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Scales	1 : 250	15-272-C3056.dwg
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Grid	MGA	Approved AM



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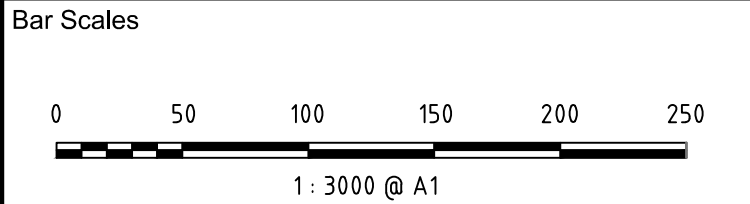
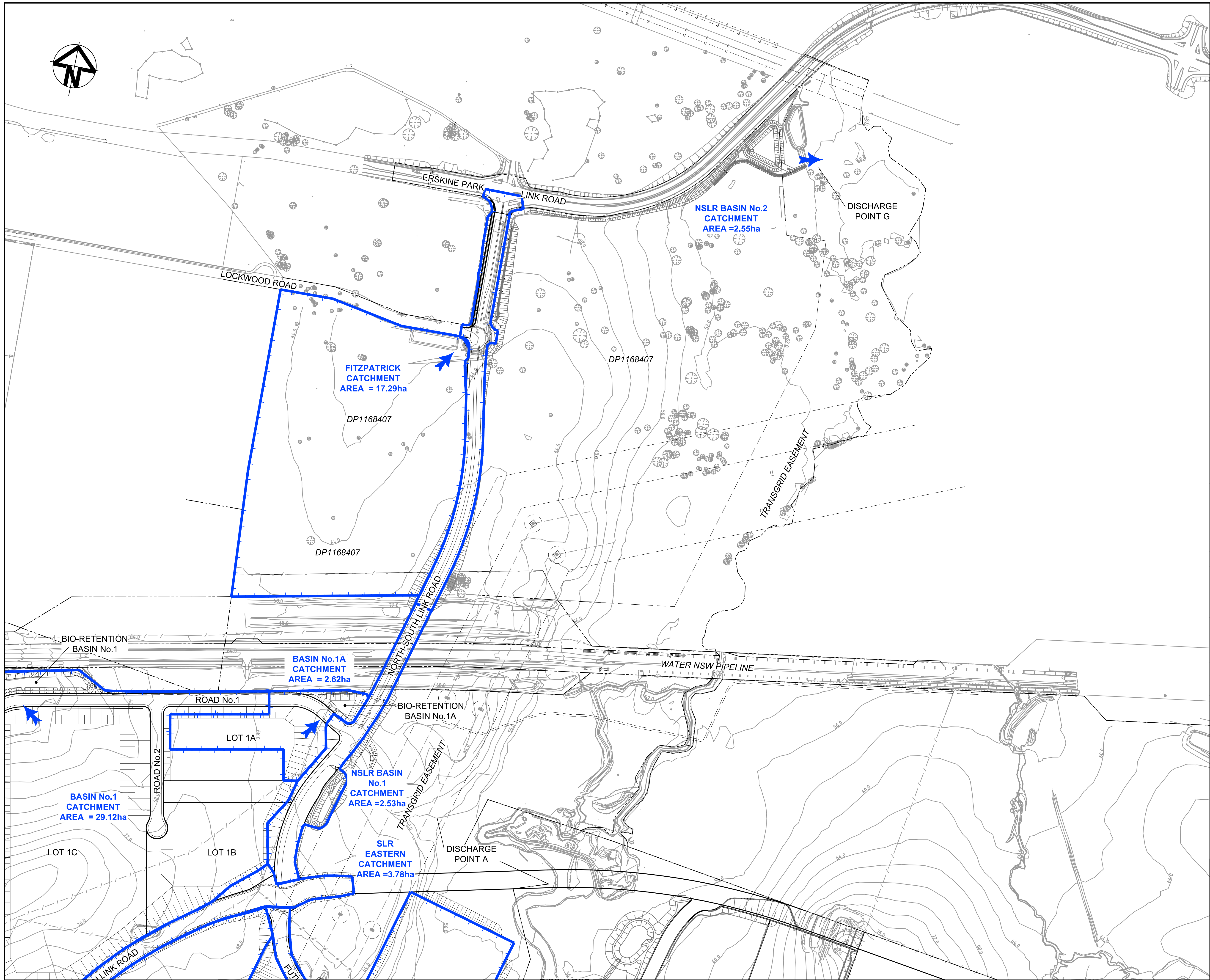
Project

PROPOSED INDUSTRIAL DEVELOPMENT OAKDALE WEST

Title

STORMWATER DRAINAGE CATCHMENT PLAN (PRE-DEVELOPED)

Drawing No.	Project No.	Issue
15-272-C3056	15-272	A1



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Project

PROPOSED INDUSTRIAL DEVELOPMENT OAKDALE WEST

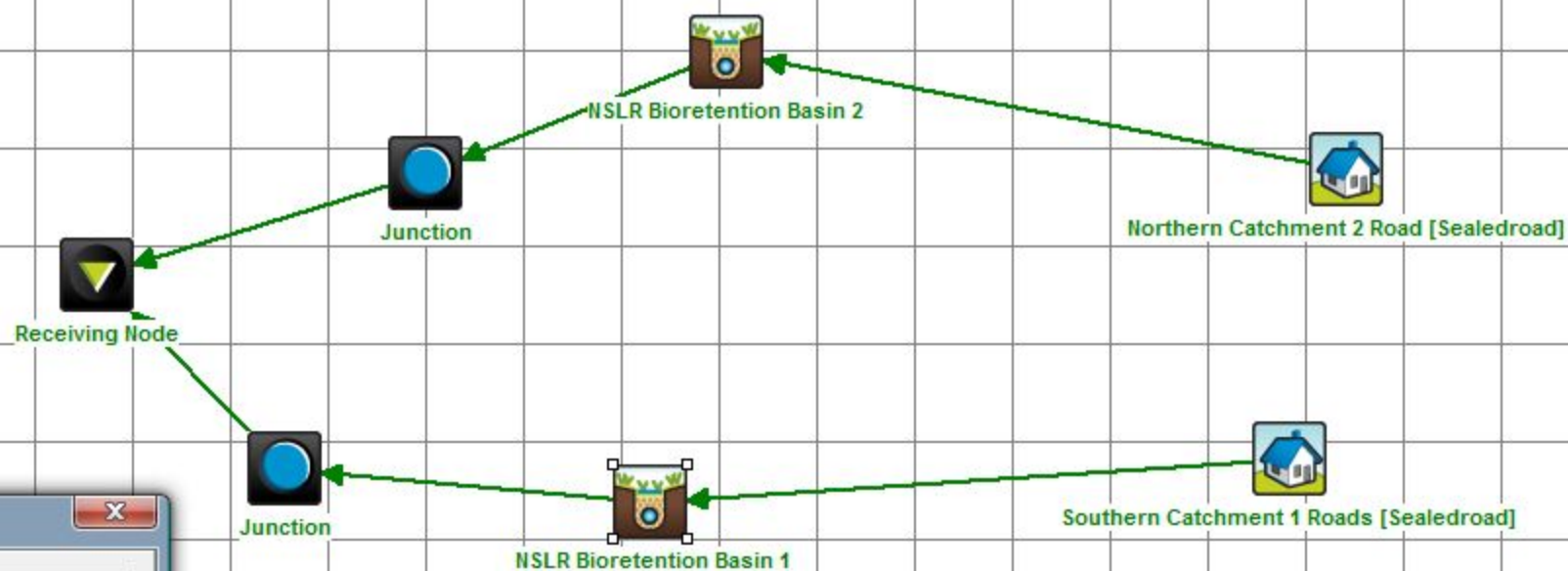
Title

STORMWATER DRAINAGE CATCHMENT PLAN (POST-DEVELOPED)

Drawing No.	Project No.	Issue
15-272-C3057	15-272	A1

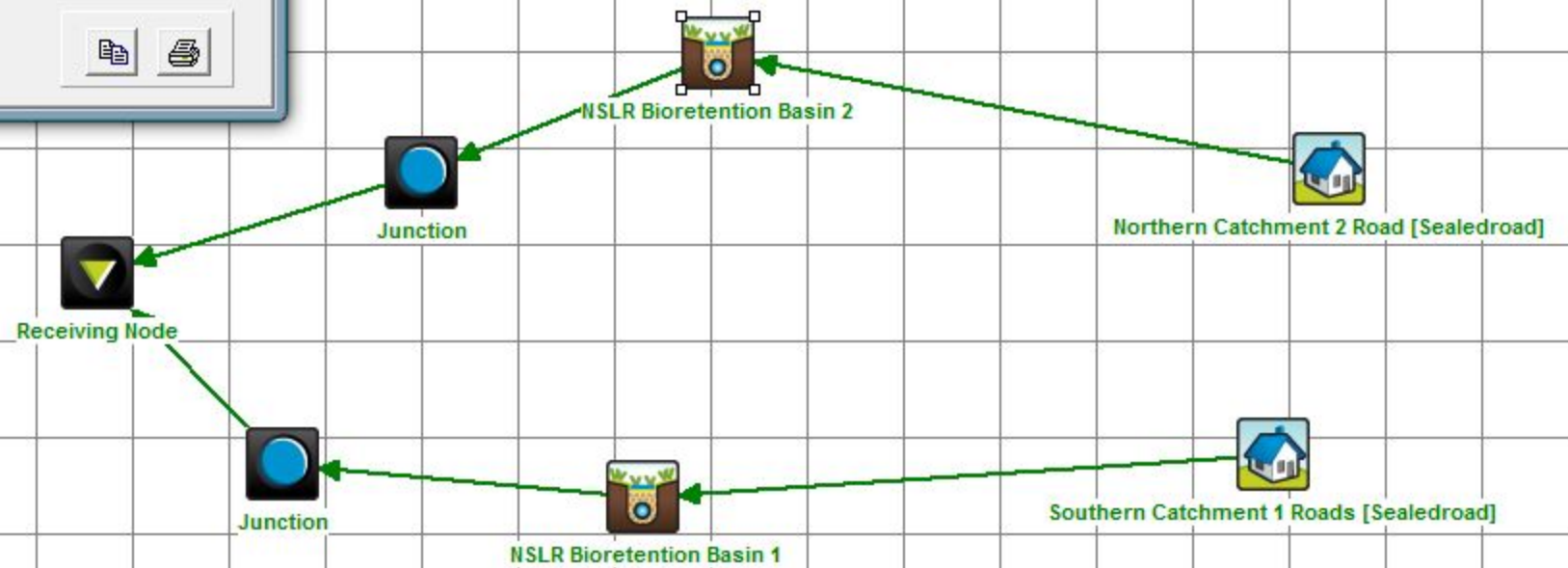
Appendix C – MUSIC Model and Results

Treatment Train Effectiveness - NSLR Bioretention Basin 1			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	13.7	13.2	3.8
Total Suspended Solids (kg/yr)	4920	696	85.9
Total Phosphorus (kg/yr)	8.08	2.02	75
Total Nitrogen (kg/yr)	32.6	16.1	50.7
Gross Pollutants (kg/yr)	399	2.82	99.3

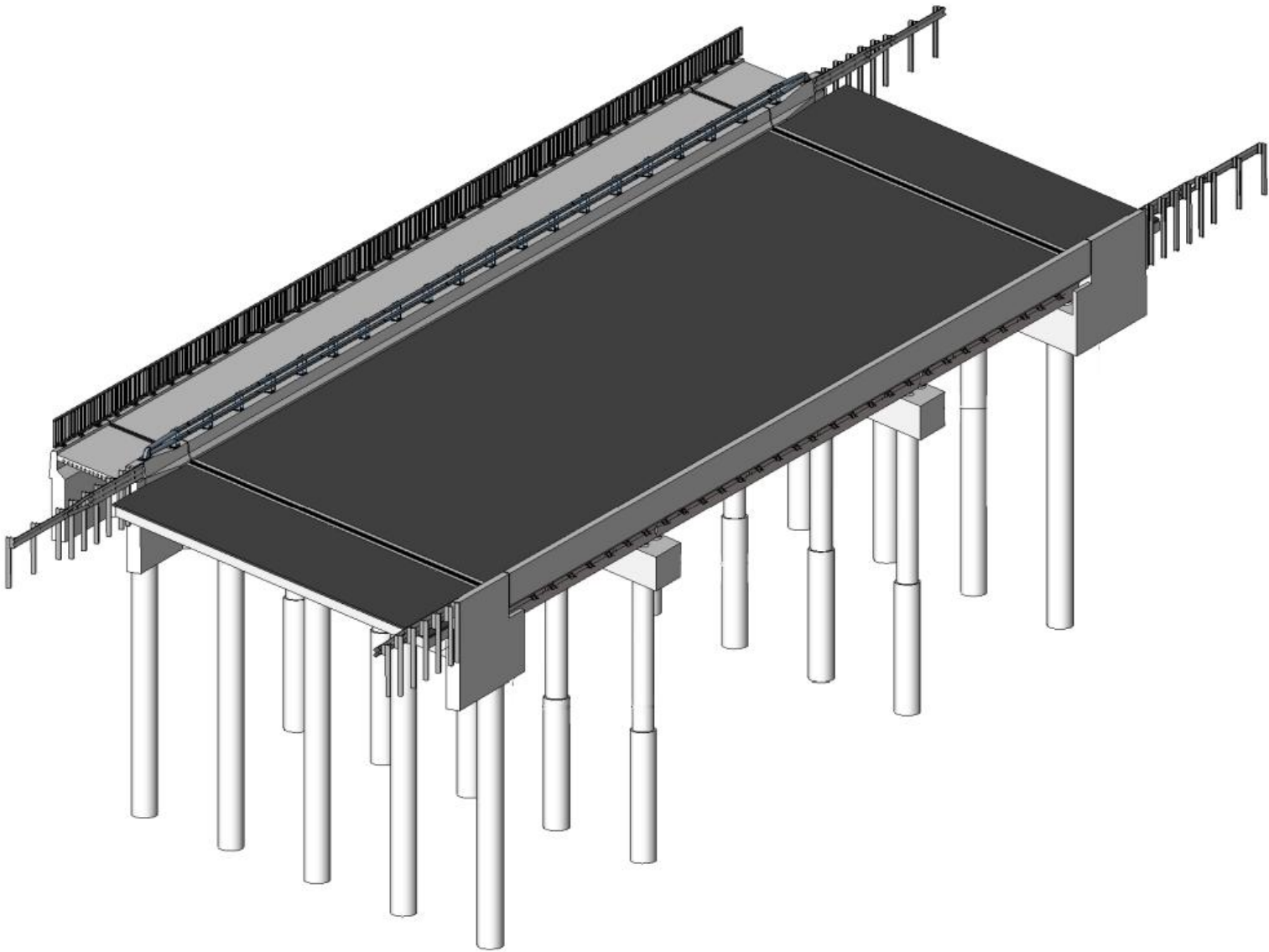


Treatment Train Effectiveness - NSLR Bioretention Basin 2

	Sources	Residual Load	% Reduction
Flow (ML/yr)	13.8	13.3	3.9
Total Suspended Solids (kg/yr)	4850	649	86.6
Total Phosphorus (kg/yr)	8.22	2.01	75.5
Total Nitrogen (kg/yr)	33.1	16	51.6
Gross Pollutants (kg/yr)	402	2.9	99.3



Appendix D – GHD Concept Bridge Design Report



AT&L

Oakdale West Estate - NSLR Bridge Concept Design Report for SSDA

October 2016

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Appendix A – Concept Design Drawings

Disclaimer

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1. Introduction

1.1 Project Overview

Goodman is developing the North South Link Road (NSLR) as part of a State Significant Development (SSD) for Oakdale West Estate. AT&L (Civil Engineers) engaged GHD Pty Ltd on 2nd April 2016 to prepare a concept bridge design for inclusion into the SSD application submission.

The project will involve construction of twin bridges (side by side) across the Warragamba to Prospect pipelines (owned and operated by Water NSW), which contains dual carriageways (2 lanes in each direction); northbound and southbound which forms part of the NSLR route within the Oakdale West Estate development.

1.2 Purpose and Scope of Report

The purpose of this report is to document the review and assessment of the NSLR Bridge concept design.

1.3 Site Locality

The project is located approximately 530 m south of Lockwood Road in Erskine Park, NSW. The road bridges form part of the NSLR connecting the proposed Southern Link Road in the south to Erskine Park Link Road (EPLR) in the north. The bridges traverse over two water supply lines (Warragamba to Prospect) which are located within the Water NSW corridor. The location of the proposed bridges are shown on Figure 1.

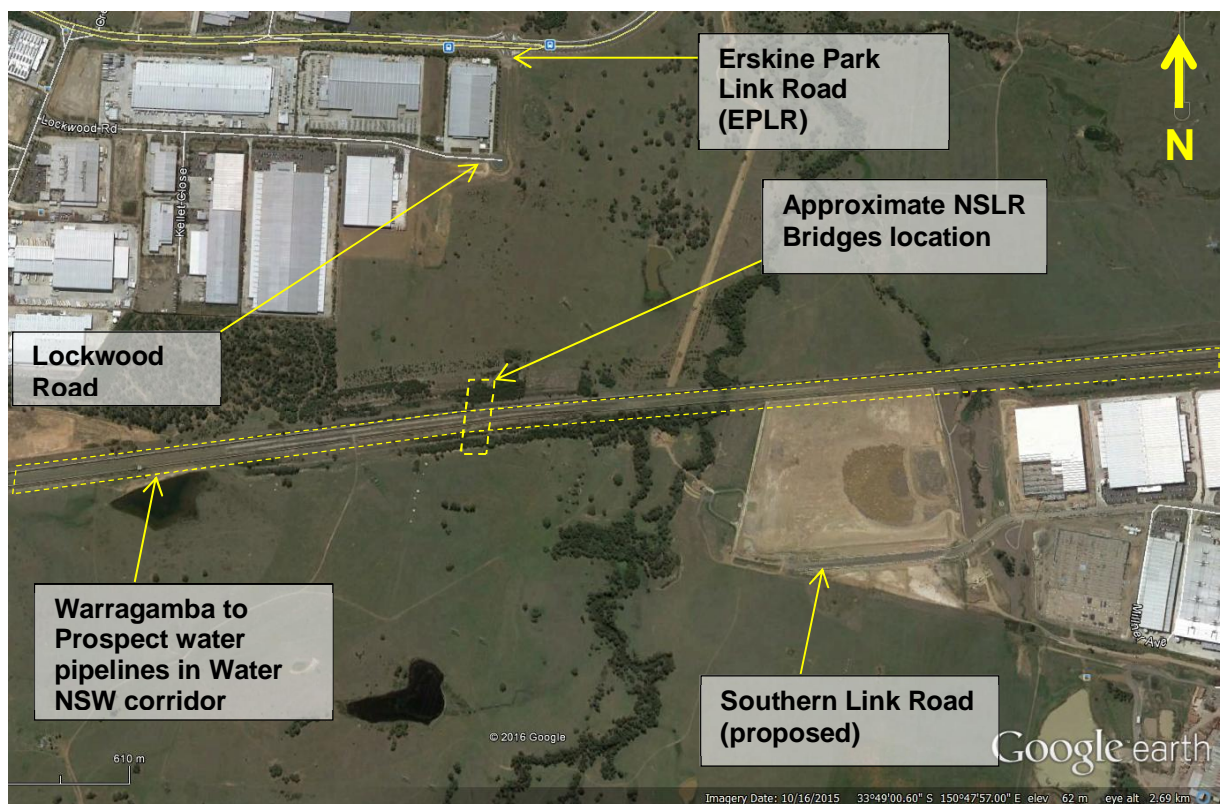


Figure 1 NSLR Bridges Location Plan

2. Bridge Concept Design

2.1 Concept Options

Prior to commencement of the concept design, three concept options were presented to AT&L (and Goodman) for review and selection of the preferred option to proceed to concept design. The options are as follows:

1. **Option 1:**
5 span bridge with a total deck length of 89 m. Spans were of equal length at 17.8 m and consist of 700 mm deep Prestressed concrete (PSC) planks.
2. **Option 2:**
3 span bridge with a total deck length of 61.8 m. Span lengths are 2 x 23 m and 1 x 15 m. The deck consists of 1000 mm deep super-T girders.
3. **Option 3:**
4 span bridge with a total deck length of 90 m. End spans are 20 m and interior spans are 25 m. The deck consists of 1200 mm deep super-T girders.

All options have the same substructure which consists of 3 columns and 3 piles per pier. Due to limited geotechnical information at the proposed bridge site, the length of the piles is to be determined subsequent to a geotechnical investigation.

AT&L and Goodman have selected to proceed with Option 2 for the following reasons:

- More cost effective compared with the other two options. The overall length is shorter and has less spans, therefore has less piers to construct.
- Clearances between the piles and the existing Water NSW pipelines are outside the 5 m radius zone stipulated in the requirements of Water NSW, therefore foregoes the requirement of undertaking further structure stability analysis of excavation effects on the pipelines.

Sketches detailing Option 2 are attached in Appendix A.

2.2 Bridge Alignment

An alignment of the NSLR has been provided by AT&L. It is envisaged that the bridges will be designed to suit the road alignment in order to minimise any changes to the road levels at the interchanges near each bridge abutment.

The skew of the bridge is 26° spanning over the Water NSW corridor and there is no horizontal curve of the road within the proposed extents of the bridges.

The longitudinal fall is 1% in the southbound direction.

2.3 Design Standards

The design of the bridge will be carried out in accordance with the design documents listed below.

- AS 5100 Bridge Design Set
- AS/RMS 5100.5 – 2004 Concrete Interim Standard (November 2012)
- AS 3600 Concrete Structures
- AS 2159 Pile Design and Installation
- AS 1170-2002 Structural Design Actions

- AS 4678 Earth Retaining Structures
- Bridge Technical Direction Manual – RMS
- RMS Structural Drafting and Detailing Manual

2.4 Bridge Details

2.4.1 Superstructure

The proposed NSLR Bridge superstructure shall consist of the following:

- Extent of the bridge deck will be from CH 797.327 m to CH 859.100 m. Overall bridge deck length is 61.8 m.
- 3 span bridge; 2 x 23 m spans and 1 x 15 m span.
- The bridge deck shall consist of 18 x 1000 mm deep super-T girders (RMS Type 2) per bridge. Girders are precast prestressed concrete units.
- Bridge decks shall have a cross-fall of 3%.
- 3.68 m wide pedestrian shared path on each bridge.
- A 200 mm thick topping slab will be cast on top of the girders and overlaid with a 75 mm thick layer of asphaltic concrete (AC).
- Traffic barriers will be reinforced concrete and steel railing will be fixed to the top of the barriers. As the bridges span over the Water NSW pipelines which are significant pieces of infrastructure, the barriers shall be of medium performance.
- Drainage scuppers will be located at 3-5 m spacing on the east side of the southbound carriageway and west side of the northbound carriageway.
- Approach slabs shall be 200 mm thick and 6 m in length at each end of the bridges.
- In accordance with AS5100, minimum vertical height clearance under bridges for access roads is 5.3 m. This satisfies Water NSW's requirement of 4.6 m. To achieve this clearance, the existing access roads will be regraded and the two access roads on each side of the corridor will be realigned as well.

2.4.2 Substructure

- Bridge piers will consist of 3 x 1000 mm diameter columns that transition into piles. The columns will have a height of approximately from 5 m to 6 m (due to 3% cross-fall in the bridge decks).
- Piles will be 1200 mm diameter.
- Abutments will consist of a headstock beam supported on piles.
- Wing walls will be constructed on both sides of the abutments.
- Reinforced soil walls will be constructed at each abutment.
- The substructure configuration will be confirmed once a geotechnical investigation has been undertaken.

2.4.3 Miscellaneous

- Provisions for the following utilities have been made:
 - 300 mm diameter water main on the northbound bridge.
 - 6 - 9 electrical conduits at each bridge.

- 4 telecommunication conduits at each bridge.
 - 1 conduit for lighting at each bridge.
 - 150 mm diameter drainage pipe at each bridge.
- Provisions for lighting on the bridges will be at a nominal spacing of 20 m.
- Anti-throw screen to be installed on both bridges.

3. Construction Issues

Construction issues that have been identified to potentially have an effect on the proposed works are as follows:

- As the bridges traverse over the Water NSW corridor, it is a requirement for any construction work to not damage or disturb the pipelines. This may be in the form of an encasement of the pipelines underneath the entire width of the bridges.
- Regrading and/or realignment of the access roads cannot occur concurrently as it is a requirement of Water NSW to maintain vehicle access for regular maintenance procedures of the pipelines. As a solution, only 1 access road can be regraded and/or realigned at any one time.

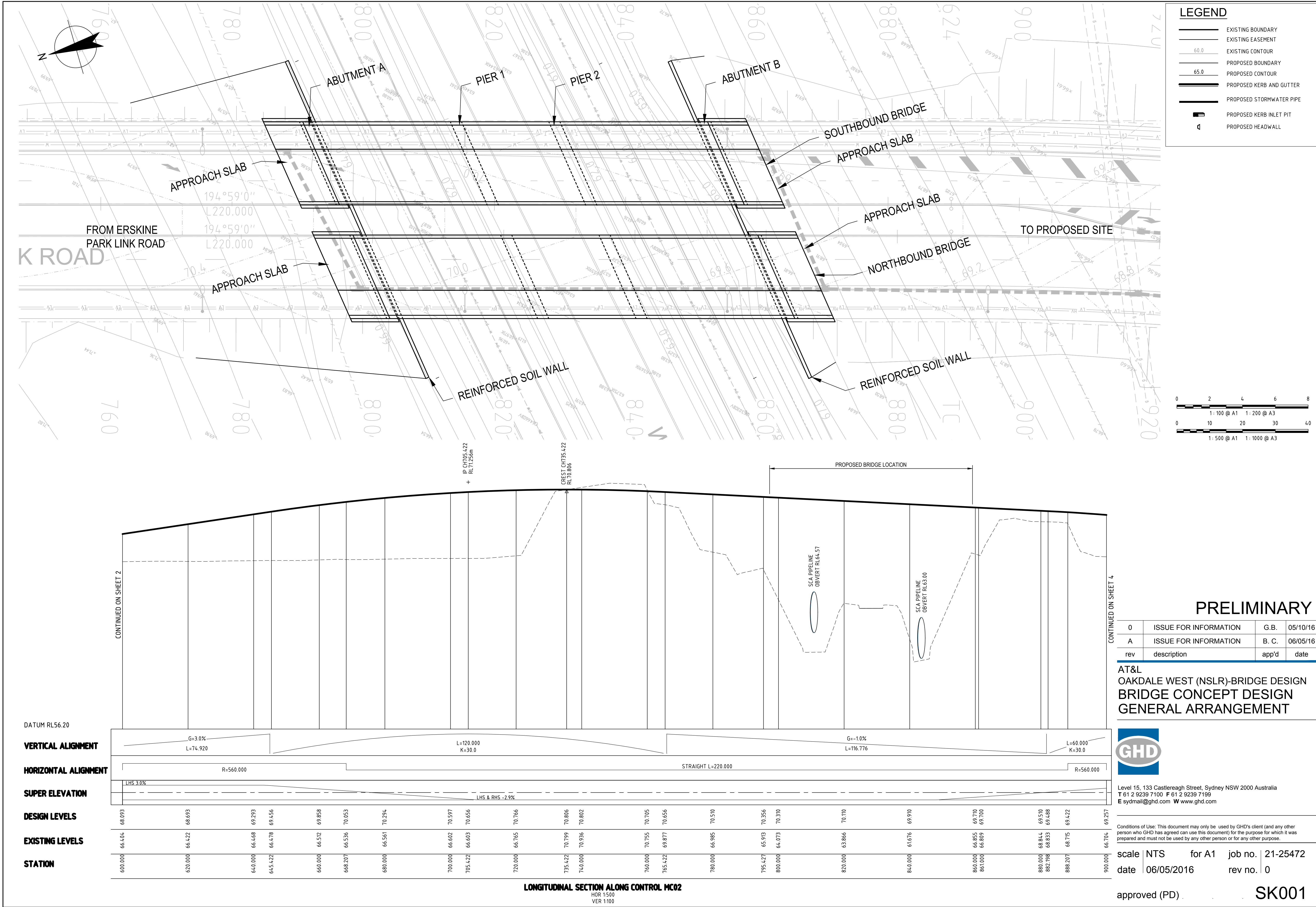
4. Work, Health and Safety during Design and Construction

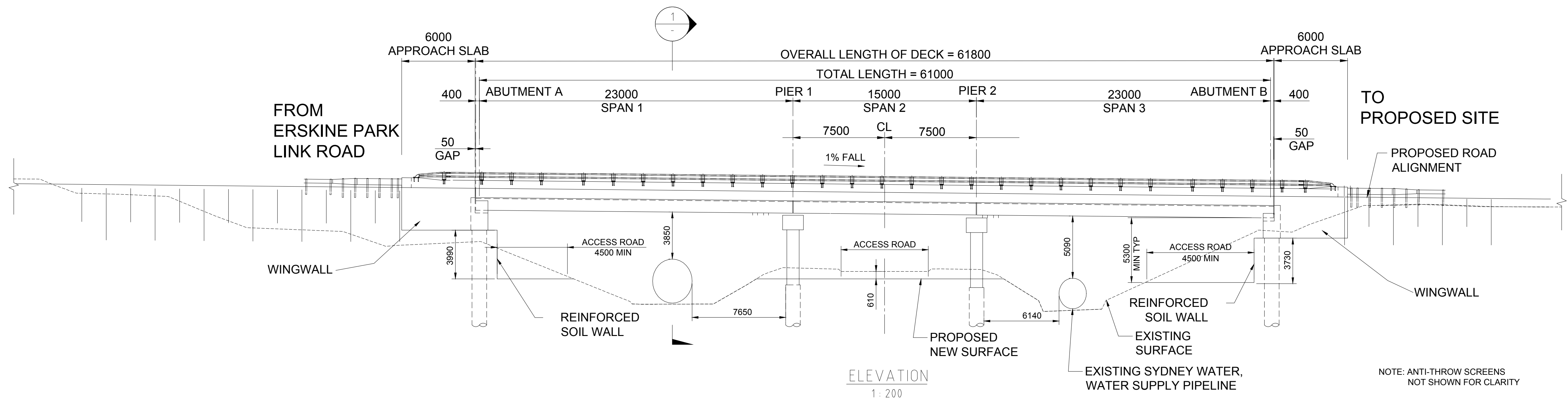
A preliminary Safety in Design (SiD) risk assessment has been developed and shown in the table below:

Design Ref	Design Life Cycle Stage	Hazards <small>What could cause injury or ill health, damage to property or damage to the environment</small>	Risk <small>What could go wrong and what might happen as a result</small>	Existing Control Measures	Potential Control Measures <small>(Consider Hierarchy of Control - Elimination, Substitution, Isolation, Engineering Controls, Administrative Controls, PPE)</small>
Material	Investigation and Design	Material deterioration over time.	Reduced structural strength and affect operation safety and reliability	Structure material selected is concrete precast units. All concrete elements will be designed in accordance with AS5100 durability requirements. Concrete slump and test core samples will be taken prior to concrete pour and strength will be verified under laboratory conditions.	NA – Existing control measure sufficient.
Structural	Investigation and Design	Underground services	Hitting and damage to underground services	Dial Before You Dig plans.	Verify location of services on site prior to construction.
Structural	Investigation and Design	Vehicle falling onto Water NSW pipelines	Damage to pipelines	Medium performance traffic barriers for high containment.	NA - Existing control measure sufficient.
Construction	Setup, Construction and Commissioning	Fauna and flora.	Affect habitat of flora and fauna.	REF is prepared for this project by Goodman Group.	NA - Existing control measure sufficient.
Construction	Setup, Construction and Commissioning	Manual handling of large construction materials and equipment.	Injury from weight handling.	N/A	Ensure construction personnel are appropriately trained in the use of specified equipment, complete manual handling training courses and attend construction site induction. Ensure that lifting equipment are tested and follow relevant safety protocol during operation.
Construction	Maintenance	Personnel walking along bridge structure during construction.	Fall from structure and result in injury	N/A	Ensure construction personnel to have fall arrest or fall prevention systems in place prior to undertaking work on the bridge decks and in other areas where working at heights is applicable.
Construction	Setup, Construction and Commissioning	Falling objects and construction debris.	Objects or debris damaging passing Water NSW maintenance vehicles.	NA	Prior to construction, consultation must be sought between contractor and Water NSW on safety protocols when Water NSW maintenance vehicles require to pass through construction zone.

Appendix A – Concept Design Drawings

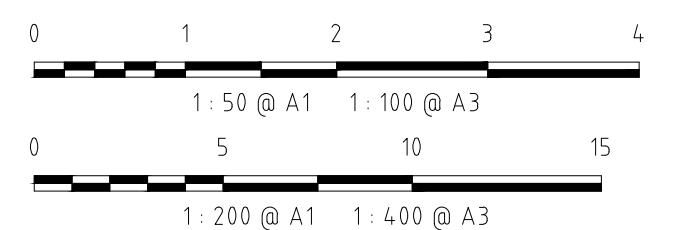
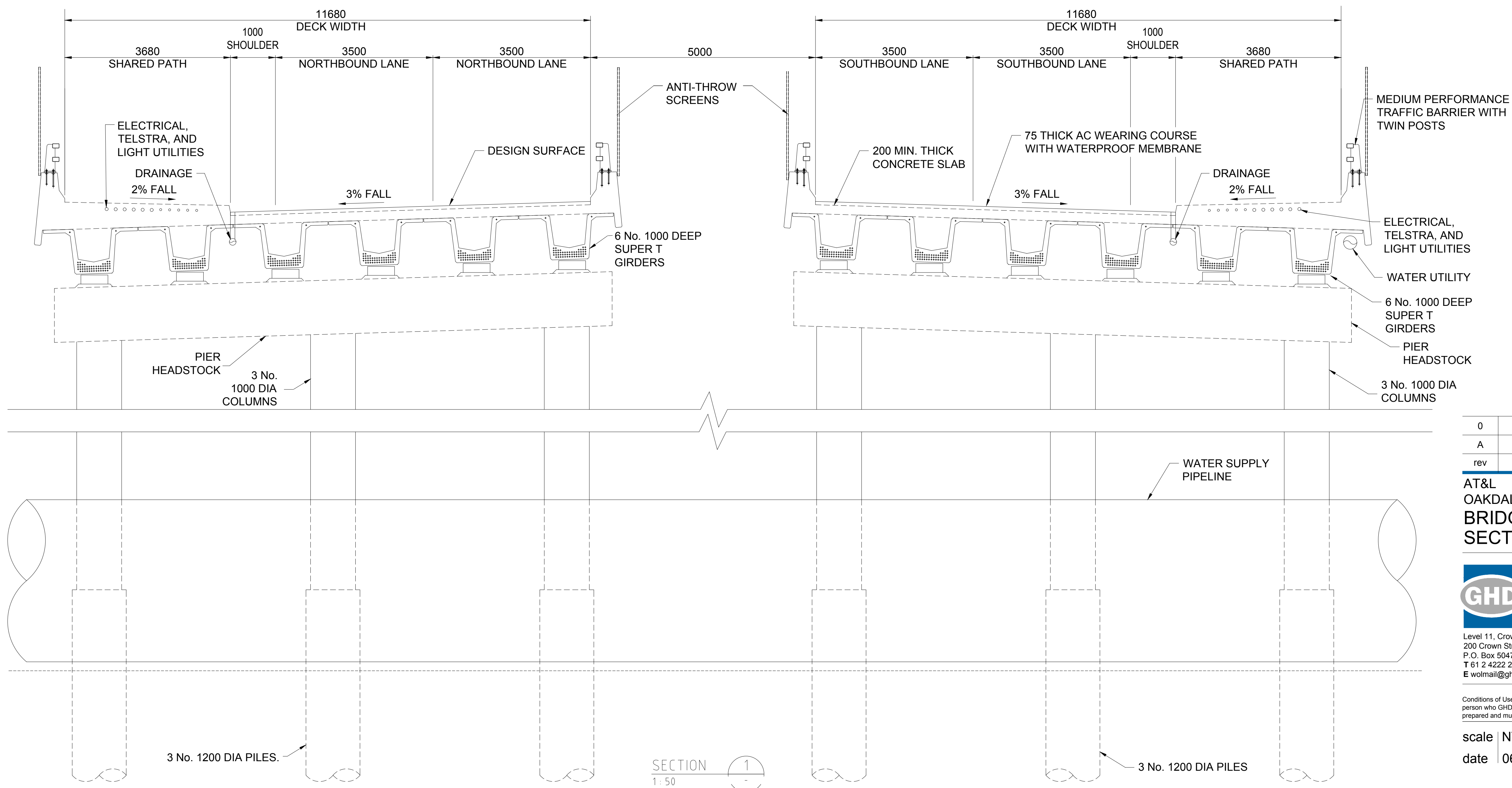
Appendices





SOUTHBOUND BRIDGE

NORTHBOUND BRIDGE



PRELIMINARY

0	ISSUE FOR INFORMATION	G.B.	05/10/16
A	ISSUE FOR INFORMATION	B. C.	06/05/16
rev	description	app'd	date

AT&L
OAKDALE WEST (NSLR)-BRIDGE DESIGN
BRIDGE CONCEPT DESIGN
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		Name	Signature	Name	Signature	Date
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