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North Terrace Drainage Design

Tender

10-Mar-15



COVER LETTER**BUSINESS ADDRESS****MAWSON LAKES
BOULEVARD,
MAWSON LAKES,
SA 5095****CONTACT DETAILS****(08) 8302 6611****TONKIN CONSULTING
2/66 RUNDLE STREET
KENT TOWN, SA 5067**

Tender No. 001

Description of Works: Enhancement of Stormwater drainage systems of North Terrace, Kent Town

Due Date: 11 March, 2015

Dear Tim Kerby

Attached is our expression of interest for tender No. 001, the North Terrace Drainage Design.

Green Drainage Solutions offer to execute in conformity with the Conditions of Contract and associated tender documents, the following Works and Related Services, viz: North Terrace drainage design.

Furthermore, this tender is formulated in reference to the following provided documentation at this time:

- *Call for tender Document*
- *Stormwater Infrastructure Drainage Plan*
- *Metropolitan Adelaide Stormwater Management Study*
- *Stormwater Drainage Contract Document*
- *Survey of North Terrace*

Any revisions required at a later date will be subject to price review at that time.

THE TOTAL PRICE OF OUR TENDER IS: \$ 147,600

(IN WORDS: ONE HUNDRED AND FORTY SEVEN THOUSAND, AND SIX HUNDRED DOLLARS)



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We understand that your written Contract Agreement shall constitute the acceptance of our Tender and shall become a binding Contract between us, until a formal Contract is prepared and executed.

Thank you for giving us this opportunity. Should you have any questions related to this tender please do not hesitate to contact Green Drainage Solutions.

We look forward to hearing from you.

Yours Sincerely,



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COMPANY DECLARATION

We, the undersigned, hereby declare that our project tender entitled "NORTH TERRACE DRAINAGE DESIGN" submitted to Tonkin Consulting, complies fully with the specific requirements as provided by the City of Norwood Payneham & St Peters metropolitan council.

- The undersigned attest to their integrity, correctness and adherence to all the requirements under statutory declaration, including:
- The preservation of confidential information
- The respect of the rights and intellectual property submitted within a tender
- To comply in full with the Regulations and building codes as stated in the conditions of the contract
- To complete all works as described within the (4) weeks of tender approval date
- To provide the defects liability period of 12 months as from acceptance date, as disclosed under section (5)
- To provide reimbursement and insurance coverage for compensation of liable defects, section (1)
- To provide a bank guarantee of 10% of tender price to be supplied for the defects liability period.

This bid assumes that if it is granted, all parties will work together to develop a mutually agreeable construction schedule.

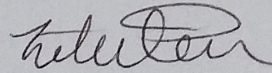


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Name

Signature

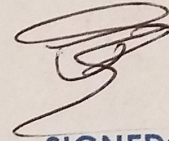
Lisa Hutchinson



DATE: 10/3/2015

SIGNED:

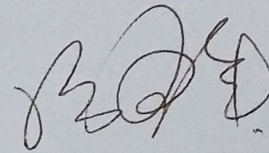
Michael Renko



DATE: 10/3/2015

SIGNED:

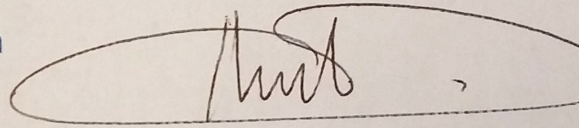
Mengliu Feng



DATE: 10/3/2015

SIGNED:

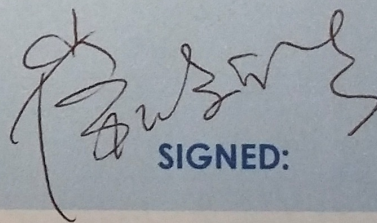
Mohammed Bokhamseen



DATE: 10/3/2015

SIGNED:

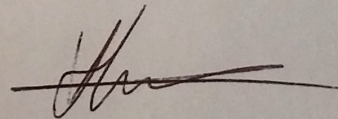
Minghao Cui



DATE: 10/3/2015

SIGNED:

VASILIOS HOIMES



DATE: 10/3/2015

SIGNED:



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1. BRIEF

As this is the first time the client has worked with the tenderer, Green Drainage Solutions (GDS) would like to take the opportunity to introduce the consultancy and highlight key goals and services that we offer. This statement will also describe some key personnel.

GREEN DRAINAGE SOLUTION'S VISION STATEMENT

At GDS our number one vision is to supply our clients with designs, feasibility studies or constructions, which provide efficient and environmentally friendly civil engineering concepts, at the highest quality.

We put large emphasis on client communication and honesty, which in the past has been greatly beneficial to resolve on site issues and keep the client consistently informed on project concepts and progress. This ensures both parties are on the same page and are greatly satisfied with the standard of work produced in the given time frame.

GDS also ensure that the solutions developed are those, which are not only the most beneficial for the client, but also environmentally friendly and promote sustainable practice.

COMPANY HISTORY

Established in 2009, GDS has been involved in many projects, not all based around water solutions, though this is our area of specialisation. For an extensive list of these projects please see Section 3.0.

Since 2009 we have also grown, employing more local professionals and developing more solutions for South Australia's metropolitan and rural regions.



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SERVICES WE OFFER

As mentioned, the company specialises in delivering the following types of projects, to the highest quality:

- Drainage design
- Incorporating water sensitive urban design treatments into the existing environment and implementing this technology into new establishments
- Waste water management
- Water supply to existing and new allotments

Though this is our area of specialty we also have expertise in the following:

- Road design
- Traffic modeling
- Structural projects

OUR OBJECTIVES AND GOALS

GDS employees recognise that each project is unique, though in each of these we strive to achieve the following:

- Safety – The safety of our employees and other personnel involved in our projects is paramount. We believe that safety focuses shouldn't be limited to construction work, and consistently build on safety standards in our office environment and during site visits. We also provide our staff with opportunities to develop skills and knowledge in WHS through training programs, which are nationally recognized.
- Quality – We aim to produce designs and construct products that are suitable now, but also for the future. Each design is reviewed and re-reviewed to ensure that the most appropriate solution is selected and then constructed from locally sourced materials.
- Client and Stakeholder Satisfaction – Having open and consistent communication with our client and stakeholders ensures that GDS and other involved teams are satisfied with the final product and both have a deep understanding of the principles used to develop this.



- Environmental Considerations – The products we use are environmentally friendly, as are our processes and procedures. GDS considers many aspects of the environment, from noise, air pollution and dust control, water quality, vibration and impact on the existing environment to name a few. These are considered from the feasibility stage through to the end of construction, to ensure we protect the environment we live in.
- Impact to Local Community and Community Consultation – GDS also appreciates that local community may have opinions and views on the best solutions and the way these can be constructed. We consult with the local community regularly to ensure that the impact on residents, traffic etc. are minimized.

Our solutions have also been quoted as being:

- Innovative – In understanding that each problem is unique, we believe that each solution should also be unique. We always aim to develop designs that serve their main purpose but also are aesthetically pleasing, modern and promote biodiversity.
- Cost Effective – Whilst incorporating the aspects described above we also provide competitive costing, whilst not compromising on quality.
- Efficient – Past clients have been impressed with the efficient use of time by our project team but also efficient use of materials.



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KEY PERSONNEL

As the name suggests, most of the projects we complete are drainage, stormwater, waste water or water systems related, though our project teams come from a wide range of backgrounds and have a wealth of knowledge and experience. This ensures that our focus isn't singly on the drainage or water issue, and that all other aspects are considered and designed for. Other elements such as urban design, traffic management, safety, water quality and environmental management are considered.

For more information on our team, please see Section 4.2.

FINANCIAL BACKING

As discussed, GDS has continued to grow since its establishment in 2009 and is financially supported by multiple stakeholders, many who have been involved with the company since its establishment.

As a result of this we can offer our clients financial stability. We achieve this by completing detailed cost estimates for each of our projects, focusing on labour and material costs and continuing to satisfy stakeholders with our quality work.



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2.SUMMARY OF PAST PROJECTS

Green Drainage Solutions is confident they can deliver quality output for the North Terrace drainage design. This confidence is backed by the extensive experience that our project team has acquired. Please see below for the list of past projects our team have been involved in:

- **AHMAD AL-JABER OIL & GAS EXHIBITION CENTRE, AHMADI, THE STATE OF KUWAIT (2013-2014):**
 - Established the earth works (excavation and back-fillings), foundations and sewer systems.
- **ADMINISTRATION, EDUCATIONAL AND STUDENTS SERVICES BUILDINGS (AESSB) COMPLEX FOR THE PUBLIC AUTHORITY FOR APPLIED EDUCATION AND TRAINING (PAAET) AT SHUWAIKH CAMPUS, KUWAIT CITY, THE STATE OF KUWAIT (2014-2015):**
 - High-rise building of 23 stories and 2 basement floors.
- **BRADKENFOUNDRY PTY LTD UPGRADE PROJECT (2014):**
 - Environmental impact assessment)
- **CITY WEST UNISA CAMPUS DESIGN (2012):**
 - As a team we marked out the area where the building was planned to be built. We then estimated the height of the building from the plans given. Using Australian Standards, we then placed the building in a cyclonic wind load range. This was based on the buildings location and whether it was closed in by buildings or exposed to large areas where wind can gain speed and power.
- **COLD-FORMED STRUCTURES DESIGN PROJECT (2013)**
- **DESIGN ON STORM AND SEWER DRAINAGE IN THE RESIDENTIAL AREA OF STRATHALBYN (2014):**
 - This design included mapping out each residential area then planning the layout and connection of pipes. Using Drains and a detailed contour map, we ensured that each pipe was at a correct depth, elevation and slope, to allow smooth uninterrupted flow of storm water and wastewater.
- **DUBAI METRO LIGHT RAIL PROJECT (FOOTBRIDGE STRUCTURAL MODELLING) (2013)**



- **EWB CHALLENGE (2012):**
 - Working in a team of undergraduate engineers to develop a simple, cost effective water treatment option to purify water in the An Minh district in Southern Vietnam. The study focused on the current water standards, design considerations unique to the location and available resources, types of water treatments, the Australian standard of drinking water and a final design concept, description and cost estimate.
- **MAADS (MOBILE ART ARCHITECTURE AND DESIGN STUDIO (2015):**
 - This was both design and hands on working using student's work that had been completed the previous year. This project began in 2011 and the first steps involved cad drawings. We had the opportunity to cover the whole spectrum of a project. In this respect we would design a concept, research the concept, complete a detailed design and continue to construct it and implement it into the MAADS container. This project also stressed the importance of journal writing and logging of all work done as once we had completed 2 weeks on the project, other students would be using our incomplete work.
- **MAIN NORTH RD AND MCLNTYRE RD (ROAD AND TRAFFIC MANAGEMENT) (2013)**
- **SEAFORD RETAINING WALL AND STABLE SLOP DESIGN (2014):**
 - This involved working in a team of undergraduate civil engineers to design a retaining wall and stable slope, given borelog information for the site. The team was required to perform calculations, and gain understanding, on interpreting borelog data, consolidation and settlement, bearing capacity gravity retaining walls, using GALENA software and slope design.
- **SHANGHAI EXPO BUS ROUTES ROAD AND TRAFFIC DESIGN (2009-2010)**
- **SHANGHAI HONGQIAO EXHIBITION CENTER ENVIRONMENTAL PLANNING AND ROAD DESIGN (2010-2013)**
- **SHANGHAI S26 EXPRESSWAY BRIDGE DESIGN (2012-2013)**



- **SOUTHERN EXPRESSWAY DUPLICATION PROJECT (2014):**
 - One team member completed 11 months of work on the Southern Expressway Duplication Project as an undergraduate engineer through the DPTI. Whilst on the project, experience was gained in ITS systems, drainage, structures, traffic management, environmental management and road surfacing design and application.
- **STRATEGIC BUS PRIORITY PROJECT (2014/2015):**
 - One team member also completed 3 months of work in the Planning and Design Section of the DPTI. This work consisted mainly of data analysis and road design.
- **WATER RESOURCES SYSTEM DESIGN PROJECT (2014):**
 - This project involved working in a team of undergraduate civil engineers to design a system that managed stormwater, sewage and water supply to a new residential allotment. Throughout the project the team performed hand calculations and verified these using the DRAINS software.
- **WHYALLA REGIONAL CANCER CENTRE DEVELOPMENT AND WHYALLA HOSPITAL (STRUCTURAL DESIGN) (2013):**
 - This involved analyzing dead loads, live loads and wind loads to design a wing for the Whyalla Hospital.



3. CAPABILITY STATEMENT

As discussed our team is capable of producing quality output which continues to satisfy our project clients and key stakeholders. Section 3.0 also highlights the dynamic experience the project team possesses. The team structure for completing the feasibility study is designed in a way to highlight individual team member's strengths and areas of interest.

Section 3 and 4 shows how this team is structured and provides a brief introduction to some of our key personnel, who would be heavily involved in the feasibility study.

ORGANISATIONAL STRUCTURE

The structure in Figure 1 highlights how management and the project team would be structure and which resources would be allocated to each sub-section.



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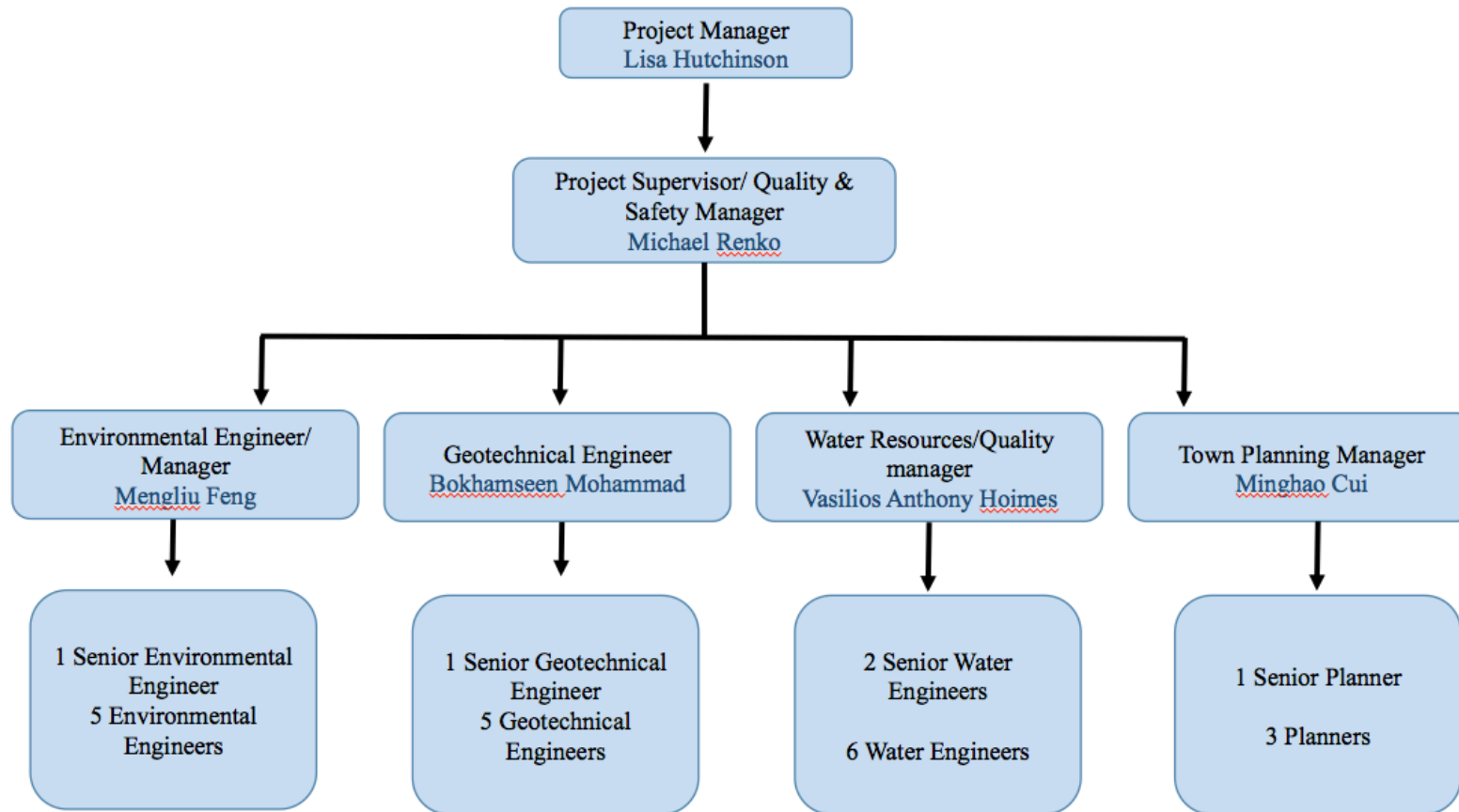


Figure 1 Organizational Structure of GDS Team for Feasibility Study

4. KEY PERSONNEL

GDS prides themselves on working with enthusiastic and innovative team leaders. The following profiles provide a short introduction to these leaders and describe what their key roles and responsibilities would be in the feasibility study.

LISA HUTCHINSON - PROJECT MANAGER

As the project manager and team leader Lisa Hutchinson is very enthusiastic about the work that she, and the company, continues to prepare. Lisa has confidence in her team and their efficiency and attention to detail when completing all aspects of their work, from tendering, to feasibility, detailed designs and construction. Lisa's teams see the project from start to finish, always delivering quality work to time and budget constraints.



Lisa achieves positive outcomes through consistent and positive communication with the team and good leadership skills. Project managers work with the team to overcome any issues, liaise with clients and project stakeholders and apply proficient problem solving skills.

MICHAEL RENKO-PROJECT SUPERVISOR/SAFETY AND QUALITY MANAGER

Michael Renko is the Project Safety Supervisor and Quality Assurance Manager at Green Drainage Solutions. Michael utilizes his engineering knowledge and skills specializing in the fields of Geotechnical Design, Structural Analysis, and Reinforced Concrete Design. Michael's experience and skills are an asset to the Company and he complements the design team in achieving successful outcomes in all areas of major project development.



MENGLIU FENG-ENVIRONMENTAL ENGINEER/MANAGER

Mengliu Feng is an experienced engineer in civil and environmental aspects. In GDS she is in charge of the environmental division. She has worked in a variety of infrastructure, development and environmental management projects and her experience covers the fields of water, wastewater, soils, noise, waste and energy.



With her leading, our Environment team has earned a reputation for excellence by offering integrated, practical and innovative solutions to all levels of government authorities and private organisations. As a senior environment engineer, she insists on maximising the application for human well being and minimising impact on the environment in every project. Feng assists GDS to provide services to optimise infrastructure and adapt to environmental changes in ways that balance the needs of human communities. She also enables clients to meet compliance, improve profitability and maintain their commitment to sustainability.

MOHAMMAD BOKHAMSEEN-GEOTECHNICAL ENGINEER/MANAGER

Mohammad has gained experience over the years related to almost every aspect of civil engineering to any project. However, he specializes specifically in the field of Geotechnical Engineering. Mohammad is skilled in all phases of engineering project. Consistently finishes projects under budget and ahead of schedule, embraces modern principles and practices of civil engineering, especially as they pertain to structural course work including steel design and concrete design; skilled in complex data interpretation and risk assessment.



VASILIOS HOIMES-WATER RESOURCES/WATER QUALITY MANAGER

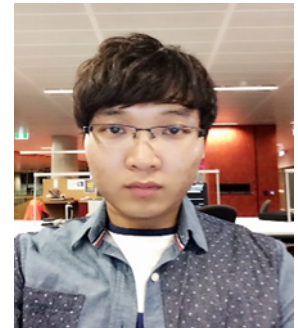
Vasili Hoimes Joined Green Drainage Solutions in early March 2015 as the Water Resources Engineer and Quality Manager. He uses his experience from geotechnical engineering, hydraulics and hydrology and sustainable engineering practices to solve problems. Vasili is passionate in what he does with fantastic interpersonal skills with out of the box thinking involving sustainable practices and environmental longevity. With his background in water resource management he is very well suited in being one of the senior water resources engineers. His attention to detail will be invaluable in respect to applying the highest quality of work for the client and the city of Adelaide.



His role encompasses overviews of drainage layout environmental impacts of works and quality management of the entire project.

MINGHAO CUI-TOWN PLANNING MANAGER

Minghao Cui is the town planning manager at Green Drainage Solutions. He is experienced with an extensive knowledge in planning. He leads the GDS team to investigate council regulations and heritage issues pertaining to the project. Minghao also undertakes public meetings to explore concerns and possible options to manage public traffic and plays a key role in ensuring the designs selected will complement the existing and future town infrastructure.



5.QUALITY ASSURANCE

Quality does not only begin with a letter Q; it must be followed by U. Green Drainage Solutions always positions our clients to be the first. GDS draw on the skills of their engineers, planners, scientists and auditors to deliver services which meet the quality expectations of customers and comply with ISO standards (AS/NZS9001, 9002, 9003). We are committed to providing high quality products with low cost and high efficiency. The Quality Assurance System assists us in being a dynamic, client-focused organisation which seeks to improve and gain achievements.

GDS ensures maximum use of resources to deliver professional, innovative, progressive and quality services to clients. We aim to achieve customer satisfaction by consistently meeting the needs and expectations.

To achieve these quality aims, we have set up a quality management system, which refers to:

- Defining the requirements of clients and projects relative ISO standards
- The selection and training of employees, and ensuring they are skilful and working together as a team; providing continuous professional training for employees;
- The selection of appropriate resources, and ensuring that resources effectively reached desired results for project;
- Monitoring, reviewing and updating the quality management of each project, as one project sets the foundation for the next;
- Building mutually beneficial relationships with customers and suppliers;
- Implementing and maintaining management systems according to AS/NZS ISO standards in relation to quality, construction, workplace health and safety, and environment.



Outcomes from the quality management system include providing:

- Exceptional service and reliability;
- Quality workmanship by committed and trained personnel;
- Value for money using suitable quality materials only;
- Satisfaction of our clients' requirements, industry regulators and staff
- Services in a professional and ethically responsible manner

Assurance of high quality will ensure the continued success of GDS and the satisfaction of clients, regulators and staff.



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6. COMPANY POLICIES

GDS continues to maintain the high standards, which it sets, and achieve goals. A large portion of this success is built around the company policies described below.

WORK HEALTH AND SAFETY (WH&S) POLICY

The personnel and management at GDS preserve a high level of safety within the operational environment. The overall principles of protection regarding the welfare and health of the staff members and visitors ensure they are workable and applicable to the different circumstances. We at GDS value safety of the members above all and hence are committed to our Work Health and Safety (WH&S) policy to create a workplace free of misfortunate events through careful planning, organization, and agreement.

GDS considers rational, theoretical, and practical measurements to enhance the operating environment. As much as we are committed to our safety policies, staff working in the field are expected to take responsibility to operate safely and take appropriate care of their safety, not jeopardize the safety of others and stay dedicated to the values of safety, integrity, and leadership in order to achieve the company's aim of a safe environment. At GDS we understand that the safety and wellbeing of the personnel are essential to the success of the company's operations, therefore WHS considerations are primary.

GDS is committed to the following:

- Form an informed and safe operating environment where Work Health and Safety (WH&S) Policy is followed by all personnel.
- Fulfilling all applicable health and safety laws, standards and guidelines.
- Executing risk and hazard management systems to improve the performance of the Work Health and Safety (WH&S) policy.
- Ensuring all administration members are aware of their responsibility, and are accountable for the health, safety and welfare of their teams and all other employees.
- Appropriate and periodical health and safety training to personnel to establish clear objectives to improve health and safety in the workplace.



- Maintaining constant communication to deliver relevant policies, procedures, systems, information, training, recognition programs, and organizational structures to support and communicate effective health and safety practices throughout projects.
- Actively responding and investigating all incidents, risks, hazards and injuries to reduce the risk of further injuries or if possible eliminate the risk if any arise.

ENVIRONMENTAL AND SUSTAINABLE POLICY

ENVIRONMENTAL

GDS is aware of the undesirable effect that can be caused as a result of construction projects. Yet, the implementation of environmental management strategy, program and system will reduce or avoid the environmental issues.

GDS recognizes the importance of delivering a consistent high-end quality solution service within an environmentally sound framework. To this end, the company has achieved an Environmental Management system, which meets the requirements of ISO 14001 and covers all of our activities. The management systems address all GDS activities across the following phases:



It is our policy to:-

- Minimize waste, emissions, and consumption of resources (materials, fuel, water and energy) and ensure that unavoidable waste is disposed of responsibly.
- Foster a sense of responsibility for the environment amongst personnel by providing information and training.
- Assess, monitor and where possible, reduce the impact of our activities on the local and general environment.
- Take into account the environmental impact of all raw materials, packaging and processes and wherever possible take steps to minimize this through strategic evaluation and planning.
- Maintain systems to set and monitor objectives and targets; identify deviations from the stated policy and implement appropriate corrective action.
- Advise customers and other parties where appropriate on the best environmental practices associated with the storage, use and disposal of the company's products.
- Ensure that all staff members and sub-contractors comply with this policy and our Environmental Management System.
- Strive to continually improve performance and prevent pollution.
- Comply with all relevant Environmental Legislation and other applicable legal requirements to which the company subscribes.



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SUSTAINABILITY

A significant amount of time and money has been devoted in developing principles by which we follow. Consequently, it is our company's promise to deliver ecofriendly services, incorporating quality exertion and feasible cost teamed with expertise from professionally trained personnel.

GDS is committed to developing a sustainable corporate, as well as a sustainable and resilient environment. We acknowledge that this necessitates intensive efforts in a world encountered by climate change, resource constraints, and political & social disturbance.

We identify the need to balance economic growth with social development and the protection of the environment. We seek to embed sustainability as an integral part of our culture, our skills and our deliverables by:

- Helping our clients, partners and stakeholders meet their sustainability commitments.
- Incorporating sustainability considerations into our services and project deliverables.
- Increasing our sustainability knowledge, skills and tools.
- Incorporating sustainability into our corporate values.
- Reducing the footprint of our operations, including our carbon emissions.

In responding to the broader sustainability and immediate climate change challenges, we encourage innovation, and support sound scientific and engineering research into enhanced energy, building, water and infrastructure solutions that meet community needs, now and into the future.



KEY STAKEHOLDERS

GDS prioritize the requirements and securities of all stakeholders and investors as a main focus. During all projects, any stakeholders involved will be assured assistance for the duration of all projects.

For this project the stakeholders include:

- The client (Tonkin Consulting)
- Council (Adelaide City Council and City of Norwood, Payneham and St. Peters)
- Government departments (Department of Transportation, Energy and Infrastructure)
- Private businesses
- Landlords and residents living close to the development area.
- Environmental Protection Agency (EPA)
- Utility services (ETSA, SA Water, Telstra, APA)
- Adelaide Metro (Traffic management)

Meetings will be held with the above, mentioned stakeholders, to discuss the company's policies. These policies include:

- Recognizing stakeholders concerns and providing key information to clarify their needs and identify any potential issues.
- Acknowledging and actively monitoring the concerns of legitimate stakeholders, and take their interests into account in decision-making and operations.
- Conducting regular workshops to highlight the elements for ethical management with stakeholders within the company and related parties to solve the problems linked with the project.

Communicating regularly with stakeholders and key interest groups to develop, deliver and review policies and programs.



7. COMPONENTS OF THE FEASIBILITY STUDY

PROPOSED APPROACH

The feasibility study will consider three different options to reduce the flooding that occurs on North Terrace during heavy rainfall events. The options to be analysed are described below.

REDIRECT WATER FLOW

This option would involve analysing the existing drainage conditions on the connecting roads and redirecting the water flow to the connecting road's drainage prior to the water running into the flooded area. Calculations regarding the expected water volume (incorporating ARI data), velocity of the water and flow rate would be calculated to determine what the required diameter of the connecting pipes would need to be for the existing system to be considered sufficient to carry the redirected flow, and compared to the actual diameter of the pipe. The length and slope of these pipes would also be analysed to understand whether the existing side road infrastructure could be modified at low cost and disruption to mitigate the flooding issues. The feasibility study for this option would also analyse ways in which the stormwater quality could be improved.

As can be shown this would involve the addition of new pipes to redirect this flow but may eliminate the flooding issues if the water is directed to a pipe network which could better cope with the water volumes. The way which this is redirected would need to be analysed further but may look similar to the concept shown below, where the orange dotted line represents a potential new pipe which moves the water to the King William Street drainage network.



WATER REDIRECTION



Figure 2 Proposed concept for Redirecting Water Flow



WSUD TREATMENTS

Option 2 would involve performing the same calculations as described above for the existing drainage infrastructure along North Terrace (not on side roads), to understand the extent of the flooding and on average, how many litres of water contribute to the issue. Water sensitive urban design (WSUD) treatments would then be investigated along North Terrace, and upstream of the flooded area, to understand whether incorporating a range of WSUD treatments would eliminate flooding.

It should be noted that this option would incorporate a combination of WSUD treatments, not just one treatment. Investigating this option in the feasibility study would also include considering the environmental benefits, water quality improvements and social benefits of this option.

An example below shows how grassed swale drains could be combined with the use of permeable pavements to reduce stormwater runoff, where the red lines represent permeable pavements and the green represents grass swale drains. Though treatments like these would depend on the pavement width and surrounding conditions (eg. residential or commercial etc.), this could promote a healthier environment and improve water quality before the water enters the culvert, promoting biodiversity and reducing pollutants.



WATER SENSITIVE URBAN DESIGN



Figure 3 Proposed Concept for Using WSUD Treatments



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REFURBISH EXISTING INFRASTRUCTURE

The same calculations would be completed for this option to understand the extent of the flooding and the location where the flooding occurs. Similar to option 1, the existing drainage infrastructure would then be analysed in terms of pipe diameter, slope and length. As part of the feasibility study, the consideration of upgrading the existing pipe network would be investigated. Special consideration would need to be given to the cost of the works, duration of works and impact on traffic as North Terrace is a high frequency corridor for both private vehicles and public transport and this solution would need to be implemented with minimal impact to local traffic and environment. As with option 1, the feasibility study for this option would also analyse ways in which the stormwater quality could be improved.



Figure 4 Proposed Concept for Refurbishing Existing Infrastructure

Again, calculations would need to be accurately performed to understand which parts of the network need upgrading or refurbishing but this may look similar to below, where the red lines represent existing pipes which may have had their slopes or lengths altered, and the green represents new pipes which have replaced the existing, or have been added to the network, and are constructed with a larger diameter to handle larger water volumes.



ENVIRONMENTAL CONSIDERATIONS

Referring to the Environmental Policy of GDS, we strive for sound environmental management to protect our employees, customers, community, stakeholders and the environment. We are committed to continual improvement, compliance with environmental regulations, conservation of natural resources and the prevention of pollution. GDS has a strong team with a broad range of skills and experience in planning, water, ecology, environmental, civil, geotechnical and related aspects to provide solutions to environmental problems with a high degree of technical accuracy and guarantee an eco-friendly project.

GDS will make every attempt to minimise the negative impacts on the existing environment in the project of North Terrace Drainage Systems in Kent Town. GDS uses Strategic Environment Assessment (SEA) as the integration of environment into decision-making processes in order to offer an early analysis of the relationships between policies, plans and programmes and the likely cumulative effects that may occur. After this, an environment impact assessment (EIA) will be produced to investigate and identify the influence that the project may have on physical, chemical characteristics, community, ecological relationships, economic and biological conditions. According to SEA and EIA, possible environment issues will be listed, and then options, which can be used to overcome the problems, will be identified. After analysis and comparison, the best option for the project will be selected to apply.

For the North Terrace Drainage System Project, GDS considers the following problems according to the brief, SEA and EIA scope and baseline study:

- Air pollution – Odor, particles, emissions, and fugitive dust will mainly be caused by transport and construction during the survey and construction stage. In these stages, vehicles and machines produce organic materials and greenhouse gas emissions.
- Noise and vibration pollution – Similarly, vehicles and construction work are the main sources of noise and vibration. It may have an impact on the residents nearby.



- Soil quality – The waste from construction and precipitations are all possible sources of pollution to soil.
- Water pollution – A Water project is always linked to potential water pollution problems. In this project, the change of drainage system could cause a water balance issue. Leakage from pipes could also emit heavy metals or other toxins, and materials used during construction may become a source of pollution.

In this project, GDS will conduct modelling of the key parameters in the atmosphere, the level of noise and vibration to form an emission management program which will control the toxic emissions and be used to minimise pollution. Waste storage management will also be conducted to limit the impact on soil and water quality. All the materials used in the drainage system will also comply with the relevant certifications and standards. Designs will be modified to ensure the final option is the one that has the least negative impact to the environment. If a project option is assessed and will have detrimental effects, then it will not be considered for construction.

URBAN PLANNING AND HERITAGE CONSIDERATIONS

Green Drainage Solutions understands that designing and implementing new drainage systems in an area of high population, with the expectation of growth, produces many urban planning issues. As a company we strive to develop a drainage system that is ecological, socially and environmentally sustainable. GDS has Engineers that have expertise in Environmental, Hydrology, Geotechnical and Civil skills that are used to incorporate WSUD treatments whilst also retaining ecological development and historical features. Green Drainage Solutions is working for the future, to ensure projects completed now are long lasting. This practice has been found to assist the company in providing a sustainable environment.

Green Drainage Solutions has the resources needed to preserve the heritage and the historical features which surround the project location (for example the culvert arch bridge which is over 150 years old). This bridge currently has a stormwater pipe running through it, but GDS is confident that we will be able to repair/replace this storm drain whilst maintaining the historical and heritage value of the bridge. Through urban planning, and following the South Australian guidelines for heritage and historical features, we at Green Drainage Solutions plan to not only incorporate the culvert arch but accentuate its presence in the Adelaide CBD.



RISK MANAGEMENT

Risk is defined as the chance of injury, damage or loss. Risks can include any equipment or process which has the potential to cause injury or damage to employees or the surrounding environment. Some of these include an injury or illness, a hazardous occurrence in the work place, extreme weather, etc.

It is our obligation to minimise the risk in GDS. In our project, targets of cost, time and quality will be likely to be subject to risk and uncertainty. Project managers will undertake or propose actions which eliminate the risks prior to it occurring. Our management leaders also reduce the effect of risk or uncertainty, and make provisions for those risks, in the case in which they do occur.

It is important to recognize the root causes of uncertainties because risks can be avoided if root causes are identified and managed before the consequence. Risk management provides support for GDS to gain better control over the North Terrace Drainage design project when it comes to time (planning), estimates, quality, information and organizations.

CONSTRUCTION RISKS

Construction projects have an abundance of risks; but our engineers are able to improve the effective management of these.

Typical risks on a construction project include:

- Failure to complete within the stipulated design and construction time.
- Failure to obtain the expected outline planning, detailed planning or regulation approvals within the time allowed in the design program.
- Unforeseen, adverse ground conditions delaying the project.
- Exceptionally inclement weather delaying the project.
- Strike by the labour force.
- Unexpected price rises for labour and materials.
- An accident to an operative on site causing physical injury.



COST OF RISKS

The cost of risks could have a significant impact on the total cost of project completion.

The following cost must be accounted for:

- Direct cost of loss: repairs or replacement of damaged goods or property, third party compensation.
- Measurable consequential costs of loss: replacement of staff
- Indirect costs of loss: inability to meet contracts, recruitment problems.

EXTERNAL RISKS

There are also external risks which may exist, and include:

- The cultural, political, legal, regulatory, financial, technological, economic, natural and competitive environment, whether international, national, regional or local.
- GFC
- Loss of reputation
- Technology changes
- Competitors
- Legislation and government policies
- Conflict/war; natural disasters



RISK MANAGEMENT STEPS:

Probability, frequency, impact, importance, and exposure are the necessary factors in analyzing the steps in risk management.

- ❖ Risk identification
 - Risk identification requires considerable up-front planning and research in order to be effective. Project managers need to determine the analysis techniques to use. This involves selecting the primary participant who is to perform the risk identification and allowing participants time to evaluate the risk. The Project Manager then completes a review of project plans, calculated statistics and metrics, and peruse technical documents.
- ❖ Risk analysis
 - Project managers convert data collected during the risk identification step into useful information for the client. Two categories of risk analysis are quantitative and qualitative and both are important for consideration. The use of risk management is to identify, access and manage those events with both high impact and high probability of occurrence.
- ❖ Risk response
 - The response to the risk will be appraised by the severity of the risk to the project. There are four risk mitigation strategies that can be adopted by the team in order to reduce the risk exposure associated with a project
 - Avoidance: if the situation is assessed whereby the risk is judged to have a serious consequence, then the situation may warrant a reappraise of the concept or to cancel the project.
 - Reduction: reducing the risks may involve redesigning the project, changing the procurement strategy or incorporating different methods of construction to avoid unproven construction techniques.
 - Transfer: if risks can be transferred, their consequences can be shared or totally carried out by someone other than the client.
 - Retention: risks that are retained by either party may be controllable or uncontrollable by the party. Where control is possible it may be exerted to reduce the likelihood of occurrence of a risk event.
- ❖ Risk control
 - Project managers identify the measures or controls to establish, to lessen or avoid the impact of a risk on a process or component.



QUALITY

GDS promises to maintain the very highest levels of professional engineering standards in meeting with client expectations. GDS has also set the standard in achieving excellent engineering solutions while maintaining guaranteed economically feasible outcomes.

TRAFFIC MANAGEMENT

GDS acknowledges that traffic management around the construction region of North Terrace is of major importance and must be taken into consideration to keep the pedestrians, vehicles and workers safe whilst sustaining uninterrupted traffic flow.

Vehicles, including powered mobile units, in workplaces are constantly arriving and leaving and loading and unloading at the construction site. This could cause injuries and fatalities and poses a potential risk of harming pedestrians and workers.

DTEI's minimum traffic requirements are for two lanes to remain open to traffic. During peak hour flow both lanes will be one way in the direction of peak hour flow, which is during the morning in Adelaide inbound and evening Adelaide outbound. The maximum width for sustainable trafficable road conditions is 9.6 metres, with one lane required in each direction.

GDS has implemented a traffic management plan with the aim to isolate the road construction site and minimise the interference of the existing traffic conditions, as required by DTEI minimum traffic requirements. GDS will reroute existing traffic and pedestrian walkways around the construction regions. This traffic reroute will cycle from morning to evening i.e. two lanes on one-way traffic including bus services in direction of major traffic towards the city during peak hours in the morning.

Public transport is to be redirected away from bus stop 2 located on North Terrace, in the middle of the construction region.

GDS will organise the placement of warning signs in strategic positions along North Terrace, Dequetteville Terrace, Hackney Rd, Magill Rd, Trinity St, Payneham Rd, and other surrounding roads intersecting the construction region. Management of traffic during construction hours will be organised with the hired construction company.

Company experience has also been attained from multiple previous road traffic related projects, all of which have been successfully completed and praised by the community and clients alike.



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SAFETY MANAGEMENT

GDS respects that precedence for safety is a must when dealing with the management of any type of construction work. We have made an assessment of the potential hazards in the environment and will take all the necessary precautions to mitigate against accidents. For instance, the construction region in between the Royal Hotel and College Road on North Terrace, has tall stobie poles and overhanging live wires which will be wrapped in isolation prior to works. Warning signs will also be posted and drivers will be briefed regarding the potential dangers prior to the use of any machinery on site.

GDS will organize the installation of pedestrian barriers and temporary fencing around stobie poles closer to critical construction regions to improve the safety for workers and public property. Furthermore limiting the height of construction machinery below stobie pole cabling height, will avoid the stobie poles from interrupting the construction on North Terrace.

The priority of maximising safety is taken seriously at GDS, and therefore we will implement plans to install pedestrian warning signage along North Terrace. The work site boundaries will be patrolled and all pedestrians and unauthorized persons will be restricted entry to the construction site.



8. LIMITATIONS AND ASSUMPTIONS

Though GDS are enthusiastic at providing the best possible feasibility study for the project, the client must understand that some assumptions will be made and limitations may exist. These include

- ❖ Data limitations – The project team will require data about flow regimes and pipe geometry. Certain variables may have altered since this data was last recorded, but the team would be required to assume that the most current data supplied, accurately represents the conditions in the field.
- ❖ Pipe quality – To analyse the existing drainage situation and propose solutions, the team will be required to perform calculations, and the results of some of these will depend on the quality of the existing pipe interior. The team will strive to understand the quality of these pipes (ie. whether corrosion has occurred, when they were last replaced, what maintenance is performed etc.) though this may be difficult to estimate with limited information.
- ❖ Flow rates – Flow rates, volumes, velocities and the amount of turbulence is likely to be estimated using a combination of computer modelling and hand calculations. This may not replicate the exact situation.
- ❖ Soil profile – The project team would require borelog data, though as soil profiles can vary rapidly over a short distance, this may not be an accurate representation of the material type on site.
- ❖ Cost estimates – Part of the feasibility would include costing the design options to assist in indicating which is most feasible. Though the project team would strive to provide an accurate pricing schedule, some of these costs may vary.



9. COST ESTIMATE

The table below provides a rough estimation that the project could cost.

Table 1 Cost Estimation

Employee	Quantity	Hours Per Week	Cost Per Hour	Weeks	Cost
Project Manager	1	15	\$240	4	14400
Project Supervisor/ Quality & Safety Manager	1	15	\$240	4	14400
Environmental Engineer/ Manger	1	15	\$240	4	14400
Geotechnical Engineer/ manager	1	15	\$240	3	10800
Water Resources/ Quality manager	1	15	\$240	4	14400
Town Planning Manager	1	15	\$240	3	10800
Senior Environmental Engineer	1	15	\$220	3	9900
Environmental Engineers	5	15	\$120	4	7200
Senior Geotechnical Engineer	1	15	\$220	2	6600
Geotechnical Engineers	5	15	\$120	4	7200
Senior Water Engineers	2	15	\$220	4	13200
Water Engineers	6	15	\$120	4	7200
Senior Planner	1	15	\$220	3	9900
Graduate Planner	3	15	\$120	4	7200
TOTAL					\$147600



10. TIME AND RESOURCES SCHEDULE

GDS recognises that the key to success in any major project is efficient management of time and people. The company often uses GANTT charts to assist the client in understanding the amount of time that has been allocated to each individual task and the project groups involved in each of these tasks.

Figure 5 shows a Gantt chart prepared for the feasibility study. On this chart the time allocated to each task is shown, as well as the people involved in these. The resource codes represent the following:

- ❖ PM – Project Manager
- ❖ PS – Project Supervisor
- ❖ EM – Environmental Engineer/Manager
- ❖ GM – Geotechnical Engineer/Manager
- ❖ WR/WQM – Water Resources/Water Quality Manager
- ❖ TPM – Town Planning Manager

The Gantt chart also highlights major milestones (red) and deliverables (green), with diamond shaped spots. The deliverables are usually presented or produced on the same day as the milestone. For this project milestones include:

- ❖ Meeting with the client to discuss and agree on which options will be considered as part of the feasibility study. The deliverable to reflect this is a preliminary report prepared for the client.
- ❖ Meeting with the to discuss the findings of the review of the 3 options. A presentation will then be given to the client and stakeholders to review and discuss this as a deliverable.
- ❖ Using high level modelling and outcomes from the feasibility report to choose which option would be designed as part of the detailed design project. This will also be presented to the stakeholders and clients.
- ❖ The final milestone and deliverable is the completed feasibility report.



GANTT CHART

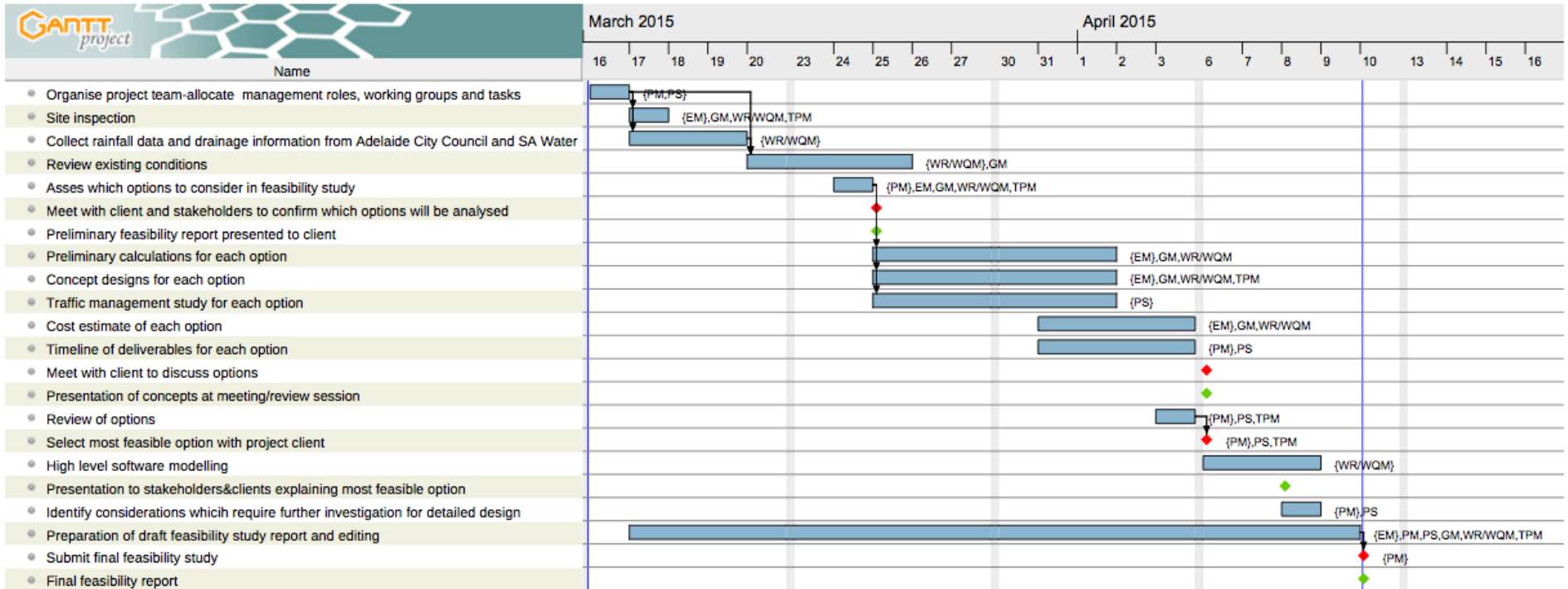


Figure 5 Gant Chart



11.CONDITIONS OF CONTRACT

All work planning to be carried out in accordance with the Australia Standards General Conditions of Contract AS 2124

Green Drainage Solutions will request a layered plan from the client showing all existing works and services.

1-year to 20 ARI data will be required for Design Calculations and the design of the Stormwater System.

A detailed Traffic Report will be required to determine safe and timely traffic management strategy for design and construction.

The Permission from The City of Norwood Payneham & St Peters is required for the new Stormwater management systems.

The Permission and guidance from the South Australian Historical Association to inspect, repair or develop further the stormwater pipe that runs through the arch culvert over first creek.

A Soil profile and Bore log data for the past 10 years to be provided to the relevant engineers inside of Green Drainage Solutions.



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12.NEXT STEPS

If GDS are successful and win the tender, the next steps will involve completing the feasibility study and detailed design for construction.

The feasibility study will be used to investigate the elements discussed in this report and then will become an analysis tool to determine the best of the three options considered.

The best option will then be taken to the final design stage. This will consist of developing detailed design drawings, performing in depth calculations and producing detailed traffic management plans, environmental management plans and timing and cost schedules to ensure the successful construction of the final design.



13.APPENDIX A

Appendix A provides resumes for the key personnel introduced in Section 4.2.



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LISA HUTCHINSON

PROFILE

I am currently studying my final year of civil engineering at the University of South Australia. I have had the opportunity to gain both on site construction and in office design experience throughout my studies through the Sylvia Birdseye Undergraduate Scholarship granted by the Department of Planning, Transport and Infrastructure.

EDUCATION

Australian Science and Mathematics School Adelaide, Australia 2010

Year 11 and 12

Flinders University

Adelaide, Australia 2012

Bachelor of Engineering (Civil) – Year 1 and 2

University of South Australia

Adelaide, Australia 2014

Bachelor of Engineering (Civil) – Year 3 and 4

Employment History

Woolworths Beer Wine and Spirits (BWS)

Adelaide, Australia

Sales Assistant

2011-July 2014

Customer assistance

Developed leadership and teamwork skills

Southern Expressway Duplication Project-DPTI

Adelaide, Australia

Undergraduate Civil Engineer

December 2013-November 2014

- Site experience in ITS, earthworks, drainage and structures.
- Office duties
- Liaising with suppliers
- Communicating with local residents
- Quality audits

Planning and Design-DPTI

Adelaide, Australia

Undergraduate Civil Engineer

December 2014-Current

- Strategic Bus Priority Planning Project
- Data analysis
- Road design



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RELEVANT SKILLS

- Proficient in Microsoft Office Suite
- Knowledge of Citilabs Cube transport modeling software
- Studied 12D model software
- Punctual
- Reliable

ACHIEVEMENTS

Offer to Golden Key Society-Flinders University

2013

Based on academic merit

Placed on Chancellors Letters of Commendation List-University of South Australia

2013

Achievement received due to obtaining results that were in the top 5% of my division

Granted the Sylvia Birdseye Undergraduate Scholarship for Women in Engineering-DPTI

2013

Awarded scholarship based on academic merit, resume and application letter

Statement of Attainment: Work Safely in The Construction Industry-Civil Train

2013

Completed white card training course which covered basic site induction

Student Award for University of South Australia – Institute of Transport Engineers Australia and New Zealand

2014

Achievement based on study completed during Transport Modeling university course

Statement of Attainment: Control Traffic with Stop/Slow Bat and Implement Traffic Management Plans-Civil Train

2014

Completed work zone traffic management course which covered site traffic regulations

2 Offers to Golden Key Society-Flinders University and University of South Australia

2014

Based on academic merit



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MICHAEL RENKO

PROFILE

Motivated Civil Engineer and Civil Drafting Design Engineer who embraces modern principles and practices of Civil Engineering.

EDUCATION

TAFE SA-Panorama Campus

Adelaide, Australia 2012

Diploma of Engineering Drafting Civil Design-Awarded 2012

UNISA-Mawson Lakes Campus

Adelaide, Australia 2015

Bachelor Degree in Civil and Structural Engineering

EMPLOYMENT HISTORY

Foodland Supermarkets

Adelaide, Australia

Part time retail

2009

Dairy

Frozen

Fruit and vegetables

Teamwork and punctuality

RELEVANT SKILLS

- AutoCAD 2012 & Inventor Professional 2012
- Experienced with Microsoft Office Package suite of programs & computer hardware
- Good problem solving skills & critical thinking
- Works well with members of a team
- Eager to learn new engineering concepts and to stay abreast with the latest developments in the Engineering field.

ACHIEVEMENTS

Civil Engineering Graduates' Society Prize

2013

Achieved a CEGS prize for students who achieve a GPA of 6.0 or higher



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MENGLIU FENG

PROFILE

Civil and Environmental Engineering student

Phone: 0450 098 522

Email: fenmy005@mymail.unisa.edu.au

EDUCATION

Gezhi High School Shanghai, China 2002-2005

High school student

Tongji University Shanghai, China 2005-2009

Bachelor of Engineering (Structural)

University of South Australia Adelaide, Australia 2013-present

Bachelor of Engineering (Civil and Environmental)

EMPLOYMENT HISTORY

Shanghai Construction Group Shanghai, China

Technician (field work) March-May 2008

Collecting and sorting files
Planning projects
Drafting

Shanghai Municipal Planning Design Research Institute Shanghai, China

Technician (field work) July 2009-February 2013

Road and bridge design
Transportation planning

Shanghai Urban Construction and Communications Commission

Shanghai, China

Facilitator and Coordinator (Seconded from SHMPI) October 2011-May 2012

Inspecting and promoting construction works
Coordinating between departments
Organising meetings
Bridge design counselor



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RELEVANT SKILLS

- Confident and competent in specialised areas.
- Sound knowledge of Australia standard.
- Sound knowledge of work-related software i.e. Microsoft Office, AutoCAD, MUSIC, DRAINS, HEC-RAS, 12D, Strand7, Calena, CIRCLY, SLOG
- Multilingual – able to communicate in both English and Chinese (Mandarin, Shanghainese, Cantonese).



MOHAMMAD BOKHAMSEEN

PROFILE

Role: Senior Geotechnical Engineer
Email: BOKMY001@mymail.unisa.edu.au
Mobile: 0420513269

EDUCATION

University of South Australia **Adelaide, Australia 2015**

Final year Civil Engineering Student

South Australian Institute for Business and Technology (SABIT)
Adelaide, Australia 2011-2012

Diploma of Engineering

EMPLOYMENT HISTORY

Real Estate Construction and Fabrication Co, (RECAFCO), Kuwait City, State of Kuwait

Junior Site Engineer 2014-2015
Ensuring accurate implementation of designs

AL-Kharafi National Engineering and Procurement & Construction, Kuwait City, State of Kuwait

Intern civil engineer for Ahmad AL-Jaber Oil & Gas Exhibition Centre Project 2013-2014

RELEVANT SKILLS

- Detail-Oriented
- Good English and Arabic language skills
- Excellent in organizing and implementation of projects
- Maintaining computer hardware and printers
- Prioritize Accurately

ACHIEVEMENTS

- Member of Kuwait Society of Engineers (2012-Present)
- Student member Engineers Australia (2012-Present)



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VASILIOS HOIMES

PROFILE

Carlton Parade, Torrensville
Phone : 0401031816
Email: hoiva001@mymail.unisa.edu.au

EDUCATION

Unley High School **Adelaide, Australia 2009**

High school graduate

University of South Australia **Adelaide, Australia 2009-present**

Bachelor of Civil Engineering (Honours)

EMPLOYMENT HISTORY

All State Pest Control **Plympton, Adelaide**

Assistant pest control 2010-2012

Visiting client's homes to inspect for termites
Spraying for termites under floor boards
Using heavy machinery to bore holes for termite traps and long term treatments
Visit homes to check existing traps and ensure the spraying had been effective
This job has developed my communication skills and overall professionalism, you need to enter someone's home to complete a job with respect and diligence.

Dan Murphy's Liquor Merchants **Norwood, Adelaide**

Team member 2013-present

My main role is to help customers in anyway necessary, this involves advice, physical help e.g. (carrying cartons of beer/wine) and cashier work.
Secondary roles are to work stock from the warehouse out onto the shelves
This job has developed my communication allows me to relate to people from all works of life and work in a team based environment under management and among peers.

RELEVANT SKILLS

- Storm water and sewer design
- Computer design by means of Drains, Solidworks and Geoinformatics (GIS)



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- Rock and soil mechanics
- Hydraulics and hydrology
- Engineering design and innovation
- Water quality fundamentals
- Sustainable engineering practice

ACHIEVEMENTS

Involvement in the design of UNISA City West Campus 2013

Design on storm and sewer drainage in the residential area of Strathalbyn
2014

Involvement in the design and construction of MAADS (Mobile Art Architecture and Design Studio) 2015



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MINGHAO CUI

PROFILE

- Date of Birth: 23/12/1992
- Place of Birth: Shenyang, China
- Nationality: Chinese
- Marital Status: Single
- Email: sam8868@hotmail.com

EDUCATION

Bradford College

Adelaide, Australia 2010

Graduated in 2010

University of South Australia

Adelaide, Australia 2011

Foundation studies, graduated in 2011

School of Saibit

Adelaide, Australia 2011

Graduated in 2013

University of South Australia

Adelaide, Australia 2015

Bachelor of Civil Engineering, date of graduation: December, 2015

Employment History

Jin Guang Yuan Municipal Corporation

Shen Yang, China

Summer Intern

Construction management

Beam column and slab reinforcement checks

Calculation checks

Vegetation management



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RELEVANT SKILLS

- General: Microsoft Word, Microsoft Excel and Visio Technical.
- Engineering design softwares: Solid Works, Strand 7, Space Gass.
- Fluent in both Chinese and English.

Mature, dynamic and honest. Work well with a multi-cultural and diverse work force. Work well with others or independently. Willing to learn and progress. Have positive work attitude and be willing and able to work diligently without supervision.



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