Glendowie Branch Sewer Upgrade – Integrated Transport Assessment

Prepared for Watercare

Final Draft

April 2016

MWH®

BUILDING A BETTER WORLD

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
[redacted]	[redacted]

PREPARED BY	[redacted]	07/04/2016
CHECKED BY	[redacted]	07/04/2016
REVIEWED BY	[redacted]	07/04/2016
APPROVED FOR ISSUE BY	[redacted]	07/04/2016

AUCKLAND
MWH House Level 3, 111 Carlton Gore Road, Newmarket, Auckland 1023
PO Box 9176, Newmarket, Auckland 1149
TEL +64 9 580 4500, FAX +64 9 580 7600

REVISION SCHEDULE

Rev No	Date	Description	Signature or Typed Name (documentation on file).			
			Prepared by	Checked by	Reviewed by	Approved by
1	17/06/15	Draft for Comment	MS	AG	JE	RS
2	02/10/15	Second Draft	MS/JE	AG	RS	RS
3	11/03/16	Third Draft	MS	AG	JE	RS
4	31/03/16	Fourth Draft	MS	AG	JE	RS
5	07/04/16	Final Draft	MS	AG	JE	RS

Executive Summary

MWH has been commissioned by Watercare Services Ltd to undertake an Integrated Transport Assessment (ITA) to assess the traffic impact associated with the construction of the Glendowie Branch Sewer Upgrade. The scope of works involves the construction of a large diameter transmission sewer, a new wastewater pump station, a new overflow structure, associated pipework chambers and decommissioning of abandoned infrastructure. Appendix A provides the preliminary layout for the project.

This assessment quantifies the level of construction traffic expected as a result of the proposed works and identifies suitable arrangements to accommodate the safe and efficient movement of traffic. This ITA takes into consideration the potential impact to public/active transport services and access to local amenities.

Proposed Works

The new branch sewers are proposed to run broadly adjacent to the following roads:

- Elstree Avenue - between Taniwha Street and the Glen Innes Aquatic Centre.
- Taniwha Street - between Elstree Avenue and Fenchurch Street.
- Taniwha Street – directly crossing the roadway adjacent to No 109 Taniwha Street.
- Taniwha Street – directly crossing the roadway adjacent to No. 117 Taniwha Street.

The proposed works consist of the following:

- New Pumping Station.
- Storage tunnel (DN 1950 to DN2300).
- Sanitary Sewer Overflow (SSO) Chamber.
- Concord Place Sewer diversion.
- Concord Place Sewer diversion.
- Storage Tank Modifications.
- Connection to existing DN450 sewer.
- Sewer replacement.
- General Demolition & Decommissioning.

Further details relating to the proposed works are provided within Section 1.3 of this report.

Construction Impact and Mitigation

It is estimated that the works will generate a maximum of 140 vehicles (including 20 heavy vehicles) per day at any one time during the 24 month construction period. This impact relates to a peak construction period whereby the works for the new sanitary sewer overflow (SSO) chamber aligns with the works for the Concorde Place and Taniwha Street storage tunnels. The peak generation of heavy vehicles per day is 44, which corresponds to the works for the new pump station aligning with the works for the Maybury Reserve storage tunnel.

New Pumping Station Works

Construction traffic relating to the new pump station will primarily utilise a temporary construction access connecting onto Elstree Avenue and passing through Maybury Reserve. However, some construction vehicles will be required to utilise the residential streets of Maybury Street and (to a lesser extent) Rowena Crescent.

To accommodate vehicles travelling along Maybury Street the existing pumping station site access will be temporarily widened through the utilisation of adjacent residential plots (72E and 74 Maybury Street). Existing traffic calming measures opposite 74 Maybury Street will be temporarily removed during the construction period. Other traffic calming measures which run centrally along Maybury Street may also need to be temporarily removed to allow construction vehicles to pass. If required by Auckland Transport, similar temporary traffic calming measures can be constructed as closely as possible to the

current arrangement. All traffic calming measure will be reinstated upon completion of the works to Auckland Transport roading standards.

Access and parking for the Adult Literacy Centre adjacent to the existing pump station will be maintained during the construction period. However vehicles entering and exiting the site access road onto Maybury Street will need to be coordinated through the Contractors traffic management plan. The shared uses of the existing site access road with Watercare Operations will continue during the construction period.

Vehicles accessing via Rowena Crescent will utilise a temporary access located within the vacant lot between 16 and 18A Rowena Crescent. The use of Rowena Crescent as an access route will result in a small loss of on-street parking opposite Nos. 12A to 16 Rowena Crescent. It is anticipated that Rowena Crescent will primarily be used by construction personnel accessing the site.

Elstree Avenue Storage Tunnel Works

To facilitate the works a partial road closure of Elstree Avenue (Taniwha Street to approximately 110m north of Maybury Street) will be required. Two-way movement will however be maintained up to Nos. 84 and 86 Elstree Avenue through the temporary removal of on-street parking during the associated period of construction. The impact of this temporary loss of on-street parking is not expected to be significant given that all adjacent properties provide off-street parking and the existing supply does not appear to be heavily utilised.

Works relating to the shaft at the Taniwha Road/Elstree Avenue intersection will also be undertaken within the road reserve, and therefore the southern approach to the roundabout will be closed and a traffic diversion route via Apirana Avenue/Line Road will be implemented. The roundabout will also be temporarily reshaped to ensure that all movements (aside from the entry from the southern approach) are retained.

Taniwha Street / Fenchurch Street Storage Tunnel Works

The works to be undertaken near to the intersection of Taniwha Street and Fenchurch Street will not affect movement into or out of Fenchurch Street.

Construction Routing

Where possible, construction traffic will be limited to the main arterial routes and the use of local residential roads will be discouraged. However some small residential roads such as Maybury Street and Rowena Crescent will see some heavy vehicle movements during the construction of the new pump station. Construction vehicles will be restricted through the Contract to use by the minimum number of vehicles required. Furthermore, vehicles will only be permitted to use the shortest route of travel from the nearest arterial road. Access through the Maybury Reserve will be facilitated primarily with the temporary new construction access connecting onto Elstree Avenue.

Heavy vehicles travelling to/from the SH1 motorway will be encouraged to use the Ellerslie-Panmure Highway and Urban Route 6 (Pilkington Road/Jellicoe Road) as a means of avoiding low bridges and overpasses and limiting the distance travelled through residential areas.

Unless unavoidable, construction vehicles should be discouraged from traversing through the Glen Innes commercial area (west of the site) as there are a large number of property accesses and a high pedestrian footfall.

Traffic Management Plan

To effectively manage any potential adverse traffic impacts (inclusive of those related to construction of the temporary access road through Maybury Reserve), the following mitigation measures have been identified, which should be included within the traffic management plan for the works:

- Construction hours to be restricted to 0700 and 1800, Monday to Saturday.
- As far as practicable, heavy vehicle movements along Maybury Street and Taniwha Street (past Tamaki College) should be minimised during school opening and closing periods (0800-0900 and 1445-1545).
- All construction personnel parking shall be accommodated in defined areas on site with little or no overspill onto the surrounding local roads.
- Suitable wheel wash facilities should be provided for all vehicles exiting the construction site.

- All vehicles transporting cut and fill should have adequate damping and cover to avoid dust impacts on adjacent properties.
- Temporary pedestrian access with adequate signage to be provided within the vicinity of the shaft works.
- Where necessary, reintroduce traffic calming measures along Maybury Street.
- Ensure that throughout the construction process the emergency services are able to suitably access all properties and facilities (such as the Tamaki College).
- Construction vehicles should avoid accessing and egressing the site via Maybury Street during the times close to the local pre-school's opening and closing when a number of vulnerable road users will be within the vicinity.
- The Contractor shall use Variable message Signs (VMS) boards and approved notification signage to Auckland Transport / NZTA standards to provide early as well as on-going warning to all road users and the public of upcoming changes to road usage.
- The Contractor shall provide letter drops to all properties within and around the construction area warning them of upcoming changes to road usage.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 Introduction

1.1 Project Background

MWH have been commissioned by Watercare to undertake an Integrated Transportation Assessment (ITA) for the proposed Glendowie Branch Sewer Upgrade. The objective of the project is to construct a new branch sewer pipeline (also acting as storage tunnel) which will be approximately 1.0km in length and 1.9m to 2.5m in diameter[1]. These works will support the future population growth in the Tamaki area and help to minimise wastewater overflows into the environment.

This assessment is limited to the identification of the traffic impact of the construction works. It is considered that, given the nature of the project, there are no long-term impacts to traffic progression or accessibility within the local area.

1.2 Project Location

The project is located within the largely residential suburb of Glen Innes, Auckland. The new pump station is to be located within Maybury Reserve, adjacent to the existing pump station. The branch sewer lines are proposed to run adjacent to Tamaki College and Glen Innes Aquatic Centre, within sections of Elstree Avenue and Taniwha Street. The approximate locations of the construction shafts are shown within the project drawings provided within Appendix A.

The location of the project is identified within Figure 1-1. The figure also identifies the extent of the proposed works, inclusive of the specific alignment of the new branch sewer and the location of the new pump station.

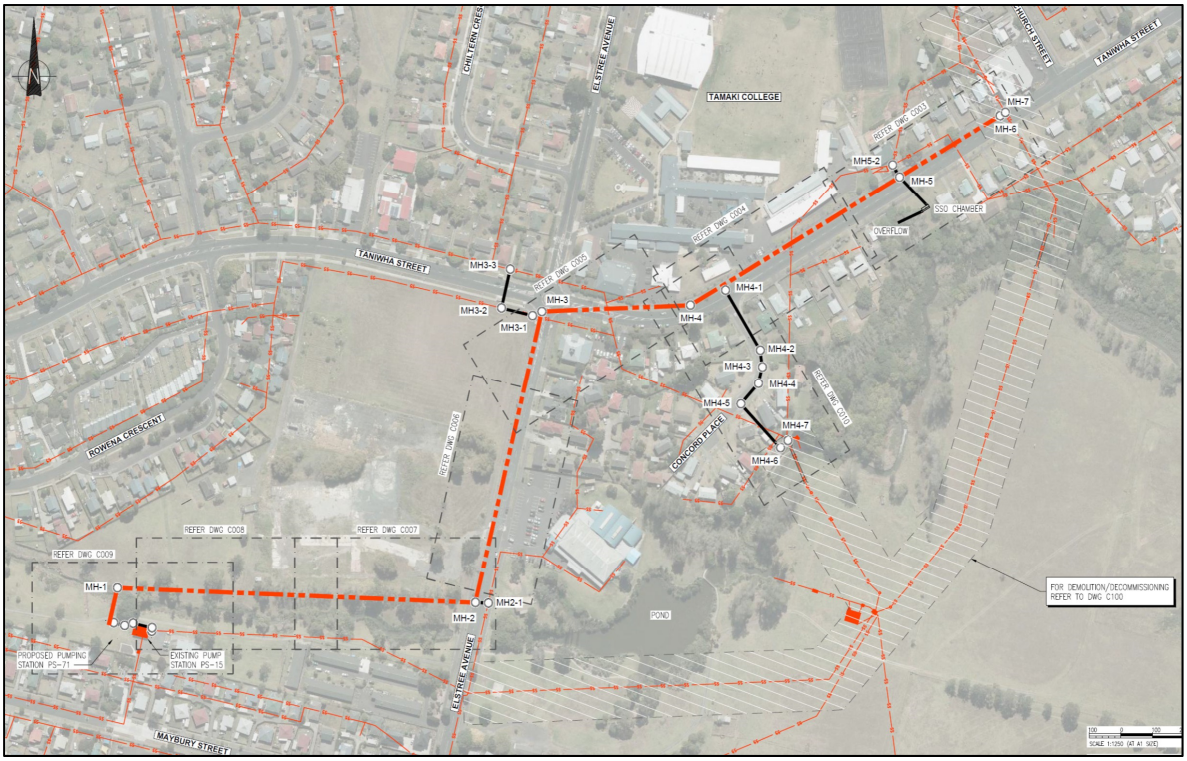


Figure 1-1: Glendowie Branch Sewer Upgrade – Overall Site Plan

[1] This report is based on a pipe size of DN2100. The final diameter is subject to detailed design, replacement of sections of the existing local sewer network, new manholes, overflow structures and the construction of a new pumping station.

1.3 Proposed Construction Works

The majority of the branch sewer will be constructed using trenchless technology, however up to 9 deep chambers need to be constructed along the tunnel alignment, to varying depths that will involve open construction and piling.

The Project consists of the following works:

- **New Pumping Station** – The pumping station will be approximately 12m x 8.5m x 15m. A plan and cross-section of the pumping station has been included in the appendices. This will also include an odour control biofilter, new transformer on a slab and new site roading/drainage area (less than 1000m^2). The construction will be mostly below ground but will have a significant amount of surface disturbance. For construction of the PS, access to the site will have to be gained by constructing either a temporary culvert crossing or bailey bridge across the creek to the reserve. Temporary construction access to the pump station site from 74 & 72B Maybury Street will also be required. This will also require removal of a traffic calming road island.
- **Storage tunnel (DN 1950 to DN2300)** –The new 1150m long storage tunnel, which will be a concrete pipe, will run through Maybury Reserve and along Elstree Avenue and terminate in Taniwha Street. This will be mostly trenchless construction at depths of up to 12m. However there will be a need to construct six temporary deep open shafts (8m x 6m x 12m) at the locations of the MH chambers.
- **SSO Overflow Chamber** – From chamber MH205 a new DN800 pipe will be laid across Taniwha Street to a new below ground SSO (sanitary sewer overflow) chamber in the reserve. From the new SSS chamber a new overflow pipe will be installed running to a new or existing discharge structure on the creek.
- **Concord Place Sewer diversion** – From the existing CSO chamber (combined sewer overflow) at the rear of No 6 Concord Place, all local sewers will be intercepted and will be diverted into a new sewer in the road in Concord Place and will run along the road and discharge into the new storage tunnel in Taniwha Street.
- **Connection to existing DN450 Sewer** – Located in Taniwha Street and includes the refurbishment of existing chamber and outfall pipe at the rear of No 94 Taniwha Street.
- **Sewer replacement** – Sections of sewer replacement on the existing Glendowie branch sewer and local sewers network.
- **General Demolition & Decommissioning**:
    - The existing pump station will be demolished along with the existing biofilter. This will require significant below and above ground construction work.
    - The existing Concord Place CSO chamber (combined sewer overflow) at the rear of No 6 Concord Place will be demolished and removed.
    - The existing pipe bridge at the rear of No 6 Concord Place will be removed.
    - The existing DN450 sewer from Concord Place CSO will be removed (open cut shallow).
    - Demolition of the existing CSO chamber and pipework located in No 109 Taniwha Street.
    - Demolition of the existing overflow and pipe bridge behind No 94 Taniwha Street.
    - Demolition of the DN450 Point England branch sewer (open cut shallow).

1.4 Purpose of this ITA

Given the scale of the project and the proximity of the construction activities to major trip generators such as schools and recreational facilities, consideration needs to be given to the impact to traffic operation, property access and amenity.

This ITA considers the impacts associated with the construction phase of the works and recommends mitigation measures to reduce the impact to all modes of travel. This report has been produced in support of a Notice of Requirement and the associated resource consent applications.

To adhere to the above objective, the following information is presented within this report:

- Details of the existing traffic operation within the vicinity of the works;
- Details of potentially impacted public transport services;
- Anticipated safety implications associated with the construction;
- An estimate of the associated construction traffic; and
- Recommended measures to mitigate the adverse traffic impacts associated with the works.

2 Existing Network Operation

This section of the report provides an overview of the existing conditions of the road network within the immediate vicinity of the proposed works. Included within this section are details relating to the existing traffic volumes, historical accident data and public transport services.

2.1 Existing Conditions

2.1.1 Road Network

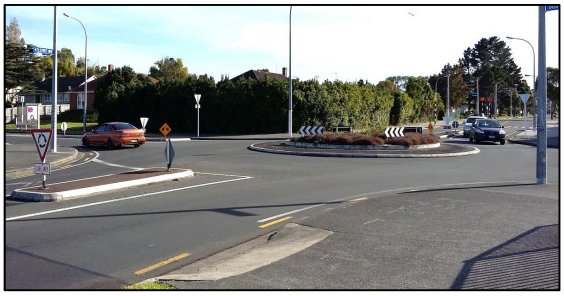
The construction of the branch sewer lines will primarily impact upon the operation of Elstree Avenue (between Taniwha Street and Maybury Street), Taniwha Street (between Elstree Avenue and Fenchurch Street) and Taniwha Street (between Elstree Avenue and No. 117 Taniwha Street). Taniwha Street is a secondary arterial route[2] with a posted speed limit of 50kph and includes a roundabout at its intersection with Elstree Avenue. The majority of other intersections within the vicinity of the project are give-way intersections.

2.1.2 Land Use

Aside from residential dwellings, there are a number of local amenities within the area including schools, churches and a leisure centre. Tamaki College is one such amenity with a current student roll[3] of 508 students which can be accessed from both Taniwha Street and Elstree Avenue. In addition to an off-street supply of approximately 77 spaces, on-street parking provision is also available along both sides of Taniwha Street and Elstree Avenue. Peak periods for the school coincide with the opening (08:00-09:00) and closing (14:45-15:45) times.

The Glen Innes Aquatic Centre is considered to be another major trip generator and is open from 05:30 to 21:00 on weekdays and from 07:30 to 19:30 on the weekends. The Aquatic Centre provides 89 off-street car parking spaces. Further public facilities are located close to the existing pump station on Maybury Street and include an Adult Literacy Centre and a Church/Pre-School. Courses at the Adult Literacy Centre[4] generally run from Monday to Thursdays between 10:00 and 14:30.

Figure 2-1 provides site visit photographs of the local area.



1) Taniwha Street/Elstree Avenue Roundabout

2) Tamaki College (Taniwha Street Entrance)

3) Existing Pump Station Access (Maybury Street)

4) Existing Pump Station (Maybury Street)

Figure 2-1: Site Visit Photographs

[2] Auckland Transport Code of Practice, Chapter 4: Road Classification, Figure 9
[3] https://www.educationcounts.govt.nz/statistics/schooling/student-numbers/6028
[4] http://www.adultliteracy.org.nz/index.php/home-2

2.2 Traffic Volumes

In order to develop an understanding of the existing traffic conditions within the vicinity of the works, existing traffic survey data has been sourced from both the RAMM and the Auckland Transport (AT) [5] traffic count databases. Table 2-1 provides a summary of the two-directional annual daily traffic (ADT) data for localised counts in addition to AM, inter-peak (IP) and PM peak hour counts recorded by AT.

The count data range is between 2004 and 2013. Therefore to establish a comparable dataset, a suitable traffic growth rate has been identified using the 2001, 2006 and 2013 census population data for the areas of Glen Innes West, Glen Innes East and Point England. The data[6] indicates that the combined residential population of these areas remained relatively consistent over the 12 year period; with a total of 11,548 residents in 2001 compared to 11,469 residents in 2013. Therefore for the purpose of the traffic data comparison, it is considered that the historical counts are reflective of existing (2016) travel conditions and therefore no growth rate has been applied to the historical count data.

Table 2-1: Historical Traffic Count Data[7]

Data Source	Road	Location	Year	7 Day ADT (Two-way)		Peak Hour Volume (Two-way)		
				Total	HCV[8]	AM	IP	PM
AT	Taniwha St	Line Rd-Heatherbank St	2013	7,310	3.5%	715	758	746
AT	Elstree Av	Taniwha St–Maybury St	2013	9,520	2.3%	1,084	866	982
AT	Pt England Rd	Pilkington Rd–Ropata Ave	2013	6,265	3.2%	664	556	759
AT	W Tamaki Rd	Paddington St–Elstree Av	2012	7,107	4.2%	967	561	742
RAMM	Fenchurch St	Taniwha St–Sunnymead Rd	2007	1,100	6.0%	-	-	-
RAMM	Fenchurch St	Sunnymead Rd-Aveline Pl	2007	1,100	0.0%	-	-	-
RAMM	Maybury St	End-Elstree Av	2004	2,000	6.0%	-	-	-
RAMM	Pt England Rd	Taurima Av-Elstree Av	2004	6,000	0.0%	-	-	-
RAMM	Pt England Rd	Elstree Av-Kawiti Av	2004	2,500	0.0%	-	-	-
RAMM	Taniwha St	Elstree Av-Concord Pl	2005	7,000	0.0%	-	-	-
RAMM	Taniwha St	Concord Pl-Fenchurch St	2005	7,000	0.0%	-	-	-

The data has identified that the AM peak hour (08:00-09:00) is the busiest period during the day. This intuitively seems correct given that this time coincides with the College opening period. Figure 2-2 on the next page identifies the locations of the two-way counts in relation to the proposed works.

The traffic count data has identified that the average two-way daily traffic volume along Taniwha Street and Elstree Avenue is around 7,000 and 9,000 vehicles respectively. In terms of the peak period volumes the surveys undertaken along Elstree Avenue identified a two-way volume of over 1,000 vehicles.

Table 5.1 of Austroads Guide to Traffic Management Part 3 notes that the typical mid-block capacity for urban roads with interrupted flow is 900 vehicles per hour per lane[9]. Given the existing volumes and a consideration of peak direction flow[10] it is considered that during the AM peak periods the local roads are operating at a maximum of around 50-80% of capacity. This equates to spare capacity of

[5] https://at.govt.nz/about-us/reports-publications/traffic-counts
[6] http://www.censusauckland.co.nz/census-area-unit-view
[7] Note that there is no available traffic count data for Rowena Crescent.
[8] Vehicle classes: MCV, HCV-I and HCV-II
[9] Parked vehicles are not considered to obstruct the flow of traffic due to the presence of wide (12m) lanes along both Elstree Avenue and Taniwha Street.
[10] Assumption that 65% of the observed two-way traffic is in the peak direction during both the AM peak.

approximately 200 and 400 vehicles during the peak hours[11] for Elstree Avenue and Taniwha Street respectively. Furthermore, on-site observations identified no existing significant delay or queuing issues at either intersections or mid-blocks within the local area.

New Developments

The Tāmaki Redevelopment Company, in partnership with Housing New Zealand, have recently constructed 11 new homes in Taniwha Street (close to Sunnymead Road) with construction already underway on a further 21 houses[12]. Typical New Zealand peak hour trip rates are 1.2 trips per dwelling house and therefore it can be expected that around 38 peak hour trips will be generated by the new development. Given the existing capacity of the road network, the addition of this traffic to the local network is considered to be negligible.

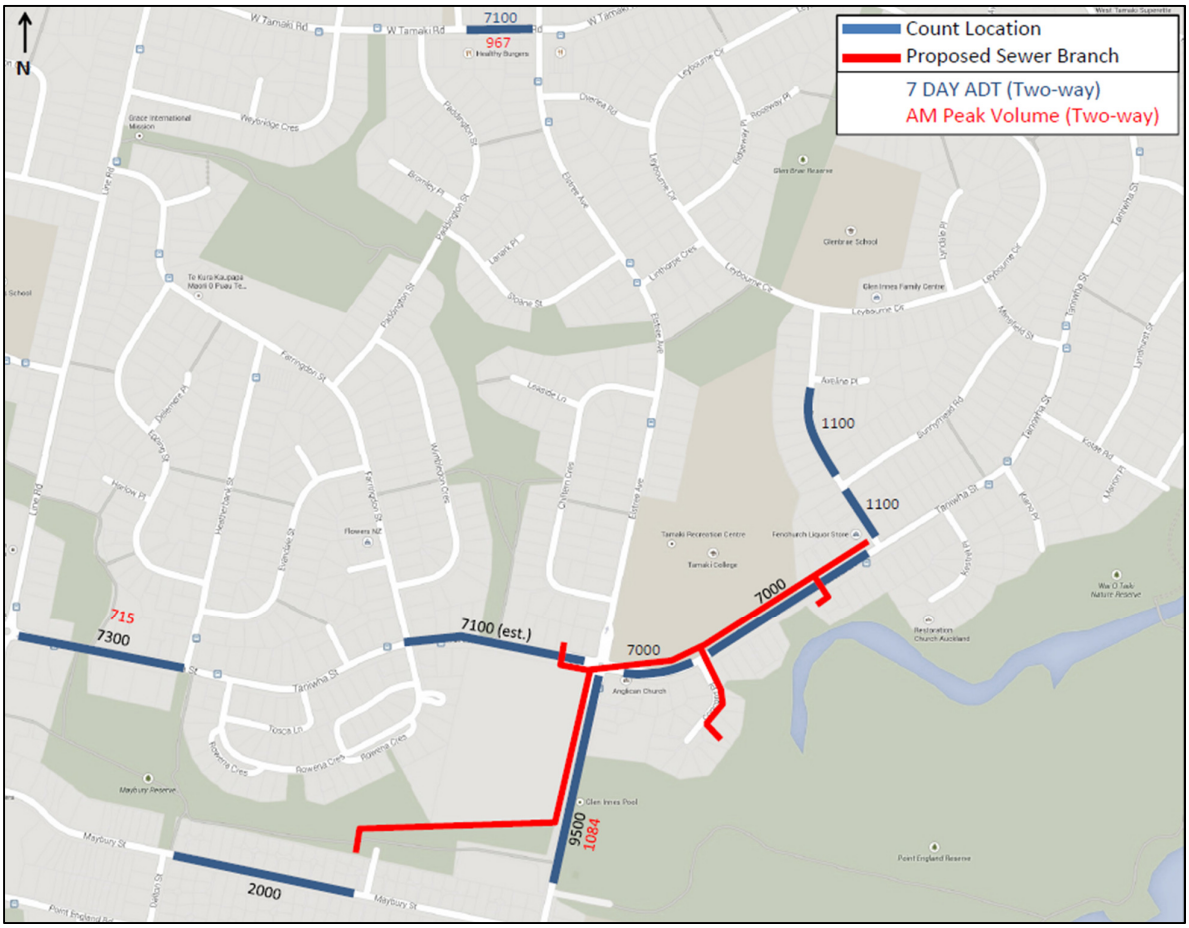


Figure 2-2 : Existing Traffic Counts

[11] High-level analysis based upon an acceptable volume-to-capacity ratio of 85%.

[12] http://www.aucklandcouncil.govt.nz/EN/newseventsculture/OurAuckland/News/Pages/housingareatakesshape.aspx

2.3 Existing Crash Data

Crash data for roads within the immediate vicinity of the project have been obtained for the most recent five year period (2011-2015) using NZTA's Crash Analysis System (CAS). A summary of the accident data is presented in Table 2-2 below, whilst a diagram indicating the location and type of each crash is provided as Figure 2-3.

Table 2-2: Historical Crash Data

Severity	2011	2012	2013	2014	2015	Total
Fatal	0	0	0	0	0	**0**
Serious	0	0	1	1	0	**2**
Minor	1	0	2	0	1	**4**
Non-Injury	9	8	5	5	2	**29**
TOTAL	**10**	**8**	**8**	**6**	**3**	**35**

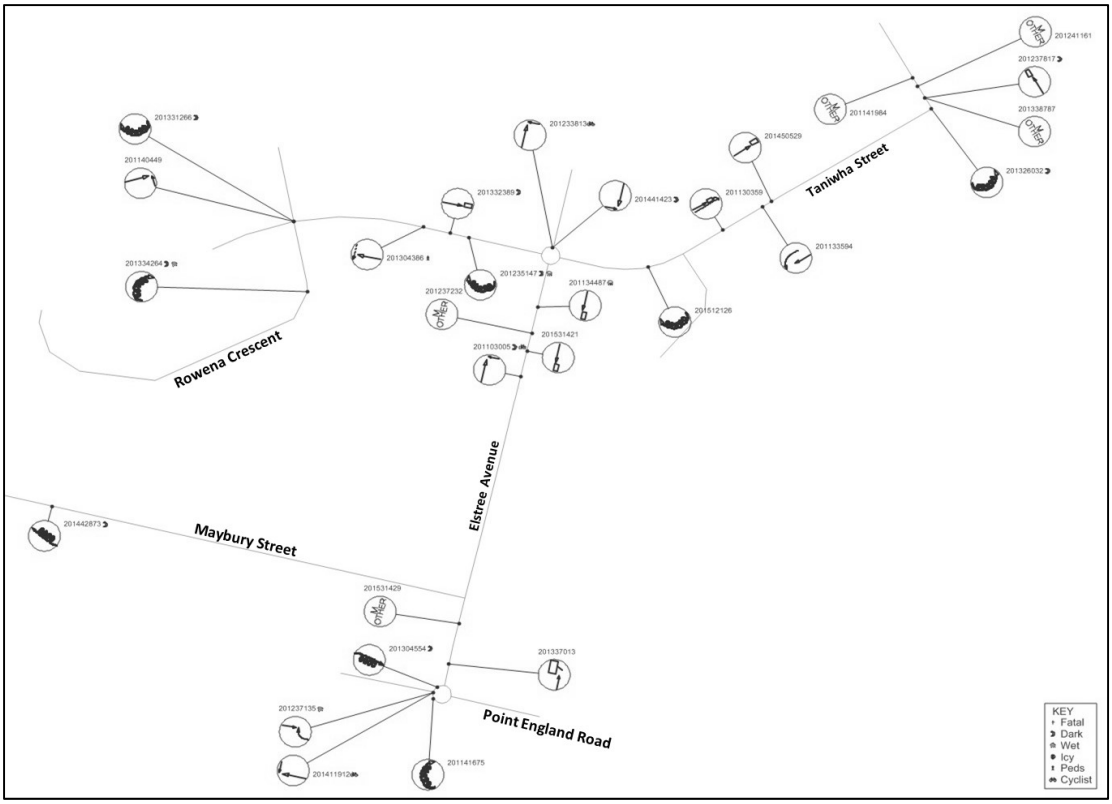


Figure 2-3 : Historical Crash Locations

The data identifies that between 2011 and 2015 a total of 35 crashes were recorded within the periphery of the project, primarily along Taniwha Street (10) and Elstree Avenue (9). Of all the recorded crashes during the five year period, two resulted in serious injury whilst a further nine resulted in minor injuries.

The data identified that the majority of crashes occurred at or around intersections, particularly at the Taniwha Street/Elstree Avenue roundabout and the Taniwha Street/Fenchurch Street T-Junction. The primary causes for crashes at these intersections related to driver error such as following too closely or inattentiveness to surroundings. The cause for two crashes along Taniwha Street, which resulted in serious injuries, related to pedestrians crossing unsafely.

A review of the accident data has not identified any serious issues which could impact the safety of personnel accessing the construction areas from the local road network or, conversely, to local residents. Indeed the total number of reported accidents within the area has been seen to have reduced year-on-year since 2011.

2.4 Public Transport Services

The local area is served by three bus routes which stop along both Taniwha Street and Elstree Avenue (north of the Taniwha Street/Elstree Avenue roundabout only). Route 745 provides a downtown service via Kohimarama Road, whilst Routes 756 and 757 provide the downtown service via Long Drive and Mission Bay. Table 2-3 provides a summary of the existing services which stop within the vicinity of the proposed works, including the approximate service frequencies. Note that some school bus services may also pass through the area.

Table 2-3: Existing Bus Services

Route No.	Local Stops	Service Frequency		
		Mon-Fri		Saturday
		Peak	Off Peak	
745	• Taniwha St (40m West of Roundabout) • Elstree Av (Opp. Tamaki College)	30 mins	1 hour	1 hour
756	• Taniwha St (40m West of Roundabout) • Taniwha St (Fenchurch St Intersection)	45 mins	-	1 hour
757	• Taniwha St (40m West of Roundabout) • Taniwha St (Fenchurch St Intersection)	30 mins	30 mins	1 hour

Given the close proximity of the bus stops along Taniwha Street to works at the roundabout, consultation between the Contractor and Auckland Transport should be undertaken to understand any requirement for temporary bus stops to be provided further downstream of the construction site. It is recommended that prior notification regarding any impact to service is provided on both the MAXX and AT websites.

Given the relatively low bus service frequency, works at the Taniwha Street/Elstree Avenue roundabout would generate only a minimal impact to public transport operations. Indeed the impact is likely to be limited to providing a temporary bus stop further downstream of the Taniwha Street/Elstree Avenue works. Site vehicles accessing and egressing Rowena Crescent are unlikely to impact bus operations along Taniwha Street.

3 Construction Traffic

This section of the report provides details of the planned construction process alongside an estimate for the associated number of trips that may be generated. Note that details regarding the precise nature of the construction methods associated with the works are not yet known and therefore it is only possible to provide an estimation of the construction traffic volumes.

Details regarding the future installation of services are provided within Appendix B.

3.1 Construction Traffic Estimates

The following estimations have been derived separately for the works associated with the new pumping station, branch sewer, sanitary sewer overflow (SSO) chamber and local sewer upgrades. The proposed works can be seen in the project drawings included in Appendix A.

The construction methods have been assumed and are subject to change once a preferred contractor has been selected. Therefore, the estimations have been based around a worst case scenario, in terms of heavy vehicle volumes, in that all material will be removed from the site and new fill material will be imported in.

3.1.1 New Pumping Station

The construction works associated with the new pump station relate to earthworks and construction. Table 3-1 below provides a breakdown of the works, inclusive of the estimated time periods for each activity.

Table 3-1: New Pump Station Works Detail

Works		Details	Traffic Estimate (Two-way)
1	Temporary retaining system (sheet/secant pile wall or deep soil mixed columns).	Excavation retaining structure for construction of the new pump station.	50 truck movements over a 5 week period.
2	Earthworks removal.	Approximately 3150m^3 of earth to be excavated and removed from site.	600 truck movements over a 5 week period.
3	Formation of pumping station base.	Following excavation of the pumping station pit, approximately 115m^3 of concrete will be placed to form the base.	259 trucks working over 3 week period.
4	Construction of remaining structure & control building.	Prefabrication of 35 precast concrete panels to be undertaken off-site and then delivered to the site for staged assembly.	120 truck movements over a 25 week period.
5	Biofilter.	Construction of a new biofilter. To be constructed after completion of the pumping station.	70 truck movements over a 6 week period.
6	Site Roading & Drainage.	Construction of site roading and drainage.	60 truck movements over a 6 week period.
7	Reinstatement works.	Reinstatement of grassed areas, public footpaths etc.	30 truck movements over a 3 week period.
8	Commissioning.	Activities to bring new infrastructure into operation.	30 truck movements over a 6 week period.

The expected construction period for the main works for the new pumping station is 60 weeks, noting that some activities may overlap and the contractors scheduling will have an effect upon the overall construction period.

In order to minimise the impact upon the local road network the following construction access plan is proposed to be implemented to facilitate the construction of the new pump station:

- A temporary access road, leading off from Elstree Avenue (near to the proposed chamber MH-2) and broadly running parallel to the Omaru Creek, will be constructed.

- A temporary bailey bridge will be constructed to allow access over Omaru Creek in the Maybury Reserve adjacent to the new pump station.
- The existing pumping station access from Maybury Street shall be maintained and used by the local community. However the adjacent residential plots 72E and 74 Maybury Street, will be used to create a wide temporary access for construction vehicles. This access will not be used as the main site access.
- The existing access to the Adult Literacy Centre will be maintained.

It is expected that the majority of construction traffic relating to the new pump station will utilise the new temporary construction road connecting onto Elstree Avenue. Indeed, it is anticipated that all excavation material will be transported using this proposed temporary access. However, some site traffic will be required to utilise Maybury Street and Rowena Crescent (to a lesser extent).

The construction trips, as per Table 3-1, are expected to be approximately distributed 30% to Maybury Street, 10% to Rowena Crescent and 60% to the proposed temporary construction access from Elstree Avenue.

3.1.2 Storage Tunnel

The storage tunnel is expected to be constructed sequentially, most likely in the following order:

1. New Pump Station (PS71) to Elstree Avenue (through the Maybury Reserve).
2. Elstree Avenue to the roundabout junction with Taniwha Street.
3. Taniwha Street/Elstree Avenue roundabout junction to the start of the tunnel (adjacent to No. 99 Taniwha Street).

Maybury Reserve Section

The tunnel will cross under the Omaru Creek and run along the edge of Maybury Reserve to another tunnelling reception/launch shaft located in Elstree Avenue. Table 3-2 provides a breakdown of these works. The expected construction period for the main works for the section of tunnel in Maybury Reserve is 25 weeks.

Table 3-2: Storage Tunnel Works Detail – Maybury Reserve Section (MH1-MH2)

Works		Details	Traffic Estimate (Two-way)
1	Construction of launch shaft and MH1.	A temporary shaft approximately 10m x 10m x 12m will be constructed in the Maybury Reserve adjacent to the new pumping station location. It will be constructed using a temporary retaining system using potentially sheet piles, secant piles or DSM (deep soil mixed) columns.	30 truck movements over a 3 week period for installation of the retention system. 400 truck movements over a 3 week period for removal of excavated material. These vehicles will access the site via the Elstree Avenue, Maybury Street or the Rowena Crescent accesses.
2	Tunnel construction. Installation of a new DN2100 concrete pipe (MH1 to MH2).	a) Approximately 1,400m^3 of earth/rock material to be excavated and removed from site. b) Approximately 130m x DN2100 concrete pipes to be delivered to site and installed.	a) Excavation works: 460 truck movements over a 35 day period. b) Concrete pipe deliveries: 130 truck movements over same 35 day period. Construction vehicles will use either the Elstree Avenue or Maybury Street accesses.

Elstree Avenue Section

This section covers the construction of the storage tunnel along Elstree Avenue towards the junction with Taniwha Street. This section of the tunnel is to be constructed under the existing road and will require road closures (see Section 4). Table 3-3 provides a breakdown of the works. The expected construction period for the main works for the section of tunnel in Elstree Avenue section is 25 weeks.

Table 3-3: Storage Tunnel Works Detail – Elstree Avenue Section (MH2-MH3)

Works		Details	Traffic Estimate (Two-way)
1	Construction of tunnelling launch shaft and MH2.	a) Installation of temporary excavation retention system and excavation of shaft. Potentially using sheet piles, secant piles or DSM (deep soil mixed) columns. b) Temporary shaft size 10m x 10m x 12m. Approximately 1200m^3 of earth to be excavated and removed from site.	a) 30 truck movements over a 3 week period for installation of the retention system. b) 400 truck movements over a 3 week period for removal of excavated material.
2	Preparation for micro tunnelling machine.	Approximately 10m^3 of concrete will be placed to form the thrust block for the tunnelling machine.	5 trucks working over a 2 week period.
3	Tunnel construction Installation of a new DN2100 concrete pipe (MH2 to MH3).	a) Approximately 1,050m^3 of earth/rock material to be excavated and removed from site. b) Approximately 94 x DN2100 concrete pipes to be delivered to site and installed.	a) Excavation works: 360 truck movements over a 4 week period. b) Concrete pipe deliveries: 94 truck movements over the same 4 week period.
4	Construction of tunnelling launch shaft and MH3.	a) Installation of temporary excavation retention system and excavation of shaft. Potentially using sheet piles, secant piles or DSM (deep soil mixed) columns. b) Temporary shaft size 12m x 12m x 12m. Approximately 1730m^3 of earth to be excavated and removed from site.	a) 30 truck movements over a 3 week period for installation of the retention system. b) 570 truck movements over a 5 week period for removal of excavated material.

Taniwha Street Section

The tunnel will run along the eastbound lane of Taniwha Street towards another tunnelling shaft that will be located adjacent to No 124 Taniwha Street and then onto another shaft that will be located adjacent to No. 99 Taniwha Street. The new storage tunnel alignment has been designed to run partially in the road and footpath to allow construction to take place without having to fully close the road. Construction of the storage tunnel along Taniwha Street will be carried out using a trenchless construction method and will involve the installation of new DN2100[13] concrete pipes at depths of approximately 9m over a length of 450m.

Table 3-4 provides a breakdown of the works for the Elstree Avenue to Taniwha Street section of the storage tunnel. The expected construction period for the main works for the section of tunnel in Taniwha Street is 50 weeks.

Table 3-4: Storage Tunnel Works Detail – Taniwha Street Section (MH3-MH4)

Works		Details	Traffic Estimate (Two-way)
1	Construction of shaft at MH4.	a) Installation of temporary excavation retention system and excavation of shaft. Potentially using sheet piles, secant piles or DSM (deep soil mixed) columns. b) Temporary shaft size 9m x 5m x 12m, Approximately 540m^3 of earth to be excavated and removed from site.	a) 30 truck movements over a 3 week period for installation of the retention system. b) 180 truck movements over a 3 week period for removal of excavated material.
2	Tunnel construction Installation of a new DN2100 concrete pipe (MH3 to MH4).	a) Approximately 560m^3 of earth/rock material to be excavated and removed from site. b) Approximately 51 x DN2100 concrete pipes to be delivered to site and installed.	a) Excavation works: 185 truck movements over a 3 week period. b) Concrete pipe deliveries: 55 truck movements over the same 3 week period.

[13] The pipe will be between 1.9m and 2.5m in width.

Works		Details	Traffic Estimate (Two-way)
3	Tunnel construction Installation of a new DN2100 concrete pipe (MH4 to MH5).	a) Approximately 885m^3 of earth/rock material to be excavated and removed from site. b) Approximately 81 x DN2100 concrete pipes to be delivered to site and installed.	a) Excavation works: 295 truck movements over a 4.5 week period. b) Concrete pipe deliveries: 85 truck movements over the same 4.5 week period.
4	Construction of shaft at MH5.	a) Installation of temporary excavation retention system and excavation of shaft. Potentially using sheet piles, secant piles or DSM (deep soil mixed) columns. b) Temporary shaft size 9m x 5m x 12m. Approximately 540m^3 of earth to be excavated and removed from site.	a) 30 truck movements over a 3 week period for installation of the retention system. b) 180 truck movements over a 3 week period for removal of excavated material.
5	Tunnel construction Installation of a new DN2100 concrete pipe (MH5 to MH6).	a) Approximately 420m^3 of earth/rock material to be excavated and removed from site. b) Approximately 39 x DN2100 concrete pipes to be delivered to site and installed.	a) Excavation works: 140 truck movements over a 3 week period. b) Concrete pipe deliveries: 40 truck movements over the same 3 week period.
6	Construction of shaft at MH6.	a) Installation of temporary excavation retention system and excavation of shaft. Potentially using sheet piles, secant piles or DSM (deep soil mixed) columns. b) Temporary shaft size 9m x 5m x 12m. Approximately 540m^3 of earth to be excavated and removed from site.	a) 30 truck movements over a 3 week period for installation of the retention system. b) 180 truck movements over a 3 week period for removal of excavated material.

3.1.3 New Sanitary Sewer Overflow (SSO) Chamber

A new SSO chamber is proposed to be constructed to allow the new storage tunnel to discharge overflows to the Omaru creek (fewer than two times per year). The new chamber is proposed to be constructed in the section of reserve between No.104 and No.108 Taniwha Street.

Construction of this overflow pipe and sanitary sewer overflow chamber will require approximately 160m^3 of earth material to be excavated and removed from site and approximately 30 x DN1000 concrete pipes to be delivered to site and installed. A new overflow pipe will be constructed directly across Taniwha Street. It is expected that the Contractor will be required to close a portion of the road during construction of the pipework. However dual lane traffic should be maintainable during peak travel periods and single lane traffic during off peak travel.

The total number of truck movements required for the disposal of the excavated materials will be approximately 30 over a 2 week period, whilst the concrete deliveries are expected to require 20 truck movements over a 3 week period.

The anticipated construction period for the new SSO chamber is 16 weeks. There will be other vehicle movements for minor works such as mechanical and electrical fitting that cannot be accurately determined. The vehicle movements associated with the movement of excavated materials and delivery of concrete materials are considered to have the most impact.

3.1.4 Existing Sewer Diversion – Concorde Place to Taniwha Street

The existing local sewer network in Concorde Place will be diverted to the new storage tunnel and will require the construction of approximately 152m of a new local sewer.

Construction will be by open cut at depths from 2.0m to 3.5m. Construction of this section of local sewer will require approximately 570m^3 of earth/rock material to be excavated and removed from site and approximately 70 x DN450 concrete pipes and DN1200 chambers to be delivered to site and installed.

The total number of truck movements required for the disposal of the excavated materials will be approximately 190 over a 20 day period. Concrete pipe deliveries are expected to require 20 truck movements over the same 20 day period. These works will likely be carried out after completion of the main tunnel.

The anticipated construction period for the new Concorde Place sewer diversion is approximately 12 weeks. There will be other minor vehicle movements associated with the works that cannot be accurately determined. The vehicle movements associated with the transportation of excavated materials and delivery of concrete materials are considered to have the most impact.

3.1.5 Existing Sewer Diversion – Taniwha Street

The existing DN300 local sewer that runs along Taniwha Street will be diverted to the new storage tunnel. The sewer will be intercepted adjacent to No. 117 Taniwha Street and will be diverted directly across Taniwha Street to a new sewer in the footpath.

Construction will be by open cut at depths from 2.0m to 3.5m. Construction of this section of local sewer will require approximately 250m^3 of earth/rock material to be excavated and removed from site and approximately 25 x DN525 concrete pipes and DN1200 chambers to be delivered to site and installed.

The total number of truck movements required for the disposal of the excavated materials will be approximately 50 over a 5 week day period. Concrete pipe deliveries are expected to require 20 truck movements over a 5 week period. These works will likely be carried out after completion of the main tunnel. One lane of Taniwha Street will always be open and full accessibility will be maintained (see Section 4).

3.1.6 Existing Sewer Diversion – Elstree Avenue

The existing DN300 earthen ware sewer that runs along Elstree Avenue will be intercepted and diverted into the new storage tunnel. The sewer will be intercepted adjacent to the location of the new MH-2 and will be directed across Elstree Avenue to MH-2. This is highlighted within the plans provided within Appendix A.

Construction will be by open cut at depths of up to 1.8m and will require approximately 25m^3 of earth/rock material that will excavated and removed from site. Approximately 5 x DN400 concrete pipes and DN1500 chambers will be delivered to site and installed. The total number of truck movements (combined two-way) will be approximately 20 over a 3 week period. These works will be carried at the time as the construction of MH-2. One lane of Elstree Avenue will always be open and full accessibility will be maintained (see Section 4).

3.1.7 Demolition Works

The scope of the demolition works involves the demolition of the existing Point England Pumping Station PS15 and the demolition of existing structures in Point England Reserve.

The demolition works will be carried out over a period of approximately one month and will be undertaken once the majority of the new works have been completed and are in operation. Therefore no other construction work will be being carried out at the same time as the demolition works, which means that traffic movements generated by demolition activities will not coincide with the vehicle movements produced by other activities.

Demolition of the Existing Point England Pumping Station

The demolition of the of Point England Pumping Station will require approximately 16 truck movements (over a 3 week period) for the purpose of transporting material for disposal from the demolished above ground building and below ground pumping station structure. It is expected that the excavation from the demolished pumping station will be backfilled with suitable surplus materials from the main works. This means that the back fill materials should not be required to be brought onto the site. The construction

machinery required for the work (such as excavators and cranes) will already be on site from the previous construction activities. It is expected that all vehicle movements will be via Maybury Street to Elstree Avenue.

Demolition of Existing Structures in the Point England Reserve.

The demolition works will include the removal of existing pipe bridges, associated structures and the removal of sections of the abandoned sewer network. Some sections of the abandoned sewer will be left in place and will be backfilled will a cement grout. Equipment that will be brought to site includes excavators, cranes and concrete pumps. No significantly sizable Contractors site compound area is required for this work. The demolition works in Point England reserve will require approximately 30 truck movements (over a 2 week period) for the purpose of transporting materials for disposal. It is expected that all vehicle movements will be via an existing vehicle entrance onto Elstree Avenue.

The overall traffic impact of the demolition works is considered to be minimal.

3.2 On-Site Personnel

On-site construction personnel are anticipated to have a minimal impact on traffic operation.
For the new pumping station, no more than 25 staff are likely to be on site at any one time. As such, a maximum of 25 vehicles (50 movements) associated with construction staff is anticipated for any particular day. For the storage tunnel and sewer diversion works, up to maximum of 20 light vehicles (40 movements) is expected for any particular day. Construction personnel parking will be limited to the Contractors main site compound. Parking in residential parking spaces will not be permitted.

3.3 Overall Construction Impact

Construction is intended to commence in approximately May 2017 and will be completed within 24 months. Construction will not be undertaken continuously for the 24 month period, but rather, there will be intermediate periods during which testing, commissioning and snagging processes will take place. It is intended that the construction will be divided into stages as a means of minimising the overall impact, as identified within Table 3-5 below.

Table 3-5: Estimated Construction Timeframes

	Works	Estimated Timeframe
1	New Pumping Station.	60 weeks
	Storage Tunnel - Maybury Reserve Section.	25 weeks
2	Storage Tunnel - Elstree Avenue Section.	25 weeks
	Existing Sewer Diversion – Elstree Avenue	3 weeks
3	Storage Tunnel – Taniwha Street Section.	50 weeks
4	New SSO Chamber (Feed pipe, Chamber & Overflow Pipe).	16 weeks
	Existing Sewer Diversion – Concorde Place to Taniwha Street.	12 weeks
	Existing Sewer Diversion – Taniwha Street (opposite No. 117).	5 weeks
5	Demolition Works – Pumping Station	3 weeks
	Demolition Works – Point England Reserve	2 weeks

The construction of the sections of the existing sewer diversions and new SSO chamber may take place at any time during the 24 month period. However, it is considered that these works are likely to be undertaken following construction of the storage tunnel and new chamber MH-5. The exact construction programme can only be determined once the preferred Contractor has been selected and construction programme agreed.

For the purpose of the analysis it has been assumed, as a worst-case scenario in terms of trip generation, that construction of the new pump station will be undertaken at the same time as construction of the Maybury Reserve section of the storage tunnel. Table 3-6 presents a summary of the maximum construction traffic impact for each of the aforementioned stages of the construction process.

Table 3-6: Construction Traffic Impact

	Area	Associated Works For Maximum Trip Generation	Two-Way Movement (Daily)	
			Light	Heavy
1	New Pump Station	Earthworks removal	50	20
	Storage Tunnel - Maybury Reserve Section	Tunnel Construction	40	24
	Total		**90**	**44**
2	Storage Tunnel - Elstree Avenue Section	Tunnel Construction	40	24
	Existing Sewer Diversion – Elstree Avenue	Sewer Diversion	40	2
	Total		**80**	**26**
3	Storage Tunnel – Taniwha Street Section	Tunnel Construction	**40**	**16**
4	New SSO Chamber	Overflow Pipe Construction	40	4
	Existing Sewer Diversion – Concorde Place	Sewer Diversion	40	12
	Existing Sewer Diversion – Taniwha Street	Sewer Diversion	40	4
	Total		**120**	**20**
5	Pumping Station	Demolition Works	10	2
6	Point England Reserve	Demolition Works	10	3

Table 3-6 identifies that the works will generate a maximum of 140 vehicles (120 light + 20 heavy) per day at any one time during the entire construction period. Given a typical 11 hour working day (refer to Section 3.4), the expected number of movements per hour is around 12-18 vehicles, relating to Stage 4 of the works. The peak generation of heavy vehicles per day is 44, which corresponds to the works for the new pump station aligning with the works for the Maybury Reserve storage tunnel.

Given the existing levels of spare capacity of the road network (refer to Section 2.2), the impact of the construction traffic upon the operational performance of the road network is likely to be negligible. Traffic survey data at the Elstree Avenue/Taniwha Street roundabout would be required to assess the impact to performance at the intersection level. However, the effect of an additional 14-20 vehicles per hour at the intersection level is expected to be minimal.

4 Mitigation

This section of the report discusses potential mitigation solutions aimed at minimising the impact of construction. An overview of the mitigation measures is presented graphically in Figure 4-1 below.

Figure 4-1: Mitigation Measures Overview

4.1 New Pumping Station Works

To accommodate vehicles travelling along Maybury Street the existing pumping station site access will be temporarily widened through the utilisation of adjacent residential plots (72E and 74 Maybury Street). Existing traffic calming measures opposite 74 Maybury Street will be temporarily removed during the construction period. Other traffic calming measures which run centrally along Maybury Street may also need to be temporarily removed to allow construction vehicles to pass. If required by Auckland Transport, similar temporary traffic calming measures can be constructed as closely as possible to the current arrangement.

Access and parking for the Adult Literacy Centre adjacent to the existing pump station will be maintained during the construction period. However vehicles entering and exiting the site access road onto Maybury Street will need to be coordinated through the Contractors traffic management plan. The shared uses of the existing site access road with Watercare Operations will continue during the construction period.

Vehicles accessing via Rowena Crescent will utilise a temporary access that will be located within the vacant lot that exists between 16 and 18A Rowena Crescent. To enable trucks to suitably turn into and

out of Rowena Crescent, the temporary removal of a small amount of on-street parking opposite properties 12A to 16 Rowena Crescent may be required. The vehicle tracking paths for access via Rowena Crescent and the temporary access from Elstree Avenue are provided within Appendix C.

The effects of the replacement of traffic calming measures along Maybury Street, access to the Adult Literacy Centre and the loss of on-street parking along Rowena Crescent is expected to be negligible.

4.2 Elstree Avenue Storage Tunnel Works

Construction works relating to the Elstree Avenue storage tunnel and chambers MH-2 and MH-3 are to be undertaken within the roadway. Given the space constraints, a partial road closure of Elstree Avenue (Taniwha Street to approximately 100m north of Maybury Street) will be required alongside the closure of the northbound approach to the Taniwha Street roundabout. However, two-way movement will be maintained up to Nos. 84 and 86 Elstree Avenue through the temporary removal of on-street parking during the associated period of construction. The impact of this temporary loss of on-street parking is not expected to be significant given that all adjacent properties provide off-street parking and the existing supply does not appear to be heavily utilised.

Vehicles that would otherwise travel northbound from Elstree Avenue through the roundabout will be diverted along an alternative route via Point England Road, Line Road and Taniwha Street. A review of AADTs and peak hour traffic volumes from counts along Apirana Avenue, Line Road and Taniwha Street (refer to Section 2.2) identified that there is likely to be suitable available capacity throughout the day to accommodate any short term rise in traffic that will occur as a result of the diversion.

The roundabout is to be temporarily reshaped to ensure that all movements (aside from the entry from the southern approach) are retained. This solution, as illustrated within Figure 4-2, presents the following advantages:

- Access to all properties can be maintained;
- Simple to implement and provides as a familiar temporary traffic management solution;
- Three arms of the roundabout remain open at all times; and
- Modification of the roundabout is not expected to present any inherent safety issue as the approaches and exits for vehicles accessing the roundabout will remain consistent with those for the existing situation.

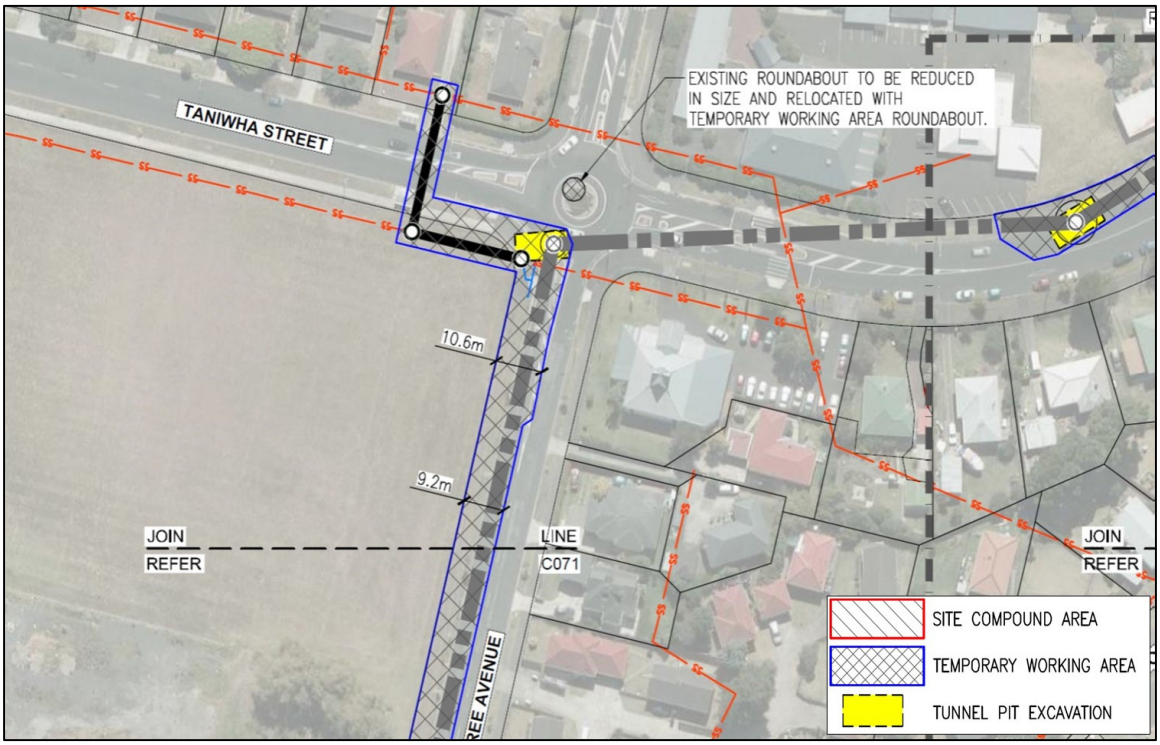


Figure 4-2: Taniwha Street/Elstree Avenue Roundabout Potential Temporary Road Closure

Two-way traffic will also be maintained to the Glen Innes Aquatic Centre, with the expectation that buses accessing the site are suitably able to manoeuvre around the designated off-street car park. Temporary pedestrian access will be provided within the vicinity of the works to provide safe access for the public.

Appropriate signage, in accordance within the Code of Practice for Temporary Traffic Management, should be placed at suitable locations along Elstree Avenue, Maybury Street and Point England Road to alert drivers to any forthcoming diversion routes.

4.3 Taniwha Street / Fenchurch Street Storage Tunnel Works

Three open cut construction works will be undertaken across Taniwha Street, relating to the Concorde Place sewer diversion(C010), the new Taniwha Street SSO chamber (C020) and the Taniwha Street sewer diversion (SK136). Temporary traffic management measures should be placed to ensure that one lane will always be open and full accessibility is maintained. Given the existing level of traffic along Taniwha Street this solution is not expected to generate any significant queuing or delays.

The works to be undertaken near to the intersection of Taniwha Street and Fenchurch Street will not affect movement into or out of Fenchurch Street.

For works along Taniwha Street, it is recommended that construction vehicles are discouraged (as part of the Traffic Management Plan) from accessing work sites close to Tamaki College during the school's opening and closing periods. Temporary pedestrian access is also proposed to be provided within the vicinity of the shaft works.

Taniwha Street is approximately 12m in width. There is therefore available space to retain two-way traffic throughout the construction period through the temporary removal of parking along sections adjacent to the works. Works at the Taniwha Street SSO chamber will be staged in order to retain two-way flow.

5 Traffic Management

This section of the report outlines measures which should be considered as part of the traffic management plan for the works.

5.1 Construction Routing

Aside from the section between the intersections of Taniwha Street/Elstree Street and Taniwha Street/Fenchurch Street, the construction shall be largely located away from immediate residential properties. However some small residential roads such as Maybury Street and Rowena Crescent will see some heavy vehicle movements during the construction of the new pump station. In this instance construction vehicles will be restricted through the Contract to use by the minimum number vehicles required. Furthermore, vehicles will only be permitted to use the shortest route of travel from the nearest arterial road.

Construction traffic should, where possible, be limited to the main arterial routes. Heavy vehicles travelling to/from the SH1 motorway should be encouraged to use the Ellerslie-Panmure Highway and Urban Route 6 (Pilkington Road/Jellicoe Road) as a means of avoiding tunnels and limiting the distance travelled through residential areas.

Unless unavoidable, construction vehicles should be discouraged from traversing through the Glen Innes commercial area (west of the site) as there are a large number of property accesses and a high pedestrian footfall. The use of local roads, such as Maybury Street and Anderson Avenue, as through routes should also be discouraged.

5.2 Traffic Management Plan

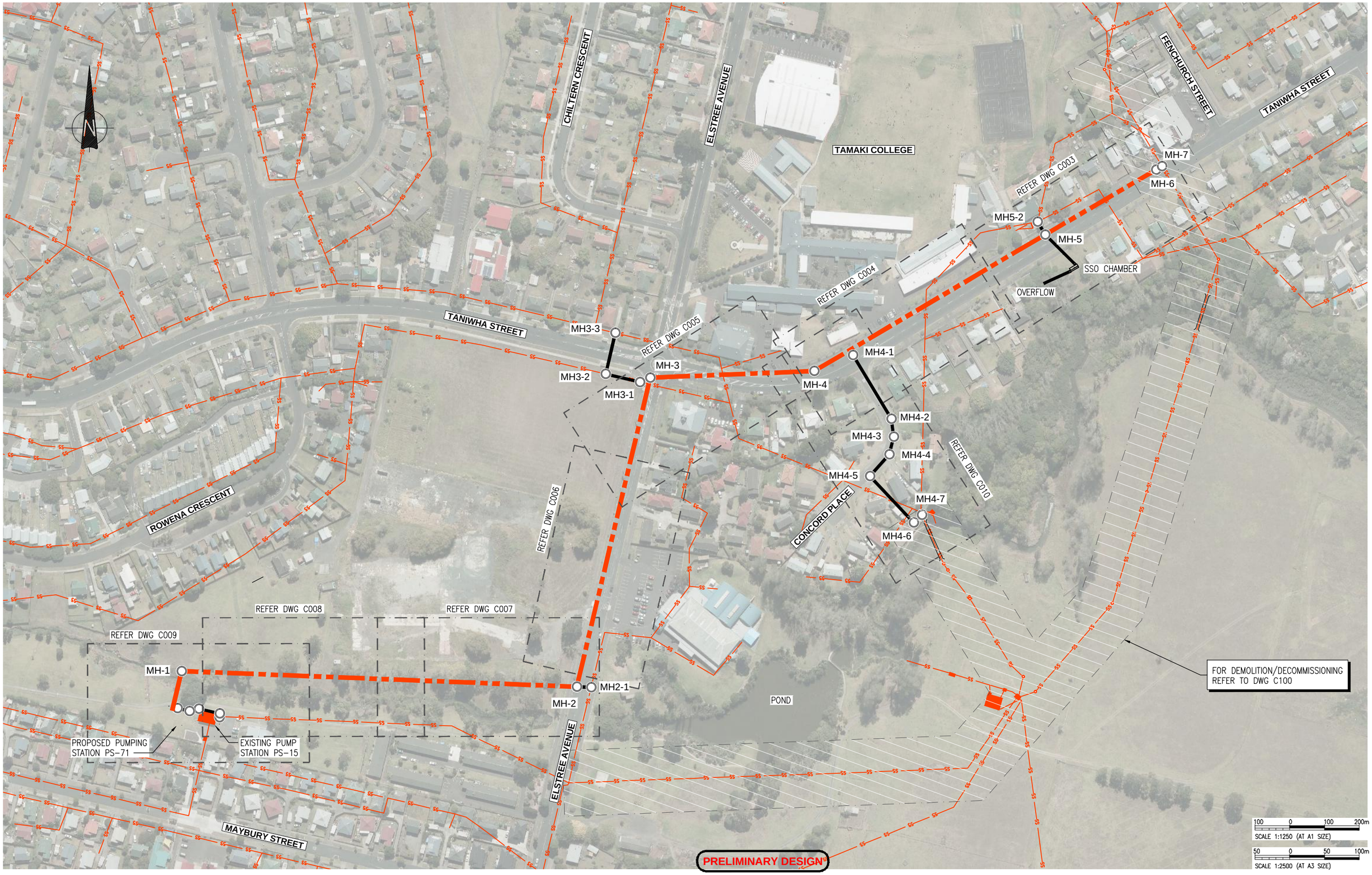
In order to minimise any adverse impacts associated with the works[14], a Traffic Management Plan should be developed by the contractor to the full satisfaction of Auckland Transport, Auckland Council and Watercare. The Plan should define the following minimum requirements:

- Construction hours to be restricted to 0700 and 1800, Monday to Saturday.
- As far as practicable, heavy vehicle movements along Maybury Street and Taniwha Street (past Tamaki College) should be minimised during school opening and closing periods (0800-0900 and 1445-1545).
- All construction personnel parking shall be accommodated in defined areas on site with little or no overspill onto the surrounding local roads.
- Suitable wheel wash facilities should be provided for all vehicles exiting the construction site.
- All vehicles transporting cut and fill should have adequate damping and cover to avoid dust impacts on adjacent properties.
- Temporary pedestrian access with adequate signage to be provided within the vicinity of the shaft works.
- Where necessary, reintroduce traffic calming measures along Maybury Street.
- It should be ensured that throughout the construction process that the emergency services will be able to suitably access all properties and facilities (such as the Tamaki College).
- Construction vehicles should avoid accessing and egressing the site via Maybury Street during the times close to the local pre-school's opening and closing when a number of vulnerable road users will be within the vicinity.
- The Contractor shall use Variable message Signs (VMS) boards and approved notification signage to Auckland Transport / NZTA standards to provide early as well as on-going warning to all road users and the public of upcoming changes to road usage.
- The Contractor shall provide letter drops to all properties within and around the construction area warning them of upcoming changes to road usage.

[14] Inclusive of works related to construction of the temporary access road through Maybury Reserve.

Appendix A Preliminary Design Drawings

- Sewer Pipeline sheet reference C002.
- Plan & profile sheets 1 to 7: C003, C004, C005, C006, C007, C008, C009.
- Concorde Place plan and long section: C010.
- Taniwha Street SSO chamber site plan: C020.
- Taniwha Street Overflow pipeline profile: C021.
- MH - 2 Site Plan: C032.
- MH - 2 Sections: C033.
- MH 6 & MH 7 Site Plan: C040.
- MH 6 & MH 7 Section: C041.
- Pump Station Site Plan: C052.
- Working Areas: C070.
- Working Areas Sheet 1: C071.
- Working Areas Sheet 2: C072.
- Working Areas Sheet 3: C073.
- Working Areas Sheet 4: C074.



ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	08.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	08.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE SHEET REFERENCING

CAD FILE Z1962101-01-001-C002 DATE

ORIGINAL SCALE A1 AS SHOWN

CONTRACT No.

REF. No. Z1962101-01-001-C002

ISSUE 2

DWG. No. XXXXXXX

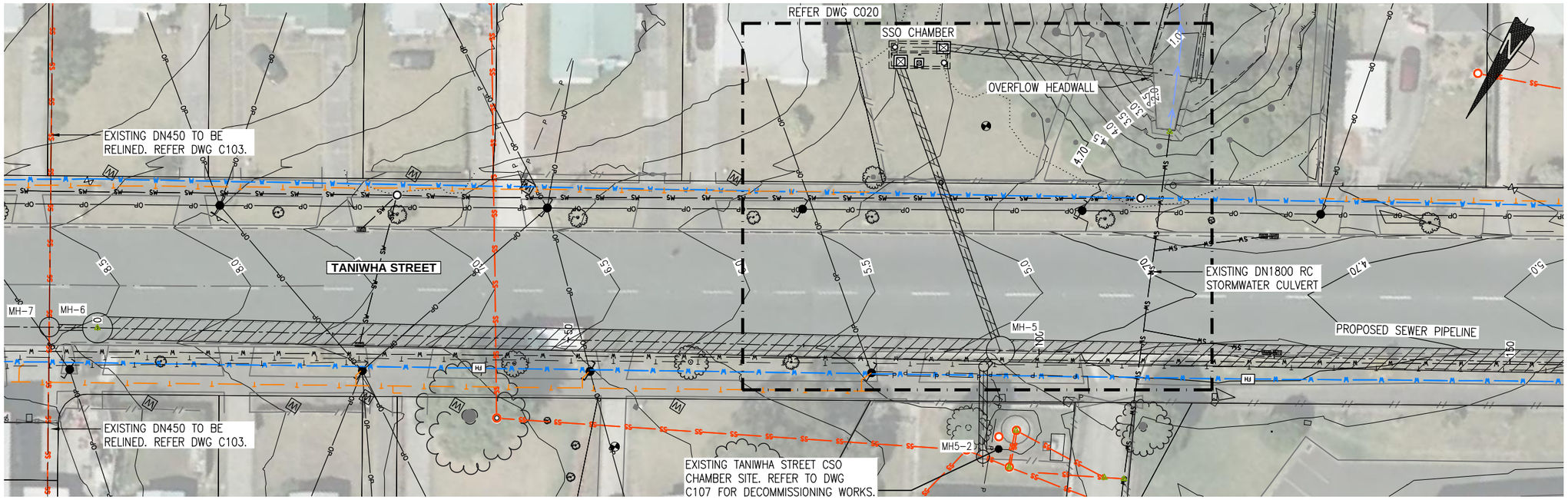
2

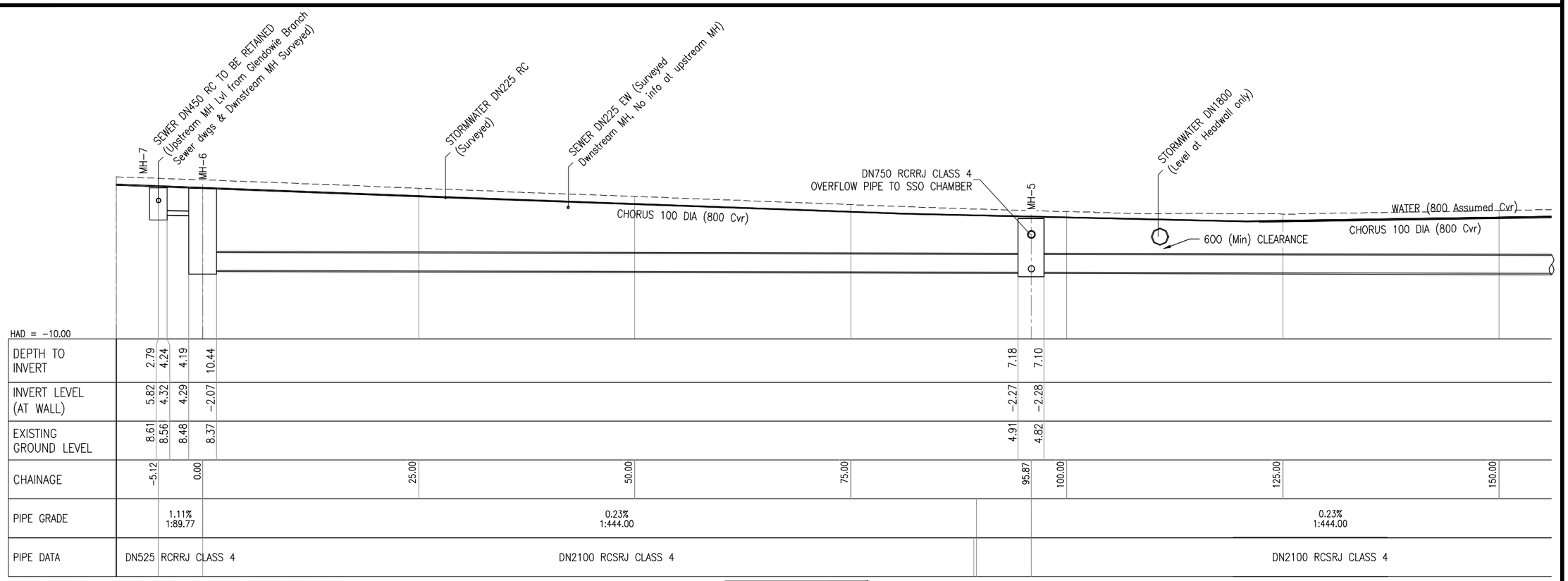
LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE





LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE – PLAN AND PROFILE SHEET 1 OF 7

CAD FILE Z1962101-01-001-C003 DATE

ORIGINAL SCALE A1 1 : 250

CONTRACT No.

REF. No. Z1962101-01-001-C003

ISSUE 2

DWG. No. XXXXXX

2

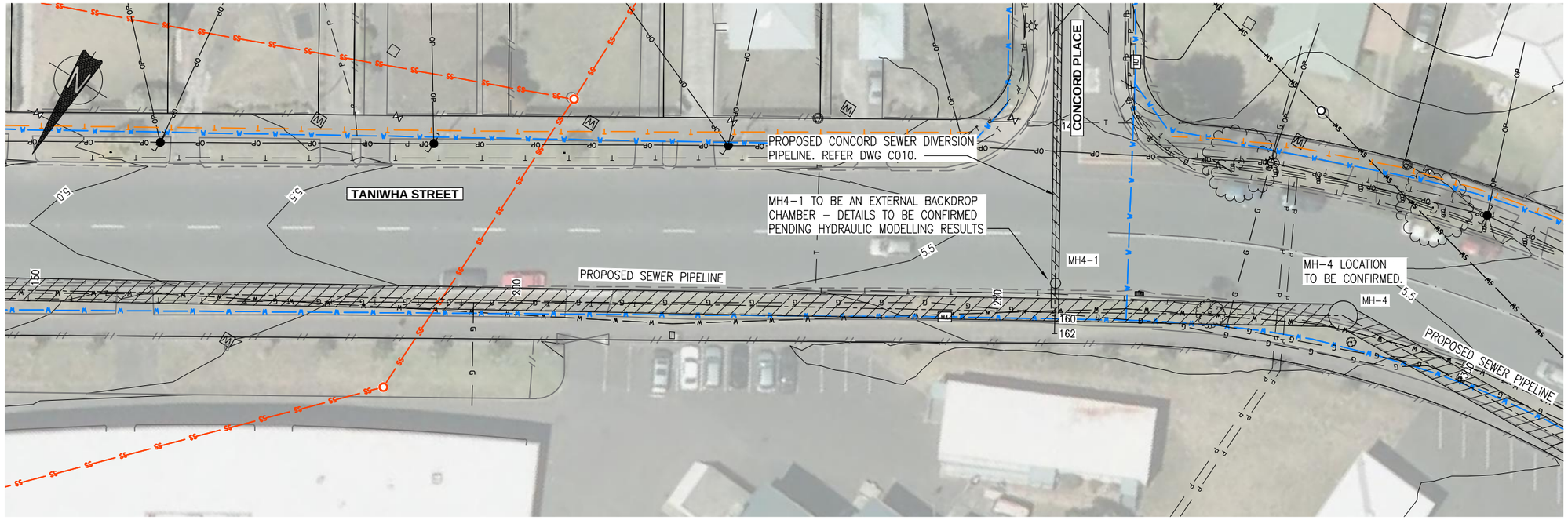
LEGEND - SERVICES

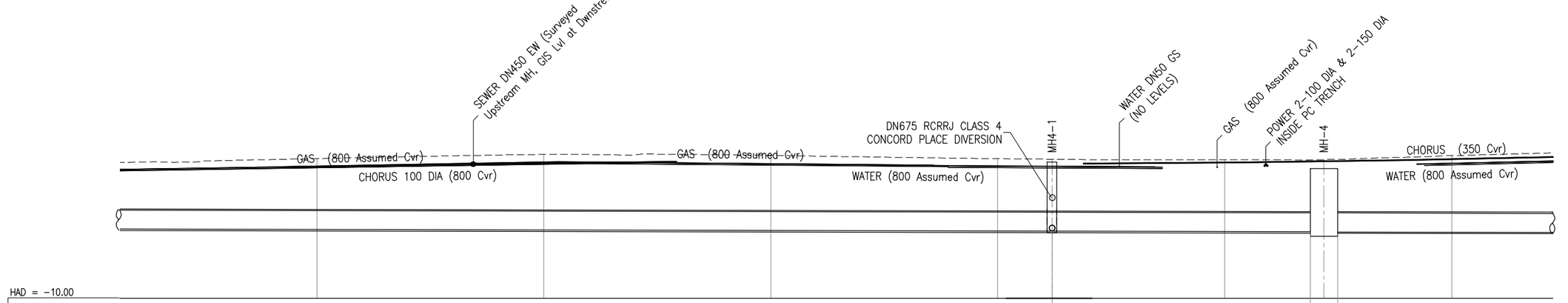
- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

MANHOLE	LIGHT
CESSPIT	POWER POLE
FIRE HYDRANT	SIGN
VALVE	POST
WATER METER	POLE
TELECOM PLINTH	TREE TRUNK
	BOLLARD

- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE





HAD = -10.00

DEPTH TO INVERT							7.92			7.91	7.96			
INVERT LEVEL (AT WALL)							-2.64			-2.70	-2.71			
EXISTING GROUND LEVEL							5.28			5.21	5.25			
CHAINAGE	175.00		200.00		225.00		250.00	256.00	275.00		285.94		300.00	
PIPE GRADE		0.23% 1:444.00												
PIPE DATA		DN2100 RCSRJ CLASS 4												

LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m
SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE – PLAN AND PROFILE SHEET 2 OF 7

CAD FILE Z1962101-01-001-C004 DATE

ORIGINAL SCALE A1 1 : 250

CONTRACT No.

REF. No. Z1962101-01-001-C004

ISSUE 2

DWG. No. XXXXXXX

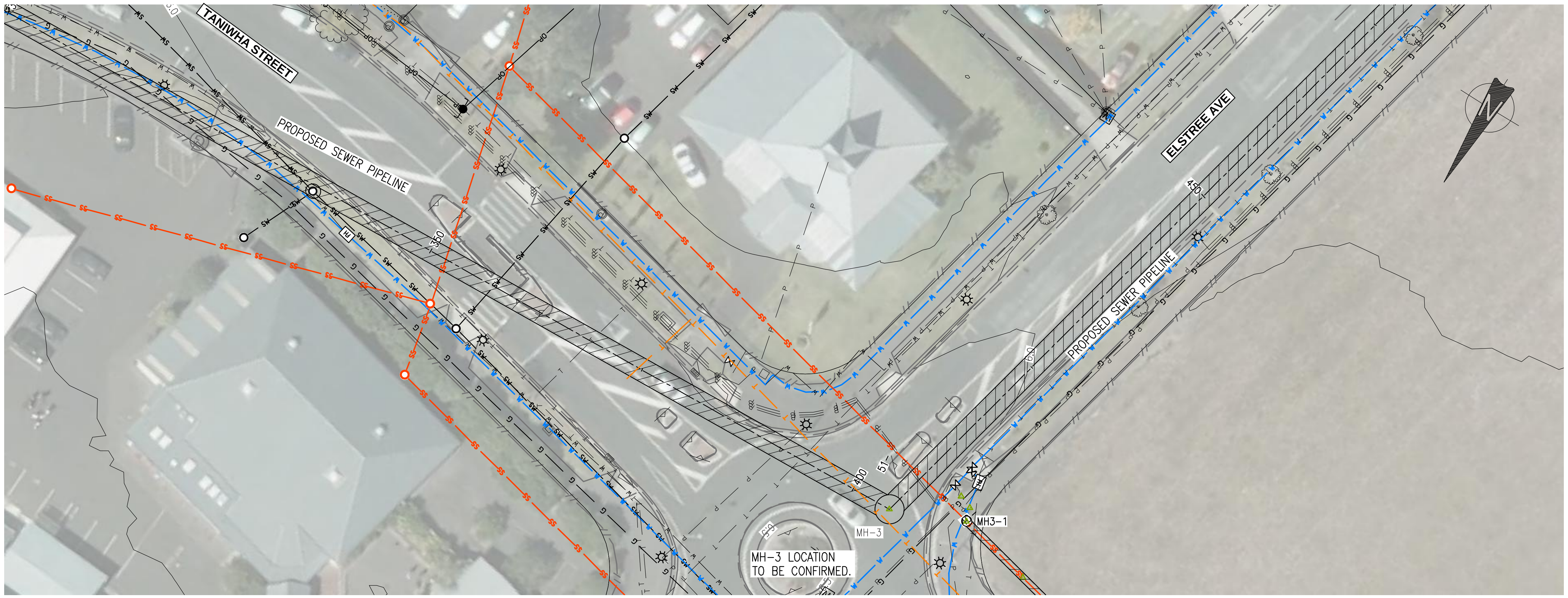
2

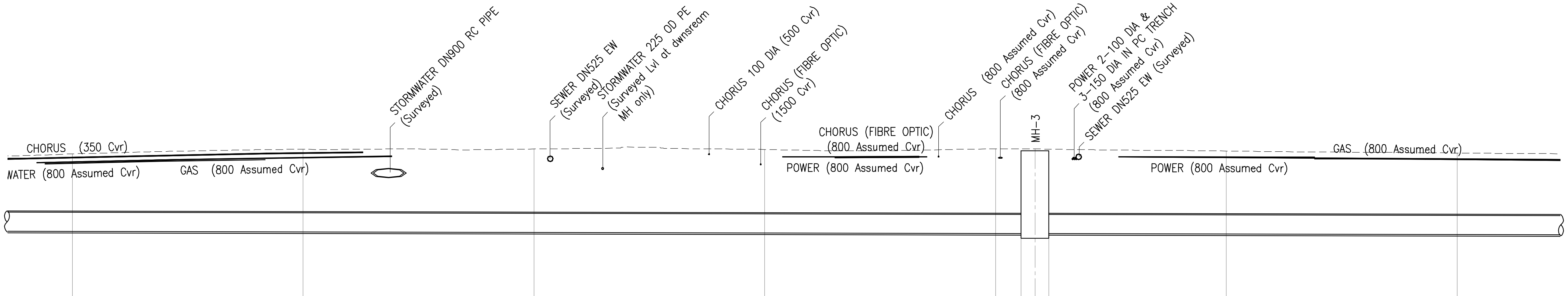
LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE





DEPTH TO INVERT						9.20	9.17		
INVERT LEVEL (AT WALL)						-2.97	-2.98		
EXISTING GROUND LEVEL						6.23	6.20		
CHAINAGE	300.00	325.00	350.00	375.00	400.00	404.28		425.00	450.00
PIPE GRADE	0.23% 1:444.00						0.23% 1:444.00		
PIPE DATA	DN2100 RCSRJ CLASS 4						DN2100 RCSRJ CLASS 4		

LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m
SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

	BY	DATE
DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER

PRELIMINARY LAYOUT

SEWER PIPELINE – PLAN AND PROFILE SHEET 3 OF 7

CAD FILE Z1962101-01-001-C005 DATE

ORIGINAL SCALE A1 1 : 250

CONTRACT No.

REF. No. Z1962101-01-001-C005 ISSUE 2

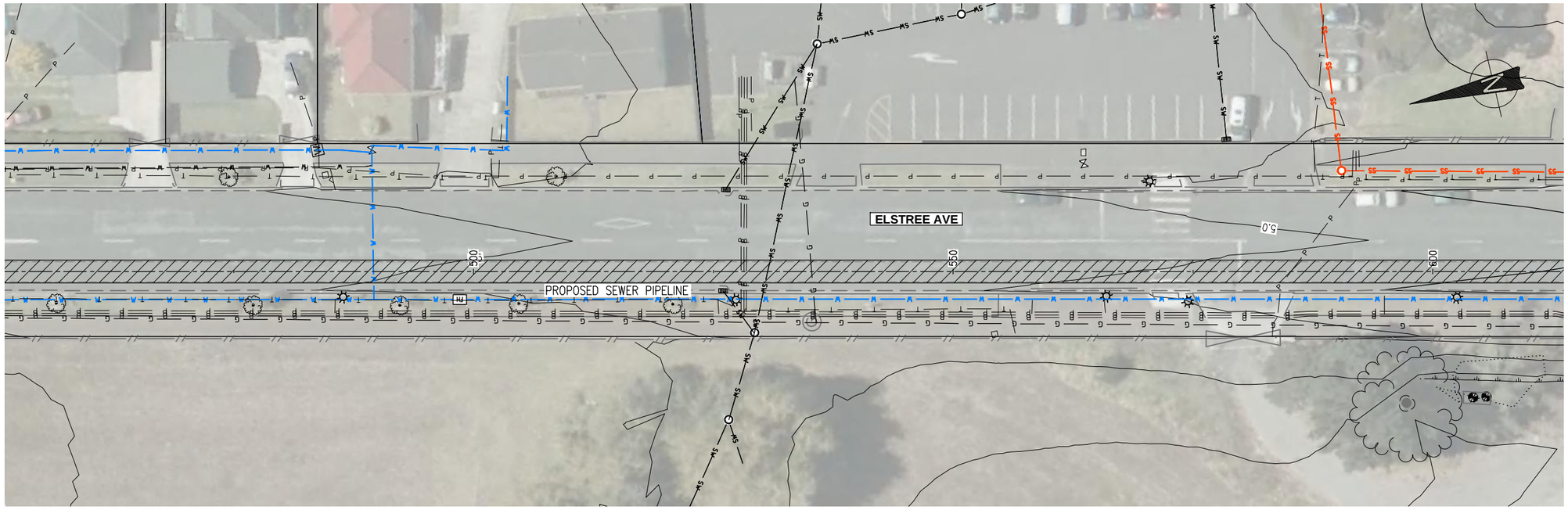
DWG. No. XXXXXXX 2

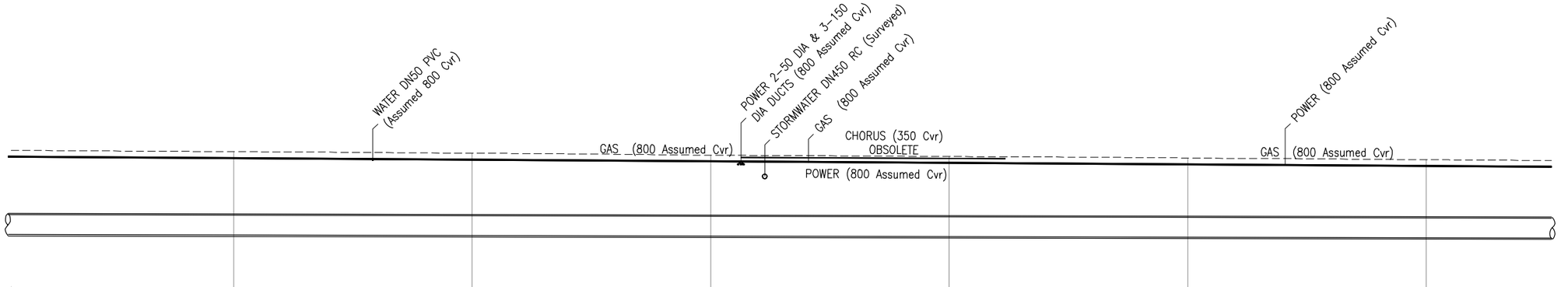
LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE





HAD = -10.00

DEPTH TO INVERT						
INVERT LEVEL (AT WALL)						
EXISTING GROUND LEVEL						
CHAINAGE	475.00	500.00	525.00	550.00	575.00	600.00
PIPE GRADE			0.23% 1:444.00			
PIPE DATA			DN2100 RCSRJ CLASS 4			

LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m

SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED	Roy Slater	21.08.15
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE – PLAN AND PROFILE SHEET 4 OF 7

CAD FILE Z1962101-01-001-C006 DATE 21.08.2015

ORIGINAL SCALE A1 1 : 250

CONTRACT No.

REF. No. Z1962101-01-001-C006

ISSUE 1

DWG. No. XXXXXX

1

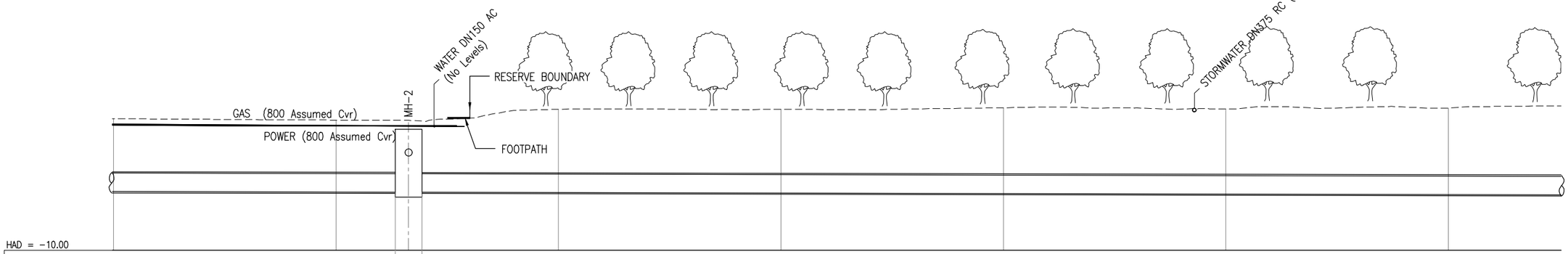
LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

MANHOLE	LIGHT
CESSPIT	POWER POLE
FIRE HYDRANT	SIGN
VALVE	POST
WATER METER	POLE
TELECOM PLINTH	TREE TRUNK
	BOLLARD

- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE



HAD = −10.00

	625.00	633.15	650.00	675.00	700.00	725.00	750.00
DEPTH TO INVERT		8.07	8.00				
INVERT LEVEL (AT WALL)		−3.48	−3.49				
EXISTING GROUND LEVEL		4.59	4.51				
CHAINAGE							
PIPE GRADE						0.23% 1:444.00	
PIPE DATA						DN2100 RCSRJ CLASS 4	

LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m
SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
BY		DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE – PLAN AND PROFILE SHEET 5 OF 7

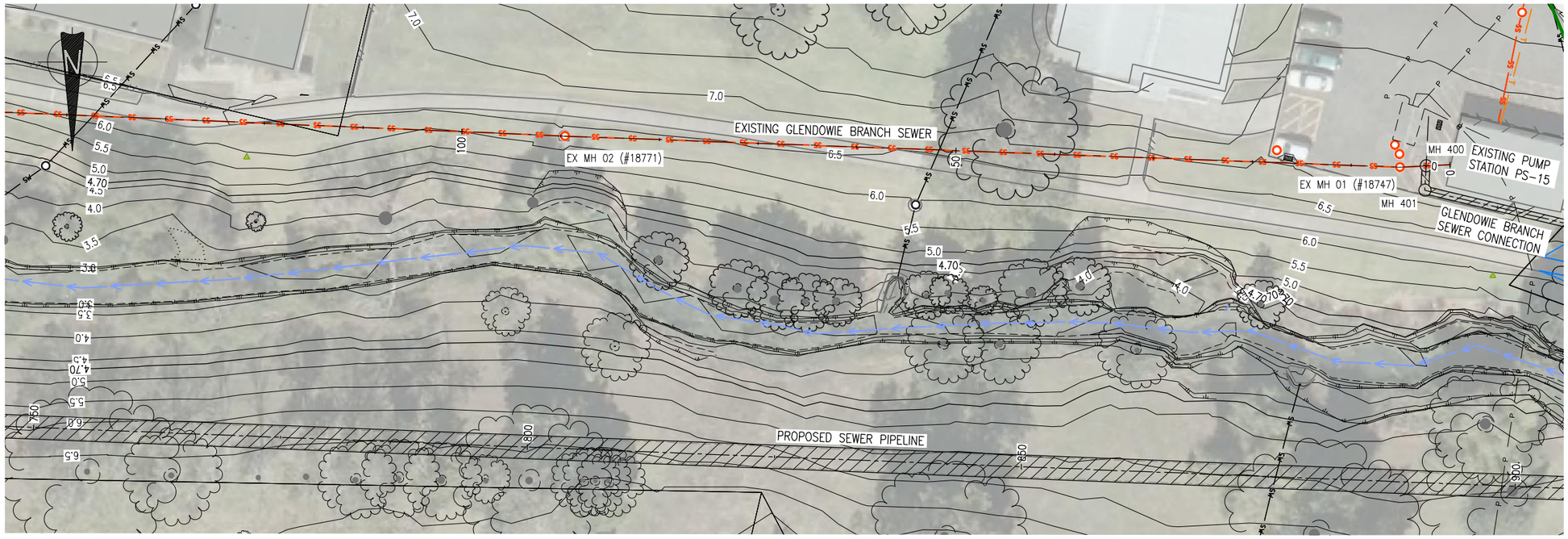
CAD FILE Z1962101-01-001-C007	DATE
ORIGINAL SCALE A1 1 : 250	CONTRACT No.
REF. No. Z1962101-01-001-C007	ISSUE 2
DWG. No. XXXXXXX	2

LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE



HAD = −10.00

	750.00	775.00	800.00	825.00	850.00	875.00
DEPTH TO INVERT						
INVERT LEVEL (AT WALL)						
EXISTING GROUND LEVEL						
CHAINAGE						
PIPE GRADE		0.23% 1:444.00				
PIPE DATA		DN2100 RCSRJ CLASS 4				

LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m
SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE – PLAN AND PROFILE SHEET 6 OF 7

CAD FILE Z1962101-01-001-C008 DATE

ORIGINAL SCALE A1 1 : 250

CONTRACT No.

REF. No. Z1962101-01-001-C008

ISSUE 2

DWG. No. XXXXXX

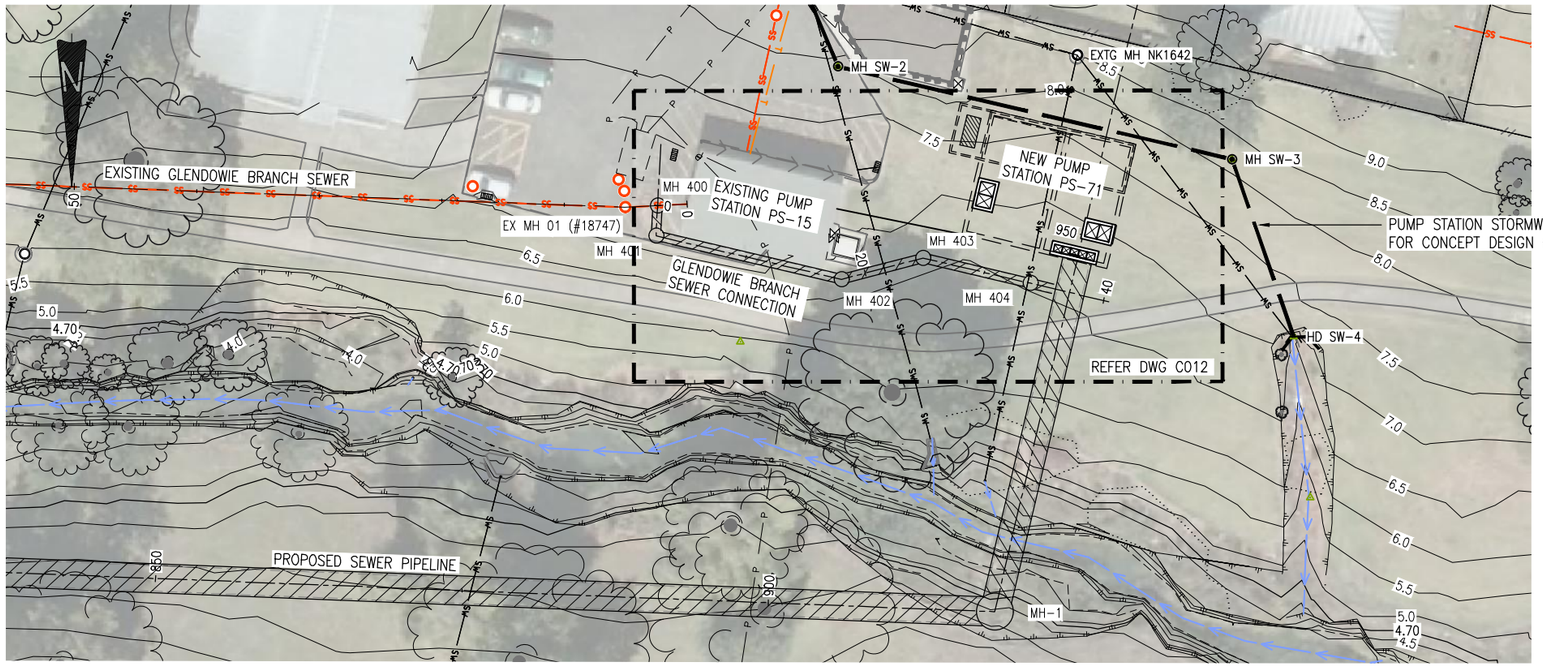
2

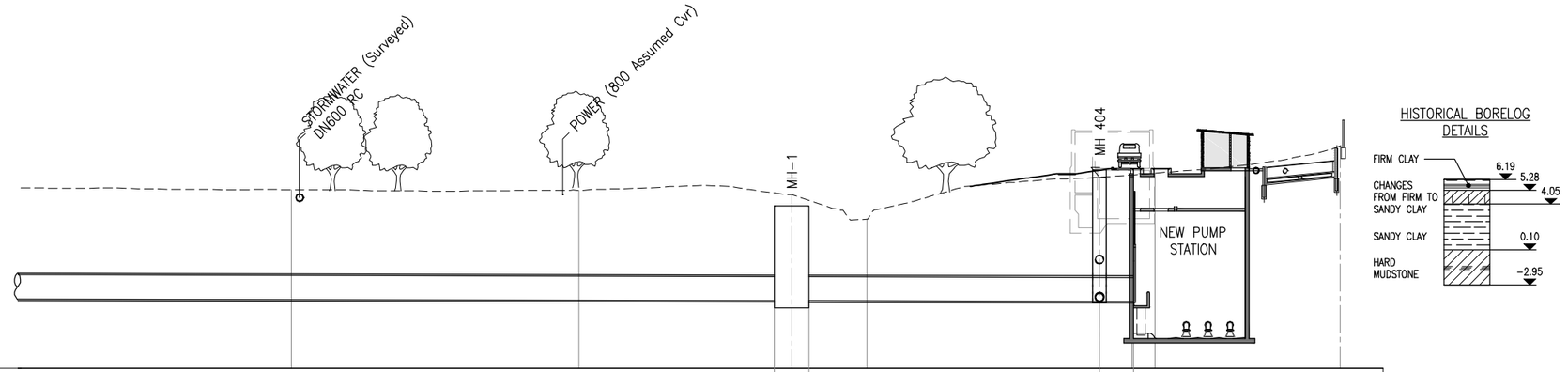
LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE





HAD = −10.00

DEPTH TO INVERT						9.34	8.69				10.76	10.97		
INVERT LEVEL (AT WALL)						−4.13	−4.13				−4.19	−4.20		
EXISTING GROUND LEVEL						5.21	4.56				6.56	6.77		
CHAINAGE	875.00			900.00		918.48		925.00			945.19	948.04	950.00	
PIPE GRADE	0.23% 1:444.00							0.23% 1:444.00						
PIPE DATA	DN2100 RCSRJ CLASS 4							DN2100 RCSRJ CLASS 4						

LONG SECTION – SEWER PIPE – TANIWHA STREET TO PS-71

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m
SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
SEWER PIPELINE – PLAN AND PROFILE SHEET 7 OF 7

CAD FILE Z1962101-01-001-C009 DATE	
ORIGINAL SCALE A1 1 : 250	CONTRACT No.
REF. No. Z1962101-01-001-C009	ISSUE 2
DWG. No. XXXXXX	2

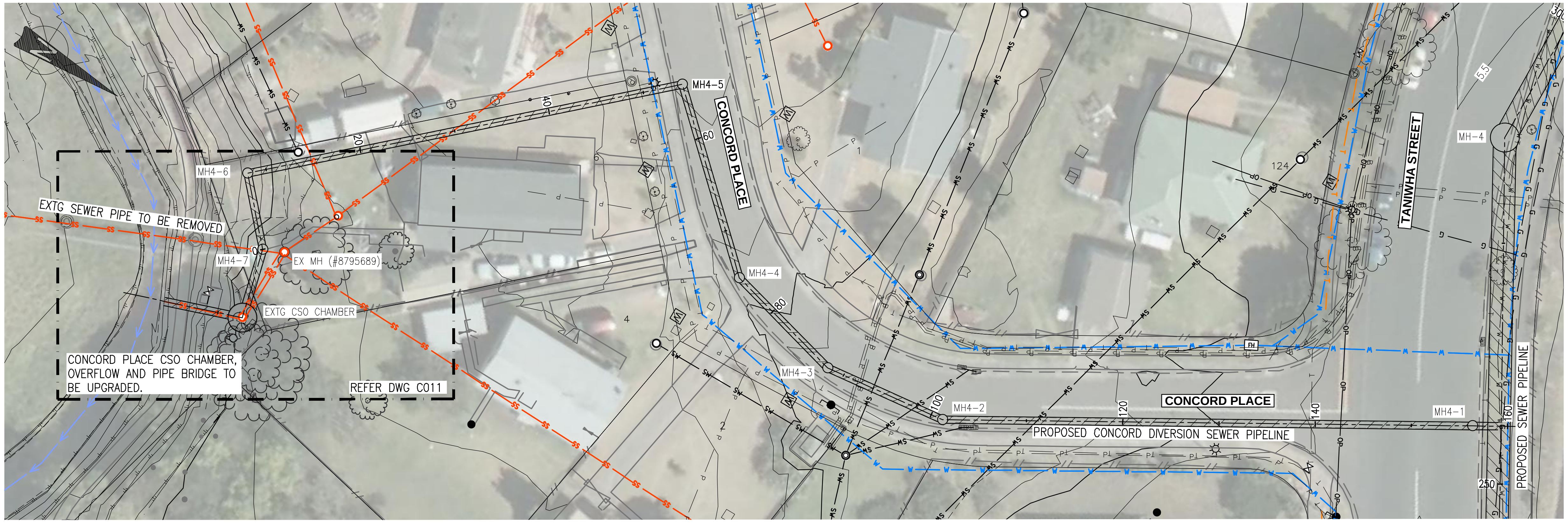
LEGEND - SERVICES

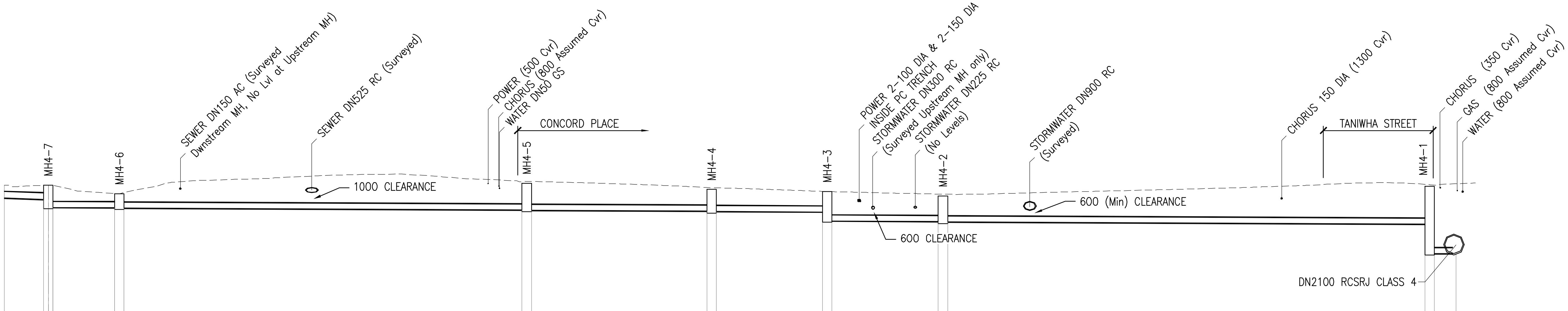
- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

○	MANHOLE	☼	LIGHT
▥	CESSPIT	●—	POWER POLE
FH	FIRE HYDRANT	^	SIGN
⋈	VALVE	■	POST
W	WATER METER	●	POLE
Ⓟ	TELECOM PLINTH	•	TREE TRUNK
		⊕	BOLLARD

- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE





HAD = -10.00

	MH4-7	MH4-6	MH4-5	MH4-4	MH4-3	MH4-2	MH4-1	
DEPTH TO INVERT	2.49	1.61 / 1.75	3.21 / 3.25	2.68 / 2.67	2.30 / 3.33	3.11 / 3.13	4.51 / 7.77	7.92
INVERT LEVEL (AT WALL)	2.60	2.56 / 2.53	2.31 / 2.28	2.18 / 2.15	2.12 / 1.06	1.00 / 0.97	0.71 / -2.63	-2.64
EXISTING GROUND LEVEL	5.09	4.17 / 4.28	5.52 / 5.53	4.86 / 4.82	4.42 / 4.39	4.11 / 4.09	5.22 / 5.14	5.28
CHAINAGE (-5.00)	0.00	8.05	54.15	75.08	88.17	101.26	156.36	159.36

	MH4-7 – MH4-6	MH4-6 – MH4-5	MH4-5 – MH4-4	MH4-4 – MH4-3	MH4-3 – MH4-2	MH4-2 – MH4-1	MH4-1 – 159.36
PIPE GRADE	0.48% 1:210.00	0.48% 1:210.00	0.48% 1:210.00	0.48% 1:210.00	0.48% 1:210.00	0.48% 1:210.00	0.50% 1:199.47
PIPE DATA	DN675 RCRRJ CLASS 4	DN675 RCRRJ CLASS 4	DN675 RCRRJ CLASS 4	DN675 RCRRJ CLASS 4	DN675 RCRRJ CLASS 4	DN675 RCRRJ CLASS 4	DN675 RCRRJ CLASS 4

LONG SECTION – CONCORD PLACE DIVERSION

SCALES HORIZ 1 : 250 VERT 1 : 250

PRELIMINARY DESIGN

5 0 5 10m
SCALE 1:250

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

	BY	DATE
DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
CONCORD PLACE DIVERSION

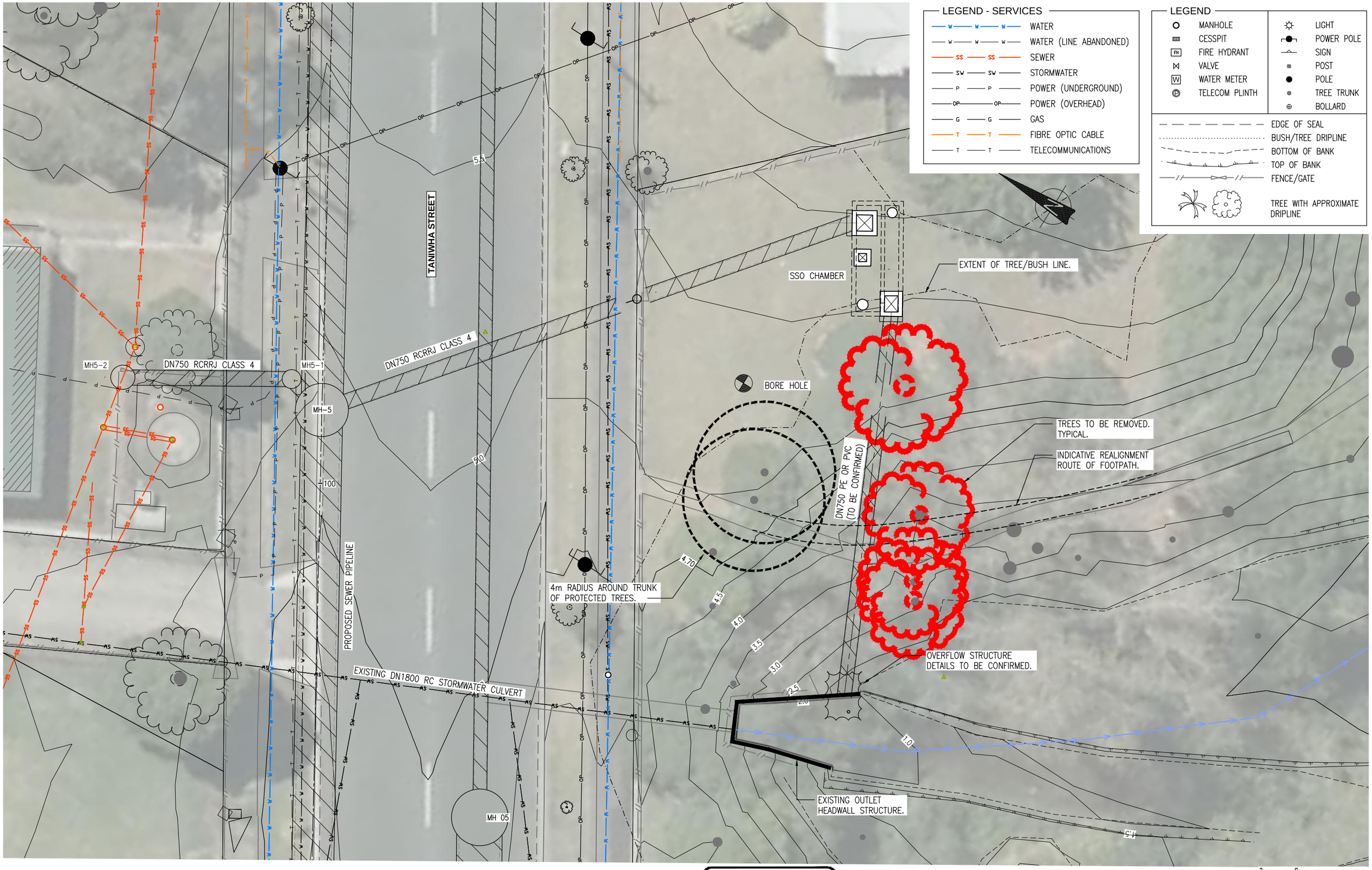
CAD FILE Z1962101-01-001-C010 DATE

ORIGINAL SCALE A1 1 : 250

CONTRACT No.

REF. No. Z1962101-01-001-C010 ISSUE 2

DWG. No. XXXXXXX 2



ISSUE	DATE	AMENDMENT	BY	APPD.
2	19.01916	FOR INTEGRATED TRANSPORT ASSESSMENT	JE	RS
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
TANIWHA STREET SSO CHAMBER SITE PLAN

CAD FILE Z1962101-01-001-C020 DATE

ORIGINAL SCALE A1 : 1 : 100

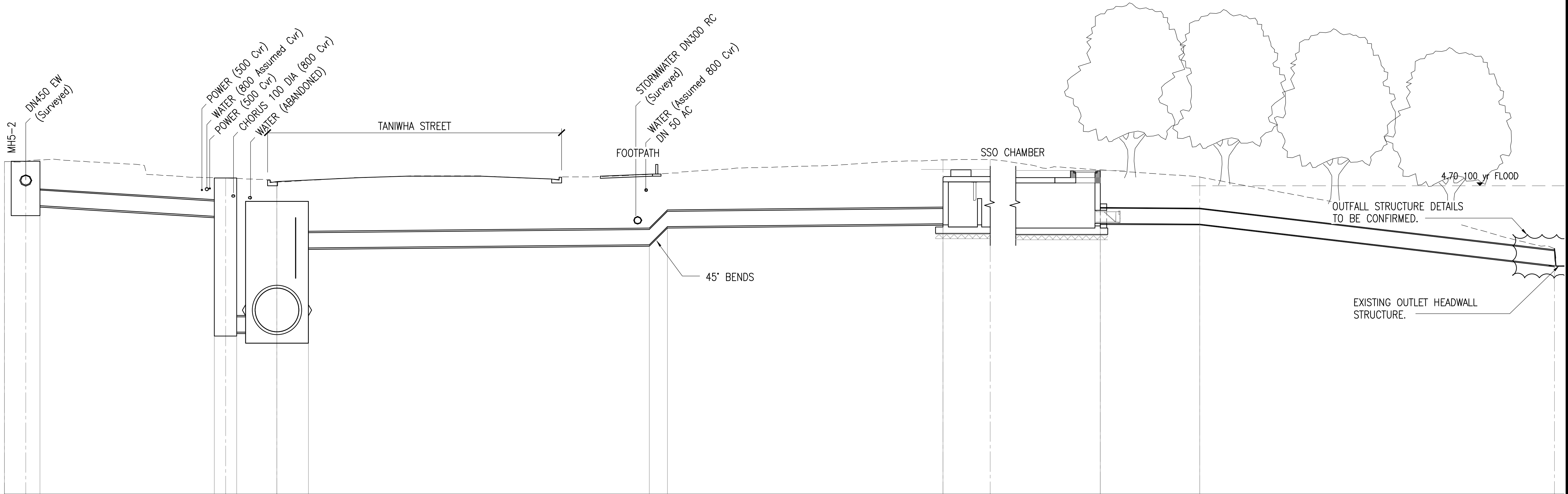
CONTRACT No.

REF. No. Z1962101-01-001-C020

ISSUE 2

DWG. No. XXXXXXX

2



HAD = −10.00

DEPTH TO INVERT		2.17	1.84	4.59	7.32	4.90	3.23	3.35	2.54	3.06	2.55	2.24	0.83
INVERT LEVEL (AT WALL)		3.76	3.24		−2.28		1.72	1.89	2.75	2.88	2.90	2.88	0.88
EXISTING GROUND LEVEL	5.87	5.93	5.08	5.07	5.05	4.86	4.96	5.24	5.29	5.94	5.45	5.12	1.71
CHAINAGE	−11.98			−2.45		0.00				31.76	39.26	44.01	60.92

PIPE GRADE	−6.24% −1:16.02	0.00% Horizontal	−0.94% −1:106.86	−100.00% −1:1.00	−0.98% −1:102.48	0.50% 1:200.00	11.81% 1:8.47 (GRADE TO BE CONFIRMED)
PIPE DATA	DN750 RCRRJ CLASS 4	DN750 RCRRJ CLASS 4	DN750 RCRRJ CLASS 4	DN750 RCRRJ CLASS 4	DN750 RCRRJ CLASS 4	DN750 PE OR PVC (TO BE CONFIRMED)	DN750 PE OR PVC (TO BE CONFIRMED)

LONG SECTION – OVERFLOW
SCALES HORIZ 1 : 100 VERT 1 : 100

2 0 5m
SCALE 1:100

PRELIMINARY DESIGN

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

	BY	DATE
DESIGNED	John Eaton	05.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	05.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		

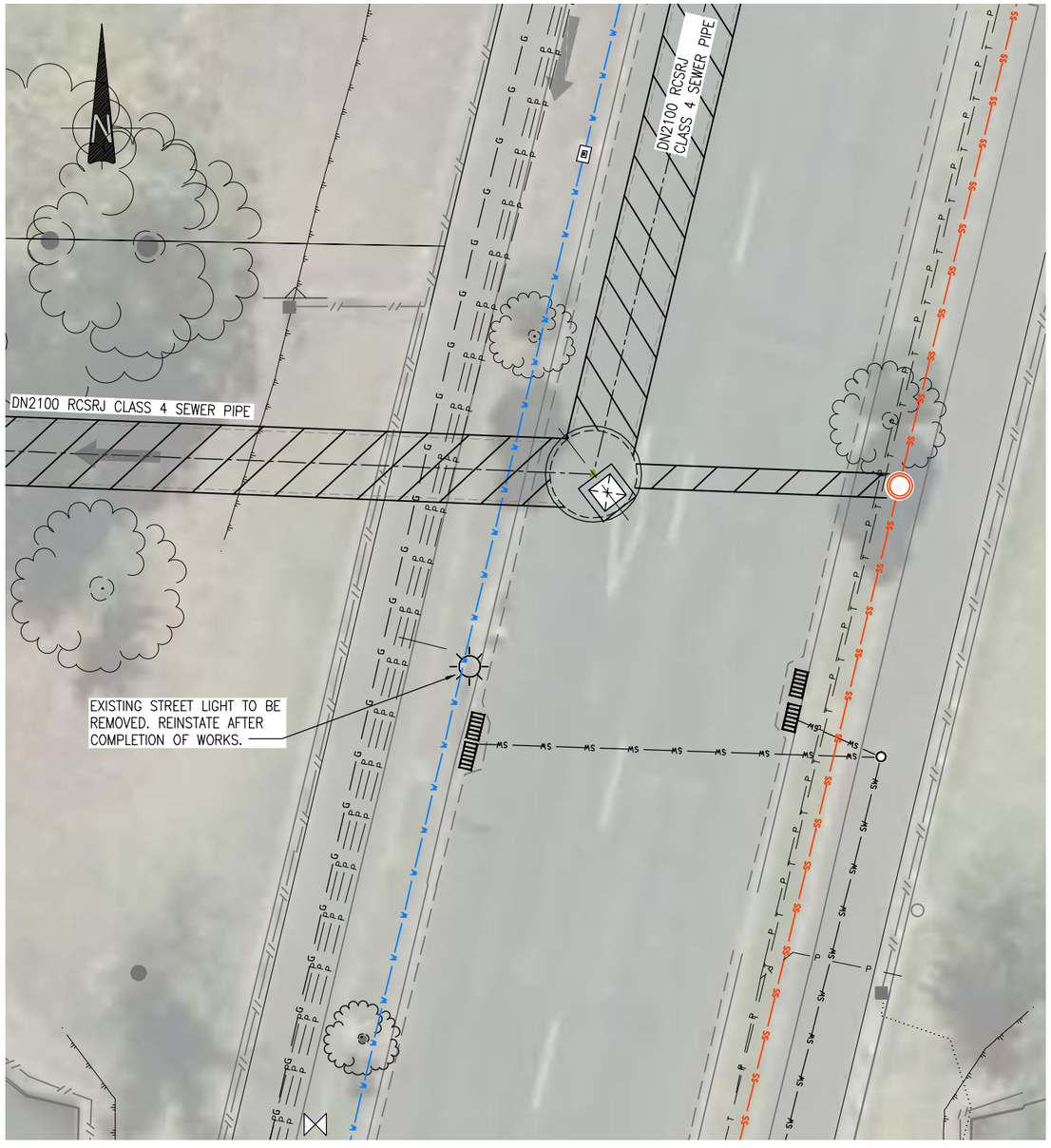
OPERATIONS
INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
TANIWHA STREET OVERFLOW PIPELINE PROFILE

CAD FILE Z1962101-01-001-C021 DATE
ORIGINAL SCALE A1 1 : 100
CONTRACT No.
REF. No. Z1962101-01-001-C021
ISSUE 2
DWG. No. XXXXXXX 2



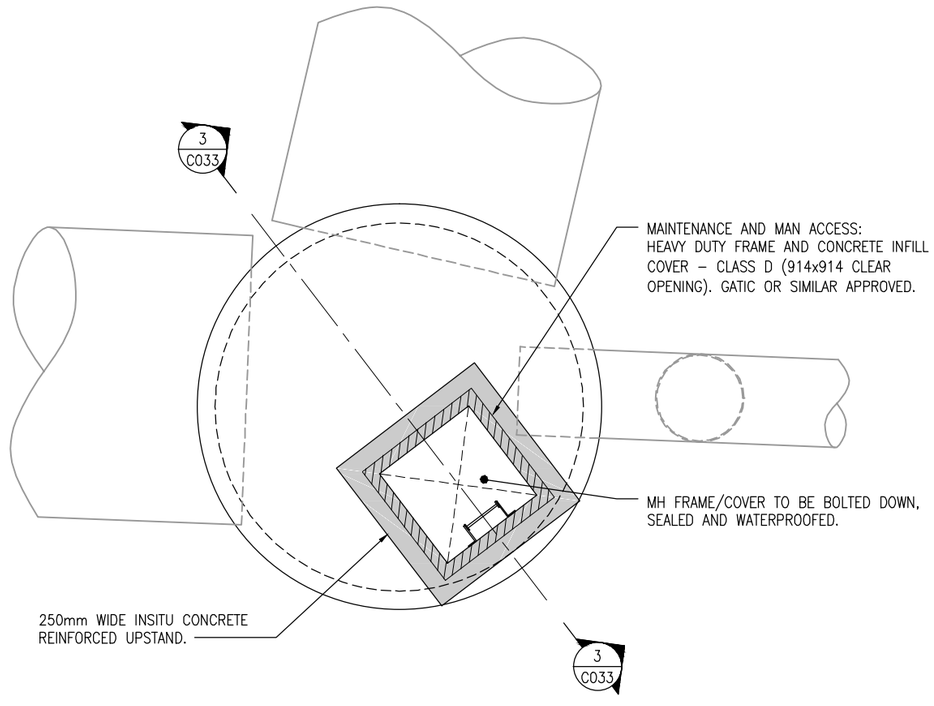
SITE PLAN
SCALE 1 : 100

LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE



CONCRETE LID – PLAN
SCALE 1 : 25

PRELIMINARY DESIGN

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	08.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	08.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

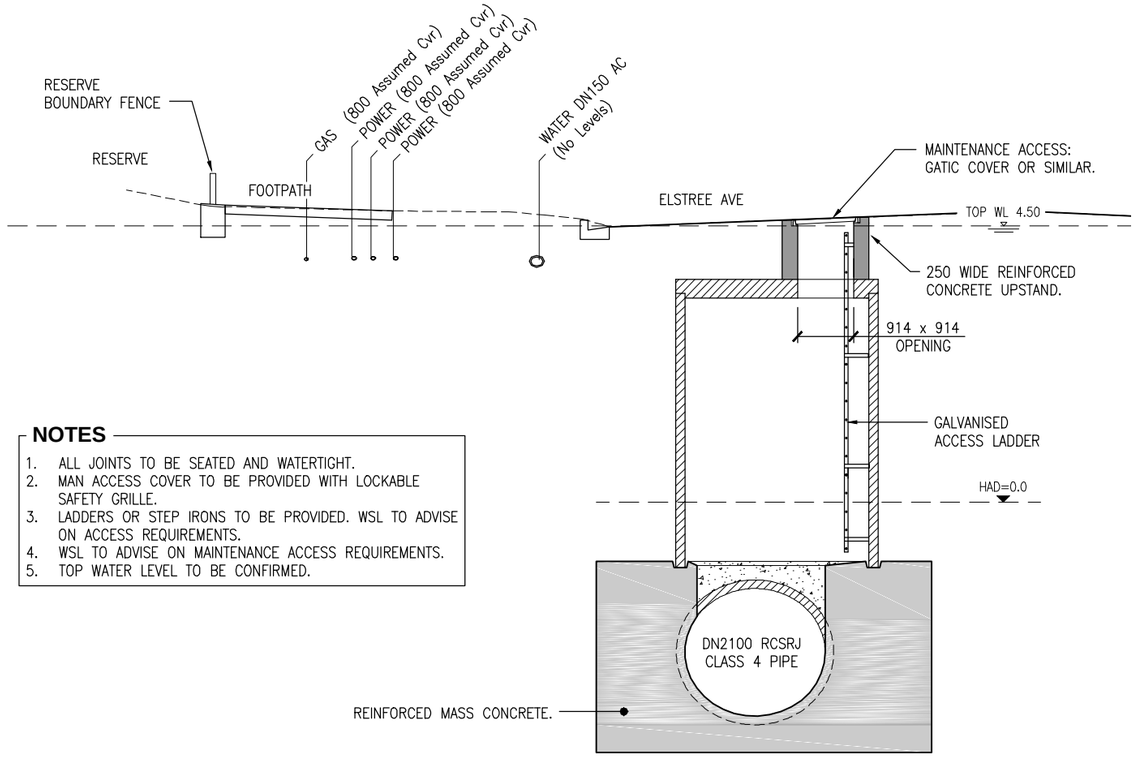
INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
MANHOLE MH-2 SITE & LID PLANS

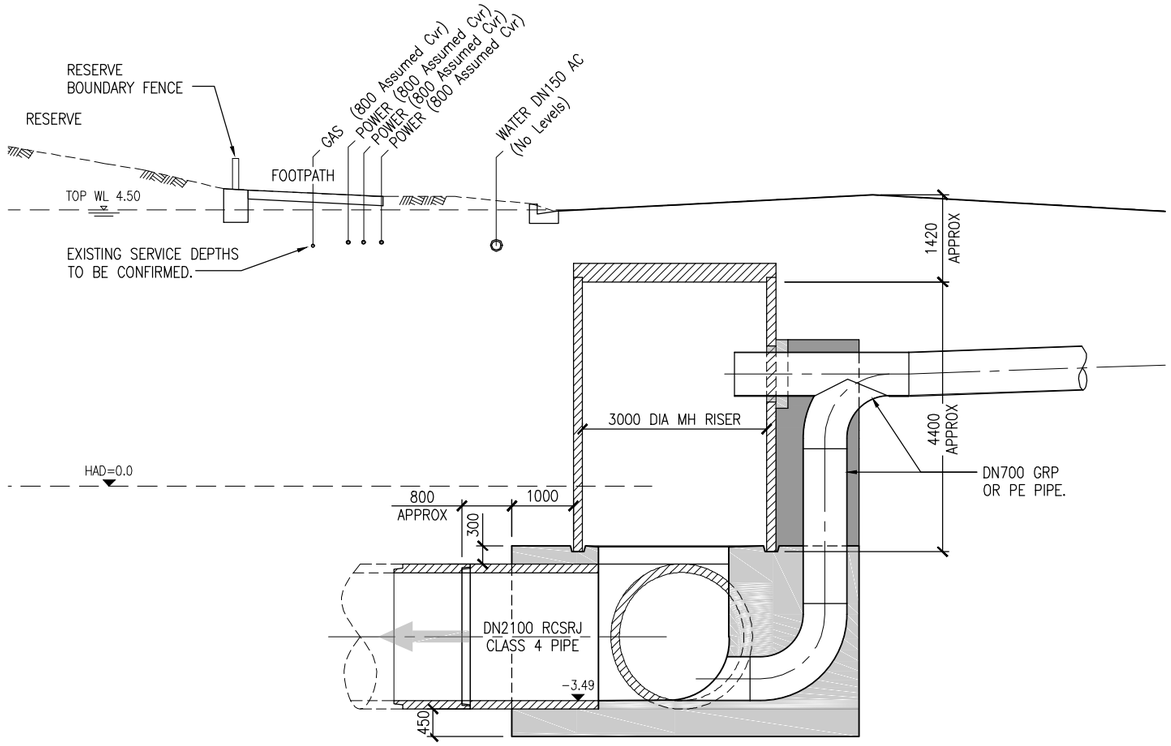
CAD FILE Z1962101-01-001-C032 DATE	
ORIGINAL SCALE A1 AS SHOWN	CONTRACT No.
REF. No. Z1962101-01-001-C032	ISSUE 2
DWG. No. XXXXXXX	2



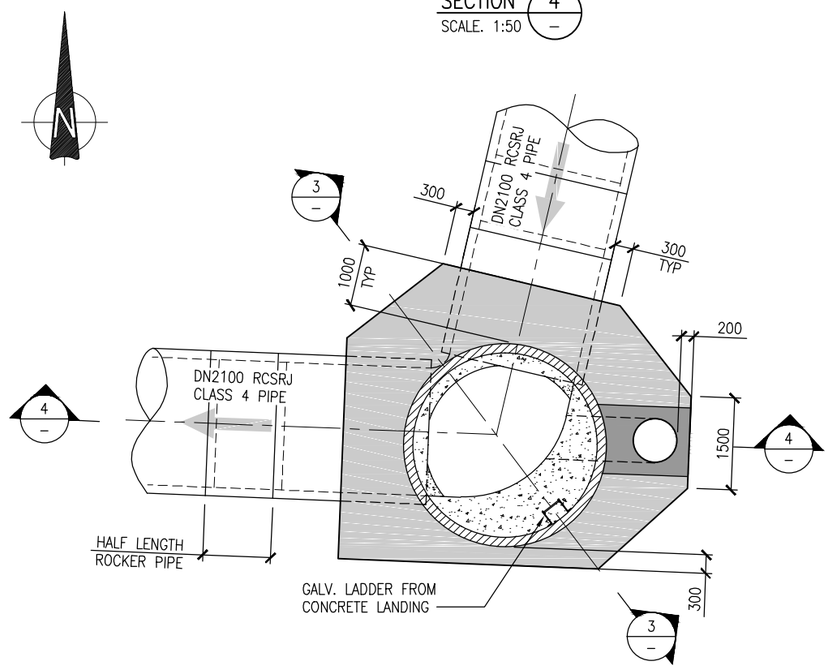
NOTES

1. ALL JOINTS TO BE SEATED AND WATERTIGHT.
2. MAN ACCESS COVER TO BE PROVIDED WITH LOCKABLE SAFETY GRILLE.
3. LADDERS OR STEP IRONS TO BE PROVIDED. WSL TO ADVISE ON ACCESS REQUIREMENTS.
4. WSL TO ADVISE ON MAINTENANCE ACCESS REQUIREMENTS.
5. TOP WATER LEVEL TO BE CONFIRMED.

SECTION 3
SCALE. 1:50



SECTION 4
SCALE. 1:50



MH BASE PLAN
SCALE 1 : 50

PRELIMINARY DESIGN

ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

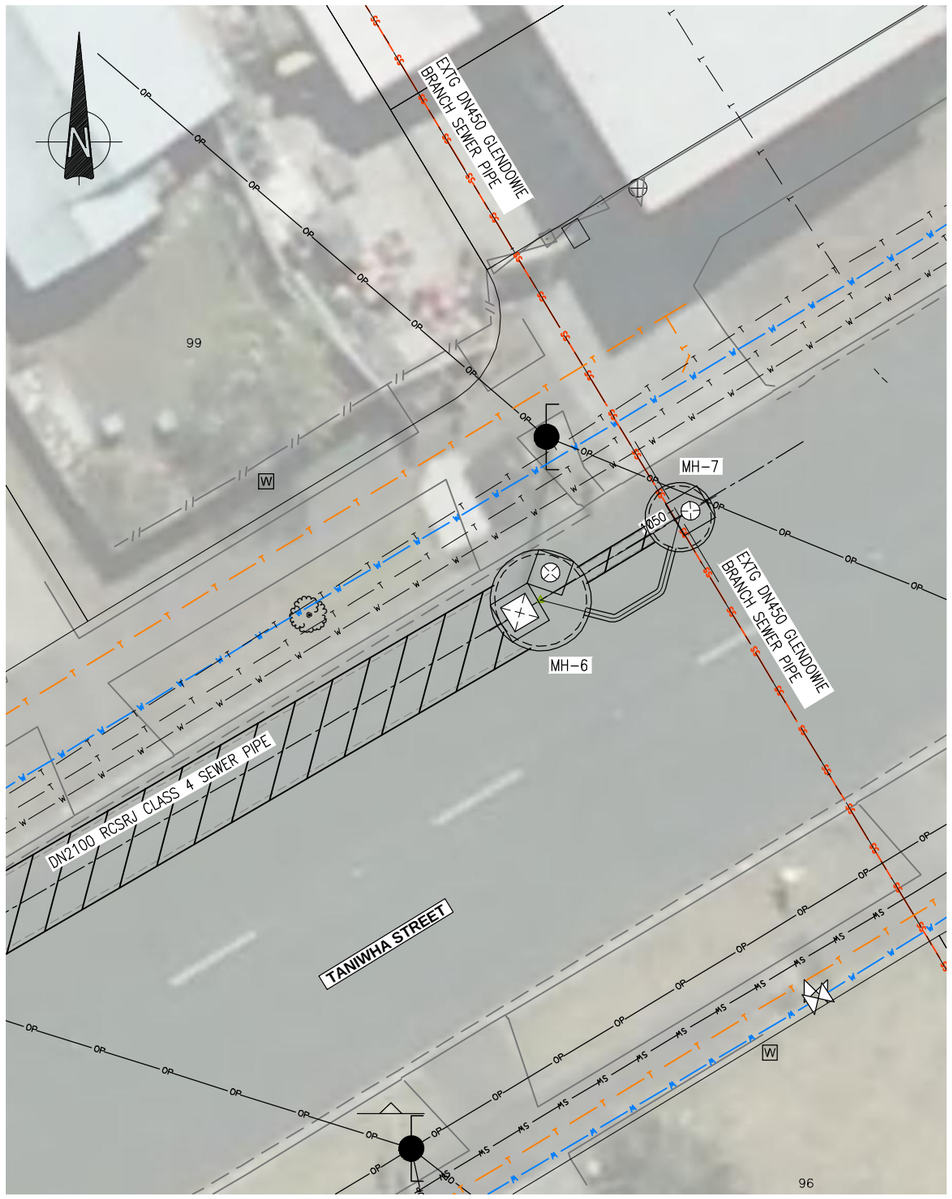
DESIGNED	John Eaton	08.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	08.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS
INFRASTRUCTURE

Watercare
MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
MANHOLE MH-2 SECTIONS

CAD FILE Z1962101-01-001-C033 DATE
ORIGINAL SCALE A1 AS SHOWN
CONTRACT No.
REF. No. Z1962101-01-001-C033
ISSUE 1
DWG. No. XXXXXXX
2



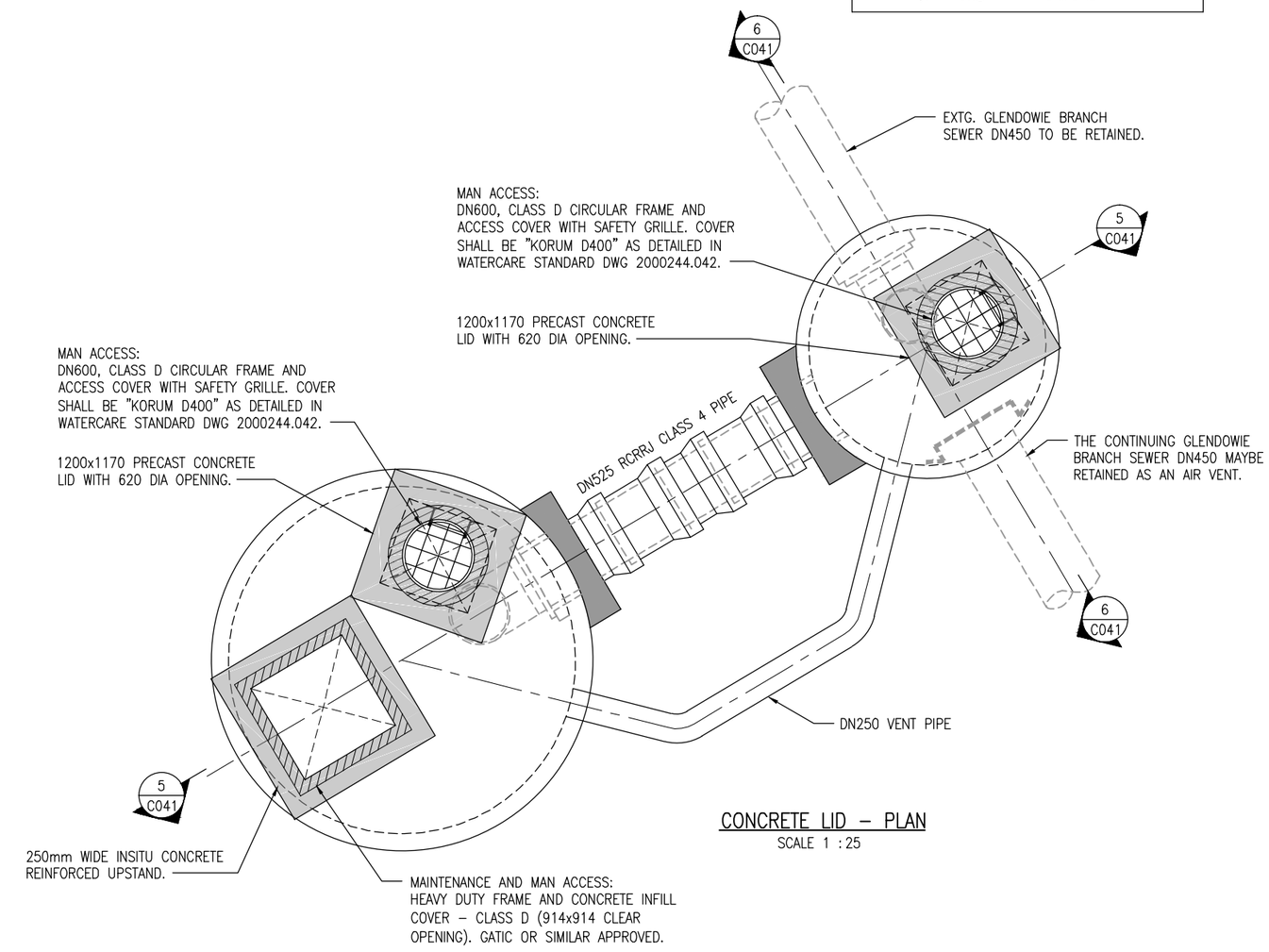
SITE PLAN
SCALE 1 : 100

LEGEND - SERVICES

- WATER
- WATER (LINE ABANDONED)
- SEWER
- STORMWATER
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- GAS
- FIBRE OPTIC CABLE
- TELECOMMUNICATIONS

LEGEND

- MANHOLE
- CESSPIT
- FIRE HYDRANT
- VALVE
- WATER METER
- TELECOM PLINTH
- LIGHT
- POWER POLE
- SIGN
- POST
- POLE
- TREE TRUNK
- BOLLARD
- EDGE OF SEAL
- BUSH/TREE DRIPLINE
- BOTTOM OF BANK
- TOP OF BANK
- FENCE/GATE
- TREE WITH APPROXIMATE DRIPLINE



CONCRETE LID – PLAN
SCALE 1 : 25

PRELIMINARY DESIGN

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	08.2015	
DESIGN CHECK	John Eaton	21.08.15	
DRAWN	Brent James	08.2015	
CAD REVIEW	James Burke	21.08.15	
DESIGN REVIEW	Roy Slater	21.08.15	
MWH APPROVED			
	BY	DATE	

OPERATIONS

INFRASTRUCTURE

Watercare

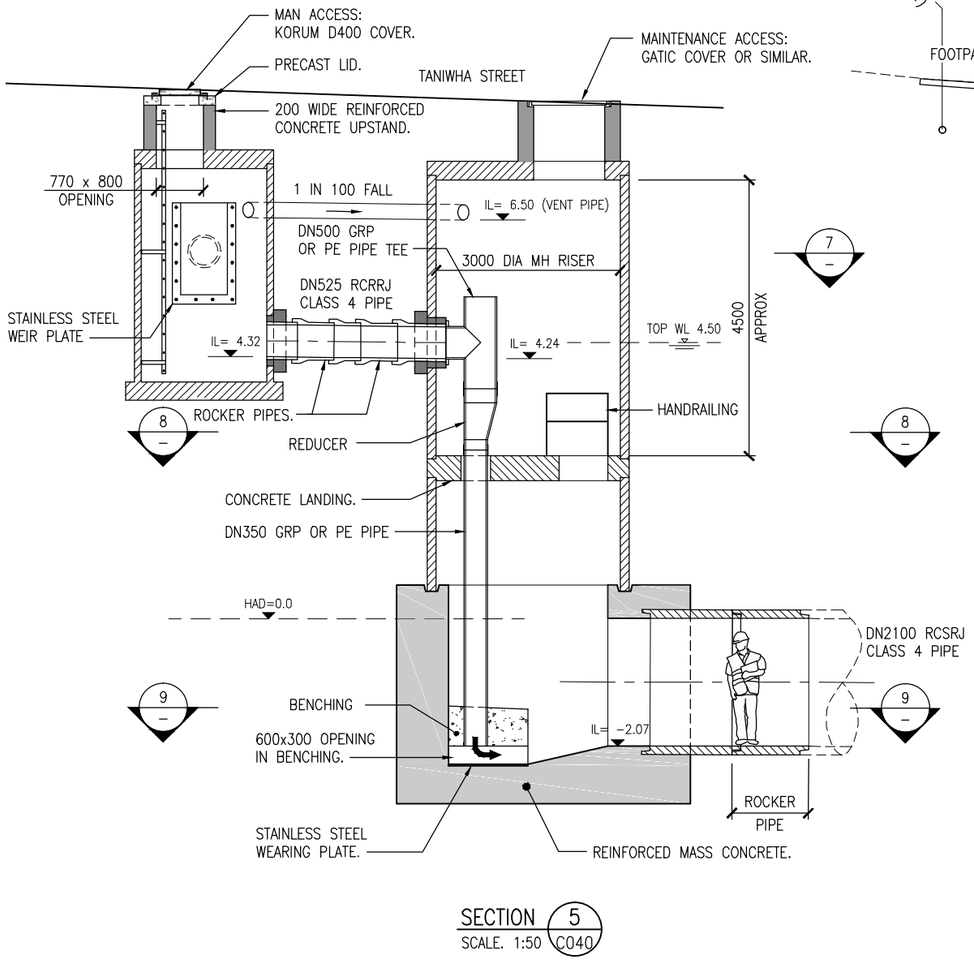
MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
MANHOLE MH-6 & MH-7 SITE & LID PLANS

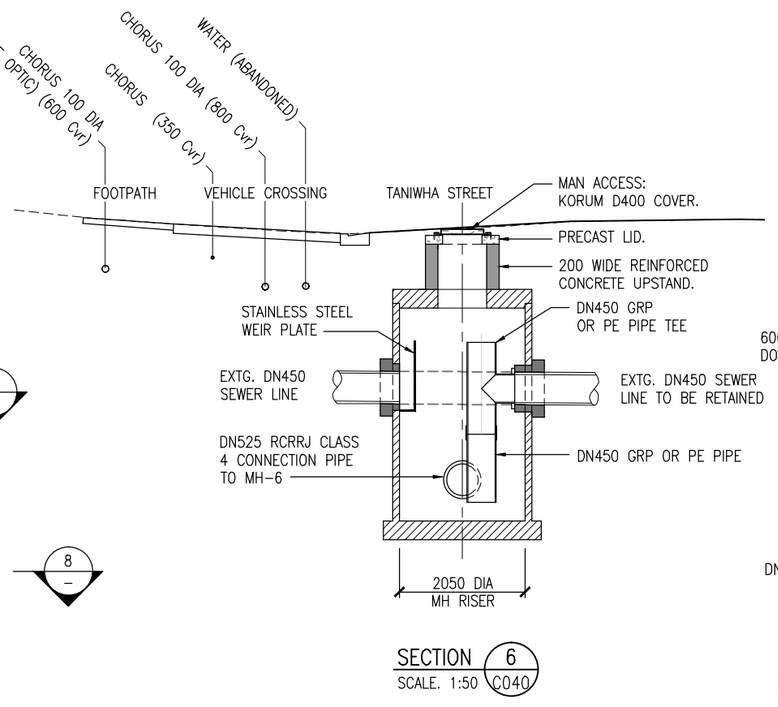
CAD FILE Z1962101-01-001-C040 DATE	
ORIGINAL SCALE A1 AS SHOWN	CONTRACT No.
REF. No. Z1962101-01-001-C040	ISSUE 2
DWG. No. XXXXXX	2

NOTES

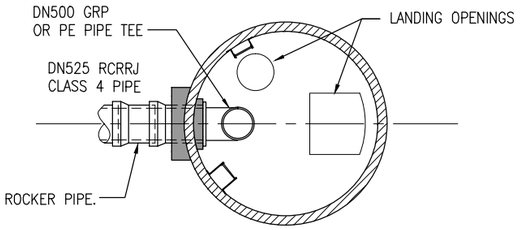
1. ALL JOINTS TO BE SEATED AND WATERTIGHT.
2. MAN ACCESS COVER TO BE PROVIDED WITH LOCKABLE SAFETY GRILLE.
3. LADDERS OR STEP IRONS TO BE PROVIDED. WSL TO ADVISE ON ACCESS REQUIREMENTS.
4. WSL TO ADVISE ON MAINTENANCE ACCESS REQUIREMENTS.



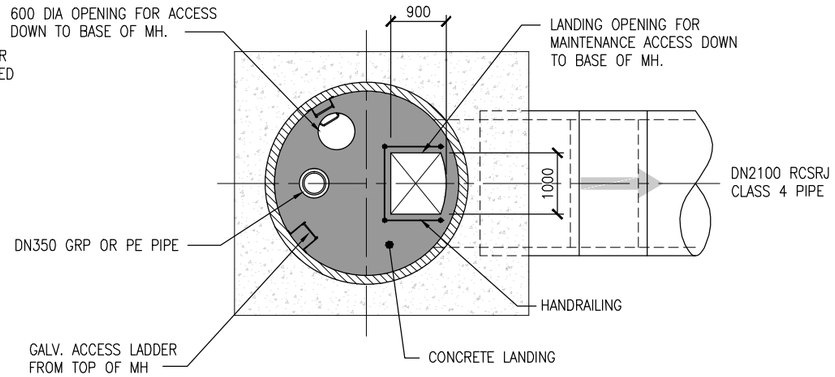
SECTION 5
SCALE. 1:50 C040



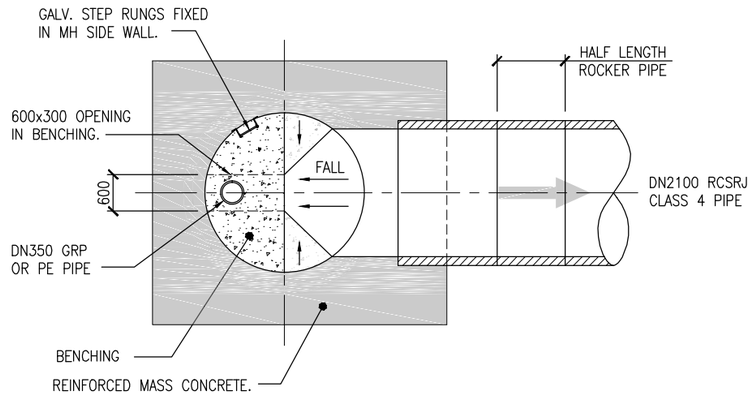
SECTION 6
SCALE. 1:50 C040



SECTION 7
SCALE. 1:50 –



SECTION 8
SCALE. 1:50 –



SECTION 9
SCALE. 1:50 –

PRELIMINARY DESIGN

ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	08.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	08.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
MANHOLE MH-6 & MH-7 SECTIONS

CAD FILE Z1962101-01-001-C041 DATE

ORIGINAL SCALE A1 AS SHOWN

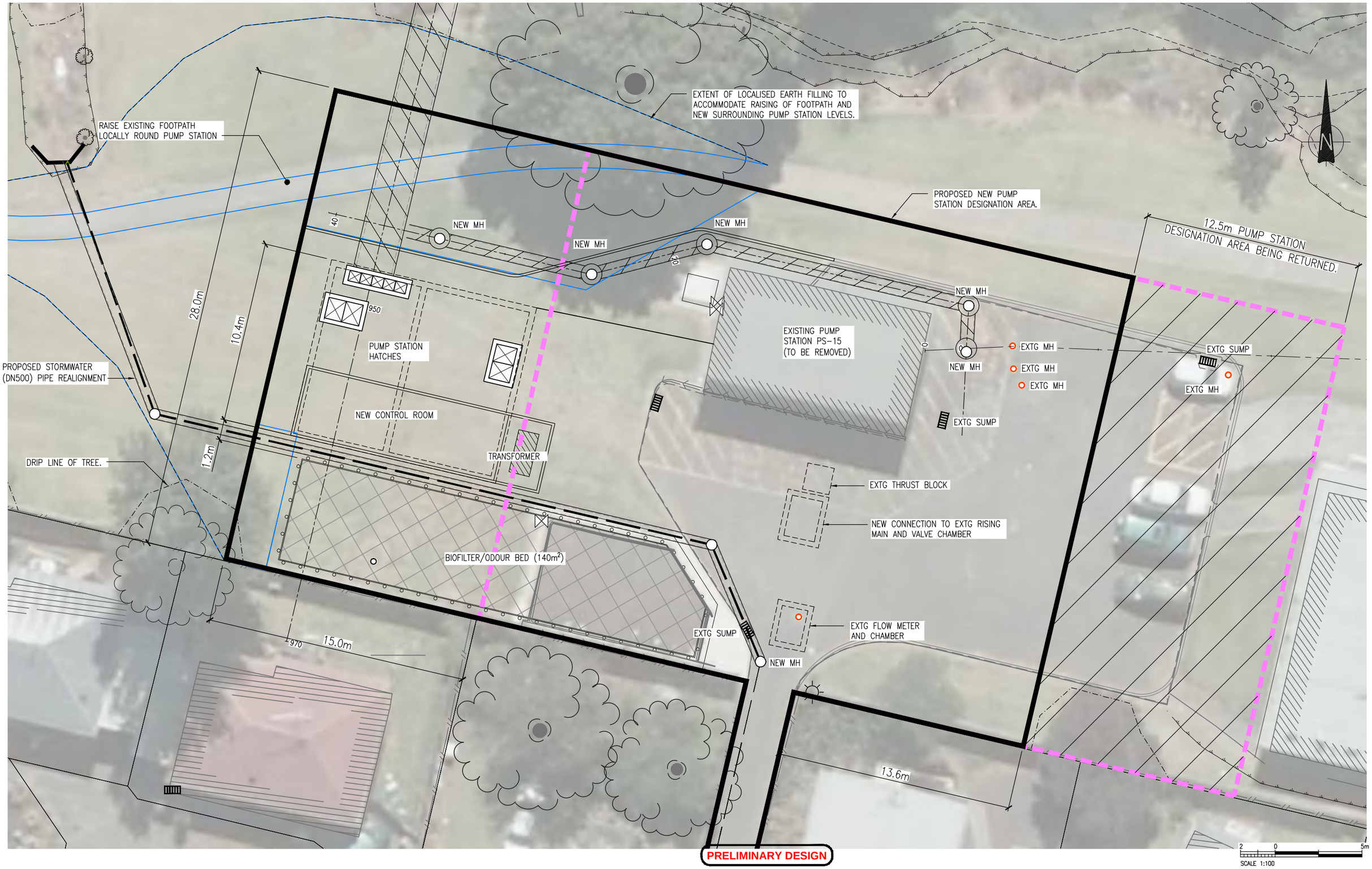
CONTRACT No.

REF. No. Z1962101-01-001-C041

ISSUE 2

DWG. No. XXXXXX

2



ISSUE	DATE	AMENDMENT	BY	APPD.
2		FOR INTEGRATED TRANSPORT ASSESSMENT		
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	02.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	02.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
PUMP STATION SITE PLAN

CAD FILE Z1962101-01-001-C052 DATE 23.02.2016

ORIGINAL SCALE A1 1 : 100

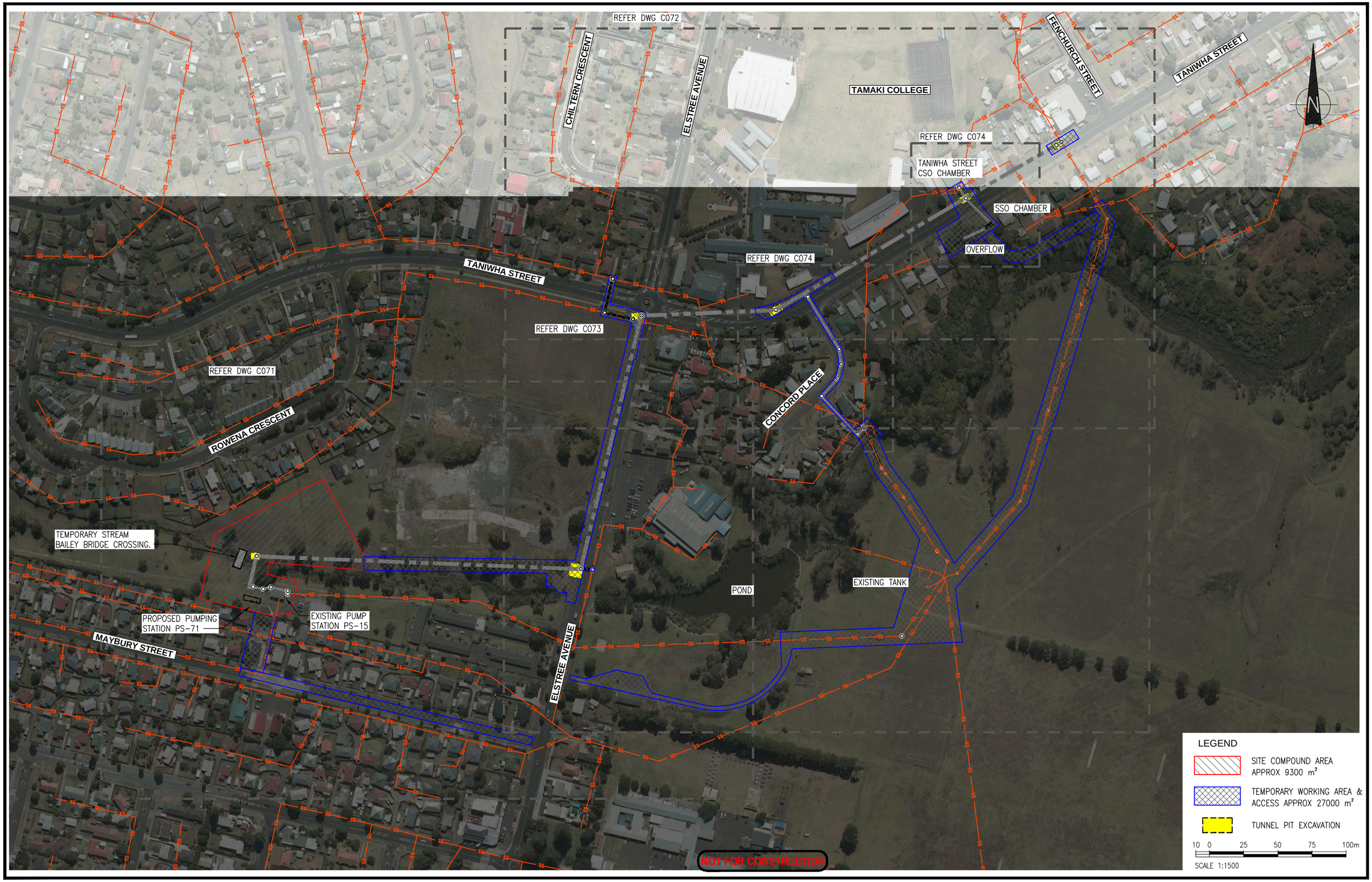
CONTRACT No.

REF. No. Z1962101-01-001-C052

ISSUE 2

DWG. No. XXXXXXX

2



ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	07.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	07.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
WORKING AREAS

CAD FILE Z1962101-01-001-C070 DATE

ORIGINAL SCALE A1 1:1500

CONTRACT No.

REF. No. Z1962101-01-001-C070

ISSUE 2

DWG. No. XXXXXX

2

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	07.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	07.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

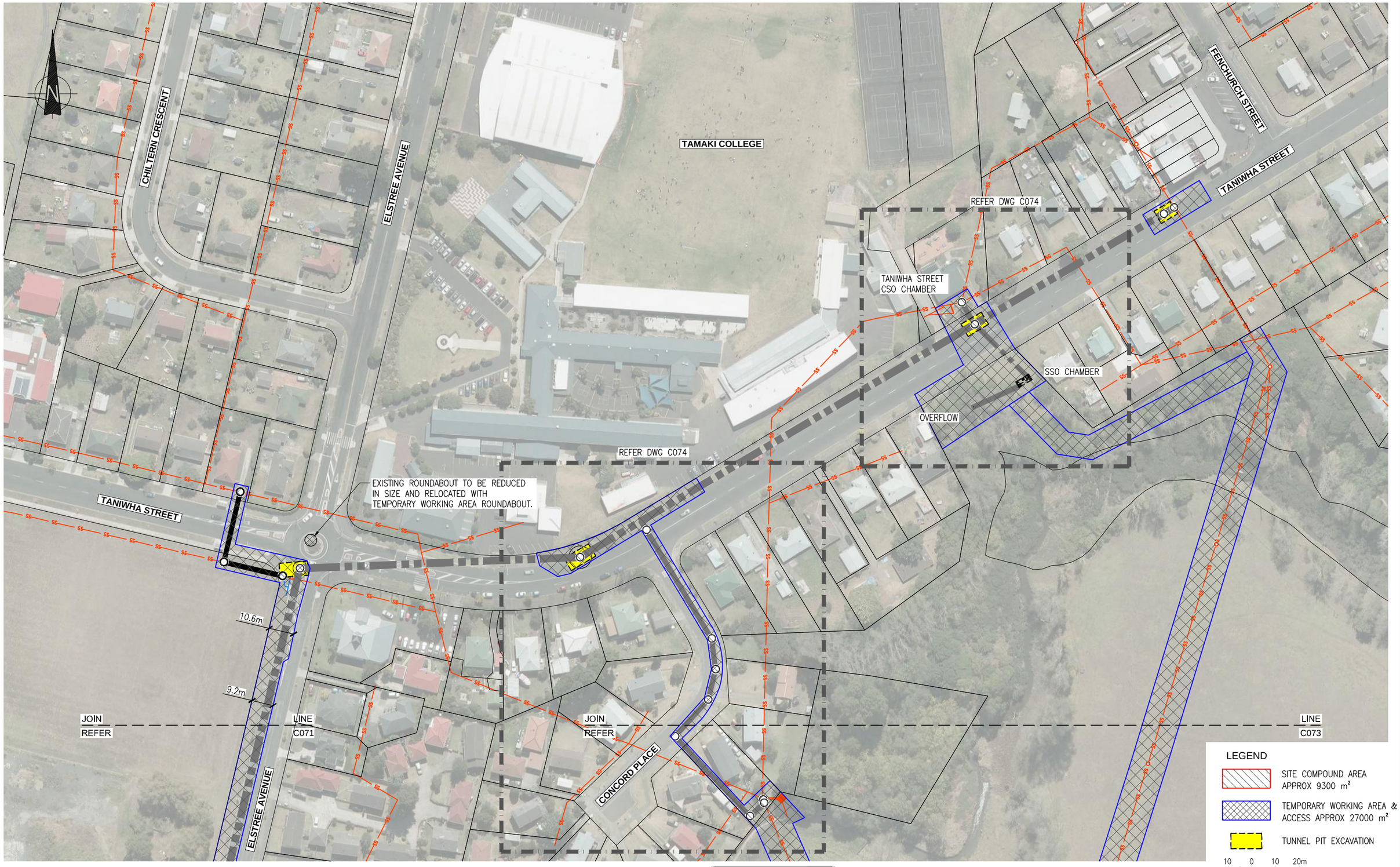
INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
WORKING AREAS ENLARGEMENT – SHEET 1 OF 4

CAD FILE Z1962101-01-001-C071 DATE	
ORIGINAL SCALE A1 AS SHOWN	CONTRACT No.
REF. No. Z1962101-01-001-C071	ISSUE 2
DWG. No. XXXXXXX	2



NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	07.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	07.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
WORKING AREAS ENLARGEMENT – SHEET 2 OF 4

CAD FILE Z1962101-01-001-C072	DATE
ORIGINAL SCALE A1 AS SHOWN	CONTRACT No.
REF. No. Z1962101-01-001-C072	ISSUE 2
DWG. No. XXXXXXX	2

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

DESIGNED	John Eaton	07.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	07.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		
	BY	DATE

OPERATIONS

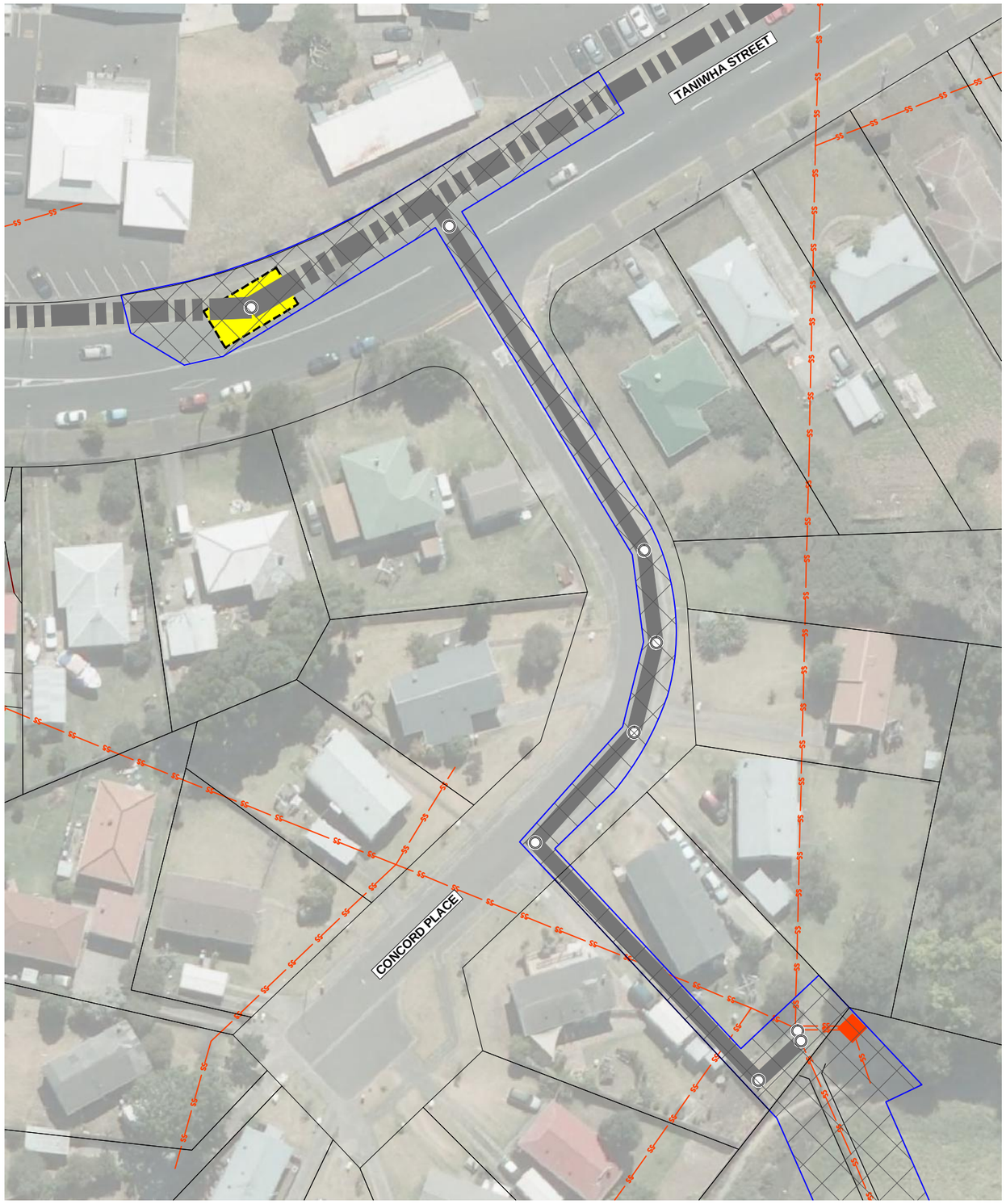
INFRASTRUCTURE

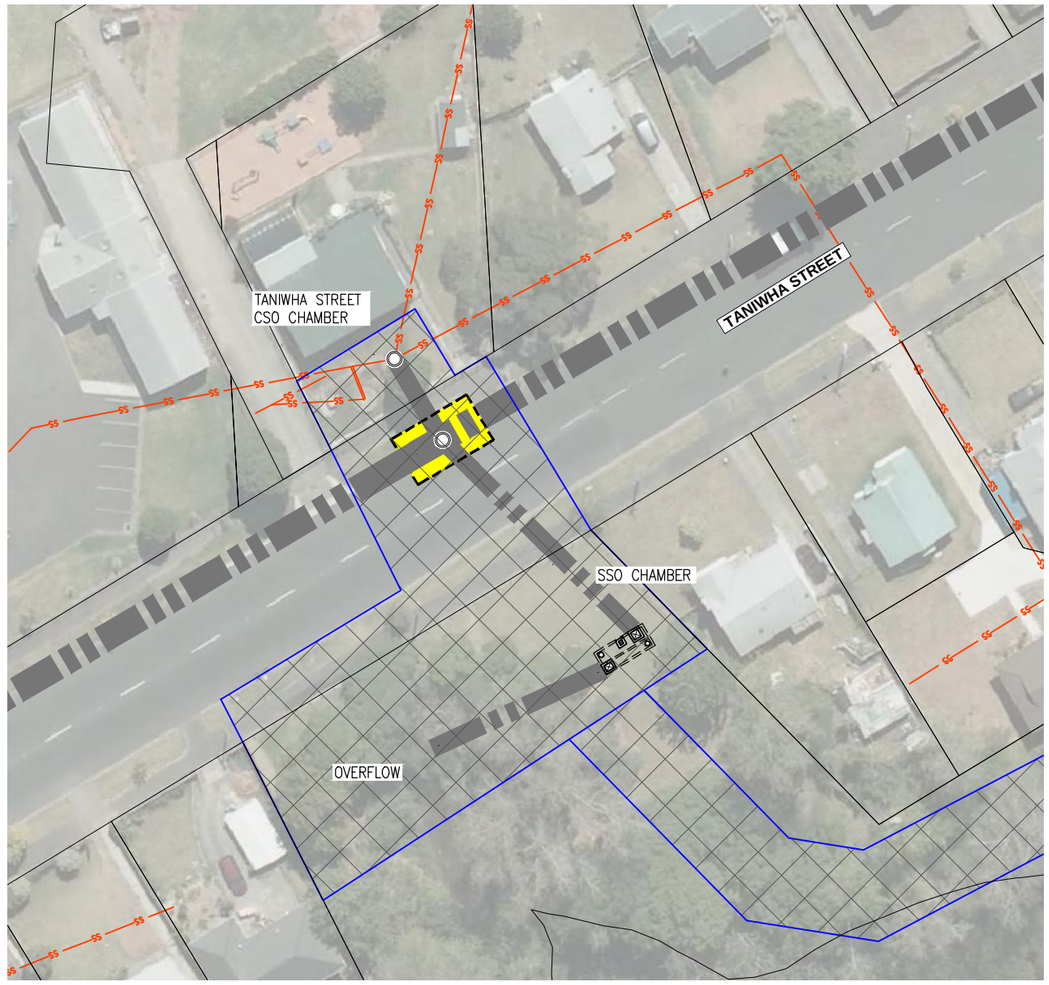
Watercare

MWH.

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
WORKING AREAS ENLARGEMENT – SHEET 3 OF 4

CAD FILE Z1962101-01-001-C073 DATE	
ORIGINAL SCALE A1 AS SHOWN	CONTRACT No.
REF. No. Z1962101-01-001-C073	ISSUE 2
DWG. No. XXXXXXX	2





LEGEND

- SITE COMPOUND AREA APPROX 9300 m²
- TEMPORARY WORKING AREA & ACCESS APPROX 27000 m²
- TUNNEL PIT EXCAVATION

5 0 10 20m

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT	BY	APPD.
1	21.8.15	PRELIMINARY DESIGN	JE	RS

	BY	DATE
DESIGNED	John Eaton	07.2015
DESIGN CHECK	John Eaton	21.08.15
DRAWN	Brent James	07.2015
CAD REVIEW	James Burke	21.08.15
DESIGN REVIEW	Roy Slater	21.08.15
MWH APPROVED		

OPERATIONS

INFRASTRUCTURE

Watercare

MWH.

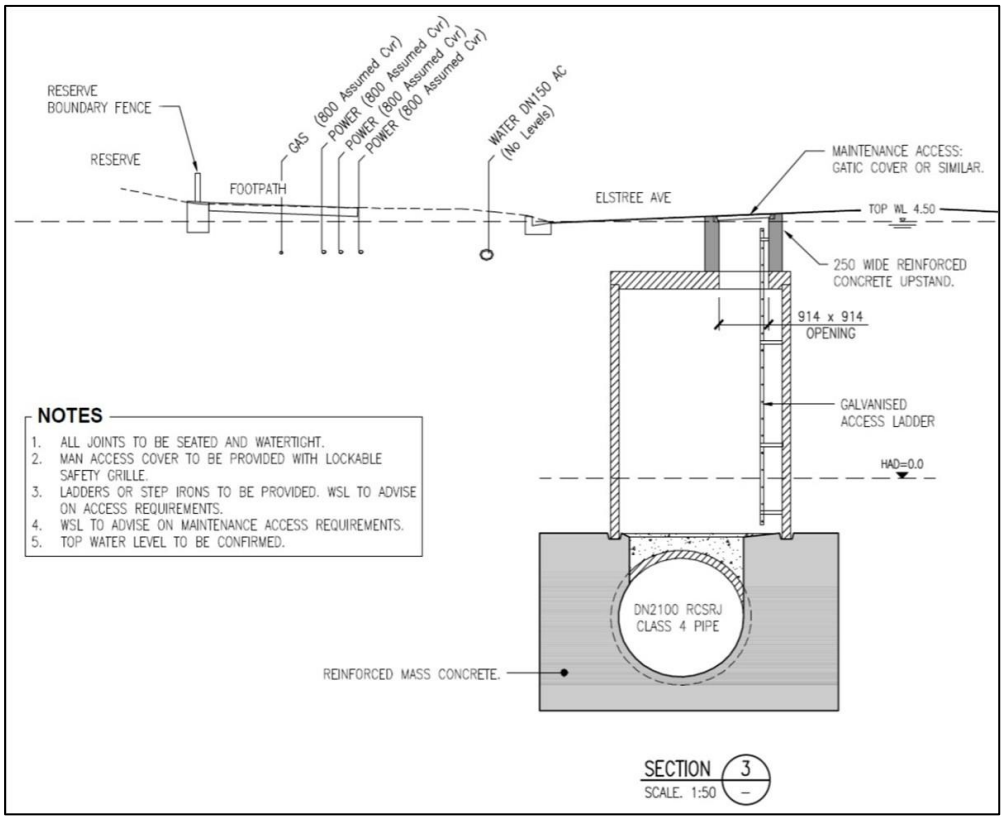
GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
WORKING AREAS ENLARGEMENT – SHEET 4 OF 4

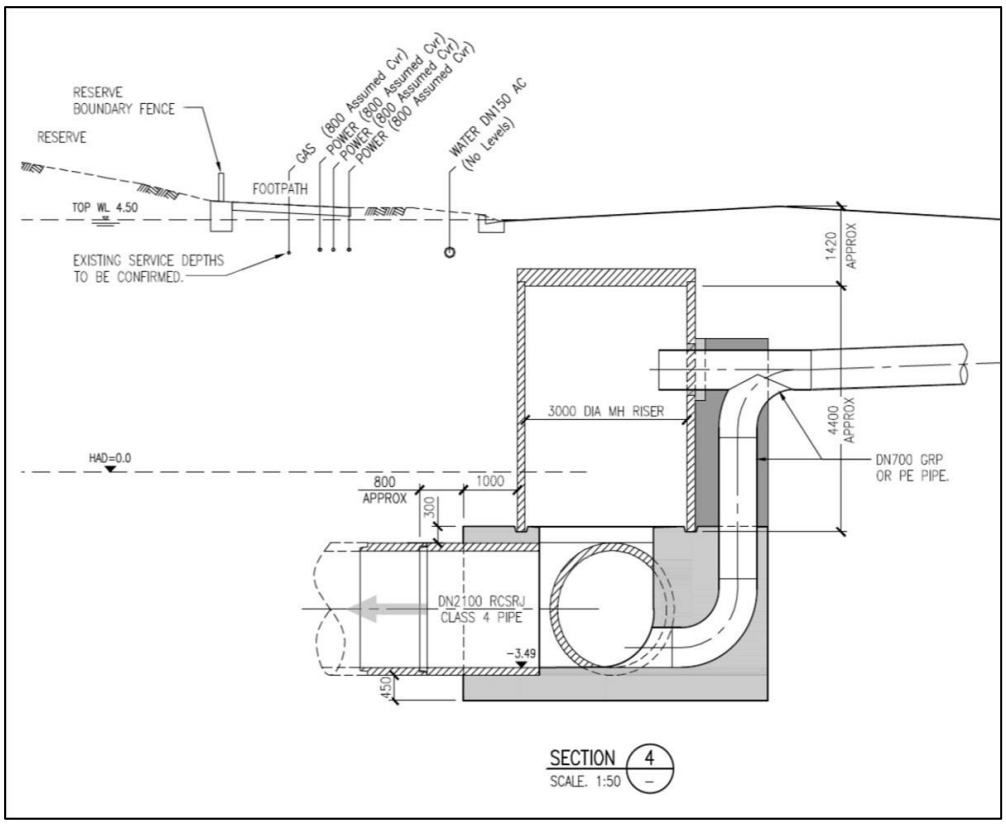
CAD FILE Z1962101-01-001-C074 DATE	
ORIGINAL SCALE A1 NTS	CONTRACT No.
REF. No. Z1962101-01-001-C074	ISSUE 2
DWG. No. XXXXXXX	2

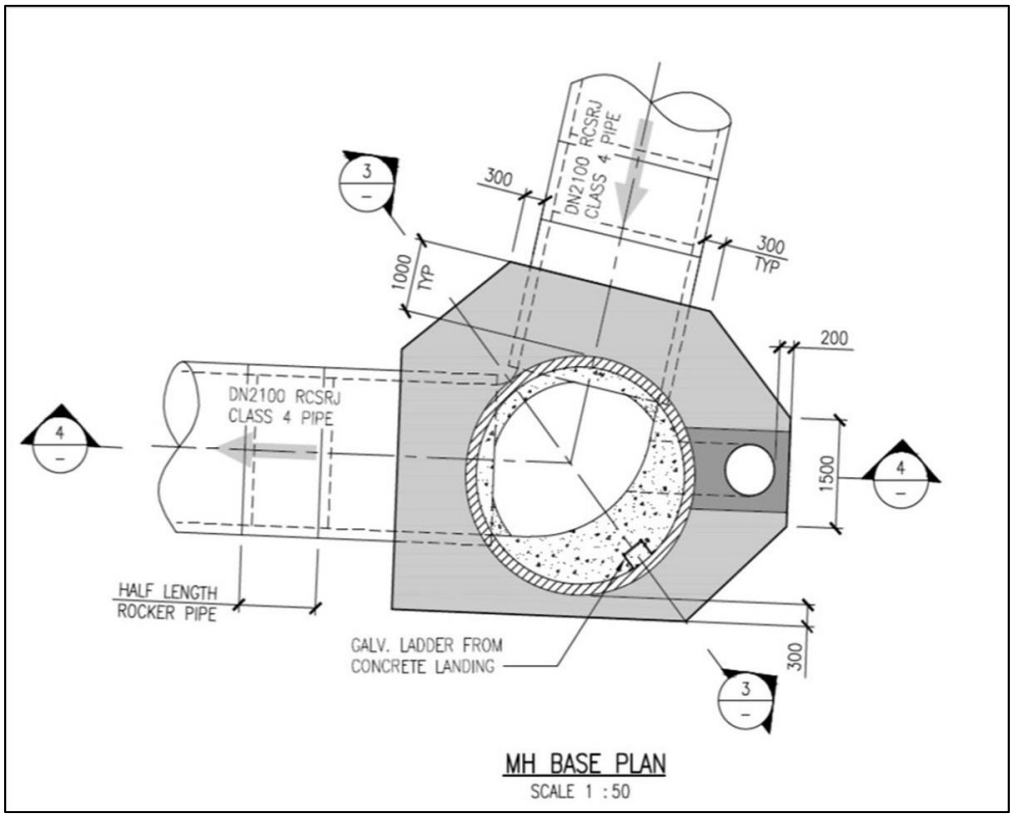
Appendix B Installation of Service

For construction of the new chambers existing services will need to be diverted and reinstated to accommodate the new structures. The chamber will also be designed to allow future residential utility distribution services to be installed in the footpath. Any future services will be able to be installed over the top of the chamber roof slab. The reinstated services will be installed at the same level as originally found and any future services will be able to be installed with a minimum cover of 1.2m.

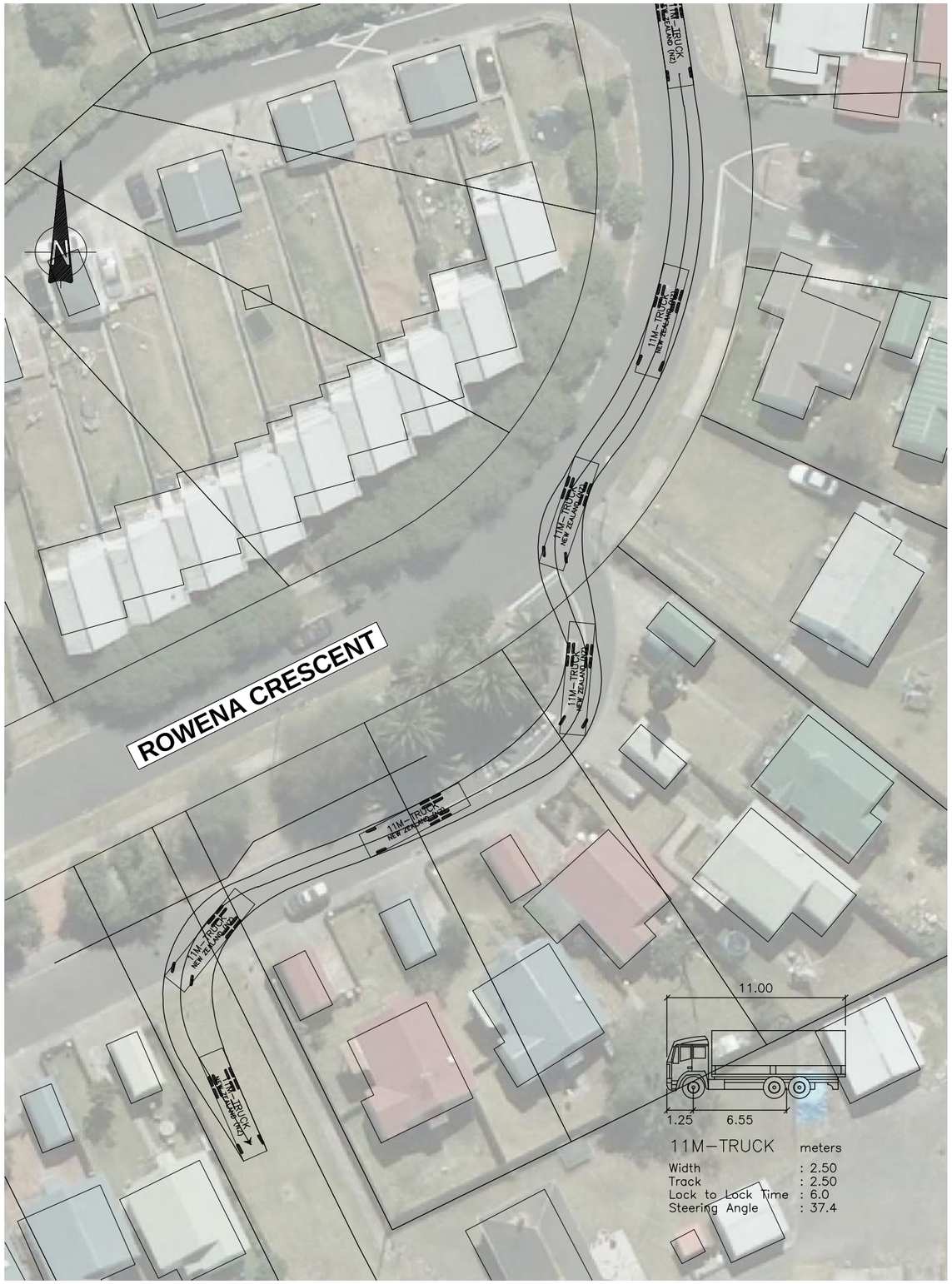
Services Installed Over New Structures – Typical Arrangement

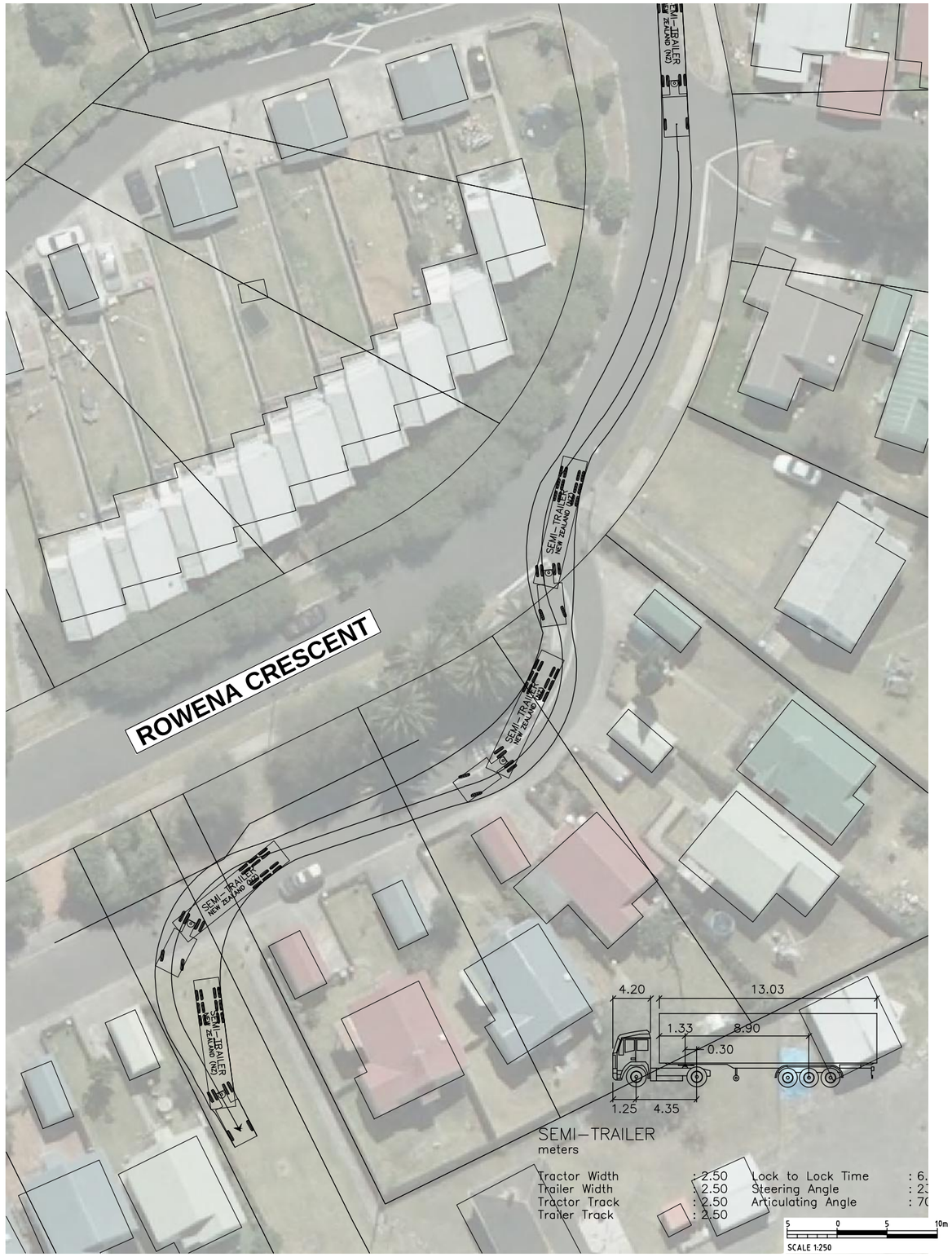





DN2100 RCSRJ CLASS 4 PIPE
300
300 TYP
1000 TYP
200
DN2100 RCSRJ CLASS 4 PIPE
1500
HALF LENGTH ROCKER PIPE
GALV. LADDER FROM CONCRETE LANDING
300
3
4
MH BASE PLAN
SCALE 1 : 50

Appendix C Vehicle Tracking





ISSUE	DATE	AMENDMENT	BY	APPD.

DESIGNED		
DESIGN CHECK		
DRAWN	Brent James	12.2015
CAD REVIEW		
DESIGN REVIEW		
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
ROWENA CRES SITE ACCESS TRACKING PATH

DRAFT

CAD FILE Z1962101-01-001-Rowena Site Access Turning Paths DATE

ORIGINAL SCALE A1 AS SHOWN

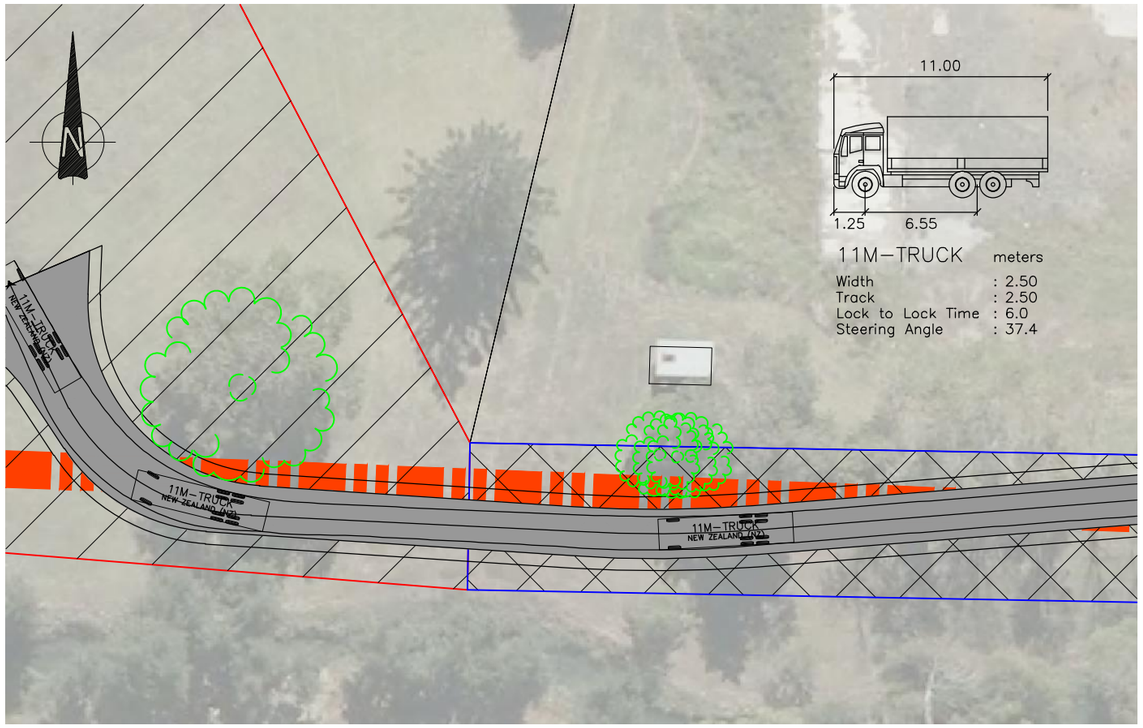
CONTRACT No.

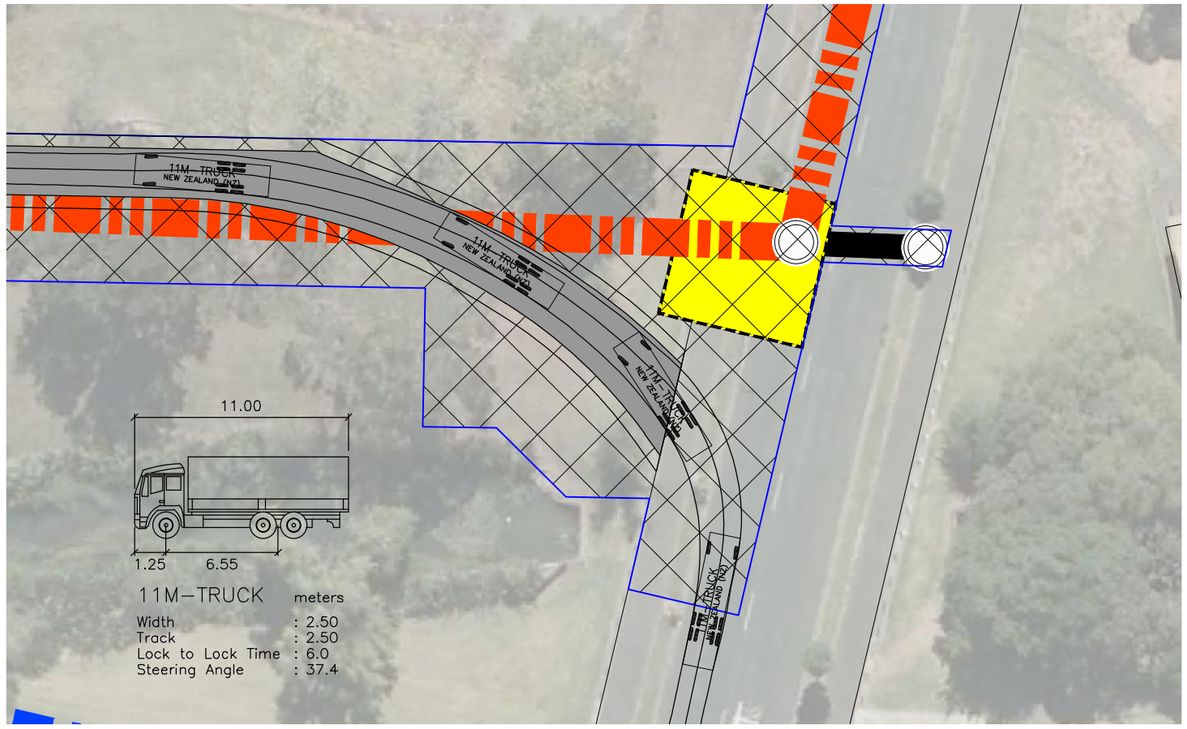
REF. No. Z1962101-01-001-

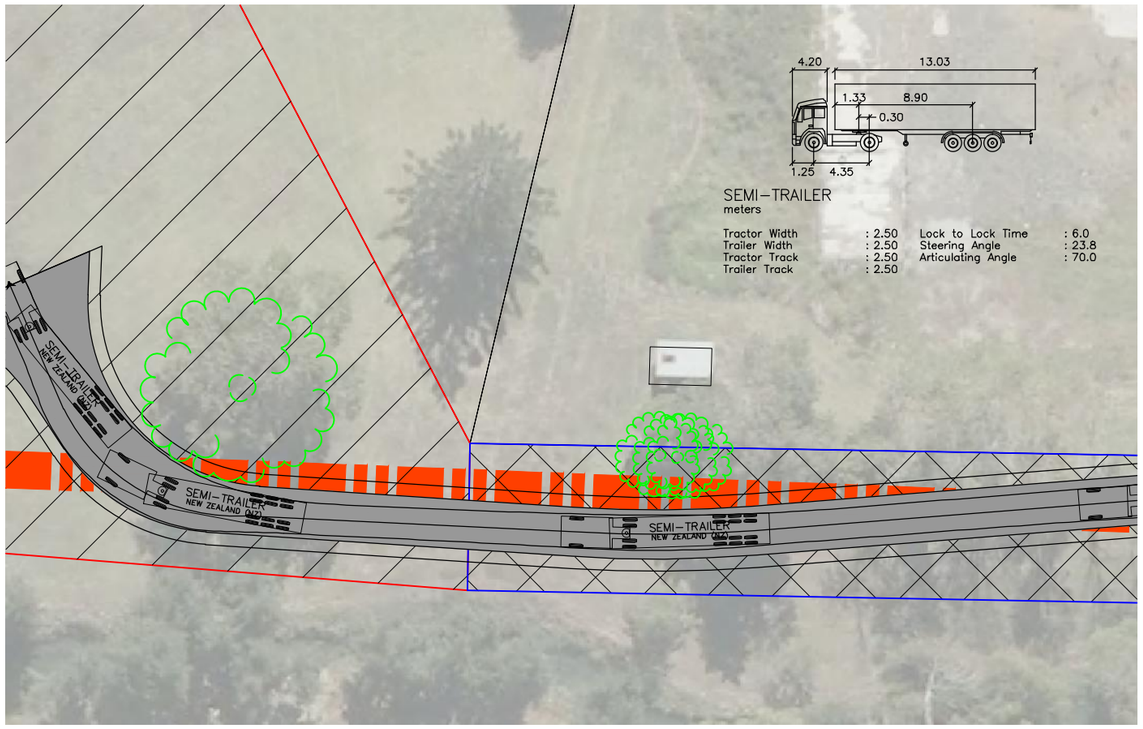
ISSUE 1

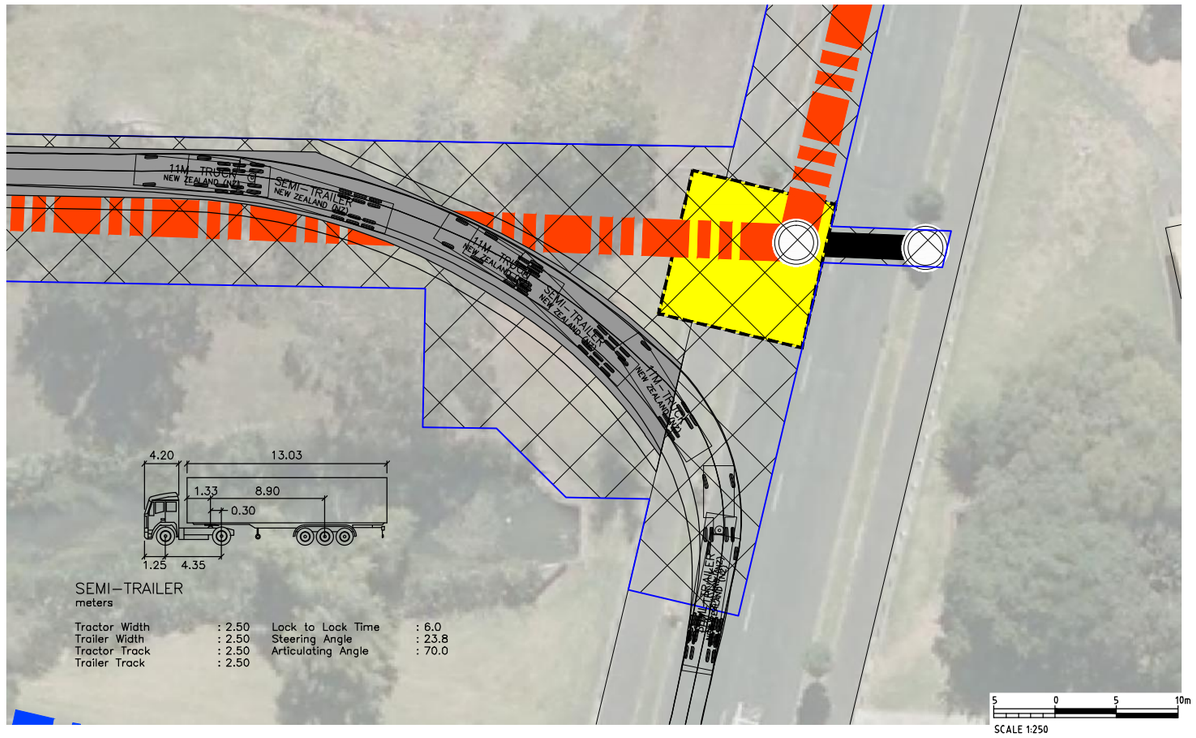
DWG. No. XXXXXXX .XXX

A









ISSUE	DATE	AMENDMENT	BY	APPD.

DESIGNED		
DESIGN CHECK		
DRAWN	Brent James	12.2015
CAD REVIEW		
DESIGN REVIEW		
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER
PRELIMINARY LAYOUT
MAYBURY RESERVE SITE ACCESS TRACKING PATH

DRAFT

CAD FILE Z1962101-01-001-Maybury Site Access Turning Paths DATE

ORIGINAL SCALE A1 AS SHOWN

CONTRACT No.

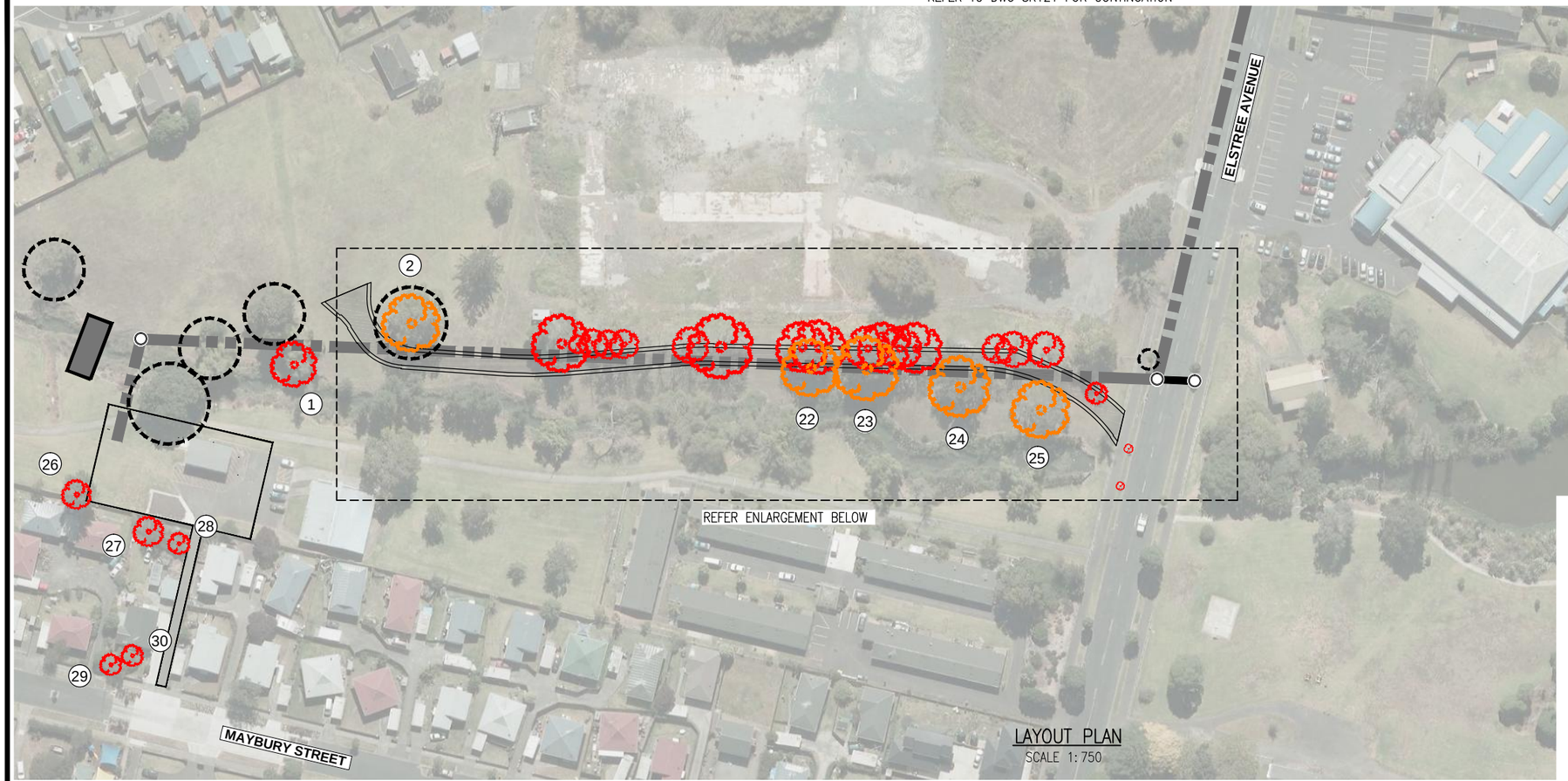
REF. No. Z1962101-01-001-

ISSUE 1

DWG. No. XXXXXXX .XXX

A

REFER TO DWG SK121 FOR CONTINUATION

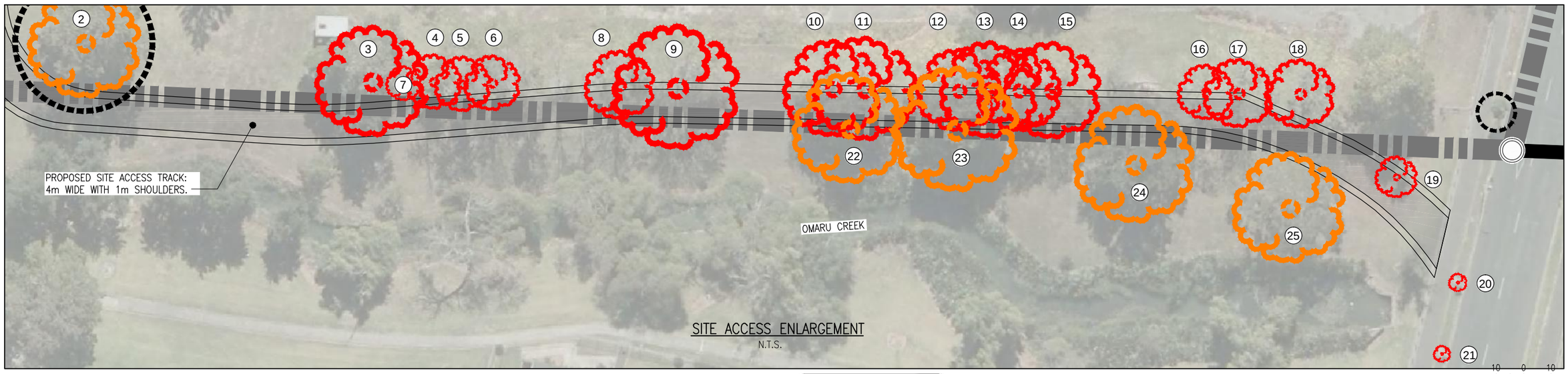


LAYOUT PLAN
SCALE 1: 750

LEGEND:

- TREE TO BE PRUNED, (IF REQUIRED). REFER TO TABLE FOR ADDITIONAL INFORMATION.
- TREE TO BE PRUNED, (IF REQUIRED). REFER TO TABLE FOR ADDITIONAL INFORMATION.
- TREE PROTECTION FENCING FOR TREES TO BE MAINTAINED.

TREE IDENTIFYING NUMBER	COMMENT
1	DEAD/DYING WILLOW *(SALIX SP.)* TREE.
2	TREE TO BE PRUNED AND PROTECTED WITH FENCING
3 TO 18	DEAD POPLAR TREES, REMOVE FOR SITE ACCESS AND SAFETY.
19 TO 21	TREE TO BE REMOVED
22 TO 25	TREES TO BE PRUNED
26	POPLAR *(POPULUS SP.)* IN HOUSING NZ PROPERTY.
27 TO 30	TREES TO BE REMOVED



SITE ACCESS ENLARGEMENT
N.T.S.

NOT FOR CONSTRUCTION

10 0 10 20m
SCALE 1:750

ISSUE	DATE	AMENDMENT	BY	APPD.
1	06.07.15	FOR ARBORIST REPORT	JE	RS

DESIGNED	John Eaton	04/2015
DESIGN CHECK		
DRAWN	Brent James	04/2015
CAD REVIEW		
DESIGN REVIEW		
MWH APPROVED		
	BY	DATE

OPERATIONS

INFRASTRUCTURE

Watercare

MWH

GLENDOWIE BRANCH SEWER

TREE REMOVAL SHEET 1 OF 2

DRAFT

CAD FILE Z1962101-01-001-SK120 DATE 14.10.2015

ORIGINAL SCALE A1
AS SHOWN

CONTRACT No.

REF. No.
Z1962101-01-001-SK120

ISSUE
2

DWG. No.
XXXXXXX

2