified
P1	XX.XX.XX	PRELIMINARY ISSUE	X.X.

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified

NORTH

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PROJECT
WEE HUR REDFERN STUDENT VILLAGE
13-23 GIBBONS STREET, REDFERN, NSW 2016

TITLE
STORMWATER SERVICES
FLOOD ASSESSMENT
PROFILE ALONG EASTERN BOUNDARY WITH DESIGN LEVEL EDGE OF PROPOSED LANEWAY

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

DRAWN	X.X.	SCALE @ A1	
CHECKED	J.S.	AS SHOWN	
APPROVED	J.S.		
CREATED	12/18		
JOB No.	180391	DRAWING No. L02	REV P1

Appendix J01

JHA CONSULTING ENGINEERS

Address : **Wee Hur Student Village Redfern, NSW 2016**

OSD TANK SIZING AND MUSIC DATA INPUT

	Development Site Area	Ar =	1365	m^2
	Sydney Water OSD volume requirement	=	24	m^3
1)	**Provide OSD tank plan area**		28	m^2
	Required OSD tank min depth		0.86	m^3
				900 mm provided
	Sydney Water PSD requirement	=	48	l/s

Orifice Calculation

	Top water level	TWL	=	23.9	m		
	Outlet pipe invert level	IL_{outlet}	=	22.962	m		
2)	Diameter of orifice	d	=	150	mm		Plate 350x350
	Diameter of outlet Pipe	d	=	225	mm		
	Center of orifice		=	23.075	m		
	Invert of orifice or tank		=	23	m		
	Head for orifice	H	=	0.825	m		
		C	=	0.6	(Orifice 0.6, Pipe 0.8)		
	$Q = C.A.\sqrt{(2.g.h)}$						
	Capacity of one orifice	Q	=	42.7	l/sec		
	No. of orifices used		=	1	Orifice		
	Total discharge	Q_{tot}	=	42.7	l/sec		
	PSD	Qpsd	=	48	l/sec	***OK !***	

From: Stormwater [mailto:Stormwater@sydneywater.com.au]
Sent: Wednesday, 31 October 2018 9:59 AM
To: Jimmy Soo <Jimmy.Soo@jhaengineers.com.au>
Subject: RE: Wee Hur Student Village Redfern - OSD volume and PSD requirement

Jimmy,

The On Site Detention requirements for the
1,365 square meters site at 13 – 23 Gibbons Street, Redfern, are as follows:

On Site Detention	24 cubic meter
Permissible Site Discharge	48 L/s

Appendix J02

JHA CONSULTING ENGINEERS

Address : **Wee Hur Student Village Redfern, NSW 2016**

OSD TANK SIZING AND MUSIC DATA INPUT

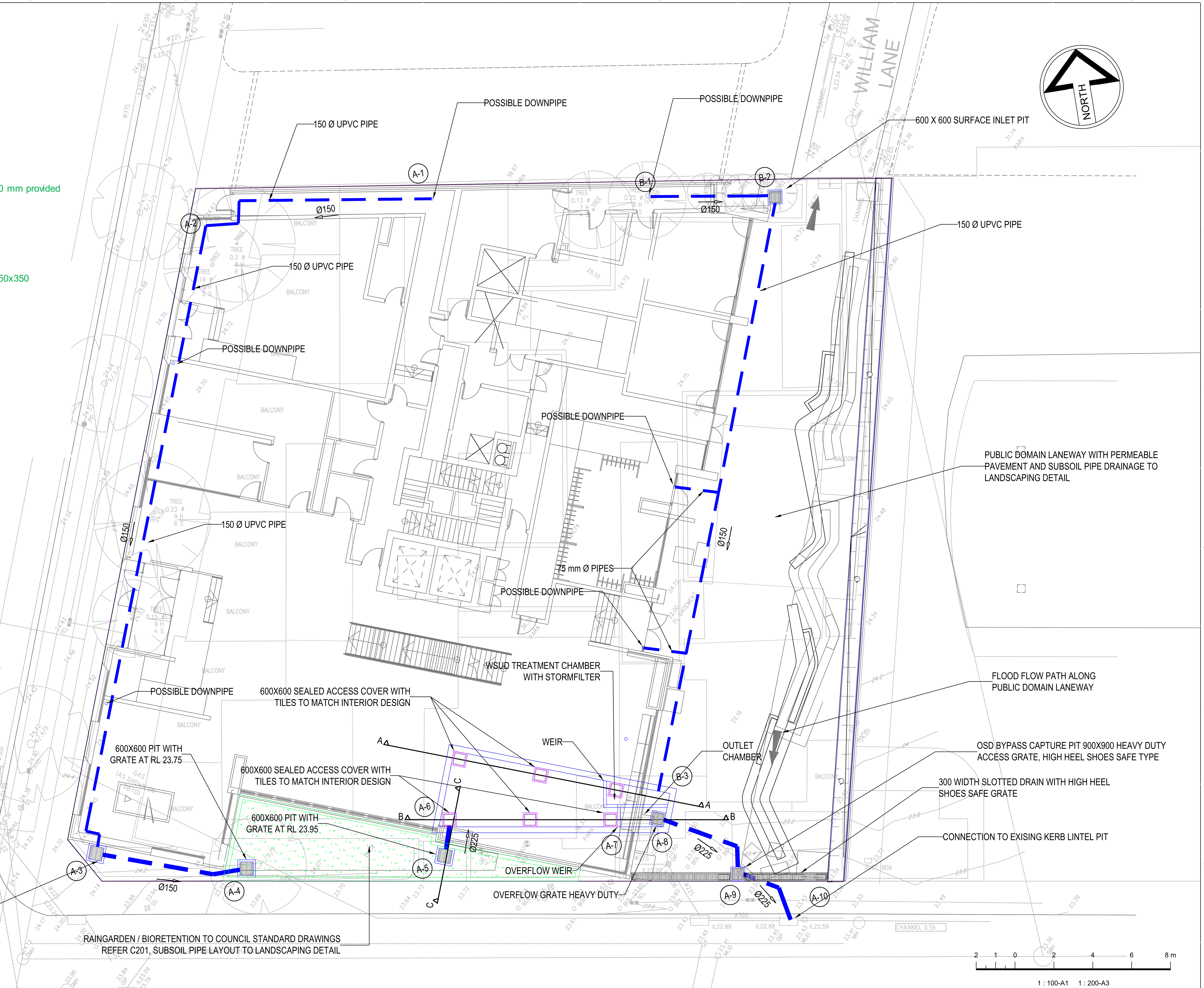
Development Site Area	Ar =	1365	m^2	
Sydney Water OSD volume requirement	=	24	m^3	
1) **Provide OSD tank plan area**		28	m^2	
Required OSD tank min depth		0.86	m^3	900 mm provided
Sydney Water PSD requirement	=	48	l/s	

Orifice Calculation

Top water level	TWL	=	23.9	m	
Outlet pipe invert level	IL_{outlet}	=	22.962	m	
2) Diameter of orifice	d	=	150	mm	Plate 350x350
Diameter of outlet Pipe	d	=	225	mm	
Center of orifice		=	23.075	m	
Invert of orifice or tank		=	23	m	
Head for orifice	H	=	0.825	m	
	C	=	0.6	(Orifice 0.6, Pipe 0.8)	

$Q = C.A.\sqrt{(2.g.h)}$

Capacity of one orifice	Q	=	42.7	l/sec	
No. of orifices used		=	1	Orifice	
Total discharge	Q_{tot}	=	42.7	l/sec	
PSD	Qpsd	=	48	l/sec	***OK !***



REVISIONS / AMENDMENTS

Rev	Date	Description	Verified
P1	02.11.18	PRELIMINARY ISSUE	J.S.
P2	22.11.18	PRELIMINARY ISSUE	J.S.
P3	11.12.18	PRELIMINARY ISSUE	J.S.
P4	19.12.18	PRELIMINARY ISSUE	J.S.

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified

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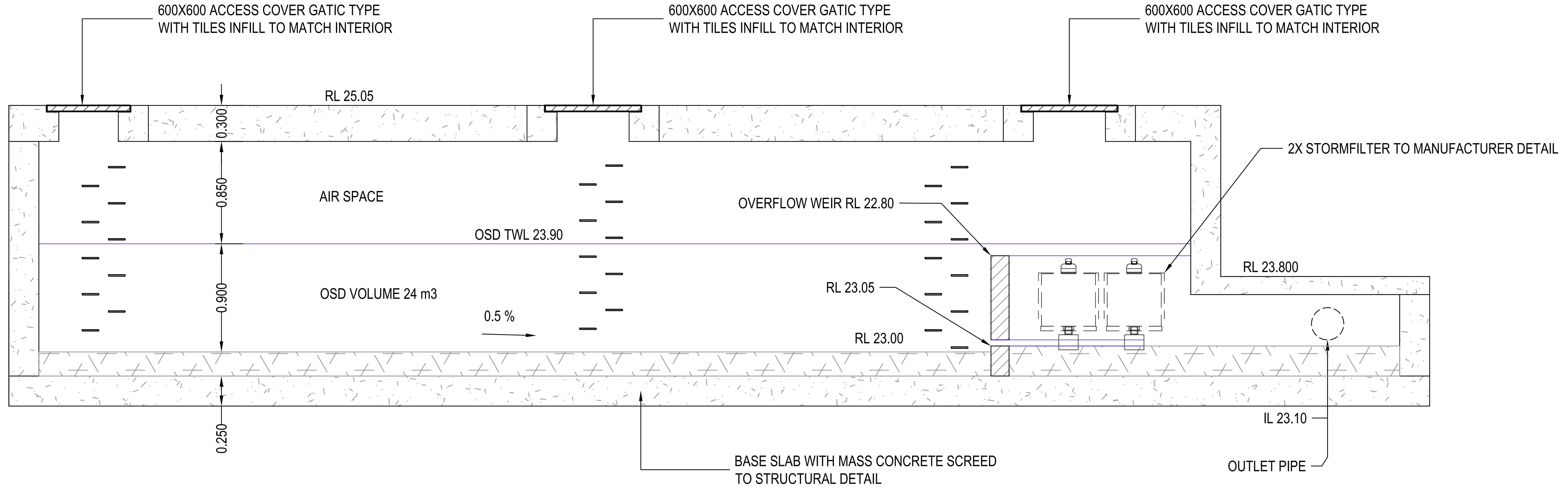
PROJECT
WEE HUR REDFERN STUDENT VILLAGE
13-23 GIBBONS STREET, REDFERN, NSW 2016

TITLE
STORMWATER SERVICES
GROUND LEVEL
STORMWATER LAYOUT PLAN
OSD CALCULATION

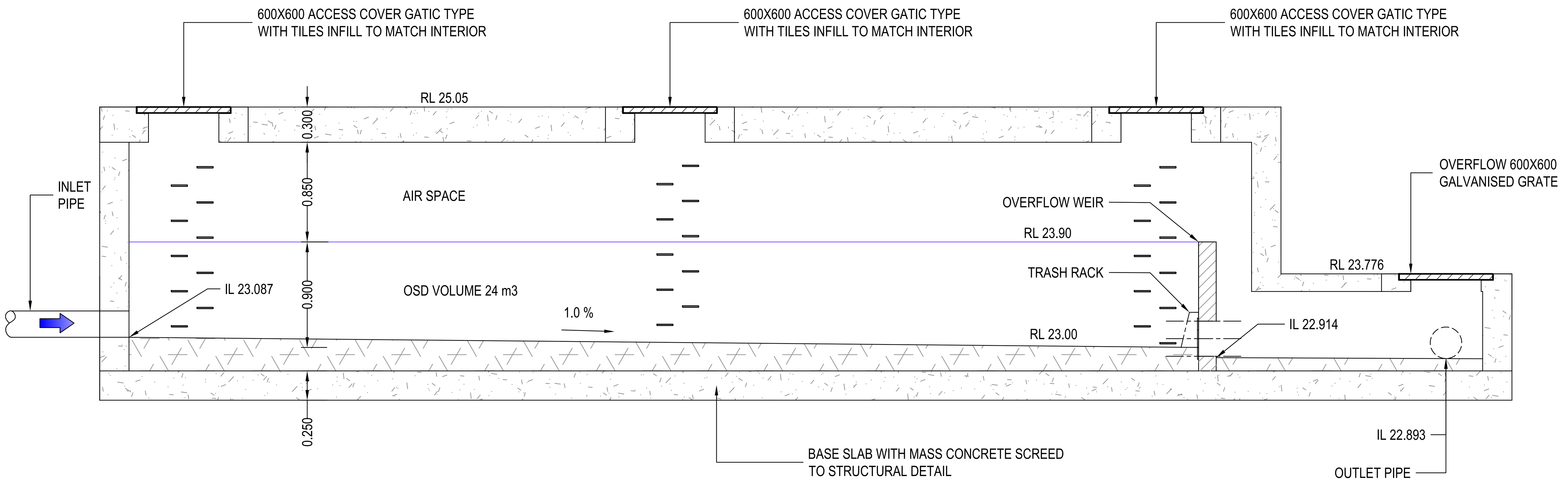
PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN	J.S.	SCALE @ A1	
CHECKED	J.S.	1:100	
APPROVED	J.S.		
CREATED	11/18		
JOB No.	DRAWING No.	REV	
180391	C101	P4	

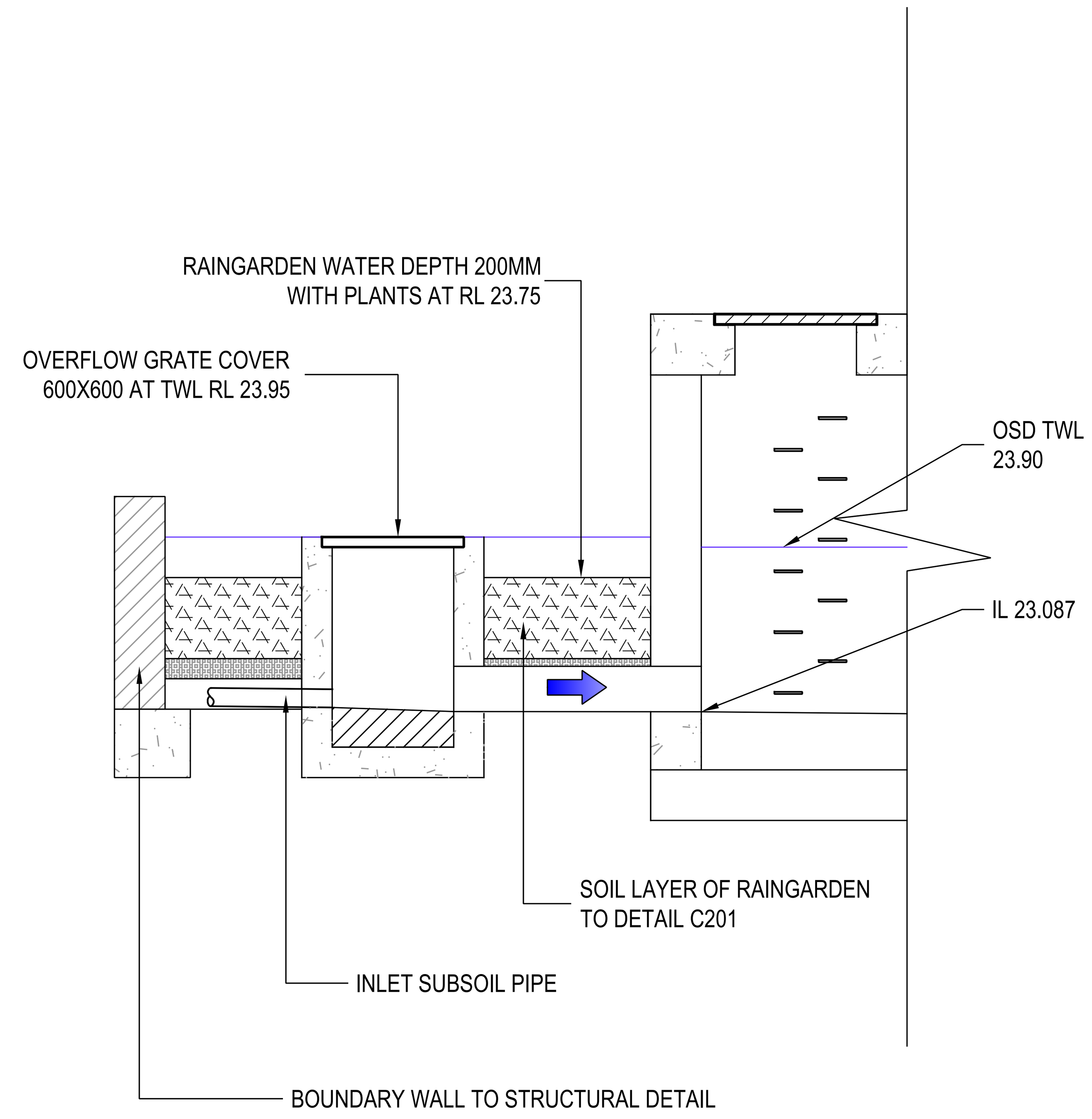
Appendix J03



OSD TANK SECTION A-A



OSD TANK SECTION B-B



RAINGARDEN SECTION C-C

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified
P1	02.11.18	PRELIMINARY ISSUE	J.S.
P2	22.11.18	PRELIMINARY ISSUE	J.S.
P3	11.12.18	PRELIMINARY ISSUE	J.S.
P4	19.12.18	PRELIMINARY ISSUE	J.S.

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified

NORTH

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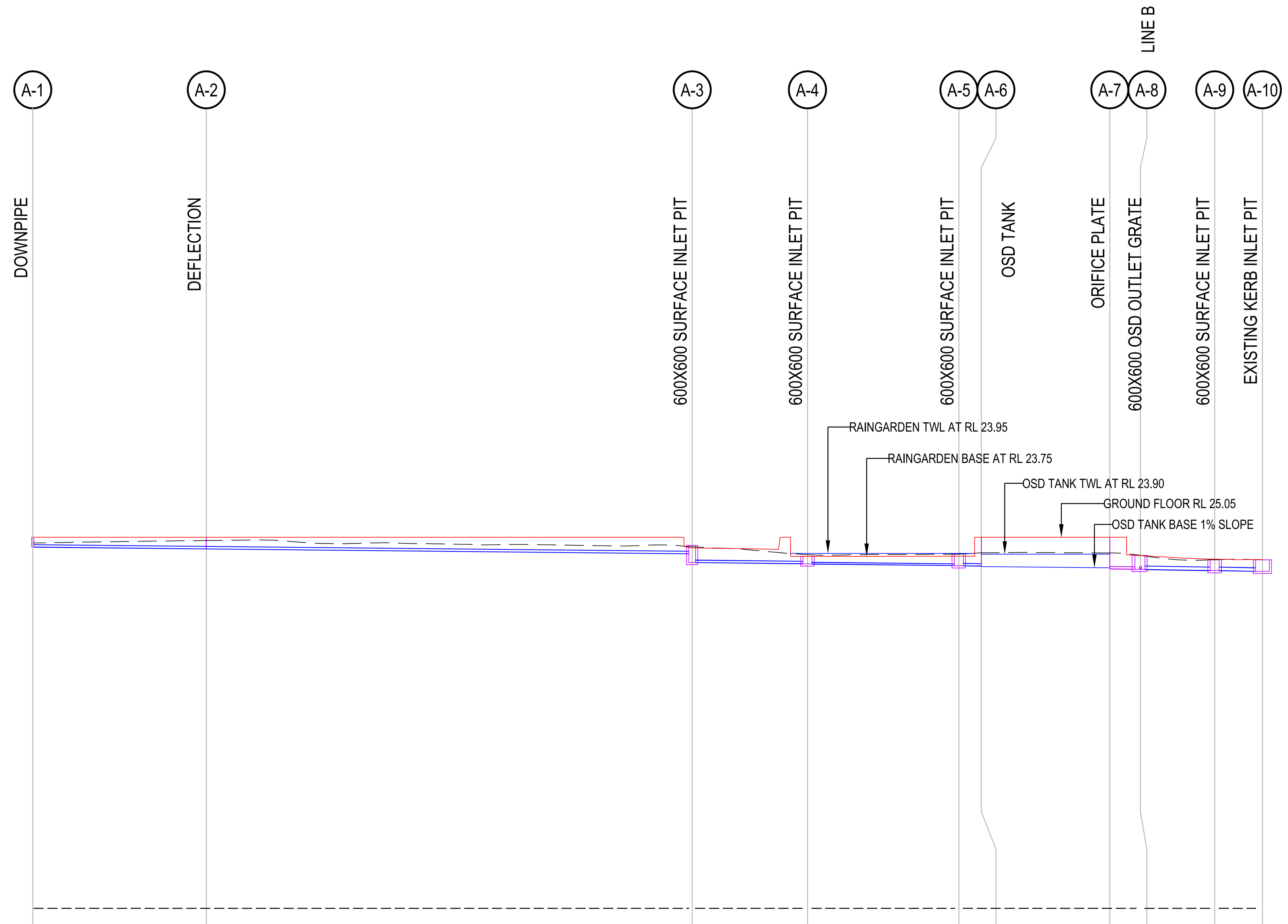
PROJECT
WEE HUR REDFERN STUDENT VILLAGE
13-23 GIBBONS STREET,
REDFERN, NSW 2016

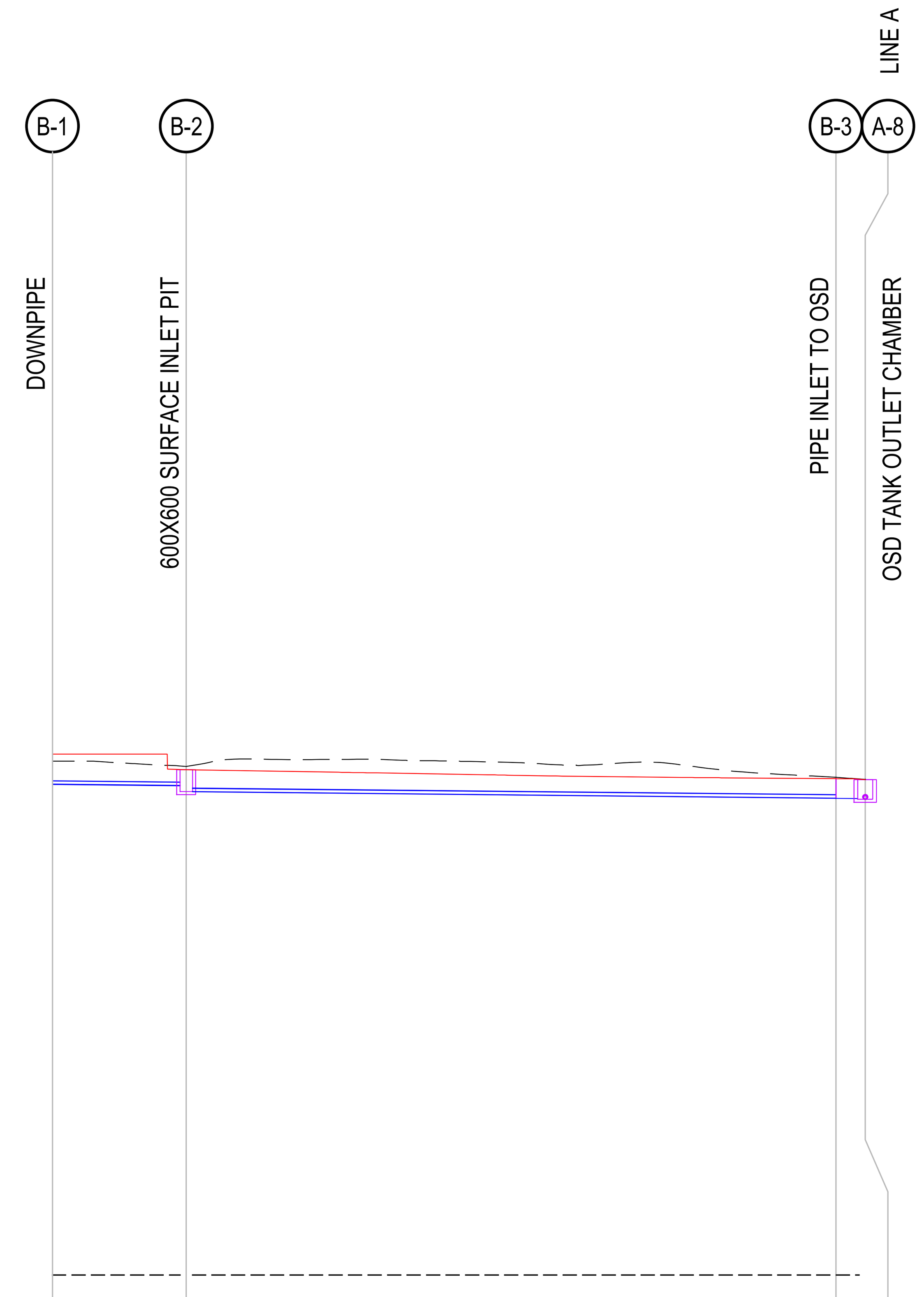
TITLE
STORMWATER SERVICES
GROUND LEVEL
OSD TANK / RAINGARDEN
LONGITUDINAL SECTION,
AND CROSS SECTION

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN	J.S.	SCALE @ A1
CHECKED	J.S.	1:25
APPROVED	J.S.	
CREATED	11/18	
JOB No.	DRAWING No.	REV
180391	C103	P4

Appendix J04





DATUM (m) -21.00

	A-1 – A-2	A-2 – A-3	A-3 – A-4	A-4 – A-5	A-5 – A-6	A-6 – A-7	A-7 – A-8	A-8 – A-9	A-9 – A-10
PIPE CLASS	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC
PIPE SIZE (mm)	150	150	150	100	150	150	150	225	225
PIPE COVER MIN (m)	0.50	0.25	0.74	0.48	0.46	1.80	0.77	0.54	0.51
PIPE GRADE (%)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.50
FULL PIPE VELOCITY (m/s)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEAK FLOW (L/s)	0	0	0	0	0	0	0	0	0

	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
DESIGN SURFACE LEVEL	25.050	25.050	24.500	24.163	23.741	25.050	25.050	23.820	23.563	23.525
HYDRAULIC GRADE LINE	0.000	0.000 / 0.000	0.000 / 0.000	0.000 / 0.000	0.000 / 0.000 / 0.000	0.000	0.000 / 0.000 / 0.000	0.000	0.000 / 0.000	0.000 / 0.000
INVERT LEVEL	24.385	24.268 / 24.268	23.940 / 23.342	23.264 / 23.244	23.142 / 23.122 / 23.107	23.087	23.000 / 22.914 / 22.893	22.873	22.798 / 22.798	22.750 / 22.750
PIPE CHAINAGE	0.000	11.702	44.491	52.268	62.486	63.999	72.671	74.737	79.750	82.968

LINE A

DATUM (m) -21.00

	B-1 – B-2	B-2 – B-3	B-3 – A-8
PIPE CLASS	UPVC	UPVC	UPVC
PIPE SIZE (mm)	150	150	150
PIPE COVER MIN (m)	0.60	0.75	0.76
PIPE GRADE (%)	1.00	1.00	1.00
FULL PIPE VELOCITY (m/s)	0.00	0.00	0.00
PEAK FLOW (L/s)	0	0	0

	B-1	B-2	B-3	A-8
DESIGN SURFACE LEVEL	25.050	24.298	23.866	23.820
HYDRAULIC GRADE LINE	0.000	0.000 / 0.000	0.000 / 0.000 / 0.000	0.000
INVERT LEVEL	23.605	23.541 / 23.246	22.934 / 22.934 / 22.920	22.873
PIPE CHAINAGE	0.000	6.427	37.647	39.056

LINE B

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified
P1	02.11.18	PRELIMINARY ISSUE	J.S.
P2	22.11.18	PRELIMINARY ISSUE	J.S.
P3	11.12.18	PRELIMINARY ISSUE	J.S.
P4	19.12.18	PRELIMINARY ISSUE	J.S.

REVISIONS / AMENDMENTS

Rev	Date	Description	Verified

NORTH

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PROJECT
WEE HUR REDFERN STUDENT VILLAGE
13-23 GIBBONS STREET,
REDFERN, NSW 2016

TITLE
STORMWATER SERVICES
GROUND LEVEL
DRAINAGE NETWORK
PROFILE

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN	J.S.	SCALE @ A1
CHECKED	J.S.	1 : 250
APPROVED	J.S.	
CREATED	11/18	
JOB No.	DRAWING No.	REV
180391	C102	P4

Appendix K01

STORMWATER QUANTITY AND QUALITY TREATMENT SYSTEM MONITORING AND MAINTENANCE SCHEDULE

WEE HUR REDFERN STUDENT VILLAGE

General Notes:

1 - Maintenance is to be carried out with regard to relevant occupational health and safety guidelines and standards. This includes all confined space, traffic management, fall arrest and other requirments.

2 - Initial monitoring and inspections of the stormwater system post commissioning are to be carried out every 3 months for the first year of operation. The amount and type of debris is to be noted and recorded.

3 - The frequency of inspections shown in the stormwater maintenance schedule are the maximum periods. Inspection frequencies may be reduced upon completion of the initial monitoring and inspection program as noted in note 2.

4 - Blank copies of the maintenance schedule are to be made and filled out during each subsequent inspection with the details kept on site for future reference.

Inspected by: …………………………………………………………………………..

Date of Inspection: ………………………………………………………………… Date of Next Inspection: ……………………………………………………...

Item to be Inspected	Frequency	Performed by	Inspected	Maintenance Required	Maintenance Procedure	Maintenance Completed
			Yes/No	Yes/No		Date
General						
Eaves/Box Guttering System and Downpipes	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect and remove any build up of sediment, debris, litter and vegetation within gutter system.	
Stormwater surface inlet and junction pits	Four Monthly/ After Major Storm	Owner / Maintenance Contractor			Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter and vegetation. (e.g. Vacuum) Inspect and ensure grate is clear of sediment, debris, litter and vegetation. Ensure flush placement of grate on refitment.	
General visual inspection of entire stormwater drainage system	Bi-annually	Owner / Maintenance Contractor			Inspect all drainage structures noting any dilapidation, carrry out required repairs.	
Raingarden						
Raingarden area and surrounding areas.	Four Monthly/ After Major Storm	Owner / Maintenance Contractor			Check the area of any rubbish and build up of dirt and silt. Collect and remove rubbish and dirt/silt.	
Plants health and remove weeds	Four Monthly/ After Major Storm	Owner / Maintenance Contractor			During long period of drought, check if the plants are in good health. If necessary provide irrigation or replace dead plants. Remove weeds or other plant species that are not suitable for raingarden.	
Filter media (Biofiltration, transition, drainage layers) clogging and constant ponding	6 Monthly	Owner / Maintenance Contractor			Inspect for surface clogging/ponding in filter media. If clogging or ponding present check subsoil drainge line for blockage and cleanout. If no blockage present in sub-soil driange remove clogged filter media and replace with specified filter media.	
Evidence of surface erosion of raingarden	6 Monthly	Maintenance Contractor			Check for scour of filter media at inlet pit and overflow pit. If scour present rake back filter media and provide scour protection.	
Inlet pit, overflow pit and raingarden walls.	Annually	Owner / Maintenance Contractor			Inspect pit and wall/batter structure to ensure in good condition with no deterioration present. If required provide repairs.	
StormFilters Chamber						
Stormfilter Chamber, drainage pipes and weir	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect base of chamber for sediment and build up of silt. Remove accumulated sediment and debris if present. Ensure no blockage of incoming pipes and weir for structural integrity. Repair if required.	
Stormfilters unit and cartdriges.	Refer Manufactures Manual	Maintenance / Specialised Contractor			Refer to manufacturers operation and maintenance manual.	
On-Site Detention Tank						
Trash Screen	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect trash screen to ensure correct operation. Remove accumulated litter & debris. If device is not functioning properly repair or replace.	
Orifice Plate	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect orifice plate to ensure correct operation. Check orifice diameter size is correct and no damage is present to orifice edge. Check orifice plate is securely fastened to wall with no gaps present between plate and face of wall. If gaps are present fill with sealant or mortar to provide water tight seal.	
Tank wall and tank roof	Annually	Owner / Maintenance Contractor			Check structural integrity of the entire tank including wall, roof and access covers. Any dilapidation including holes or gaps are to be noted and repaired.	
Permeable pavement at Laneway						
Permeable Stoneset pavement	Six Monthly/ After Major Storm	Owner / Council			Check if ponding on the pavement and stormwater could not infiltrate into the sand layer due to clogging. Remove any collected sediment, debris, litter and vegetation. Repair and unclog using vacuum if necessary.	