E8 CONSULTING ENGINEERS PTY LTD.

Tender for O-Bahn City Access Project – Stage 1

Client: Department of Planning, Transport and Infrastructure

Government of South Australia
Department of Planning, Transport and Infrastructure

Company Declaration

Company Name:	E8 Consulting Engineers Pty Ltd.
Business Address:	Mawson Lakes Blvd, Mawson Lakes SA 5095
Contact Details:	Phone: (08) 8302 5055 Email: admin@e8consulting.com.au

Company Declaration Statement

The signatories at E8 Consulting Engineers declare that they have read the design brief in regards to the O-Bahn City Access Project – Stage 1. This includes obtaining an understanding of the key aims, and expected outcomes the client has displayed in the brief, and delivering a solution that satisfies the client's requirements.

The tender submission is deemed non valid, if a contract has not been received within four weeks of the submission close date. A revised tender submission may be submitted, if both the client and signatories at E8 Consulting Engineers have come to a mutual agreement.

Upon submission of the tender, all information provided throughout the document is deemed to be accurate to the best ability of E8 Consulting Engineers.

Jason Maddison
Project Manager
Signed: 10th March 2017

Joseph Cavallaro
Assistant Project Manager
Signed: 10th March 2017

Mr Mark Ellis
Department of Transport, Planning and Infrastructure
77 Grenfell Street
Adelaide SA 5001

RE: Tender for O-Bahn City Access Project – Stage 1

Dear Mark,

E8 Consulting Engineers are delighted to formally register an expression of interest to undertake a feasibility study in regards to the O-Bahn City Access Project – Stage 1, put forward by the Department of Transport, Planning and Infrastructure.

E8 Consulting Engineers is a South Australian organisation which was founded in 2002. With 15 successful years within the industry, the company has expanded encompassing a total of 32 engineers. E8 Consulting Engineers specialise in various disciplines of engineering including, but not limited to:-

- Project Management
- Structural Design and Analysis
- Geotechnical Engineering
- Urban Planning
- Environmental and Safety Management
- Transport Design, Analysis and Management
- Water & Resource Systems Design and Service Relocation

Throughout our experiences within the industry, we have been accustomed to pride ourselves on a high attention to detail, while ensuring the project is completed both on time and on budget.

The following tender document provides an overview of E8 Consulting Engineers, stating the philosophy and policies the company abides by. During this proposal three solutions have been identified, in order to satisfy the aims and outcomes put forward by the client.

In order to complete the feasibility stage of the project, E8 Consulting Engineers have valued the works at:

$597,135.00 Inc. GST

E8 Consulting Engineers value the opportunity put forward by the Department of Planning, Transport and Infrastructure to tender for the O-Bahn City Access Project – Stage 1. If any queries or questions arise, please do not hesitate to contact us. We look forward to discussing this with you further in the future.

Yours sincerely,

Jason Maddison
Project Manager

Contents

List of Figures

List of Tables

1 Company Profile

1.1 Company History and Services

Established in 2002, E8 Consulting Engineers started out as a small consultancy of 8 engineers based in the city of Adelaide, with the vision of bringing client's ideas to life. Since then E8 Consulting Engineers has grown into a national group, engaging mainly in urban development, transport infrastructure and engineering consulting and design.

The team here at E8 Consulting Engineers pride ourselves on our rapport with clients and colleges ensuring all aspects of a project are satisfied. We have a good eye for detail along with some of the brightest engineering minds in the business ensuring we turn your problems into a modern solution.

With our expansion E8 Consulting Engineers is now specialising in most engineering disciplines consisting of:-

- Structural
- Civil
- Environmental
- Geotechnical
- Transport and infrastructure
- Urban surveying
- Project management
- Water Management and design

1.2 Company Values

E8 Consulting Engineers place the safety of clientele, employees and the community at the forefront of all actions. We believe in equal opportunities for all genders and race acting transparently as a consultancy based around respect. Our creative and innovative outlook on problems enables us to produce a sustainable solution that cannot be overlooked. Much of the success of E8 Consulting Engineers is a result of the core values we strive to abide by, these values include, but are not limited to:-

- Promoting ethical conduct throughout our company.
- Working collaboratively with clients to ensure all objectives are achieved.
- Creating sustainable design solutions that are both effective and affordable.

1.3 Previous Projects

1.3.1 Goodwood Junction Rail Grade Separation

Client: Department of Planning, Transport and Infrastructure

Cost: $55 million

Project Description:

Construction of a new underpass to grade separate the ARTC freight and Belair Passenger lines from the twin tracks of the Seaford Railway Line. The underpass comprises of two bridge decks; the first is a 52 metre long rail deck carrying the Belair line and the ARTC freight line over the lowered twin tracks of the Seaford line; the second a 16 meter wide road deck carrying Victoria Street over the lowered Seaford line.

Project Deliveries:

- Retaining Structures – The underpass incorporated a large extent of retaining walls thus a significant effort was inputted to design the structures to achieve optimum design conditions.
- Design – Improvements to the design was cost effective and time efficient. Where a shorter temporary freight rail diversion was incorporated instead of permanently raising the rail alignment.
- Existing Structures – Earthworks were conducted past Goodwood station platform that wasn't equated within the design and a section of the retaining wall collapsed. To prevent this happening again a thorough investigation was launch prior to excavation.
- Slab Track- The slab on the track had void issues. To eliminate the issue, further projects will utilise a standardised construction methodology such as the Outer Harbour Rail Bridge.

Figure 1: Goodwood Junction Rail Grade Separation

1.3.2 Seaford Rail Extension

Client: Department of Planning, Transport and Infrastructure

Cost: $291 million

Project Description:

A 5.7km extension of the dual track line from Noarlunga Centre Railway Station to the Seaford District Line. Including a 1.2km elevated rail bridge (dual ended, incrementally launched concrete box structure) over the Onkaparinga Valley, bus interchange, stations and road bridges.

Project Deliveries:

- Construction Methodology- the Seaford Road Bridge was constructed in two stages, with the bridge constructed in two halves (slab design/pavement design), for efficient traffic conditions.
- Collaborative Design- The team defined engineering practices which were followed by the team. By getting the basic right ensured that the project ran successfully without deterring budget and quality.
- Value for Money- Majority of the corridor included cuts to depths of 8-10 meters therefore effective corrosion control measures were investigated to save future works/repair costs.
- Environment- There were several discoveries of Aboriginal Burials within the site therefore the aboriginal community was engaged and with constant communication work was conducted.

Figure 2: Seaford Rail Extension

1.3.3 Whyalla Centre Redevelopment

Client: Whyalla Hospital & Services|

Cost: $69 million

Project Description:

Whyalla Hospital is one of the few rural hospital within SA. The Whyalla Redevelopment increases the capacity of technology available to provide high quality, safe and sustainable services to the community.

Project Deliveries:

- Construction Methodology - The construction sequence for the slab, footing and column was set out such that the services within the hospital would not be halted, where one section of the hospital was outfitted before moving on to the other.
- Innovative Design - The design team created an innovative and efficient design for the redevelopment of the cancer ward.

https://www.builtenvirons.com.au/projects/health/whyalla-regional-cancer-centre-redevelopment-sa/

Figure 3: Whyalla Hospital and Cancer Centre

1.4 Company Policies

1.4.1 Work, Health and Safety (WHS) Policies

We strive to provide all workers, contractors and visitors that may be affected by our business operations throughout the duration of the project with the safest working environment. All projects overseen by E8 Consulting Engineers are designed in accordance with all relevant and current Australian Standards to prevent injuries and endangerment to life throughout the entirety of the project.

All personnel working for or in conjunction with E8 Consulting Engineers must conduct their business in a safe manner complying with our Work, Health and Safety policies (WH&S) policies. Whilst conducting site inspections or gathering data, all contactors and employees of E8 Consulting Engineers will abide by all safety requirements put forward by the relevant construction company.

E8 Consulting Engineers WH&S policies aim to:-

- Document and examine all reported incidences to improve the workplace.
- Ensure any personnel injured whilst under the employment of E8 Consulting Engineers receives adequate rehabilitation.
- Inform all personnel of their responsibilities within the workplace.
- Meet all current health and safety regulations.

1.4.2 Environmental Policies

At E8 Consulting Engineers all projects are appointed a senior Environmental Management Engineer to guarantee all environmental issues are assessed and mitigated. Even though all projects lead to pollution being contributed to the environment, our company strives to reduce any additional pollution where possible. E8 Consulting Engineers are willing to consider alternate design solutions that are less economical, if they will contribute less pollution to the surrounding environment.

New Materials are constantly being reviewed and considered for all upcoming projects to determine the most sustainable and appropriate materials are being implemented throughout the project.

E8 Consulting Engineers Environmental policies aim to:-

- Implement environmental mitigation procedures such as re-vegetation.
- Choose suppliers with similar environmental ethics.
- Optimise Energy use.
- Reduce office and building wastes.
- Reduce the use of machines that produce excessive greenhouse gas emissions.
- Utilise resources such as grey water.

1.4.3 Quality Assurance Policies

E8 Consulting Engineers have a well-respected reputation in providing high quality services that satisfies all client's requirements. Our quality assurance policy is based on the procedures put forward by the International and Australian Quality Assurance Standard AS/NZS ISO 9001: 1994.

All employees and subcontractors are made aware of the quality assurance policies put forward by E8 Consulting Engineers before engaging in any work practices.

E8 Consulting Engineers quality assurance policy consists of the following objectives:-

- Ensure all clients are afforded with excellent services throughout a projects development.
- Communicate proposals/detailed plans to our clients, employees and society in the most efficient way.
- Obtain the best performance solution at an economical cost.
- Maintain and improve the highest reputation in service for the company.
- Keep a friendly working environment where all employees can perform their best in any project.
- Providing employees with appropriate equipment, tools, materials and training to allow them to conduct their tasks.
- Obtaining quality audits by recording the tasks each employee or contactor has conducted, and review at project meetings.

In addition, E8 Consultant Engineers will also apply procedures to ensure:-

- All personnel have the relevant training about quality awareness through induction processes.
- All employees are aware of their responsibilities to ensure our quality guarantee.
- The policy is regular reviewed by receiving feedback to improve the effectiveness and relevance of all quality policies.

1.4.4 Training Policies

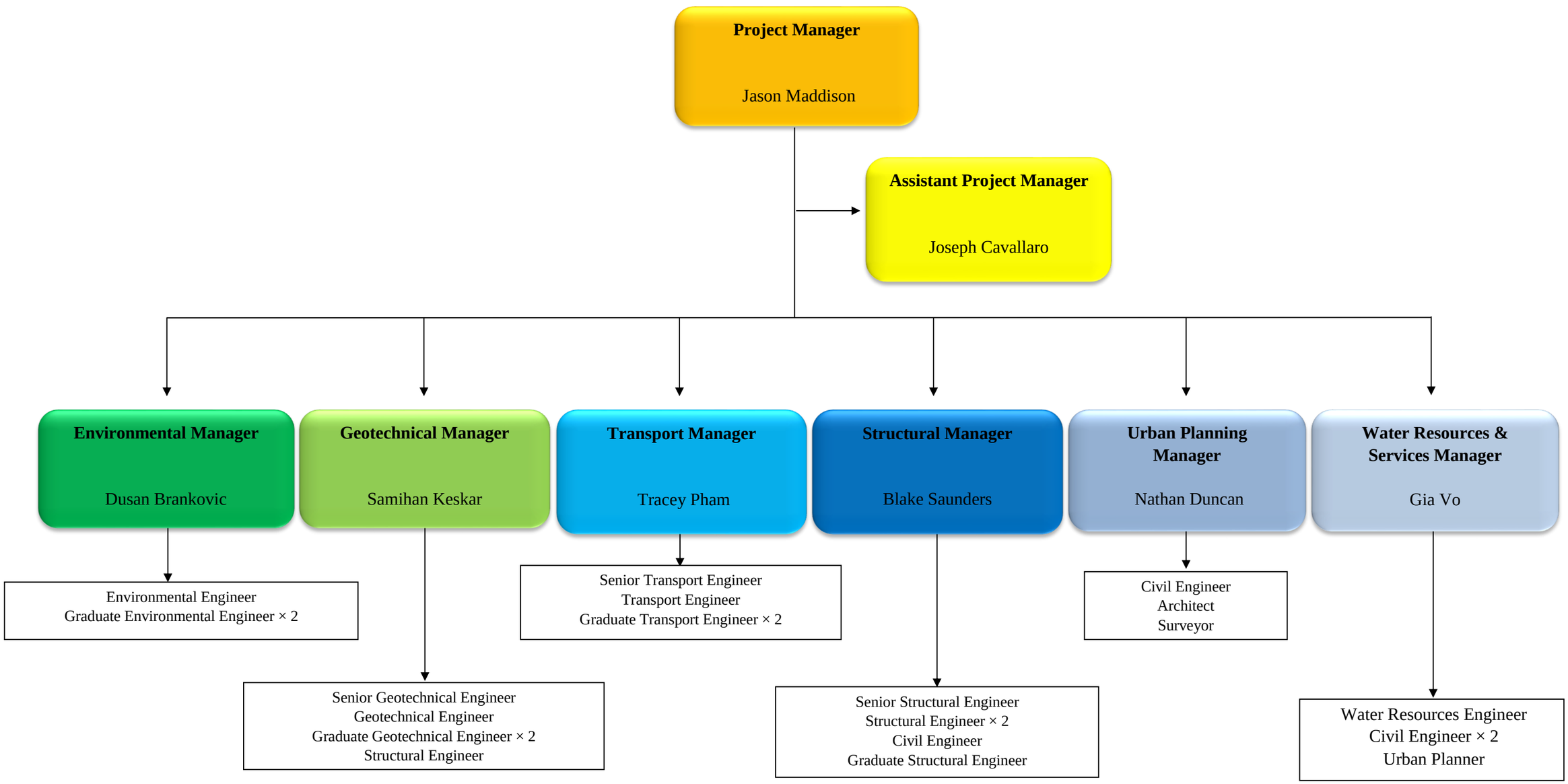
At E8 Consulting Engineers, we understand the importance of assigning skilled labour to all projects we undertake, and never place an individual in a situation where they do not have the relevant skills to work effectively and safely. The company commits to training and assisting all employees to explore their potential and improve their skills. This provides a platform to fulfil the aims and objectives of our clients, as well as the services provided by the company, not only in the office work but at the project site.

Office training is required to ensure all employees involved in the project are capable of understanding, recognising and delivering the expected outcomes of the project, as well as the demands of the customers. By implementing this procedure, employees are capable of preparing and providing the relevant documentation to clients including drawings, correspondence, meeting minutes, specifications and project plans. This allows the project to remain both on time and budget, to ensure client's satisfaction is obtained. Training is also provided to employees where new procedures, methods, changes in regulations or legislations occur.

All employees of E8 Consulting Engineers possess a Work, Health and Safety Construction Induction (white card). This enables all employees to gain access to the project site after an induction, to conduct site inspections and obtain key information in regards to the progression of the project.

2 Management Structure

2.1 Team Structure



2.2 Team Management Profiles

2.2.1 Project Manager

Jason Maddison

Project Manager

E: madjd004@mymail.unisa.edu.au

CAREER PROFILE

I am a self-motivated and passionate about all facets of engineering affording a high attention to detail. I have a range of experience in areas including scheduling, procurement, design and technical support.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

J² Consulting Engineers **(May 2015 – Present)**

- Fire Safety Engineering
- Fire Services Engineering
- BCA Consultancy
- Engineering Project Management
- Bushfire Consultancy
- Fire Modelling and Design

Pernod Ricard Australia **(2008 to 2014)**

- Imports Coordinator of Mumm Champagne, Spirits and New Zealand Wine

Parafield Timber Building Supplies **(1995 to 2008)**

- Procurement
- Estimation and Design
- Team Leader

PREVIOUS PROJECTS

- Condition, compliance and capacity reviews of all University of South Australia buildings including provision of fire services asset registers, risk assessment, project management of upgrades (2015 - Present).
- Bunnings Windsor Gardens alternative solution report developed in accordance with the performance requirements of the BCA (2016).
- Building re-classification and Essential Safety Provisions including sprinkler design provided to aged care facilities (2015).

2.2.2 Assistant Project Manager

Joseph Cavallaro

Assistant Project Manager

E: cavjl001@mymail.unisa.edu.au

CAREER PROFILE

Previous experiences within structural consultancy and civil construction have enabled me to develop an understanding of the key fundamentals associated within the corresponding industry. This has also resulted in me obtaining a high attention to detail, to ensure the most effective and efficient solution is obtained.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural (Honours) (2014 - Present)

PRIOR EXPERIENCE

Bryant Concepts **(Jan 2016 – Present)**

- Structural Engineering
- Engineering Project Management

Cavco Earthmoving **(2010 to 2015 - Holidays)**

- Project Estimator
- Labourer

PREVIOUS PROJECTS

- Various Industrial Sheds within South Australia (2017).
- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016).
- Water Resource Systems design for a housing subdivision in Strathalbyn (2016).
- Noarlunga Rail Line No 59 Extension (2016).
- Housing subdivisions in the Barossa Valley, South Australia (2015).
- Construction of Water Resource Systems throughout the Barossa Valley (2015).

2.2.3 Environmental Manager

Dusan Brankovic

Environmental and Safety Manager

E: brady016@mymail.unisa.edu.au

CAREER PROFILE

I am passionate about high standards of work with great motivation in working well in a team. The studies I have undertaken will help me adhere to all classes of projects undertaken and prove a valuable asset to this team.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

E8 Consulting Engineers **(Mar 2014 – Present)**

- Structural Analysis
- Water Resource Systems Design
- Bridge Design and Construction
- Geotechnical Engineering
- Road Design
- Reinforced Concrete Design
- Steel and Timber Design

FMG Engineering **(Jan 2016 to Feb 2017)**

- AutoCAD Footings Drafter (Housing)
- Co-Site Inspector (Housing)

PREVIOUS PROJECTS

- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016)
- Water Resource Systems design for a housing subdivision in Strathalbyn (2016)
- Noarlunga Rail Line No 59 Extension (2016)

2.2.4 Geotechnical Manager

Samihan Keskar

Geotechnical Manager

E: kessy003@mymail.unisa.edu.au

CAREER PROFILE

An experienced Engineer with a demonstrated history of working in the civil engineering industry. Strong engineering professional skilled in AutoCAD, Matlab, Microsoft Excel, CFA Piling, QA and geotechnical engineering.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

Torrens to Torrens Project **(Nov 2016-Present)**

- Quality Assurance
- Piling Works
- Procurement

E8 Consulting Engineers **(Mar 2014 – Present)**

- Bridge Constructions
- Water Resource Systems Design
- Road Designs and Developments
- Structure Analysis

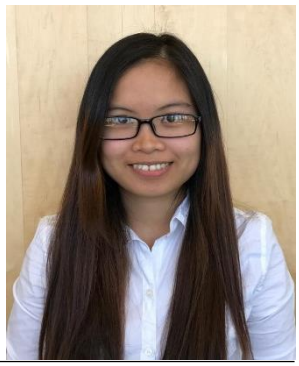
Department of Planning, Transport and Infrastructure **(Jun 2012)**

- Traffic Engineering

PREVIOUS PROJECTS

- Torrens to Torrens Project – Development of roads and bridges spanning across Torrens road and Torrens River (2016).
- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016).
- Noarlunga Rail Line No 59 Extension (2016).
- Goodwood Junction Rail Grade Separation (2015).

2.2.5 Transport Manager



Tracey Pham

Transport Manager

E: phaty058@mymail.unisa.edu.au

CAREER PROFILE

My long term goal is to advance my career as a professional Transport engineer who is highly skilled and experienced to be involved in any challenging and dynamic engineering environment. My first aim is always understanding and delivering excellent services to the clients and stakeholders as well as enhance the reputation for my own company.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

E8 Consulting Engineers **(Mar 2014 – Present)**

- Water Resource Systems Design
- Geotechnical Engineering
- Road Design
- Reinforced Concrete Design

University of South Australia **(Dec 2016 - Present)**

- Research Assistant

PREVIOUS PROJECTS

- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016)
- Water Resource Systems design for a housing subdivision in Strathalbyn (2016)
- Noarlunga Rail Line No 59 Extension (2016)
- Design of Victoria Square Canopy (2016)
- Research Project: removing Arsenic from groundwater based on using a rice derived biochar potentially decorated with a zerovalent iron coating (2016- present)
- Road Design in 12D: design a new two-lane rural road with a specific total formation width through various terrain using 12D (2015)

2.2.6 Urban Planning Manager

Nathan Duncan

Urban Planning and Surveying Manager

E: dunnp002@mymail.unisa.edu.au

CAREER PROFILE

I am very motivationally driven to exceed and provide a high standard of work. I have great communication skill and work well in a team. The theoretical and practical knowledge I have obtained whilst Studying will ensure that I'm an asset to this team.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

Peter Elson Construction (Work Experience) (2011)

- On Site Advisor
- Services Location
- Wall Joists Locations
- Wall Stud Spacing's
- Wind Bracing Design

Gilling's Enterprises (Work Experience) (2012)

- Forklift Operations
- Timber Frame Construction

PREVIOUS PROJECTS

- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016)
- Water Resource Systems design for a housing subdivision in Strathalbyn (2016)
- Noarlunga Rail Line No 59 Extension (2016)
- Designed a two-lane rural road through various terrain using 12D (2016)

2.2.7 Structural Manager

Blake Saunders

Structural Manager

E: sauba001@mymail.unisa.edu.au

CAREER PROFILE

I am both a highly enthusiastic and motivated person with a focus on applying skills with theoretical knowledge. I pride myself on my outstanding communication skillset with employees and developing a rapport with clients.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

Ginos Engineers **(Nov 2016 – Present)**

- Project Coordination and Management
- On site advisor

Riverland Coldstorage **(Jan 2016 - Present)**

- Site Operations Manager
- Forklift operations

Fusco Construction **(Mar 2015 - 2016)**

- Security
- Labourer

PREVIOUS PROJECTS

- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016)
- Water Resource Systems design for a housing subdivision in Strathalbyn (2016)
- Noarlunga Rail Line No 59 Extension (2016)
- Site manager and compliance officer of the Unley High School Tafe facilities. (2016)
- Safety and ethics report post construction of the Palm Jumerirah in the UAE (2015)

2.2.8 Water Resources and Services Manager

Gia Vo

Water Resources and Services Manager
E: voyth003@mymail.unisa.edu.au

CAREER PROFILE

As a passionate and experienced engineer, I am able to work efficiently within a team environment; possessing a good understanding of the theoretical knowledge, I am capable of providing clients with the most effective and economical solutions.

QUALIFICATIONS

University of South Australia

Bachelor of Engineering Civil and Structural LHMI (Honours) (2014 - Present)

PRIOR EXPERIENCE

E8 Consulting Engineers **(Mar 2014 – Present)**

- Bridge Constructions
- Water Resource Systems Design
- Road Designs and Developments
- Structure Analysis

Department of Planning, Transport and Infrastructure **(June 2012)**

- Traffic Engineering

PREVIOUS PROJECTS

- Whyalla Hospital and Cancer Centre, Level 1 Wing, Reinforced Concrete and Steel Framework Design (2016)
- Water Resource Systems design for a housing subdivision in Strathalbyn (2016)
- Structure Analysis of the Surf Central Building (South Australia) (2015)
- Ventilation Systems Development for Rural Nepal – Effective and economical solutions to eliminate passive smoke from indoor cooking (2014)

3 Project Information

3.1 Project Overview

The Adelaide O-Bahn is the longest and fastest guided bus service in the world. The existing O-Bahn service is highly patronised by the public compared to any other public transport service offered that travels to and from Adelaide Central Business District (CBD). With more than 8 million passengers utilising the service every year.

Currently the dedicated corridor currently terminates on to Park Road at Gilberton before continuing with passenger vehicles along Hackney Road to Grenfell Street. This section causes major delays for the final 4.4 kilometres of the O-Bahn route, due to the interaction between buses and passenger vehicles.

In the recent budget, funding has been allocated to design and construct an extension of the dedicated O-Bahn corridor to ease peak hour delays and promote the use of public transport. For this reason the project endeavours to solve the current issues, while also encouraging the use of the O-Bahn service.

The first stage of the extension to the dedicated O-Bahn Corridor is to determine an appropriate solution to provide bus priority carriageways, while also relocating and upgrading various services within the project area. By implementing this solution, it will reduce delays along the final 4.4 kilometres of the O-Bahn route, increasing the satisfaction of travelling patrons.

To determine the most appropriate solution for the project, a feasibility study will be conducted involving different departments within the engineering field. Upon completion of the feasibility study, the solution deemed most appropriate to satisfy the client's requirements will be determined, resulting in the commencement of the detailed design.

3.2 Project Aims/Outcomes

Upon completion of the of the O-Bahn upgrade the client aims to achieve a range of objectives, to provide a solution to the current issues that are evident on Hackney Road between Park Road and North Terrace. These outcomes involve:-

- Increasing the efficiency of bus operations along Hackney road, by providing bus priority routes incorporating bus lanes and bus priority lighting. By doing so it would reduce the travel time required to reach the CBD, providing an effective option for patrons to use public transport instead of their own form of transport and move away from individual driving.
- By allowing public transport to be more appealing than driving to the CBD, it will reduce the traffic congestion on surrounding roads within the inner ring route, which in return improves greenhouse emission pollution.
- By providing bus priority routes it eliminates the interaction between buses and vehicular traffic, reducing the occurrence of accidents.

When determining proposed options to put forward to the client, it is essential that the options not only provide a solution to current issues, but must also:-

- Consider future growth and current demand.
- Provide minimal disruption to all road users and pedestrians during construction.
- Provide job opportunities for local businesses, along with Aboriginal people, graduates, ex-Holden employees and the unemployed.

4 Feasibility Proposal

4.1 Proposed Options

E8 Consulting Engineers have investigated the underlying primary issues associated with the requirements of the project upgrade. We believe that the following proposed options once fully scrutinised during the feasibility study, will provide the desired outcome for DPTI and also meet the expectations of the greater community. The following proposed designs shall consider and allow for future transport initiatives. The proposed options are as follows:-

- Option 1 – Additional Western Bridge and Hackney Road Widening
- Option 2 – Additional Western Bridge and Tunnel
- Option 3 – O-Bahn Off-Ramp Realignment

4.1.1 Option 1 - Additional Western Bridge and Hackney Road Widening

a) The current heritage listed eastern bridge to remain an inbound (SOUTH) dual carriageway for public vehicular traffic movements and local busses (No O-Bahn busses).

b) The existing western bridge to become a bus only bridge for inbound and outbound (SOUTH/NORTH) one lane each way.

c) Addition of a new dual carriageway bridge to be constructed on the western side of Hackney Road for outbound (NORTH) traffic with the inclusion of a shared pedestrian and cycle lane that is physically separated from motorists. To the south this lane will connect to a newly developed shared pedestrian and cycle path parallel to Hackney road.

d) Road widening will be required to the north of the Torrens River where the newly constructed bridge will realign with the Park Road and Bundeys Road intersection, incorporating a continuation of the shared pedestrian and cycle path. To the south of the Torrens River along Hackney Road, widening will facilitate a central street scape divider that will separate north and south bound traffic. Right turning slip lanes will be afforded off Hackney road but not entering on to from the eastern side. This affording a dedicated centralised red asphalt bus lanes at surface level along Hackney Road to the North Terrace/Botanic Road intersection.

GOOGLE MAPS, 2016. *Map of Hackney road.* [online]. Google. Available from: https://www.google.com.au/maps/@-34.9146575,138.6155107,15.75z?hl=en [Accessed 8th March 2017].

Figure 4: Proposed Design Option 1 – Additional Western Bridge and Hackney Road Widening

4.1.2 Option 2 - Additional Western Bridge and Tunnel

Using parts a), b), and c) from Option 1 with the inclusion of a dual carriageway tunnel to be constructed centrally along Hackney Road dedicated for busses only. The tunnel entrance to be afforded as close to the southern end of the existing Torrens River western bridge and then continuing to the North Terrace/Botanic Road intersection. This proposes that a tunnel would extend under the fore mentioned intersection and beyond. Road widening to the north of the Torrens River would be required as for Option 1.

The major benefits here:-

- Reduction in the amount of road widening to Hackney Road.
- Allows an increased future proofing of the traffic corridor.
- Minimising right turns across bus lanes.
- Increased separation of busses from motorists.
- Further reductions in travel time.

GOOGLE MAPS, 2016. *Map of Hackney road.* [online]. Google. Available from: https://www.google.com.au/maps/@-34.9146575,138.6155107,15.75z?hl=en [Accessed 8th March 2017].

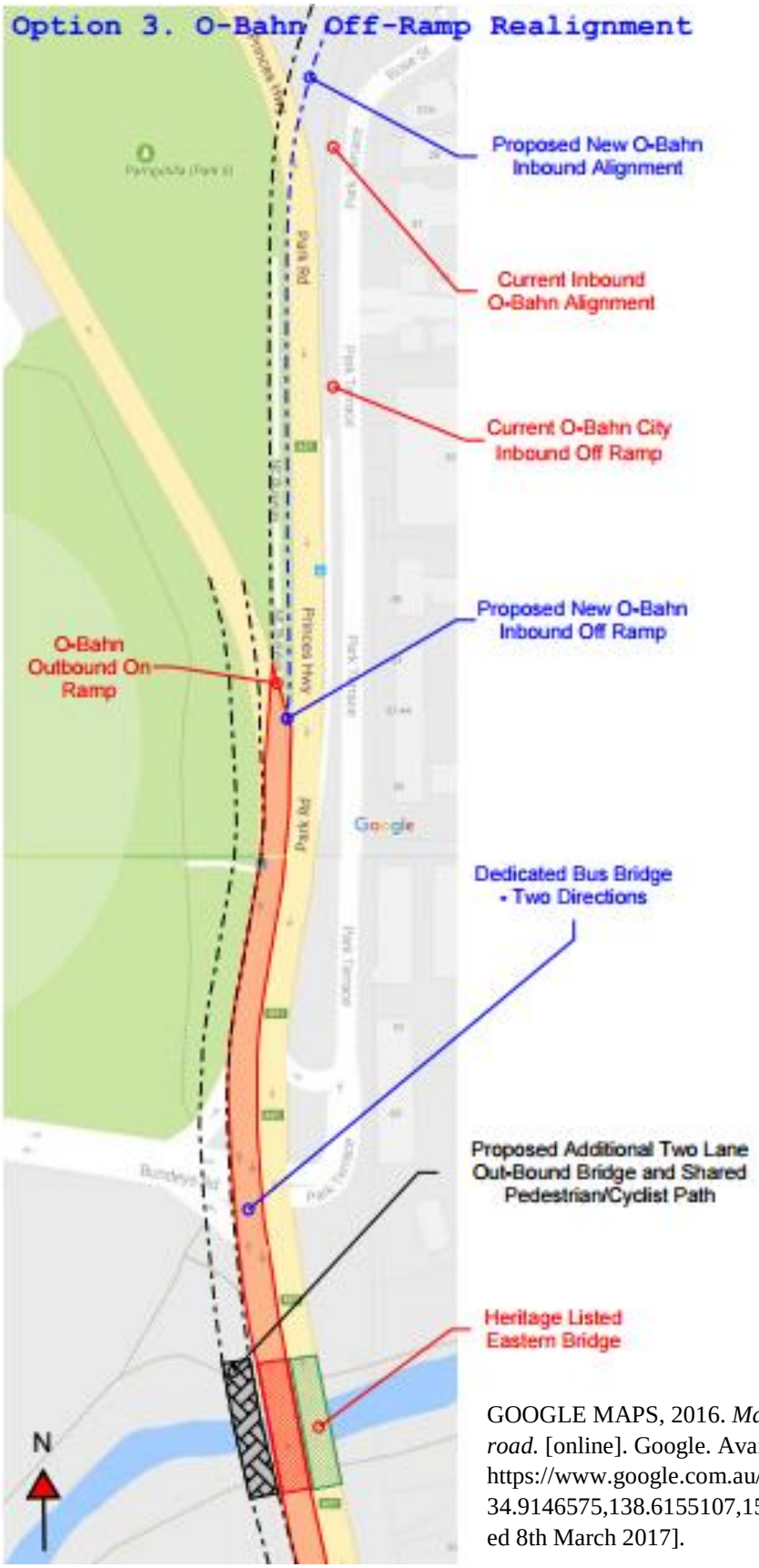
Figure 5: Proposed Design Option 2 – Additional Western Bridge and Tunnel

4.1.3 Option 3 - O-Bahn Off-Ramp Realignment

In conjunction with either of Option 1 or Option 2, Option 3 proposes the realignment of the existing inbound O-Bahn off-ramp at Gilberton to be situated adjacent to the outbound on-ramp to the north of Bundeys Road intersection. This would require both O-Bahn tracks to pass under Park Road (inbound) therefore mitigating the requirement for busses on, or to cross any lanes of Park Road on the approach to or within the Bundeys Road/Park Terrace intersection.

Both O-Bahn bus lanes would be centrally located and now aligned with the existing western dedicated bus only bridge proposal. At the Bundeys Road/Park Terrace Intersection, O-Bahn busses and cars would cross on the same traffic signalling sequence without interaction. The foreseen advantages are but not limited to:-

- Remove a specific signalling sequence currently in place for busses alone, reducing overall traffic congestion.
- Increased bus scheduling services of the O-Bahn.



GOOGLE MAPS, 2016. *Map of Hackney road.* [online]. Google. Available from: https://www.google.com.au/maps/@-34.9146575,138.6155107,15.75z?hl=en [Accessed 8th March 2017].

Figure 6: Proposed Design Option 3 – O-Bahn Off-Ramp Realignment

4.2 Feasibility Study Approach

E8 Consulting Engineers will ascertain the appropriate outcome by using a proven team method of validation by combining site inspections with desktop studies. Liaising with government and key local stake holders will play a large part in the initial stages as SA Water's newly replaced Hackney Road trunk water main and sewer upgrade will provide valuable information to the location of further sub surface services. Constraints such as these will challenge design options and therefore be of major significance in the analysis stage.

Six division managers for the preliminary investigations will be utilised with a further sub-set of engineers with varying disciplines allocated to each. This will deliver the required aims and outcomes through a consultative process deriving appropriate solutions at each step. A conscious effort will be employed to explore innovative options to enhance the project across all construction phases. Each divisional group will identify and outline the potential issues and considerations that are likely to occur in a project of this calibre. Consultation between residents, local businesses and the wider community will be sought throughout all project stages and milestones to minimise any adverse impact, promoting a positive and lasting relationship for the project.

4.3 Environmental

E8 Consulting Engineers strives to provide the most effective solution for all terms of environmental issues. We consider this a high priority when designing projects as correct management of the environment will lead to great success in developing both a socially and environmentally sustainable project.

4.3.1 Objectives

One of the major objectives is to meet all requirements put forward by the Native Vegetation Act of 1991 along with the Aboriginal Heritage Act of 1988, and procure all environmental permits necessary to commence works. The removal of vegetation and shrub land will be kept minimal and replanting vegetation will be done in all areas where possible. Procedures will be put forward to promote the use of sustainable and recyclable materials.

4.3.2 Assumptions

Key assumptions that will be considered include:-

- All identified significant trees will be retained.
- An improvement of air quality due to the reduction in traffic congestion, resulting from a decrease in the number of stationary idling vehicles.

4.3.3 Considerations

As part of the processes put forward by E8 Consulting Engineers we will implement the following procedures:-

- An evaluation of the local environment in and around the site.
- Identification of issues and/or impacts from our design.
- A suitable design will be reviewed and assessed for any issues.
- Suitable solution will be evaluated and chosen.
- Implementation of the solution into the project.

Defining environmentally friendly solutions is an important part of E8 Consulting Engineers ethos combined with our determination, will ensure the design solutions will have minimal impact on the environment.

Water Quality

A common issue in various areas regarding interruptions to traffic efficiency include unwanted bodies of water resulting from a sudden change in weather. It is important that the design is appropriate to deal with such issues. At E8 Consulting Engineers the proposed solutions include innovative ways to ensure there is no excessive ponding on the road surface. Some of this wastewater can be reused for surrounding vegetation or guided somewhere else if considered to be appropriate. This design may include:-

- Water banks to hold water for slow release.
- Filtered solutions for reuse.

Air Quality (Dust)

Air Quality is a constant problem when dealing with construction and affects immediate and surrounding areas. Air pollution is mainly contributed by dust from earthworks and exhaust fumes from heavy plant equipment. The management strategies to mitigate the issues, consist of:-

- Keeping all earth areas damp using water trucks, which will limit dust drastically.
- Ensuring all vehicles and plant equipment must meet Australian emission standards.

Excavated Soil

- All unwanted earth material will be removed and dealt with accordingly. This will be both documented and outlined during the procedure which will include any material brought on site.
- If the project design consists of an underpass, then groundwater may be present which adds extra complication due to the greater risk of contamination.

Waste

- All waste material will be collected, removed and disposed of appropriately from site.

Noise Emission

Construction sites produce large amounts of unwanted noise and in urban areas can cause a disturbance to the surrounding communities. It is important that the construction team remain mindful and act appropriately in response to any communication involving excessive noise and respect any noise restrictions that are in place. The management strategies to mitigate the issues, consist of:-

- All construction involving excessive noise will comply with noise restriction laws in South Australia.

Work hours will be negotiated and agreed upon with stakeholders.

- The noise will be monitored and the plan reviewed when necessary.

Flora and Fauna

Throughout the duration of the project, areas of concern while undertaking preliminary assessments by division manager will consist of but not be limited to:-

- If any threatened species are encountered they will be dealt with appropriately according to any rules and regulations set by the South Australian government.
- Relocation of nesting boxes for any trees that have be removed along the western side of Hackney Road.
- The relocation of any vegetation including shrubs and trees will have appropriate documentation and approvals prior to.
- The Environmental Management Plan will be constantly reviewed.

4.4 Geotechnical

The geotechnical team within E8 Consulting Engineers play a vital role throughout the project as employees within the division are faced with the task of preliminary assessments to determine the nature of the soil and the design limitations.

By gathering information needed for design from site investigations and conducting various studies, the geotechnical team can be ensured to provide solutions which will consider future capacity.

4.4.1 Objectives

Due to the fact that the infrastructure construction takes place above and below the ground, our experienced and highly knowledgeable geotechnical team will play a vital role in:-

- Pre-Construction Site Inspections
- Reviewing Geotechnical Data
  - Topographic Maps
  - Soil Profiles
  - CBR/SPT
  - Stability Analysis
  - Soil Classification
  - Bore logs
  - Aerial Photographs
  - Geological Maps
  - Soil Conservations Reports
  - Contour Maps
- Subgrade Designs
- Pavement Designs
- Slab Design
- Embankment Design

4.4.2 Assumptions

E8 Consulting Engineers assumes all relevant information to conduct the scope of works will be provided and up to date. This information includes, but is not limited to:-

- The Geotechnical reports including contour maps of the site, bore logs, topographic maps, aerial photography and all utilised within GIS for conventional work.
- The Compaction tests – simplified and proctor tests (OMC, Maximum Dry Density)
- The Californian Bearing Ratio test – provide load penetration resistance of the soil.

** All tests conducted to be in accordance to Australian Standards **

4.4.3 Considerations

If the proposed subsurface method was deemed appropriate, considerations would have to include the influence of the groundwater table, in conjunction with:-

- Existing services underneath and along Hackney Road will be assessed during the geotechnical investigation for design purposes.
- Bearing Capacity will be investigated in detail for the bridge footings. The footing must be designed in accordance to the shear failure, bearing capacity and settlement.

Where structural elements requiring bearing capacity will be considered, the legal and physical attributes for the site will need to be considered, but not limited to:-

- Exposed geology.
- Road alignment.
- Determination of vertical and lateral Torrens River widths.
- Soil type variances between the Hackney Road & Botanic Road intersection and the Torrens River.
- Hydraulic fluctuations of the Torrens River.
- Depth of the water table.
- Seismic data.
- Predicted calculated settlements.

4.5 Transport

In this project, transportation is one of the most important aspects that needs to be considered, as a result of the excessive traffic congestion that is evident along Hackney Road during peak times. The excessive traffic congestion not only affects passenger vehicles but has also affects bus routes. Therefore the main considerations throughout the project would be to distribute the traffic volume and avoid/minimise traffic disruption during construction on Hackney Road in both peak and non-peak times.

4.5.1 Objectives

A traffic management plan will be formulated from current traffic volumes at key intersections and how any upcoming scheduled traffic maintenance on adjoining roads may impact the project. Any scheduled service outages not attributed to this project should be taken into consideration to try and align with so to not extend this service disruption. The objectives that E8 Consulting Engineers aims to achieve include, but are not limited to:-

- Evaluate the total traffic volumes including the percentages of heavy vehicles along Hackney Road and other nearby roads which share the same intersections such as Bundeys Road and Plane Tree Drive. This can be taken from traffic counts of DPTI surveys.
- Modify/Upgrade the major intersections existing along Hackney Road to be suitable for the new design of another carriageway or road extension.
- Separate buses from passenger vehicles by incorporating bus priority routes utilising bus lanes along Hackney Road.
- A traffic management plan will be implemented to limit the access of traffic flows on Hackney Road to and from the city during the construction phase. This involves procedures such as detours and providing right/left turn restrictions.
- Limit the community disruptions.
- Ensure adequate access for construction vehicles while also providing minimal impact to the existing roads, infrastructure and parklands.

4.5.2 Assumptions

E8 Consulting Engineers assumes that DPTI will be responsible to provide the following information:-

- Up-to-date locality maps, zoning including the roads and road dimensions, intersections, number of lanes and directions of each road as well as the number of residential properties within the project area.
- Latest surveys of traffic volumes at certain times of the included roads (AADT, ETA, NADT).
- Number of bus routes travelling across the project area including timetables, numbers and bus stops.

The proposed road alignment will be designed in a manner to minimise the acquisition of the Parklands, while also adding dedicated bus lanes along with a shared cycle and pedestrian path.

4.5.3 Considerations

Construction

During the construction, vehicles would be affected drastically due to the alteration of access roads and intersections, along with the addition of construction vehicles near the project site. To accommodate for the works to be completed, temporary lane closures will be implemented along with right/left turn restrictions at various intersections along Hackney road, to minimise the traffic disruption.

Construction vehicle access

All construction vehicles must be granted access to the site without causing significant impacts on the existing roads. The eastern side of Hackney is comprised of business and local residential areas, while the western side consists of park lands. Majority of the works to be completed are within the western side of Hackney Road, in consultation with the environmental team and the Adelaide Parklands Act and the Botanic Gardens and Herbarium Act, temporary paths for construction vehicles could be implemented.

Public transport

Currently there are various bus routes passing along Hackney Road. Due to construction, the buses will be temporarily allocated alternate routes detouring around construction phases.

Local properties access and Parking

Temporary parking restrictions will be implemented at different construction phases which will limit the current available parking spaces in the short term. This will be outlined in our traffic management plan.

Pedestrians and cyclists

All proposed options put forward have to accommodate for cyclists and pedestrians that utilise Hackney Road and the Parklands. Therefore prior to the commencement of construction, a management plan has to be implemented which re-directs the existing routes cyclist and pedestrians currently utilise.

4.6 Urban Planning

The work related to urban planning and surveying largely revolves around the businesses and homes on the east side of Hackney road and the Botanic Gardens on the West. If Hackney road is to be widened an agreement will need to be made to encroach into the Botanic gardens. The following legislations are required to be satisfied before any work can commence:

- *Adelaide Parklands Act, 2005*
- *Botanic Gardens and State Herbarium Act, 1978*
- *City of Adelaide Act, 1998*
- *Highways Act,1926*
- *National wine centre (Restructuring and Leasing Arrangements) Act, 2002*

Additionally, architects will be contracted to work with the Urban Planners on the conceptual design to ensure the finished project is aesthetically pleasing.

All plans will also be discussed with the City of Adelaide, City of Norwood, Payneham and St Peters to ensure their legislations are met and to discuss economic development and future land uses.

4.6.1 Objectives

The objectives of this project are to not only satisfy the requirements stated in the brief, but also to reduce the impact on the surrounding public whilst under construction and after completion. The extension needs to be designed in such a way that it accounts for an ever-expanding city.

The main objectives that need to be addressed are as follows:-

- Account for population growth.
- Assess surrounding structures for heritage listings.
- Decrease bus travel time on this route.
- Have a positive impact on all who use it or are affected by it.
- Make nearby residents aware of future constructions and their rights.
- Optimised land usage.
- Reduce accidents in this area.

4.6.2 Assumptions

Due to high volumes of traffic within the project area, large sections of road are going to need to be closed off causing severe congestion. This also means there will not be adequate room to store large quantities of materials or machinery on site. Due to the location of the project, sound barriers may need to be implemented within the area to keep the serenity of the Botanic Gardens and the surrounding residents satisfied. Historic buildings and structures along Hackney Road are to remain unchanged.

4.6.3 Considerations

To minimise the amount of time the road will need to be closed and to minimise the effects to traffic, some work may need to be performed at night. Performing work at night would then affect nearby residents. Therefore, research will need to be conducted and precautions put in place to result in the most effective solution possible.

4.7 Structural

At E8 Consulting Engineers we have a vast range of experience in our structural engineering department. The team has successfully designed and implemented numerous highway bridges, hospital redevelopments, railway infrastructure upgrades and multistorey buildings.

For technical work, we rely on modelling our projects using software alongside hand calculations to cross reference the results, minimising any possible errors whilst producing a visual representation for the clients.

4.7.1 Objectives

Elements of the structural design must meet the following objectives:-

- Produce an unobtrusive design that complements the existing environment whilst having the capabilities to withstand the loadings that may be applied.
- Sourcing innovative materials that will provide required strength and reducing the cost of the project.
- Make the use of bike paths more appealing to reduce the congestion on the roads.

4.7.2 Assumptions

The heritage listed eastern bridge over the River Torrens and existing western bridge will remain unchanged. The construction of a new bridge will be provided with a clear span without central piers. Precast members will be manufactured off site and assembled into their final position on site. Precast structures will be manufactured locally providing opportunities for local business.

4.7.3 Considerations

As the city is for ever changing and expanding the design needs to consider possible alterations that my take place on Hackney Road. The major structural considerations include:-

- Ensuring that larger busses can fit in the event of the service becoming more popular and necessary to increase the number and size of busses using the route.
- Ensure the tunnel and road service are adequately designed in the event of the ring route becoming accessible to larger or heavier vehicles to cross its path.
- Integrating the required infrastructure in to the existing landscape.
- Ensure carriageways can be easily modified in the instance of future widening.

For proposed design solutions stated in section 4.1, whereby bridge construction, tunnelling and the shared pedestrian foot bridge is required, the structural team must work collaboratively with the geotechnical department. This will ensure the correct footing/retaining wall will be selected, along with determining the appropriate loading that will be applied to all structures.

This is necessary to ensure all structures are designed with sufficient capacity to withstand the external loads.

Throughout the design of all concrete structural elements, an emphasis is going to be placed on maximising the use of pre-cast members. This will ensure the designed structures (bridges and tunnels) are constructed more efficiently both in time and cost.

4.8 Water Resources Systems Design and Services

During the construction phases of the project, possible interruptions could occur upon the provision of services; including telecommunication connection, water, gas and power supply. These interruptions could significantly impact local residents and businesses daily activities. In order to minimise the interruption of services, thorough studies and planning is essential prior to the project's initiation. With vast experience obtained from previous projects, service engineers from the project team are capable of ensuring that services location are determined and risk analysis are conducted in order to provide appropriate and efficient solutions. Existing services upgrade and installation of new services are also to be taken into consideration, as it essential for the design and construction process of new pavements. Active and inactive services are also required to be identified for the simplicity of new services management plans. To further promote the use of pedestrian and cyclist paths, service enhancements of the path are to be taken in consideration.

4.8.1 Objectives

One of the main objectives of the service engineering team is to determine the location of existing services, and determine a new location within the overall O-Bahn extension upgrade to ensure the most economical and appropriate solution. Furthermore, relocation of unknown services can take long periods thus slowing down the progress of the entire project. Along with services relocation, upgrades and realignments of existing services and additional provisions are also to be taken into account in order to augment the effectiveness of the design.

Another objective is to promote the use of a safe pedestrian and cyclist path. Services enhancements such as lighting installations and path illumination will enhance and promote the use of the path as another means of transport to and from the city.

4.8.2 Assumptions

As the services investigation takes place, several assumptions are required to be made, including:-

- Relocation plan for existing services is feasible.
- Relocation proposal of existing services is presented and accepted by local stakeholders and community.
- Services management and design is accurate for new location.
- Pavement design is adequate for services relocation.
- Current active and inactive services location are provided by relevant bodies.
- Hydrological and Hydraulic data provided is accurate for stormwater system design.
- Opportunity for Water Sensitive Urban Design (WSUD) features may be implemented to the upgrade of the storm water system.

4.8.3 Considerations

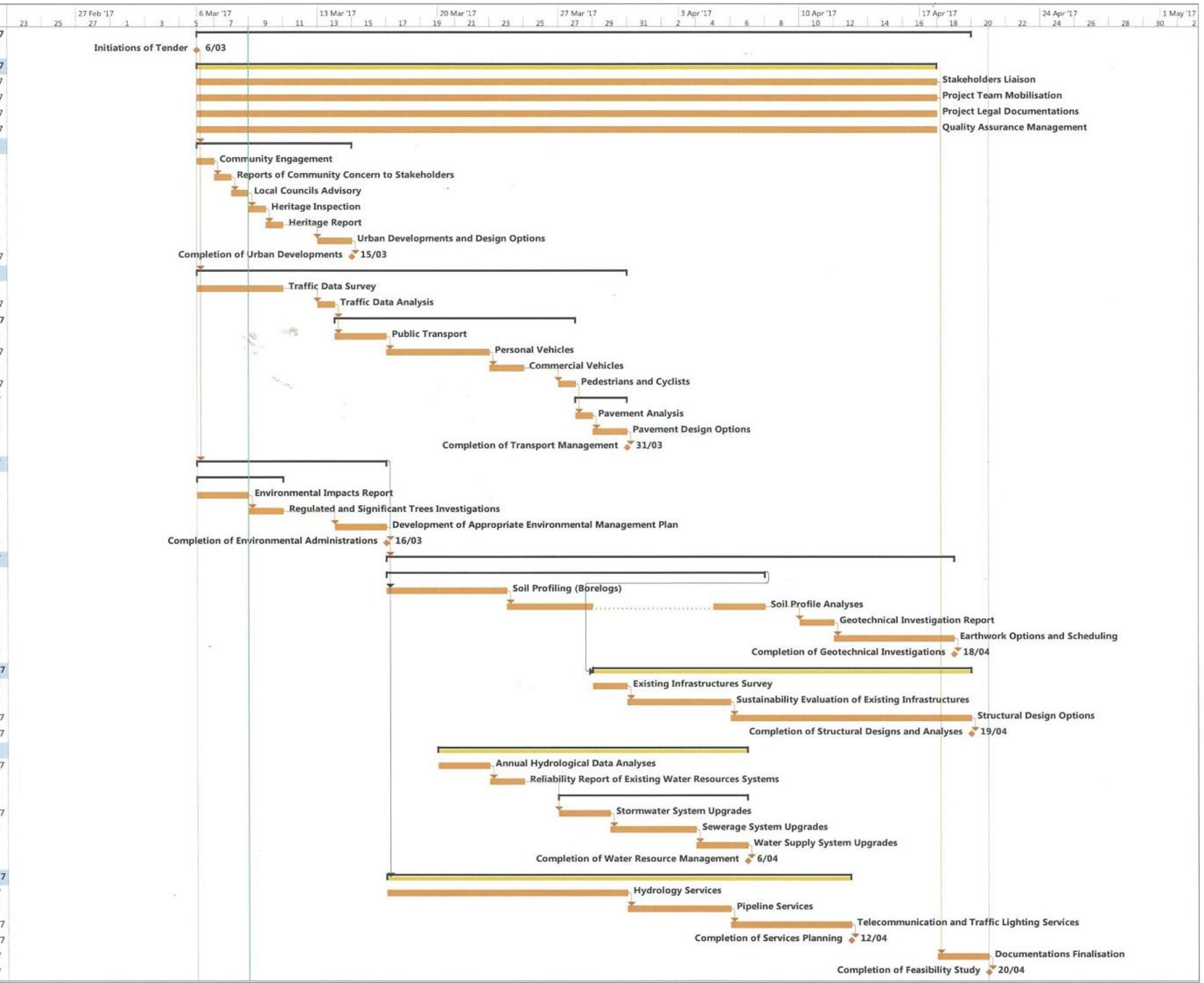
Services engineers from E8 Consulting Engineers will take in to consideration a variety of factors that are capable of influencing the outcome of the project, such as:-

- Minimisation of services interruption.
- Appropriate relocation suitable for future developments.
- Existing services upgrades and relocation.
- Sewer pipe installation.
- Water main pipe installation.
- New network cable installation.
- Gas pipe installation.
- New stormwater system design due to road widening.
- Pedestrian and cyclist path illumination.

5 Project Schedule

Table 1: Feasibility Project Schedule

ID	Task Name	Duration	Start	Finish
1	**Expression of Interest and Feasability Study**	**34 days**	**Mon 6/03/17**	**Wed 19/04/17**
2	**Initiations of Tender**	0 days	Mon 6/03/17	Mon 6/03/17
3	**Project Initiations and On-going Evaluations**	**32 days**	**Mon 6/03/17**	**Mon 17/04/17**
4	Stakeholders Liaison	32 days	Mon 6/03/17	Mon 17/04/17
5	Project Team Mobilisation	32 days	Mon 6/03/17	Mon 17/04/17
6	Project Legal Documentations	32 days	Mon 6/03/17	Mon 17/04/17
7	Quality Assurance Management	32 days	Mon 6/03/17	Mon 17/04/17
8	**Urban Developments**	**7 days**	**Mon 6/03/17**	**Tue 14/03/17**
9	Community Engagement	1 day	Mon 6/03/17	Mon 6/03/17
10	Reports of Community Concern to Stakeholders	1 day	Tue 7/03/17	Tue 7/03/17
11	Local Councils Advisory	1 day	Wed 8/03/17	Wed 8/03/17
12	Heritage Inspection	1 day	Thu 9/03/17	Thu 9/03/17
13	Heritage Report	1 day	Fri 10/03/17	Fri 10/03/17
14	Urban Developments and Design Options	2 days	Mon 13/03/17	Tue 14/03/17
15	***Completion of Urban Developments***	0 days	Wed 15/03/17	Wed 15/03/17
16	**Transport Management**	**19 days**	**Mon 6/03/17**	**Thu 30/03/17**
17	Traffic Data Survey	5 days	Mon 6/03/17	Fri 10/03/17
18	Traffic Data Analysis	1 day	Mon 13/03/17	Mon 13/03/17
19	**Traffic flow Management**	**10 days**	**Tue 14/03/17**	**Mon 27/03/17**
20	Public Transport	3 days	Tue 14/03/17	Thu 16/03/17
21	Personal Vehicles	4 days	Fri 17/03/17	Wed 22/03/17
22	Commercial Vehicles	2 days	Thu 23/03/17	Fri 24/03/17
23	Pedestrians and Cyclists	1 day	Mon 27/03/17	Mon 27/03/17
24	**Pavement Developments in Accordance to Surveyed Data**	**3 days**	**Tue 28/03/17**	**Thu 30/03/17**
25	Pavement Analysis	1 day	Tue 28/03/17	Tue 28/03/17
26	Pavement Design Options	2 days	Wed 29/03/17	Thu 30/03/17
27	***Completion of Transport Management***	0 days	Fri 31/03/17	Fri 31/03/17
28	**Environment Aministrations**	**9 days**	**Mon 6/03/17**	**Thu 16/03/17**
29	**Ecosystem Examination**	**5 days**	**Mon 6/03/17**	**Fri 10/03/17**
30	Environmental Impacts Report	3 days	Mon 6/03/17	Wed 8/03/17
31	Regulated and Significant Trees Investigations	2 days	Thu 9/03/17	Fri 10/03/17
32	**Development of Appropriate Environmental Management Pl**	3 days	Tue 14/03/17	Thu 16/03/17
33	***Completion of Environmental Administrations***	0 days	Thu 16/03/17	Thu 16/03/17
34	**Geotechnical Investigations**	**24 days**	**Fri 17/03/17**	**Tue 18/04/17**
35	**Site Inspection**	**17 days**	**Fri 17/03/17**	**Fri 7/04/17**
36	Soil Profiling (Borelogs)	5 days	Fri 17/03/17	Thu 23/03/17
37	Soil Profile Analyses	6 days	Fri 24/03/17	Fri 7/04/17
38	Geotechnical Investigation Report	2 days	Mon 10/04/17	Tue 11/04/17
39	Earthwork Options and Scheduling	5 days	Wed 12/04/17	Tue 18/04/17
40	***Completion of Geotechnical Investigations***	0 days	Tue 18/04/17	Tue 18/04/17
41	**Structural Designs and Analyses**	**17 days**	**Wed 29/03/17**	**Wed 19/04/17**
42	Existing Infrastructures Survey	2 days	Wed 29/03/17	Thu 30/03/17
43	Sustainability Evaluation of Existing Infrastructures	5 days	Fri 31/03/17	Wed 5/04/17
44	Structural Design Options	10 days	Thu 6/04/17	Wed 19/04/17
45	***Completion of Structural Designs and Analyses***	0 days	Wed 19/04/17	Wed 19/04/17
46	**Water Resource Management**	**15 days**	**Mon 20/03/17**	**Thu 6/04/17**
47	Annual Hydrological Data Analyses	3 days	Mon 20/03/17	Wed 22/03/17
48	Reliability Report of Existing Water Resources Systems	2 days	Thu 23/03/17	Fri 24/03/17
49	**Water System Urban Design Options**	**10 days**	**Mon 27/03/17**	**Thu 6/04/17**
50	Stormwater System Upgrades	3 days	Mon 27/03/17	Wed 29/03/17
51	Sewerage System Upgrades	4 days	Thu 30/03/17	Mon 3/04/17
52	Water Supply System Upgrades	3 days	Tue 4/04/17	Thu 6/04/17
53	***Completion of Water Resource Management***	0 days	Thu 6/04/17	Thu 6/04/17
54	**Services Planning**	**20 days**	**Fri 17/03/17**	**Wed 12/04/17**
55	Hydrology Services	10 days	Fri 17/03/17	Thu 30/03/17
56	Pipeline Services	5 days	Fri 31/03/17	Wed 5/04/17
57	Telecommunication and Traffic Lighting Services	5 days	Thu 6/04/17	Wed 12/04/17
58	***Completion of Services Planning***	0 days	Wed 12/04/17	Wed 12/04/17
59	**Documentations Finalisation**	3 days	Tue 18/04/17	Thu 20/04/17
60	***Completion of Feasibility Study***	0 days	Thu 20/04/17	Thu 20/04/17



5.1 Milestones

To ensure deadlines are met, minor and major project milestones are scheduled throughout the duration of feasibility study. The implementation of these procedures will help us maintain a high standard of work, productivity and ensure all deadlines are adhered to.

This procedure will include:-

- Weekly meetings with the division managers, for engineers to express any concerns to their respective managers with progress updates.
- Weekly managers meetings will be held, to ensure mangers can raise any concerns to the project and assistant mangers.
- The Project and assistant managers will then meet with the principal fortnightly, and allocate personnel within the project to ensure efficiency within the divisions.
- Each time a milestone is reached, a performance assessment will be conducted to ensure the project reaches its desired quality throughout.

6 Cost and Resource Schedule

For any project to be identified as successful, it must be delivered on time and within a given budget. As a well-established company, it is E8 Consultant Engineers' utmost priority to provide clients with the most effective and economical solutions. Table 2 outlines the detailed resource schedule and the breakdown of the project costing.

Table 2: Project Costing and Resource Schedule

Description	Employees	Rate ($/hr)	Hours*	Total Cost
Management				
Project Manager (SE)	1	$ 240.00	105	$ 25,200.00
Assistant Manager (SE)	1	$ 220.00	105	$ 23,100.00
Section Total				**$ 48,300.00**
Transport				
Transport Engineer (SE/M)	1	$ 200.00	105	$ 21,000.00
Transport Engineer (SE)	1	$ 180.00	105	$ 18,900.00
Transport Engineer	1	$ 160.00	105	$ 16,800.00
Transport Engineer (GE)	2	$ 120.00	105	$ 25,200.00
Section Total				**$ 81,900.00**
Urban Planning				
Urban Planner (SE/M)	1	$ 200.00	105	$ 21,000.00
Civil Engineer	1	$ 160.00	105	$ 16,800.00
Architect	1	$ 110.00	105	$ 11,550.00
Surveyor	1	$ 100.00	105	$ 10,500.00
Section Total				**$ 59,850.00**
Structural				
Structural Engineer (SE/M)	1	$ 200.00	105	$ 21,000.00
Structural Engineer (SE)	1	$ 180.00	105	$ 18,900.00
Structural Engineer	2	$ 160.00	105	$ 33,600.00
Civil Engineer	1	$ 160.00	105	$ 16,800.00
Structural Engineer (GE)	1	$ 120.00	105	$ 12,600.00
Section Total				**$ 102,900.00**
Water Resources and Services				
Water Resources Engineer (SE/M)	1	$ 200.00	105	$ 21,000.00
Water Resources Engineer	1	$ 160.00	105	$ 16,800.00
Civil Engineer	2	$ 160.00	105	$ 33,600.00
Urban planner	1	$ 160.00	105	$ 16,800.00
Section Total				**$ 88,200.00**
Environmental				
Environmental Engineer (SE/M)	1	$ 200.00	105	$ 21,000.00
Environmental Engineer	1	$ 160.00	105	$ 16,800.00
Environmental Engineer (GE)	2	$ 120.00	105	$ 25,200.00
Section Total				**$ 63,000.00**
Geotechnical				
Geotechnical Engineering (SE/M)	1	$ 200.00	105	$ 21,000.00
Geotechnical Engineering (SE)	1	$ 180.00	105	$ 18,900.00
Geotechnical Engineering	1	$ 160.00	105	$ 16,800.00
Structural Engineer	1	$ 160.00	105	$ 16,800.00
Geotechnical Engineer (GE)	2	$ 120.00	105	$ 25,200.00
Section Total				**$ 98,700.00**

Total Cost (Exc. GST)	**$ 542,850.00**
GST - 10%	**$ 54,285.00**
Total Cost (Inc. GST)	**$ 597,135.00**

NOTES:

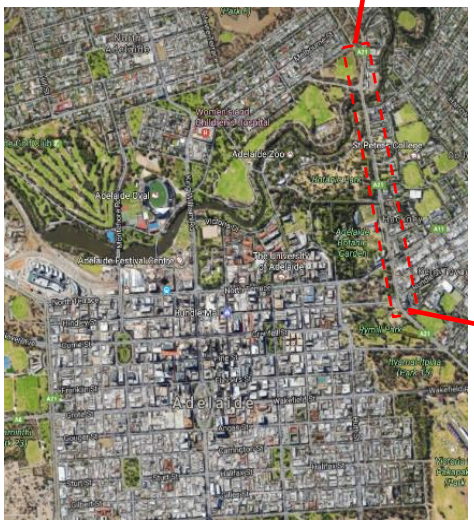
- Abbreviations
  - M = Manager
  - SE = Senior Engineer
  - GE = Graduate Engineer
- *Assuming the project runs for 7 weeks

7 Detailed Design Negotiation

On completion of the feasibility study E8 Consulting Engineers will liaise with the Principal to identify the projects primary components to be selected for the commencement of the detailed design. Once agreed upon E8 Consulting Engineers will formally provide an Offer and Quotation for undertaking the detailed design to the Principal. The detailed design brief will entail:-

- Full documentation of the primary elements.
- Production of Contract Documents for selected components.
- CAD drawings, Bills of quantities and Specifications of components.
- Projected expected duration of works.
- Public presentation of the project.

Appendix A – Site Location



Start of proposed O-Bahn extension

End of proposed O-Bahn extension

GOOGLE MAPS, 2016. *Map of Hackney road*. [online]. Google. Available from: https://www.google.com.au/maps/@-34.9146575,138.6155107,15.75z?hl=en [Accessed 8th March 2017].