Table of Contents

9 July 2012

Mangrove Mountain Agricultural School
C/- Ghazi Al Ali Architect
Suite 40, 28 Maddox Street
Alexandria NSW 2015

Dear Sir,

Re: Proposal – Wastewater Treatment Plant – Mangrove Mountain Agricultural School

Thank you for allowing Standard Industries the opportunity of being able to submit our design of the waste water treatment plant for the above project. We have system based on the information and requirements as specified in the Douglas Partners Effluent Disposal Assessment and the supporting information as supplied. The proposed design and specifications included will meet and exceed the effluent requirements.

We have reviewed all the information provided and the design has posed a number of challenges though the design chosen will to ensure that all aspects of the STP have been covered. We have also looked at the power and chemical consumption of a treatment plant during its operation to ensure that the design is economical to operate and has a lower chemical usage requirement than some other designs.

Daily Flow Rate of Treatment Plant

Based on the information provided, Standard Industries proposes the design of a 13,275kL per day waste water treatment plant capable of producing Class B effluent in accordance with Australian Standards and NSW DWE (2008) -Interim Guidelines for the Management of Private Recycled Water Schemes Guidelines.

This treatment plant has been designed to meet the requirements of the Mangrove Mountain Agricultural School development though some components have been sized to ensure that there is an extended period of storage capacity in both the up-front EQ tank and the final effluent storage.

a. 45kL Equalisation / Balance Tank – It is proposed by Standard Industries that a minimum of '3 days total flow' is catered for in the up-front equalisation tank. This is to allow for the comfortable rectification of faults should they appear.

b. 45kL Treated Effluent Tank – A similar principle has been applied to the sizing of the treated effluent tank. We are assuming that the existing dams/settling ponds will be used to store the treated effluent prior to being pumped to the effluent disposal areas.

It is understood that the proposed method of disposal is to the designated land application zones.

Following is a detailed functional description of the treatment plant and should you have any questions please don't hesitate to contact us.

1.0 Technical / Specification Notes

This section outlines some important topics relating to the specification prepared by Douglas Partners for the sewerage treatment plant for the Mangrove Mountain Agricultural School along with other topics that Standard Industries feel are technically important and need to be clearly raised for review.

1.1 Compliance to Specification

Standard Industries confirm that the proposed design for the sewerage treatment plant covered in this proposal has been prepared in accordance with Specification prepared by Douglas Partners.

However, the core requirement of the sewerage treatment plant is to design, construct and maintain a treatment plant capable of handling daily flows with an expected maximum of 13,275kL/day producing Class b effluent.

Standard Industries confirms the proposed design meets the stipulated requirements.

1.2 Meeting of Standards

Standard Industries confirm that the proposed design for the treatment plant meets the following standards:

- AS/NZS 1547 - On-site Domestic-Wastewater Management
- Policy No D6.41 - Water Supply Catchment Area Development Policy
- NSW DWE (2008) - Interim Guidelines for the Management of Private Recycled Water Schemes
- AS 2417 - Pumps – The International Acceptance Tests for Pumps
- AS/NZS3000 - Electrical Installations
- AS/NZS 3500.0 - National Plumbing and Drainage Code: Glossary of Terms
- AS/NZS 3500.2 - National Plumbing and Drainage Code: Sanitary Plumbing and Drainage – Acceptable Solutions
- AS 1158 - Public Lighting
- AS 1680 - Interior Lighting
- BCA - Building Code of Australia
- Australian Guidelines for Water Recycling: Managing Health and Environmental Risks
- Protection of the Environment Act 1997
- Occupational Health and Safety Act 2000
- Public Health Act 2000

1.3 Approvals

Standard Industries has been involved in the preparation of many applications for sewerage treatment plants across Australia and in particular NSW.

Standard Industries wishes to offer our services and experience, to Mangrove Mountain Agricultural School with the preparation of the application to the Department of Environment and Resource Management if required.

1.4 Influent Parameters

Section 5, Table 2 of the specification outlines the general characteristics for raw sewerage:

Table 2

Parameter	ID	Value
Suspended Solids	mg/L	200-300
Biochemical Oxygen Demand	mg/L	200-300
Chemical Oxygen Demand	mg/l	500-600
Faecal Coli forms	Cfu/100ml	10^3 - 10^3

All of these parameters are as per Australian Standards parameters for domestic grade sewerage influent.

Standard Industries confirms that the proposed treatment plant offered through this Design will handle and treat the sewerage parameters as considered to be general by the specification and that the treatment plant will still produce treated effluent to the quality required and expected of the treatment plant.

1.5 Effluent Parameters

Table 3 outlines the Effluent Quality for the sewage treatment plant.

Table 3

Parameter	ID	Value
Suspended Solids	mg/L	<30
pH		6.5-8.5
Biochemical Oxygen Demand	mg/L	<20
E. coli	CFU/100ml	<10
Phosphorus	mg/L	<20
Nitrogen	mg/L	<25
Turbidity	NTU	<6
Chlorine	Mg/l	0.2-2.0

Standard Industries confirm that the proposed treatment plant has been designed to meet these parameters.

1.6 Equalisation / Balance Tank

As stated earlier in this document, the treatment plant designed by Standard industries includes a single 45kL poly tank for the storage of the untreated effluent that is transferred from the Pump stations.

This equalisation / Balance tank has been sized at 45kL to ultimately provide at least three (3) days of buffer capacity storage in the event of a failure with the treatment plant that requires rectification. This will ensure that there will be a zero impact on the quality of the Central Coast Water Supply in accordance with Councils Policy No D6.41 - Water Supply Catchment Area Development Policy.

1.7 Treated Effluent Tank

Again, as stated earlier in this document, a single 45kL treated effluent storage tank with chlorination used as additional final treatment has been chosen to ensure that should there be a fault with one of the effluent pumps or a problem with the effluent disposal are there will be at least 3 days storage of effluent to ensure zero impact on the Central Coast water supply from an overflow of treated effluent. The treated effluent will then be pumped to the effluent disposal areas on site as per the Douglas Partners Onsite Wastewater Management Report.

2.0 Operational Notes

This section outlines some important operational topics required for the Mangrove Mountain Agricultural School along with other topics that Standard Industries feel are operationally important.

2.1 Buffering Capacity Throughout Treatment Plant

A treatment plant designed for a maximum daily flow rate of 13,275kL should always be designed in such a way that it has an additional contingency buffering capacity at critical locations throughout the treatment process.

As each treatment plant is designed to differing technical requirements, each treatment plant should have individual contingencies developed for it.

For this project Standard Industries has allowed contingency of between 20-300% in the following areas:

- Equalisation Tanks - 300%
- Anoxic Tanks - 20%
- Aeration Tanks - 25%
- Settling Tanks - 25%
- Treated Effluent Tanks - 300%

2.2 Duty Standby Methodology

Standard Industries believes that a treatment plant is an asset. Hence our designs are prepared in such a way as to ensure maximum longevity of all the critical areas of the treatment plant whilst also ensure continuous treatment to the level expected from the treatment plant and design objectives.

With that said, Standard Industries try and find the balance between being over indulgent with standby options to try and find the cost effective balance and value for money.

As can be seen from the technical drawings accompanying this Design, there are a number of areas whereby a duty/standby configuration has been selected.

As will be discussed later in this document, Standard Industries uses the NSCA (National Safety Council of Australia) scorecard system for measuring Critical Control Points (CCP) and control points that require standby options.

2.3 Use of Leading Brands

Standard Industries treat the design of waste water treatment plant as being extremely serious. Standard Industries design treatment plants as if they are for Standard Industries; we treat them as an asset, not just a project.

To assist with achieving this objective is the use of leading brands across the critical areas of the treatment plant.

An overview of some of the brands proposed for use with the treatment plant is provided later in this proposal, but this section covers a snapshot of the brands to be used, by category:

Pumps	-	Davey
Blowers	-	Gardner Denver
Valves	-	Burkert, Challenger
Poly Tanks	-	Action Tanks
Instrumentation	-	Techsys

Whilst it is commonly understood that leading brands may not be as cost-effective as other lower cost brands manufactured in countries such as China (from a capital cost viewpoint) the greater level of quality will result in greater longevity resulting in reduced ongoing operating/ownership costs for the treatment plant.

2.4 Importance of Maintenance

A strong design coupled with high quality assembly and commissioning is only the first stage of a successfully operating treatment plant.

The ongoing maintenance of a treatment plant is just as critical especially when there is an internal reuse requirement for the effluent. The heightened health risks need to be front of mind and carefully considered.

Standard Industries would suggest that the Mangrove Mountain Agricultural School develop and agree on a daily, weekly and monthly maintenance tasklist that can be undertaken by suitably trained on-site staff at Mangrove Mountain Agricultural School.

2.5 Plant Performance Guarantees

A requirement of the system should be that the following design life has been adopted. Table 13 of the specification calls for the following Design Service Life's:

Component	Service Life
Civil and Structural Works	50 years
Mechanical and Electrical Equipment	25 years
PLC and Operator Interface	15 years

3.0 Equipment Selection Notes

3.1 Control System

Standard Industries propose Techsys for the development, supply, installation and commissioning of control systems to the level required by this treatment plant.

Techsys are well recognised in Australia as a leading manufacturer and programmer of control system for treatment plants.

3.2 Pumps

Standard Industries propose the use of the following high quality brand:

DEPEND ON DAVEY

Davey are Standard Industries primary choice as a pump manufacturer due to their sound reputation value for money and quality of product.

However, Standard Industries are conscious of selecting a pump model that is ideally suited to the flow rates and head pressures required at each stage of the process. This has meant that alternative brands have been used for some pumping requirements.

Please refer to equipment schedule for full details.

For over 25 years in Australia & New Zealand, the Davey range has allowed customers to select from pumps and pumping systems, which cover a wide range of applications across the entire water life cycle - Water Supply, Water Transfer, Water Treatment and Wastewater.

3.3 Instrumentation

Standard Industries propose the use of Techsys and ABB instrumentation that covers the following:

- Flow Meters
- Pressure Sensors

3.4 Valves

The first point of interest that Standard Industries feel is important to make is that no PVC valves are proposed for use anywhere within the treatment plant.

Standard Industries believes that PVC valves are not a suitable selection due to the extreme temperatures in Brisbane.

Standard Industries propose to use only brass and stainless steel (316ss) valves through the entire treatment plant.

Challenger Valves

Challenger valves are proposed for all non-controlled valves.

Challenger Valves have been a well-respected supplier and manufacturer in the Australian Market for over twenty years.

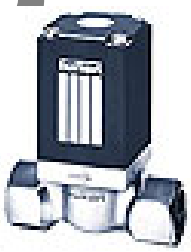
Flexibility and strong customer service have been the major key elements in the company's success, from shop floor to senior management the company's philosophy is to provide the best possible service in the best possible time.

Their production and stockholding facilities provide a wide range of options for the supply and prompt delivery of valves and valve automation packages.

Burkert

Burkert solenoid and controllable ball and gate valves are proposed for use.

Burkert offer a global experience you can rely on. Burkert is an adaptable organisation with flexible process. They are continually committed to achieving success, both for their customers and themselves. Consistent and continuous investment in research & development and in staff training enables them to offer their customers the very best in technology and services.



3.5 Blowers

Gardner Denver blowers have been recommended in a dual-duty single-standby configuration.

Gardner Denver, Inc. is a leading global manufacturer of highly engineered compressors, blowers, pumps and other fluid transfer equipment. Their products and engineered solutions are sold through multi-channel, worldwide distribution systems and are used for applications in virtually every market sector, including industrial manufacturing, transportation, to environmental processes, to healthcare applications, and to energy production. The Company's strategy focuses on organic growth through customer-driven innovation and expansion of aftermarket services, margin improvement through the internal business system - The Gardner Denver Way, and completion of selective acquisitions.

4.0 Treatment Plant Flow Process

Item	Ref
Equalisation Tank	
From	Pump Stations
Method	Pumped
Retention	3 hour
To	Anoxic Tanks # 1
Method	Pumped
Anoxic Tank # 1	
From	Equalisation Tank
Method	Pumped
Retention	2 hours
To	Aeration Tank # 1
Method	Gravity
Aeration Tank # 1	
From	Anoxic Tank # 1
Method	Gravity
Retention	5.2 hours
To	Anoxic Tank # 2
Method	Gravity
Anoxic Tank # 2	
From	Aeration Tank # 1
Method	Gravity
Retention	2 hours
To	Aeration Tank # 2
Method	Gravity
Aeration Tank # 2	
From	Anoxic Tank # 2
Method	Gravity
Retention	5.2 hours
To	Settling Tanks
Method	Gravity
Settling Tank	
From	Aeration Tank # 2
Method	Gravity
Retention	4 hours
To	Carbon Filter
Method	Pumped

Carbon Filter	
From	Settling Tanks
Method	Pumped
To	Chlorine Dosing
Method	Pumped
Chlorine dosing	
From	Carbon Filter
Method	Pumped
To	Treated Effluent Tank
Method	Pumped
Treated Effluent Tank	
From	Settling Tanks
Method	Pumped
To	Irrigation Areas
Method	Pumped

5.0 Tank and Equipment Information

5.1 TANKS

Equalisation Tank	
Number of tanks	1 off
Tank Capacity	45,000 Litres
Tank Construction	Poly
Tank Installation	Above Ground
Anoxic Tank # 1	
Number of tanks	1 off
Tank Capacity	9,000 Litres
Overall Tank Height	2.875m
Tank Length	2.4m x 2.5m
Tank Construction	Poly
Tank Installation	Above Ground
Aeration Tank # 1	
Number of tanks	1 off
Tank Capacity	16,000 Litres
Overall Tank Height	2.875m
Tank Length	3m x 2.5m
Tank Construction	Poly
Tank Installation	Above Ground
Aeration Tank # 2	
Number of tanks	1 off
Tank Capacity	16,000 Litres
Overall Tank Height	2.875m
Tank Length	3m x 2.5m
Tank Construction	Poly
Tank Installation	Above Ground

Anoxic Tank # 2	
Number of tanks	1 off
Tank Capacity	16,000 Litres
Overall Tank Height	2.875m
Tank Length	2.4m x 2.5m
Tank Construction	Poly
Tank Installation	Above Ground
Settling Tank	
Number of tanks	2 off
Tank Capacity	16,000 Litres
Overall Tank Height	2.36m
Tank Diameter	3.0m
Tank Construction	Concrete
Tank Installation	Above Ground
Treated Effluent Tank	
Number of tanks	1 off
Tank Capacity	45,000 Litres
Overall Tank Height	2.4m
Tank Diameter	6.0m
Tank Construction	Poly
Tank Installation	Above Ground
WAS Tank	
Number of tanks	1 off
Tank Capacity	6,000 Litres
Overall Tank Height	2.2m
Tank Diameter	2.884m
Tank Construction	Concrete
Tank Installation	Above Ground

5.2 PUMPS

Equalisation Pump	
Installation Location	Control Room
Duty / Standby	Duty & Standby
Pump Style	Single Stage Centrifugal
Model #	Davey 62103E
Flow Rate	50 LPM @ 18M TDH
Aeration Transfer Pumps	
Installation Location	Control Room
Duty / Standby	Duty & Standby
Pump Style	Single Stage Centrifugal
Model #	Davey 62013E
Flow Rate	150 LPM @ 13M TDH
Aeration Blowers	
Installation Location	Control Room
Duty / Standby	Duty & Standby
Model #	Greenco 2RB720 H37
Flow Rate	220NM3/H @ 350mBAR
Anoxic Transfer Pumps	
Installation Location	Control Room
Duty / Standby	Duty & Standby
Pump Style	Single Stage Centrifugal
Model #	Davey 62013E
Flow Rate	150 LPM @ 13M TDH
Return Activated Sludge	
Installation Location	Control Room
Duty / Standby	Duty & Standby
Pump Style	Single Stage Centrifugal
Model #	Davey 62013E
Flow Rate	150 LPM @ 13M TDH
Waste Activated Sludge Pump	
Installation Location	Control Room
Duty / Standby	Duty & Standby
Pump Style	Single Stage Centrifugal
Model #	Davey 62013E
Flow Rate	150 LPM @ 13M TDH
Filter Feed Pump	
Installation Location	Control Room
Duty / Standby	Duty Only
Pump Style	Submersible Drainage
Model #	Davey 62013E
Flow Rate	150 LPM @ 13M TDH

Effluent Pump	
Installation Location	Control Room
Duty / Standby	Duty Only
Pump Style	Single Stage Centrifugal
Model #	Davey 62303S
Flow Rate	400 LPM @ 32M TDH
Caustic Dosing Pump	
Installation Location	Control Room
Duty / Standby	Duty Only
Pump Style	Self Priming Liquid Ring
Model #	Prominent GALa 1005
Flow Rate	0-0.44 LPH
Molasses Dosing Pump	
Installation Location	Control Room
Duty / Standby	Duty Only
Pump Style	Self Priming Liquid Ring
Model #	Bredel SPX-10
Flow Rate	0-0.55 LPH
Alum Dosing Pump	
Installation Location	Control Room
Duty / Standby	Duty Only
Pump Style	Self Priming Liquid Ring
Model #	Prominent GALa 1005
Flow Rate	0-0.44 LPH

6.0 Drawings

Please find attached the following drawings:

- 2352-PID-0-101 - PROJECT TITLE PAGE
- 2352-PID-0-102 - PROJECT DRAWINGS LEGEND
- 2352-PID-0-103 - TREATMENT PLANT PROCESS FLOW DIAGRAM

Appendix A – Technical Drawings

Appendix B – Sample Inspection Test Procedure

Appendix C – Sample Commissioning Procedure