REPORT

Halcyon Hotels Pty Ltd

The Maltings, Mittagong

Utilities Servicing Assessment
Final Report

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1. EXECUTIVE SUMMARY

This report has been prepared by J. Wyndham Prince to assist with the service coordination of The Maltings development. The initial version of this report was developed in 2019/2020 based upon the initial Development Application and has been revised to suit the current DA Modification. Note that the content of the initial report is still mostly valid and has been verified via an analysis of the existing services. The proposed servicing of the development only includes minor changes to the number of structures being serviced. This report has been updated to show existing and proposed services present within the current design.

The historic Maltings industrial site at Mittagong is proposed to be converted to a hotel complex which caters for a series of functional spaces and uses and includes residential accommodation.

The site is surrounded by a mostly beneficial array of utilities. Within close or reasonably close proximity to the site, service mains for sewer, potable water, electricity, gas, and National Broadband Network (NBN) are present. Telstra landline is also present in the surrounding streets and the site has Telstra and Optus mobile coverage. Satellite services would also be accessible if required.

Sewer and water systems modelling using Wingecarribee Shire Council network information and expected loadings from the Maltings development has confirmed that sewer capacity and water supply is available.

Currently, no major impediments are envisaged to service the site and the servicing could be staged with relative ease. There are some details with utilities presented in this report that will require future follow up after a development consent is obtained.

The general staging approach adopted has been:

Stage	Building Serviced
1	Maltings 1 & 2
2	Maltings 3 & 4, and Maltster's House

To help deliver the development and its vision, utility services can be provided in a manner that:

- connects utility services to buildings and has alignments through the site with the services concealed underground keeping them as inconspicuous as possible; Some items will be visible.
- where a service is above ground the aim will be to hide the services with landscaping and planting or a facade balanced with safety and access needs for a utility authority;
- minimises the need for only essential utility crossings of the Nattai River in order to avoid the risk of utility damage from flooding which can inundate a notable portion of the site.

As this report presents high level information for DA purposes, the future detailed servicing requirements of authorities will be required and then designs prepared once a development consent is obtained.

Servicing approaches and stages can be adjusted but any substantial change in strategy will need confirmation of feasibility before undertaking any utility design. Also, the flood risk to a utility must always be a consideration.

In summary, The Maltings development could be adequately serviced and supply appears to be available after lead-in connections are provided.

2. INTRODUCTION

The centre of the Maltings site is located at Mittagong about 1.1km Northeast of Mittagong rail station on the Southern side of the Main Southern Railway line. The location is shown in Figure 1.

The Maltings was built in 1899 by the Maltings Company. It was then bought by Tooth and Co in 1901 and was operational until 1980 during which time it supplied malt to breweries through NSW. The Maltings is now a locally listed heritage site in the Mittagong Local Environmental Plan (LEP). It is identified as a turn-of-the-century industrial complex connected with the growth and centralisation of the NSW brewing trade.

The old industrial site currently has two main large historic buildings presenting a unique architecture from the late 1800's. Since the 1980's the site has been abandoned and has suffered severe natural degradation to the buildings and site grounds. The historic buildings have also suffered some vandalism and hence are in in a partially degraded condition depending on the building and the interior or exterior. Fortunately, much of the shell of the main buildings are in reasonable condition but the buildings do require substantial work and upgrading for reuse as a hotel facility. Towards the Eastern side of the site, a third very small building called the Maltster's House, is in such poor condition it would be demolished and replaced with a new building integrating with the architectural character of the site. The Nattai River flows through the centre of the site and along the boundary of the South Western portion.

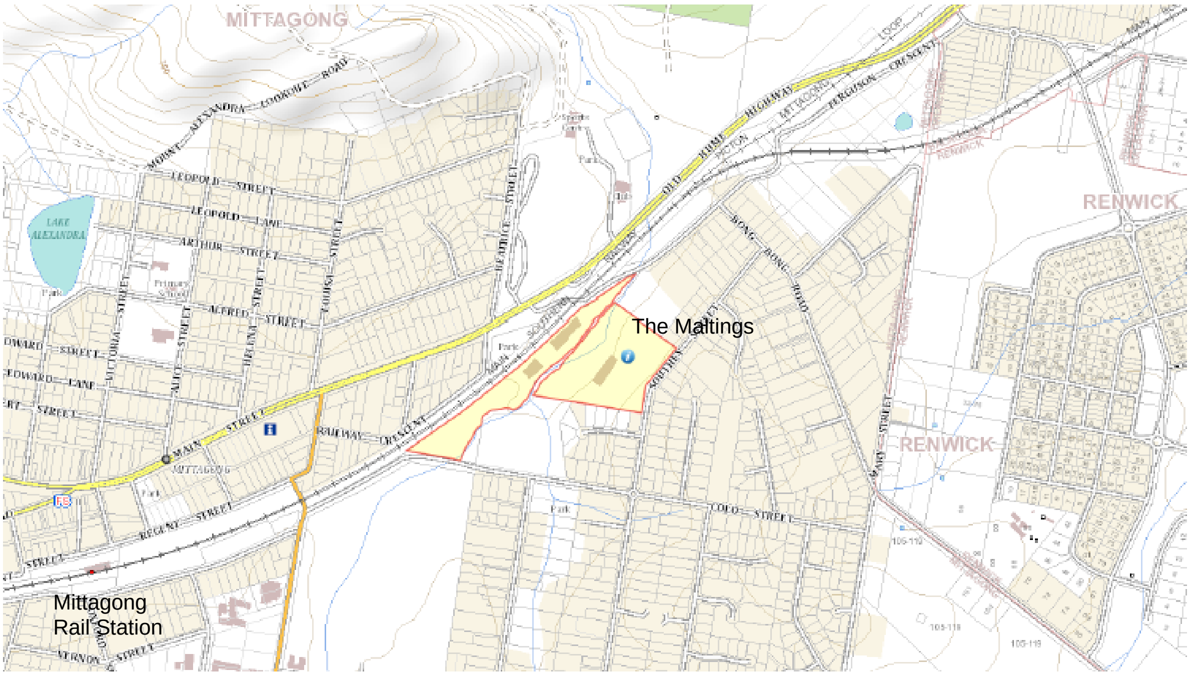


Figure 1 - Site Location

The site outline from Nearmap aerial imagery of 29 Sept 2019 is shown in Figure 2. In this, the two main buildings can be seen along with the smaller Maltster's house. By minimising intervention in the existing ruins, The Maltings development proposal will retain its character and uniqueness and allow it to become an estate of activated ruins. Alongside the existing buildings, new buildings will be embedded within the landscape in order to ensure that the existing historical buildings remain the dominant architectural presence on the site.

As part of the restoration and development of the site for a unique hotel, the development proposal will comprise of:

- Limited refurbishment and adaption of existing buildings
- New hotel accommodation, swimming pool and gymnasium (within or adjoining the existing buildings.
- Potential performance space(s) within and/or adjoining the existing buildings
- Potential private residential development (to be confirmed during planning process).

This report has been revised to support the original approved DA as well as its Modification. The original DA:

- On 13 May 2022, consent was granted by the NSW Land and Environment Court for a staged development application (DA) relating to 2 Colo Street, Mittagong, commonly known as “The Maltings” (the site).
- The approved proposal consists of a development concept for adaptive re-use of the site, in conjunction with a detailed design proposal for alterations and additions to the former malthouses (M1, M2 and M3) and redevelopment of Maltster’s Cottage to accommodate a range of uses in multi-purpose spaces for art, exhibitions, functions, recreation activities and performances, as well as construction of a hotel with ancillary uses (M4). The detailed design proposal encompasses site works, including rehabilitation of the riparian corridor along Nattai River.

The current proposal seeks to amend the existing development consent via two separate but related applications that are prepared concurrently:

- A DA to alter the design of the alterations, additions and adaptive re-use of Maltings M3, and amendment to the façade and interiors of the M4 hotel.
- A section 4.55 modification to alter the design of the alterations, additions and adaptive re-use of Maltings M1, M2, the Southern Sheds, the new Northern Shed as well as the redevelopment of Maltster’s Cottage

To help deliver this development and its vision the site will be required to have utility services provided in a manner that:

a) provides a staged approach;

b) connects utility services to buildings and has alignments through the site with the services concealed underground keeping them as inconspicuous as possible; Some items will be visible.

c) where a service is above ground the aim will be to hide the service with landscaping and planting or a façade balanced with safety and access needs for a utility authority;

d) minimises the need for only essential utility crossings of the Nattai River in order to avoid the risk of utility damage from flooding which can inundate a notable portion of the site.

With consideration of the above this preliminary utility infrastructure report has been prepared by J. Wyndham Prince. The report demonstrates possible and likely ways to service the site via a high-level approach suitable for supporting a concept development application (also referred to as a staged DA). The concept DA seeks approval for initial stages of the redevelopment (including refurbishment of heritage items) and concept approval for future stages (including additional new buildings). Utilities would be detailed following the development concept approval.

This report is based on information supplied from the client particularly architectural plans and usage and area schedules summary, site inspection, Dial Before You Dig details, feasibility assessment advice and understanding of the site constraints. Selected architectural plans and the usage and area schedules are contained in Appendix A.

Figure 2 - The Maltings site

3. UTILITIES

The Maltings site is surrounded by a mostly beneficial array of utilities. Within close or reasonably close proximity to the site, service mains for sewer, potable water, electricity, gas, and National Broadband Network (NBN) are present. Telstra landline is also present in the surrounding streets and the site has Telstra and Optus mobile coverage. Satellite services would also be accessible if required. The site is however, outside of the Sydney Water area and therefore water and sewer services are provided by Wingecarribee Shire Council.

Currently, no major impediments are envisaged to service the site and the servicing could be staged with relative ease. As this report presents high level information for DA purposes, the future detailed servicing requirements of authorities would be required and the designs prepared once a development consent is obtained.

3.1. Sewer

The existing historic buildings do not have existing sewer connection to any present day sewer main. In the era of the Maltings operations there would have been some type of sewer facility which may have discharged into the Nattai River at the northern part of the site - ie downstream end. None of this sewer infrastructure if it still exists is suitable for future use.

On a positive perspective, there is an existing well sized sewer carrier running through the central portion site between Maltings 1 & 2 and Maltings 3. This carrier continues along the edge of the Nattai River on the southern bank to a Council operated sewage pumping station (MT4) on Colo St. This is the sewer carrier the Maltings site would need to discharge into.

The location of the sewer carrier, access pits, and size of the sewer pipes have been superimposed onto the site plan based on Council’s sewer plans. Added to this are the “proposed” sewer connection lines for each of The Maltings buildings. This is displayed in Figure 3.

To assist in understanding and locating the sewer carrier in the central area, and also help avoid clashes with other development needs on site, the carrier alignment is shown in Figure 4 using aerial imagery from the 29 September 2019. Access pits are easily identifiable next to Maltings 3 building.

Aspects to note with the servicing and staging are:

a) The existing sewer carrier through the site significantly increases in capacity from a standard residential size of 150mm dia to 250mm dia at the access pit near the northern end of Maltings 3. Another increase in capacity from 250mm dia to 300mm dia exists from near the site boundary just south of Maltings 4. The 300mm dia size continues through to the pumping station MT4. Based on these sizes and changes the carrier appears to have been designed to allow for notable site inflows and is expected to cater for the proposed development.

b) In the **first stage** of sewer connection, Maltings 1 & 2 sewer would need to gravity drain to a location between the north-eastern end of Maltings 2 and the river. At this location (see Figure 5) a pumping facility would be required to pump sewage over the rising grade to the carrier. To reduce the risk of odour leaks the sewer pumping station would need to be mostly underground and a reasonable distance away from Maltings 2. The pumping station would require submersible pump and 2 storage tanks – one tank for regular use and the other for backup storage in the event of a pump failure. The storage and pumping facility would be kept hidden as much as possible with the use of landscaping and planting. In addition, the electrical controls could be located at the northern (railway) side of the Maltings 2 building to reduce the risk from damage from floods and minimise visual intrusion. The emergency overflow path could be to the Nattai River under an operating licence.

c) A rising main would need to be constructed from the sewage pumping location across the closest existing (vehicular) bridge over the Nattai River then continued over to the access pit below Maltings 4 building as illustrated in Figures 3 & 4. At this access pit the carrier pipe is 250mm dia and should suit the development needs of this site. Whilst it is preferable to not have a sewer crossing on a bridge that can be inundated by floods there is no other practical alternative. The existing structure of the bridge will need to be significantly improved (or replaced) for pipe support and flood protection and the pipe will need to be concealed in a way to retain the bridge architectural character. This sewer rising main bridge crossing will be the only location where a sewer line will not be underground. Figure 6 shows the existing bridge with an old pipe anchored across it, which would be replaced by the new rising main. The bridge further downstream as shown on the site plan would be a pedestrian bridge only and not a suitable structure for the live sewer pipe.

d) As sewer pits are generally unattractive but essential items they should be hidden from direct view by combined landscaping and planting but NOT covered over due to authority access needs. Images of the two most notable sewer pits required to be hidden are shown below in Figures 7 & 8.

e) In the **second stage** of sewer connection, Maltings 3 & 4 buildings could be connected via gravity lines to the same sewer access pit just in front of Maltings 4. The connection is shown in Figures 3 & 4. At the time of constructing this sewer line a stub would need to be included to cater for future Maltings 5 & 6 building's inflow line.

f) As part of stage 2 connection the Maltster's House would have gravity sewer connection to the closest pit where the downstream pipe increases in size to 250mm dia. Note that it is not viable to connect to the next upstream pit as the carrier pipe size in this portion is only 150mm dia which may have little capacity remaining due to upstream requirements.

g) The **third stage** of sewer connection would only be needed for Maltings 5 & 6 buildings. These would be gravity lines connecting to the stub installed in Stage 2.

3.1.1 Sewer Capacity Confirmation

With the above servicing strategy the confirmation of flows, and available carrier and sewage pumping station (SPS) MT4 capacity was undertaken by sewer system modelling using Wingecarribee Shire Council sewer network information and expected loadings from the Maltings development.

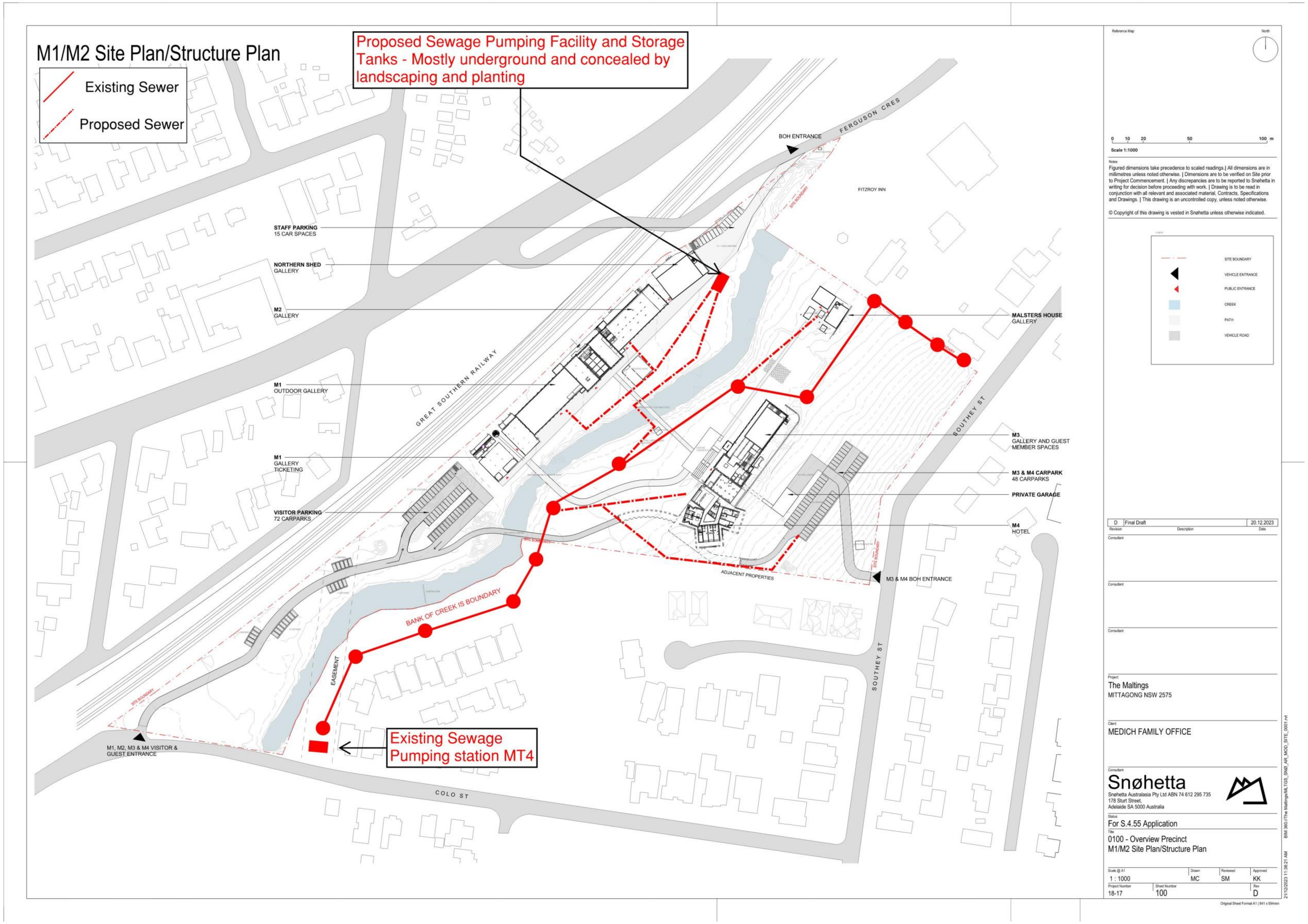
Appendix B contains the April 2020 modelling report prepared by Urban Water Solutions with input by J. Wyndham Prince. The modelling results showed negligible difference in the performance of the receiving sewerage system between the pre and post development levels.

The 250mm receiving sewer has sufficient capacity to convey the flows from the proposed development to pumping station MT4 with no detrimental effects. Pumping station MT4 has enough storage capacity to contain 8hrs of average dry weather flow, post development.

Other Considerations

The Gravity Sewerage Code of Australia v3.1 (Water Services Association of Australia, 2014) Table 5.5 p74 requires a minimum pipe size of DN 225 for commercial and industrial lots >300m². The Maltings development connects into a DN 250 sewer and complies with the code.

It should be noted that as per Appendix B Sewer & Water Modelling Report the WSC requires for all non-residential developments, the connection of the development into a 300mm sewer. This development does not comply with this requirement and would require the upgrade of approximately 65m of 250mm and 61m of 290mm sewer to be compliant. However, as noted above the upgrade is not required from flow requirement and sewerage code perspectives and as such the need for upgrade per Council's request should be contested. The other factor supporting this view is no other additional inflows to the carrier are expected before it becomes 300mm in size.



Sewer Servicing

Figure 3 - Sewer Servicing

Figure 4 - Existing Sewer Carrier alignment and access pits location beside Maltings 3

Figure 5 - Sewage pumping facility and storage tanks proposed location

Figure 6 - Bridge to be used for sewer rising main and watermain crossing of Nattai River

Figure 7 - Sewer pit adjacent to Maltings 3 to be hidden

Figure 8 - Sewer pit adjacent to Maltings 4 to be hidden

3.2. Potable Water

Potable water supply to existing buildings that would have been used in the era of malt production would not be suitable for reuse due to its condition, material type, capacity etc. For example, there is an existing (old) 100mm dia supply line connection to the northern area of the site via the Ferguson Cres road bridge over the rail line but attached to the side of the bridge. This line can be seen on the brick wall adjoining the rail bridge and it is likely this line may no longer be active due to its age. It is also not practical to replace this line with a new line at the same location due to the problems with replacement approval over an active railway and the bridge being an old structure. The location is also unsuitable.

Water supply to the site will need to be via new connection lines from surrounding watermains in streets.

The site is fortunate to have an active large capacity ie 250mm dia watermain running along Ferguson Cres and Bong Bong Rd. This is the primary water supply main for the area and based on the size would have allowed for future development in the general area including The Maltings site. On Southey St the existing supply line is only 100mm dia which would likely need upgrading between the site and Bong Bong Rd to a larger size main (ie 150mm dia). The surrounding watermain locations are shown in Figure 9.

The expected staging and supply rationales could be:

a) For the **first stage** with Maltings 1 & 2 a new underground connection (likely to be 150mm dia) would be provided from the 250mm dia watermain in the northern road verge of Ferguson Cres along the site entrance road to the eastern side of Maltings 1 & 2. The water meter for Maltings 1 & 2 would be positioned near Ferguson Cres.

b) For the **second stage** with supply to Maltings 3 & 4 the easiest option would be to provide a branch connection from Maltings 1 & 2 area across the Nattai River via the central bridge (see Figure 6) then up to Maltings 3 & 4. A much smaller branch of this line would be extended to the Maltster's House. Watermain facility on the bridge over the river needs to be provided along with flood protection. If needed, a separate water meter could be included for Maltings 3 & 4.

c) For the **third stage** Maltings 5 & 6 will be supplied. To assist with water pressure and to have metering independence, the potable water supply would have lead-in from Southey St. At the time of Maltings 5 & 6 development it should be expected that the existing 100mm dia main would be upgraded to a slightly larger size to cater for the increased demand.

The above water supply lines for each Maltings buildings based on the above are shown in Figure 10.

An **alternative** water supply route for Maltings 3 & 4 and Maltster's House could be via connecting to the existing 100mm dia watermain in Southey St. Whilst separate metering could be provided, a constraint with this approach is that the existing 100mm dia watermain may need to be upgraded. This approach would avoid a river crossing which would reduce risk of damage from floods and remove the need to connect a pipe to the bridge.

3.2.1 Water Supply Confirmation

With the above servicing strategy the confirmation of water supply availability was undertaken by water system modelling using Wingecarribee Shire Council potable water network information and expected loadings from the Maltings development.

Appendix B contains the April 2020 modelling report prepared by Urban Water Solutions with input by J. Wyndham Prince. The modelling results showed there is a negligible impact from The Maltings development, on the overall performance of the water supply network.

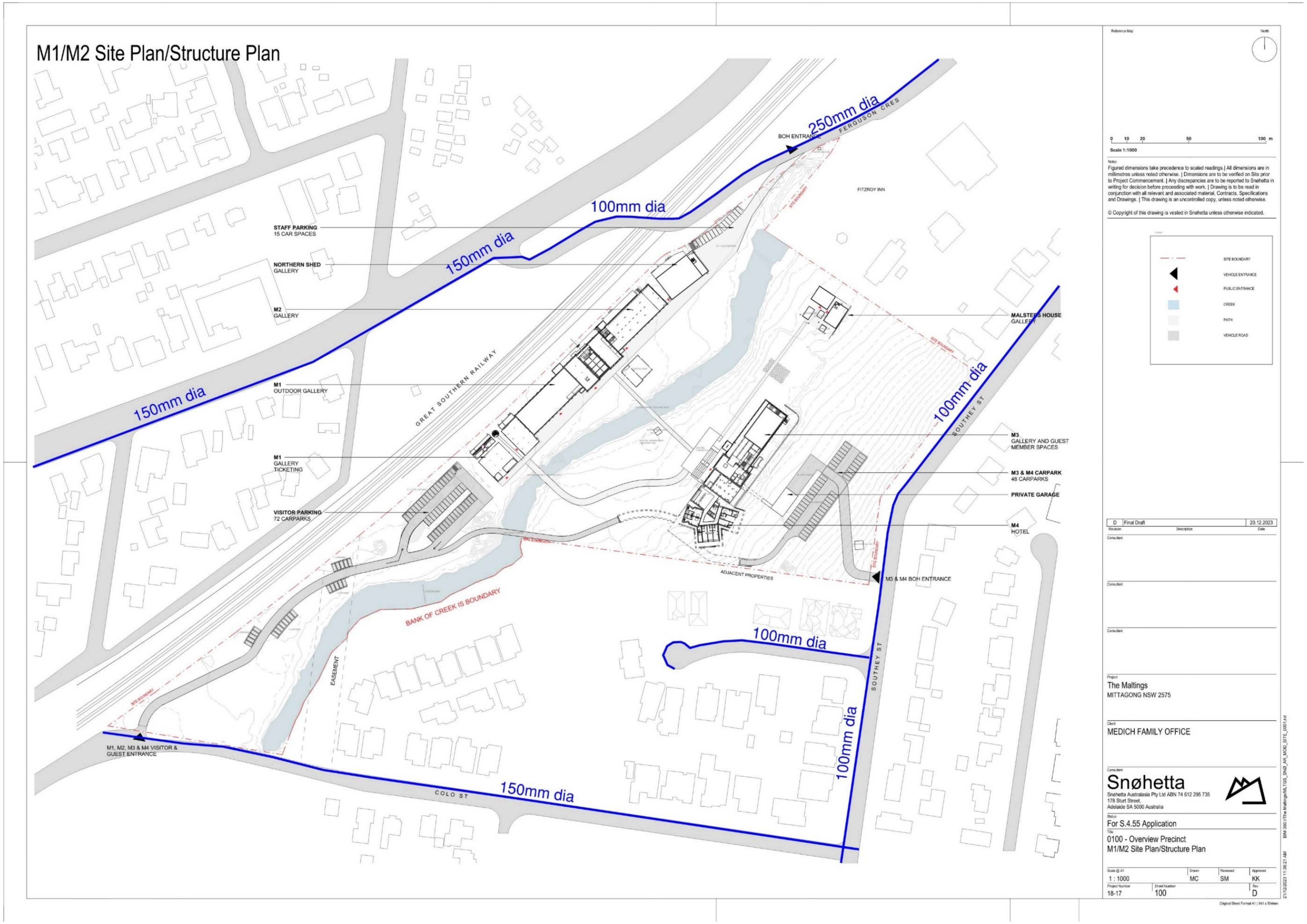
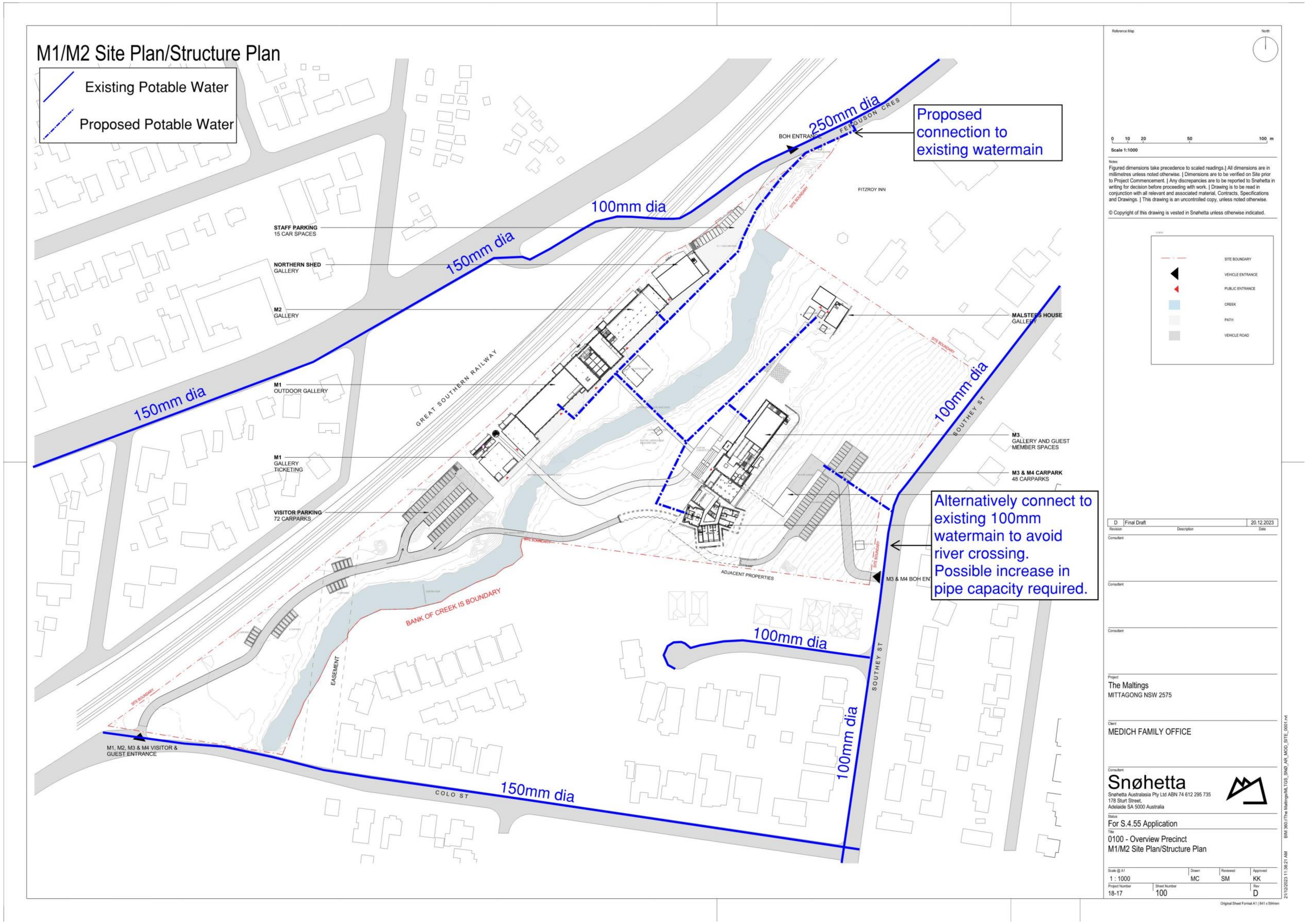


Figure 9 - Surrounding potable Watermains



Potable Water Servicing

Figure 10 - Potable Water Servicing

3.3. Electricity

Endeavour Energy have overhead High Voltage (HV) and Low Voltage (LV) Network mains present in the streets adjoining the site i.e. Southey St, Ferguson Cres, and Colo St.

To determine the electrical demand, availability from these mains, and provide electrical servicing guidance, assistance was obtained from Powerline Design at Mittagong. This specialist consultant is well experienced with electrical servicing and has the added advantage of knowing the area and site. Briefing was provided by J Wyndham Prince followed by communication to guide the electrical outcome. Powerline Design has subsequently prepared this electrical servicing summary information with minor refinements by J Wyndham Prince.

The Nattai River passes through the site separating the Northern portion from the Southern portion. Electrically and for the basis of this summary, due to environmental complications crossing the Nattai River with underground power cables the site is being treated as 2 separate sections.

If, as part of the concept design, future access across the river is constructed by the way of a suitable bridge with adequate protection for electrical conduits, or other secure method, the electrical servicing could be adjusted to take advantage of the access route across the river.

As the site has been listed on the local Wingecarribee Shire Council Heritage Register any electrical designs for the site will need to consider this, and any constraints applied under the listing, if any.

The surrounding HV network for the main portion of the site is indicated by the red coloured line in Figure 11 followed by images of the network in Ferguson Cres and Southey St in Figures 12 and 13.

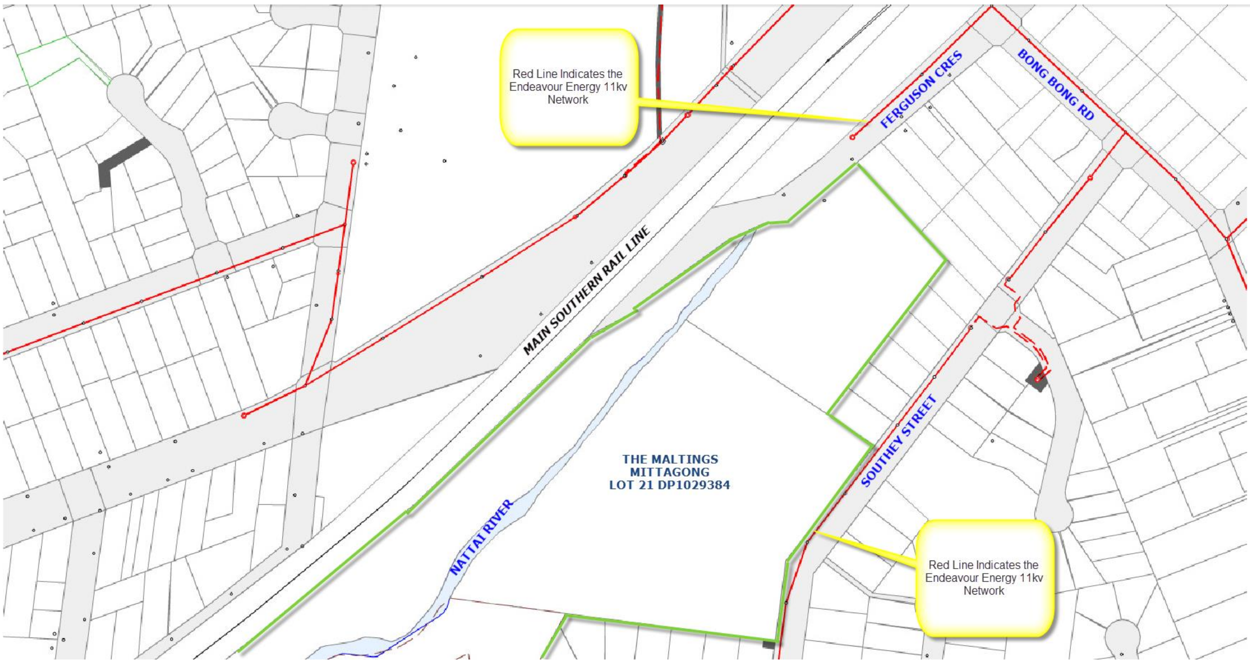


Figure 11 - Existing Endeavour Energy overhead 11Kv Network around the main portion of the site

Figure 12 - Existing overhead electrical network in Ferguson Cres near the site entrance

Figure 13 - Existing overhead electrical network in Southey St adjacent to the site

The surrounding HV network for the southern portion of the site is indicated by the red coloured line in Figure 14. The network at the southern Entry is shown in Figure 15.

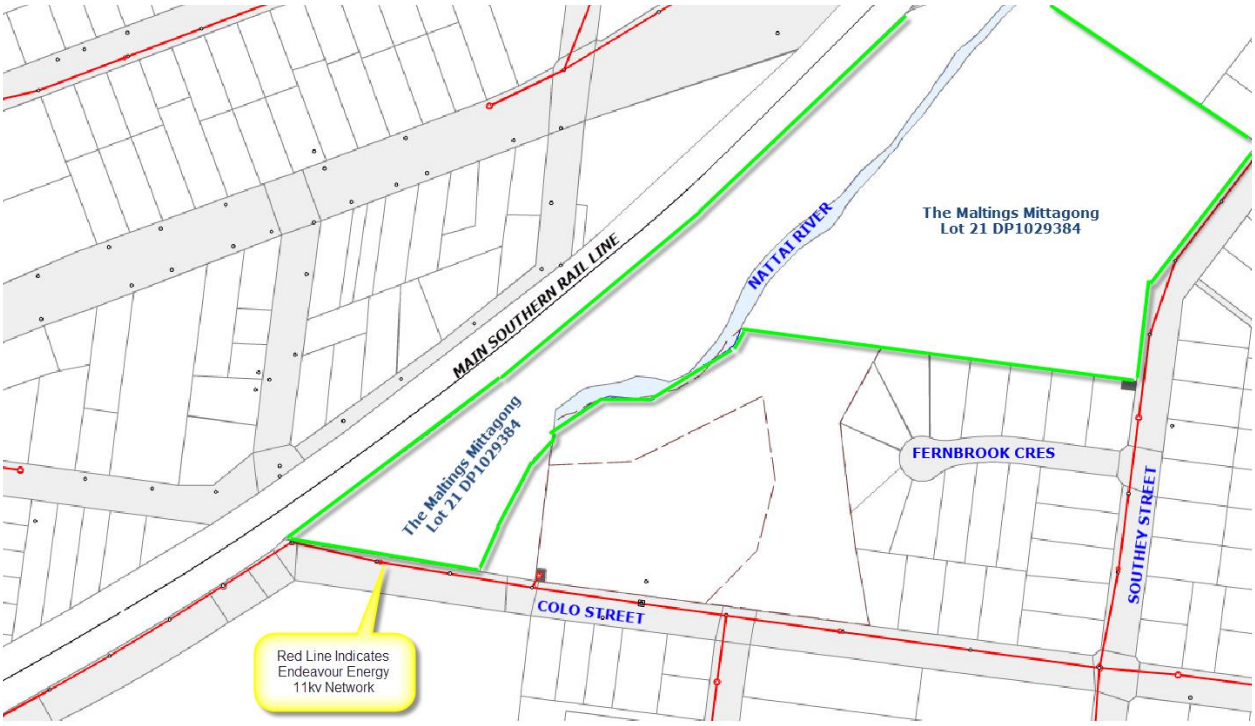


Figure 14 - Existing Endeavour Energy overhead 11Kv Network around the southern portion of the site

Figure 15 – Existing overhead network in Colo St at southern entrance

3.3.1 Northern side of Nattai River

On the Northern side of Nattai River is existing buildings Maltings 1 & 2, and outbuildings.

Based on the Australian Standard AS/NZS 3000 Table C3 using an Average Energy Demand of 100VA/m^2, plus a 50% diversity factor for unknowns, and a combined floor area of 5,200m^2 for Maltings 1 & 2, the approximate electrical requirement for the Northern Side of the Nattai River will be in the region of 750Kva or approximately 1,100 amps per phase.

This quantity of electrical load will require its own substation and will not be able to be supplied from the existing transformers/substations presently located in the surrounding streets.

Endeavour Energy's Padmount Substations are available in the following sizes, 315kva, 500kva, 1000kva and 1,500kva.

If after design and further assessment more electrical load is required, the next size substation can be specified to cater for the final electrical loads.

Endeavour Energy require their pad mount substations to be located above the 1 in 100 year Flood Level. In situations where flooding is an issue, to achieve the required height, the substations are elevated as per the example below in Figures 16 and 17.

Due to the aesthetics of the raised substations as shown below, consideration could be made to have an indoor substation, housed within a specially constructed building in keeping with the future amenity of the site.

Figure 16 - Example of Pad Mount Substation raised clear of the 1:100 year flood level

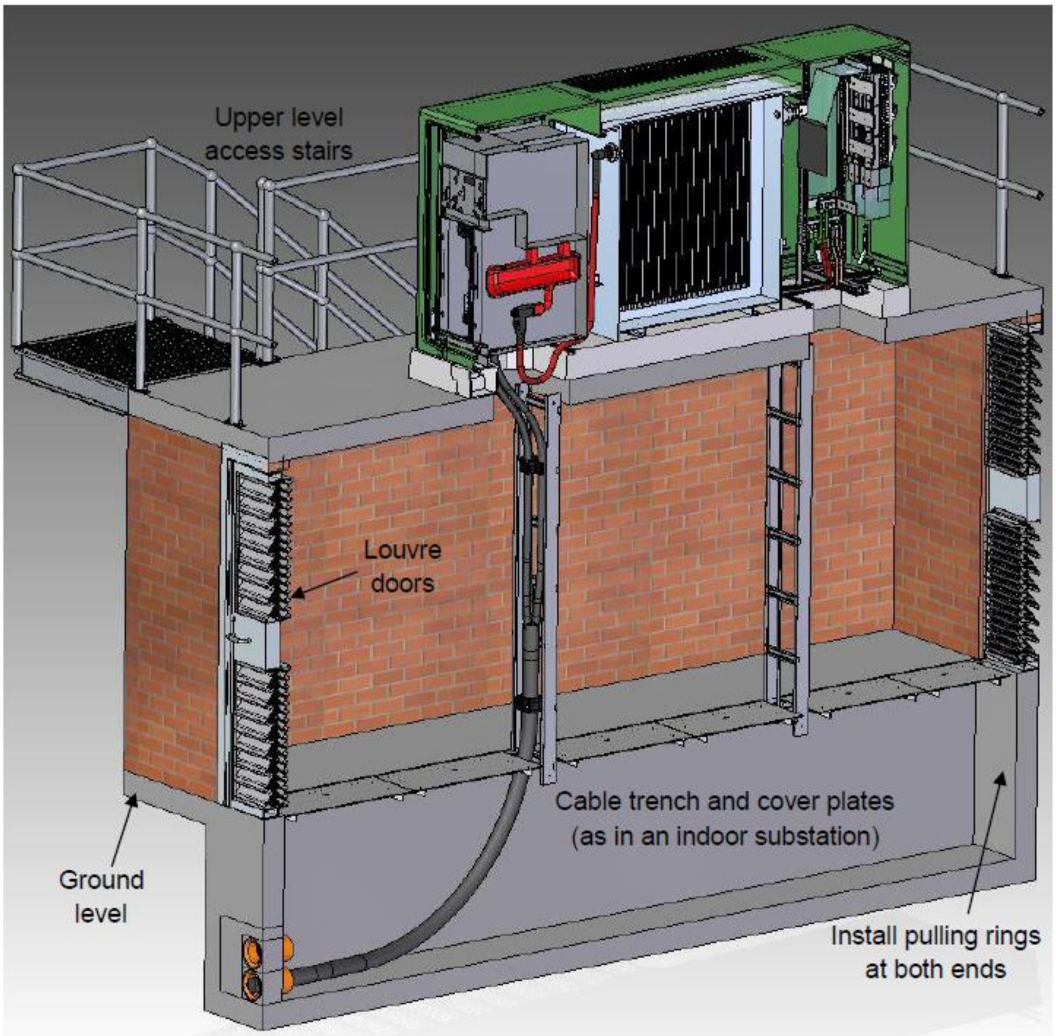


Figure 17 - Cross section of a raised Pad Mount Substation

Worth consideration, and not included in the above electrical assessments would be the addition of Electrical Vehicle Charging Stations (EV Stations).

The EV Stations load requirements are aligned with their charging rates, ie, the faster the charge the higher the load requirement.

3.3.2 Southern side of Nattai River

On the Southern side of Nattai River is existing Maltings buildings M3 and the Maltster's House and outbuildings, with the proposed M4 building to be constructed.

Based on the Australian Standard AS/NZS 3000 Table C2 allowing an Average Energy Demand of 100VA/m^2 , for an approximate combined floor area of 10,700m^2 plus a 50% diversity factor for the unknown, the approximate electrical requirement for the Southern Side of the Nattai River will be in the region of 1,600Kva or approximately 2,300 amps per phase.

This quantity of electrical load will require its own substation and will not be able to be supplied from the existing transformers/substations presently located in the surrounding streets.

Subject to final load assessment, and as a guide, either,1 x 1,500kva or potentially 2 x 1000kva Pad mount substations could be installed to adequately supply this load.

3.3.3 Endeavour Energy Network Capacity

The Maltings site is located approximately 1.6km from the Endeavour Energy Mittagong Zone Substation in Beresford Street Mittagong.

The Endeavour Energy 11kv High Voltage feeder (Bong Bong Rd 1234) is the Feeder that supplies the local area around the Maltings Site. This feeder originates at the Mittagong Zone Substation.

To enable Endeavour Energy to confirm their feeder capacity and detail any network augmentation works, to accommodate the new Maltings electrical load, they will require a Technical Review Request to be submitted and fees paid to cover the cost of their review.

The Technical Review Request will need to detail an estimated maximum demand for the site and contain preliminary site plans.

3.3.4 Servicing Summary

Preliminary estimation of the maximum electrical demand for the Maltings Site in total is in the vicinity of 2,000kva to 2,500kva.

Installing a Pad Mount Substation on the **Northern Side** of the Nattai River will likely involve the building of a structure to elevate the substation above the 1 in 100 year Flood Level. This arrangement is not visually appealing and would need to be camouflaged/hidden to suit the required historic nature of the site.

The HV connection points to extend HV cabling to the Northern side of the Maltings Site are in Ferguson Cres approximately 100m from the site frontage at the front of the Fitzroy Inn, and at the Colo St frontage to the Maltings. Endeavour Energy may require a HV tie between these 2 connection points with an underground cable to supply a 1000kva substation on the Northern Side of the Nattai River. Alternatively, a HV Ring main (in and out) from Colo St to the new Substation may be adequate. The preliminary servicing approach for the northern side is shown in Figure 18.

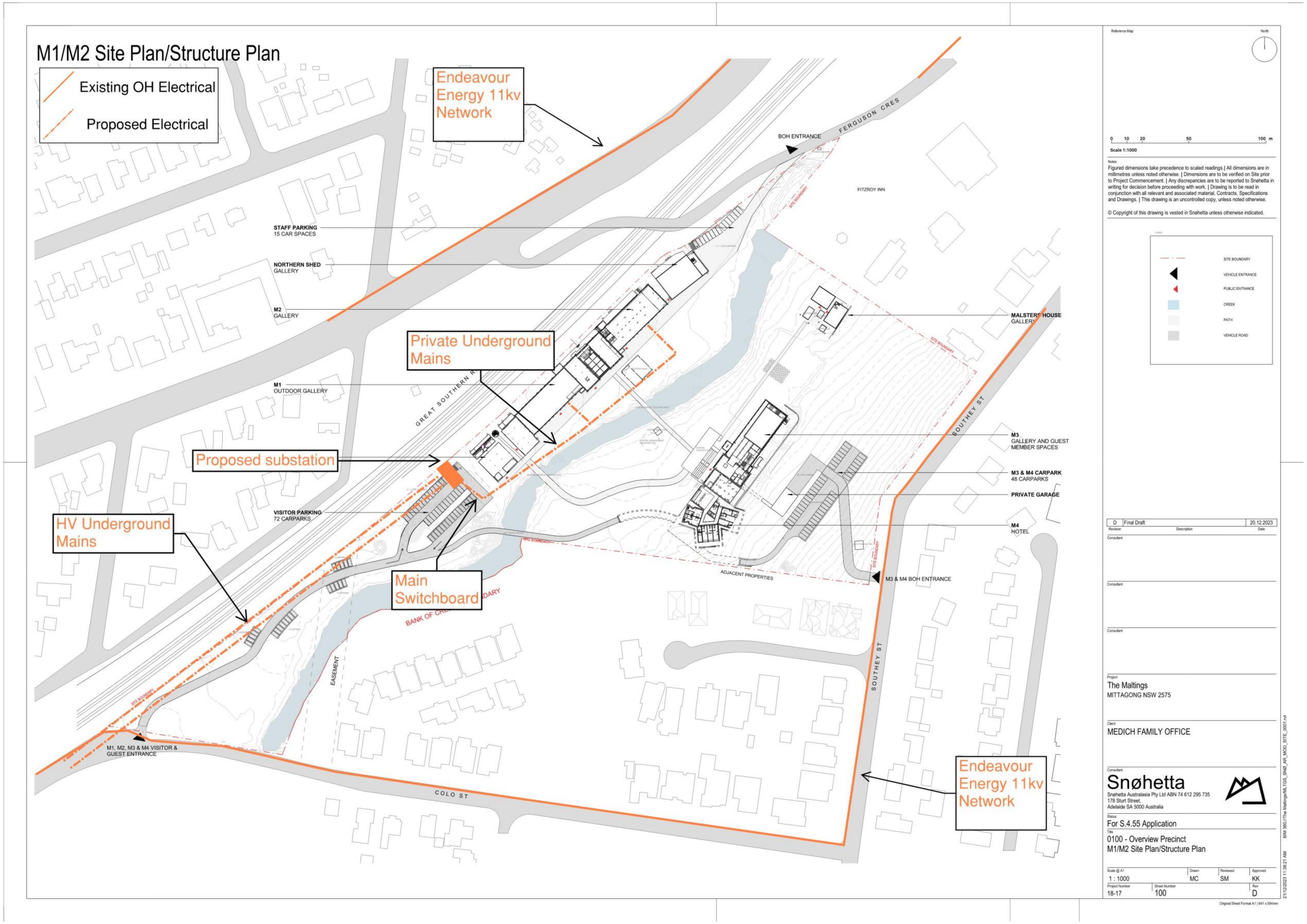


Figure 18 - Northern Side Preliminary Electrical Servicing Sketch

Depending on the final electrical load, the **Southern Side** of the Nattai River could be supplied by installing either 1 x 1,500kva or 2 x 1000kva Pad Mount Substations (side by side) South West of the proposed building M4 on the Southern side of the Maltings site by extending HV underground cables from the existing Endeavour Energy Network in Southey Street to supply the new substations.

From the substations, private mains can extend to a main switchboard, and then from the main switchboard to service buildings M3, M4 Maltster's House.

The required easement size for an Endeavour Energy Pad Mount Substation is 5.5m x 2.75m. Where 2 substations are installed side by side the easement area is double that of a single substation. Endeavour Energy will also require an easement for underground cables 3.0m wide over any HV cables placed within private land.

Endeavour Energy require the substation sites to be level across the whole easement area and the site to be above the 1:100 flood level. They also require 24hour access to the substations.

All works on Endeavour Energy's Network will need to be designed and constructed in accordance with their Policies, Standards and procedures.

Other considerations with the electrical design will include;

- Substation Earthing in respect of Earth Potential Rise (EPR) and its affect if any on the Main Southern Rail Line.
- Due to the close proximity to the Nattai River, the use of a vegetable grade transformer oil should be considered with the appropriate bunding in place for containment of any oil spills from the transformers.

The preliminary servicing approach for the southern side is shown in Figure 19.

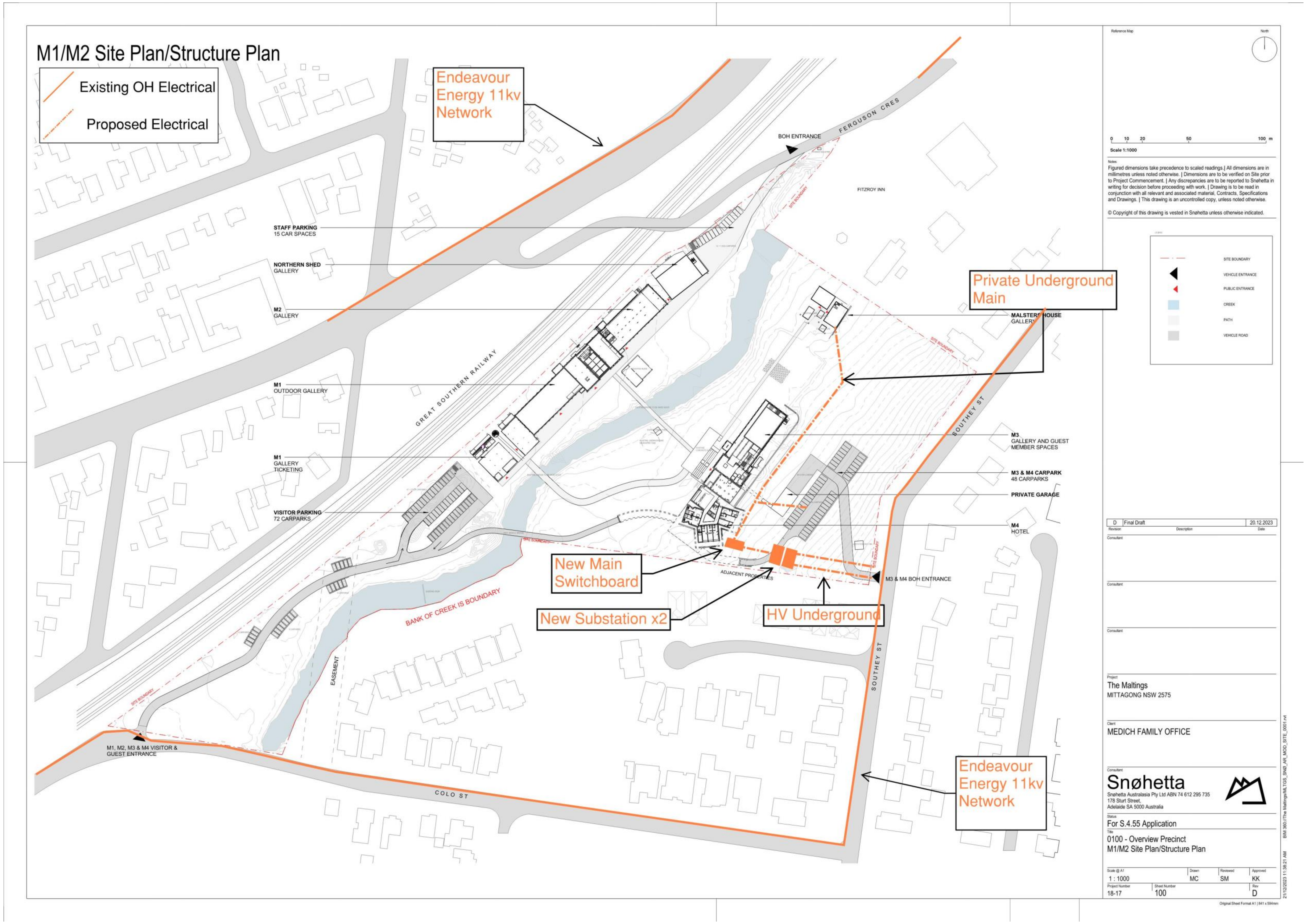


Figure 19 - Southern Side Preliminary Electrical Servicing Sketch

3.4. Gas

The gas supply feeder in the vicinity of the site is in Colo St. This 110mm dia low pressure main supplies smaller feed lines along other streets such as the 63mm dia line running along Southey St. This general availability of supply is of high benefit to the Maltings development.

Jemena would undertake the assessment of supply to the site and design of any upgrades required but it is reasonable to assume that gas supply would be easily provided as there is good access to the gas main particularly for Maltings 1 & 2. For Maltings 3, 4 and the Maltster's House gas supply would be from Southey St in order to avoid an internal site gas crossing of the river (Figure 6). Such a crossing would not be accepted by Jemena due to the flood risk to the gas line and level of the bridge.

As the hotel and accommodation complex would be a significant gas user, Jemena would see the development as a valuable customer. Also, Jemena would fund any possible upgrade in Southey St but it should be expected that the hotel would need to fund the connection from the street to each Maltings building where gas is required. There is a chance that Jemena may fund or partly fund these internal connections, but this would be subject to negotiation.

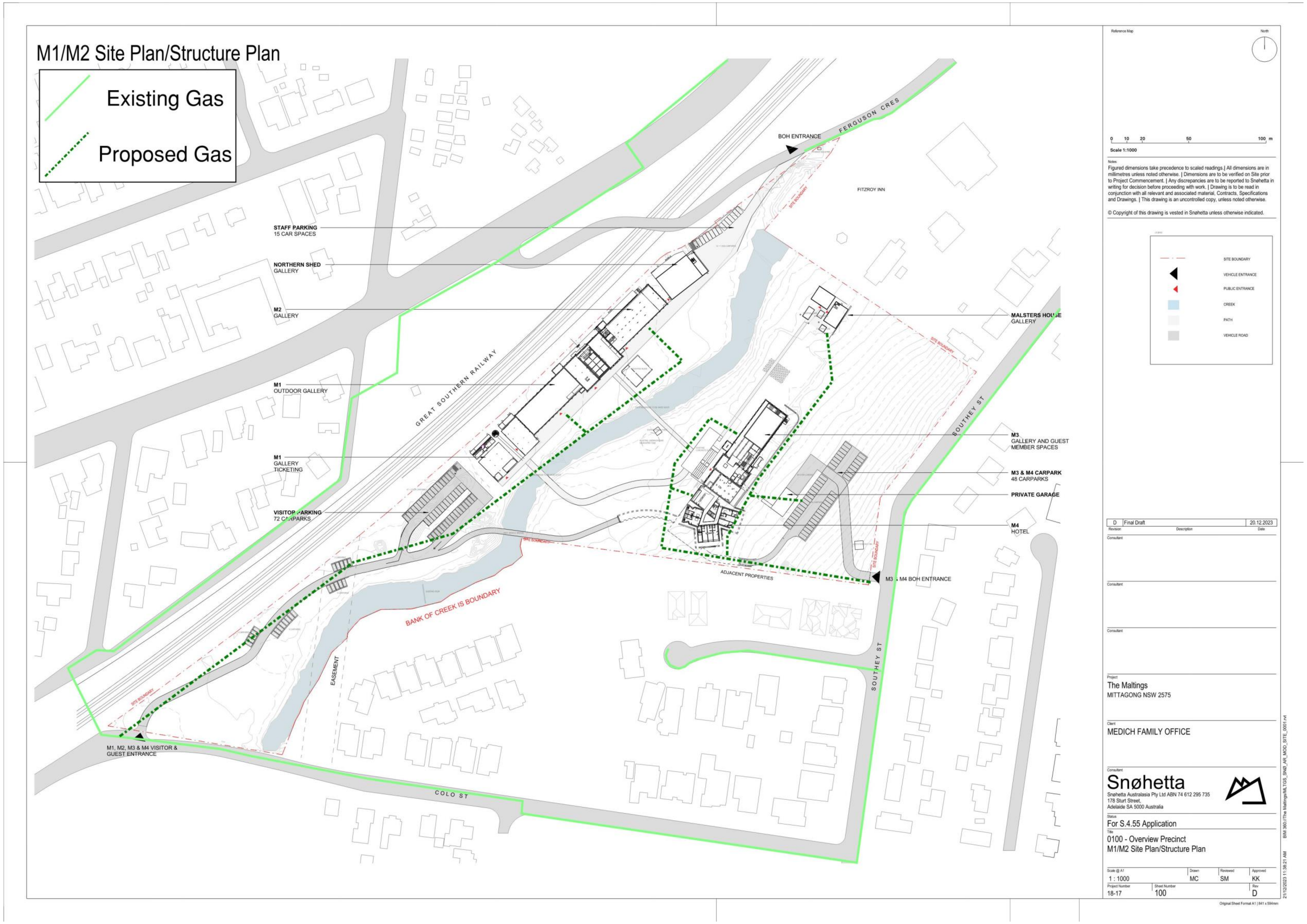
It is worth noting that a 100mm "high" pressure gas main exists on the southern verge area of the Old Hume Highway. It would be a Jemena decision/assessment whether a low-pressure main is utilised off this high pressure main following a route in the road verge of Ferguson Cres over the railway and into the site via the access road for Maltings 1 & 2 supply. There would be potential problems with construction works over a live railway.

It is not expected that any supply could be provided via the existing small 32mm dia line that runs part way down Ferguson Cres from the east but does not cross the Nattai River. This supply line is too small for the extent of this development and the bridge over the Nattai River at this location is not suitable for a gas main.

Considering the above, the likely underground supply routes and stages would be:

- From Colo St to Maltings 1 & 2.
- From Southey St to Maltings 3 & 4 and the Maltster's House.

Existing supply lines and proposed connection lines are shown in Figure 20.



Gas Servicing

Figure 20 - Gas Servicing

3.5. Telecommunications

The primary means of communication is expected to be via National Broadband Network (NBN) and mobile networks. Satellite services would also be accessible if required.

3.5.1 National Broadband Network - NBN

NBN services mostly surround the site and coverage is portrayed by NBN Co's website as being available (see Figure 21 below). On this basis no real impediments are perceived to inhibit any progressive NBN service connection to the Maltings site as it is developed. Fibre connections to the premise would provide the best service connection and are recommended,

The only constraint appears to be the bridge over the Nattai River on Ferguson Cres. There are currently no NBN cables crossing this bridge based on the NBN Dial Before You Dig information. As previously highlighted in this report this would be due to the unsuitable nature of the bridge structure and the current damage potential from flood inundation. It may be possible to provide overhead crossing of the river for NBN but this approach would be unfavourable to NBN due to having overhead cable exposure and higher maintenance obligation.

Considering the above, the likely underground supply routes and stages would be:

- From Colo St to Maltings 1 & 2.
- From Southey St to Maltings 3 & 4 and Maltster's House.

It is recommended that fibre to the premise be adopted rather than using copper cabling.

The supply routes are shown in Figure 22.

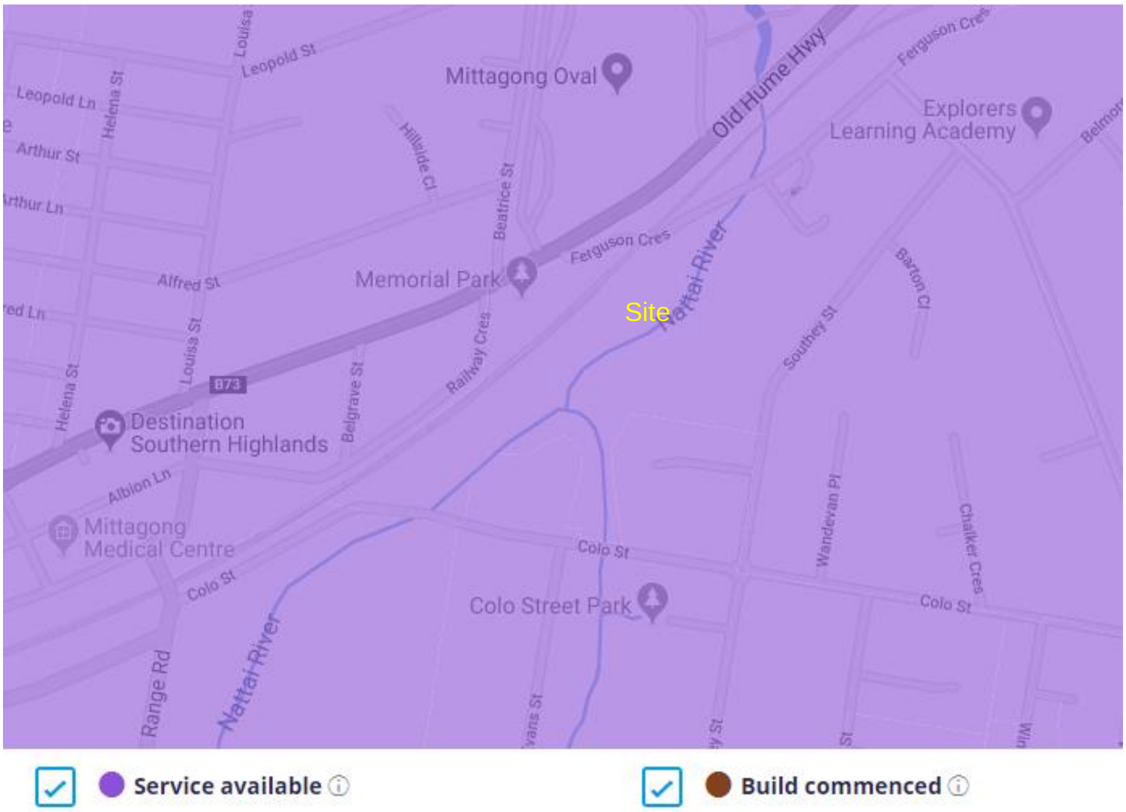
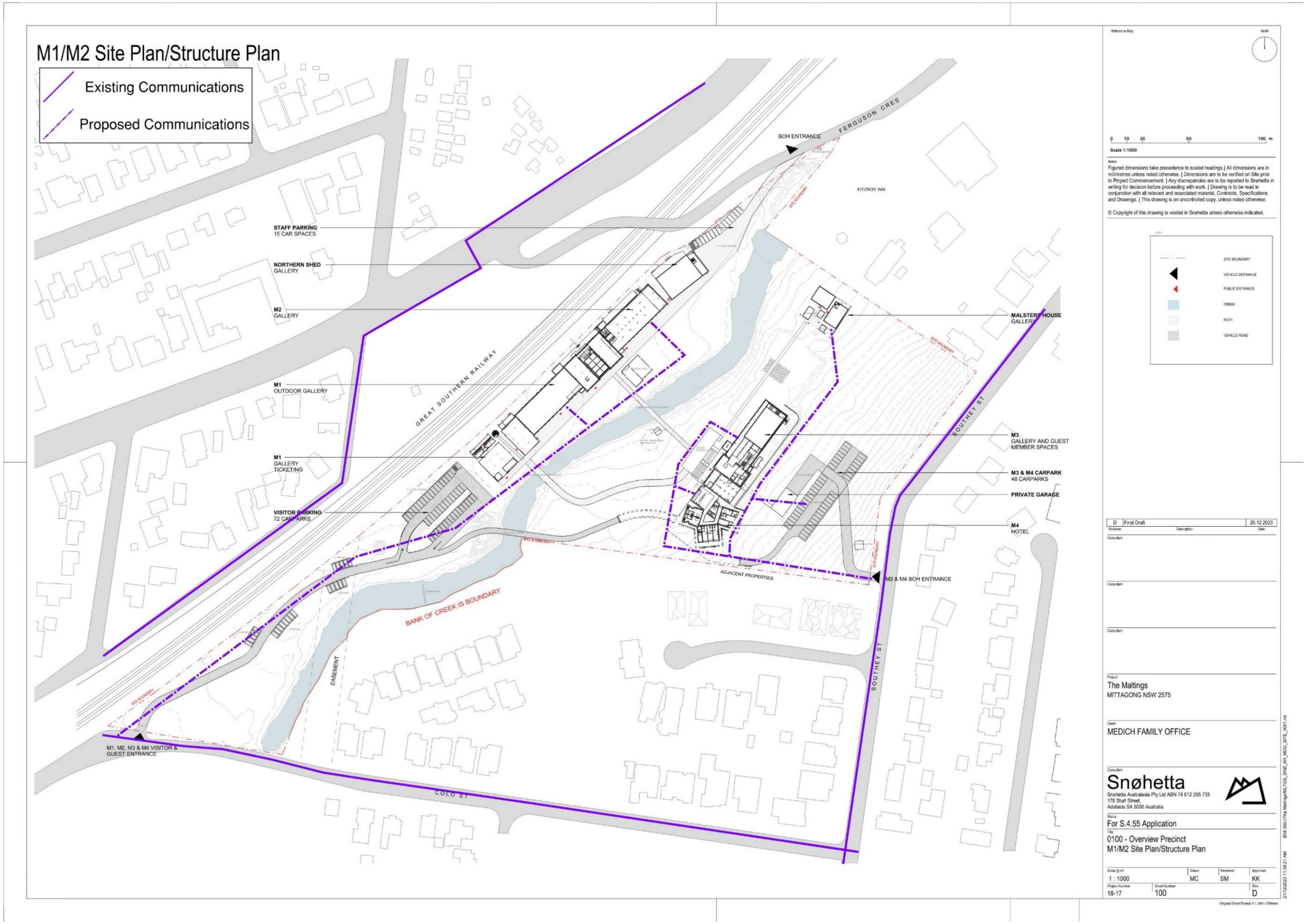


Figure 21 - NBN Coverage



NBN Servicing

Figure 22 - NBN Servicing

3.5.2 Telstra

Telstra landline is currently provided in surrounding streets mostly via copper cabling. The copper cabling is being progressively phased out by NBN services with optical fibre, There are some Telstra fibre optic cables nearby in Bong Bong Rd and in Colo St next to the railway. This cable could potentially be extended to the Maltings site should Telstra fibre connection be required.

The location of the Telstra optic fibre is illustrated by the annotations of the Telstra Dial Before You Dig plan in Figure 23.

There is also Telstra mobile coverage for the Maltings site which will eventually improve over time as services transition from 3G & 4G to 5G network capacity.

3.5.3 Optus

There is Optus mobile coverage for the site which should improve over time as network capacity and speed increases.

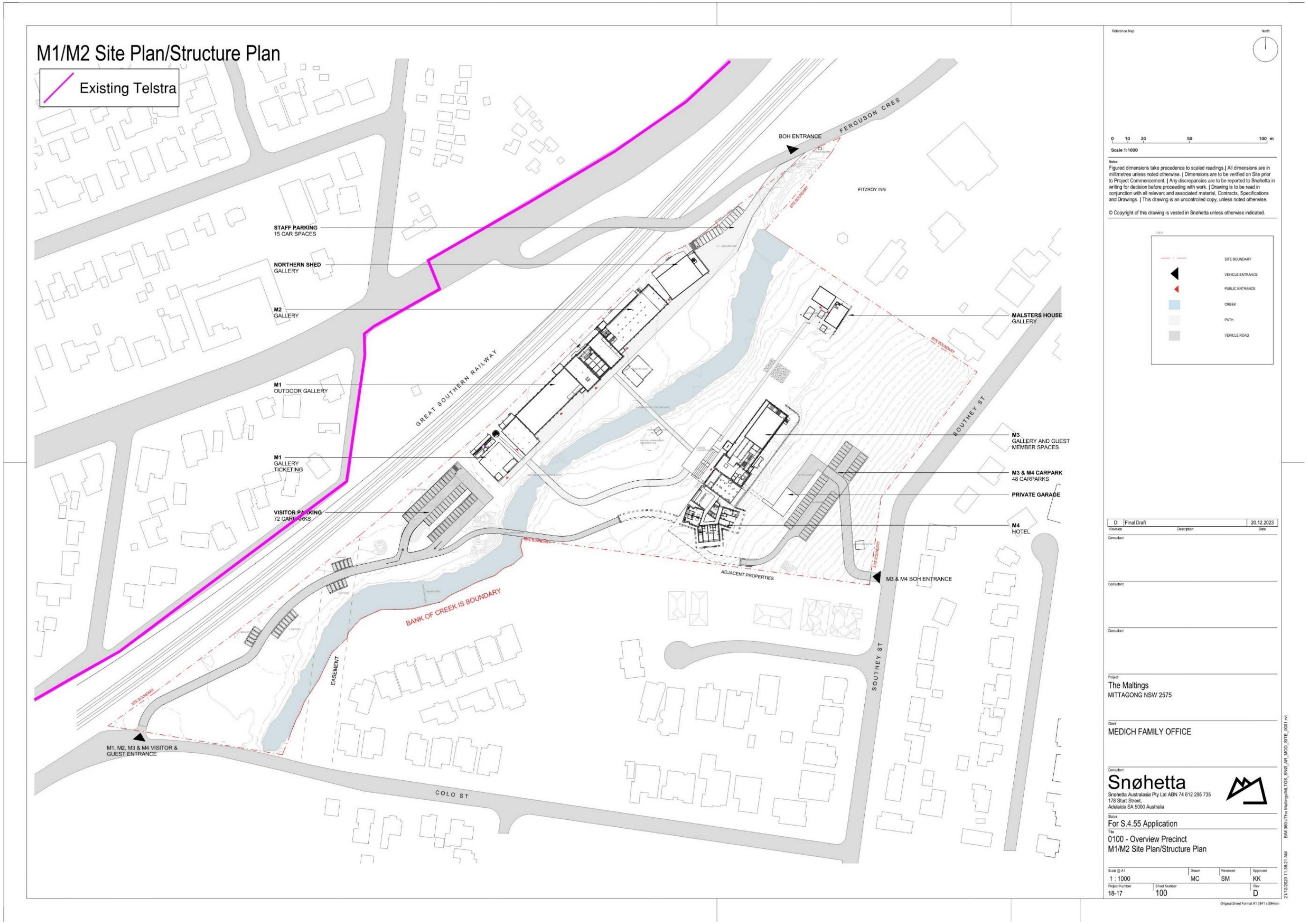


Figure 23 - Telstra Existing Landline Servicing

4. CONCLUSIONS

As stated in the Executive Summary, the content of the initial report is still valid and has been revised to display the identified services on the revised design plans.

The Maltings site is surrounded by a mostly beneficial array of utilities. Within close or reasonably close proximity to the site, service mains for sewer, potable water, electricity, gas, and National Broadband Network (NBN) are present. Telstra landline is also present in the surrounding streets and the site has Telstra and Optus mobile coverage. Satellite services would also be accessible if required.

Sewer and water systems modelling using Wingecarribee Shire Council network information and expected loadings from the Maltings development has confirmed that sewer capacity and water supply is available.

Currently, no major impediments are envisaged to service the site and the servicing could be staged with relative ease. As this report presents high level information for DA purposes, the future detailed servicing requirements of authorities will be required and then designs prepared once a development consent is obtained.

Servicing approaches and stages can be adjusted but any substantial change in strategy will need confirmation of feasibility before undertaking any utility design. Also, the flood risk to a utility must always be a consideration. None of these items as seen as significant obstacles and the development could be adequately serviced.

APPENDIX A – SELECTED ARCHITECTURAL PLANS, DEMOLITION PLANS & USAGE

Preliminary

Site Plan

CARPARKING COUNT	TOTAL
M1 OVERFLOW PARKING	25
M1 FORMAL PARKING	49
M2 BOH PARKING	15
M3+4 FORMAL PARKING	46
M4 BOH PARKING	3 + 1DDA
FUTURE M5+6 FORMAL PARKING	82

1 Site Plan
1 : 1000

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Medich Corporation

Scale @ A1: As indicated

Rev H /

100% SD / 06.04.2020

SD-A003

Area Schedules

Room Areas M1+2				
Number	Name	Area	Level	Building
1.01	TERRACE BAR	142 m²	A-01_MEZ	M1+2
1.02	BOH	14 m²	A-01	M1+2
1.03	POOL TERRACE	655 m²	A-01_MEZ	M1+2
1.04	CORE	77 m²	A-01	M1+2
1.05	CORE	22 m²	A-01	M1+2
1.06	GREAT HALL	483 m²	A-01	M1+2
1.07	TERRACE	112 m²	A-01	M1+2
1.08	BOH	6 m²	A-01	M1+2
1.09	BOH	21 m²	A-01	M1+2
1.10	KITCHEN / BOH	46 m²	A-01	M1+2
2.01	GALLERY 1	175 m²	A-02_MEZ	M1+2
2.02	GALLERY 2	111 m²	A-02_MEZ	M1+2
2.03	GALLERY 3	86 m²	A-02_MEZ	M1+2
2.04	CORE	22 m²	A-02_MEZ	M1+2
2.05	BOH	7 m²	A-02_MEZ	M1+2
2.06	CORE	75 m²	A-02_MEZ	M1+2
G.01	MULTI-PURPOSE	335 m²	A-00_SHD	M1+2
G.02	BOH	68 m²	A-00_SHD	M1+2
G.03	BOH	21 m²	A-00_SHD	M1+2
G.04	CHANGE RM.	140 m²	A-00_SHD	M1+2
G.05	ARRIVAL	115 m²	A-00_SHD	M1+2
G.07	MULTI-PURPOSE	410 m²	A-00	M1+2
G.08	POOL PLANT	216 m²	A-00	M1+2
G.09	CORE	84 m²	A-00	M1+2
G.10	BOH	6 m²	A-00	M1+2
G.11	MULTI-PURPOSE	219 m²	A-00	M1+2
G.12	SILO	174 m²	A-00_PLA	M1+2
G.13	COURTYARD	23 m²	A-00	M1+2
G.14	TERRACE	93 m²	A-00	M1+2
G.15	COURTYARD	23 m²	A-00	M1+2
G.16	HANGING GARDENS	220 m²	A-00	M1+2
G.17	LOBBY	120 m²	A-00	M1+2
G.18	CORE	22 m²	A-00	M1+2
G.19	BOH	6 m²	A-00	M1+2
G.20	AMENITIES	34 m²	A-00	M1+2
G.21	STAFF AMENITIES	23 m²	A-00	M1+2
G.22	REFUSE	22 m²	A-00	M1+2
G.23	BOH	345 m²	A-00	M1+2
G.24	STREET	92 m²	A-00	M1+2
G.25	NORTH SHED	583 m²	A-00	M1+2
G.26	KITCHEN / BOH	31 m²	FHL	M1+2
Grand total: 41		5481 m²		

M1+2 FECA		
Name	Level	Area
M1+2	A-00	2497 m²
M1+2 Sheds	A-00	423 m²
M1+2 Sheds	A-00	296 m²
M1+2 Sheds	A-00	610 m²
M1+2	A-00	39 m²
M1+2	A-01	1058 m²
M1+2	A-01	666 m²
M1+2	A-02_MEZ	586 m²
Grand total: 8		6175 m²

Room Areas M3				
Number	Name	Area	Level	Building
G.01	FOYER	63 m²	C-00	M3
G.02	SILOS	173 m²	C-00	M3
G.03	CORE	44 m²	C-00	M3
G.03	RECEPTION	168 m²	C-00	M3
G.04	EXP. GARDEN	565 m²	C-00	M3
G.05	BOH	22 m²	C-00	M3
G.06	MUILTI-PURPOSE SPACE	107 m²	C-00	M3
C-00: 7		1142 m²		
1.01	CINEMA LOBBY	144 m²	C-01	M3
1.02	CINEMA	45 m²	C-01	M3
1.03	BOH / STORAGE	75 m²	C-01	M3
1.04	AMENITIES	34 m²	C-01	M3
1.05	STAFF AMENITIES	28 m²	C-01	M3
C-01: 5		326 m²		
2.01	KITCHEN / DINING	137 m²	C-02	M3
2.02	BOH KITCHEN	64 m²	C-02	M3
2.03	BOH	26 m²	C-02	M3
2.04	LOUNGE	459 m²	C-02	M3
2.05	BAR	58 m²	C-02	M3
C-02: 5		744 m²		
3.01	LOUNGE / RECEPTION	112 m²	C-04	M3
3.02	ONSEN	102 m²	C-04	M3
3.03	CHANGE	11 m²	C-04	M3
3.03	TREATMENT ROOMS	27 m²	C-04	M3
3.04	STORE	16 m²	C-04	M3
3.05	GALLERY	88 m²	C-04	M3
3.06	PRIVATE EVENT ROOM	41 m²	C-04	M3
3.07	BOH	7 m²	C-04	M3
C-04: 8		405 m²		
4.01	MEZZANINE	132 m²	C-04_MEZ	M3
C-04_MEZ: 1		132 m²		
5.02	STUDY	62 m²	C-05	M3
C-05: 1		62 m²		
Grand total: 27		2810 m²		

M3+4 FECA		
Name	Level	Area
M3	H-05	79 m²
M3	H-04	108 m²
M3	H-03	439 m²
M3	H-02	1029 m²
M3	H-01	701 m²
M3	H-00	1396 m²
M4	H-05	320 m²
M4	H-04	432 m²
M4	H-03	572 m²
M4	H-02	584 m²
M4	H-01	558 m²
M4	H-00	656 m²
M4	H-B1	198 m²
Grand total: 13		7072 m²

Room Areas M4				
Number	Name	Area	Level	Building
B.03	GYM	177 m²	H-B1	M4
H-B1: 1		177 m²		
H.G.00	CIRCULATION	151 m²	H-00	M4
H.G.01	STANDARD	48 m²	H-00	M4
H.G.02	STANDARD	47 m²	H-00	M4
H.G.03	STUDIO	30 m²	H-00	M4
H.G.04	STUDIO	30 m²	H-00	M4
H.G.05	STUDIO	32 m²	H-00	M4
H.G.06	STUDIO	30 m²	H-00	M4
H.G.07	STUDIO	30 m²	H-00	M4
H.G.08	STUDIO	30 m²	H-00	M4
H-00: 9		427 m²		
H.1.00	CIRCULATION	98 m²	H-01	M4
H.1.01	STANDARD	47 m²	H-01	M4
H.1.02	STANDARD	48 m²	H-01	M4
H.1.03	STANDARD	48 m²	H-01	M4
H.1.04	STANDARD	47 m²	H-01	M4
H.1.05	STANDARD	47 m²	H-01	M4
H.1.06	STANDARD	48 m²	H-01	M4
H.1.07	STUDIO	30 m²	H-01	M4
H.1.08	STUDIO	30 m²	H-01	M4
H.1.09	STUDIO	30 m²	H-01	M4
H-01: 10		472 m²		
H.2.00	CIRCULATION	98 m²	H-02	M4
H.2.01	STANDARD	47 m²	H-02	M4
H.2.02	STANDARD	48 m²	H-02	M4
H.2.03	STANDARD	48 m²	H-02	M4
H.2.04	STANDARD	47 m²	H-02	M4
H.2.05	STANDARD	47 m²	H-02	M4
H.2.06	STANDARD	48 m²	H-02	M4
H.2.07	STUDIO	30 m²	H-02	M4
H.2.08	STUDIO	30 m²	H-02	M4
H.2.09	STUDIO	30 m²	H-02	M4
H-02: 10		472 m²		
H.3.00	CIRCULATION	98 m²	H-03	M4
H.3.01	STANDARD	47 m²	H-03	M4
H.3.02	STANDARD	48 m²	H-03	M4
H.3.03	STANDARD	48 m²	H-03	M4
H.3.04	STANDARD	47 m²	H-03	M4
H.3.05	STANDARD	47 m²	H-03	M4
H.3.06	STANDARD	48 m²	H-03	M4
H.3.07	STUDIO	30 m²	H-03	M4
H.3.08	STUDIO	30 m²	H-03	M4
H.3.09	STUDIO	30 m²	H-03	M4
H-03: 10		473 m²		
H.4.00	CIRCULATION	66 m²	H-04	M4
H.4.01	4.01 SUITE	95 m²	H-04	M4
H.4.02	4.02 SUITE	95 m²	H-04	M4
H.4.03	STUDIO	30 m²	H-04	M4
H.4.04	STUDIO	30 m²	H-04	M4
H.4.05	STUDIO	30 m²	H-04	M4
H-04: 6		347 m²		
5.01	PRIVATE TERRACE	103 m²	H-05	M4
H.5.01	OWNER'S SUITE	255 m²	H-05	M4
H-05: 2		358 m²		
Grand total: 48		2727 m²		

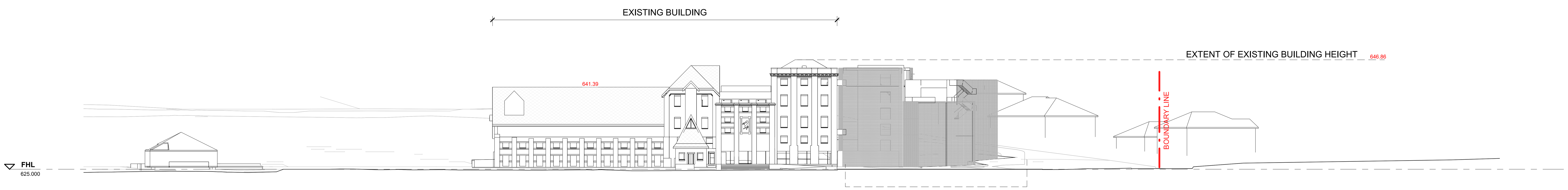
M4 ROOM COUNT	AREA	TOTAL
SMALL	33m²	18
MEDIUM	50m²	20
LARGE	100m²	2
TOTAL		40 + 1 OWNER

Maltster's House Areas				
Number	Name	Area	Level	Building
1.01	MEZZANINE	28 m²	MALTSTER'S MEZ	Maltster's
G.01	EXHIBITION	173 m²	MALTSTER'S GROUND	Maltster's
G.02	KITCHEN	7 m²	MALTSTER'S GROUND	Maltster's
G.03	BATHROOM	12 m²	MALTSTER'S GROUND	Maltster's
Grand total: 4		221 m²		

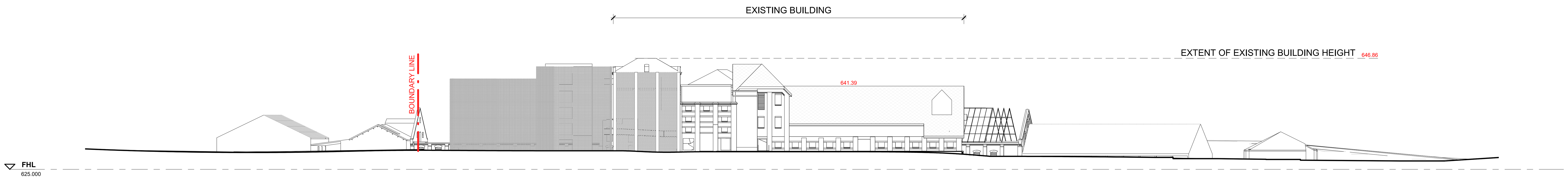
CARPARKING COUNT	TOTAL
M1 OVERFLOW PARKING	25
M1 FORMAL PARKING	49
M2 BOH PARKING	15
M3+4 FORMAL PARKING	46
M4 BOH PARKING	3 + 1DDA
FUTURE M5+6 FORMAL PARKING	82

Preliminary

Site Elevations



1 **West Elevation - Site**
1 : 500



2 **East Elevation - Site**
1 : 500

3 **East Elevation 2 - Site**
1 : 500

Notes:

- Boundary line not perpendicular to view.

4 **West Elevation 2 - Site**
1 : 500

0 5 10 25 50 m

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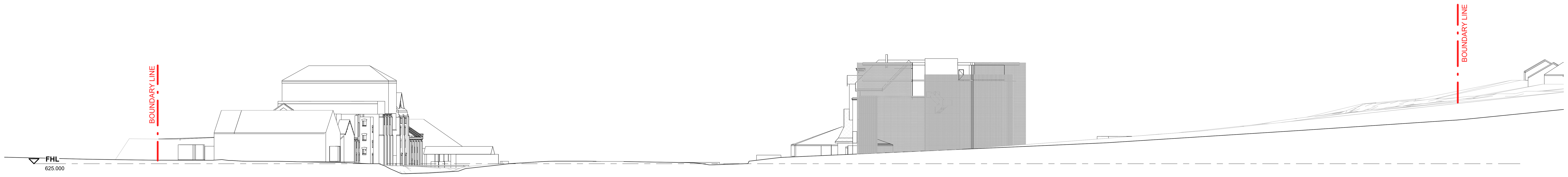
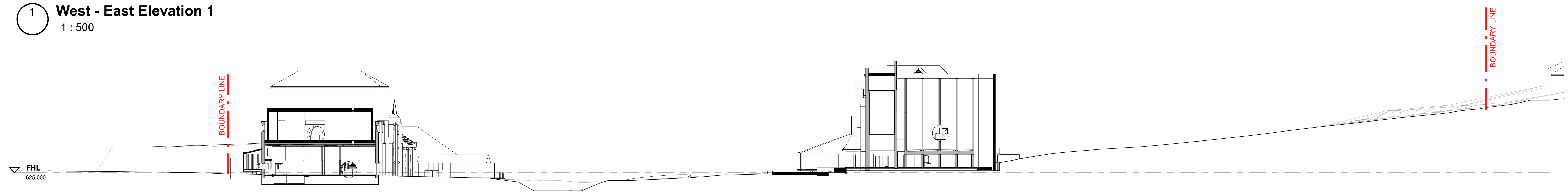
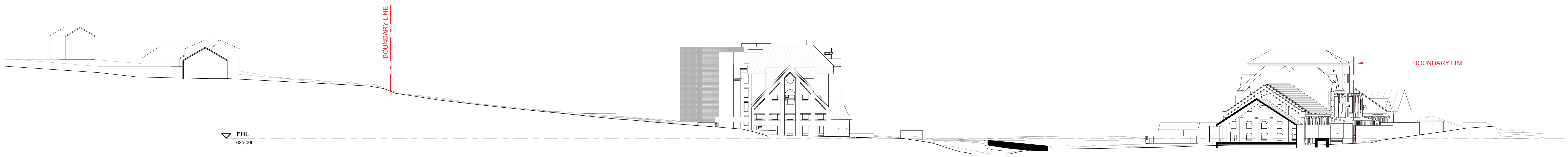
Site Elevations



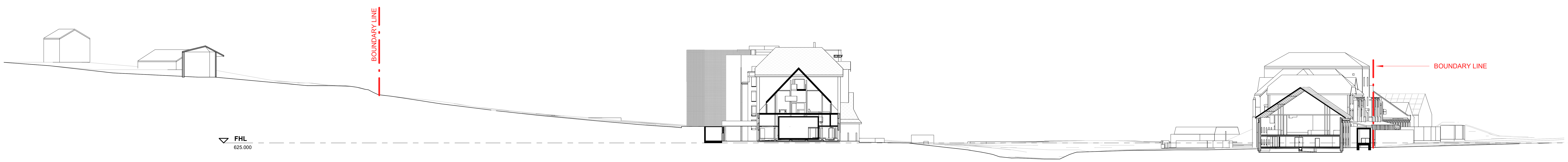
1 **West - East Elevation 1**
1 : 500



4 **West - East Section 1**
1 : 500



2 **East - West Elevation 1**
1 : 500



3 **East - West Section 1**
1 : 500

Notes:

- Boundary line not perpendicular to view.

0 5 10 25 50 m

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Scale @ A1: 1 : 500

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APPENDIX B – SEWER & WATER MODELLING REPORT

HALCYON HOTELS P/L

THE MALTINGS
2 COLO STREET, THE MALTINGS MITTAGONG NSW
DEVELOPMENT ASSESSMENT REPORT
WATER AND SEWER MODELLING

urbanwater solutions

22 APRIL 2020

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Prepared by	Checked by	Authorised by
0	A	Client comment	11/3/2020	AS/AP	PE/KK	AP
0	B	Update loadings	22/4/2020	AP		AP

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Table of Figures

1 Introduction

Urban Water Solutions (UWS) was commissioned by Halcyon Hotels P/L to assess the impact on the existing water and sewerage systems of a proposed commercial development at 2 Colo Street, The Maltings, Mittagong NSW.

Wingecarribee Shire Council (WSC) is the local water authority providing potable water supply and reticulated sewerage services.

The proposed development will consist of various accommodation and function facilities.

This report details the impact of the proposed development on the existing WSC water and sewerage systems at full build out, incorporating this development, and is subject to approval by WSC.

1.1 Location

The development site is at 2 Colo Street, The Maltings, Mittagong NSW and has a total area of approximately 6.4 ha, and a total floor area of approximately 11,900 m².

A locality plan is presented in Figure 1-1 with a proposed site plan provided in Figure 1-2.

Figure 1-1: Development Location

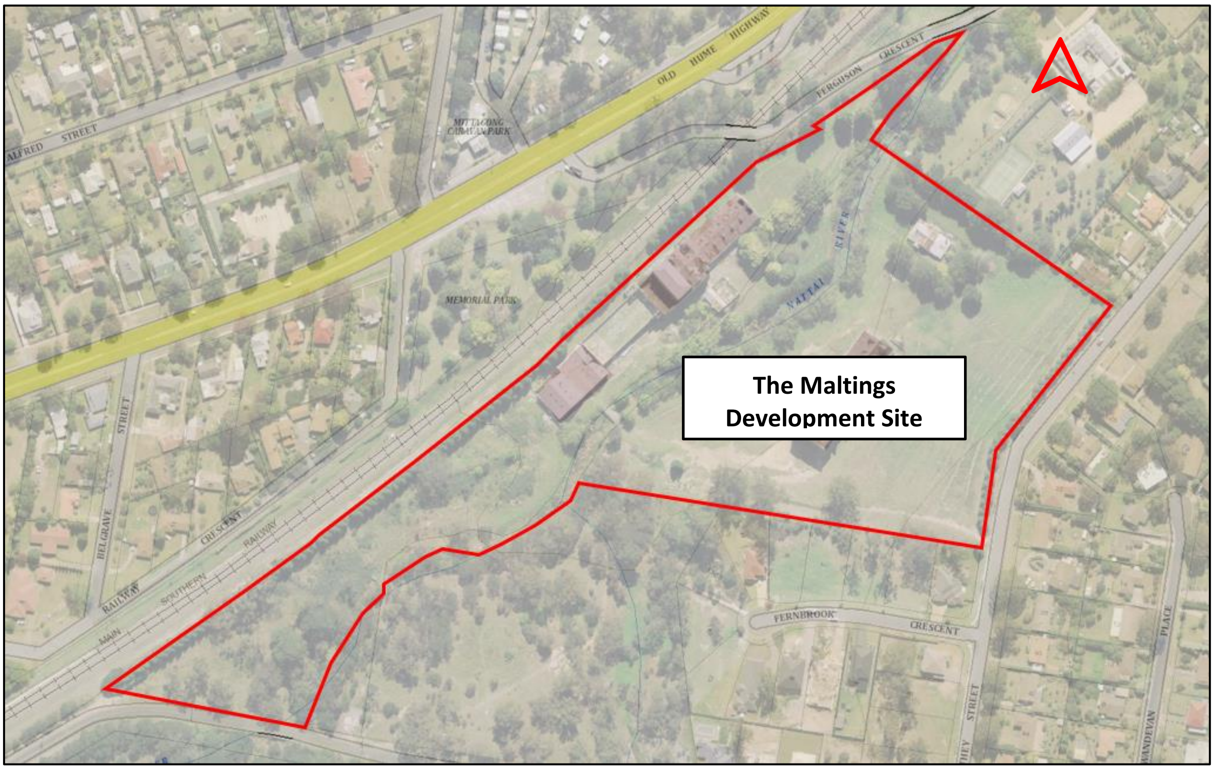
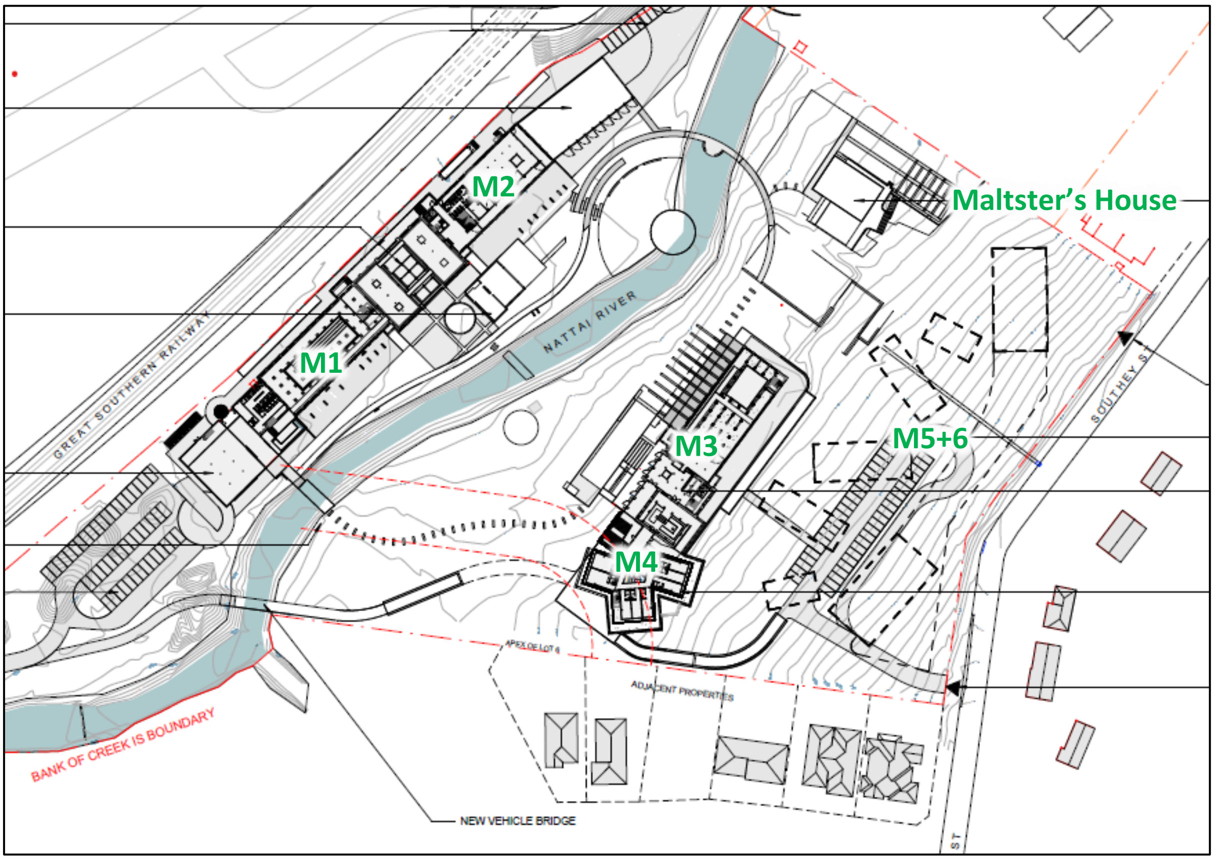


Figure 1-2: Site Plan



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Details of the proposed buildings within the site are provided in Table 1 below.

Table 1: Building Details

Building Name	Proposed Building Use	Building Area (m²)	Number Bedrooms	Revised area
M1 & M2	Exhibition/performance space, pool, private functions	5,281		4684m2
M3	Hotel Reception, restaurant, wellness centre, cinema	2,874		5136
M4	Hotel Accommodation	3,563	40	
M5+6	Hotel Accommodation	7,430*	60	
Maltster's House	Flexible space	194		279
		19342	10,099	

The above allowances are all higher than those detailed in the Proposed Development brief dated 07 April 2020 with the exception of the Gross Floor Area (GFA) for M5+6 which has been sourced from this document.

* The 7,430m² GFA includes the provision for 5,640m² of accommodation.

2 Sewerage System

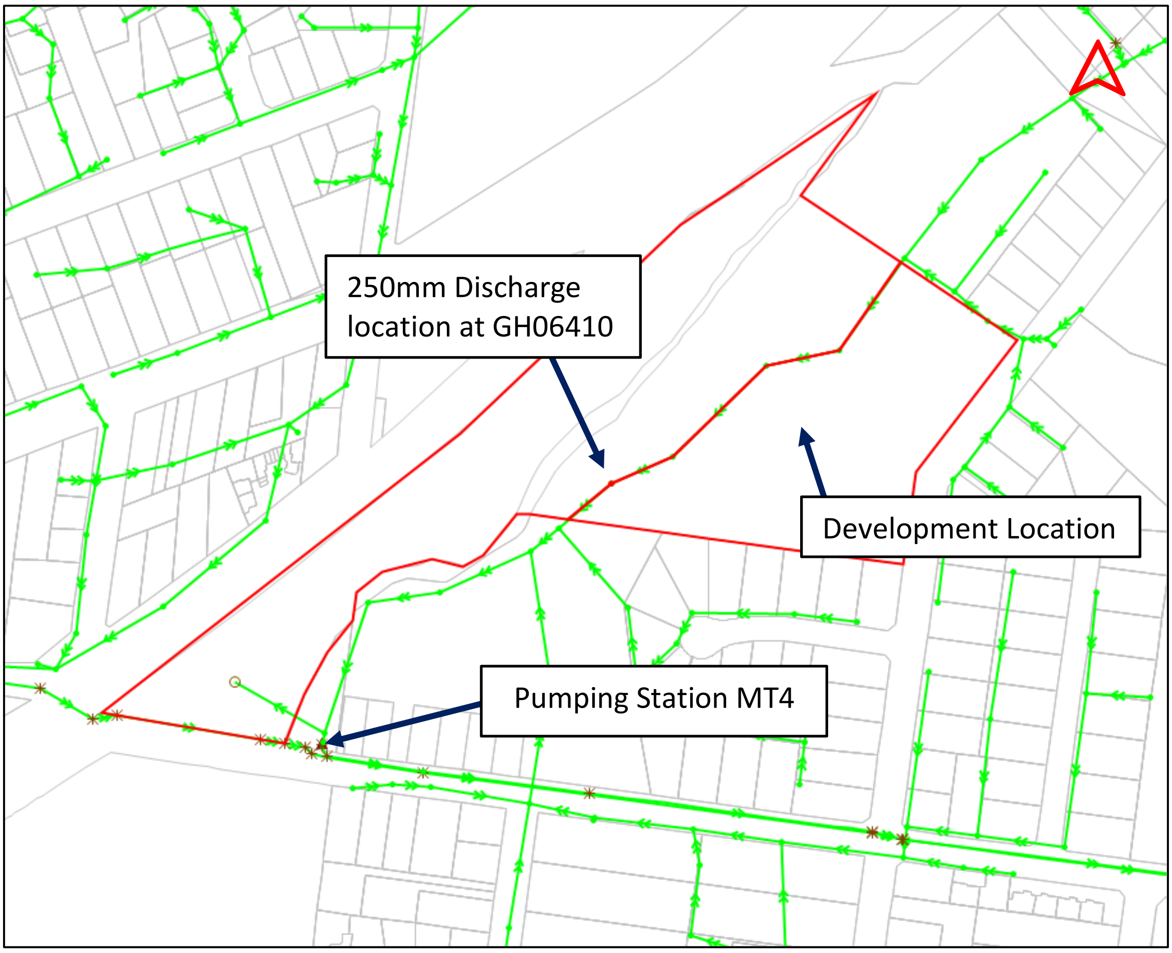
2.1 *Background*

The Mittagong InfoWorks ICM hydraulic model was used to assess the system performance and impact of flows from the proposed development. The model was built and calibrated in 2016.

Details of the proposed development were incorporated into the hydraulic model. Figure 2-1 displays the development location and the potential connection points into the WSC sewerage system.

The development can be serviced by a 250mm diameter sewer running through the property. For the modelling we have assumed that it will discharge into manhole GH06412 near the middle of the development. Flows from the development site drain to pumping station SPS MT4 located approximately 400m downstream from manhole GH06412.

Figure 2-1: Development Site and Sewer Connection Point



2.2 WSC Design Standards

The Wingecarribee Shire Council (WSC) design standards applied in the assessment are as follows:

Sewer Design Standards		
Sewer Loading *Entertainment – Function Room* *ET per Floor Area (m²)*[1] *ET Sewage Loading*	 *0.01* *140*	 *kL/annum*
Sewer Loading *Accommodation – Hotel Room* *ET per Room* *ET Sewage Loading*	 *0.45* *140*	 *kL/annum*
Pumping Station *Emergency storage Detention time*	*8 hr ADWF as per WSA 02 code*	
Other Requirements *1. There should be no dry weather overflow from the system* *2. There should be no dry or wet weather overflow from a pumping station* *3. Refer S64 Determination of ET Guidelines for loading estimate for commercial and industrial developments* *4. Wet weather allowance - Inflow/infiltration (I/I): Provide 2% of the total area as a notional wet weather contribution to the sewerage system* *5. The WSA02 2002 2.3 Sewerage Code of Australia (Table 4.3) requires a minimum sewer size of 225mm DN for commercial and industrial lots >300m².*		

[1] Table 3 of the *Section 64 Determinations of Equivalent Tenements Guidelines, Water Directorate*

Sewer Loading (2 Colo Street, The Maltings)	
Dry Weather Sewage Flow	
Number of Equivalent Tenements (Function rooms)	
((5281 + 2874 + 194) m² x 0.01)	83.5 ET
Maltings 5+6	
(7430 – 5640) m² x 0.01	17.9 ET
Number of Equivalent Tenements (Hotel Rooms)	
(100 Rooms x 0.45)	45 ET
Estimated Sewage Loading (146.4 ET x 0.384 kL/day/ET)	56.2 kL/d
10% Contingency Loading	5.6 kL/d
Sewage Loading (160.6 ET = 61.8 kL/d)	0.72 L/s
Wet Weather Flow An inflow/infiltration (I/I) allowance of 2% runoff of the development area (capped at 2ha) was used to provide a notional wet weather contribution to the sewerage system. The WSC level of service standard for Mittagong is that sewerage infrastructure must have the hydraulic capacity to contain all flows associated with a 1 in 2-year rainfall event.	

2.3 *Existing WSC System Performance*

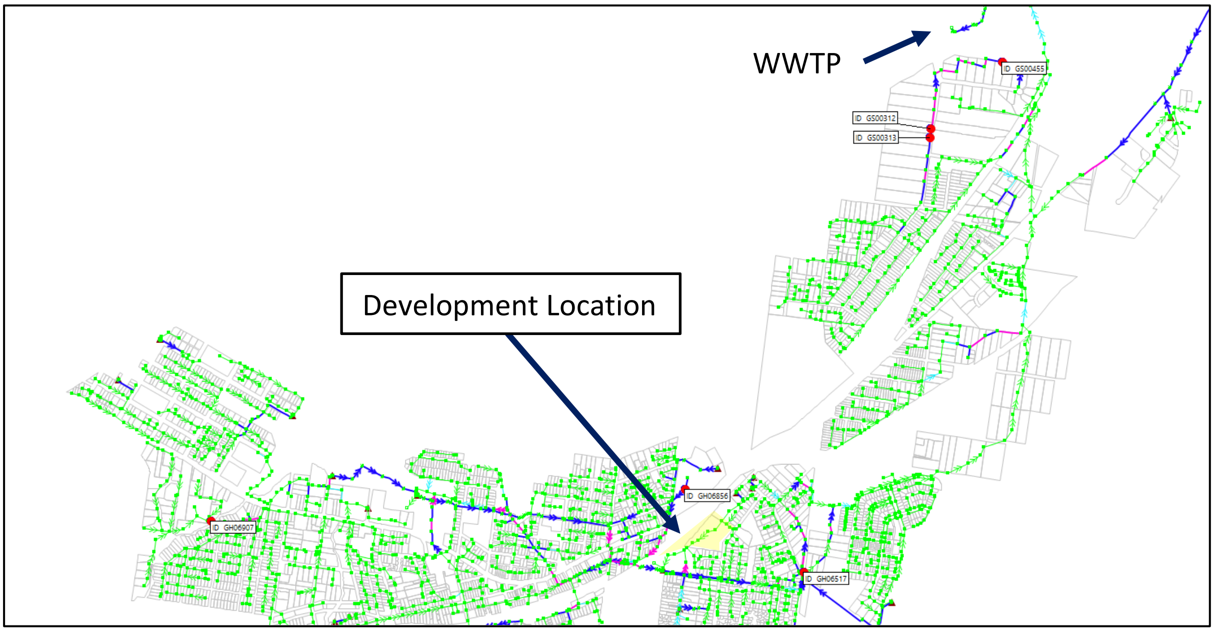
The wet weather performance of the existing system was assessed with a suite of 1 in 2-year design storms with durations ranging from 30 mins to 24 hours.

There were eight manholes predicted to overflow in the catchment during 1 in 2-year design storms. These were as a result of local capacity issues and no flooding occurs in the sewerage network downstream of the development. The 1 in 2-year 2 hour event was selected as the critical event.

Table 2: Existing System Performance

	ARI 2-year storm – Predicted Spill Volume (kL)						
Node ID	**0.5hr**	**1.0hr**	**2.0hr**	**3.0hr**	**6.0hr**	**12.0hr**	**24.0hr**
GH06517	6.8	17.3	20.9	14.0	8.1	0.7	
GH06856		1.0	1.7				
GH06907		1.3	1.3				
GS00312		2.5	4.4	1.1			
GS00313		0.1	0.7				
GS00455		4.1	7.9	9.0	7.0		
Total	**6.8**	**29.7**	**53.6**	**31.4**	**19.7**	**2.6**	**0**

Figure 2-2: Manhole Overflow Locations



2.4 *WSC System Performance including the Development*

The model was updated to include the proposed development and the performance of the WSC network was reassessed against the suite of 1 in 2-year design storms. The additional flows do not change the critical storm duration of the downstream network.

The design storm simulation results showed negligible difference in the performance of the receiving sewerage system between the pre and post development levels. The maximum water levels in the downstream infrastructure increased by 12mm or less as a result of the additional flows from the development.

Figure 2-3 displays the long section of the main sewer downstream of the proposed development during the 1 in 2-year 2-hour design storm with the connection into the 250mm sewer at manhole GH06410. The peak hydraulic grade line (HGL) under current conditions is shown as the blue shaded area within the pipes. For comparison the peak HGL from the post development simulation is displayed as the red line. The HGLs are almost identical and the sewer is running under free flow conditions down to the pumping station MT4. The development does not increase the number of pipes surcharging during the 2-hour critical event.

The predicted manhole spillage volumes are unchanged in the post development modelling. Pumping station MT4 currently has 12hrs and 10mins of average dry weather storage, the development reduces the storage time to 8hrs and 20mins. The post development average dry weather storage time exceeds the required 8hrs ADWF therefore no additional storage is required to contain the additional development flows.

2.5 Sewer Assessment Summary

Hydraulic Capacity

The modelling results showed negligible difference in the performance of the receiving sewerage system between the pre and post development levels.

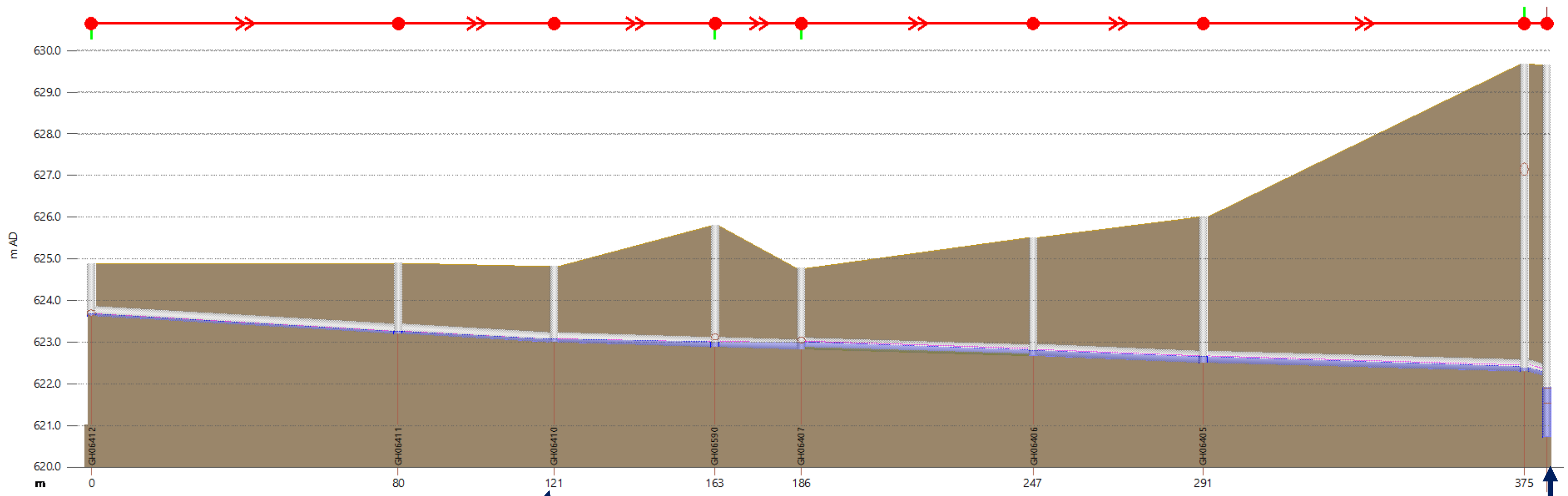
The 250mm receiving sewer has sufficient capacity to convey the flows from the proposed development to pumping station MT4 with no detrimental effects. Pumping station MT4 has enough storage capacity to contain 8hrs of average dry weather flow, post development.

Other Considerations

The Gravity Sewerage Code of Australia v3.1 (Water Services Association of Australia, 2014) Table 5.5 p74 requires a minimum pipe size of DN 225 for commercial and industrial lots >300m^2. This development connects into a DN 250 sewer and complies with the code.

It should be noted that WSC require for all non-residential developments, the connection of the development into a 300mm sewer. This development does not comply with this requirement and would require the upgrade of approximately 65m of 250mm and 61m of 290mm sewer to be compliant.

Figure 2-3: Receiving Sewer Long Section – Max HGL 1 in 2yr 2hr



Link	GH06412.1	GH06411.1	GH06410.1	GH06590.1	GH06407.1	GH06406.1	GH06405.1	-
width (mm)	250	250	250	250	290	300	300	300
us inv (m AD)	623.623	623.207	622.995	622.885	622.826	622.667	622.506	-
ds inv (m AD)	623.207	622.995	622.885	622.826	622.667	622.506	622.297	-
surc	0.19	0.30	0.49	0.71	0.61	0.48	0.48	-
r.pfc (l/s)	43	43	31	31	38	59	49	127
DS flow (l/s)	2.68	2.53	5.16	5.93	22.27	22.23	22.17	-

Node	GH06412	GH06411	GH06410	GH06590	GH06407	GH06406	GH06405	SPS COS1 Access Chamber
ground (m AD)	624.873	624.892	624.815	625.790	624.767	625.507	626.000	629.670

Development connection at GH06410

MT4 Pumping Station

3 Water Supply System

3.1 Introduction

WSC provided an InfoWorks WS Pro hydraulic model of the water supply system to assess the impact of the additional demand from the development at 2 Colo Street, The Maltings, Mittagong NSW on the water supply network.

Analysis of the existing and future network was undertaken for the Ultimate Maximum Day Demand (MDD) scenario.

3.2 WSC Design Standards

The following Wingecarribee Shire Council (WSC) design standards were applied in this assessment:

Water		
<u>Demand</u>		
Average Day Demand per person	*260*	*L/person/day*
Average Day Demand per dwelling	*684*	*L/dwelling/day*
Max Day Demand per dwelling	*3000*	*L/dwelling/day*
Max Hour / MDD Factor	*2.76*	
<u>Pressure</u>		
Minimum pressure required at the domestic meter	*12*	*m*
Maximum pressure should be less than	*120*	*m*
Fire flow – Residential	*10 L/s*	*at 15m residual pressure in the water main*
Fire flow - Commercial	*20 L/s*	
<u>Velocity & Headloss</u>		
Maximum velocity in mains	*2*[1]	*m/s*
Target maximum head loss in mains	*5 m/km*[2]	*for reticulation mains*
Target maximum head loss in mains	*3 m/km*	*for trunk mains*
<u>Reservoir</u>		
Total storage	*24hr PDD*	*ML*
Reserve storage at the lowest operating range	*12hr PDD*	*ML*

1 Velocities in the reticulation network < 2 m/s. Velocities exceeding this value should be approved by WSC. For fire fighting, velocities up to 4.0 m/s are acceptable.
2. These are target values and can be exceeded in certain circumstances in consultation with WSC.

The development demand was estimated using information provided by the client to determine the equivalent tenement (ET) loading.

Water Demand Estimate 2 Colo Street, The Maltings, Mittagong NSW	
Site Area	6.6 ha
Category - Entertainment/Function Space Use Food Preparation / Amenity	0.01 ET
M1 &M2 Floor Area	*5281 m²*
Number of ET (0.01*5281)	52.8 ET
M3 Floor Area	*2874 m²*
Number of ET (0.01*2874)	28.7 ET
Maltster's House Floor Area	*194 m²*
Number of ET (0.01*194)	1.9 ET
Maltings 5+6 Function Area (7430 – 5640)	*1790 m²*
Number of ET (0.01*1790)	17.9 ET
Category - Accommodation – Hotel Room	0.3 ET
M4 - 40 rooms	
M5+6 – 60 rooms	
Number of ET (0.3*100)	30 ET
Subtotal	131.4 ET
10% Contingency	13.1 ET
Total Number of ET	**144.5 ET**
Average Day Demand (ADD) Total	98.8 kL/d
Max Day Demand (MDD) Total	433.4 kL/d
Max Hour Demand (MHD) Total	49.8 kL/hr

- Category from the Water Directorate Report: Section 64 Determinations of Equivalent Tenements Guidelines (2017)
- 1 Standard ET = Town Water Usage of 230 kL/annum (630 L/ET/d)

3.1 Hydraulic Modelling

The development at 2 Colo Street, The Maltings, Mittagong NSW is geographically located within the Willow Vale Zone (RES-WC14). The development is supplied as shown in Figure 3-1.

It has been assumed that Maltings 1 & 2 will connect into the 250mm DICL water pipe located in Ferguson Cres on the west side of the Nattai River to the north of the development.

The remaining buildings have been connected to the 96.5mm AC main located in Southey Street as shown in Figure 3-2.

Figure 3-1: Overview of the Development and Water Supply Network

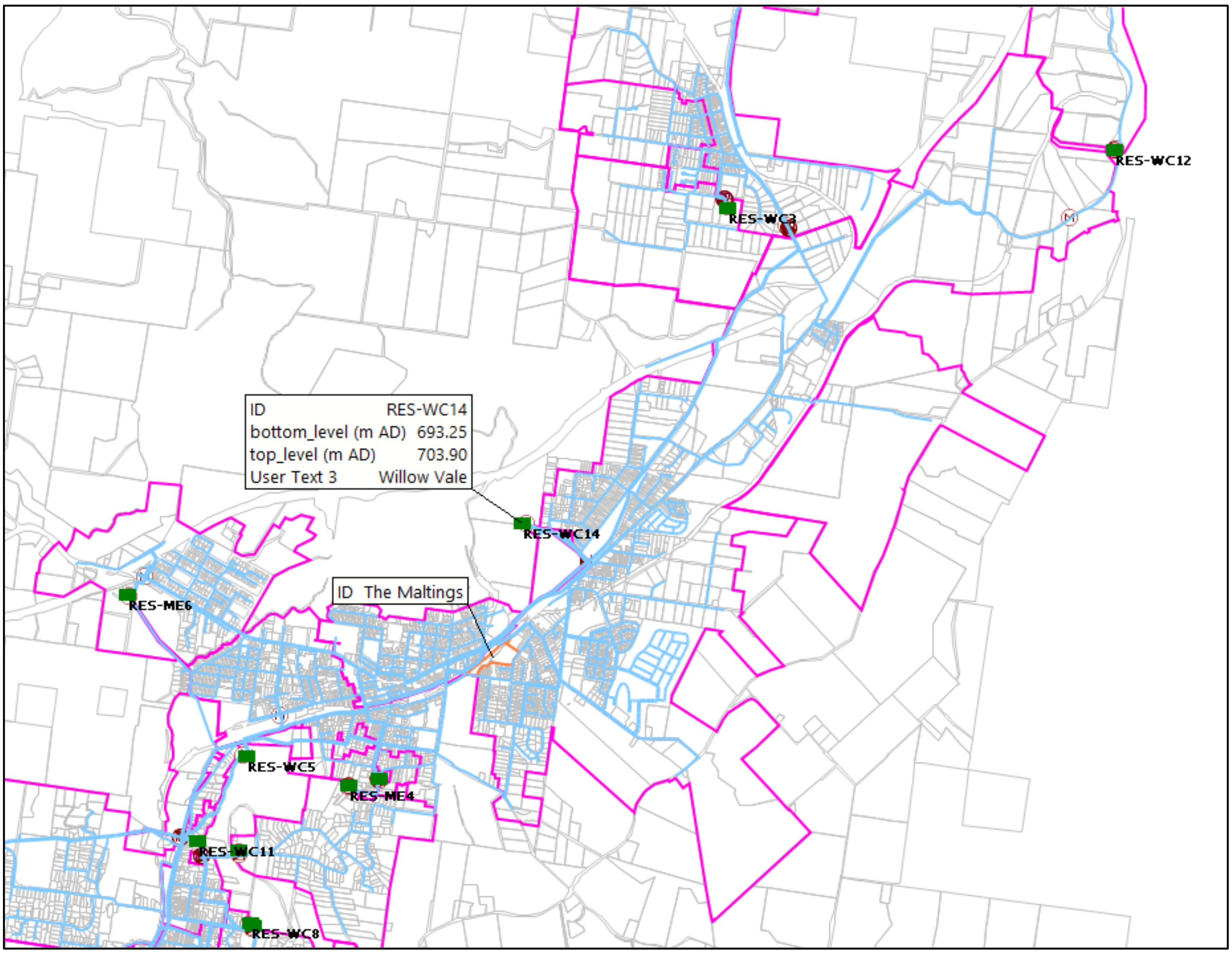
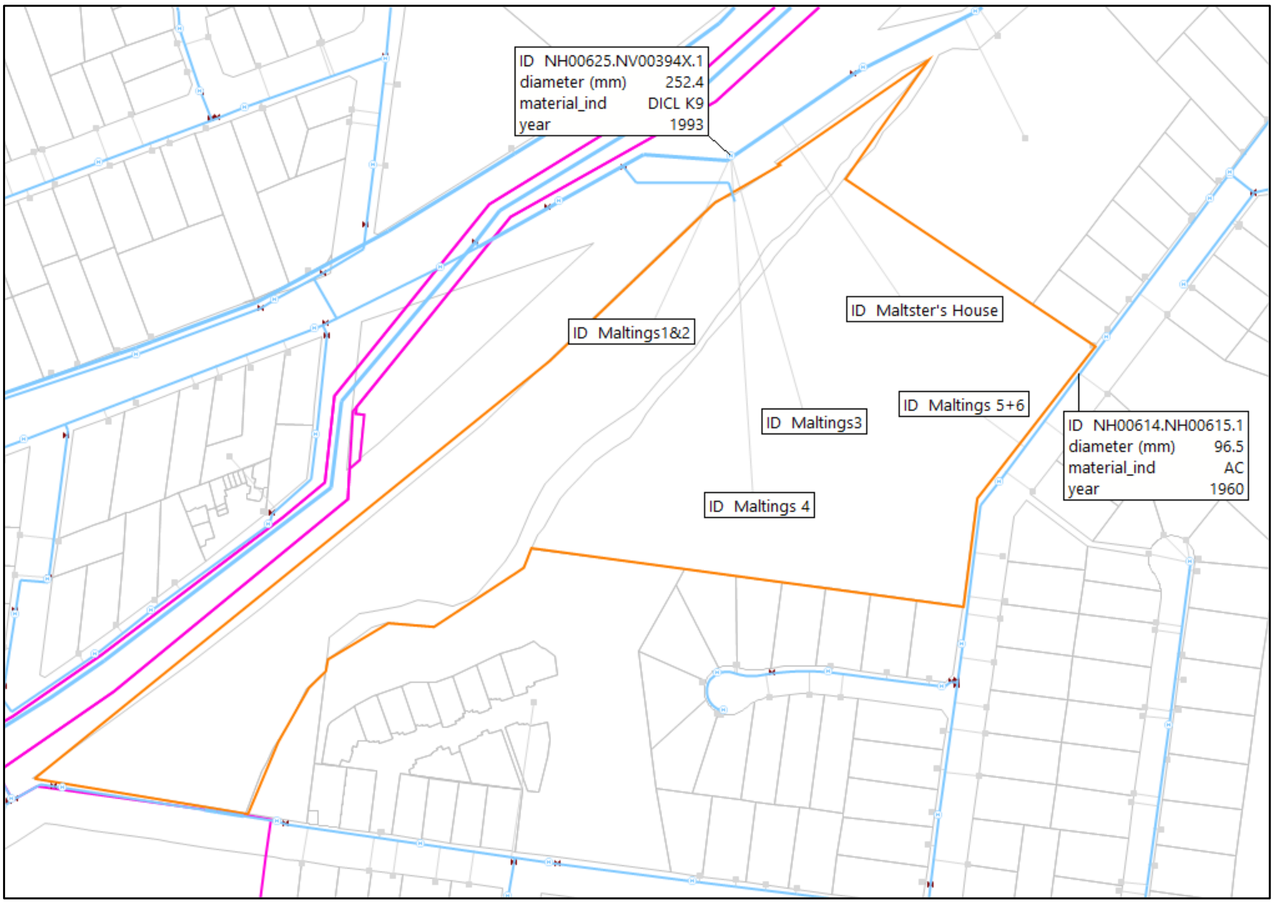


Figure 3-2: Detailed Development layout and Water Supply Connection



3.1.1 Model Configuration

The Ultimate scenario in WSC's InfoWorks WS Pro v4.0.5 model database has been configured to conform with WSC's Development Assessment Template.

Model items used are:

- Demand Diagram – MDD PHF 3.0 + Growth 0.01,
- Demand Scaling – MDD 2.0x AD + Growth, and
- Alternative Demand item – ALTD Growth Sites 0.01 Growth Sites + 1.0 MVEC 0.04 (with additional development lots added)

3.2 *System Performance Results*

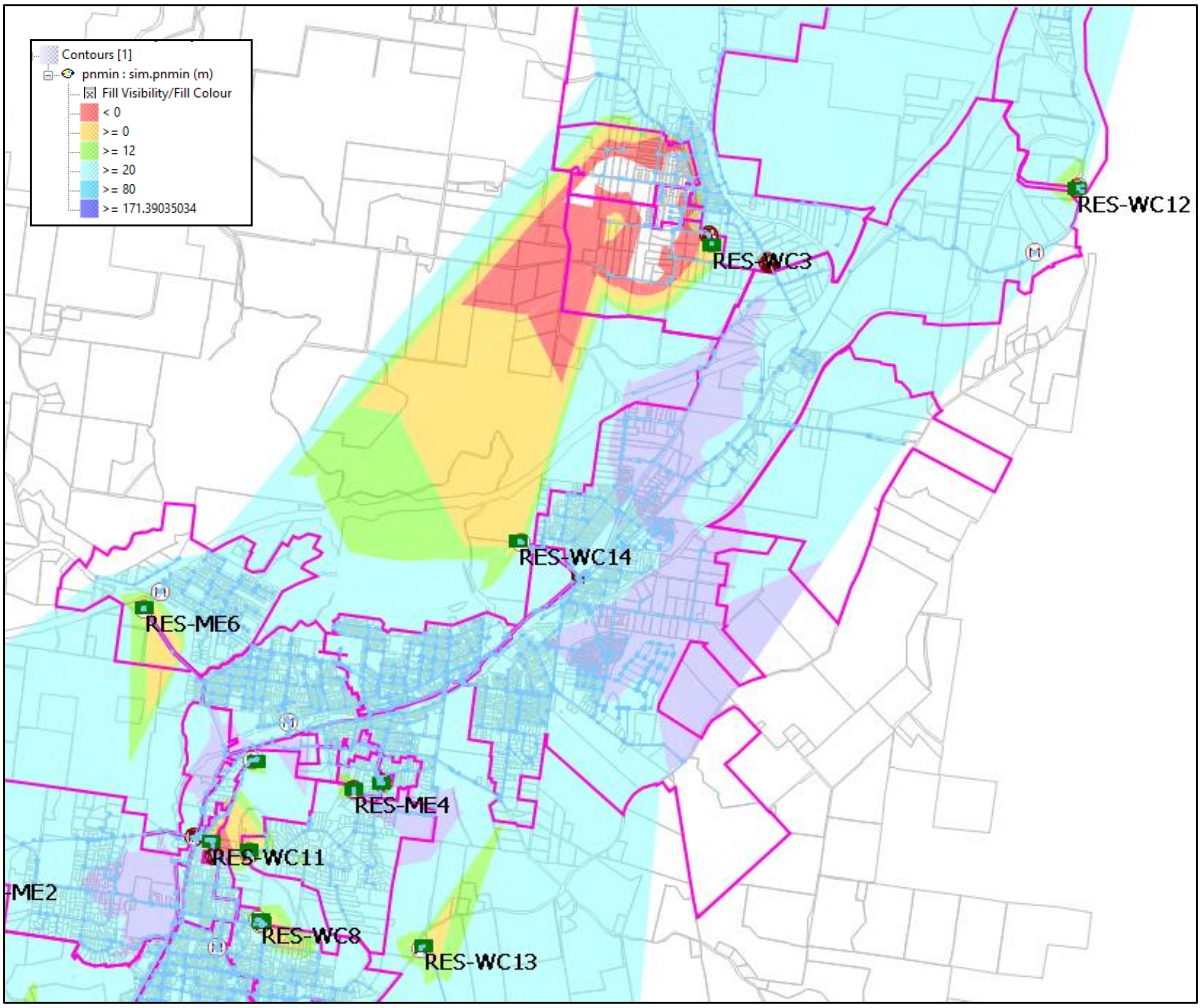
3.2.1 Existing System Performance

Minimum Pressures

The minimum pressures within the Willow Vale Zone (RES-WC14) exceed 12m at all nodes containing modelled customer demand.

Figure 3-3 shows the minimum pressure contours in the network base case.

Figure 3-3: Pressure Contours – Base Case



Reservoir Storage

The development is geographically located within the Willow Vale zone (RES-WC14).

The Willow Vale Reservoir (RES-WC14) has a storage volume of 10.0 ML.

The MDD for the ultimate scenario for Willow Vale pre-development is 3.6 ML/day thus the reservoir storage (10.0 ML) meets the WSC requirement for a minimum of 24 hours of MDD.

The minimum reservoir operating volume (7.8 ML) meets the requirement for reserve storage (greater than 12 hours of MDD).

Peak Velocity and Headloss

Three pipes experience pipe velocity above 2 m/s in the Willow Vale zone in the existing model.

There are 186 pipes, 95 valves and one meter with diameters of 300 mm or less in the Willow Vale Zone that experience a maximum headloss greater than 5 m/km.

There are 15 pipes with a diameter of greater than 300 mm in the Willow Vale Zone that experience a maximum headloss greater than 3 m/km.

Details of these assets are provided in the following section.

3.2.2 System Performance including Development

The results of the hydraulic modelling indicate that the additional demand from the development has minimal impact on the system pressure in the Willow Vale Zone.

Minimum Pressures

The minimum pressures within the Willow Vale Zone (RES-WC14) exceed 12m at all nodes containing modelled customer demand.

The demand node with the lowest pressure in the Willow Vale Zone is bmm000380 (Customer Point JM15566, "The Abbey") where the post development minimum pressure is predicted to be 18.1m (maximum pressure of 23.0m). The address for The Abbey is 300 Range Road, whereas the model has the Customer Point located at 166 Range Road. The customer location and impact should be reviewed by WSC. This node is not impacted by the additional loading from the development at 2 Colo Street, The Maltings, Mittagong NSW.

Figure 3-4 shows the minimum pressure contour with the inclusion of the additional development.

Figure 3-5 shows the difference in pressure in the water supply network due to this development. The demand node experiencing the largest decrease of minimum pressure (1.55 m) is ND00796 (Southey Street at development connection), however the resultant post-development minimum pressure is 61.1 m at this location.

Figure 3-4: Pressure Contours – Base Case + Development

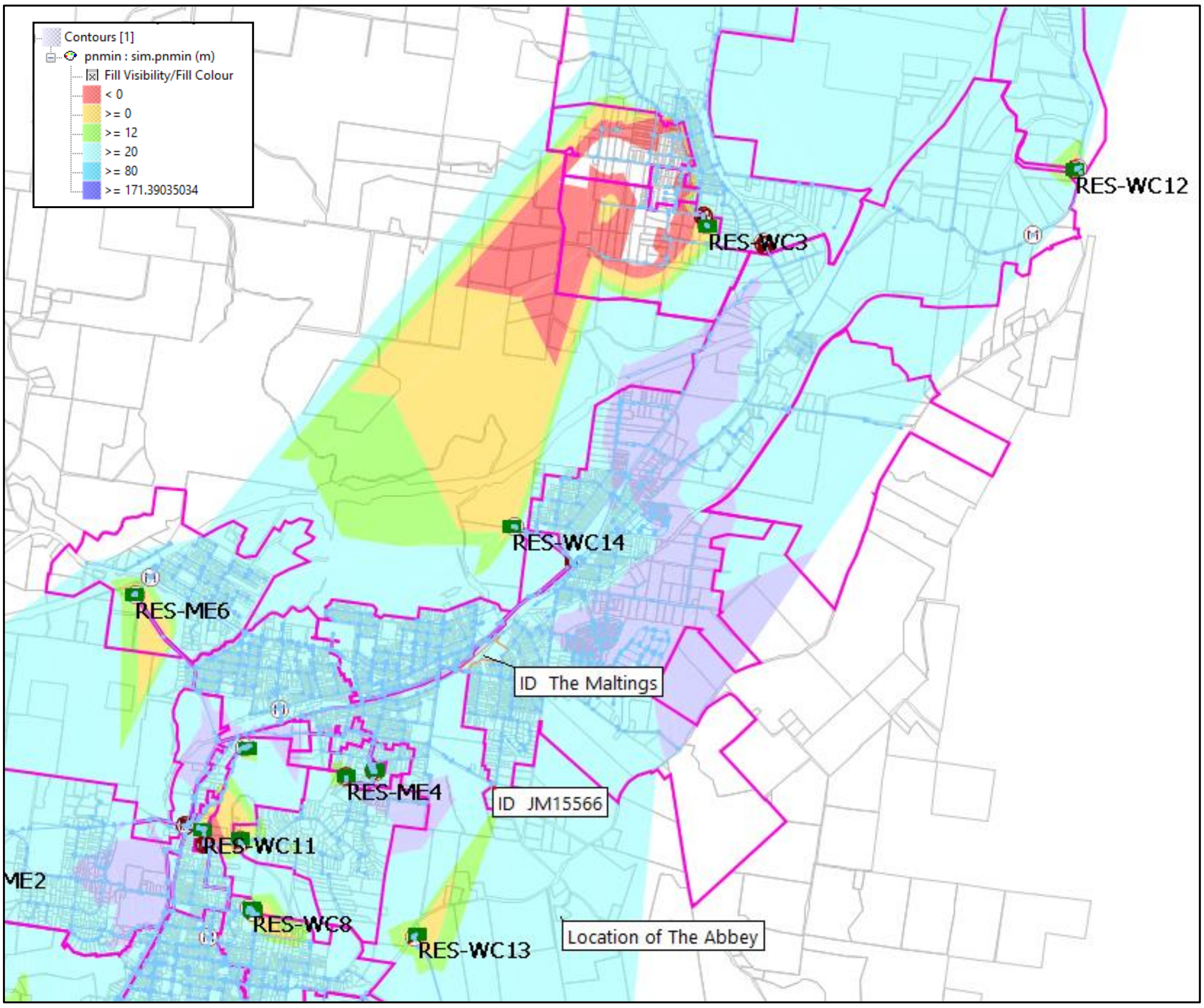


Figure 3-5: Pressure Contour Difference

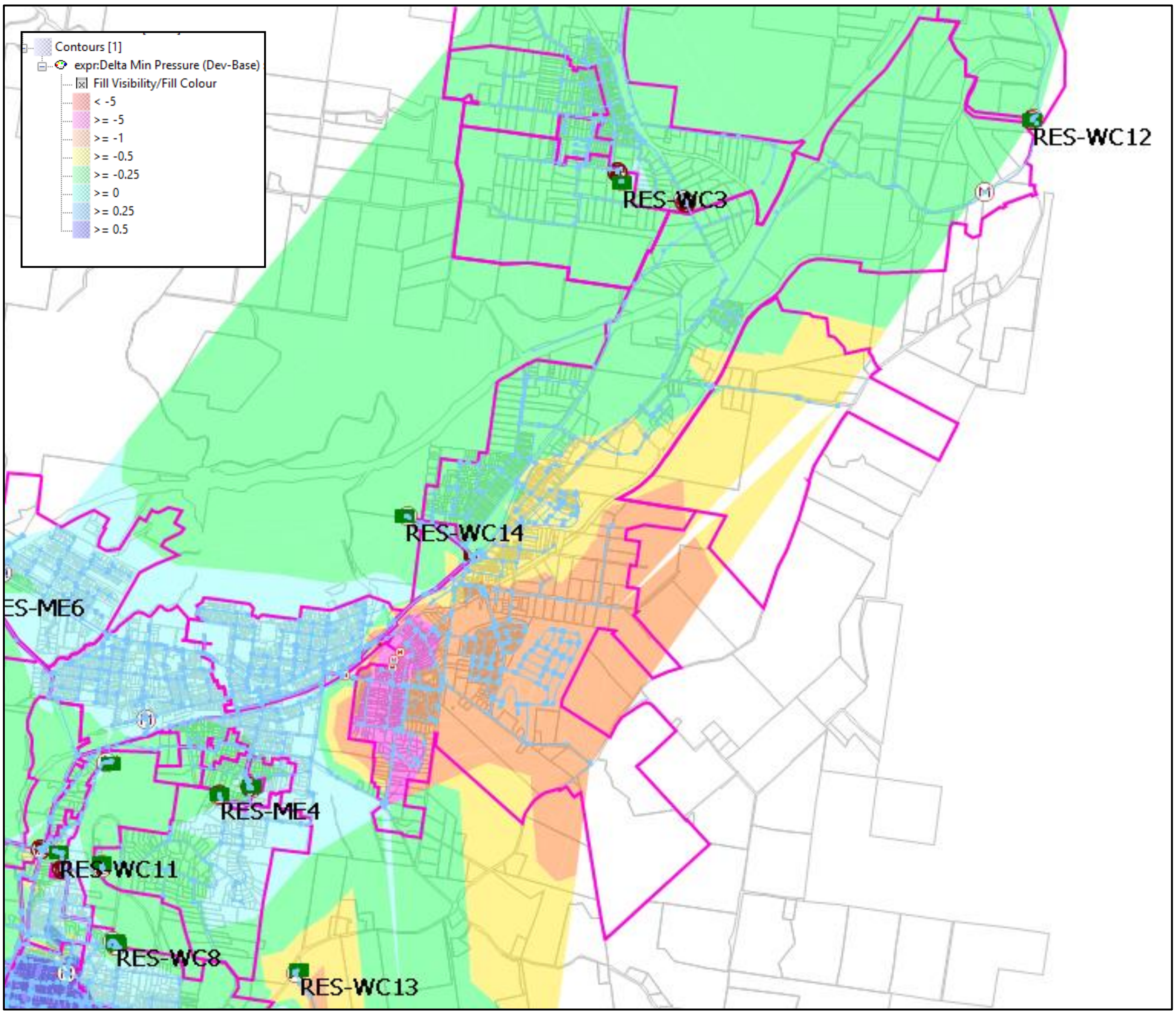
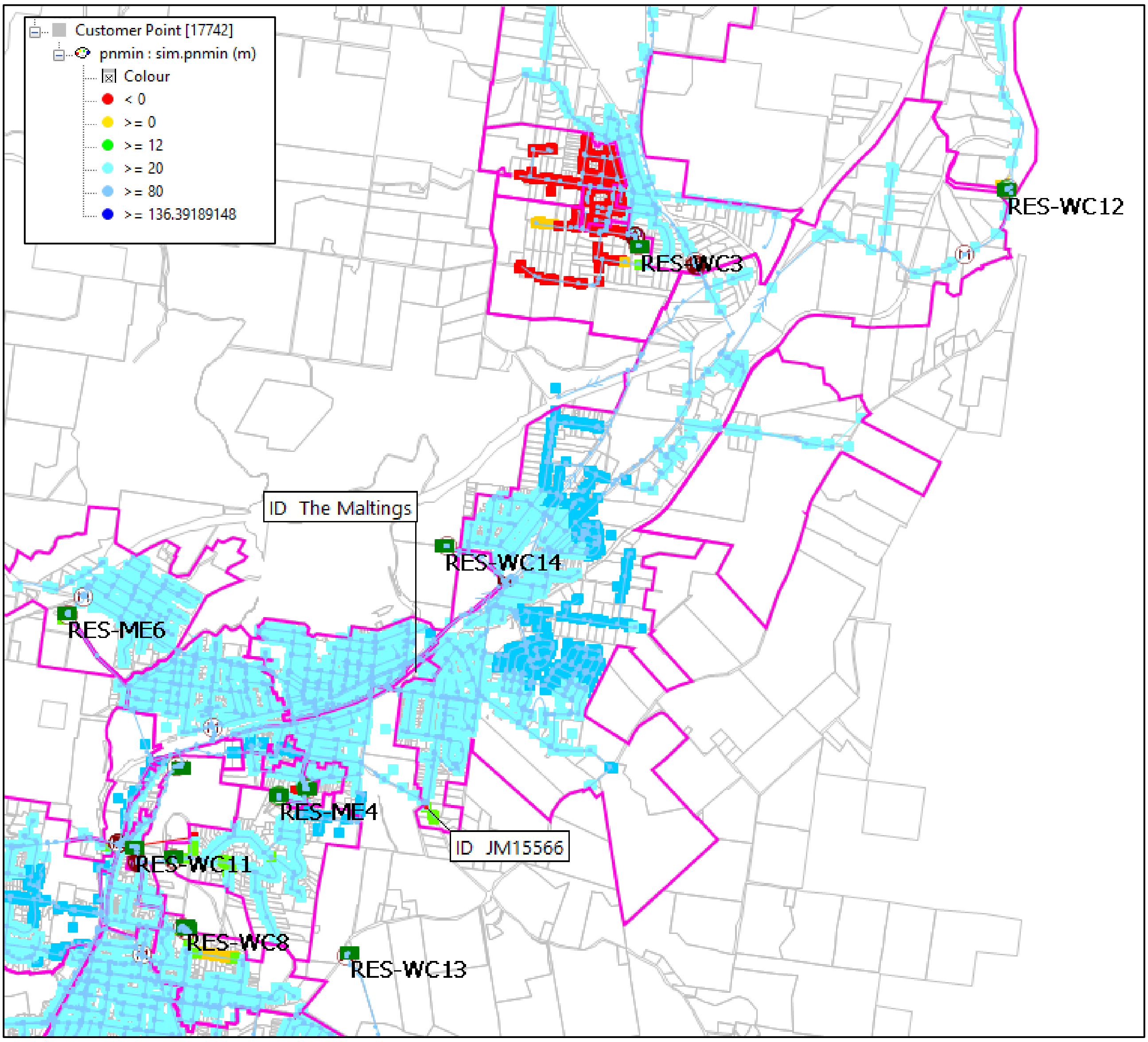


Figure 3-6: Minimum Pressure Customer Points – Base Case + Development



Low pressures are predicted for the customer points shown in red in Figure 3-6. These are located within the Colo Vale Reservoir Zone and are not impacted by this development.

Reservoir Storage

The MDD for the ultimate scenario for Willow Vale post-development is 4.1 ML/day thus the reservoir storage (10.0 ML) meets the WSC requirement for a minimum of 24 hours of MDD.

The minimum Willow Vale reservoir (RES-WC14) operating volume at (7.8 ML) meets the requirement for reserve storage (greater than 12 hours of MDD).

Pipe Velocity

Three pipes experience a pipe velocity above 2 m/s due to the additional loading from the new development. Table 3 shows the predicted maximum pipe velocities for the pre and post development scenarios.

Table 3: Velocity Summary Results

Asset ID (Model ID)	Diameter (mm)	Maximum Velocity (m/s)	
		Base	+ Dev
NP02362 (ND04092.ND04093.1)	101.70	2.04	2.02
NP02362 (ND04093.NV04286X.1)	101.70	2.04	2.02
NP02362 (NV04286Y.NH06721.1)	101.70	2.04	2.02

Headloss

Diameter 300mm or less

There are 187 pipes, 97 valves and one meter with a diameter of 300 mm or less in the Willow Vale zone that experience a maximum headloss greater than 5 m/km.

Diameter greater than 300mm

15 pipes and one valve with a diameter greater than 300 mm in the Willow Vale zone experiences a maximum headloss greater than 3 m/km in the post-development scenario.

A summary of pipes exceeding the target maximum headloss is shown in the Appendix A.

3.3 Fire Flow

A simulation was run to confirm that the development can be serviced with a 20L/s fire flow occurring at 19:00 (the peak demand time), while maintaining a residual pressure in the WSC supply main.

The nearby hydrants (shown in Figure 3-7) was tested with results shown in Table 4.

Figure 3-7: Hydrant Test Locations

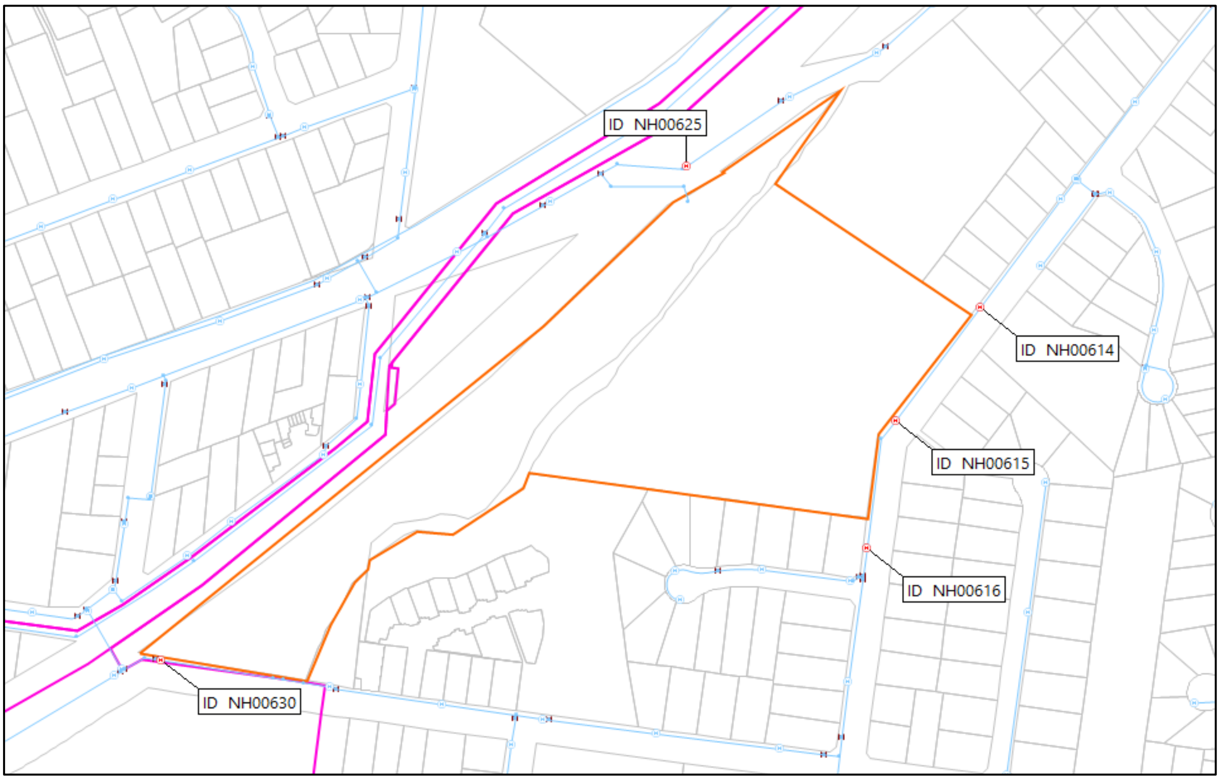


Table 4: Fire Flow Summary Results

Node Tested	Location	Results (20L/s and maximum hydrant flow)
NH00614	Hydrant on Southey Street 96mm AC main	20 L/s @ 44.6 m 36.9 L/s @ 17.4 m
NH00615	Hydrant on Southey Street 96mm AC main	20 L/s @ 47.7 m 38.5 L/s @ 18.9 m
NH00616	Hydrant on Southey Street 96mm AC main	20 L/s @ 41.4 m 36.0 L/s @ 16.7 m
NH00630	Node at South West extent of development	20 L/s @ 54.2 m 54.1 L/s @ 36.5 m
NH00625	Hydrant in Ferguson Cres 252mm DICL main	20 L/s @ 68.3 m 65.8 L/s @ 53.4 m

3.4 Water Supply Assessment Summary

The analysis showed there is a negligible impact from the proposed development at 2 Colo Street, The Maltings, Mittagong NSW on the overall performance of the water supply network.

3.5 Appendix A – Pipe Headloss Results

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
Target maximum headloss in reticulation mains (<=300mm) of 5 m/km				
NV01467 (Valve)	NV01467X.NV01467Y.1	50	16	16
NP03216 (Pipe)	NH07556.NV04874X.1	85	2.46	5.71
NP03216 (Pipe)	NH07557.NH07558.1	85	2.46	5.71
NP03216 (Pipe)	NH07558.NV04875X.1	85	2.46	5.71
NP03216 (Pipe)	NV04874Y.NH07557.1	85	2.46	5.71
NP03216 (Pipe)	NV04875Y.ND04638.1	85	2.46	5.71
NP01180 (Pipe)	ND02778.ND02781.1	87	4.61	6.85
NP02189 (Pipe)	ND02781.NV03916X.1	87	14.91	19.64
NP02973 (Pipe)	ND04558.ND04559.1	87	25.41	25.44
NP02973 (Pipe)	ND04559.ND04560.1	87	25.41	25.44
NP01180 (Pipe)	NH00515.ND02778.1	87	3.25	5.19
NP02189 (Pipe)	NV03916Y.ND03739.1	87	14.91	19.64
NP01549 (Pipe)	ND00673.NV02642X.1	96.5	72.18	71.23
NP01508 (Pipe)	ND00928.ND00937.1	96.5	50.4	50.74
NP01508 (Pipe)	ND00929.ND00928.1	96.5	53.37	53.72
NP01501 (Pipe)	ND00931.NV02573X.1	96.5	7.95	7.97
NP01501 (Pipe)	ND00932.NV02572X.1	96.5	8.08	8.1
NP01508 (Pipe)	ND00933.NV02574X.1	96.5	53.37	53.72
NP01505 (Pipe)	ND00947.NV03443X.1	96.5	26.92	27.28
NP01503 (Pipe)	ND00953.NH05090.1	96.5	6.98	7.03
NP01519 (Pipe)	ND00958.NH05878.1	96.5	7.93	8.01
NP01519 (Pipe)	ND00959.NH05112.1	96.5	10.89	10.96
NP00868 (Pipe)	ND00965.NH04811.1	96.5	28.54	28.86
NP00870 (Pipe)	ND00966.NV01480X.1	96.5	21.95	21.98
NP00870 (Pipe)	ND00967.ND00966.1	96.5	21.83	21.86
NP00870 (Pipe)	ND00968.NV01478X.1	96.5	18.31	18.34
NP01549 (Pipe)	ND01309.NH04877.1	96.5	72.18	71.23
NP00885 (Pipe)	ND01310.NH04878.1	96.5	47.66	48.23
NP01503 (Pipe)	ND03031.NV03449X.1	96.5	7.06	7.11
NP01501 (Pipe)	ND03947.NH06195.1	96.5	7.95	7.97
NP00885 (Pipe)	ND04095.ND01310.1	96.5	45.31	45.86
NP01501 (Pipe)	NH04492.NV02575X.1	96.5	8.08	8.1
NP00868 (Pipe)	NH04808.ND00962.1	96.5	26.27	26.57
NP00868 (Pipe)	NH04810.NH04808.1	96.5	26.76	27.07
NP00868 (Pipe)	NH04811.NV01249X.1	96.5	28.54	28.86
NP01549 (Pipe)	NH04877.NH06721.1	96.5	72.59	71.64

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NP00885 (Pipe)	NH04878.NV05059X.1	96.5	47.66	48.23
NP01503 (Pipe)	NH05090.NH05091.1	96.5	6.77	6.81
NP01503 (Pipe)	NH05091.NH05092.1	96.5	5.77	5.81
NP01503 (Pipe)	NH05092.NV03445X.1	96.5	5.42	5.46
NP01505 (Pipe)	NH05093.NV01475X.1	96.5	28.57	28.94
NP01505 (Pipe)	NH05094.NH05093.1	96.5	28.11	28.48
NP00873 (Pipe)	NH05103.NV01477X.1	96.5	5.2	5.23
NP00870 (Pipe)	NH05104.NH05872.1	96.5	18.78	18.81
NP00870 (Pipe)	NH05108.NH05109.1	96.5	21.95	21.98
NP00870 (Pipe)	NH05109.ND04560.1	96.5	21.95	21.98
NP01519 (Pipe)	NH05112.NV01496X.1	96.5	10.89	10.96
NP01519 (Pipe)	NH05113.NH05114.1	96.5	7.32	7.37
NP01519 (Pipe)	NH05114.NH05115.1	96.5	5.93	5.98
NP01519 (Pipe)	NH05115.NV01497X.1	96.5	5.72	5.77
NP01519 (Pipe)	NH05116.NH05117.1	96.5	6.56	6.64
NP01519 (Pipe)	NH05117.NH05118.1	96.5	5.37	5.44
NP00870 (Pipe)	NH05872.ND00967.1	96.5	19.46	19.49
NP01519 (Pipe)	NH05878.NH05116.1	96.5	7.06	7.14
NP01501 (Pipe)	NH06195.ND00931.1	96.5	7.95	7.97
NP00868 (Pipe)	NV01249Y.NH04810.1	96.5	27.91	28.23
NP01505 (Pipe)	NV01475Y.ND03280.1	96.5	28.79	29.16
NP00873 (Pipe)	NV01477Y.ND00968.1	96.5	5.2	5.23
NP00870 (Pipe)	NV01478Y.NH05104.1	96.5	18.31	18.34
NP00870 (Pipe)	NV01480Y.NH05108.1	96.5	21.95	21.98
NP01519 (Pipe)	NV01496Y.NH05113.1	96.5	8.66	8.72
NP01519 (Pipe)	NV01497Y.ND00958.1	96.5	5.47	5.53
NP01501 (Pipe)	NV02572Y.NH04492.1	96.5	8.08	8.1
NP01501 (Pipe)	NV02573Y.ND00932.1	96.5	7.95	7.97
NP01508 (Pipe)	NV02574Y.ND00929.1	96.5	53.37	53.72
NP01501 (Pipe)	NV02575Y.ND00934.1	96.5	8.08	8.1
NP01549 (Pipe)	NV02642Y.ND01309.1	96.5	72.18	71.23
NP01505 (Pipe)	NV03443Y.NH05094.1	96.5	27.34	27.71
NP01503 (Pipe)	NV03445Y.ND03280.1	96.5	5.42	5.46
NP01503 (Pipe)	NV03449Y.ND00953.1	96.5	7.06	7.11
NP00885 (Pipe)	NV05059Y.ND05010.1	96.5	47.66	48.23
NP01552 (Pipe)	ND00673.NV02648X.1	98	38.77	38.23
NP01552 (Pipe)	NV02648Y.ND01313.1	98	38.77	38.23
NV00030 (Valve)	NV00030X.NV00030Y.1	100	19.57	19.75

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NV00361 (Valve)	NV00361X.NV00361Y.1	100	3.76	6.39
NV00364 (Valve)	NV00364X.NV00364Y.1	100	4.58	5.24
NV00391 (Valve)	NV00391X.NV00391Y.1	100	6.09	7.24
NV00392 (Valve)	NV00392X.NV00392Y.1	100	6.09	7.24
NV01245 (Valve)	NV01245X.NV01245Y.1	100	8.06	8.14
NV01247 (Valve)	NV01247X.NV01247Y.1	100	16.27	16.43
NV01249 (Valve)	NV01249X.NV01249Y.1	100	48.39	48.94
NV01251 (Valve)	NV01251X.NV01251Y.1	100	55.35	55.94
NV01475 (Valve)	NV01475X.NV01475Y.1	100	49.92	50.58
NV01477 (Valve)	NV01477X.NV01477Y.1	100	8.76	8.82
NV01478 (Valve)	NV01478X.NV01478Y.1	100	31.57	31.62
NV01480 (Valve)	NV01480X.NV01480Y.1	100	37.94	37.99
NV01494 (Valve)	NV01494X.NV01494Y.1	100	6.19	6.17
NV01496 (Valve)	NV01496X.NV01496Y.1	100	17.56	17.68
NV01497 (Valve)	NV01497X.NV01497Y.1	100	9.24	9.32
NV02570 (Valve)	NV02570X.NV02570Y.1	100	6.38	6.39
NV02571 (Valve)	NV02571X.NV02571Y.1	100	6.62	6.64
NV02572 (Valve)	NV02572X.NV02572Y.1	100	13.75	13.77
NV02573 (Valve)	NV02573X.NV02573Y.1	100	13.52	13.55
NV02574 (Valve)	NV02574X.NV02574Y.1	100	93.12	93.73
NV02575 (Valve)	NV02575X.NV02575Y.1	100	13.75	13.77
NV02590 (Valve)	NV02590X.NV02590Y.1	100	119.18	119.97
NV02642 (Valve)	NV02642X.NV02642Y.1	100	126.26	124.58
NV02643 (Valve)	NV02643X.NV02643Y.1	100	7.41	7.33
NV02644 (Valve)	NV02644X.NV02644Y.1	100	7.41	7.33
NV02648 (Valve)	NV02648X.NV02648Y.1	100	73.17	72.13
NV02652 (Valve)	NV02652X.NV02652Y.1	100	7.94	7.86
NV03338 (Valve)	NV03338X.NV03338Y.1	100	26.51	25.9
NV03442 (Valve)	NV03442X.NV03442Y.1	100	5.32	5.36
NV03443 (Valve)	NV03443X.NV03443Y.1	100	46.65	47.28
NV03444 (Valve)	NV03444X.NV03444Y.1	100	5.32	5.36
NV03445 (Valve)	NV03445X.NV03445Y.1	100	9.15	9.22
NV03446 (Valve)	NV03446X.NV03446Y.1	100	7.72	7.84
NV03449 (Valve)	NV03449X.NV03449Y.1	100	11.99	12.07
NV03661 (Valve)	NV03661X.NV03661Y.1	100	21.18	21.37
NV03662 (Valve)	NV03662X.NV03662Y.1	100	20.93	21.11
NV03723 (Valve)	NV03723X.NV03723Y.1	100	197.78	198.37
NV03724 (Valve)	NV03724X.NV03724Y.1	100	197.78	198.37

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NV03916 (Valve)	NV03916X.NV03916Y.1	100	21.46	28.83
NV03982 (Valve)	NV03982X.NV03982Y.1	100	5.74	5.32
NV03994 (Valve)	NV03994X.NV03994Y.1	100	8.79	8.43
NV04058 (Valve)	NV04058X.NV04058Y.1	100	4.9	5.09
NV04072 (Valve)	NV04072X.NV04072Y.1	100	6.84	7.06
NV04089 (Valve)	NV04089X.NV04089Y.1	100	8.83	8.43
NV04090 (Valve)	NV04090X.NV04090Y.1	100	8.83	8.43
NV04279 (Valve)	NV04279X.NV04279Y.1	100	8.83	8.43
NV04281 (Valve)	NV04281X.NV04281Y.1	100	11.17	10.33
NV04283 (Valve)	NV04283X.NV04283Y.1	100	9.33	8.56
NV04284 (Valve)	NV04284X.NV04284Y.1	100	6.67	6.02
NV04285 (Valve)	NV04285X.NV04285Y.1	100	6.33	5.7
NV04286 (Valve)	NV04286X.NV04286Y.1	100	127.75	126.07
NV04491 (Valve)	NV04491X.NV04491Y.1	100	6.63	6.71
NV04492 (Valve)	NV04492X.NV04492Y.1	100	6.39	6.47
NV04496 (Valve)	NV04496X.NV04496Y.1	100	6.63	6.71
NV04634 (Valve)	NV04634X.NV04634Y.1	100	5.78	5.71
NV04636 (Valve)	NV04636X.NV04636Y.1	100	5.78	5.71
NV04638 (Valve)	NV04638X.NV04638Y.1	100	5.78	5.71
NV04640 (Valve)	NV04640X.NV04640Y.1	100	5.49	5.43
NV04667 (Valve)	NV04667X.NV04667Y.1	100	2420.31	2431.4
NV05059 (Valve)	NV05059X.NV05059Y.1	100	83.08	84.07
NM00001 (Meter)	bmm000033.bmm000034.1	100	93.51	93.79
NP01513 (Pipe)	ND00960.NV03662X.1	101.7	9.3	9.39
NP01513 (Pipe)	ND00961.ND00960.1	101.7	9.3	9.39
NP01520 (Pipe)	ND00961.NH04806.1	101.7	9.3	9.39
NP01518 (Pipe)	ND00965.NV01251X.1	101.7	24.25	24.51
NP01520 (Pipe)	ND03433.NV00030X.1	101.7	8.8	8.87
NP02176 (Pipe)	ND03706.ND03715.1	101.7	24.52	24.78
NP02176 (Pipe)	ND03715.NH06304.1	101.7	24.52	24.78
NP02228 (Pipe)	ND03818.ND03819.1	101.7	9.87	9.55
NP02228 (Pipe)	ND03819.ND03820.1	101.7	9.87	9.55
NP02228 (Pipe)	ND03821.ND03842.1	101.7	9.87	9.55
NP02228 (Pipe)	ND03842.ND03818.1	101.7	9.87	9.55
NP02362 (Pipe)	ND04091.ND04092.1	101.7	34.18	34.6
NP02362 (Pipe)	ND04092.ND04093.1	101.7	55.49	54.76
NP02362 (Pipe)	ND04093.NV04286X.1	101.7	55.49	54.76
NP02364 (Pipe)	ND04094.NH06720.1	101.7	34.18	34.6

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NP02364 (Pipe)	ND04095.ND04094.1	101.7	34.18	34.6
NP01520 (Pipe)	NH04804.NV01247X.1	101.7	7.44	7.51
NP01520 (Pipe)	NH04805.ND03433.1	101.7	8.9	8.98
NP01520 (Pipe)	NH04806.NH04805.1	101.7	9.12	9.2
NP01518 (Pipe)	NH04812.NH04813.1	101.7	24.25	24.51
NP01518 (Pipe)	NH04813.ND03705.1	101.7	24.51	24.77
NP01513 (Pipe)	NH05974.NV03661X.1	101.7	9.3	9.39
NP02176 (Pipe)	NH06304.NH06305.1	101.7	24.51	24.77
NP02176 (Pipe)	NH06305.ND03705.1	101.7	24.51	24.77
NP02364 (Pipe)	NH06720.ND04091.1	101.7	34.18	34.6
NP01520 (Pipe)	NV00030Y.NH04804.1	101.7	8.28	8.35
NP01520 (Pipe)	NV01247Y.ND03540.1	101.7	7.27	7.34
NP01518 (Pipe)	NV01251Y.NH04812.1	101.7	24.25	24.51
NP01513 (Pipe)	NV03661Y.ND00962.1	101.7	9.41	9.5
NP01513 (Pipe)	NV03662Y.NH05974.1	101.7	9.3	9.39
NP02362 (Pipe)	NV04286Y.NH06721.1	101.7	55.49	54.76
NP03353 (Pipe)	ND05010.NV05061X.1	132	9.36	9.46
NP03353 (Pipe)	ND05011.NV05062X.1	132	9.36	9.46
NP03345 (Pipe)	ND05020.NV05075X.1	132	60.27	60.53
NP03353 (Pipe)	NH07808.ND05011.1	132	9.36	9.46
NP03353 (Pipe)	NV05061Y.NH07808.1	132	9.36	9.46
NP03353 (Pipe)	NV05062Y.bmm000431.1	132	9.36	9.46
NP03345 (Pipe)	NV05075Y.ND05019.1	132	60.27	60.53
NP01469 (Pipe)	bmm000033.NV03724X.1	146.3	12.84	12.88
NP01564 (Pipe)	ND00895.ND03213.1	146.3	9.72	9.73
NP01497 (Pipe)	ND00904.NH04464.1	146.3	5.79	5.36
NP01509 (Pipe)	ND00937.NH04493.1	146.3	5.41	5.45
NP01565 (Pipe)	ND01274.ND03282.1	146.3	7.8	7.85
NP01469 (Pipe)	ND01536.ND01537.1	146.3	12.91	12.95
NP01469 (Pipe)	ND01537.NV02490X.1	146.3	12.92	12.96
NP00877 (Pipe)	ND01544.NH04829.1	146.3	5.54	5.52
NP01497 (Pipe)	ND05020.NH07829.1	146.3	20	19.94
NP01469 (Pipe)	NH04269.ND01536.1	146.3	12.91	12.95
NP01469 (Pipe)	NH04270.NH04269.1	146.3	12.86	12.9
NP01469 (Pipe)	NH04271.NV03723X.1	146.3	12.84	12.88
NP01469 (Pipe)	NH04272.NH04271.1	146.3	12.81	12.84
NP01469 (Pipe)	NH04273.NH04272.1	146.3	12.8	12.83
NP01497 (Pipe)	NH04464.ND05020.1	146.3	5.87	5.43

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NP01497 (Pipe)	NH04470.ND00904.1	146.3	5.4	5.02
NP01509 (Pipe)	NH04493.NH04497.1	146.3	5.3	5.33
NP01509 (Pipe)	NH04497.NV02579X.1	146.3	5.23	5.27
NP01565 (Pipe)	NH04522.NV02590X.1	146.3	7.81	7.86
NP00877 (Pipe)	NH04828.NV02684X.1	146.3	5.93	5.91
NP00877 (Pipe)	NH04829.NH04828.1	146.3	5.77	5.75
NP01497 (Pipe)	NH07829.NV04465X.1	146.3	20	19.94
NP01469 (Pipe)	NV02490Y.ND01104.1	146.3	12.92	12.96
NP01509 (Pipe)	NV02579Y.ND00941.1	146.3	5.23	5.27
NP01565 (Pipe)	NV02590Y.ND01274.1	146.3	7.81	7.86
NP00877 (Pipe)	NV02684Y.ND00944.1	146.3	5.93	5.91
NP01469 (Pipe)	NV03464Y.NH04270.1	146.3	12.85	12.89
NP01469 (Pipe)	NV03723Y.bmm000034.1	146.3	12.84	12.88
NP01469 (Pipe)	NV03724Y.NV03464X.1	146.3	12.84	12.88
NP01489 (Pipe)	ND00879.NH06932.1	150	12.98	12.9
NP01489 (Pipe)	ND01994.NV02585X.1	150	12.98	12.9
NP01489 (Pipe)	NH06932.NV03458X.1	150	12.98	12.9
NP01489 (Pipe)	NV02585Y.ND00879.1	150	12.98	12.9
NP01489 (Pipe)	NV03458Y.ND03282.1	150	12.98	12.9
NV01461 (Valve)	NV01461X.NV01461Y.1	150	10.05	10.06
NV01462 (Valve)	NV01462X.NV01462Y.1	150	18.51	18.62
NV01476 (Valve)	NV01476X.NV01476Y.1	150	7.11	7.21
NV02490 (Valve)	NV02490X.NV02490Y.1	150	30.22	30.31
NV02562 (Valve)	NV02562X.NV02562Y.1	150	12.14	11.29
NV02579 (Valve)	NV02579X.NV02579Y.1	150	12.04	12.13
NV02585 (Valve)	NV02585X.NV02585Y.1	150	34.63	34.42
NV02684 (Valve)	NV02684X.NV02684Y.1	150	13.68	13.64
NV03342 (Valve)	NV03342X.NV03342Y.1	150	6.92	6.98
NV03457 (Valve)	NV03457X.NV03457Y.1	150	10.05	10.06
NV03458 (Valve)	NV03458X.NV03458Y.1	150	34.63	34.42
NV03464 (Valve)	NV03464X.NV03464Y.1	150	30.06	30.14
NV03656 (Valve)	NV03656X.NV03656Y.1	150	156084.8	157633.5
NV03657 (Valve)	NV03657X.NV03657Y.1	150	7.11	7.21
NV03791 (Valve)	NV03791X.NV03791Y.1	150	12.14	11.29
NV04464 (Valve)	NV04464X.NV04464Y.1	150	12.14	11.29
NV04678 (Valve)	NV04678X.NV04678Y.1	150	10.93	10.78
NV05061 (Valve)	NV05061X.NV05061Y.1	150	12.67	12.82
NV05062 (Valve)	NV05062X.NV05062Y.1	150	12.67	12.82

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NV05075 (Valve)	NV05075X.NV05075Y.1	150	83.31	83.68
NP03344 (Pipe)	NH04463.NV05076X.1	162	6.27	6.26
NP03344 (Pipe)	NV05076Y.ND04978.1	162	6.27	6.26
NV01464 (Valve)	NV01464X.NV01464Y.1	200	5.08	5.11
NV01483 (Valve)	NV01483X.NV01483Y.1	200	9.5	9.44
NV01484 (Valve)	NV01484X.NV01484Y.1	200	9.5	9.44
NV03990 (Valve)	NV03990X.NV03990Y.1	200	5.74	5.89
NV04070 (Valve)	NV04070X.NV04070Y.1	200	10.21	10.47
NV04073 (Valve)	NV04073X.NV04073Y.1	200	7.12	7.29
NV04329 (Valve)	NV04329X.NV04329Y.1	200	10.55	10.8
NV04330 (Valve)	NV04330X.NV04330Y.1	200	10.21	10.47
NV04331 (Valve)	NV04331X.NV04331Y.1	200	10.55	10.8
NP00793 (Pipe)	ND00814.ND00815.1	201.4	5.74	6.2
NP00793 (Pipe)	ND03681.ND00814.1	201.4	5.74	6.2
NP00874 (Pipe)	ND00910.NV03620.1	243.4	5.8	5.82
NP00874 (Pipe)	ND00911.NV03621.1	243.4	5.8	5.82
NP00874 (Pipe)	ND00912.NV02660.1	243.4	5.8	5.82
NP00874 (Pipe)	ND00913.ND04372.1	243.4	5.8	5.82
NP00874 (Pipe)	ND00915.NV03617.1	243.4	5.8	5.83
NP00874 (Pipe)	ND00916.NV03615.1	243.4	5.8	5.83
NP00874 (Pipe)	ND01275.NV03618.1	243.4	5.8	5.82
NP00874 (Pipe)	ND01276.ND01275.1	243.4	5.8	5.82
NP00874 (Pipe)	ND01277.ND01276.1	243.4	5.8	5.82
NP00874 (Pipe)	ND01278.ND01277.1	243.4	5.8	5.82
NP00874 (Pipe)	ND05019.NH07830.1	243.4	5.8	5.82
NP00874 (Pipe)	NH07830.ND00912.1	243.4	5.8	5.82
NP00874 (Pipe)	NV02660.ND00911.1	243.4	5.8	5.82
NP00874 (Pipe)	NV03615.ND03381.1	243.4	5.8	5.83
NP00874 (Pipe)	NV03616.ND00916.1	243.4	5.8	5.83
NP00874 (Pipe)	NV03617.NV03616.1	243.4	5.8	5.83
NP00874 (Pipe)	NV03618.ND00913.1	243.4	5.8	5.82
NP00874 (Pipe)	NV03619.ND01278.1	243.4	5.8	5.82
NP00874 (Pipe)	NV03620.NV03619.1	243.4	5.8	5.82
NP00874 (Pipe)	NV03621.ND00910.1	243.4	5.8	5.82
NP00874 (Pipe)	NV04467Y.ND00915.1	243.4	5.8	5.83
NV04467 (Valve)	NV04467X.NV04467Y.1	250	20.02	20.11
NP01262 (Pipe)	ND03733.ND04542.1	294.6	11.52	11.49
NP01262 (Pipe)	ND04542.NV03541.1	294.6	11.52	11.49

Asset ID	Model ID	Diameter (mm)	Max Headloss (m/km)	
			Pre	+ Dev
NP01262 (Pipe)	NV03459.NV03265.1	294.6	11.56	11.53
NP01262 (Pipe)	NV03460.NV03459.1	294.6	11.52	11.49
NP01262 (Pipe)	NV03541.NV03655.1	294.6	11.52	11.49
NP01262 (Pipe)	NV03655.NV03460.1	294.6	11.52	11.49
NV03440 (Valve)	NV03440X.NV03440Y.1	300	17.02	17.10
NV03900 (Valve)	NV03900X.NV03900Y.1	300	560.2	558.76
NV03902 (Valve)	NV03902X.NV03902Y.1	300	49.68	49.56
NV03903 (Valve)	NV03903X.NV03903Y.1	300	49.68	49.56
Target maximum headloss in trunk mains (>300mm) of 3 m/km				
NP02181 (Pipe)	bmm000188.NV03907X.1	363.3	3.89	3.88
NP02181 (Pipe)	bmm000314.NV03903X.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03667.ND03668.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03668.ND03669.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03669.ND03670.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03670.ND03711.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03707.ND03667.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03709.ND03707.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03711.bmm000188.1	363.3	3.89	3.88
NP02181 (Pipe)	ND03732.ND03733.1	363.3	3.89	3.88
NP02181 (Pipe)	NV03900X.NV03902X.1	363.3	3.89	3.88
NP02181 (Pipe)	NV03902Y.ND03709.1	363.3	3.89	3.88
NP02181 (Pipe)	NV03903Y.NV03900Y.1	363.3	3.89	3.88
NP02181 (Pipe)	NV03907Y.ND03732.1	363.3	3.89	3.88
NP02181 (Pipe)	RES-WC14.bmm000314.1	363.3	3.89	3.88
NV03913 (Valve)	NV03913X.NV03913Y.1	375	1.82	3.07