BRISBANE CITY COUNCIL
BRISBANE WATER

Australia Trade Coast Sewer Project
SP299 - Viola Place Pump Station
Operation & Maintenance Manual
Contract No. BW30137-02/03

Volume No. 5 Contents

BRISBANE CITY COUNCIL
Brisbane Water
Viola Place P/S SP299 Australia Trade Coast Sewer Project

BCC Contract No. BW30137-02/03

Viola Place Pump Station SP299

Revision Control

Revision Number	Date	Amendment Details	Responsible Officer
Version 0.00	5 April 2006	Draft Manual Issued	Stuart Cowhig
Version 1.00	28 April 2006	Manual Issued	Stuart Cowhig

Viola Place Pump Station-SP299 Operation & Maintenance Manual

Table of Contents

BRISBANE CITY COUNCIL
Brisbane Water
Viola Place P/S SP299 Australia Trade Coast Sewer Project

BCC Contract No. BW30137-02/03

Viola Place Pump Station-SP299 Operation & Maintenance Manual
Table of Contents

BRISBANE CITY COUNCIL BCC Contract No. BW30137-02/03
Brisbane Water
Viola Place P/S SP299 Australia Trade Coast Sewer Project

Viola Place Pump Station-SP299 Operation & Maintenance Manual
Table of Contents

Viola Place Pump Station-SP299 Operation & Maintenance Manual
Table of Contents

Viola Place Pump Station-SP299 Operation & Maintenance Manual
Table of Contents

Viola Place Pump Station-SP299 Operation & Maintenance Manual
Table of Contents

Australia Trade Coast Sewer Project
Contract No. BW 30137-02.03

Revised Developed Design Report Separable Portion No. 3 Pump Station SP299 Viola Place and Associated Rising Mains

September 2004

Brisbane Water

Awards won in 2003

Winner
Engineering
Excellence Award
Category: Project Management

Highly Commended
Engineering
Excellence Award
Category: Project Management

Winner
National and Queensland
Case Earth Award
Category 3: Environmental
Excellence - projects over
$10 million

Highly Commended
Queensland Stormwater
Industry Association
State Award
Category: Major WSUD Project
>$1.0 million

Minister's Grand Prize
Healthy Waterways Awards
Category: Industry Award

Finalist
Healthy Waterways Awards
Category: Industry Award

Commendation
Public Domain Awards
Category: Bridges

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Parsons Brinckerhoff Australia Pty Limited ACN 078 004 798 and Parsons Brinckerhoff International (Australia) Pty Limited ACN 006 475 056 trading as Parsons Brinckerhoff ABN 84 797 323 433

12th floor, IBM Centre
348 Edward Street
Brisbane Qld 4000
GPO Box 2907
Brisbane Qld 4001
Australia
Telephone +61 7 3218 2222
Facsimile +61 7 3831 4223
Email brisbane@pb.com.au

ABN 84 797 323 433
NCSI Certified Quality System ISO 9001

Author: Ian Cameron, Design Manager.....

Signed: .....

Reviewer: Vic Bowyer, ...

Signed: .....

Approved by: Ian Cameron, Design Manager.....

Signed: .....

Date: 21 September 2004, Revision B .....

Distribution: Brisbane Water .....

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Contents

PARSONS BRINCKERHOFF

Contents (continued)

Page Number

List of appendices

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1. Introduction

This Developed Design Report has been prepared in accordance with the requirements of Section 1.12.1 of Annexure 4:Part 1 (Engineering Design) to the Contract.

The Report consolidates, in relation to Separable Portion 3 (SP3), design information relating to the underlying design concepts, calculations and assumptions, correspondence relating to discussions with statutory authorities and other relevant stakeholders, and details permits and approvals that have been obtained for the Viola Place SP299 pump station and associated rising mains.

SP3 consists of:

- design and construction of a new sewage rising main between the existing Kingsford Smith Drive SP131 and the existing Hugh Street SP136;
- design and construction of a new sewage rising main from the existing Hugh Street SP136 to the existing McBride Road SP131; and
- design and construction of a new sewage rising main between the existing McBride Road SP131 and the proposed Serpentine Road SP300.

The above works are described in the *Separable Portion 3 Pipelines Developed Design* Report. The following SP3 works are described in this report.

- Viola Place SP299 pump station.
- DN315 rising main from SP299 to DN1370 Luggage Point RM.
- DN315 rising main from SP299 to DN1840 Luggage Point RM.
- DN110 future rising main (blanked off) from Meeandah Barracks to Viola Place SP299.

This report supersedes the previous Developed Design Report dated 17 June 2004. The Viola Place pump station design was put on hold in early July 2004 due to possible conflicts with the Gateway Motorway alignment. Approval to proceed with re-design work was subsequently issued in late August 2004. (Refer to Appendix I for details of Gateway Motorway Overlay.)

2. Design summary

2.1 Viola Place SP299

2.1.1 Pump station

The flow required to be pumped by SP299 was increased by BW during the detailed design phase of the project from 89 L/s to 104 L/s to accommodate increased flows from the Trade Coast Central site and adjacent lands.

BW adopted the value adding suggestion offered by LCPL at the tender stage to pump directly into the Luggage Point rising mains rather than building a rising main from SP299 to SP300 at Serpentine Road.

By pumping into the Luggage Point rising mains, cost savings were available to the project by not building the extra rising main to SP300, however VSDs are required on the pumps and the head on the pumps increased significantly.

2.1.2 Construction access

For the construction of SP299 and associated rising mains, construction access will be available via Lamington Avenue/Terminal Drive/Viola Place.

It should be noted that Abigroup Contractors has a temporary gate erected in Viola Place on BCC land which will need to be removed or access provided to Leighton Contractors for the construction of SP299 and associated rising mains.

2.1.3 Operations and maintenance access

Permanent access to SP299 will need to be maintained through the Trade Coast Central site when it is redeveloped. We have assumed that vehicular access will either be available from Terminal Drive or the proposed Schneider Road overpass over the Pinkenba railway line.

The proposed roadworks associated with SP299 have only been designed for rigid body trucks as instructed by BW.

2.2 Associated rising mains

The SP3 pipelines associated with the Viola Place SP299 may be summarised as follows:

Section	Length	Pipe Materials
SP299 to DN1370 RM	259 m	DN315 PN12.5 PE100
SP299 to DN1840 RM	269 m	DN315 PN12.5 PE100
SP299 to Meeandah Barracks (future connection)	300 m	DN110 PN12.5 PE100
Total	828 m	

2.2.1 SP299 to Luggage Point Rising Mains

The rising mains will be constructed within the proposed easement across Lot 1 RP8444114, owned by the Commonwealth and which is controlled by BACL, as detailed on SUR040313-02 (see Appendix G).

The proposed rising mains will be constructed under the existing open drain and then laid in parallel with the existing 600 MSCL water main and underground electricity service (adjacent to the railway boundary).

2.2.2 Connection between rising mains

The SP299 rising mains will connect into both the existing DN1370 and DN1840 Luggage Point rising mains.

Actuated control valves at the SP299 pump station will control which of the existing Luggage Point rising mains SP299 will discharge to.

2.2.3 Meeandah Barracks rising main

The rising main route will be parallel to and in a common trench with the DN315 rising mains. The Meeandah Barracks rising main will be blanked off adjacent to the existing 1370ND rising main, with a marker post installed to allow for a future sewerage connection from Meeandah Barracks.

The flow in the Meeandah Barracks rising main will be in the opposite direction to the SP299 rising mains, and will discharge to the collection MH at SP299.

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3. Drawings

The Developed Design Report should be read in conjunction with the following design drawings:

Viola Place SP299

Drawing No	Description
486/5/7-SQ700/000	Drawing List
486/5/7-SQ700/001	Locality and Site Plan
486/5/7-SQ700/002	Setout Plant
486/5/7-SQ700/003	General Arrangement
486/5/7-SQ700/004	Not Used
486/5/7-SQ700/005	Not Used
486/5/7-SQ700/006	Roof Plan
486/5/7-SQ700/007	Equipment List and Notes
486/5/7-SQ700/008	Sectional Plan
486/5/7-SQ700/009	Sections (Sheet 1 of 2)
486/5/7-SQ700/010	Sectional (Sheet 2 of 2)
486/5/7-SQ700/011	Not Used
486/5/7-SQ700/012	Structural-General Notes
486/5/7-SQ700/013	Concrete Details – 1
486/5/7-SQ700/014	Concrete Details – 2
486/5/8-SQ700/015	Reinforcement Details – 1
486/5/7-SQ700/016	Reinforcement Details – 2
486/5/7-SQ700/017	Reinforcement Details – 3
486/5/7-SQ700/020	Odour Scrubbing and Septicity Control
486/5/7-SQ700/021	Miscellaneous Details
486/5/7-SQ700-030	RAG Reduction Tube for the Vega Level
486/5/7-SQ700-031	Power Distribution Schematic Diagram
486/5/7-SQ700-032	Pump 01 Schematic Diagram
486/5/7-SQ700-033	Pump 02 Schematic Diagram
486/5/7-SQ700-034	Motorised Valve 01 Schematic Diagram
486/5/7-SQ700-035	Motorised Valve 02 Schematic Diagram
486/5/7-SQ700-036	Generator Control Schematic Diagram
486/5/7-SQ700-037	DC Power Supply Schematic diagram
486/5/7-SQ700-038	MITS RTU Digital Input
486/5/7-SQ700-039	MITS RTU Digital Input
486/5/7-SQ700-040	MITS RTU Digital Output

Drawing No	Description
486/5/7-SQ700-041	MITS RTU Analogue Input
486/5/7-SQ700-042	PLC Digital Inputs Slot 3
486/5/7-SQ700-043	PLC Digital Inputs Slot 4
486/5/7-SQ700-044	PLC Digital Inputs Slot 5
486/5/7-SQ700-045	PLC Digital Inputs Slot 6
486/5/7-SQ700-046	PLC Analogue Inputs Slot 7
486/5/7-SQ700-047	PLC Analogue Inputs Slot 8
486/5/7-SQ700-048	PLC Analogue Output Slot 9
486/5/7-SQ700-049	Switchboard General Arrangement
486/5/7-SQ700-050	Switchboard Construction Notes
486/5/7-SQ700-051	Equipment List
486/5/7-SQ700-052	Switchboard Construction Details
486/5/7-SQ700-053	Label Schedule
486/5/7-SQ700-054	Site Layout
486/5/7-SQ700-055	Cabling Block Diagram
486/5/7-SQ700-056	Cable Schedule
486/5/7-SQ700-057	Cathodic Protection Wiring Diagram

BCC Standard Drawings

486/5/25-SC002/1	"G" Type Maintenance Hole General Arrangement
486/5/25-SC002/2	"G" Type Maintenance Hole Top Slab Reinforcement and Construction Details
486/5/25-SC006/1	900 Dia Rising Main Discharge Maintenance Hole Preferred Option
486/5/25-SC006/2	900 Dia Rising Main Discharge Maintenance Hole Alternative Option
486/5/25-SF002/1	Maintenance Hole Cover Sewer Class B – Conc Infill Frame Details
486/5/25-SF002/2	Maintenance Hole Cover Sewer Class B – Conc Infill Frame Details
486/5/25-SF002/3	Maintenance Hole Cover Sewer Class B – Conc Infill Lifting Hole Details
486/5/25-SF003/1	Maintenance Hole Cover Sewer Class B – Bolt Down Frame Details
486/5/25-SF003/2	Maintenance Hole Cover Sewer Class B – Bolt Down Cover Details
486/5/25-SF003/3	Maintenance Hole Cover Sewer Class B – Bolt Down Cover Details
486/5/25-SF009	Standard M.S. Ladders and Associated Fittings

486/5/25-S25	Standard 2440 Dia Sewage Pump Station Section B
486/5/25-S26	Standard 2440 Dia Sewage Pump Station Section C
486/5/25-S27	Standard 1830 Dia Dia Grit Collector Maintenance Hole Details
486/5/25-S28	Standard 1830 Dia Grit Collector Maintenance Hole Details
486/5/25-S29	Standard 1830 Dia Grit Collector Maintenance Hole Details
486/5/25-S30	Standard 2440 Dia Sewage Pump Station Vent Pole Details
486/5/25-S31	Standard 2440 Dia Sewage Pump Station Potable Water Details
486/5/25-S32	Standard 2440 Dia Sewage Pump Station Level Probe Bracket Detail
486/5/25-S33	Standard 2440 Dia Sewage Pump Station Level Probe Bracket Detail
486/5/25-S34	Standard 2440 Dia Sewage Pump Station Anode Hook Detail
486/5/25-S35	Standard 2440 Dia Sewage Pump Station Electrical Connection Box Detail
486/5/25-S47	Grit Collector Maintenance Hole Inlet Valve General Arrangement
486/5/25-S48	Grit Collector Maintenance Hole Inlet Valve Spindle Shaft Details
486/5/25-S49	Grit Collector Maintenance Hole Inlet Valve Bearing Support Details
486/5/25-S50	Standard 1830 Dia Grit Collector Maintenance Hole Bar Screen Details
486/5/25-S51	Standard 1830 Dia Grit Collector Maintenance Hole Bar Screen Details
486/5/25-WC002/4	General Arrangement Tapping Points Options for 25 mm Copper Services

IPWEAQ Standard Drawings

G-0041	Fencing Chain Wire Security Fencing
D-0080	Inlet and Outlet to Stormwater Drains

HALLCO Standard Drawings

BCC-03	1650x1600 Valve Pit Cover details of Recesses for Cover Installation
BW-1/1	Recess Details – P.S. 1/1 For 2400x2600 C/O cover for Cover Installation
BW-01	Multi-part Removable Alum. Cover
BW-02	Multi-part Removable Alum. Cover
BW-03	Multi-part Removable Alum. Cover

BW-10	Multi-part Removable Alum. Cover
HE-02	End & Centre Hinge Details

Associated rising mains

Drawing No	Description
486/5/8-SM16/021	Overall Layout
486/5/8-SM16/022	Plan and Long Section – CH 0.000 to CH 269.02
486/5/8-SM16/023	Miscellaneous Details
486/5/8-SM16/024	Trench Details
486/5/8-SM16/025	Scour and Air Valve Details
486/5/25-SB008	Valve Chamber Details for Sluice Valves on Sewer Systems
486/5/25-SF004/1 to 4	Maintenance Hole Cover Sewer-Class D Cover, Riser Ring and Frame Details
486/5/25-SF007	Standard M.S. Ladders and Associated Fittings
486/5/25-SF010	Cast Iron Valve Box & Cover – Sewerage
486/5/25-WD005	Cast Iron Valve Box & Cover Long Type
486/5/25-WM003	One Segment C.I. Cover and Frame for Water Supply and Recycled Water Valve Pits
486/5/25-WM004	Cover and Frame for Water Supply, Sewerage and Recycled Water Air Valve Pit

4. Input design data

4.1 Survey

Brisbane Airport Corporation Limited (BACL) provided topographic survey in the vicinity of SP299. Additional survey has been carried out by Leighton Contractors to validate the survey provided by BACL and to provide supplemental information, including the location of services, location of RP boundaries and changes to ground profiles that have occurred since the BACL survey was carried out.

4.2 Public utility plant (PUP) location

4.2.1 Dial Before You Dig (DBYD)

DBYD searches have been carried out and relevant services are shown on the Drawings.

4.2.2 Viola Place SP299

Details of existing PUP in the vicinity of Viola Place SP299 have been obtained from the as-constructed drawings and potholing by Leighton Contractors and relevant services are shown on the Drawings.

Note optic fibre cable will be relocated to allow for the construction of SP299. The Vodafone transmitter on the adjoining BACL land has been removed by others.

4.2.3 On-site service location

All services, identified from DBYD information, site inspection and discussions with service authorities, which may influence the alignment or construction of the works have been located on site by potholing and surveying. The location and level of each service has been surveyed and recorded.

4.3 Service authorities

Following a review of DBYD searches information, field verification of service locations was completed by LCPL construction personnel using visual inspection and pipeline location equipment.

On-site meetings with all relevant service authorities have also been completed either to verify the location of services and or to supervise the potholing and surveying of buried services.

The detailed services information was provided to drafting staff to design the pump station and pipelines, and check inspections were also completed as required to clarify the location of the critical services such as the existing Luggage Point rising mains.

4.4 Geotechnical information

4.4.1 Brisbane Water

For the proposed SP299 pump station and associated SP3 pipeline works, Brisbane Water had completed limited geotechnical investigations for the pipeline routes.

A significant volume of geotechnical reports was included in the tender documents for the project, the most relevant of which for the Viola Place SP3 works was the following:

- *Australia Trade Coast North Viola Street to Serpentine Road Geotechnical Investigation*, BCC, City Design, November 2002.

We have not included the above geotechnical report in this Developed Design Report, due to the volume of information included in the above reports, and readers are referred to the existing documentation held by BW.

4.4.2 Coffey Geosciences

Coffey Geosciences (Coffeys) were commissioned by PB to complete geotechnical investigations at the SP299 Viola Place pump station site.

The subsequent geotechnical report dated 1 April 2004, provided information for the structural design of the pump station and associated structures.

A copy of the Coffeys report is included in Appendix E1.

4.4.3 Parsons Brinckerhoff

Parsons Brinckerhoff (PB) completed a geotechnical review of available information for SP299 based upon the Coffeys report (April 2004) and previous Brisbane Water geotechnical investigations.

A copy of the PB geotechnical report is included in Appendix E2 (and includes comments upon SP298 and SP300 also).

4.5 Land and property issues

The proposed Viola Place SP299 pump station is located in land owned by the Brisbane City Council described as Lot 30 RP802412. Lot 30 RP802412 is part of a larger parcel of land to be redeveloped as part of the "Trade Coast Central" project, with SP299 providing sewerage services to this project (see SUR Plan in Appendix G).

The rising mains from SP299 to the existing Luggage Point rising mains will traverse Commonwealth owned land which is part of the Brisbane Airport, administered by the Brisbane Airport Corporation Limited (BACL).

The Commonwealth owned land is described as Lot 1 RP844114 over which an approximate 10 m wide easement is being sought by BCC for services including the proposed rising mains (and the proposed rising main from Meeandah Barracks to SP299).

A Development Application (DA) was lodged with BACL and the delegate of the Commonwealth Department of Transport for the proposed pipelines across the Commonwealth land, and subsequently approvals were obtained. Refer to information contained in Appendix A.

4.6 Gateway Motorway Alignment

Ad detailed in the Introduction to this report, a potential conflict with piers and walls associated with the proposed Gateway Motorway duplicated bridge over the Brisbane River caused the SP299 pump station to be relocated.

Detailed discussions between Brisbane Water and the Department of Main Roads have resulted on an agreed location for SP299 being the centre line of the wet well being 18 m west of the common boundary between BCC and BACL land. (Refer to Appendix I.)

5. Developed design

5.1 Viola Place SP299

5.1.1 Site

The Viola Place SP299 pump station is located on land owned by the Brisbane City Council and described as Lot 30 RP802412.

The Viola Place SP299 site adjoins the common boundary with Commonwealth land described as Lot 1 RP844114 which is part of the Brisbane Airport site. A Vodafone transmitter station close to the common boundary on BACL land has been removed by others.

5.1.2 Structures

Structures will include:

- 0.9 m diameter rising main discharge maintenance hole;
- 3.6 m diameter RC wet well with rectangular valve chamber;
- standard BW grit collector maintenance hole;
- 1.8 m diameter Collection Maintenance Hole (CMH);
- 1.05 m diameter overflow structure, discharging to the open drain adjacent to SP299;
- concrete slab for standby generator; and
- monorail crane.

Concrete structures have been designed in accordance with *AS 3600 Concrete Structures* except where *AS 3735 Concrete Structures for Retaining Liquids* requires greater cover to steel reinforcement.

5.1.3 Construction methods

Concrete structures containing sewage will either be cast in-situ in accordance with BW's requirements or constructed as pre-cast units. Constructability reviews by LCPL have indicated that sheetpiling will not be required for construction of the wet well. The use of a blinding layer of concrete and annulus forms is proposed.

5.1.4 Duty points

104 L/s at 54.2 m with one pump operating (peak) 104 L/s at 11.7 m with one pump operating (minimum). (See Appendix C for additional information.)

5.1.5 Pumps

Two Hidrostal H05K–S01R 110 kW submersible pumps in duty/standby arrangement. (See Appendix C for additional information.)

5.1.6 Starters

Two Danfoss VLT8000 variable speed drives.

5.1.7 Discharge system

DN200/DN250 DICL discharge pipework connected to two DN315 PE100 PN12.5 rising mains with magnetic flowmeters.

5.1.8 Power supply

Negotiations with Energex–Geebung have resulted in a commitment to provide an overhead power supply to the Viola Place SP299 site from an existing transformer to the west on Terminal Drive.

The overhead power lines will be constructed parallel to the railway boundary fence with a pole mounted transformer being provided adjacent to the SP299 site on the southern side of Viola Place. An overhead power feed from the pole mounted transformer will connect to a property pole supplied and installed by Leighton Contractors.

No contribution by BW for the proposed works is required (see Appendix B1).

BCC will need to grant Energex 24 hour access to the proposed overhead power lines, and BCC/DRS will approve the proposed powerline alignment. (An Energex consent to the Erection of Electric Line was forwarded to BW on 7 June 2004 for approval for the overhead powerline works.)

SP299 will incorporate a 150 kVA diesel powered backup generator that will cut in if the main power supply is unavailable. The generator will have sufficient capacity to start and run one of the duty pumps, plus any essential loads from ancillary equipment such as lighting, chemical dosing and control gear.

5.1.9 Controls and instrumentation

The following equipment is proposed:

- one "multitrode" digital level switch;
- one vega analogue level transmitter;
- two ABB Magmaster analogue magnetic flow transmitters;
- two vega D84 analogue pressure transmitters;
- PLC to be free-issued by BW; and
- telemetry equipment to be free-issued by BW.

5.1.10 Control philosophy

The incoming flow to SP299 will come from new development in the Trade Coast Central area. While PB was preparing the Trade Coast Central Master Plan, Barry Dennien from BW advised the new development was likely to be served by low pressure grinder pumping stations in lieu of gravity sewerage. These systems will be installed progressively as the catchment develops.

Sewage from the developing SP299 catchment will be diverted into the CMH at SP299, and will be pumped through two new DN315 rising mains to the existing DN1370 and DN1840 Luggage Point rising mains.

SP299 will operate as a variable speed station with feedback control based on level. The electromagnetic flowmeters on the discharge lines will be used for monitoring purposes and will not have any control function.

The control philosophy for the SP299 pump station is included in Appendix H.

5.1.11 Water hammer analysis

Design Detail and Development was commissioned by PB as a specialist sub-consultant to complete the water hammer analysis for the overall project.

The water hammer report for SP299 and associated rising main SP3 works is included in Appendix F, and the following conclusions were reached.

- Transient pressures are within the derated design rating of the pipe material, except where the manual valve at the DN1370 rising main cut-in point is closed quickly with a pump operating at full capacity.
- Operating instructions should be developed to make it clear that the operators should not close the isolators at the large diameter rising mains while the pumps are running.
- Compliance with WSA 01 has been demonstrated.
- Check valves do not require counterweights.
- The use of variable speed drives for the pumps will minimise the fatigue effects on the pipelines significantly.

5.1.12 Odour and septicity equipment

A specialist odour and septicity sub-consultant, the Odour Unit has been commissioned by PB to analyse liquid and gas phase results sampled by BW.

The need for odour scrubbing and/or septicity control will be confirmed following a review of the report from The Odour Unit.

It is likely that no odour scrubbing equipment or septicity control equipment will be constructed at SP299 at this time.

A standard BW 12.5 m high vent pole will be constructed to vent the wet well and grit chamber.

5.2 Associated rising mains

5.2.1 Pipe sizing

The sizing of the rising mains has been based on a suitable flow velocity to provide a trade off between minimising headloss and maximising slime stripping and sediment transport.

The rising mains from the Viola Place SP299 to will be DN315.

The rising main from Meeandah Barracks to the proposed Viola Place SP299 will be DN110, to allow for a future discharge from Meeandah barracks in SP299.

The DN110 pipeline will be capped to allow for a future connection from Meeandah Barracks at a later date by others.

5.2.2 Pipe material

All rising mains will be constructed from PE100 PN12.5 pipe.

5.2.3 Trenching arrangement

Typical trench details are shown on the drawings. Structural design of the pipelines complies with AS2566.1 (Refer Appendix C)

5.2.4 Rising main connections

The SP3 rising mains from SP299 have been designed to allow for the connection of the proposed pump station SP299 to the existing Luggage Point DN1370 and DN1840 rising mains.

6. Environmental management

Environmental management issues associated with the proposed works include the following:

- the presence of acid sulphate soils;
- the presence of high groundwater levels; and
- declared Fire Ant area.

7. Permits and approvals

The following permits and approvals have been obtained and are contained in Appendix A:

- DA-BACL
- Airport Environmental Protection and Building Control Office/Building Approval
- BCC/DRS

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Appendix A

Permits and approvals
A1 — BACL
A2 — Airport Environmental Protection and Building Control Office
A3 — BCC/DRS

18 August 2004

FAXED 18/8/04

JKB
2138110B
Rec'd 23/8/04

Parsons Brinckerhoff Australia Pty Ltd
GPO Box 2907
Brisbane Qld 4001

Brisbane Airport Corporation Ltd
Make the most of life.

Attention: Mr Ian Cameron

Dear Sir

Development Consent Approval
Re: Proposed Australia Trade Coast Sewer Project

Development Consent No. 2004/061

Project Registry No 2004/94

TF Colin
2:15 pm
23/8/04
JKB.

I write on behalf of Brisbane Airport Corporation as the Airport Lessee Company that in accordance with the Airports (Building Control) Regulations 1996, Development Consent for this project is granted.

The purpose of this document is to set out the conditions of consent by Brisbane Airport Corporation limited to the development identified above as contemplated by Regulation 2.03 and 2.04 of the Airports (Building Control) Regulations1996 made under the Airports Act 1996.

Yours faithfully

Colin Stewart
Project Manager - Operations

Encl.

cc: Mr Willie Tait — Airport Building Controller, Department of Transport and Regional Development

Stephen Goodwin — General Manager Operations
Brad Bowes — Company Secretary

Banksia Place, Brisbane Airport, Qld 4007 I PO Box 61, Hamilton Central, Queensland 4007 Australia I Telephone: +61 7 3406 3000 I Fax: +61 7 3406 3111
email: info@bne.com.au I www.brisbaneairport.com.au I www.flydirect.com.au

ACN: 076 870 650 I ABN: 54 076 870 650

DEVCON 2004/061

BRISBANE AIRPORT CORPORATION LIMITED
CONDITIONS FOR DEVELOPMENT CONSENT

PROPOSAL: Proposed Australia Trade Coast Sewer Project

PROPOSED BY: Parsons Brinkerhoff on behalf of BCC

LOCATION: Serpentine Road and Viola Place Brisbane Airport

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1. Description of Proposed Building Activity

This proposal is to construct and install rising sewer mains and pump stations at Viola Place and Serpentine Road. Brisbane Airport as part of the larger Australia Trade Coast Sewer Project.

2. Consistency with the 2003 Master Plan

This project is located in a precinct of the Airport master planned for General Industry. BAC has consented to provide land for the BCC to construct these works. These works form part of the BCC infrastructure. It is the responsibility of the BCC to negotiate an easement for these works with the DoTARS.

3. Major Airport Development

This project does not form part of a Major Development Plan as described in Section 89 of the Airports Act 1996.

4. Consistency with the 2004 Airport Environment Strategy

I refer to the development application for the abovementioned project and provide a statement describing how the proposed building activity is consistent with the approved final Airport Environment Strategy (AES) for Brisbane Airport in accordance with the requirement of the Airport (Building Control Regulations 1996, Regulation 2.05 (1)(d).

Section 14 of the 2004 AES addresses environmental management of "Development Projects" in general and the following refers to how the abovementioned project is consistent with the AES:

- Comprehensive environmental impact assessment studies have been undertaken predominantly by Brisbane City Design on behalf of Brisbane Water between 2001 and 2003.
- Long term performance and design standards have been incorporated into the final design; and

- A Construction Environmental Management Plans (CEMP) has been supplied as part of the Development Consent process which addresses satisfactorily all BAC requirements in this matter.

5. Planning Objectives

I confirm that this project is consistent with the intent of the latest edition of the Brisbane Airport Corporation Limited Planning Procedures and Guidelines.

6. Documentation

The approval is not a design check, and all design aspects of the project remain the responsibility of Brisbane City Council and their design team.

This consent relates to the development as described in the following documents.

7. Building Approval by Airport Building Controller

This consent is subject to Building Approval for the works being obtained by Parsons Brinckenhoff from the Airport Building Controller. A copy of the submission to and approval from the Airport Building Controller is to be provided to Brisbane Airport Corporation Limited as soon as it is available and before any work commences.

8. Site Development

Consent is conditional on the proposed development complying with the following:

1. Noise and dust to be controlled within airport Environmental Protection Regulations during constructions.
2. All work which may cause a disruption to the effective operation of the airport to be carried out in non peak periods.
3. Demolition not to affect any base airport services.
4. Provision of all trade and statutory certificates to the Airport Building Controller on completion of works.
5. Compliance with the Brisbane Airport Corporation does not indicate compliance with the DDACT.
6. All workmanship and materials to comply with the relevant Australian Standards.
7. The contractor shall be responsible for disconnecting and terminating any existing water, drainage, sewerage and electrical services and the works are to be carried out in accordance with the relevant codes.
8. The contractor shall comply with the State Workplace Health & Safety Act and Occupational Health & Safety Act, 1989 and 1991 respectively and any associated regulations and amendments.
9. The contractor shall be responsible for damages to any airport property and existing services and the contractor is to advise the

Corporation immediately of any damage. The contractor shall be held responsible for making good any damage caused to airport property and services as a result of their activities.

10. The contractor should manage the site to prevent any environmental impacts contrary to the Airports (Environment Protection) Regulations, such as acid sulfate soil disturbance, runoff to surface drains, sediment loads in stormwater runoff from the site, soil contamination, dust and other air quality issues, excessive noise, ecology and cultural heritage.

9. Site Requirement

The site shall be kept free of rubbish and debris and be maintained in a tidy condition at all times. Access to the site will be as directed by BAC.

10. Services

All services are to be located and protected within the surrounding works area.

11. Occupational Health and Safety

The Contractor is responsible for Occupational Health and Safety requirements throughout the duration of the total site works.

12. Insurances

The Contractor is to provide to BAC a copy of their contractor's insurance.

- Contractors All Risks
- Public Liability ($10,000,000 Landside) ($20,000,000 Airside).
- Workers Compensation

13. Security

The Contractor is to maintain full site security and public safety throughout the duration of the works.

14. Signage

Any proposed signage shall be submitted to BAC for context and graphic approval. Appropriate barriers and public warning shall be maintained at all times.

15. Development Guidelines

The developer shall adopt and comply with the latest edition of the BAC Development Guidelines.

16. Permit to Commence Work

A Permit to Commence work must be obtained from the BAC before any work commences on site.

The Permit to Commence work will be issued on the supply of the following:

- Name of Contractor and telephone number
- Name of Contractors Project Officer and contact for 24 hours access.
- Copies of all insurances
- Copy of the submission to and approval of the Airport Building Controller
- Safe Work Plan
- Approval Environmental Management Plan for Construction
- Method of Work Plan

The Permit to Commence Work must be signed by the Contractor to acknowledge acceptance of the permit conditions before any work commences on site.

17. Occupancy

Upon the completion of the project, design and compliance certificates will be required to show that all work has been completed in accordance with the requirements of the Building Code of Australia and the relevant Australian Standards. Occupancy of the area can not be permitted until the Airport Building Controller has issued a Certificate of Compliance.

18. Protection of Persons and Property

In order to protect against damage to property and persons and injury resulting thereof from the new works, the following will be engaged during construction.

a) Provide for adoption of a safe work plan for the building/works activity.

b) Ensure the Qld state legislation relative to workplace health and safety is adopted and enforced during the operations.

c) Provide safety fences, boarding and barricades around the work area to prevent public access and confine the contractor to works in the nominated area.

d) Provide appropriately qualified and experienced staff to ensure there is no unauthorised entry to the work site.

19. Clean up/Rehabilitation

a) Provision is to be made in the documents for the contractor's debris and rubbish/dust/dirt and the like to be removed from the site and

disposed in a suitable licensed dumping area.

b) And that all building fabric and or landscaping to be enhanced as part of the project or at least returned to a condition at least equivalent to its prior condition.

20. Development Consent Approval

This Development Consent Approval is dependant upon Brisbane Airport Corporation Limited receiving payment of the development Consent fee. Our tax invoice is included in this approval.

Parsons Brinckerhoff

12th Floor, IBM Centre
348 Edward Street
Brisbane QLD 4000
GPO Box 2907
Brisbane QLD 4001
Australia
Telephone +61 7 3218 2222
Facsimile +61 7 3831 4223
Email brisbane@pb.com.au

ABN 84 797 323 433
NCSI Certified Quality System ISO 9001

Our Reference: 2138110B-LTR030A1ic:syg

8 June 2004

Colin Stewart
Project Manager Operations
BACL Australia
PO Box 61,
HAMILTON CENTRE QLD 4007

Dear Colin

Development Consent Application — Australia Tradecoast Sewer Project

Please find enclosed an application for development consent, on behalf of Brisbane Water, for construction of components of the Trade Coast Sewer Project on airport land controlled by BACL. The scope of works on airport land includes rising mains connecting to a new pump station (SP299) at Viola Place and construction of a new pump station (SP300) Serpentine Road including access from Lomandra Drive.

In support of this application, please find enclosed two copies of a report with appended documentation supporting the application.

We trust that the information provided is sufficient to enable assessment of the project for consistency with the objectives of the approved airport master plan. If further information or clarification is required please contact Mike Hall on (07) 3218 2206 or Kate Robbins on (07) 3218 2260.

Yours sincerely

Ian Cameron
Water Executive
Parsons Brinckerhoff Australia Pty Limited

Encl.

31/08/2004 16:04 0732163100 ANE PAGE 01/04

Airport Environmental Protection and Building Control Office
Appointed by the Australian Government Department of Transport and Regional Services

Facsimile Transmission				
To	cc	Company	Attention	Fax No.
✓		**Parsons Brinckerhoff**	**Ian Cameron**	**07 3831 4223**

Project	Australia Trade Coast Sewer Project	Ref	BNE 04 B0032
From	**Willie Tait**	Date	31 August 2004
Subject	Building Approval	Pages	4

Ian,

Copy approval attached as discussed.

Regards

Willie Tait
Airport Building Control Office

If you have problems receiving this correspondence, please contact this office immediately

Airport Environment Protection and Building Control Office *PO Box 137, Hamilton Central QLD 4007* *(Unit 7, 35 Qantas Drive, Eagle Farm Qld 4009)*	*Contact: 07 3216 3040 (tel)* *07 3216 3100 (fax)* *0417 757 695 (mob)*

Airport Environment Protection and Building Control Office

Appointed by the Australian Government Department of Transport and Regional Services

Ref: BNE 04 B0032

BUILDING APPROVAL – BUILDING/WORKS PERMIT

Property details

Viola Place and Serpentine Road, Brisbane Airport

Issued to

Developer or agent

Brisbane Water
TC Beirne Centre
315 Brunswick Street Mall
Fortitude Valley Qld 4006

Attn: Arnold Crowe

COPY

Builder

Leighton Contractors
Level 3, 143 Coronation Drive
Milton Qld 4064

Nature of Work	Installation of sewer pump stations and associated civil and building activity as indicated on the referenced endorsed drawings

Cost of work	$460,000.00

List of documents

Drawing No	Revision	Drawing No	Revision	Drawing No	Revision
Parsons Brinckerhoff Drawings Project No 2138110B Drawing No's 486/5/7-TR201/					
020	P2	021	P2	022	P2
023	P2	024	P2	030	P2
031	P2	032	P2	034	P2
035	P2	037	P2	040	P2
041	P1	043	P1		
Parsons Brinckerhoff Drawings Project No 2138110B Drawing No's 486/5/8-TR201 042 Revision P3					
Institute of Public Works Engineering Australia Qld Division Drawing No G-0041 Revision A					

Building Classification

Part of building works	BCA Classification	Description
Sewer pump stations and associated civil works	N/A	Installation of sewer pump station and associated infrastructure
Security Fence	Class 10b	Security fence

Completion of building works	A certificate of compliance is required to be issued by the Airport Building Controller prior to occupation/use of this building/works or part

Airport Building Controller

Name: Willie Tait

Signature: _____ Date of issue of permit: 23 August 2004

See attachment for building approval conditions.

Airport Environmental Protection and Building Control Office
PO Box 137, Hamilton Central Qld 4007 (Unit 7, 35 Qantas Drive, Eagle Farm QLD 4009)
Tel 07 3216 3040 – Fax 07 3216 3100

Building Approval Conditions. This permit is issued subject to the following conditions:

1. Any works done pursuant to this building approval shall comply with the Airports Act 1996 and the Airports (Building Control) Regulations 1996 and with any conditions or requirements imposed in accordance with the Act or Regulations. *Reason: Statutory*

2. A 'Permit to Commence Work' is required to be attained and issued by Brisbane Airport Corporation Limited prior to the commencement of any work. *Reason: To ensure the Brisbane Airport Corporation Limited consent is complied with.*

3. The building works are to be carried out in compliance with any conditions attached to the issue of the Brisbane Airport Corporation Limited 'Permit to Commence Work'. *Reason: To ensure the Brisbane Airport Corporation Limited consent is complied with.*

4. All workmanship and materials to comply with the relevant Australian Standards. *Reason: To ensure compliance with relevant Standards.*

5. Mandatory Inspections
   - The structural engineer is required to inspect and certify the construction of all structural elements associated with the building activity. The extent of and timing of inspections is to be determined by the structural engineer.
   - The final inspection is to be undertaken by the Airport Building Controller.

   Reason: To ensure compliance with relevant Standards.

6. The approval is subject to the following conditions. *Reason: To ensure compliance with relevant Standards.*
   - Electrical work must be carried out in accordance with the requirements of AS 3000.

7. Prior to issue of a Certificate of Compliance for Occupancy the following documents must be submitted to the Airport Building Controller: *Reason: To ensure compliance with relevant Standards and the Airport Lessee Company Consent.*
   a) A letter from the applicant requesting the issue of a certificate of compliance.
   b) A letter from Brisbane Airport Corporation stating that a final inspection was carried out and that the works completed are to the Corporation's satisfaction.
   c) A certificate from a Registered Practicing Structural Engineer stating that all structural components of the building have been inspected and installed in accordance with all relevant Australian design codes.
   d) A letter from the civil consultant/contractor stating that the civil works including associated drainage were carried out in accordance with the relevant specifications, codes and approved documents.
   e) A certificate from the electrical services engineer/contractor stating that all wiring installations were carried out in accordance with AS 3000.

8. The contractor shall be responsible for disconnecting and terminating any existing water, drainage, sewerage and electrical services and the works are to be carried out in accordance with the relevant codes. *Reason: To ensure public safety and compliance with relevant Standards.*

9. The contractor shall comply with the State Workplace Health & Safety and Occupational Health & Safety Legislation. *Reason: To ensure public safety and compliance with relevant Standards.*

10. The following conditions relative to environmental protection apply. *Reason: Statutory.*

    a) Construction activities must comply with the ***Airports (Environment Protection) Regulations 1997.*** The Regulations deal with issues such as runoff to surface drains, sediment loads in stormwater runoff, soil contamination, noise, dust and other air quality issues, excessive noise, ecology and cultural heritage.

    b) The contractor(s) and / or agent(s) must comply with the terms and conditions of the Construction Environmental Management Plan (CEMP) prepared by Leighton Contractors referenced Q1112 dated 27 May 2004 and any subsequent revisions.

    Particular attention should be paid to management of stormwater runoff, erosion and sediment controls, acid sulphate soils and red imported fire ants.

    c) Any environmental incident, complaint, audit, monitoring and / or inspection records produced as a result of carrying out the requirements of the CEMP mentioned above must be provided to the Airport Environment Officer by fax (07 3216 3100) as soon as possible after receipt of the information.

    d) Appropriate permits should be obtained from the Queensland Department of Primary Industries should the proposed works require the removal of mangroves.

    e) The contractor or agent must comply with the requirements under the Regulations for reporting any discovery of possible cultural heritage significance to the Brisbane Airport Corporation and the Airport Environment Officer, and the proposed management of such discoveries.

Other Issues

1. Under section 2.19 of the Airports (Building Control) Regulations the building approval has effect from the time it is granted until the end of 3 years after the grant.

2. Under the Airports (Building Control) Regulations the applicant for the approval may make application to the Administrative Appeals Tribunal to have the decision of the Airports Building Controller to impose a condition on a building approval reviewed.

3. Two sets of "as constructed' plans are to be provided to the Airport Building Controller a minimum of six months from the time of issue of the Certificate of Compliance.

Parsons Brinckerhoff

12th Floor, IBM Centre
348 Edward Street
Brisbane QLD 4000
GPO Box 2907
Brisbane QLD 4001
Australia
Telephone +61 7 3218 2222
Facsimile +61 7 3831 4223
Email brisbane@pb.com.au

ABN 84 797 323 433
NCSI Certified Quality System ISO 9001

Our Reference: 2138110B-LTR029A1ic:syg

8 June 2004

Mr Willie Tate
Airport Building Controller
Airport Environmental Protection and Building Control Office
PO Box 137,
HAMILTON CENTRE QLD 4007

Dear Mr Tate,

Building Approval Application — Australia Tradecoast Sewer Project

Please find enclosed an application for Application for Building Permit, on behalf of Brisbane Water, for construction of components of the Trade Coast Sewer Project on airport land controlled by BACL. The scope of the proposed works on airport land includes rising mains connecting to a new pump station (SP299) at Viola Place and construction of a new pump station (SP300) Serpentine Road including access from Lomandra Drive.

In support of this application, please find enclosed two copies of the following documentation:

- Application for Building Permit;
- Report in Support of Application to BACL and Airport Building Controller with appended supported drawings and documentation;
- Cheque to the value of $2,100.00 to cover the Building Application fee.

We trust that the information provided is sufficient to enable assessment of the application for consistency with regulations. If further information or clarification is required please contact Mike Hall on (07) 3218 2206 or Kate Robbins on (07) 3218 2260.

Yours sincerely

Ian Cameron

Ian Cameron
Water Executive
Parsons Brinckerhoff Australia Pty Limited

11/6/04

Encl.

Over a Century of Engineering Excellence

Airport Environment Protection and Building Control Office

Application for Building Permit

Airports Act 1996

Airports (Building Control) Regulations 1996

To Airport Building Controller

Applicants Details

Name: Brisbane Water

Postal Address: T.C. Beirne Centre, 315 Brunswick St Mall, Fortitude Valley Postcode: 4006

Contact Person: Arnold Crowe

Phone No: 3403 9608 Fax No. E-Mail AOPC5@brisbane.qld.gov.au

Description of Building Activity

Location of Works: SP 299 Viola Place
Accurate address must be provided. SP 300 Serpentine Road

Description of Works: Two Sewerage pump stations

Value of Works: $460,000.00

Duration of Works: July to December 2004.

Building Contractor: Leighton Contractors

ABN. 84 797 323 433 Registration Number:

Postal Address: Level 3, 143 Coronation Drive Milton Postcode: 4064

Project Manager: James Whybrow

Phone No: 3907 8500 Fax No. E-Mail james-whybrow@leicon.com.au

Applicant

Signature: AHCrowe Date of Application: 9/06/04

Note
Fees in accordance with Regulation 2.02 of the Airports (Building Control) Regulations must be paid on lodgement of the application.

Airport Environmental Protection and Building Control Office
PO Box 137, Hamilton Central Qld 4007 (Unit 7, 35 Qantas Drive, Eagle Farm QLD 4009)
Tel 07 3216 3040 ~ Fax 07 3216 3100

4138110B

#39

Contact Name: John Donaghy
Telephone: 3403 8888
Fax (Direct): 3407 0750
Your Ref: 2138110B-LTR01 Acc Oak

RECEIVED
18 FEB 2004

Brisbane City Council
ABN 72 002 765 795

North Regional Business Centre
Development and Regulatory Services
Customer & Community Services Division
960 Gympie Road
Chermside Qld 4032
Locked Bag 960 Virginia Qld 4014

Telephone 07 3403 8888
Facsimile 07 3407 0750

February 16, 2004

Parsons Brinckerhoff
GPO Box 2907
BRISBANE QLD 4001

Noted
JRb
18/2/04

Attn: Ian Cameron – Design Manager

Dear Sir,

NOTICE OF INTENTION TO PERFORM WORK ON ROAD
at Lytton Road Pump Station to Serpentine Road Pump Station –
Re: Australia Trade Coast Sewer Project –
Approval of Alignments for Sewerage Rising Mains

I refer to your notice, dated 10 February 2004, in which you seek permission to perform work at the above location.

The alignment for the work is to be as per Drawings submitted and any work in footways is to have a permanent level of 1:50 above the top of kerb. You are required to adopt this alignment for the full length of the proposed works.

Service Pillars or Boxes are to be placed on an alignment of 0.6m from the Real Property Alignment. If your proposal includes the placement of any RIMs, RCMs or any type of Cabinet in new subdivisions they are to be placed in parkland or in a small area of land inside the real property alignment excised by the developer.

Any variation to any of the above conditions or alignments must be authorised by the Region' s Team Leader, Licensing and Compliance, Development and Regulatory Services.

Local Area Precincts, Queen Street and Brunswick Street Malls will require separate approvals.

If you require a work zone permit, the hooding or removal of parking meters, or a road or part road closure permit you will be required to lodge a separate application. The approval to commence the proposed work does not allow you to park vehicles on footways, loading zones, bus stops or any restricted parking area.

The preferred method of laying of cables, conduits or pipes within the City of Brisbane is by boring or tunnelling.

As you are responsible for the repair of any damage that you may cause to any Council asset during this proposed work, you will be required to fully restore the asset. Repair of the asset may involve full restoration of any signature type of asset. You are also required to notify this office stating the date of repair and type of damage that has been caused to Council=s assets. You should also be aware that Council requires you to maintain any repairs to its assets for a period of not less than six (6) months from the date of notification of the repairs. Council will not accept repairs that do not conform to Council Standards.

Road trenching where necessary is to be saw cut and backfilling is to be compacted to Mod 95% AASHO before resealing. Council may require proof from you that this compaction has been attained. All roadwork is to conform to Brisbane City Council's Standard Road Patching Design Guide.

Concrete footpath is to be removed in 1m sections by saw cutting and replaced to standard drawing UMS.231 or for full width concrete footpath UMS.232. Signature and Banded Footpath is to be fully replaced. Pavers are to be lifted (not saw cut) and stored in a secure location until replaced.

Concrete kerb and channel is to be saw cut in a minimum length of 1m and replaced to standard drawing UMS.211.The use of paint for marking site locations is to be kept to a minimum and all paint marks are to be removed at the completion of work.

Where damage may occur to Council Footpath Trees, Council's Vegetation and Pest Services are to be contacted prior to commencement of work. Where damage may occur to Bushland Rehabilitation Areas, Council's Local Assets Services are to be contacted prior to commencement of work.

Driveways across footpaths are considered by Council to be privately owned by the property owner, prior to commencing any work, that may damage a private driveway, you should negotiate with the property owner and agree on the standard of repair.

It is also your responsibility to check for any heritage, vegetation or environmental listings and also to check for the location of all other Public Utility Services, and to repair any damage that may occur to any street furniture or Council asset.

Council has a policy of notifying the Ward Councillor, all residents and local businesses that may be affected by any planned works in advance of the commencement of this work. It is considered that part of your consultation process should be the same and to also notify any other person that may be affected by your proposed work.

Where work is to be performed on roads under the control of Department of Main Roads, then they are to be contacted for approval of the works, prior to the commencement of any work.

Development and Regulatory Services has no objection to you proceeding with the proposed work from the date of this letter

Yours sincerely

F. Donaghy

for John Donaghy
Licensing and Compliance Officer North
DEVELOPMENT AND REGULATORY SERVICES

PARSONS BRINCKERHOFF

Appendix B

Communications
B1 — Energex

2138110B
Noted DKL

5 June 2004

e-copy to Andrew Bamunk 7-6-04

energex

Parsons Brinkerhoff
GPO Box 2907
Brisbane QLD 4001

Attention Ian Cameron

Dear Sir

AUSTRALIA TRADE COAST SEWER PROJECT –
POWER SUPPLY FOR LYTTON ROAD PUMP STATION SP298

ENERGEX has now finalised all the arrangements regarding the installation of a 500kVA Padmount Transformer for the above development, I advise as follows;

The customers responsibilities:

- To prepare the Substation site 3.0m x 2.8m to ENERGEX Specifications. This includes the supply and installation of the culvert.
- To pay a Padmount Transformer fee of $4,400 plus $440 GST and an excess cable fee of $7,500 plus $750 GST (Total $11,900 plus $1,190GST = $ 13,090).
- To supply and install 4 x 125mm conduits from the proposed transformer site to 150mm beyond the front property boundary to ENERGEX Specifications.
- The customer's point of supply will be from the low terminals of the transformer. The maximum fault level for a 500KVA transformer is 15.7kA

Please note a tax invoice will be issued when the supply of goods or services has been completed. For tax invoice purposes, could you please provide ENERGEX with the name of whom the invoice is to be made out to, including their address and A.B.N. number etc.

INTERNATIONAL QUALITY MANAGEMENT SYSTEM

Enquiries
Robert Mitchell
Telephone
(07) 3000 6882
Facsimile
(07) 3407 5560
Email
robertmitchell@energex.com.au

Corporate Office
150 Charlotte Street
Brisbane Qld 4000
GPO Box 1461
Brisbane Qld 4001
Telephone (07) 3407 4000
Facsimile (07) 3407 4609
www.energex.com.au

ENERGEX Limited
ABN 40 078 849 055

Reference C0054564

Please find attached;

A 'Business Connection – Electricity & Gas' form, which is to be filled out by the customer and returned to this office with all other associated paperwork and payments.

A 'Metering CT Order' form, which is to be filled out by the electrician when they require the new CT's. In order for this form to be filled out in full, the customer must have first returned the above 'Business Connection – Electricity & Gas' form to obtain their new account number.

Two copies of the 'Proposed Electricity Supply Arrangements' form, which summarises the supply arrangements including dates and explains the customer's responsibilities. Please read this form, sign one copy and return it to this office with all other associated paperwork and payments.

ENERGEX has nominated a target date for supply of the 30/09/2004. To achieve this target the substation site is to be ready by the 10/09/2004 for inspection. All paperwork and payments are to be received at our Greenslopes Office by the 30/07/2004.

The transformer will be placed on site on the 17th of September 2004, the electrician has the week from the 17th of September 2004 to the 24th of September 2004 to pull their consumer mains into the transformer whilst the transformer is de-energised. After the transformer is energised on the 24th of September 2004, the electrician will need to pay for a safety observer to open the transformer, over see their work, and then close the substation on completion.

Should you require any further information regarding the above, please do not hesitate to contact myself on telephone (07) 3000 8882.

Yours sincerely

Robert Mitchell
Planning Officer

energex
160 Charlotte Street Brisbane 4000
GPO Box 1461 Brisbane Queensland 4001

Proposed Electricity Supply Arrangements
Industrial and Commercial Customers requiring a Substation Site

Project				
Reference Numbers	ENERGEX - C0054584	Location – Greenslopes Depot		
Project Name	Australia Trade Coast Sewer Project – SP299			
Location of Project	Lytton Rd, Hemmant			
Real Property Description	Lot 715 on SP110610			
Customer Details				
Name of Customer (please print)				
Customer's Representative	Parsons Brinckerhoff			
Telephone Number	3218 2222		**Facsimile Number**	3831 4223
Address	GPO Box 2907			
	Brisbane QLD 4001			
Contact Person (please print)	Ian Cameron			
Exist Account No.(s)				
Supply Information				
Type of Industry or Purpose of Building				
AS 3000 Calculated Demand	500kVA		**Estimated Demand**	500KVA
Size of Largest Motor / Special Apparatus	kW			
Location of Substation	Located as per ENERGEX fax dated 19-04-2004			
Type of Substation	Padmount Transformer			
Major ENERGEX Equipment and Rating	Initially	500kVA	Ultimately	500kVA
High Voltage Method of Supply	From	the existing underground mains in Lytton Road.	To	to the RMU inside the proposed padmount transformer.
Low Voltage Circuits	To Customer	ONE		
	To ENERGEX Network	Up to three.		
Metering Type (High Voltage / Low voltage)	Low			
Customer to install/uprate metering CT's (yes/no)	Yes			
Customer's Point of Supply (Customer's Terminals)	is the LV terminals of the transformer			
Possible Fault Level at Customer's Point of Supply	15.7kA at 433V			
Customer to Carry Out	Preparation of substation site as per ENERGEX Specifications. Install 4 x 125mm conduits from the proposed padmount transformer site to 150mm beyond the front property boundary to ENERGEX Specifications.			
Customer to Bear Cost of	All costs to prepare the substation site including the supply of the culvert. The cost to supply and install the conduits. A transformer fee of $4,400 plus $440 GST and excess cable fee of $7,500 plus $750 GST (Total $13,090). Any work required outside normal working hours.			

	Type	Name	Telephone No.	Facsimile No.
ENERGEX Contacts	Design	Rob Mitchell	(07) 3000 8882	(07) 3407 6660
	Metering/Inspection of Customer's Installation	Gary McCormick	(07) 3407 6606	(07) 3407 6800
	Construction and Transformer Delivery	Rob Mitchell	(07) 3000 8882	(07) 3407 6660

Relevant Drawings	*Enclosed		
Application for Supply	*To be lodged	**Date Lodged**	/ /
Date Supply Required	30/09/2004		

* Cross out where not applicable

To be completed by ENERGEX

ENERGEX will proceed with detailed planning for supply to the above project after receipt of acceptance of the supply arrangements as set out in this form and the drawings above.

Note: If this is a new account, the customer is required to apply for electricity supply and provide the relevant security deposit before electricity supply can be connected to the property. This can be done by telephoning ENERGEX's Call Centre on telephone number 13 12 53. Please quote ENERGEX project number D1401385 when making application for supply.

Nothing contained herein or shown on the drawings absolves the customer from obtaining building approval for the proposed substation from the relevant Authority.

Under the provisions of the Electricity Act 1994 -

1 the space necessary for and suitable to the erection of a substation shall be provided free of cost to ENERGEX
2 right-of-way for electricity lines and cables and access to install, maintain and remove its equipment without hindrance or obstruction shall be available at all times to ENERGEX
3 maintenance and repair of the substation space including building structure to the requirements of ENERGEX shall be the responsibility of the Customer

The Customer shall make the transformer site ready for inspection by the date nominated and is required to notify ENERGEX to arrange a site inspection. Failure of the site to pass inspection or be ready by the required date may delay the supply availability date.

Details of the time and date of delivery will be negotiated between the Customer and ENERGEX's representative after the site has passed inspection. A minimum period of five (5) working days shall be allowed for delivery to the site. ENERGEX estimate that supply will be made available within 10 working days of delivery of the transformer(s) to site.

Once the transformer has been placed on site, the customer's electrician will have 5 working days, prior to energising of the transformer, to pull the consumers mains into the transformer. If the electrician fails to install the consumer's mains into the transformer prior to energising of the transformer, ENERGEX will require the electrician to engage an approved safety observer at their cost. The safety observer will open the transformer, oversee the task and close the transformer on completion of works.

Name (please print)	Rob Mitchell
Position (please print)	Electrical Paraprofessional
Signature (for Chief Executive)	**Date** 05/06/2004

To be completed by the Customer or Customer's Representative

I, on behalf of the Customer specified in this document, accept the electricity supply arrangement as described in the above information. I confirm that the substation site will be completed to ENERGEX's requirements and ready for inspection by ENERGEX on 10/09/2004. Taking into account the lead times required by ENERGEX, I also confirm that the "Date Supply Required" 30/09/2004.

Name (please print)	
Position (please print)	
Organisation	
Signature	**Date** / /

03/06/2004 11:03 ENERGEX PLANNING/DESIGN → 038314223 NO.442 D01

3/6/04
Noted
SAB
213110 B

energex

Attention	Ian Cameron
Company	Parsons Brinckerhoff
Fax Number	(07) 3831 4223
Date	3 June 2004 **Number of Pages** 1
Subject	Expected Fault Level - Viola Place Pump Station

Dear Ian

With regard to your request for the expected fault level at Viola place I advise that:

Fault Level for a 500kVA Transformer: 15.7kA at 433V

Yours sincerely

Chris Allan

Chris Allan
Design Technical Officer

for General Manager Asset Services

Copy to Dickson
Allan 3/6/04.

INTERNATIONAL QUALITY MANAGEMENT SYSTEM

Enquiries
Chris Allan
Telephone
(07) 3407 5808
Facsimile
(07) 3407 5853
Email
chrisallan
@energex.com.au

Asset Services
524 Wilsen Road
Geebung Qld 4034

Corporate Office
150 Charlotte Street
Brisbane Qld 4000
GPO Box 1461
Brisbane Qld 4001
Telephone 07 3407 4000
Facsimile 07 3407 4609
www.energex.com.au

ENERGEX Limited
ABN 40 078 849 055

Ian Cameron

SP299 - Vida Place 07 JUN 2004

1146 12.11.2002

energex

Wayleave Number

Consent to the Erection of Electric Line

Owner and Property Details (please print)

Owner (provide full name/s)

Company Name (if applicable) BRISBANE CITY COUNCIL

Postal Address

Postcode

Contact Telephone No.

Property Description **Lot No.** 30 **Plan No.** (RP, CH etc) RP895254

Parish **County**

Owner's Consent

I/we the owners/s of the property described above, **for the consideration of Two Dollars paid to the Owner(s) hereby consent to** the construction by ENERGEX in pursuance of the Electricity Act and Electricity Regulation 1994, of an electric line as defined by the said Act through or across the above property, involving the erection/installation of –

- ☒ Installation of Plant (transformers, A/B Switches etc); ☒ Four Poles
- ☐ Additional Cables on existing poles ☐ Ground Stays
- ☐ The Removal of timber and/or provision of access tracks ☐ Crossings (Service Cable and/or Mains)
- ☐ Other (please describe) –

I/We clearly understand and agree that –

1 ENERGEX, its employees or contractors, will have the right of access at any time for the purpose of maintenance of the said line and for any subsequent re-clearing of all timber and regrowth in proximity to the line.

2 ENERGEX is to remain liable for all accidents, damages and injuries by reason of the said electric line as provided by law.

3 All aforementioned poles, cables or other electrical installations erected on the land always remain the property of ENERGEX.

4 This consent will not be withdrawn without the agreement of ENERGEX.

It is the owner's responsibility to inform any lessee's or occupier's of this property of the existence of this agreement.

Special Conditions –

Owner's Signature(s) **Date** / /

Witness

Name (please print)

Signature **Date** / /

ENERGEX Use Only	
Site Address	**Locality**
Site ID's applicable to this wayleave (eg Pxxxx, SPxxxx etc)	**Project Number**
	Date original sent to Corporate Office / /
	ENERGEX Contact Name

27/05/2004 15:33 ENERGEX PLANNING/DESIGN → 038314223 NO.390 001

POWER SUPPLY:- END OCT 2004

energex

Attention	IAN CAMERON
Company	PARSONS BRINCKERHOFF
Fax Number	(07) 3831 4223
Date	27 May 2004 **Number of Pages** 3
Subject	VIOLA PLACE PUMP STATION SUPPLY

Dear Ian

With regard to your request for supply to the Viola Place Pump station, I advise the following.

Works Required:

Erect 3 x 11kV poles to extend 11kV mains to new PT station.

Erect 1 x 500kVA Pole mounted transformer.

Replace 1 x 11kV pole

String 4 spans of 11kV open wire mains.

Erect 2 x 95mm Bundle service to property pole installed by customer.

Associated 11kV overhead works

No customer contribution is required for these works.

At present a lead-time of approximately 20 weeks may be required before construction is commenced, however every effort will be made to minimise this time frame where possible.

Please note that this offer is valid for a period of 60 days only. ENERGEX reserves the right to withdraw this offer should approvals from statutory authorities to complete the work be withheld and/or the offer period lapses.

INTERNATIONAL QUALITY MANAGEMENT SYSTEM

Enquiries
Chris Allan
Telephone
(07) 3407 5808
Facsimile
(07) 3407 5853
Email
chrisallan
@energex.com.au

Asset Services
524 Bilsen Road
Geebung Qld 4034

Corporate Office
150 Charlotte Street
Brisbane Qld 4000
GPO Box 1461
Brisbane Qld 4001
Telephone 07 3407 4000
Facsimile 07 3407 4609
www.energex.com.au

ENERGEX Limited
ABN 40 078 849 055

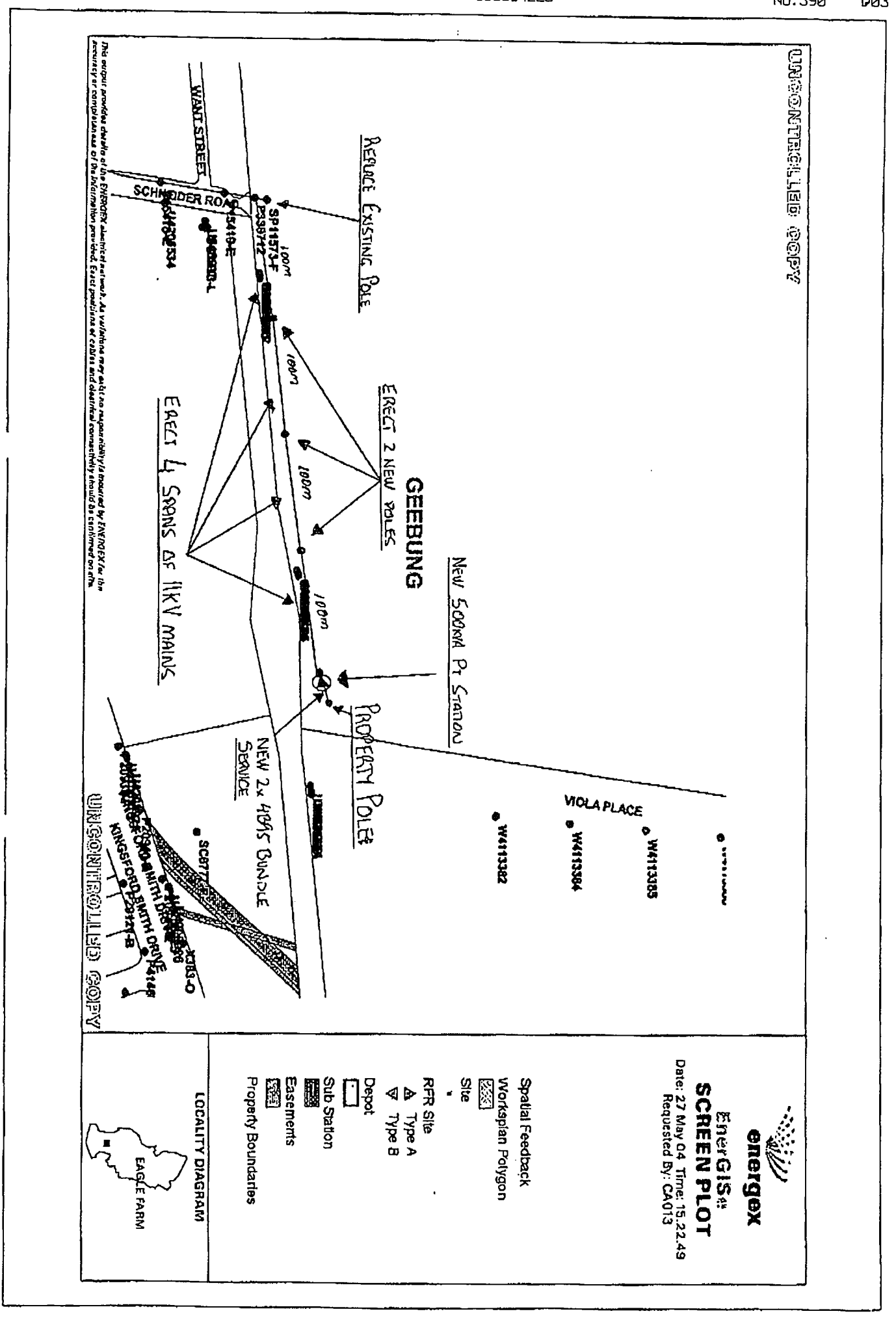
To proceed with this project please fax your decision to me (07) 3407 5853 as soon as possible so that the work can be scheduled.

Should you have any further questions regarding this matter, please call me on (07) 3407 5805.

Yours sincerely

Chris Allan
Design Technical Officer

for General Manager Asset Services


UNCONTROLLED COPY
REMOVE EXISTING POLE
ERECT 2 NEW POLES
GEEBUNG
NEW 500KVA PT STATION
ERECT 4 SPANS OF 11KV MAINS
PROPERTY POLE
NEW 2x 4C/S BUNDLE SERVICE
VIOLA PLACE
WANT STREET
SCHNEIDER ROAD
KINGSFORD SMITH DRIVE
100m
100m
100m
W4113382
W4113384
W4113385
energex
EnerGIS
SCREEN PLOT
Date: 27 May 04 Time: 15.22.49
Requested By: CA013
Spatial Feedback
Worksplan Polygon
Site
RFR Site
Type A
Type B
Depot
Sub Station
Easements
Property Boundaries
LOCALITY DIAGRAM
EAGLE FARM
UNCONTROLLED COPY

Ian Cameron

SP299 - Vida Place 07 JUN 2004

1146 12.11.2002

energex

Wayleave Number

Consent to the Erection of Electric Line

Owner and Property Details (please print)

Owner (provide full name/s)

Company Name (if applicable) BRISBANE CITY COUNCIL

Postal Address

Postcode

Contact Telephone No.

Property Description **Lot No.** 30 **Plan No.** (RP, CH etc) RP895254

Parish **County**

Owner's Consent

I/we the owners/s of the property described above, **for the consideration of Two Dollars paid to the Owner(s) hereby consent to** the construction by ENERGEX in pursuance of the Electricity Act and Electricity Regulation 1994, of an electric line as defined by the said Act through or across the above property, involving the erection/installation of –

- ☒ Installation of Plant (transformers, A/B Switches etc); ☒ Four Poles
- ☐ Additional Cables on existing poles ☐ Ground Stays
- ☐ The Removal of timber and/or provision of access tracks ☐ Crossings (Service Cable and/or Mains)
- ☐ Other (please describe) –

I/We clearly understand and agree that –

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Special Conditions –

Owner's Signature(s) **Date** / /

Witness

Name (please print)

Signature **Date** / /

ENERGEX Use Only	
Site Address	**Locality**
Site ID's applicable to this wayleave (eg Pxxxx, SPxxxx etc)	**Project Number**
	Date original sent to Corporate Office / /
	ENERGEX Contact Name

PARSONS BRINCKERHOFF

Appendix C

Design Calculations SP299

Parsons Brinckerhoff Australia ABN. 84 797 323 433

REVISION RECORD

Document Type:	PB Document Name:	Page
DESIGN CALCULATIONS	**SP 299 Design**	Cover

Document Title:	Rev.:
SP 299 (Viola Pl) DESIGN CALCULATIONS	**1.9**

Rev No.	Prepared Initials & Date	Verified Initials & Date	Approved Initials & Date (Effective Date)	Description
0.0	MB 22-May-03			Initial issue
0.1	MB 1-Jun-03			Flotation calcs added
0.2	Not used			Not used
0.3	MB 23-Jun-03			For Tender
1.0	MB 28-Jan-04			Start of Detailed Design
1.1	MB 4-Feb-04			DN1370 RM duty modified
1.2	MB 16-Feb-04			Pipe and Valve arrangement modified
1.3	MB 21-Feb-04			Top levels modified
1.4	MB 5-Mar-04			Issue for Pump Selection Report
1.5	MB 31-Mar-04			Reduced size delivery calcs added
1.6	MB 14-Apr-04			Hidrostal pump curves added
1.7	MB 8-Jun-04			Levels checked against dwgs
1.8	MB 25-Jun-04			Manufacturer's curves added
1.9	IC 18-Sep-04			Revised location and levels

Project Use

Notes:

Client:	Client Project No:	Client Rev.:
Brisbane Water		
Plant Area: **SP 299 - Viola Place Pinkenba**	Client Doc No:	
Superintendent: Rod Richards	Project Name: **Australia Trade Coast Sewerage Project**	
PB Project Manager: Ian Cameron		
The information contained in this document is subject to Copyright and may not be copied or otherwise used without the express authority of PB	PB Project No.: **2138110B**	

I:\2138110B Trade Coast Sewerage post-Award\WORK\Pumping Stations\SPS 299 Viola Place\[SP 299 Design Rev 1.9.xls]Water Properties

Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Australia Trade Coast Sewerage Project
PB Job Code: 2138110B

Comments and Questions

9/05/2003
Design friction factors based on Sydney Water's design values for sewage rising mains

material	k value
MSCL / DICL	0.60 mm
PE	0.15 mm

9/05/2003
Initial friction factors based on AS2200 values for sewage rising mains

material	k value
MSCL / DICL	0.03 mm
PE	0.003 mm

15/05/2003
Brisbane Water - Water and Sewerage Standards

2.1.2.1	PWWF of 1200L/ep.day two pumps - one duty one standby three pumps - two duty one standby
2.1.2.2	Types of pumps standardised. Info available from BCC.
2.1.2.3	Std overflows required. Preferably off incoming sewer.
2.1.2.5	Minimum 10m x 10m area. Access road min 4m wide, all weather, heavy vehicles Fenced and landscaped.
2.1.3.1	Preferable velocity 0.9m/s to 1.5m/s. Min 0.6m/s, max 3.0m/s.
2.1.3.3	Bedding to comply with reqts for DICL gravity sewers.
2.1.3.4	Rising mains to be located in road verge or road pavement. Minimum easement width 6m.
2.1.3.5	Cover 600mm - but check Table 2.9 for other reqts.
2.1.3.6	Air valves -std dwg SB006
2.1.3.7	Scours - std dwg SB005
2.1.3.8	Discharge MH - std dwg SC005 Not in private property.

2.1.8	Dwg stds
2.2.7	Accredited pipe laying programmes Metal detector tapes on plastic pipes
2.2.10.4	Pipe testing
2.3.2	Pipe, valve and fitting materials
2.3.3	Manhole construction

28/01/2004

PS to be relocated slightly and to discharge directly into the Eagle Farm rising mains.
Duty points to be calculated from Eagle Farm hydraulics spreadsheet.

Need to include high and low system curves to check variable speed performance with direct entry into high pressure and low pressure mains

16/02/2004

Pump delivery system modified to incorporate separate pipes going to each large diameter rising main.
Should the isolation valves on the large RMs be upgraded to sluice valves due to the criticality of their purpose?

21/02/2004

The top level of the structures should be 300mm above the road level in accordance with BW's comments. This will bring the top of concrete of the structures up to around RL4.20m

4/03/2004

All head loss calcs checked against ITT Flygt Colebrook White calculator in FLYPS.

8/06/2004

PS levels checked against drawing.

18/09/2004

Revised pump station location and top slab level

Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Australia Trade Coast Sewerage Project
PB Job Code: 2138110B

Entered
Calculated

SUMMARY OF DUTY FOR SP 299

SP 299 - Viola Place

Design PWWF (Tender Docs)	104.0 L/s	per duty pump
Total Flow (Tender Docs)	**104.0 L/s**	maximum duty flow
Static Head (from Pump Calcs)	**50.1 m**	effective residual into DN1370 main with full EFPS flow
Design Total Head (from Pump Calcs)	**54.7 m**	104L/s into DN1370 main with full EFPS flow
Low Duty Head	**12.1 m**	104L/s into DN1840 main with no EFPS flow

Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Australia Trade Coast Sewerage Project
PB Job Code: 2138110B

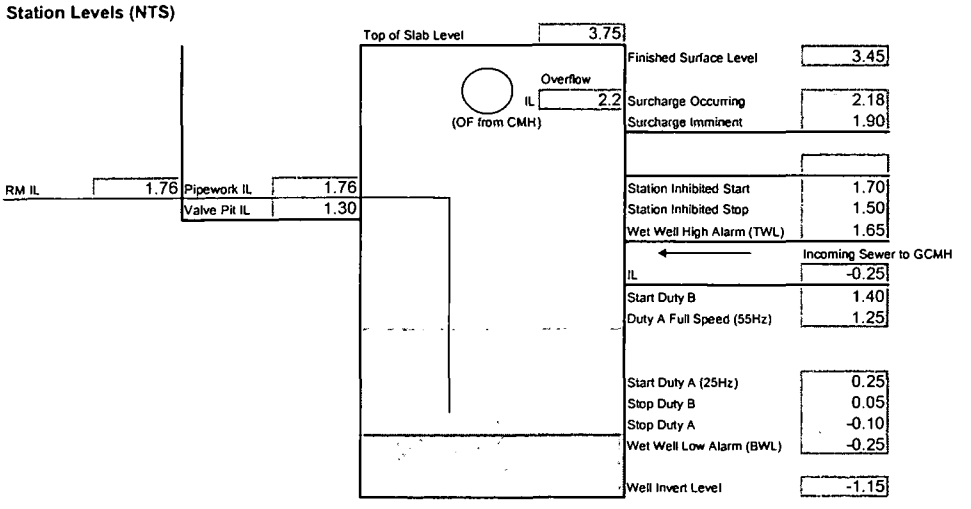
Entered
Calculated

SP 299 DIMENSIONS AND LEVELS (Datum is AHD)

Proposed SP 299	Source	Design Values
Wet Well Internal Diameter	PB	3.60 m
Max Water Depth: OF Level to SPS Floor	calc	3.35 m
Total Depth: FSL to Underside of Base	calc	3.75 m
Incoming "Sewer" Diameter (to GCMH)	ID375 OICL (gravity grade for 121L/s is min 1:64)	357 mm
Rising Main Diameter	OD315 PE100 PN12.5	315 mm
Discharge Pipe and Valve Diameter	velocity < 3m/s at ultimate flow from single pump (121L/s)	250 mm
Switchgear Level	150mm above top slab	3.90 RL
Roof Slab - Finished Level	300mm above road level	3.75 RL
Roof Slab - Underside	estimate 350 thick - structural designer to confirm	3.40 RL
Finished Surface Level	survey shows edge of road at RL3.90	3.45 RL
Flood Level	TBA - use FSL	3.45 RL
Physical Overflow Level (OF)	dwg 011	2.20 RL
Surcharge Occurring Level	25 below OF	2.18 RL
	dwg 011	RL
Incoming "RMs" to CMH - Invert	depth driven by cover on overflow - see cross section 011	1.65 RL
Surcharge Imminent Alarm Level	300 below OF	1.90 RL
Station Inhibited Start Level	200 below Surcharge Imminent	1.70 RL
Discharge Pipework - Invert Level	dwg 011 - approx 400mm above valve pit floor	1.76 RL
Rising Main - Invert Level	dwg 011	1.76 RL
Station Inhibited Stop Level	200 below Station Inhibited Start	1.50 RL
Wet Well High Alarm (TWL)	400 above Duty A Full Speed	1.65 RL
Incoming Sewer to GCMH - Invert Level	dwg 011	1.55 RL
Start Duty B (55Hz)	150 above Duty A Full Speed	1.40 RL
Valve Pit Floor - Invert Level	2100mm below underside of roof slab	1.30 RL
Duty A Full Speed (55Hz)	300 below incoming sewer	1.25 RL
Grit Collector - Invert Level	900mm below incoming sewer - dwg 25 - S24	0.65 RL
Start Duty A (25Hz)	1000mm below Duty A Full Speed	0.25 RL
Stop Duty B	150 above Stop Duty A	0.05 RL
Stop Duty A	GOAL SEEK THIS TO GIVE 15 STARTS PER HOUR ON DUTY PUMP	-0.10 RL
Wet Well Low Alarm (BWL)	150 below Stop Duty A	-0.25 RL
Required Pump Submergence	conservative Hidrostal submergence (Flygt 680mm)	0.90 m
Wet Well - Invert Level	BWL less submergence	-1.15 RL

Flotation Calcs:	
Top Level of Roof Slab	from above
Roof Slab Thickness	assume 350mm
Diameter of Roof Slab	well ID + 2 x wall thickness
Mass of Roof	calc at 2400kg/m3
Wall Thickness	assume 300mm
Depth of Walls (excluding roof and floor)	calc
Mass of Walls	calc at 2400kg/m3
Floor Slab Thickness	change this by goal seek (see below)
Mass of Floor	calc at 2400kg/m3
Total Concrete Mass	calc at 2400kg/m3
Total Volume of Structure	volume of wet well
Total Mass of Water Displaced	assume 1000kg/m3
Net Buoyancy (positive down)	GOAL SEEK THIS TO ZERO BY CHANGING FLOOR THICKNESS
Underside of Structure	calc

Station Levels (NTS)



Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Trade Coast Sewerage D&C
PB Job Code: 2138110B

DYNAMIC LOSS CALCULATION — DN200 DICL K12
Pump Discharge Pipework (DN200 sections)

Flow rate	374.4	m3/hr	0.10	m3/s	Flowrate 104.0 L/s
Pipe internal diameter	**204.0**	mm	0.20	m	**single pump flow (2031)**
Surface area	0.033	m2	8	inch	**pipes for Ultimate (121 L/s)**
Water velocity	3.182	m/s	0.0006	m	
Reynolds Number	645,231.13				
Roughness coefficient	**0.600**	mm	1.01E-06	m2/s	
Equivalent length of pipe	**0**	m			
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	66.37	m/km			
Pipe dynamic loss	**0.00**	m			

Component fitting losses:	k value	fitting loss		
90 degree bend R=1D	0.75	0.39	m	check formulae when inserting rows
taper 200 / 250	0.03	0.02	m	
		0.00	m	
		0.00	m	
		0.00	m	
Total component losses		**0.40**	m	

Total dynamic loss in section 0.40 m

DYNAMIC LOSS CALCULATION — DN250 DICL K12
Pump Discharge Pipework (DN250 sections)

Flow rate	374.4	m3/hr	0.10	m3/s	Flowrate 104.0 L/s
Pipe internal diameter	**256.0**	mm	0.26	m	**single pump flow**
Surface area	0.051	m2	10	inch	
Water velocity	2.021	m/s	0.0006	m	
Reynolds Number	514,168.55				
Roughness coefficient	**0.600**	mm	1.01E-06	m2/s	
Equivalent length of pipe	**5**	m			
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	20.13	m/km			
Pipe dynamic loss	**0.10**	m			

Component fitting losses:	k value	fitting loss		
90 degree bend R=1D	0.75	0.16	m	pipe take off is for the most hydraulically disadvantaged configuration
check valve (John Fig. 404)	0.70	0.15	m	check formulae when inserting rows
gate valve (John Fig 694)	0.11	0.02	m	
tee - line to branch	0.80	0.17	m	
tee - branch to line	0.80	0.17	m	
knifegate valve	0.00	0.00	m	
check valve (John Fig. 404)	0.70	0.15	m	
		0.00	m	
Total component losses		**0.80**	m	

Total dynamic loss in section 0.90 m

DYNAMIC LOSS CALCULATION — OD315 PE100 PN12.5
DN315 Rising Main

Flow rate	374.4	m3/hr	0.10	m3/s	Flowrate 104.0 L/s
Pipe internal diameter	**268.0**	mm	0.27	m	**single pump flow**
Surface area	0.056	m2	11	inch	
Water velocity	1.844	m/s	0.0002	m	
Reynolds Number	491,146.08				
Roughness coefficient	**0.150**	mm	1.01E-06	m2/s	
Equivalent length of pipe	**259**	m	from CMBK long sections 14/4/04		
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	11.66	m/km			
Pipe dynamic loss	**3.02**	m			

Component fitting losses:	k value	fitting loss		
		0.00	m	check formulae when inserting rows
		0.00	m	
		0.00	m	
		0.00	m	
		0.00	m	
Total component losses		**0.00**	m	

Total dynamic loss in section 3.02 m

DYNAMIC LOSS CALCULATION — DN300 DICL K12

DN300 Cut In Section

Flow rate	374.4	m3/hr	0.10	m3/s	**Flowrate** 104.0 L/s
Pipe internal diameter	313.0	mm	0.31	m	**single pump flow**
Surface area	0.077	m2	12	inch	
Water velocity	1.352	m/s	0.0006	m	
Reynolds Number	420,534.02				
Roughness coefficient	0.600	mm	1.01E-06	m2/s	
Equivalent length of pipe	0	m			
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	7.02	m/km			
Pipe dynamic loss	0.00	m			

Component fitting losses:	k value	fitting loss		
90 degree bend R=1D	0.75	0.07	m	check formulae when inserting rows
90 degree bend R=1D	0.75	0.07	m	
gate valve (John Fig 694)	0.11	0.01	m	
tee - branch to line - sharp	1.20	0.11	m	
		0.00	m	
Total component losses		0.26	m	

Total dynamic loss in section	0.26	m

PUMP DUTY CALCULATION — SP299 Viola Place Eagle Farm

Operating BWL in SPS	(0.1)	RL	Stop Duty A level in SPS Dimensions and Levels
Residual HGL in discharge main	50.0	RL	check latest version of EFPS 1370RM Hydraulics
Static head	50.1	m	
Total dynamic loss in suction	0.0	m	submersible station
Total dynamic loss in discharge	4.6	m	
Pump duty head	54.7	m	
Pump efficiency	72	percent	
Pump shaft power	77	kW	
Selected pump	Hidrostal H05K		

NPSH CALCULATION — SP299 Viola Place Eagle Farm

NPSHa = Static head at the inlet + surface pressure head - the vapor pressure of your product - the friction losses in the suction piping, valves and fittings.

Pump centreline	(0.2)	RL	nominally 100mm below Stop Duty A
BWL on suction side	(0.1)	RL	Stop Duty A
Surface pressure head	10.3	m	normal atmospheric pressure 10.34m
Temperature	20	deg. C	
Vapour pressure	0.2	m	
Loss in suction	0.0	m	submersible station
NPSH Available	10.2	m	
NPSH Required	1.5	m	from pump curve at the operating point
Safety Margin	8.7	m	positive is OK (prefer >1)

High System Curve

Single Pump Flow L/s	Duty Head m
	54.7
1	50.1
10	50.2
20	50.3
30	50.5
40	50.8
50	51.2
60	51.7
80	52.8
100	54.3
104	54.7
110	55.2
120	56.2
140	58.4
160	60.8

Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Trade Coast Sewerage D&C
PB Job Code: 2138110B

DYNAMIC LOSS CALCULATION — DN200 DICL K12
Pump Discharge Pipework (DN200 sections)

Flow rate	374.4	m3/hr	0.10	m3/s	**Flowrate** 104.0 L/s
Pipe internal diameter	**204.0**	mm	0.20	m	**single pump flow (2031)**
Surface area	0.033	m2	8	inch	**pipes for Ultimate (121 L/s)**
Water velocity	3.182	m/s	0.0006	m	
Reynolds Number	645,231.13				
Roughness coefficient	**0.600**	mm	1.01E-06	m2/s	
Equivalent length of pipe	**0**	m			
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	66.37	m/km			
Pipe dynamic loss	**0.00**	m			

Component fitting losses:	k value	fitting loss		
90 degree bend R=1D	0.75	0.39	m	check formulae when inserting rows
taper 200 / 250	0.03	0.02	m	
		0.00	m	
		0.00	m	
		0.00	m	
Total component losses		**0.40**	m	

Total dynamic loss in section 0.40 m

DYNAMIC LOSS CALCULATION — DN250 DICL K12
Pump Discharge Pipework (DN250 sections)

Flow rate	374.4	m3/hr	0.10	m3/s	**Flowrate** 104.0 L/s
Pipe internal diameter	**256.0**	mm	0.26	m	**single pump flow**
Surface area	0.051	m2	10	inch	
Water velocity	2.021	m/s	0.0006	m	
Reynolds Number	514,168.55				
Roughness coefficient	**0.600**	mm	1.01E-06	m2/s	
Equivalent length of pipe	**5**	m			
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	20.13	m/km			
Pipe dynamic loss	**0.10**	m			

Component fitting losses:	k value	fitting loss		
90 degree bend R=1D	0.75	0.16	m	check formulae when inserting rows
check valve (John Fig. 404)	0.70	0.15	m	
gate valve (John Fig 694)	0.11	0.02	m	
tee - line to branch	0.80	0.17	m	
tee - branch to line	0.80	0.17	m	
knifegate valve	0.00	0.00	m	
check valve (John Fig. 404)	0.70	0.15	m	
		0.00	m	
Total component losses		**0.80**	m	

Total dynamic loss in section 0.90 m

DYNAMIC LOSS CALCULATION — OD315 PE100 PN12.5
DN315 Rising Main

Flow rate	374.4	m3/hr	0.10	m3/s	**Flowrate** 104.0 L/s
Pipe internal diameter	**268.0**	mm	0.27	m	**single pump flow**
Surface area	0.056	m2	11	inch	
Water velocity	1.844	m/s	0.0002	m	
Reynolds Number	491,146.08				
Roughness coefficient	**0.150**	mm	1.01E-06	m2/s	
Equivalent length of pipe	**269**	m			from CMBK long sections 14/4/04
Temperature	20	deg. C			
Kinematic viscosity	1.006	m2/s			
Hydraulic gradient	11.66	m/km			
Pipe dynamic loss	**3.14**	m			

Component fitting losses:	k value	fitting loss		
		0.00	m	check formulae when inserting rows
		0.00	m	
		0.00	m	
		0.00	m	
		0.00	m	
Total component losses		**0.00**	m	

Total dynamic loss in section 3.14 m

DYNAMIC LOSS CALCULATION — DN300 DICL K12

DN300 Cut In Section

Flow rate	374.4	m3/hr	0.10	m3/s	**Flowrate**	104.0 L/s
Pipe internal diameter	313.0	mm	0.31	m	**single pump flow**	
Surface area	0.077	m2	12	inch		
Water velocity	1.352	m/s	0.0006	m		
Reynolds Number	420,534.02					
Roughness coefficient	0.600	mm	1.01E-06	m2/s		
Equivalent length of pipe	0	m	length is an estimate only			
Temperature	20	deg. C				
Kinematic viscosity	1.006	m2/s				
Hydraulic gradient	7.02	m/km				
Pipe dynamic loss	0.00	m				

Component fitting losses:	k value	fitting loss		
90 degree bend R=1D	0.75	0.07	m	check formulae when inserting rows
90 degree bend R=1D	0.75	0.07	m	
gate valve (John Fig 694)	0.11	0.01	m	
tee - branch to line - sharp	1.20	0.11	m	
		0.00	m	
Total component losses		0.26	m	

Total dynamic loss in section 0.26 m

PUMP DUTY CALCULATION — SP299 Viola Place Eagle Farm

Operating BWL in SPS	(0.1)	RL	Stop Duty A level in SPS Dimensions and Levels
Residual HGL in discharge main	7.3	RL	static level at inlet to LPWWTP with no flow down DN1840
Static head	7.4	m	
Total dynamic loss in suction	0.0	m	submersible station
Total dynamic loss in discharge	4.7	m	
Pump duty head	12.1	m	
Pump efficiency	70	percent	
Pump shaft power	18	kW	
Selected pump	Hidrostal H05K		

NPSH CALCULATION — SP299 Viola Place Eagle Farm

NPSHa = Static head at the inlet + surface pressure head - the vapor pressure of your product - the friction losses in the suction piping, valves and fittings.

Pump centreline	(0.2)	RL	nominally 100mm below Stop Duty A
BWL on suction side	(0.1)	RL	Stop Duty A
Surface pressure head	10.3	m	normal atmospheric pressure 10.34m
Temperature	20	deg. C	
Vapour pressure	0.2	m	
Loss in suction	0.0	m	submersible station
NPSH Available	10.2	m	
NPSH Required	1.5	m	from pump curve at the operating point
Safety Margin	8.7	m	positive is OK (prefer > 1)

Low System Curve

Single Pump Flow L/s	Duty Head m
	12.1
1	7.4
10	7.5
20	7.6
30	7.8
40	8.1
50	8.5
60	9.0
80	10.2
100	11.8
104	12.1
110	12.7
120	13.7
140	15.9
160	18.4

Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Australia Trade Coast Sewerage Project
PB Job Code: 2138110B

MAXIMUM PUMP STARTS CALCULATION - SP 299

Duty Pump Rate	60	l/s	enter min flow for pump starts from Hidrostal curves
		l/s	
Inflow rate	30	l/s	worst case inflow = half duty pump discharge rate
Wet well diameter	3.60	m	from SPS dimensions and levels
Wet well benching width			not used for circular wells
Wet well benching length			not used for circular wells
Effective wet well area	10.18	m2	calculated
Start Duty A (25Hz)	0.25	m	from SPS dimensions and levels
Stop Duty A	-0.10	m	from SPS dimensions and levels

Wet well plan area	10.2	m^2	1.979 1.979	from wet well dimensions above
Duty Pump Pumping Rate	60	l/s	0	from above
Time for one pumping cycle	4.0	*minutes*		goal seek this to 4 minutes by changing Stop Duty A on SPS dimensions and levels
giving a total of	15	*pump starts per hour*		**adopt 15 starts per hour for this PS as they occur at min speed**
*** Total average pump running time**	30	*minutes per hour*		calcutated

* The total pump running time is the average time per hour a pump is running
In alternating duty/standby systems each pump will run for half the total running time

Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Australia Trade Coast Sewerage Project
PB Job Code: 2138110B

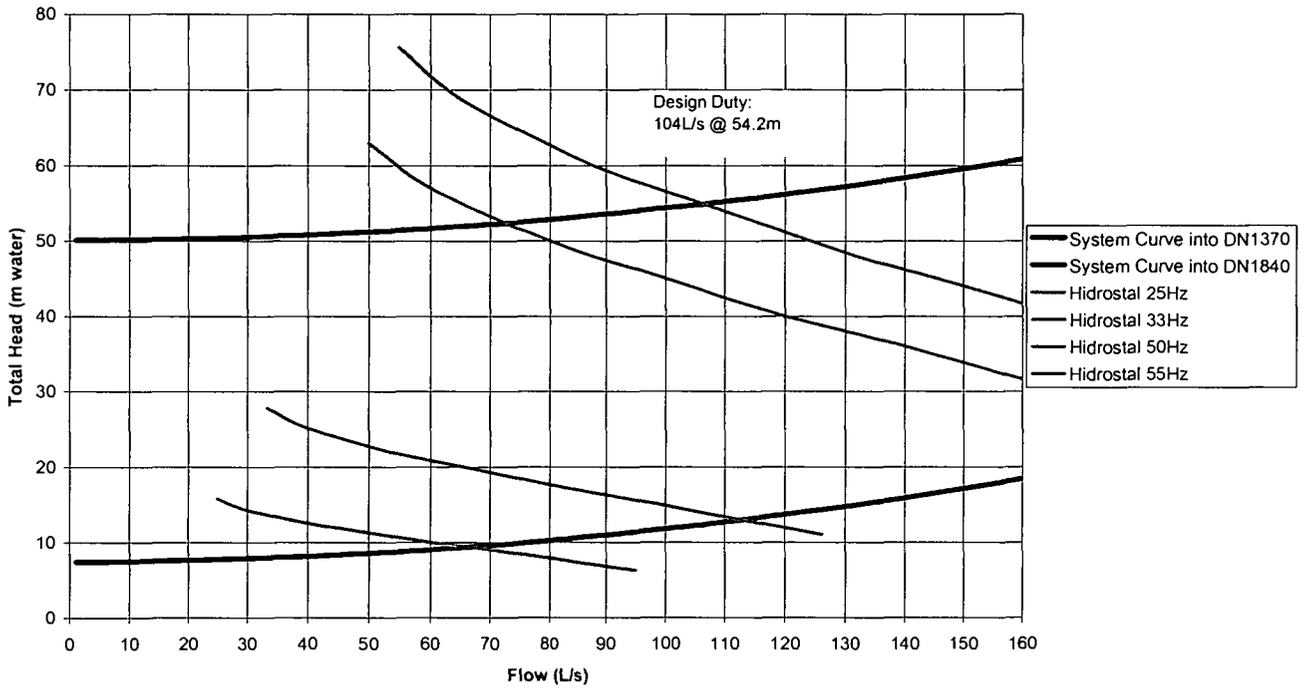
PERFORMANCE CURVE DATA
SP 299 - Viola PI

Pump Type	Hidrostal H05K-S01R
Curve No.	83-K3022c
Imp. Diameter.	
Rated Power	110 kW

derived from spreadsheet provided by Weir

Hidrostal 25Hz		Hidrostal 33Hz		Hidrostal 50Hz		Hidrostal 55Hz	
L/s	Total Hd	L/s	Total Hd	L/s	Total Hd	L/s	Total Hd
25	15.75	33.21918	27.80855	50	63	54.79452	75.66147
30	14.25	39.86301	25.16011	60	57	65.75342	68.45562
40	12.5	53.15068	22.07028	80	50	87.67123	60.04879
50	11.25	66.43836	19.86325	100	45	109.589	54.04391
60	10	79.72603	17.65622	120	40	131.5068	48.03903
70	9	93.0137	15.8906	140	36	153.4247	43.23513
95	6.25	126.2329	11.03514	190	25	208.2192	30.02439

SP 299 (Viola Pl) - Performance Curves - One Hidrostal H05K / 110kW



Parsons Brinckerhoff - Brisbane Office
Client: Brisbane Water
Project: Australia Trade Coast Sewerage Project
PB Job Code: 2138110B

Properties for Water

Temperature C	Density kg/m3	Kin viscosity m^2/s	Vapour Press m H2O
0	999.84	1.787E-06	0.062
4	999.97	1.514E-06	0.083
10	999.7	1.304E-06	0.125
15	999.09	1.137E-06	0.174
20	998.2	1.002E-06	0.238
25	997.04	8.910E-07	0.323
30	995.65	7.980E-07	0.433
40	992.22	6.540E-07	0.752
50	977.77	5.480E-07	1.258

Ref GCD 332 - 1.1

Interpolator

x=	30	a=	0.433
y=	35	b=	0.5925
z=	40	c=	0.752

$$b = a - \frac{(a-c)*(x-y)}{(x-z)}$$

For fluids other than water, parameters need to be investigated. Figures for water should not be used for other fluids.

24-MAR-2004 12:04 FROM WEIR SERVICES TO 00738314223 P.01

- 8 JUN 2004

Facsimile Weir Services Australia

15 Gindurra Road
Somersby NSW 2250
PO Box 461
Gosford NSW 2250

Tel: +(61) 02 4349 2999
Fax: +(61) 02 4349 2900
matthew.winser@weir.com.au
www.weir.com.au

From the office of
Matthew Winser

Excellent Engineering Solutions

WEIR SERVICES

Attention of	Michael Brand	**From**	Matthew Winser
Company	PB Consulting	**Direct line**	07 3218 2635
Fax number	07 3831 4223	**Ref**	E-208888-PB Consulting
Pages (Inc. cover)	6	**Date**	23 March 2004
Subject	**HIDROSTAL PUMPS FOR BRISBANE CITY COUNCIL**		

Requires ☐ Immediate attention ☐ 1-3 day turnaround ☐ Information only ☐ Follow-up by:

Dear Michael,

As recently discussed, please find enclosed a revised quotation for the pump for Viola Place. This selection is based upon new information received today from Hidrostal's technical department who now feel that a larger motor is required to give acceptable bearing & mechanical seal life at the super-synchronous duty.

The unique, screw centrifugal impeller of the Hidrostal pump range offers excellent rag/solids handling capabilities, which makes it particularly suitable for waste water, sewage, applications.

An 8" Hidrostal pump is currently working successfully on at a problematic Brisbane City Council sewage pump station (Archerfield Rd). Here the existing pump was blocking on a weekly basis, to date the Hidrostal has not experienced a single blockage.

Please accept our apologies for any inconvenience this late information may cause, please do not hesitate to contact the under-signed, should you require further assistance.

Best Regards,

Matt Winser
(Hidrostal Product Manager)

M. P. Winser

QUOTATION

Viola Place: Selection 1

- Duty: **Approx. 104 L/s @ 54.7M**
- Pump Type: **Hidrostal, Screw Centrifugal dry well submersible pump (incl. A0 Pedestal)**
- Pump Code: **H05K-S02R+HEUC4-XMSK+NEB9-10 (cw 4 pole speed, 110 kW motors)**
- Unit Price: **$54,957 Nett, Each**
- Q/H + NPSH R Test: **$1,637 Nett, Each**
- Hydro-Test: **$298 Nett, Each**
- Motor Test Certificate: **$1,042 Nett, Each**
- Delivery: **22-24 working weeks, subject to prior sales (Sea Freight)**

Scope of Supply

The above offer includes for the supply only of a standard Hidrostal Screw Centrifugal, submersible pump, generally of cast iron construction (cw hard wet end internals & adjustable liner system options) with tandem mechanical seal running in an oil bath + integral moisture probe. The motor is an IP58/68 submersible unit, 415/3/50 supply & fitted with thermistor over-temperature sensors. Standard 10m screened power cable length & factory paint finish is offered.

- Wet well submersibles are offered with an "A0" pedestal + top guide rail bracket
- Dry well submersibles offered are equipped with a self-contained oil-cooling jacket.
- Unwitnessed Q/H + NPSH R & Hydro tests to ISO 2548 class C are offered (Testing to take place at Hidrostal's Neunkirch factory, Switzerland)

Technical Notes

- The screw centrifugal impeller gives virtually clog-free operation, making it ideal for raw, unscreened sewage. The single vane, corkscrew design presents a leading edge near parallel to the direction of flow at the suction flange. It acts as a guide for rags & fibres & cannot clog due to rag hang-ups on the leading edge (as it does not present an edge 90 degrees to the flow, which is where conventional waste water pumps "rag up"). In the unlikely event of fibres becoming trapped between the impeller & casing, helical relieving grooves are machined into the pumps suction cover & impeller plate. Here fibres will work their way along or out of the groove, to be then pumped away.

- An 8" Hidrostal submersible pump is currently on trial at a Brisbane City Council problematic pump station. Here the station suffered major rag chokeage problems, typically requiring the pump to be unblocked once per week. The Hidrostal unit has been operating since February 2003 & to date has not experienced a single rag chokeage.

- The pumps are offered with adjustable conical liners & hardened wet end internals. This combination gives extended component life + a facility to adjust both axial & radial impeller clearances when periodical wear takes place. This allows pump efficiencies to be restored simply & easily during periodical maintenance.

Pricing
Prices in A$ & based upon a conversion factor of **1A$=0.92 SFr** (Swiss Francs). Included in the price is 5% customs & duty tariff No. 84100 900. The price quoted excludes any wholesale taxes or GST. In the event of an order, any variation to the above exchange rate (up or down) will be charged to your account. **Prices based upon Sea Freight delivery.**

Point of Delivery
Ex Works, Somersby NSW (packing included)

Terms of Payment
Weir standard terms apply (enclosed)

Validity
Our price is valid for 30 days

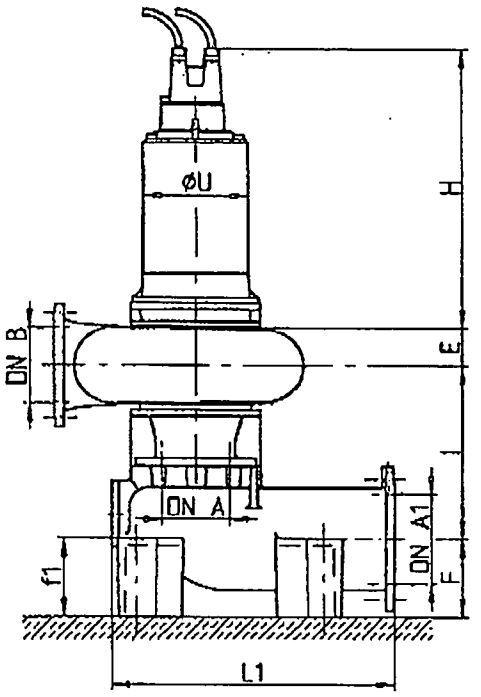
24-MAR-2004 12:04 FROM WEIR SERVICES TO 00738314223 P.05

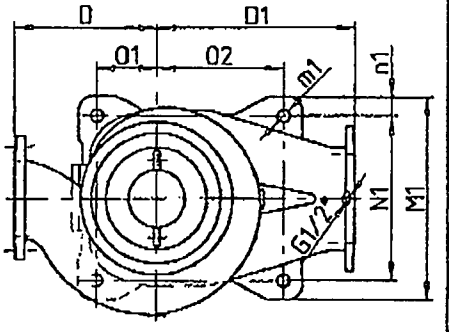
Hidrostal

IMMERSIBLE MOTOR PUMPS
ÜBERFLUTBARE MOTORPUMPEN
.EX../.EY../.EW../.EV..
.EU../.EN../.ET..

HYDRAULIC
HYDRAULIK
F-H08

B0-MOUNTING
B0-AUFSTELLUNG





MOTOR *MOTOR*	H max	øU
.EX..	850	260
.EY..	950	220
.EW..	1180	354
.EV..	1430	415
.EU..	1770	540
.EN..	1700	462
.ET..	1990	624

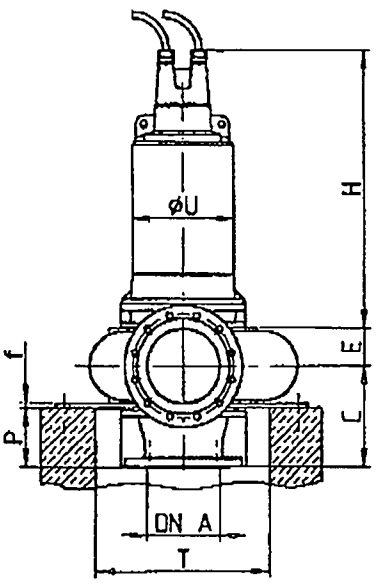
B0-MOUNTING
HYDRAULIC F04/F06: PUMP POSSIBLE TO BE MOUNTED EVERY 45°;
F10 EVERY 30°;
H05/H08 EVERY 90°

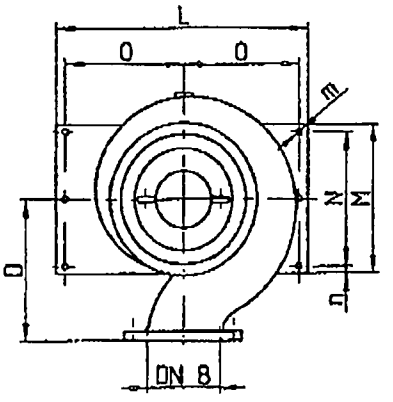
B0-AUFSTELLUNG
HYDRAULIK F04/F06: PUMPE ALLE 45° MONTIERBAR;
F10 ALLE 30°
H05/H08 ALLE 90°

DESCRIPTION/ERKLÄRUNG:
DN=NOMINAL DIAMETER/NENNWEITE
PN=NOMINAL PRESSURE/NENNDRUCK

Flanges / Flanschen:
•DN150=PN16 DIN EN 1092
•DN200=PN10 DIN EN 1092

F0-MOUNTING
F0-AUFSTELLUNG





HYDRAULIC *HYDRAULIK*	DN A	DN A1	DN B	C	D	D1	E	F	f	f1	I	L	L1	M	M1	m	m1	N	N1	n	n1	O	O1	O2	P	T
F04K	200	250	100	245	364	550	80	230	15	202	435	740	850	500	545	20	25	450	460	25	42.5	340	160	370	150	600
F040/F100																										
F06K -M			150	270	410		108				460											400			147	520
-H/S				330							520														207	
F060/F150 -E				235							425														112	
F10K -M0	250	300	250	323	475	660	127	260		260	563	860	1000	600	680		42	550	550		65		200	420	183	600
-H0/S0/SS				340							580											400			200	
F100/F250																										
H05K -MH(S)			125	280	460		96				520	940													169	800
H050/H125																										
H08K -M			200	328	530		132				568											430			181	670
-MH/H/S				398							638														251	
H080/H200 -S				316							556														169	
-MM				285							525														138	

Konstruktionsaenderungen vorbehalten
Hidrostal reserve the right to make changes without giving prior notice
Hidrostal se reserve tous droits de changement de construction

FOR QUOTATION ONLY

Drawn by/Bearb. Dat. Vis. :	27.09.00 pda
Approved by/Gepr. Dat. Vis. :	27.09.00 db

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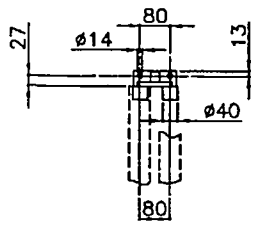
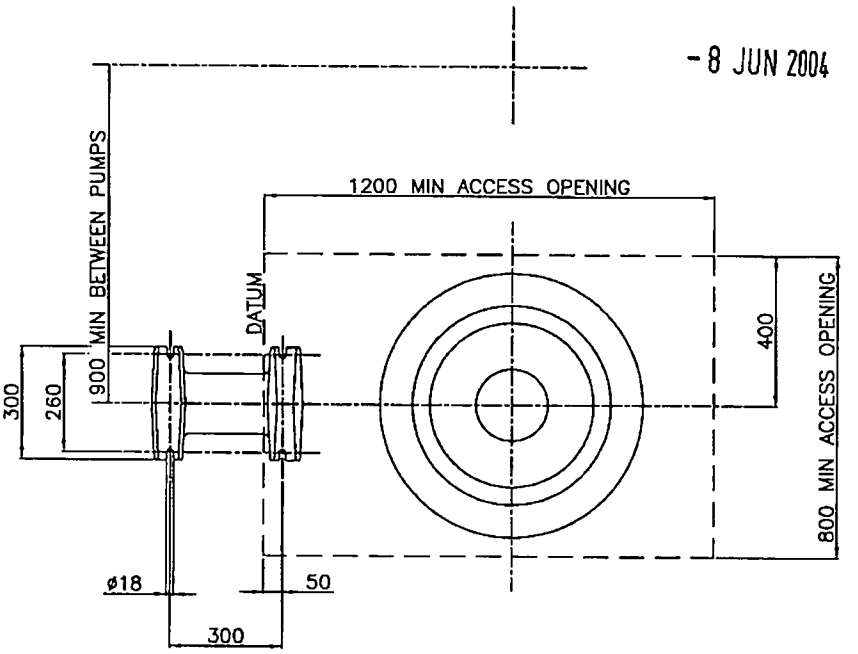
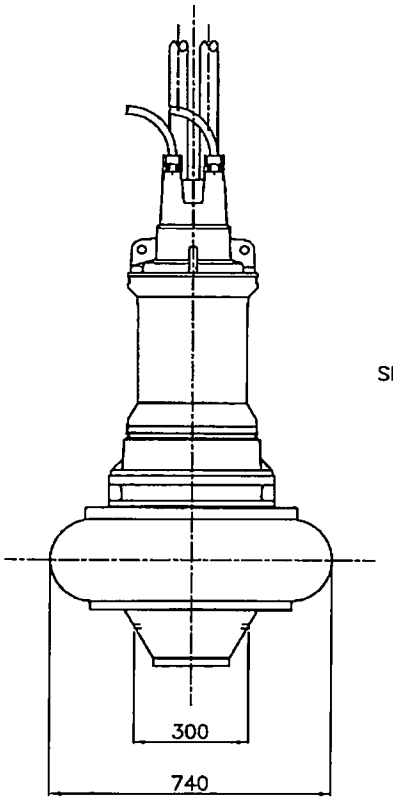
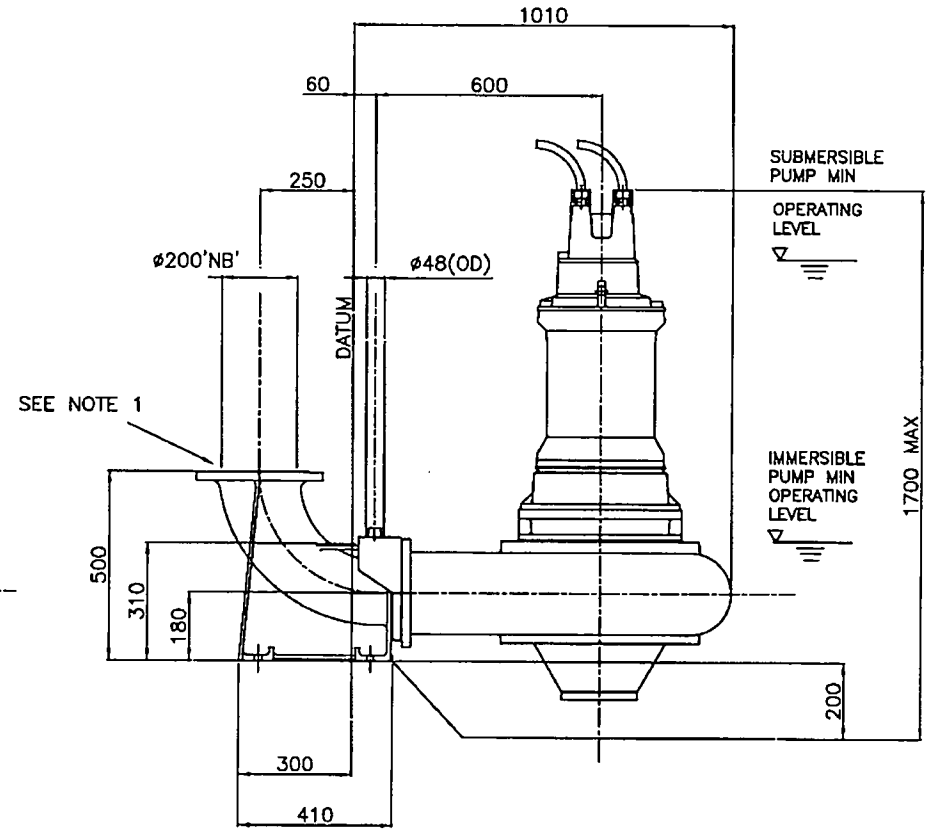


TOP GUIDERAIL BRACKET







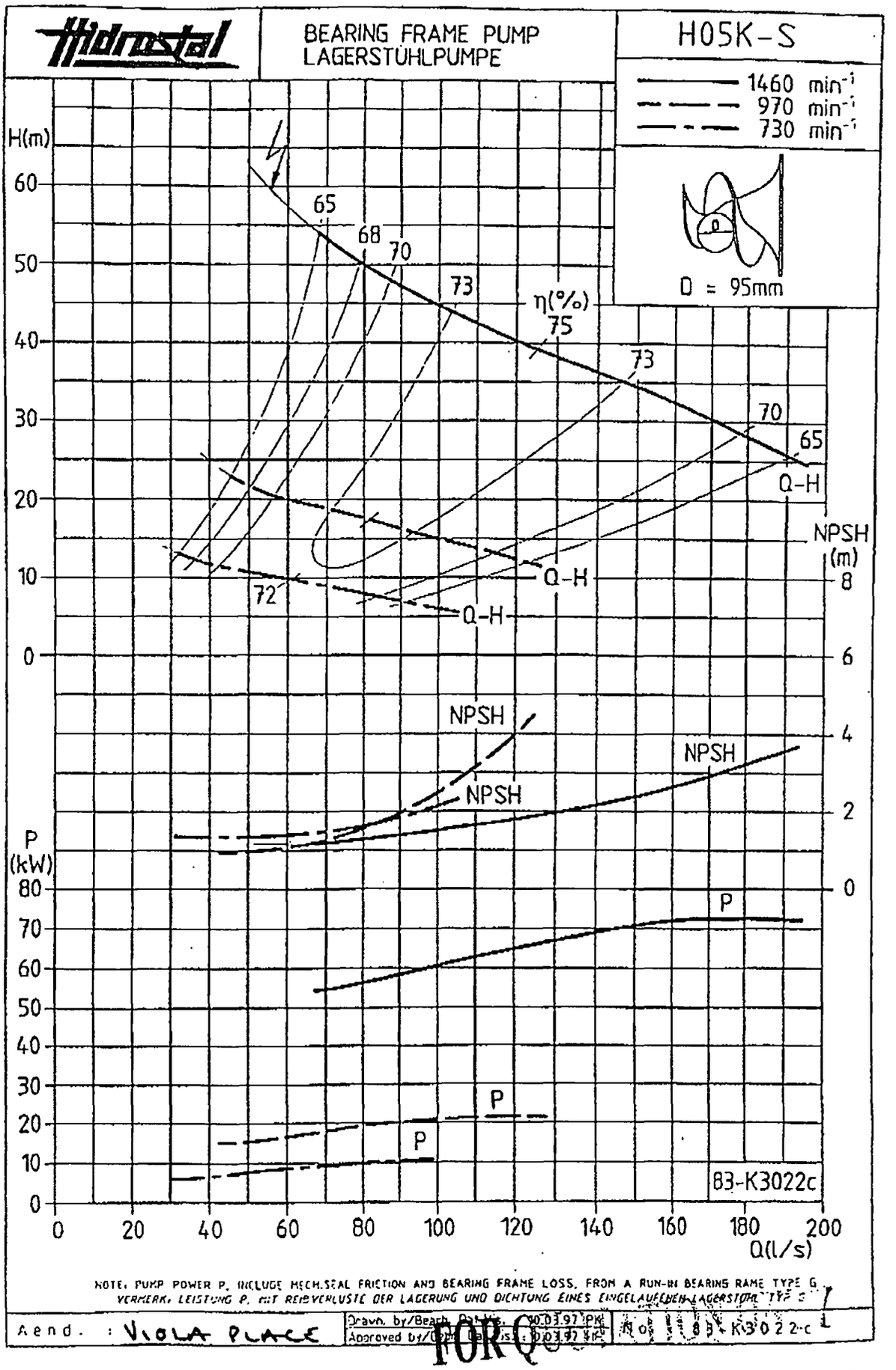
NOTES:–
1. DISCHARGE FLANGE DRILLED TO PN10 DIN EN1092, OFF CENTRELINES.
2. HIDROSTAL RESERVE THE RIGHT TO MAKE CHANGES WITHOUT GIVING PRIOR NOTICE.

Scale	Weight	Motor	Hydraulic
1:1 on CAD	1390kg	H.Y../H.X..	H05K

Published	DRG.No.	Rev	
31/07/2002	WSG01H0001	A	H05K SUB/IMMERSIBLE PUMP AO MOUNTED ø200NB DISCHARGE

Hidrostal

24-MAR-2004 12:04 FROM WEIR SERVICES TO 00738314223 P.06



TOTAL P.06

PARSONS BRINCKERHOFF

Appendix D

Odour and Septicity Study

PARSONS BRINCKERHOFF

Appendix E

Geotechnical Information

PARSONS BRINCKERHOFF AUSTRALIA PTY LTD

AUSTRALIA TRADE COAST SEWER PROJECT

VIOLA PLACE PUMP STATION (SP299)

GEOTECHNICAL INVESTIGATION

Meeandah

B17625/01-L

01 April 2004

Coffey

B17625/01-L CM:EE
01 April 2004

Parsons Brinckerhoff Australia Pty Ltd
Floor 12, IBM Centre
348 Edward Street
BRISBANE QLD 4001

Attention: Mr Ian Cameron

Dear Sir,

RE: AUSTRALIA TRADE COAST SEWER PROJECT
VIOLA PLACE PUMP STATION (SP299)
GEOTECHNICAL INVESTIGATION

Please find enclosed our geotechnical report for the above site at Meeandah. The report includes the results of field investigations undertaken at the site, and provides recommendations with respect to design and construction methods. The report also includes laboratory results from Acid Sulfate Soil (ASS) testing and provides preliminary recommendations on remediation and further assessment of Potential and Actual ASS.

Should you require further information, please do not hesitate to contact Cameron Murray or the undersigned at our Brisbane office.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

PHILIP SHAW

Distribution:	Original held by	Coffey Geosciences Pty Ltd
	1 copy	Coffey Geosciences Pty Ltd (Library)
	3 copies	Parsons Brinckerhoff Australia Pty Ltd

53B Fairlawn Street Nathan
QLD 4111 Australia
PO Box 108 Salisbury
QLD 4107 Australia
Telephone +61 7 3274 4411
Facsimile +61 7 3274 4977
Email brisbane@coffey.com.au

TABLE OF CONTENTS

1. INTRODUCTION

Coffey Geosciences Pty Ltd (Coffey) was commissioned by Parsons Brinckerhoff Australia Pty Ltd (PB) to carry out geotechnical investigations at the proposed Viola Place Pump Station at Meeandah (Refer to Figure 1). It is understood that the pumping station is part of the Australia Trade Coast Sewer Project that consists of three sewage pumping stations and associated rising mains.

The report presents the results of the field investigation, and provides recommendations with respect to design and construction methods. It is understood that the proposed foundations for the pump station structures are pad footings founded on natural ground and that excavations during construction will extend to approximately 5m below existing surface levels (equivalent to approximately RL-1.5m).

The report also includes laboratory results from Acid Sulfate Soil (ASS) testing and provides preliminary recommendations on remediation and further assessment of Potential and Actual ASS.

2. FIELD INVESTIGATON

Fieldwork was carried out on 8 March 2004 and consisted of drilling a single borehole adjacent to the proposed pumping station. The borehole (BH1) terminated in alluvial soil at a depth of 10m below existing surface levels. Standard Penetration Tests (SPTs) were carried out in sandy soils and undisturbed (U50) samples were recovered in clayey soils at 1.5m intervals over the depth range investigated. Soil samples for Acid Sulfate Soil (ASS) testing were also collected at 0.5m intervals.

The fieldwork was carried out by a Senior Geotechnician from our Brisbane office who was responsible for locating the boreholes, nominating and directing all testing and sampling and providing field logs of the soil profiles encountered.

Appendix A presents Engineering Logs of the boreholes and sheets explaining the terms and symbols used in the logs. These explanation sheets should be read in conjunction with the borehole logs. An approximate location of the borehole is presented in Figure 2.

3. SITE CONDITIONS

3.1 Surface Conditions

It is understood that the proposed pumping station and related infrastructure is to be constructed at the end of Viola Place parallel to the road. Borehole BH1 was located as close to the proposed structure as possible making allowance for the position of existing services. The distance between an existing culvert drain running across Viola Place and BH1 was approximately 23m (Figure 2).

The published geological map of the area (1:31,680 scale "Brisbane" sheet) indicates the site surface geology is Quaternary alluvial deposits of sand, silt, mud, clay and gravel.

3.2 Subsurface Conditions

The subsurface profile observed from the borehole (BH1) is summarised in Table 1. In general, the subsoil profile can be described as fill overlying recent and older alluvial deposits of clays and sands. A thin layer of soft clay was encountered from 3.8m to 4.4m depth below existing surface levels.

TABLE 1 – SUMMARY OF SUBSURFACE CONDITIONS AT BH1

Unit	Description	Approximate Depth in Borehole (m)	Pocket Penetrometer Reading at Depth (kPa)
FILL	Sandy CLAY, medium plasticity, brown and pale grey, hard, sand is fine to coarse grained.	0.0 – 2.6	-
RECENT ALLUVIUM	CLAY, high plasticity, pale grey, grey and brown, firm to stiff.	2.6 – 3.8	100 (3.45m)
	CLAY, high plasticity, dark grey and brown, soft.	3.8 – 4.4	-
	CLAY, high plasticity, grey, firm to stiff.	4.4 – 6.0	80-125 (4.95m)
	Silty CLAY, medium plasticity, pale grey-green, stiff.	6.0 – 6.8	130 (6.45m)
OLDER ALLUVIUM	Sandy CLAY / CLAY, low to medium plasticity, dark brown and green, pale grey-green, hard.	6.8 – 8.6	-
	Clayey SAND, fine to coarse grained, pale grey and brown, medium dense to dense.	8.6 – 10.0*	-

* Base of hole

3.3 Groundwater

Groundwater was encountered during drilling at approximately 1.0m depth below existing surface levels (measured 11:30am on 8 March 2004). However the groundwater level may fluctuate due to tidal effects.

4. LABORATORY TESTING

4.1 Testing for Pavement Design Assessment

The samples obtained during the field investigation were taken to our NATA registered laboratory. A single Atterberg Limit, Soaked CBR and Particle Size Distribution (PSD) Test was undertaken on a sample obtained from the fill to assist with pavement design parameters. The results of the laboratory tests are included in Appendix B and are summarised in Table 2.

TABLE 2: SUMMARY OF LABORATORY TEST RESULTS – GEOTECHNICAL INVESTIGATIONS

Borehole	Sample Depth (m)	Atterberg Limit Test				CBR Test			PSD Test
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	MDD (t/m³)	OMC (%)	CBR Value (%)	% Passing 75µm
BH1	0.0 – 1.0	40.0	21.0	19.0	9.5	1.91	12.0	9	38.6

4.2 Acid Sulfate Soil Testing

Acid Sulfate Soil (ASS) samples were forwarded to Bio-Track Pty Ltd for testing. Initial screening was carried out by pH testing of each sample and, on the basis of the screening tests, three SPOCAS tests including Scr tests were conducted on selected samples.

The laboratory results for the SPOCAS and SCR tests are presented in Tables 3 and 4, together with indicative ASS classification. The laboratory reports are presented in Appendix C including Chain of Custody documentation.

The ASS Classifications summarised in Table 3 for Acid Sulfate potential are based on the following:

- ***Non-potential acid sulfate soils (Non PASS)*** – SPOCAS testing indicates these soils have TPA/TSA values below the QASSIT Action Criteria and are not considered to present an environmental hazard;
- ***Actual Acid Sulfate Soils (AASS)*** – SPOCAS testing indicates the soil contains acidic soil horizons affected by the oxidation of soil materials rich in iron sulfides, primarily pyrite and will require management;
- ***Potential Acid Sulfate Soils (PASS)*** – SPOCAS testing indicates these soils contain iron sulfides or sulfidic material that have not been exposed to air and oxidised. These soils present an environmental hazard and management of these soils is required; and
- ***Naturally Acidic (Nat Ac)*** - SPOCAS testing indicates that these soil exhibit acidity that is not sulfur based.

TABLE 3: SUMMARY OF LABORATORY TEST RESULTS - ASS INVESTIGATION

Sample ID	Soil Classification	pH KCL	pH ox	TAA (mol/t)	TPA (mol/t)	TSA (mol/t)	S KCL (%)	S POS (%)	POS acid (mol/t)	Indicative Acid Sulfate Potential
Relevant Guidelines: QASSIT Action Criteria if 1 - 1000 tonnes of material is disturbed:				62	62	62	0.03	0.10		
Sample Location										
0.9 – 1.0	Sandy Clay	4.20	4.53	47	23	0	0.003	0.003	2	*Non-PASS*
2.8 – 3.0	Clay	4.59	4.94	49	36	0	0.001	0.008	5	*Nat Ac*
5.5 – 6.0	Clay	3.54	2.64	158	478	321	0.02	0.40	252	*PASS*
	Indicates results exceed QASSIT Action Criteria									

mol/t: moles H^+ per tonne
TAA: Total actual acidity. This currently exists in the soil and can be lost in the leachate.
TSA: Total sulfidic acidity. This additional acidity will develop if the soil becomes fully oxidised, theoretically due to the oxidation of sulfide(s) only.
TPA: Total potential activity. This is the highest level of acidity anticipated as a consequence of soil oxidation.
S_{POS} Sulfur trail - % sulfur oxidisable
* SCR tests (%). Results equivalent to S POS tests (%).

TABLE 4 – SUMMARY OF LABORATORY TEST RESULTS (S_{CR} TESTS)

Sample	Soil Classification	S_{cr} (mg/kg)	S_{cr} (%S grav.)	Lime Required (kg / cubic metre soil) *
Sample Depth (m)				
0.9 – 1.0	Sandy Clay	18	<0.002	<0.1
2.8 – 3.0	Clay	26	0.003	0.1
5.5 – 6.0	Clay	2789	0.279	14.3
Relevant Guidelines: QASSIT Action Criteria if 1 - 1000 tonnes of material is disturbed:			0.1	

* Refer to Certificate Analysis attached to Appendix C for method used to calculate lime required. Lime rates do not include any safety factor.

5. ENGINEERING ASSESSMENT AND RECOMMENDATIONS

5.1 Acid Sulfate Soil Assessment

From laboratory test results, the fill materials and Recent Alluvium to 3m depth were not considered to be either Potential Acid Sulfate Soils (PASS) or Actual Acid Sulphate Soils (AASS). However levels of naturally occurring non-sulfur acidity (i.e. Naturally Acidic soils) was noted in the Recent Alluvium at 2.8m to 3.0m depth. It is important to note that levels of acidity may occur either above or below the sample depth and could be aggressive towards structures such as concrete piping, and could therefore have implications for construction materials. As a precaution, it is recommended that excavated soils, including that required for trenching, be lined with a small amount of agricultural lime, prior to laying of pipe and backfilling. This will assist in neutralising any pre-existing acidity in the soils. The last column in Table 3 suggests the quantity of lime required as treatment of soils tested.

SPOCAS and Scr tests undertaken in the Recent Alluvium at 5.5m to 6.0m indicate the soil to be Potential Acid Sulfate Soil (PASS). Although the data from laboratory test results are insufficient to clearly define PASS layers, the results suggest that PASS soils could be present between 3.0m and 5.5m depth. Acid Sulfate Soils (ASS) will probably be mixed with Non-PASS soils during excavation and when placed in piles at the surface. Insufficient management and treatment of these soils could cause harm to the environment. It is therefore recommended that an Acid Sulfate Soil Management Plan be produced to address the treatment of these soils. The plan should also cover issues relating to the lowering of the groundwater table that will be required for construction.

5.2 Excavation Conditions

It is understood that excavations of up to 5.0m depth are proposed for the pumping station construction. These will extend beyond the soft clay layer and some distance into the firm to stiff clays.

It is understood that sheet piles are the preferred method for temporary lateral support during construction of the pump station. Whilst the sheet piles will interlock during placement they are unlikely to provide a watertight barrier around the excavation and some dewatering measures will be required in the excavation area to accommodate groundwater seepage.

Alternatively, dewatering around the perimeter could be considered using spear points. Given the clayey nature of the soils it is unlikely that these will be effective unless they are placed at very close centres. The use of spear points to draw down the water table will increase the effective vertical stress in the underlying soils. Depending on the drawdown, it is assessed that consolidation settlement of up to 75mm could occur around the excavation perimeter. It should be noted that estimates of settlement are based on assumed consolidation parameters for the range of clay strengths encountered, and are approximate only.

5.3 Design of Lateral Support

The design of sheet piles for the excavations will need to take into account the presence of the alluvial clays and the potential for bottom heave. For design purposes, geotechnical parameters in the short and long term for the range of materials encountered are provided in Table 5.

TABLE 5 – GEOTECHNICAL PARAMETERS FOR SHEET PILE DESIGN

Material	Undrained Parameters (Short Term)		Drained Parameters (Long Term)		Bulk Density (t/m^3)
	C_u (kPa)	ϕ_u (°)	C' (kPa)	ϕ' (°)	
Fill	40	0	2	25	1.7
Firm to Stiff Clay	40	0	2	25	1.6
Hard Clay	150	0	5	25	1.8
Medium Dense Sand	0	35	0	35	1.7

5.4 Buoyancy Effects

It is understood that the total load of the pumping station will be less than the soil removed for its installation, and with the base of the pumping station to be constructed at approximately 4.0m below the water table, significant buoyancy forces on the pumping station are anticipated. For design purposes, it is recommended that an allowable shaft resistance of approximately 15kPa be allowed for in the fill and alluvial clays.

5.5 Footing Design

Pad footings may be designed for an allowable bearing capacity of approximately 80kPa for the footings founded at approximately 5m depth below existing surface levels.

The clays below 5.0m depth are assessed to be overconsolidated and settlements due to the pump station loads are expected to be less than 30mm. It should be noted that estimates of settlement are based on assumed consolidation parameters for the range of clay strengths encountered.

5.6 Preliminary Pavement Recommendations

A design CBR for the range of subgrade materials encountered on the site can be taken as 8% at a Maximum Dry Density (MDD) of 1.91t/m^3 and Optimum Moisture Content (OMC) of 12.0%. Appropriate laboratory analysis should be completed to confirm the pavement design CBR's once earthworks have been designed and the nature of the subgrade is identified

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

Information

Important information about your Coffey Report

Coffey

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

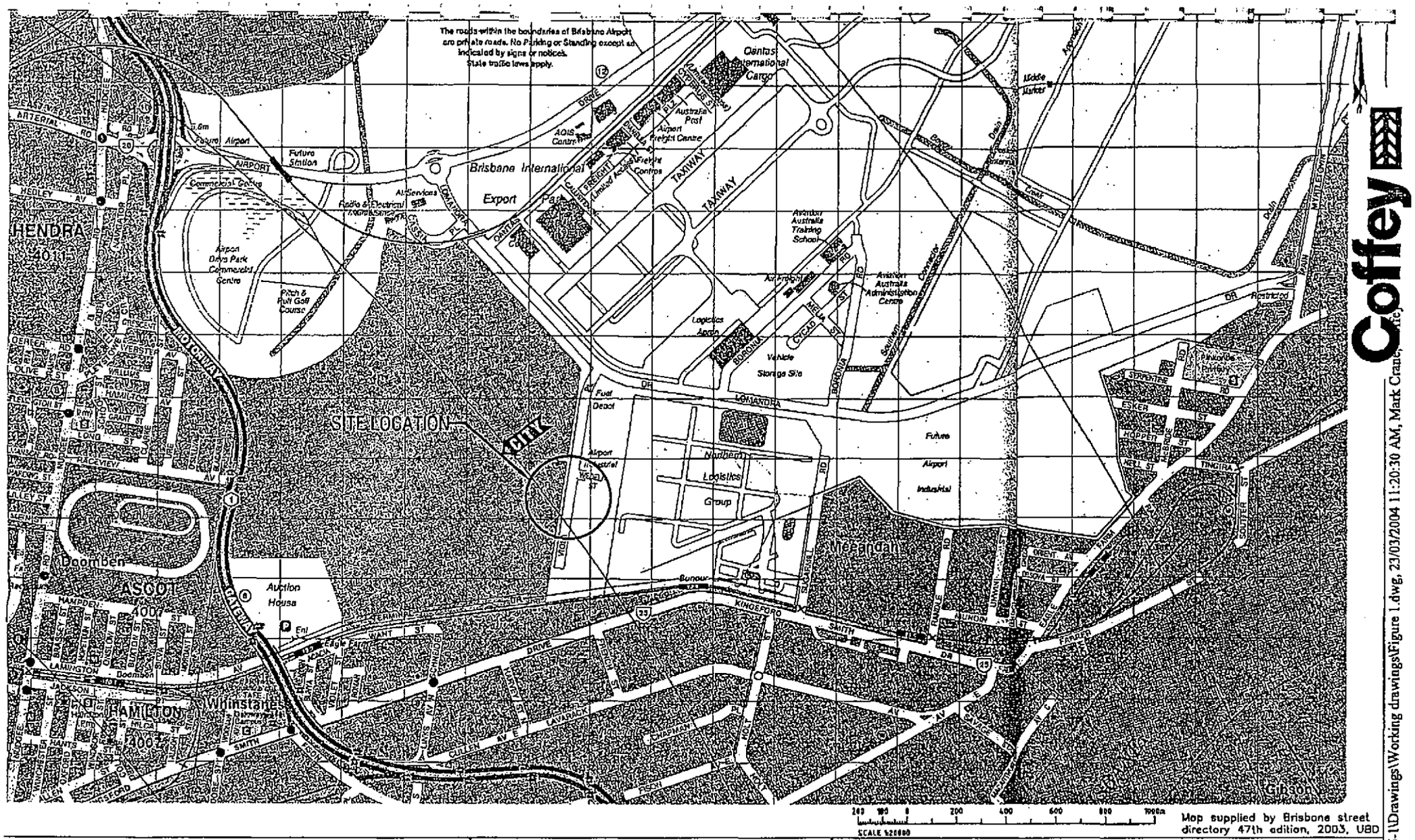
Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

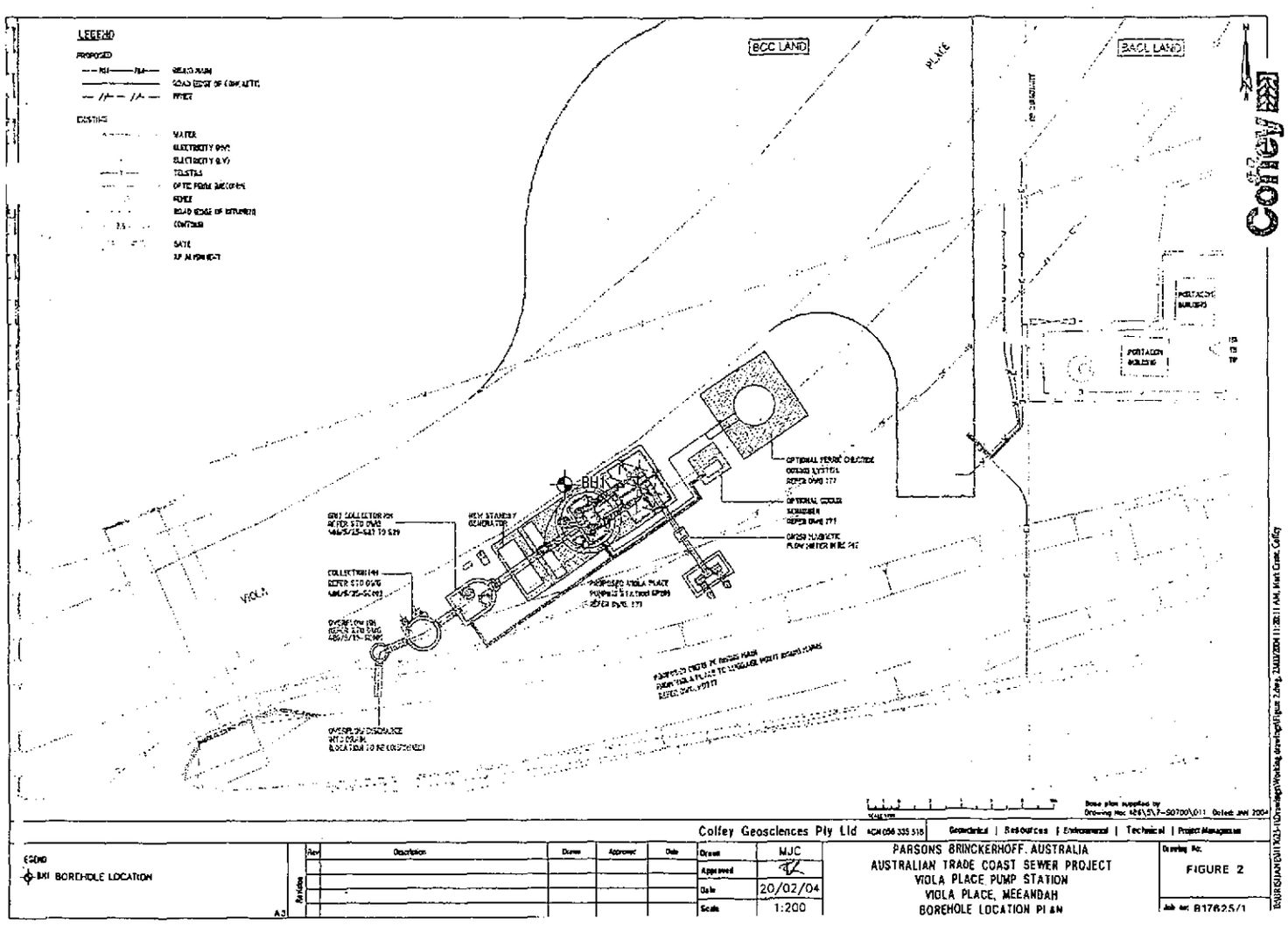
To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Form CCR 2.1 Issue 1 Rev 0 Sheet 1 of 2



Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | **Resources** | Environmental | **Technical** | Project Management	
Drawn	MJC	PARSONS BRINKERHOFF AUSTRALIA AUSTRALIAN TRADE COAST SEWER PROJECT VIOLA PLACE PUMP STATION VIOLA PLACE, MEEANDAH SITE LOCATION PLAN	Drawing No: **FIGURE 1**
Approved			
Date	20/02/04		
A4 Scale	1:20,000		Job no: B17625/1

B:\BRISBANE\B17625-1\Drawings\Working drawings\Figure 1.dwg, 23/03/2004 11:20:30 AM, Mark Crane, Life


LEGEND
PROPOSED
EXISTING
BCC LAND
BCC LAND
VIOLA
PLACE
BH1
OPTIONAL FERRIC CHLORIDE
OPTIONAL ODOUR
MONITOR
NEW STANDBY
GENERATOR
PROPOSED VIOLA PLACE
PUMPING STATION
OVERFLOW DISCHARGE
INTO CREEK
Colfey Geosciences Pty Ltd
ACN 056 335 518
Geotechnical | Resources | Environmental | Technical | Project Management
LEGEND
BH1 BOREHOLE LOCATION
Rev
Description
Drawn
Approved
Date
Drawn
MJC
Approved
Date
20/02/04
Scale
1:200
PARSONS BRINCKERHOFF AUSTRALIA
AUSTRALIAN TRADE COAST SEWER PROJECT
VIOLA PLACE PUMP STATION
VIOLA PLACE, MEEANDAH
BOREHOLE LOCATION PLAN
Drawing No.
FIGURE 2
A3

APPENDIX A

ENGINEERING LOGS

Soil Description

Explanation Sheet (1 of 2)

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil.

Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 µm to 2.36 mm
	medium	200 µm to 600µm
	fine	75 µm to 200 µm

MOISTURE CONDITION

Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.

Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH s_u (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 – 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 – 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 – 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 – 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	–	Crumbles or powders when scraped by thumbnail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 – 35
Medium Dense	35 – 65
Dense	65 — 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: < 5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 – 12% Fine grained soils: 15 – 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous layers of lenticular shape.	Moderately cemented	Effort is required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material	Structure and fabric of parent rock visible.
Residual soil	Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil	Deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Deposited on slopes (transported downslope by gravity).
Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.
Lacustrine soil	Deposited by lakes.
Marine soil	Deposited in ocean basins, bays, beaches and estuaries.

Form No. GEO5.6 Issue 3, Rev. 2.

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH1**

Engineering Log - Borehole

Sheet 1 of 2

Office Job No.: **B17625/01**

Client: **PARSONS BRINCKERHOFF**

Date started: **8.3.2004**

Principal: **LEIGHTON CONTRACTORS**

Date completed: **8.3.2004**

Project: **PUMP STATION - VIOLA PLACE**

Logged by: **AEL**

Borehole Location: **AS PER PLAN**

Checked by: CM

drill model and mounting: JACRO 200 TRUCK | Easting: | slope: -90° | R.L. Surface: NOT MEASURED

hole diameter: 100 mm | Northing | bearing: | datum: NOT MEASURED

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADT		C				1		CL	CLAYEY SAND / SANDY CLAY medium plasticity, brown and pale grey, fine to coarse grained sand, some fine to coarse gravel.	M	D/H		FILL
		M	11.30AM on 8 March 2004										
WCB				SPT 2,4,3 N*=7		2							
						3		CH	CLAY: high plasticity, pale grey, grey and brown, trace of fine grained sand.		F		RECENT ALLUVIUM
				U_{50}							St	x	PP = 100 kPa
						4		CH	CLAY: high plasticity, dark grey and brown, some fine to medium grained sand.		S		
				U_{50}		5		CH	CLAY: high plasticity, grey, trace of fine grained sand.		F/St	x	PP = 80 / 125 kPa
						6		CL	SILTY CLAY medium plasticity, pale grey-green, some fine grained sand.		St	x	PP = 130 kPa
				U_{50}		7		CL	CLAY: low plasticity, dark brown and green, trace of fine grained sand (cemented).		H		OLDER ALLUVIUM
				SPT 8,13,15 N*=28		8		CL	SANDY CLAY medium plasticity, pale grey-green, fine to medium grained sand.				

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	dialube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

BOREHOLE B17625.1.GPJ COFFEY.GDT 01.04.04

Form GEO.5.3 Issue 3 Rev.2

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH1**

Engineering Log - Borehole

Sheet 2 of 2

Office Job No.: **B17625/01**

Client: **PARSONS BRINCKERHOFF**

Date started: **8.3.2004**

Principal: **LEIGHTON CONTRACTORS**

Date completed: **8.3.2004**

Project: **PUMP STATION - VIOLA PLACE**

Logged by: **AEL**

Borehole Location: **AS PER PLAN**

Checked by: CM.

drill model and mounting: JACRO 200 TRUCK | Easting: | slope: -90° | R.L. Surface: NOT MEASURED

hole diameter: 100 mm | Northing | bearing: | datum: NOT MEASURED

drilling information							material substance					
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
WCB		M						CL	SANDY CLAY medium plasticity, pale grey-green, fine to medium grained sand. *(continued)*	M	H		
								SC	CLAYEY SAND fine to coarse grained, pale grey and pale brown, low to medium plasticity fines.		MD-D		
				U_{50}		9							
				SPT 5,6,9 N*=15		10			Borehole BH1 terminated at 10m				
						11							
						12							
						13							
						14							
						15							
						16							

BOREHOLE B17625.1.GPJ COFFEY.GDT 01.04.04

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey

APPENDIX B

LABORATORY TEST RESULTS (GEOTECHNICAL)

Coffey Geosciences Pty Ltd ACN 056 335 515

Geotechnical | Resources | Environmental | Technical | Project Management

538 Fairlawn Street
Nathan
QLD 4111
Phone (07) 32744411
Facsimile (07) 32753619
Email brisbane@coffey.com.au

California Bearing Ratio Report

Client :	PARSONS BRINCKERHOFF	Report Number :	E04-068 PG1/2
Job Number :	B17625/1	Report Date :	01/04/2004
Project :	PUMP STATION	Order Number :	
Location :	VIOLA PLACE, EAGLE FARM	Test Method :	AS 1289.6.1.1
Lab No:	CB041342 Sample ID: -	Sample Location	
Date Sampled:	08/03/2004		
Date Tested:	31/03/2004 MC Method : AS 1289.2.1.1	BH1	
Sampled By:	Coffey	0.0m - 1.0m	
Sample Method:	AS 1289.1.2.1 Sect 6.5.1		
Material Source:	Insitu		
For Use As:	-	Lot Number:	-
Remarks:		Item Number:	-

Maximum Dry Density - MDD (t/m³) :	1.91
Optimum Moisture Content - OMC (%) :	12.0
Compactive Effort :	Standard
Nominated % Maximum Dry Density Compaction :	100.0
Nominated % Optimum Moisture Content Compaction :	100.0
Achieved Dry Density before Soak (t/m³) :	1.92
Achieved Percentage of Maximum Dry Density (%) :	100
Achieved Moisture Content (%) :	12.2
Achieved Percentage of Optimum Moisture Content (%) :	100
Test Condition (Soaked/Unsoaked) / Soaking Period (Days) :	Soaked / 4
Swell (%) / Surcharge (kg):	1.5 / 4.5 kg
Dry Density after Soak (t/m³) :	1.89
Moisture Content after Soak (%) :	14.8
Density Ratio after Soak (%) :	99
Field Moisture Content (%) :	13.2
Moisture Content (Top) after Penetration (%) :	17.0
Moisture Content (Remaining) after Penetration (%) :	14.7
CBR 2.5mm (%) :	8
CBR 5.0mm (%) :	9
Minimum Specified CBR Value (%) :	
CBR Value (%) :	9
Soil Description :	CLAYEY SAND: brown, trace of silt.

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

APPROVED SIGNATORY
BRAD ROSSINGTON
Nata Accred. No: 431

Form Number: REP CBR-1

Coffey Geosciences Pty Ltd A.C.N. 056 335 516 2 OF 2

Geotechnical | Resources | Environmental | Technical | Project Management

53B Fairlawn Street, Nathan, Qld, 4111
Ph: (07) 3274 4411, Fax: (07) 3275 3619

particle size distribution & atterberg limits

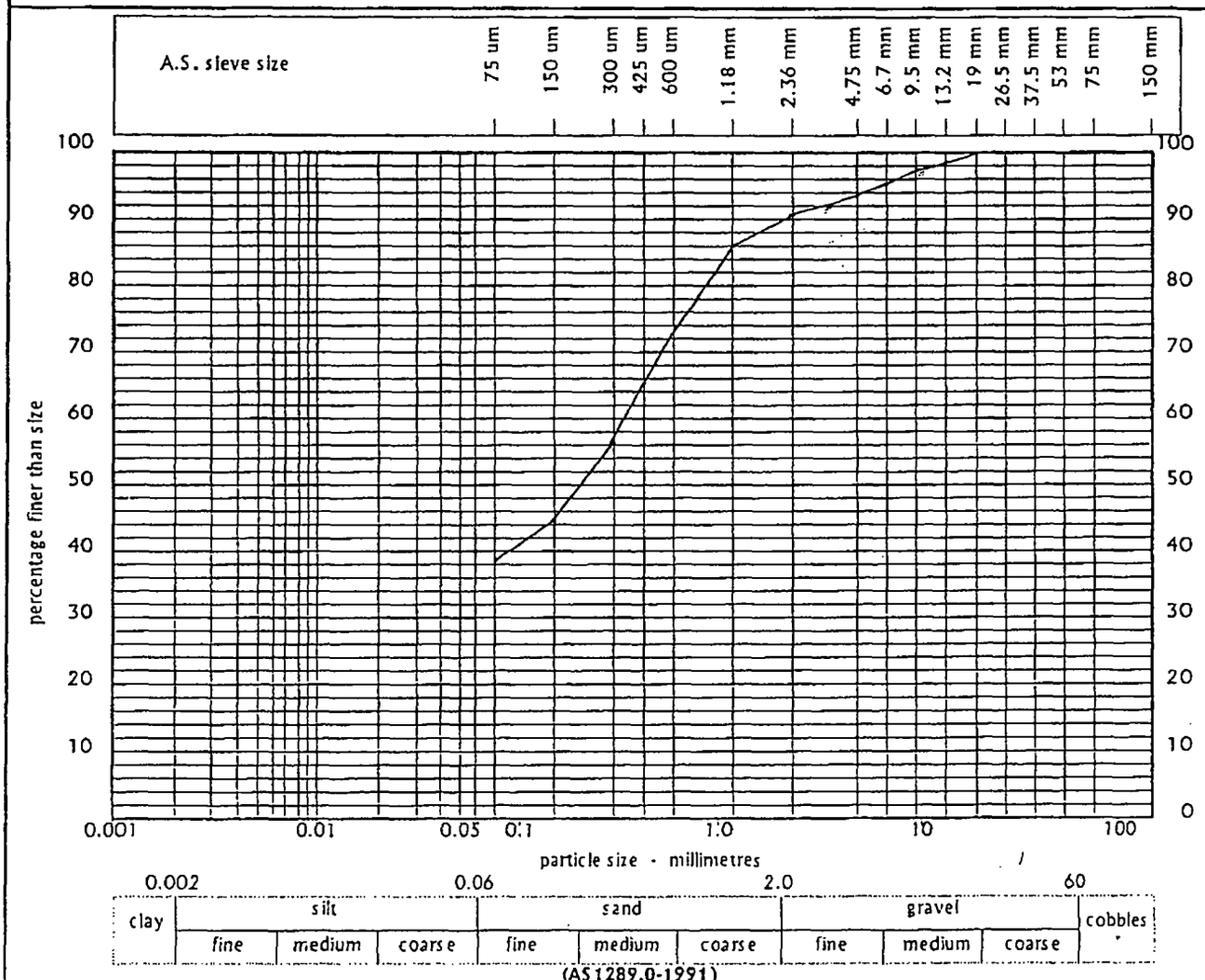
client : PARSONS BRINCKERHOFF
principal :
project : PUMP STATION
location : VIOLA PLACE, EAGLE FARM

job no : B17625/1
laboratory : BRISBANE
report date : April 01, 2004
test report : E04-068

test procedure : AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1, 3.6.1
sample no : CB041342
sample identification: BH1

depth : 0.0m - 1.0m

Form Number: L18R1 Version: 5.0



Atterberg Limit :

liquid limit	%	40.0
plastic limit	%	21.0
plasticity index	%	19.0
linear shrinkage	%	9.5
natural moisture	%	-

Sample History: natural state ☐ | air dried ☒ | oven dried ☐ | other ☐

Preparation Method: dry sieving ☒ | wet sieving ☐

Linear Shrinkage: Mould size 250 mm | crumbing ☐ | curling ☐

classification :
SILTY CLAYEY SAND: fine to coarse grianed, medium plasticity clay, trace of fine to medium grained gravel.

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Authorised Signature
NATA No 431

1/4/04

Coffey

APPENDIX C

CHAIN OF CUSTODY DOCUMENTATION AND LABORATORY TEST RESULTS (ASS SOILS)

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 MARCH 2004 Page 1 of 1 Report Pages.
CLIENT NAME CAMERON MURRAY c/o COFFEY GEOSCIENCES PTY LTD
CLIENT ADDRESS PO BOX 108 SALISBURY QLD 4107
PROJECT NAME B17625/01-J YOUR PROJECT/JOB REFERENCE B17625/01-J
SAMPLING DATE no record NUMBER OF SAMPLES 2 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/7/2004
DATE RECEIVED 19 MARCH 2004 LAB REF. LR1934.369

METHODOLOGY: As per SPOCAS (DNR QASSIT June 2003) for <850 um fraction, S,Ca & Mg by ICP; CLAY (H) for >40% clay, (M) for 5-40% clay or (L) for <5% clay (approximate estimation only)
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS RAS, LIME2 rates calculated from TAA+aS POS+ aS RAS - carbonate buffer (aCa A + aMg A)/fineness factor (1.5,1.5).
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8 (Reported as oven dry (85°C) mass)
Equivalent Sulphur (%S eq)= sTAA (%S) + S POS (%S) where sTAA (%S)=TAA/624, a-S RAS (Residual Acid Soluble Sulphur) as S in oxidised 4 M HCl extract- S POS
CBN POS = moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution. This buffers TPA.

I.D.	DEPTH	CLAY	pH	pH	SHIFT	TAA	TPA	TSA	S KCl	S P	S POS	POS ACID	LIME1	LIME2	%S eq	Ca KCl	Ca P	Mg KCl	Mg P	CBN POS	a-S RAS
	m		KCl	ox	pH	m/t	m/t	%/t	%	%	%	m/t	kg/m3	kg/m3		mg/kg	mg/kg	mg/kg	mg/kg	m/t	m/t
BH 1	0.9-1.0	nd	4.20	4.53	0.3	47	23	0	0.003	0.006	0.003	2	4.0	4.1	0.08	30	30	195	170	0	1
BH 1	2.8-3.0	nd	4.59	4.94	0.3	49	36	0	0.001	0.009	0.008	5	4.3	3.0	0.09	975	1230	770	1000	31	3

Signatory For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275

781 ML Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 25 MARCH 2004 Page 1 of 1 Report Pages.
CLIENT NAME CAMERON MURRAY c/o COFFEY GEOSCIENCES PTY LTD
CLIENT ADDRESS PO BOX 108 SALISBURY QLD 4107
PROJECT NAME B17625/01 YOUR PROJECT/JOB REFERENCE B17625/01
SAMPLING DATE no record NUMBER OF SAMPLES 1 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/7/2004
DATE RECEIVED 25 MARCH 2004 LAB REF. LR2534.395

METHODOLOGY: As per SPOCAS (DNR OASSIT June 2003) for <850 um fraction, S,Ca & Mg by ICP; CLAY (H) for >40% clay, (M) for 5-40% clay or (L) for <5% clay (approximate estimation only)
LIME1 rates calculated to neutralise TPA (or TAA if >TPA), LIME2 rates calculated from TAA+aS POS+ carbonate buffer (aCa A + aMg A)/fineness factor (1.5-1.5).
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
Equivalent Sulphur (%S eq)= sTAA (%S) + S POS (%S) where sTAA (%S)=TAA/624. [Reported as oven dry (85°C) mass]
Carbonate POS = moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution. This buffers TPA.

I.D.	DEPTH	CLAY	pH	pH	SHIFT	TAA	TPA	TSA	S KCl	S P	S POS	POS ACID	LIME1	LIME2	%S eq	Ca KCl	Ca P	Mg KCl	Mg P	Carbonate POS
	m		KCL	ox	pH	m/t	m/t	m/t	%	%	%	m/t	kg/m3	kg/m3		mg/kg	mg/kg	mg/kg	mg/kg	m/t
BH1	5.5-6.0	nd	3.54	2.64	-0.9	158	478	321	0.02	0.42	0.40	252	39.4	33.1	0.66	605	705	560	650	12

Signatory P. Edmiston For and behalf of Bio-Track Pty Ltd

Determination of sulphide sulphur as per ASSMAC 1998 Method 22B

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	23 MARCH 2004
CLIENT NAME	CAMERON MURRAY c/o COFFEY GEOSCIENCES PTY LTD
CLIENT ADDRESS	PO BOX 108 SALISBURY QLD 4107
PROJECT NAME	B17625/01-J
SAMPLING DATE	no record NUMBER OF SAMPLES 3
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
DISPOSAL	SAMPLES DISPOSED ON 1/7/2004
LOG-IN DATE	19 MARCH 2004 LAB REF. LR1934.355
METHOD	As per ASSMAC 1998 Method 22B. Lime rate calculated using %S cr only, assuming a bulk density of 1.6 t/cubic metre, lime neutralisation value of 97% and a %S to kg lime/ton soil conversion factor of 31. The rate does not include treatment of any TAA or retained acidity. The lime rate does NOT include any safety factor. Suggested factor=1.5-1.8

SAMPLE ID	S cr (mg/kg)	S cr (% S grav.)	LIME REQUIRED (kg/cubic metre soil)
BH1 0.9	18	<0.002	<0.1
BH1 2.8	26	0.003	0.1
BH1 5.5	2789	0.279	14.3

Signatory P. Edmonston For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 175 781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 MARCH 2004 Page 1 of 1 Report Pages.
CLIENT NAME MR CAMERON MURRAY c/o COFFEY GEOSCIENCES PTY LTD
CLIENT ADDRESS PO BOX 108 SALISBURY QLD 4107
PROJECT NAME B17625/01-J YOUR PROJECT/JOB REFERENCE B17625/01-J
SAMPLING DATE no record NUMBER OF SAMPLES 1 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/7/2004
DATE RECEIVED 24 MARCH 2004 LAB REF. LR2434.778

METHODOLOGY: As per SPOCAS (DNR QASSIT June 2003) for <850 um fraction, TAA end point pH=6.5, whole soil titration TAA only reported, no TPA or sulphur properties measured. CLAY (H) for >40% clay, (M) for 5-40% clay or (L) for <5% clay (approximate estimation only). Lime rates calculated for TPA (or TAA if >TPA) neutralisation irrespective of acid sulfate hazard. NB. Lime rates assume 90% lime neutralisation and Bulk Density=1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.6-1.8 (All report values refer to oven dry (85°C) mass)

I.D.	DEPTH	CLAY	pH	TAA	LIME TAA
	m		KCl	m/t	kg/m3
BH 1	0.9		3.98	49	4.0

Signatory For and behalf of Bio-Track Pty Ltd

No. 25615

Chain of Custody

Laboratory Quotation / Order No:

Job No: 017625/1 Sheet 1 of 1

Colley

Dispatch to: (Address & Phone No.) BIO-TRACK - 3289 7179 731 MT GLORIOUS RD HIGHVALE 4520	Sampled by: ALAN LITTLE	Consigning Officer: BNE Date Dispatched: 08/03/04
Attention: PETER EDMONSTON	Project Manager: (report results to) CAMERON MURRAY	Courier Service: LYNX - 3289 7111 Consignment Note No:

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
CAMERON MURRAM	08/03/04			8/3/04	2.10 pm

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required: ~~PAHs~~	~~TRHs~~	~~MAHs - BTEX~~	~~Metals~~	FIELD PH TEST	SPOCAS	Sample Condition on Receipt
BH1 0.9-1.0	SOIL	~~AMBER~~ GLASS JAR / ICE	BH1 1.0m	8/3/04					/		
1.5-1.95			2.0m						/		
2.5-3.0			3.0m						/		
4.0-4.1			4.0m						/		
4.9-4.95			5.0m						/		
5.5-6.0			6.0m						/		
7.0-7.1			7.0m						/		
7.8-7.85			8.0m						/		
8.8-9.0			9.0m						/		
9.5-9.95			10.0m						/		

Special Laboratory Instructions: SPOCAS TBA DEPENDING ON FIELD PH TESTS.

Detection Limits:

Turnaround Required: ASAP PLEASE

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES

2005/11-01

Copies: WHITE: Sign on release. YELLOW: If dispatched to interstate Lab, Lab to sign on receipt and fax back to Colley. BLUE: To be returned with results.

PARSONS BRINCKERHOFF

Appendix F

Dynamic Surge Analysis Information

Review

of

Unsteady State Hydraulic Design

Australian Trade Coast Sewerage Project

SPS 299 Viola Place PS
to
Existing Rising Mains

Commissioned by Parsons Brinckerhoff Australia
Client : Brisbane Water
Prepared by Geoffrey D Stone F I Mech E C. Eng; F I E Aust C.P. Eng
[minor amendments by Michael Brand – PB]
Date 16th June 2004
Status Revision C

Design Detail & Development *0402 35 2313*

TABLE OF CONTENTS

Design Detail & Development *0402 35 2313*

Preamble

Parsons Brinckerhoff Australia Pty Ltd (PBA) has undertaken a design for the Australia Trade Coast Sewerage Project for Brisbane Water. This report covers the unsteady state analysis of the hydraulic design for the SPS 299 Viola Place PS to the existing DN 1370 & DN 1840 rising mains. These mains run from Eagle Farm PS to Luggage Point WWTP.

Summary

The following key points summarize the initial findings of the review of the systems design:-

- The analysis was carried out using the latest version of AFT Impulse
- The steady state hydraulics are in general agreement with those used for pump selection
- The modelling was done at maximum flow and pressure to provide the worst case scenarios
- The pressure transients in the system are within the nominal design rating of the pipelines
- Compliance with WSA 01 fatigue derating is achieved
- The manual valves at the rising mains should not be closed quickly while a pump is operating at full capacity
- Additional modelling with check valves relocated to the rising mains does not reduce the pressure transient level and is not reported here.

Software Used

The software used to undertake the system unsteady state hydraulics was AFT's Impulse vr 3.0. This software enables single or dual pump modeling using the HQ curve, moment of inertia and other criteria of the selected pumps. Details of the software and its verification are available from www.aft.com.

Scenarios Modelled

This models developed were used to determine the following scenarios:-

- Loss of power for all modes of pumping
- Sudden valve closure along the length of the pipelines (however actuated valves are only fitted at the SP299 valve chamber)
- Pumps starting against a closed valve
- Single pump failure whilst another pump is running
- The knifegate valves in the valve chamber operating in changeover mode whilst a pump is running
- Closure of valve with different closing scenario

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System Modelling

The maximum momentum of the water column arises when pumping from top water level upstream of the pump with the pump at high speed. The pumps are controlled to provide a maximum flow of 104 L/s. The cases investigated are for the maximum residual HGL at the RM 1370 & 1840 of 50m and 19.6m respectively. This is the basis of the modelling.

The pump trip is modelled as *stop on inertia with no backwards flow*. Pump moment of inertia (MOI) has been taken from the Weir Services Australia Pty Ltd email advice (ref Martin O'Connor to M Brand 27th April 2004). The moment of inertia is given as 1.236 kg-m^2.

The characteristics of the non-return valves to be employed were not available from the manufacturer Tyco Water. They were modelled as swing check type valve using industry data[1].

Pipe materials consist of

- DN 250 AS 2280 K12 DICL for the station pipework;
- DN 315 PE 100 AS 4130 PN12.5 for the two discharge pipelines.

The property used in establishing the wavespeed was the instantaneous modulus of PE 100 at 20°C. This is consistent with the engineering principle that a thermoplastic when exposed to rapid load will respond based upon its instantaneous properties.

Outputs from CEANET's modelling of the transients pressure in the rising mains was provided. This output describes a number of scenarios and recommended facilites that could be put in place to mitigate the transients. The work was carried out in 1995. It is not known if all, or any of the recommendations of this work was ever carried out. In addition, if it was carried out was the modelling calibrated against the installed scenario. Therefore no attempt has been made to model transients in the rising mains and their impact on the new PE 100 rising mains. This work is considered to be outside the scope of this brief.

In another scenario, the check valves at the valve pits were relocated adjacent to the rising mains to determine the impact if this was decided upon. No additional benefit was derived. This required running all the scenarios for the system as designed to ensure that there was no negative impact on the results. The results are not reported herein.

Initial modelling of the closure of manual valves at the end of the rising mains resulted in surge pressures greater than the derated design pressure of the PE 100. Therefore the time to closure of the manual valves at the rising mains was revised and results examined. Results from these different scenarios determined the closing to 90% *closed* in ten seconds followed by *full* closure in a further 30 seconds was used in the final analysis.

[1] Fluid Transients in Pipeline Systems Prof. ARD Thorley

Design Detail & Development *0402 35 2313*

Unsteady State Response Pipelines and Pumps

SPS 299 Pumping Station

The modelled pumps for this system are duty/standby configuration based upon a Hidrostal H05K-S02R-HEUC4-XMSK-NEB9-10. This single stage vertical submersible unit model has a nominal duty of 104 L/s @ 54.3m head and is fitted with a four pole speed motor 110 kW motors. Each pump operates with an efficiency of 75% at 104 L/s in single operation. The pump was run at a speed for the purposes of the modelling to represent the maximum operating pressure case pumping to RM1370 with a flow limit of 104 L/s. The Hidrostal pump data was provided as a spreadsheet.

The alternate case was pumping to RM 1840. The flow rate in this case remained at 104 L/s @ 24m head. The models allow the input of variable speed to achieve the nominated flow rate.

No power or NPSH data was provided. Our records were used to determine this information from a hard copy of curve 87-K3748b dated 10.03.97.

The scenario of *pump failure with a second pump continuing to run* is considered as parallel pumping into a common rising main is an acceptable operating mode.

The manual valves at the discharge end of the pipelines were modelled as being closed in 10 secs to 90% and a further 30 secs to full closure.

The modelling of the scenario of the station knifegate valves changing between one rising main and the other was based upon Tyco Water data for the valve taken from a CD of their catalogue. However the degree of opening versus stem position was taken from industry data[2]. The changeover time was 120 secs.

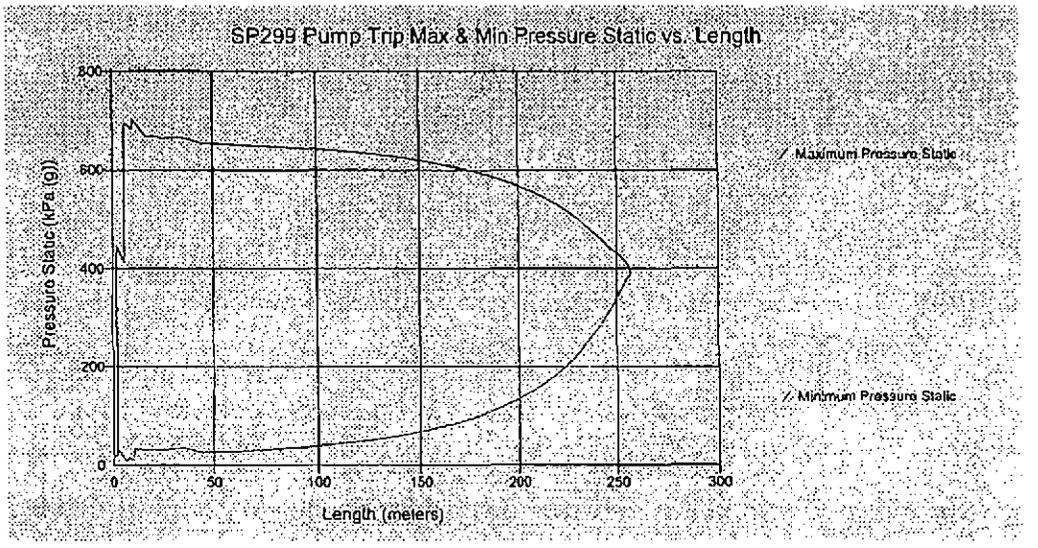
[2] Fluid Transients in Pipeline Systems 2nd Edition ARD Thorley

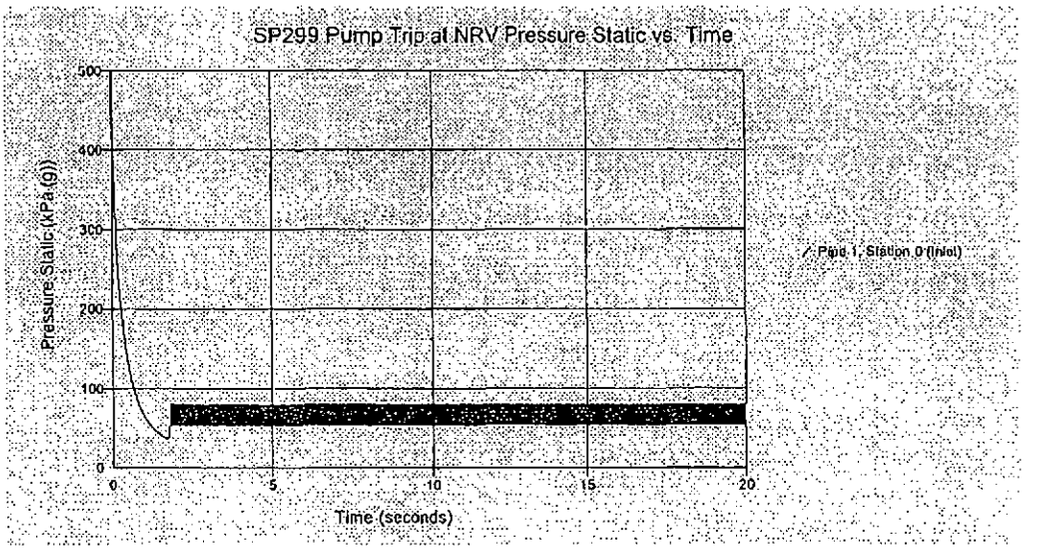
Base Case as Designed

Single Pump Trip Due to Loss of Power

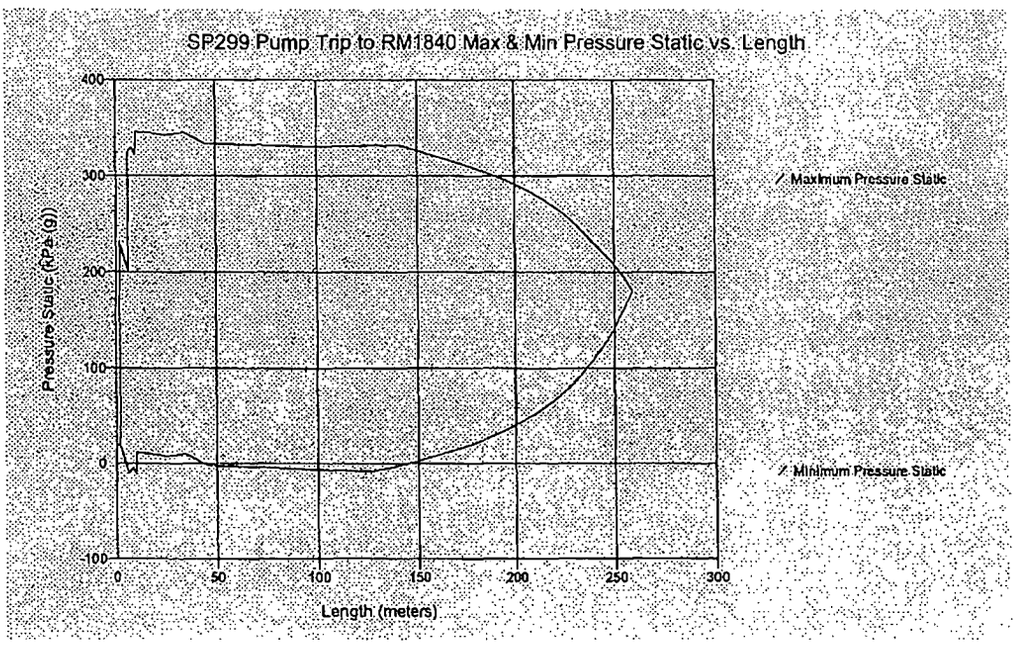
This scenario models the behaviour of the system when the duty pump trips due to loss of power or emergency stop action. The normal stopping under VSD control is considered to be even less of an issue and has not been modelled. The flow rate used in these scenarios is the maximum of 104 L/s.

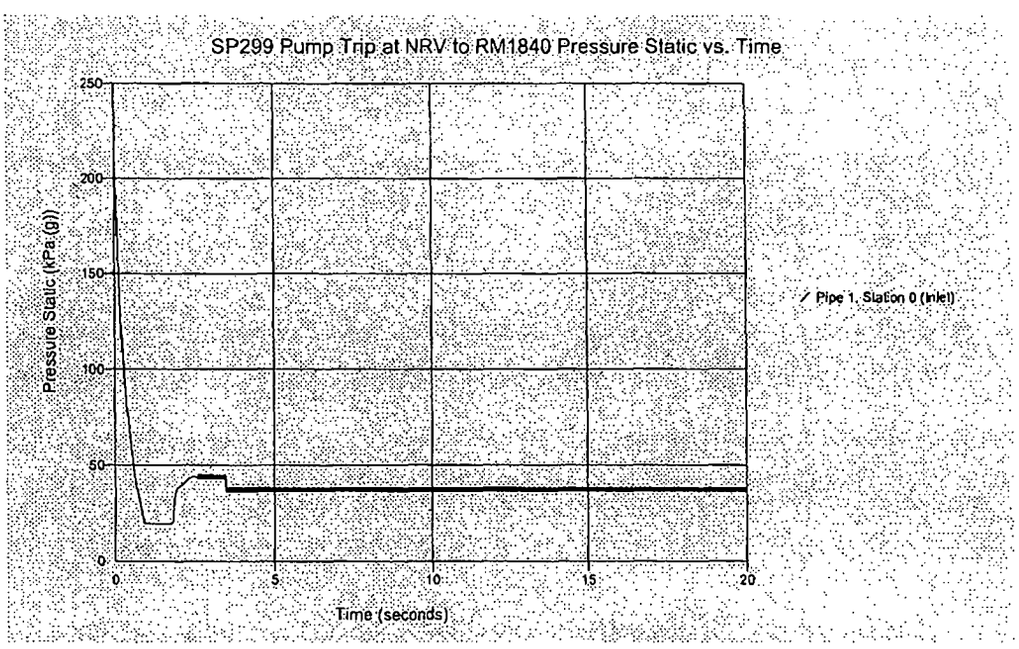
This scenario modelled the pumping to the DN 1370 rising main.The maximum & minimum surge pressure is 700 kPag positive & 5 kPag respectively. No column separation was apparent in the model in this scenario.





This scenario modelled the pipeline reporting to the DN 1840 rising main. The maximum & minimum surge pressure is 350 kPag positive & -15 kPag respectively. No column separation was apparent in the model in this scenario.



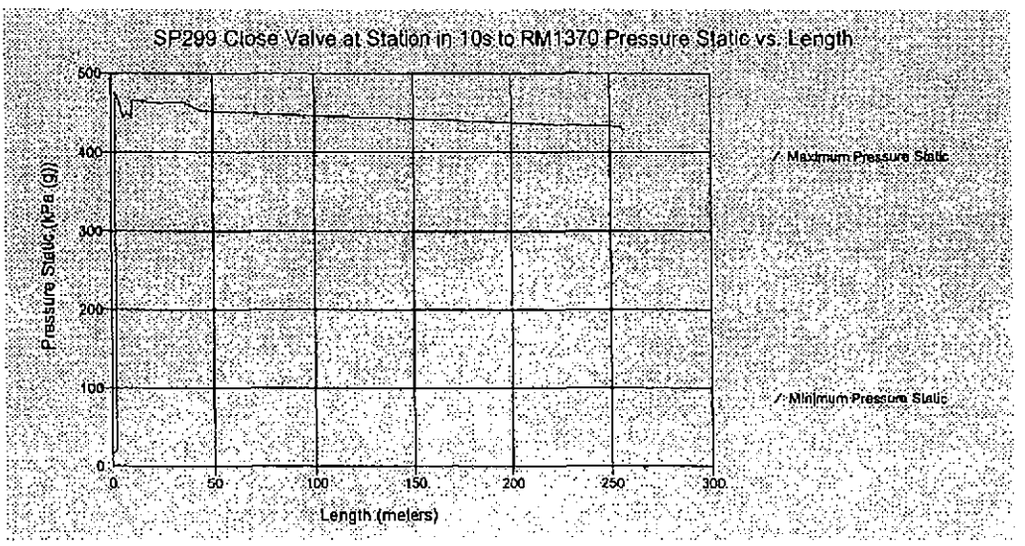


Design Detail & Development *0402 35 2313*

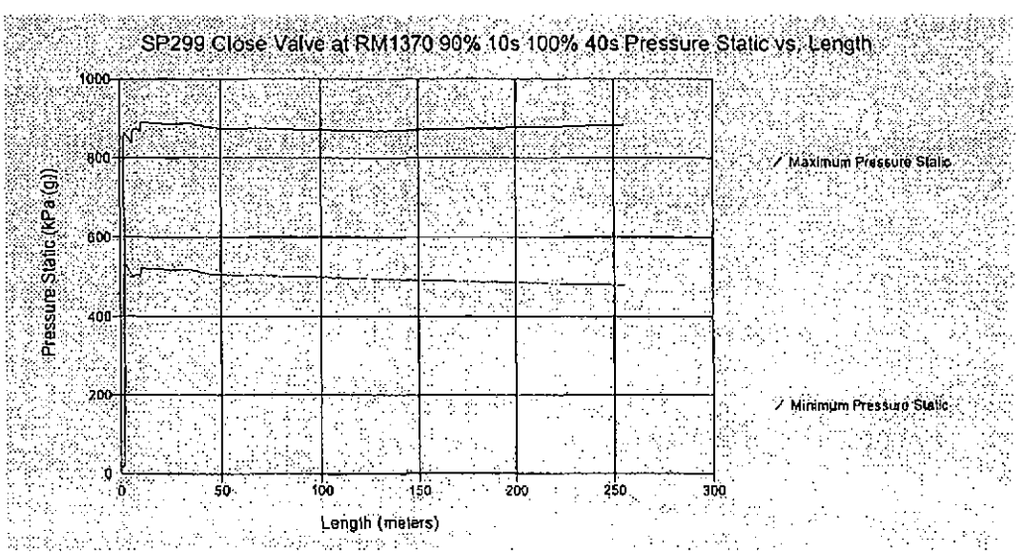
Sudden Valve Closure along the Length of the Pipeline

This scenario models the behaviour of the systems when a station valve is closed in 10 seconds whilst the pump is operating. The normal stopping under VSD control and valve closing with a stopped pump is considered to be of no consequence.

The maximum surge pressure is 480 kPag. No column separation was apparent in the model in this scenario.

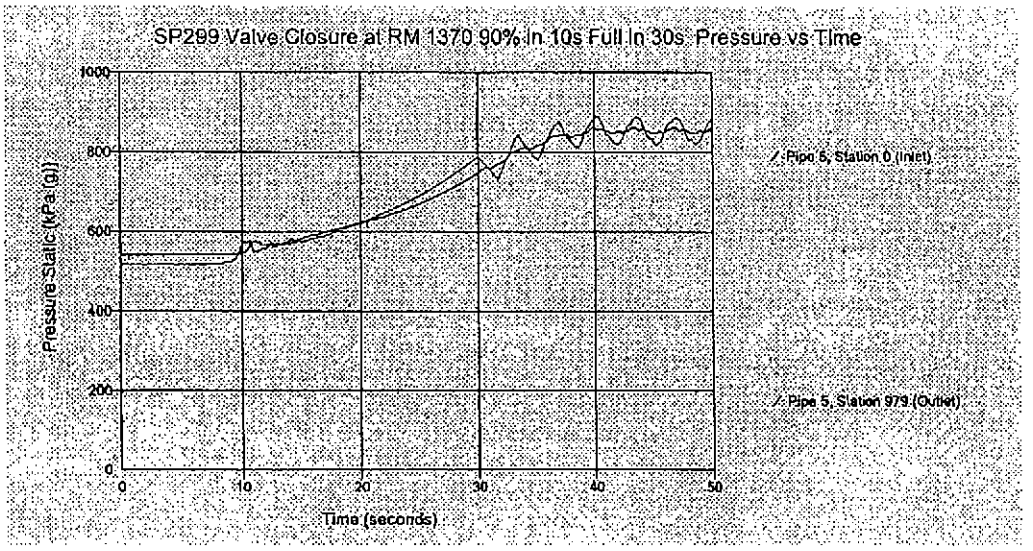


This scenario models the pipeline to rising main RM1370 where the valve close to the rising main is closed. The maximum & minimum surge pressure is 890 kPag positive & 550 kPag respectively. The selected times of operation were 90% in 10s and full closure in a further 30s. It is unlikely that the valve at the RM1370 will be closed when the pump is in operation. However it is suggested that operating instructions be available to prevent excessive surge pressures occurring. No column separation was apparent in the model in this scenario

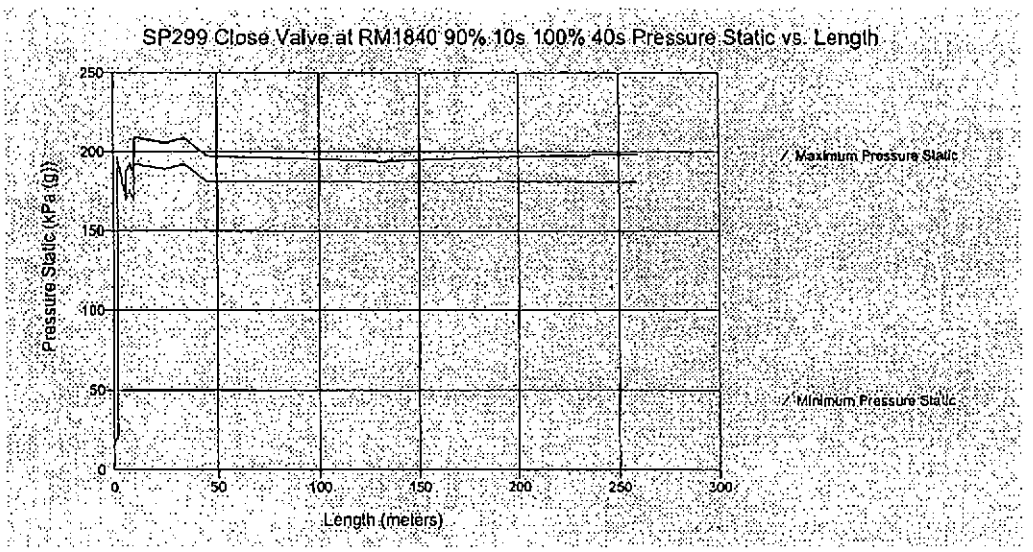


Design Detail & Development *0402 35 2313*

The graph below depicts the rise in pressure in the PE 100 section of the line arising from valve closure at the rising main to the above scenario.



This model represents the closing of a valve at the DN 1840 rising main in a time of 10 secs to 90% and the remainder in a further 30 secs. The maximum & minimum surge pressure is 210 kPag positive & 190 kPag respectively. No column separation was apparent in the model in this scenario.

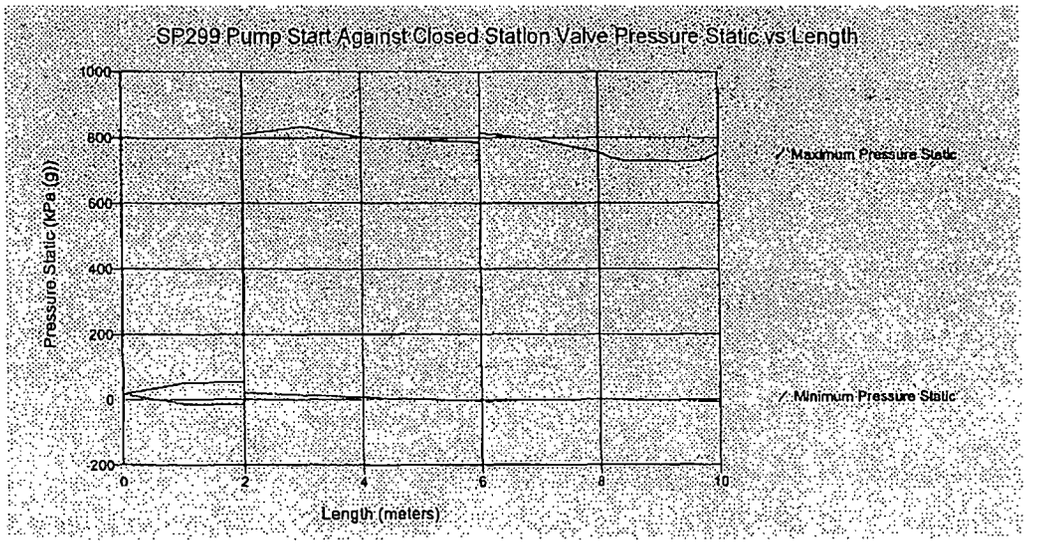


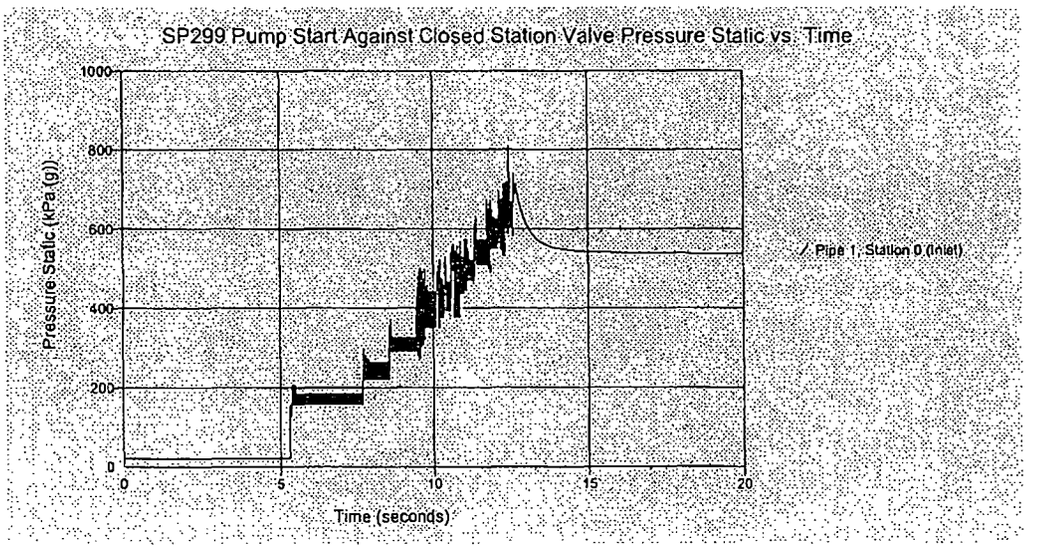
Design Detail & Development *0402 35 2313*

Pump Starting against a Closed Valve

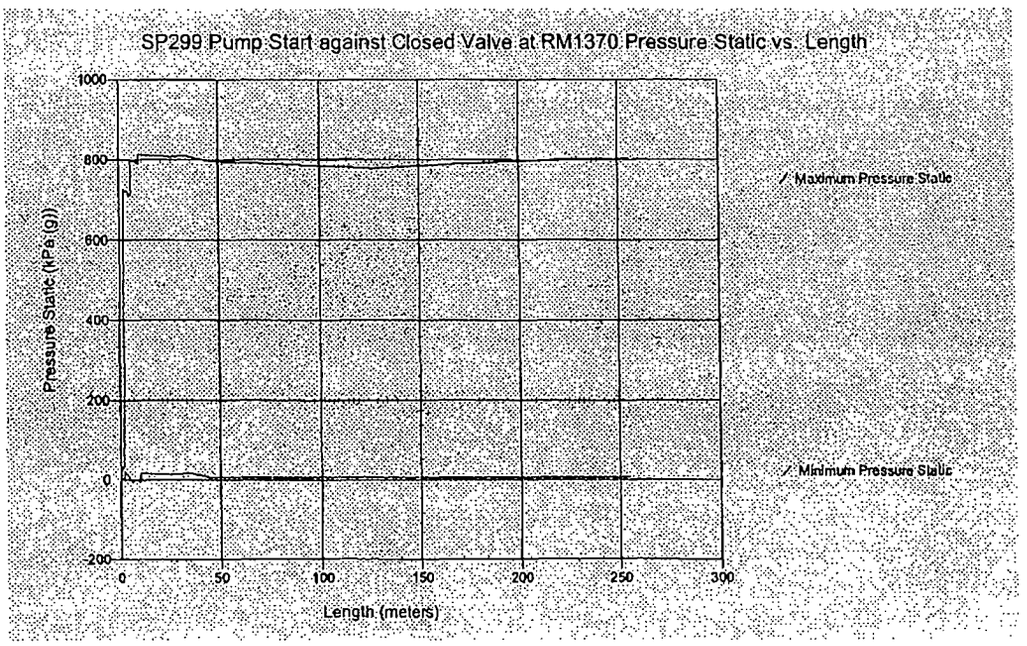
This scenario models the behaviour of the systems when a pump is started against a closed valve. Three scenarios were modelled with one using the station valve and two where a valve is closed at the selected DN 1370 or DN 1840 rising main or there is a blockage in the duty pipeline.

This scenario represents starting the pump against a closed valve at the station. The maximum & minimum surge pressure is 820 kPag positive & 0 kPag respectively. No column separation was apparent in the model in this scenario.

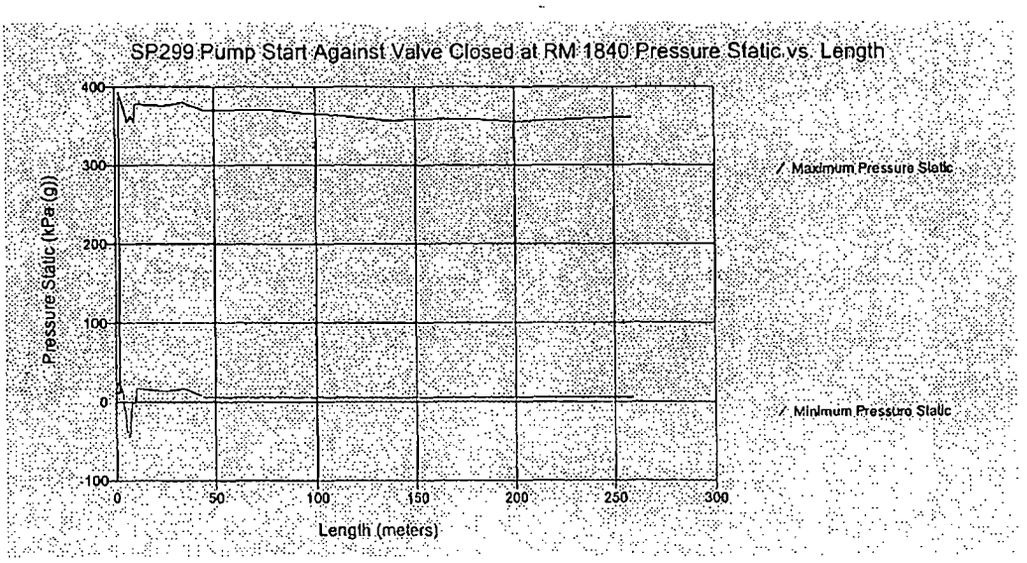




This scenario represents the starting of a pump against a closed valve at the rising main DN 1370. The maximum & minimum surge pressure is 810 kPag positive & 0 kPag respectively. No column separation was apparent in the model in this scenario.



This scenario represents the starting of a pump against a closed valve at the rising main DN 1840. The maximum & minimum surge pressure is 400 kPag positive & -50 kPag respectively. No significant column separation was apparent in the model in this scenario.

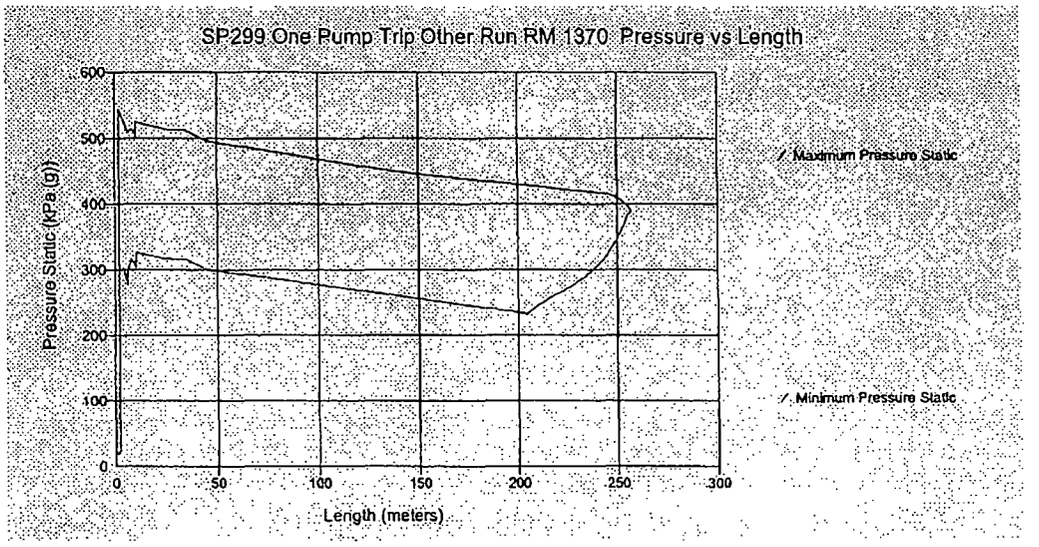


Design Detail & Development *0402 35 2313*

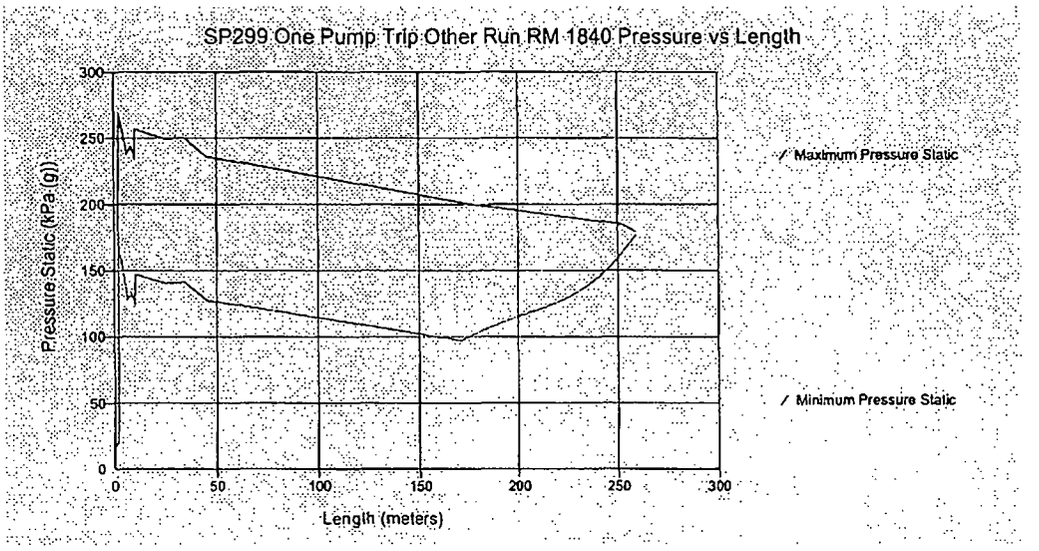
Single Pump Failure whilst another Pump is Running

This scenario models the behaviour of the systems when two pumps are inoperation and one fails. This operating scenario is permissible under the normal or emergency control. The normal stopping under VSD control and valve closing with a stopped pump is considered to be of no consequence.

This scenario represents pumping to the rising main DN 1370. The maximum & minimum surge pressure is 550 kPag positive & 270 kPag respectively. No column separation was apparent in the model in this scenario.

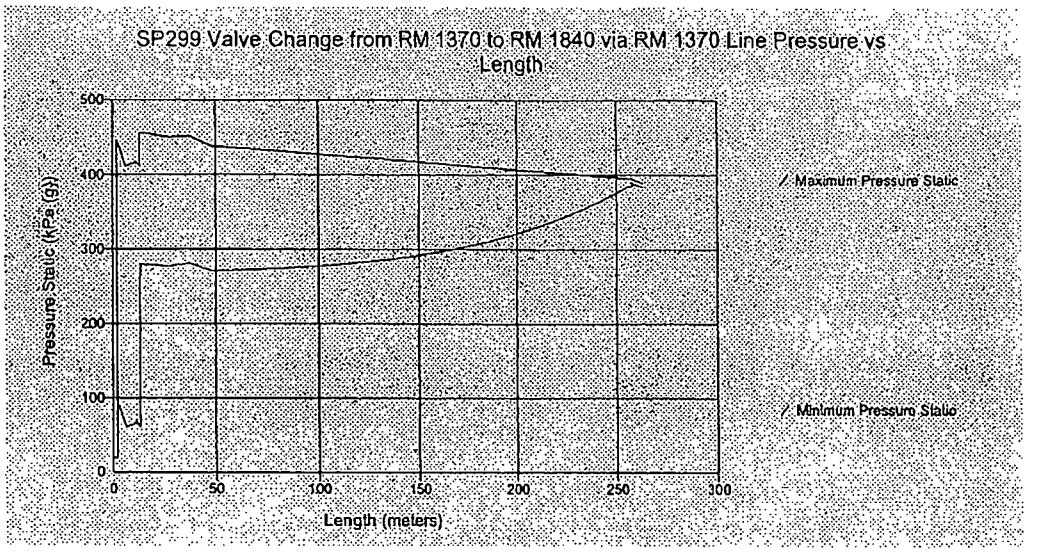


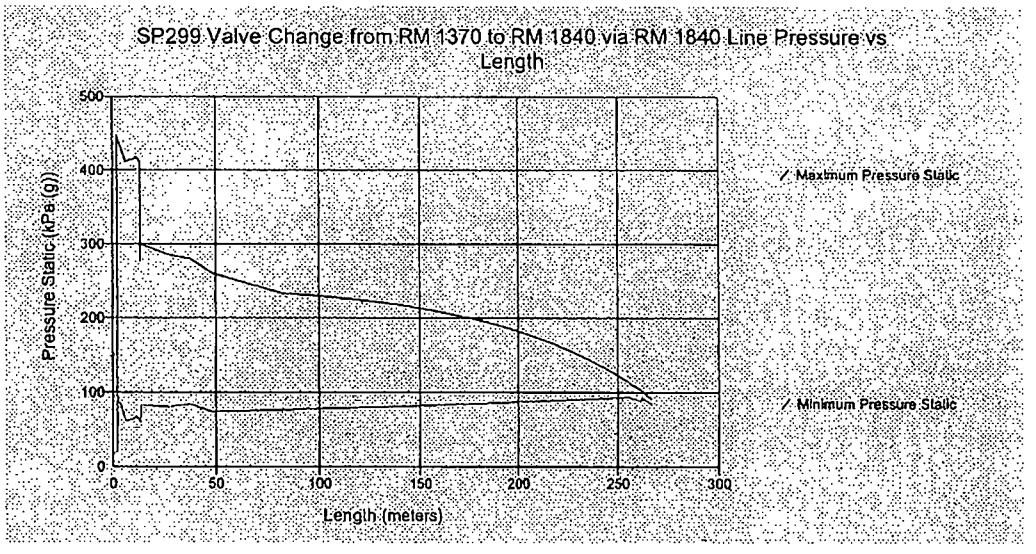
This scenario represents pumping to the rising main DN 1840. The maximum & minimum surge pressure is 270 kPag positive & 100 kPag respectively.



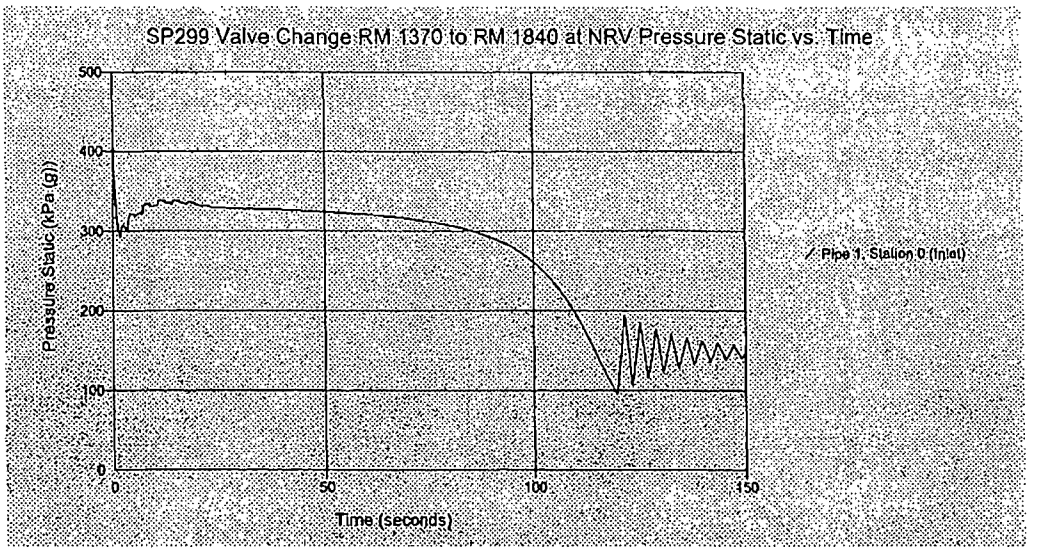
Design Detail & Development *0402 35 2313*

This scenario models the changeover from the DN 1370 to the DN 1840. An allowance has been included in the model for pump speed fluctuations that might arise from the VSD being controlled by the flow control loop. The maximum & minimum surge pressure is 450 kPag positive & 60 kPag respectively.

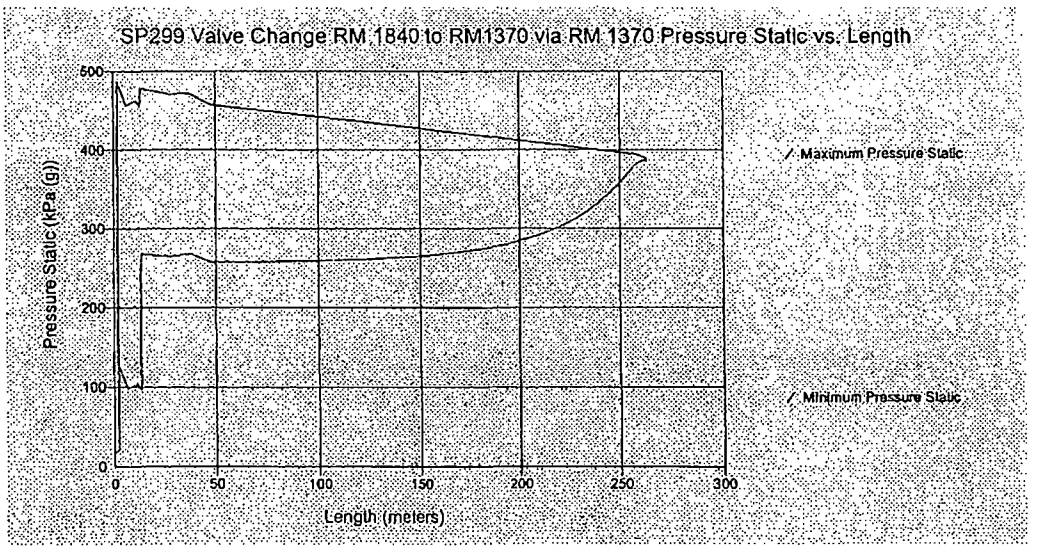


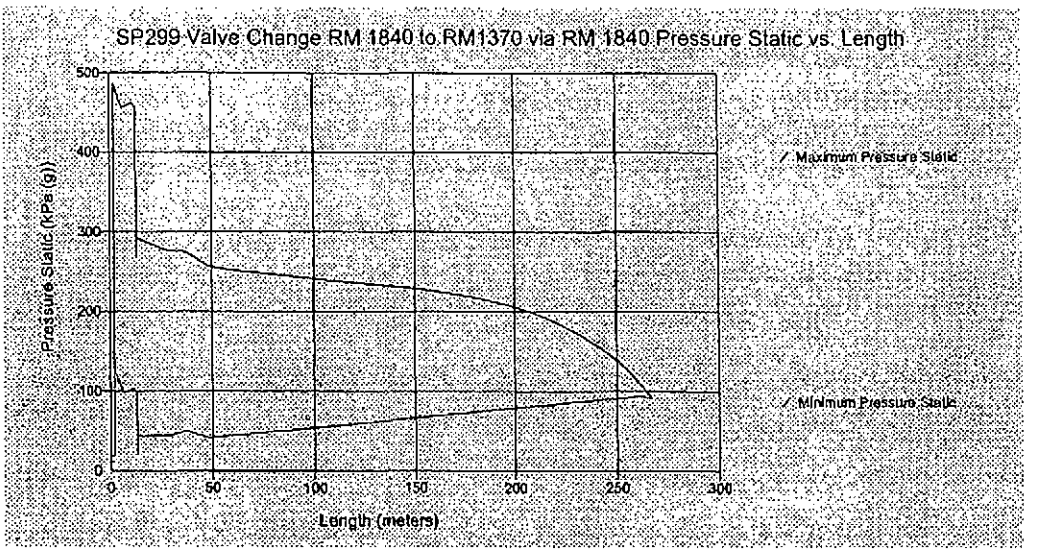


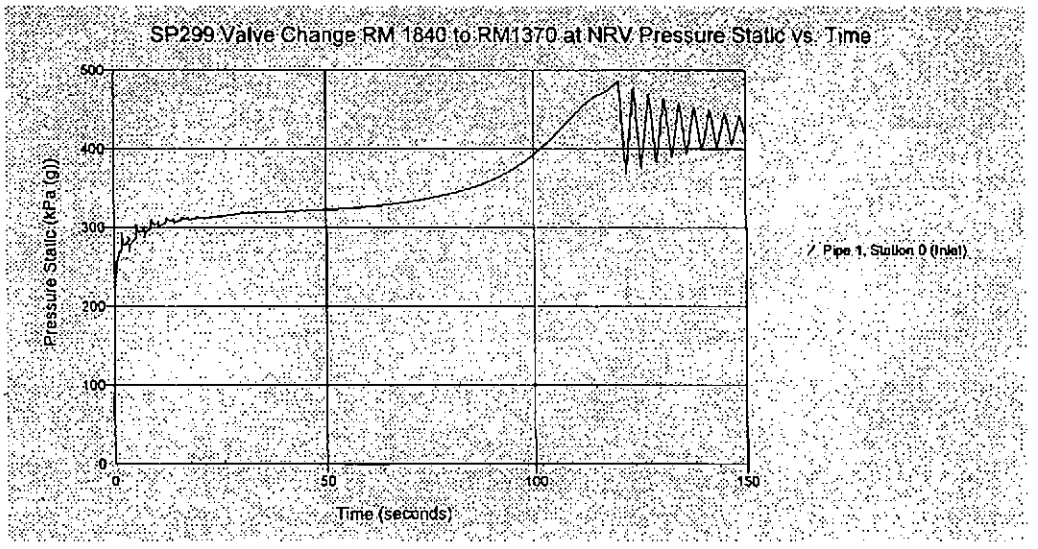
Design Detail & Development ***0402 35 2313***



This scenario models the changeover from the DN 1840 to the DN 1370. An allowance has been included for pump speed fluctuations that might arise from the VSD being controlled by the flow control loop. The maximum & minimum surge pressure is 480 kPag positive & 100 kPag respectively. No column separation was apparent in the model in this scenario.







Outcomes of the Modelling

The transient pressures are within the normal design rating of the pipe for all the above scenarios. The design rating of the pipe class selected is 1250 kPa at 20°C. If the station operates four times an hour, the derating factor for a 50 year life would be 0.81. The maximum derated pressure for the fatigue case would thus be to 1012.5 kPa for the long term case. Thus the selection complies with the requirements of WSA 01 Polyethylene Pipeline Code in the *as defined* cases of the brief except for the fast closing of the manual valves at the rising mains while a pump is operating.

The check valves selected are suitable for this application and do not require counterweights. The use of counterweights can in some instance magnify a pressure transient in the case of a poorly maintained valve. Should the valve remain open and close swiftly upon reverse velocity of the fluid column, the counter weight increases the acceleration causing a higher valve slam.

Design Detail & Development *0402 35 2313*

Conclusions

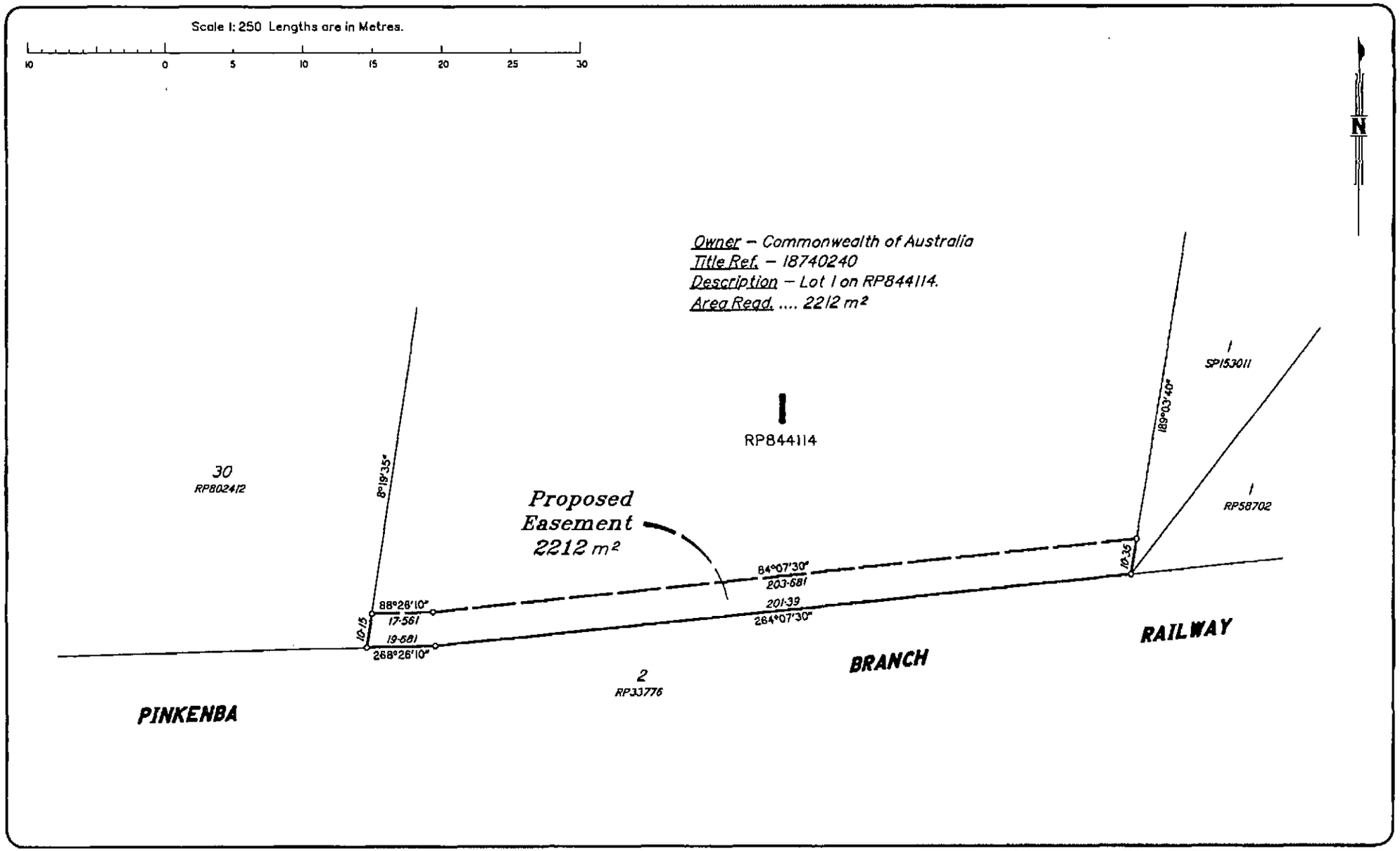
The following conclusions are drawn from this original review of the system analysis of the SP 299 Viola Place PS to the existing rising mains known as RM 1370 & RM 1840:-

- Transient pressures are within the derated design rating of the pipe material, except where the manual valve at the DN1370 rising main cut-in point is closed quickly with a pump operating at full capacity.
- Operating instructions should be developed to make it clear that the operators should not close the isolators at the large diameter rising mains while the pumps are running.
- Compliance with WSA 01 has been demonstrated
- Check valves do not require counterweights.
- The use of variable speed drives for the pumps will minimise the fatigue effects on the pipelines significantly.

oooOOOooo

Appendix G

SUR Plan



Brisbane City

SUR PLAN

of Proposed Easement in Lot 1 on RP844114.
Original Portion 3, Parish of Toombul.
County of Stanley.

Scale 1: 1000	
Drawn: AJH 3/10/2003	
Search: 1789	
CAD Ref: SUR040313–02	
Instructions: J.Bower Brisbane Water	

CITY DESIGN
TECHNICAL SERVICES
3rd Floor, T.C.Beirne Centre
315 Brunswick St Mall, 4006.
J.Dowling. ph.(07)34030489 fax.(07)34033035.

Project / Plan number	Amend
SUR040313–02	

PARSONS BRINCKERHOFF

Appendix H

Control Philosophy

SEWAGE PUMP STATION
SP 299
VIOLA PLACE EAGLE FARM

REVISED FUNCTIONAL SPECIFICATION

Revision: 1

Date of Issue: 20 September 2004

Document Approval

		Signature	Date
Author	M. Brand		
Design Verifiers			
Projects Engineering Manager			
Project Manager			
Team Leader – Projects Systems & Information Management			
Principal Process Operations Engineer			

Document History and Status

Issue	Date of Issue		Date		Date		Date		Date		Date
Rev 0	17/6/04	MB	17/6/04								
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Contents

ATTACHMENTS:
SP299 Design Calculations
SP299 Electrical Drawings

1. INTRODUCTION

1.1 Scope of Document

This document outlines the functional requirements for control, monitoring and telemetry at sewage pump station SP299 at Viola Place Eagle Farm.

1.2 Organisations Involved

The design, construction and commissioning of SP299 were components of Brisbane Water's *Australia Trade Coast Sewer Project*. The project was awarded to Leighton Contractors Pty Ltd (LCPL) in late 2003.

SP299 was designed by Parsons Brinckerhoff — LCPL's design consultant — and was constructed by LCPL in the second half of 2004.

1.3 General Description of SP299

SP299 is a 3.6 m diameter reinforced concrete pump station incorporating two variable speed driven 110 kW submersible pumps operating in a duty/standby arrangement. SP299 is located on the southeast side of Viola Place Eagle Farm, near the junction with Terminal Drive.

SP299 will service the redevelopment of the Trade Coast Central site, which is owned by the Brisbane City Council. SP299 was constructed well in advance of the Trade Coast Central development and hence needs to operate for extended periods of time under low inflow conditions.

SP299 discharges a maximum of 104 L/s of raw sewage through one of two OD315 PE100 rising mains into the existing Eagle Farm to Luggage Point sewage rising mains. The system operators can remotely select either the high pressure DN1370 MSCL rising main or the low pressure DN1840 MSCL rising main to take the flow from SP299.

2. FUNCTIONAL REQUIREMENTS

2.1 Pump Station Duties

SP299 is required to deliver a maximum of 104 L/s into either the high pressure DN1370 Eagle Farm to Luggage Point rising main, or the low pressure DN1840 Eagle Farm to Luggage Point rising main. Both the large diameter rising mains are connected to variable speed pumps at the Eagle Farm Pump Station (EFPS) and hence the sewage flows in each main are variable.

The EFPS actually consists of two pump stations:

- EFPS#1, which has three 2000kW pumps in a two duty/one standby arrangement; and
- EFPS#2, which has two 1850kW pumps in a duty/standby arrangement.

During dry weather, EFPS#1 is normally used in conjunction with the DN1370 main. Under the current operating arrangements, EFPS#1 can deliver a maximum of around 4200 L/s through the DN1370 main to the Luggage Point WWTP.

During wet weather events, EFPS#1 is normally used in conjunction with the DN1370 main, and EFPS#2 is brought online to assist, in conjunction with the DN1840 main. Under the current operating arrangements, the EFPS can deliver a maximum of around 8000 L/s through both mains to the WWTP.

As SP299 is required to deliver sewage directly into the existing rising mains, its duty head is a strong function of the residual head in the selected discharge main. The maximum and minimum pump duties for SP299 are presented in the table below.

Main in Use	EFPS Flow (L/s)	SP299 Flow (L/s)	SP299 Head (m)
DN1370	4200	**104**	**54.2**
	0	**104**	**11.6**
DN1840	3800	**104**	**19.6**
	0	**104**	**11.6**

System curves, pump performance curves and duty calculations for SP299 are presented in the Attachments.

2.2 Equipment Installed

2.2.1 Pumps

Two Hidrostal H05K submersible pumps with 110 kW four pole electric motors are installed in the wet well.

2.2.2 Pump Protection Equipment

Each pump is fitted with moisture probes in the oil chamber and thermistors in the stator windings.

2.2.3 Starters

Two Danfoss VLT8000 Variable Frequency Drives (VFDs) are installed in the pump station switchboard.

2.2.4 Flowmeters

Two direct buried DN300 ABB Magmaster electromagnetic flowmeters are installed in the DN315 PE100 discharge mains downstream of the valve chamber.

2.2.5 Level Sensors

One Vega hydrostatic level transmitter and one Multitrode level probe are installed in the wet well.

2.2.6 Pressure Transmitters

Two Vega D84 pressure transmitters are installed on the discharge pipework in the valve chamber.

2.2.7 Actuated Valves

Two DN250 Keystone Figure 951 knifegate valves with 415V Rotork actuators are installed in the discharge pipework in the valve chamber.

2.2.8 Dosing Pumps

Provision was made for two chemical dosing pumps (nominally Alldos 0.09 kW) to be installed adjacent to the dosing slab. Provision was made for VFDs for these pumps to be installed in a dedicated control panel adjacent to the pumps.

2.2.9 Activated Carbon Scrubber

Provision was made for one activated carbon odour scrubber (nominally RKR Engineering Airclenz) to be installed adjacent to the wet well. Provision was made for the starter and controls for the activated carbon unit to be installed in a dedicated control panel adjacent to the scrubber.

2.2.10 Emergency Generator

One Stamford/John Deere 300 kVA (size and make to be confirmed) diesel powered backup generator is installed on a slab adjacent to the valve chamber. The generator includes its own GE FANUC PLC mounted in a dedicated control panel inside the generator housing.

2.2.11 Pump Station PLC

One GE FANUC PLC is installed in the pump station switchboard.

2.2.12 Telemetry Equipment

One MITS RTU is installed in the pump station switchboard.

2.3 Pump Station Operating States

SP299 has two operating states:

- Remote
- Local

The Local/Remote selector switch dictates the mode of operation. This switch is located in the door of the main switchboard.

2.3.1 Remote State

This is the normal operating state. Pump functionality is directed by the PLC based on automatic feedback control of the wet well level. The PLC calculates the deviation between the measured well level (from the hydrostatic transmitter) and the level setpoint (in the PLC software) and manipulates the speed of the operating pump(s) through the VFDs.

2.3.2 Local State

In Local mode, no automatic control is performed. The PLC controls the pumps based on the manual initiation of the pumps individual start and stop pushbuttons. Once started in manual, the pumps will run until they are requested to stop manually. The operator or electrician is fully responsible for the consequences of running the station in this mode.

THE VFD KEYPADS WILL BE DISABLED AFTER COMMISSIONING TO AVOID OPERATION BY UNTRAINED PERSONNEL.

Electricians with proper training will be able to enable the keypad and allow the pumps to be operational in an emergency situation.

2.4 Pump Start/Stop Sequence

A pump will start if both the following conditions are true:

1. the pump is available for PLC control; and
2. the pump is requested to run.

A pump will stop if either of the following conditions are true:

1. the pump is no longer available for PLC control; or
2. the pump is requested to stop.

Once a start request is accepted by the PLC, the pump is started using the following sequence:

- VFD run/stop relay output shall close;
- VFD speed control shall be set to the required speed depending on control being Local or Remote;
- a low flow inhibit timer set to 60 seconds inhibits the low flow cut-out (based on the magnetic flowmeter signal) while the pump starts;
- if the magnetic flowmeter has not registered a flow of at least 10 L/s after the time delay has expired, then the run/stop relay remains energised; and
- the status indicator lights turns on.

Upon a stop request being reset, the pump is stopped using the following sequence:

- VFD run pump relay output shall open;
- VFD frequency reaches 0 Hz, the drive running light on the panel is de-energised; and
- the status indicator light turns off.

The emergency stop sequence for a pump will be executed in the following manner:

- main switchboard or VFD panel emergency stop pushbutton is pressed;
- the isolating contactor opens;
- VFD run/stop relay is de-energised; and
- run light on VFD panel is de-energised

2.5 Pump Availability

A pump must be available before it can be started. Any one of the following onsite fault conditions will make the pump unavailable:

Fault Condition	Description	Set Criteria	Reset Criteria
Pump Control Power NOT on	Pump or Control Circuit breaker switched to the "OFF" or "Tripped" position	Physical input inactive	Physical input active
Pump Emergency Stop	Pump Emergency Stop pushbutton pressed	Physical input inactive	Physical input active
Pump VFD NOT Ready	VFD faulted due to any of the conditions listed in 2.5.1	Physical input active	Physical input inactive
Pump VFD Not Ready Count Exceeded	More than 3 VFD Not Ready faults in 8 hours	Counter > 2	Local or Remote Reset
Pump Contactor fail to operate (open or close)	Any pump contactor fails to operate. Fail to open or fail to close)	Output command ≠ Input Feedback for 2 seconds	Local or Remote Reset

In Remote mode, under normal operating conditions (not surcharge pumping), a pump motor restart request is locked out for ten minutes to protect the motor starting equipment from thermal failure. This lockout is bypassed by the remote start command from the MITS SCADA system.

A pump cannot be stopped (except emergency stop) once the wet well level is above surcharge imminent.

The emergency stop button is a latched button. The physical button has to be reset before the emergency stop condition is reset.

Local mode prevents the CRO from controlling the site and the pump unavailable alarm is suppressed in this mode. Critical alarms as surcharge imminent and surcharge occurring are sent back to the CRO regardless of his control status.

2.5.1 Pump VFD Ready and in Auto Mode

The local control keypad for the VFD is mounted in the door of the pump compartment. The following control functions are available on the keypad:

"VFD Ready" PLC digital input signal. This signal will be on when the VFD is powered up and the following conditions are not present:

- one of the VFD essential faults has not been detected. The VFD essential faults are:
  - Earth fault;
  - Switch mode fault;
  - Short circuit;
  - Auto-optimisation not OK;
  - Heat sink temperature too high;
  - Motor Phase Failure;
  - Inverter Fault.

If any of these essential faults is detected, the VFD will stop the pump and the "VFD Ready" PLC input signal will be off.

- "VFD Auto Mode selected" this signal will be on, if the drive is selected to Auto on the keypad and is ready for remote control.
- "VFD Running" this signal will be on when the drive is running.
- "VFD Running Speed" PLC analogue input signal will provide 4–20 mA VFD running Hz to the PLC.
- When selected to Auto mode with the pump station mode selector switch in Remote, each VFD speed will be controlled via an analogue output from the PLC. The pump operating speed will be set by the PLC.
- When the VFD is in Auto mode with the pump station mode selector switch in Local, each VFD speed will be controlled via a potentiometer mounted on the pump starter panel part of the main switchboard.

The pumps will be available for PLC control if the "VFD Ready" and "VFD Auto Selected" signals are on.

The pump "VFD Not Ready" fault will be unlatched and the pump will become available for PLC control if any of the following conditions are true.

1. The pump VFD Not Ready fault condition is reset (VFD Ready PLC input signal active) and the local reset pushbutton is pressed.

2. The pump VFD Not Ready fault condition is reset (VFD Ready PLC input signal active) and a reset is issued from the operator workstation.

3. The pump VFD Not Ready reset delay timer times out. This will be indicated by the pump VFD Ready auto reset flag being active.

When the pump VFD faults, the VFD Auto reset timer will start. The VFD Ready delay reset timer is used to allow a preset time to pass before unlatching the fault.

2.6 Running Philosophy

The incoming flow to SP299 comes from the Trade Coast Central development and the Meeandah Barracks. Sewage is pumped from both locations into the inlet maintenance holes at SP299. The sewage then passes through the collection maintenance hole into the grit collector maintenance hole, and finally into the wet well.

SP299 is designed to discharge into one of two Eagle Farm to Luggage Point rising mains — a low pressure DN1840 steel rising main and a higher pressure DN1370 steel rising main. Pressure transmitters are installed in the discharge pipework leading to each main to advise the control system which main is in use.

Motorised knifegate valves with proximity switches are installed in the discharge pipework to allow automatic switching between the discharge mains. SP299 is not designed to discharge to both mains simultaneously.

During normal operation, SP299 operates on level control. The electromagnetic flowmeters on the discharge lines are for monitoring only, and flow setpoints are not used to control the station. The proposed level control philosophy is described below.

Level control is used in order to operate the pump station as a "flow-in/flow-out" transfer station as opposed to a "fill and drain" station. SP299 will, however, operate in "fill and drain" mode if the inflow is less than the minimum flow from the station (ranging from 0 L/s to 70 L/s, depending on the rising main in use and the residual pressure in the main).

The control system attempts to maintain a steady level in the pump station by adjusting the output of the operating pump(s). The control loop uses an analogue level signal (from the hydrostatic level transmitter) as the measured variable and manipulate the pump speed through the VFDs.

The PID control loop should be configured at commissioning to provide Proportional-only control action. That is, the integral time constant should be set to a very large number and the derivative constant should be set to zero.

Proportional Control (PC) manipulates the pump speed in response to the deviation between the measured level and a nominal level setpoint. PC will not maintain the level exactly at the setpoint but will allow it to vary around the nominal setpoint within a range called the Proportional Band (PB). The amplitude of the PB can be set arbitrarily by changing the Proportional Gain (Kp) of the feedback controller. **The Proportional Gain should be set to a value of 30** at commissioning to give a PB of +/- 0.5 m around the nominal setpoint, allowing for a pump speed range of 25 Hz to 55 Hz. **The nominal setpoint should be RL1.20 mAHD**.

At the start of an operating cycle, the level in the wet well will be at Cut Out and all pumps will be off. As sewage enters the station the level will rise.

When the level reaches Bottom of PB (Cut In) the Duty A pump will start at the minimum speed of 25 Hz. If the inflow is less than the pump output at minimum speed, the level will fall and the pump will cut out at Cut Out. The operating volume between Cut In and Cut Out is sized for a maximum of 15 starts per hour with one pump producing a nominal flow of 60 L/s.

If the inflow is greater than the minimum discharge rate, the level in the wet well will continue to rise after the pump starts. Within the PB, the controller will modulate the speed of the pump in proportion to the level until the pump can stabilise the level. The VFD will ramp the pump supply frequency within a range from a minimum of 25 Hz (at the bottom of the PB) to a maximum of 55 Hz (at the top of the PB) with a linear distribution between the two limits. At 55 Hz a single pump will discharge approximately 104 L/s into the high pressure main when the EFPS is delivering its peak flow of 4200 L/s.

If the well level continues to rise above the Top of PB, the Duty B pump will start. The feedback level control loop will continue to operate as normal and both pumps will operate at the same speed. The Duty B pump will cut out when the level is drawn down to the Stop Duty B level.

During Level Control operation, the discharge flowrate from the pump station will be monitored by the PLC through the magnetic flowmeters. If the discharge flowrate reaches the upper flow limit of 104 L/s, the PLC will not command any further frequency modulation that will drive the flow above this limit. The speed that corresponds to this flowrate will depend on the main in use (DN1370 or DN1840) and the residual pressure in the main at the time. The pump speed required to deliver 104 L/s could be as low at 30Hz (with the minimum residual in the DN1840 main), or as high as 55 Hz (with the maximum residual in the DN1370 main).

The PLC will also monitor the discharge rate to ensure it does not drop below 45 L/s during steady operation. This flow corresponds to the intersection between the peak DN1370 system curve and the nominal operating region of the pump. This part of the control logic is designed to prevent the pump station operating continuously at low speed against a high residual head and delivering no flow.

Under normal circumstances, all control functions will be initiated in response to an analogue signal from the hydrostatic level transmitter. The Multitrode level switches will be used to indicate Surcharge Imminent.

In the event of a failure of the hydrostatic level transmitter, all pumps will immediately stop and control of the pump station will be based on the surcharge imminent digital input alarm. When this alarm is received, the Duty A pump will start at maximum speed and run for a predefined time.

When the level reaches the surcharge imminent level, as per the physical surcharge imminent electrode, the station will initiate the surcharge pumping mode. In surcharge pumping mode, all starting interlocks, pump inhibits and wet well level duty setpoints are ignored. All available pumps will be commanded to run.

Surcharge pumping mode is active while surcharge pumping conditions are true and for a set period of time (site specific) after the level falls below the surcharge imminent condition. Once surcharge-pumping mode is deactivated, the station will revert to normal level of operation.

The MITS operator can inhibit one or all station pumps. A single pump can be inhibited if it is not operating in the pump curve. This will remove it from the duty cycle allowing the other pumps to operate as duty pumps until the inhibit is removed.

When the whole pump station is inhibited, it is desirable to minimise the volume pumped. This is achieved by utilising the wet well storage capacity to a safe maximum level. The duty start levels are raised to 200 mm below surcharge imminent. At this level, the pumps will run for a minimum of five minutes until the pump lockout time expires. After this period, the pumps will stop at 400 mm below surcharge imminent. While both pumps are inhibited, the wet well high alarm will be suppressed.

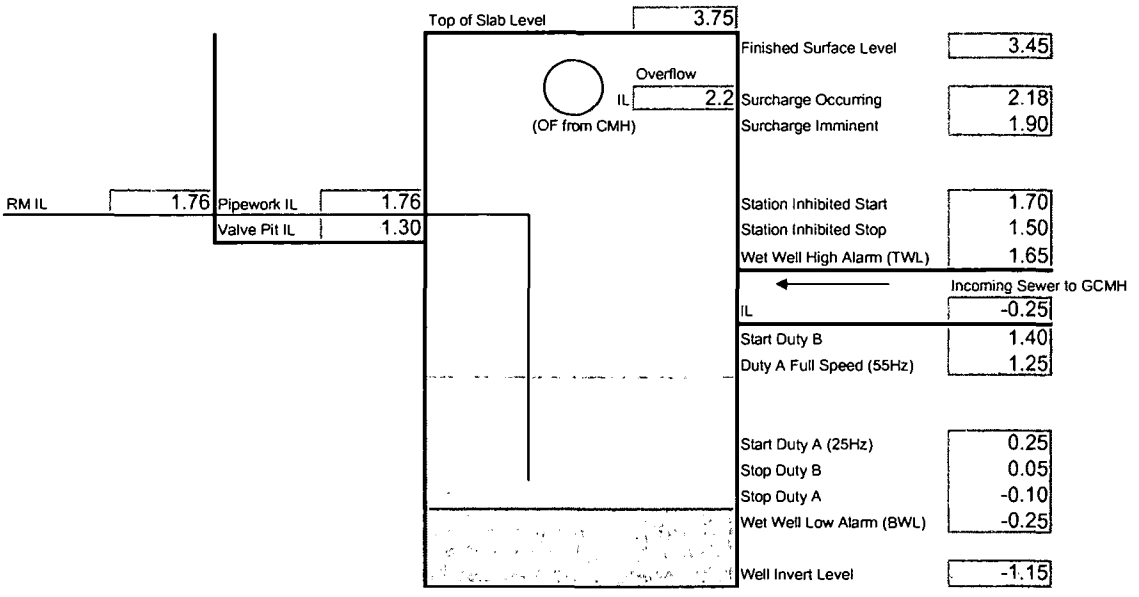
In the event of a failure of the wet well probe, all pumps will immediately stop and control of the pump station will be based on the surcharge imminent digital input alarm.

When this alarm is received, both pumps start at maximum speed.

SP299 may communicate by telemetry with the EFPS, SP298, SP299, SP146, SP136 and SP131 through BW's Cullen Avenue Control Centre. This would enable the system to be controlled as a whole, thus minimising the chance of sewage overflows in the event of a breakdown or malfunction. The nature of this system control interconnectivity is to be determined by Brisbane Water.

Operational Diagram

The following diagram shows the station structure levels and operating levels.



2.7 Site Alarms

2.7.1 Alarm Definition

When alarms are triggered, the PLC immediately transmits them to the MITS master station. These are unsolicited transmissions and, to preserve radio network capacity, these transmissions are kept to a minimum.

The alarm definitions are:

Priority 1: Immediate action

Priority 2: Action next calendar day

Priority 3: Action next working day

Priority 4: No action required, not an "alarm", log as an event for future reference.

Priority 1 alarms need immediate action and are therefore placed in the PLC trigger queue.

The alarm priority class is shown by colour in the CRO's alarm picture on the MITS. The MITS SCADA allows alarm filtering of alarms.

2.7.2 Pump Station Alarms

The following alarms are labelled Pump Station Alarms and cause the PLC to send and immediate alarm to the control room.

MITS SCADA Details		
Plant	**Quantity**	**Alarm Description**
Sewage_pumping_station	Local_Remote	Station in Local mode
Sewer_pump	Available	Sewer pump unavailable
PLC	Isagraph_stopped	PLC software stopped
PLC	Isagraph_failed	PLC software faulted
Sewage_pumping_station	Mains_fail	Site Main Power Fails
PLC	Battery	PLC power failure battery
PLC	Mains_fail	PLC power failure (mains)
Wet_well	Level_invalid	Wet well measuring instrument faulted
Wet_well	Surcharge_imminent	Wet well level reaches the surcharge imminent level
Wet_well	Surcharge_occurring	Wet well level reaches the surcharge occurring level
Wet_well	High	Wet well level rises above a high alarm level
PLC	Abnormal_operation	Abnormal operation of PLC – PLC has restarted
Wet_well	Low	Wet well level is low
Sewer_pump	Pump_hours_excessive	Pump run hours are excessive
Sewer_pump	Low_run_hours	Pump station run hours are below normal
Pressure_gauge	High	RM Pressure is high
Pressure_gauge	Low	RM Pressure is low
Pressure_gauge	Invalid	RM Pressure is invalid
Sewer_pump	Motor_power_high	Pump motor power high
Sewer_pump	Motor_power_low	Pump motor power low
Sewer_pump	Motor_power_invalid	Pump motor power invalid
Sewer_pump	Motor_current_high	Pump motor current high
Sewer_pump	Motor_current_low	Pump motor current low
Sewer_pump	Motor_current_invalid	Pump motor current invalid

MITS SCADA Details		
Plant	**Quantity**	**Alarm Description**
Sewer_pump	VFD_Fault	Pump VFD Faulted, signal provided by VFD Not Ready
Sewer_pump	VFD_count_check	Pump VFD has faulted more than 3 times in 8 hrs period
Sewer_pump	Mains_power	Pump has lost mains power
Sewer_pump	Running	Pump running indication
Sewer_pump	Contactor_Fail_to_Close	Pump contactor fail to close
Sewer_pump	Emergency_stop_fault	Pump emergency stop button is active
Sewer_pump	Moisture_In_Oil Chamber	Pump Oil Chamber - Moisture detected
Attention	Automatic_reset	Site attention indication has automatically reset

The pump performance degradation and pump blockage variables have the following values.

Index	DPBkSP (mAHD)	VSDDSP (Hz)	FlwDSP (L/s)	VSDBSP (Hz)	FlwBSP (L/s)
0		Set in code	Set in code	Set in code	Set in code
1	0	TBA	TBA	TBA	TBA
2	TBA	TBA	TBA	TBA	TBA
3	TBA	TBA	TBA	TBA	TBA

The PID loop variables have the following values.

Index	PidIN	PidSP	PidK	pidKd	PidKi	pidInt	pidDb	pidOUT
0	Set in code	Set in code	TBA	0	TBA	0	0.2	Set in code
1	Set in code	Set in code	TBA	0	TBA	0	0.2	Set in code
2	Set in code	Set in code	TBA	0	TBA	0	0.2	Set in code

Pump Performance Degradation (Monitoring Only)

The pump performance degradation alarm flag will be latched if the pump has been running, the VFD speed is valid, the flow rate is valid, the delivery pressure is valid and either of these following alarm conditions becomes active.

- During PID minimum flow control, the VFD speed is above the performance degradation minimum flow rate VFD speed setpoint for that delivery pressure for longer than the time period determined by the performance degradation minimum flow rate VFD speed timer.
- Flow rate less than the performance degradation flow rate setpoint for that delivery pressure and the VFD speed is above the performance degradation flow rate VFD speed setpoint for that delivery pressure for longer than the time period determined by the performance degradation flow rate VFD speed timer.

The alarm flag will be reset when the pump performance degradation conditions no longer exist and either of the following conditions occur:

- local reset (PnLRst) via the pump local reset pushbutton being pressed; and
- remote reset via an operator.

2.7.2.1 Pump Blockage

The pump blockage flag, which inhibits the pump from being available if another pump is available to run, will be latched if the pump station doesn't have a surcharge imminent alarm active, the pump has been running, the VFD speed is valid, the flow rate is valid and either of these following alarm conditions becomes active.

- While being in PID minimum flow control, the VFD speed is above pump blockage minimum flow rate VFD speed setpoint for that delivery pressure for longer than the time period determined by the pump blockage minimum flow rate VFD speed timer.
- Flow rate less than the pump blockage flow rate setpoint for that delivery pressure and the VFD speed is above the pump blockage flow rate VFD speed setpoint for that delivery pressure for longer than the time period determined by the pump blockage flow rate VFD speed timer.

The alarm flag will be reset when the pump blockage conditions no longer exist and any of the following conditions occur:-

- local reset (PnLRst) via the pump local reset pushbutton being pressed;
- remote reset via an operator; and
- surcharge imminent alarm becomes active.

2.7.2.2 Pump Availability

The pump available flag will only be set when all of the available conditions occur and either of the following conditions occur:

- NOT Pump no.n blockage;
- pump no.n blockage and another pump is NOT available to run; and
- pump no.n blockage and surcharge imminent alarm becomes active.

If any of the available conditions are not met then the pump is unavailable for PLC control and will not be able to be run automatically or locally via the local start pushbutton.

2.7.3 Priority 2 Alarms

Priority 2 alarms are stored in the PLC buffer and transmitted when the buffer is full or when the MITS master station polls the PLC. The CRO will be notified of these alarms once they are transmitted.

Since these alarms are non-critical, this delay is acceptable.

No priority 2 alarms are used for this site.

2.7.4 Alarm Suppression

To avoid consequential alarming that is one fault condition triggering multiple alarms at the MITS SCADA system, alarm suppression is used on secondary alarms.

The main consequential alarm condition is Site Power Fail.

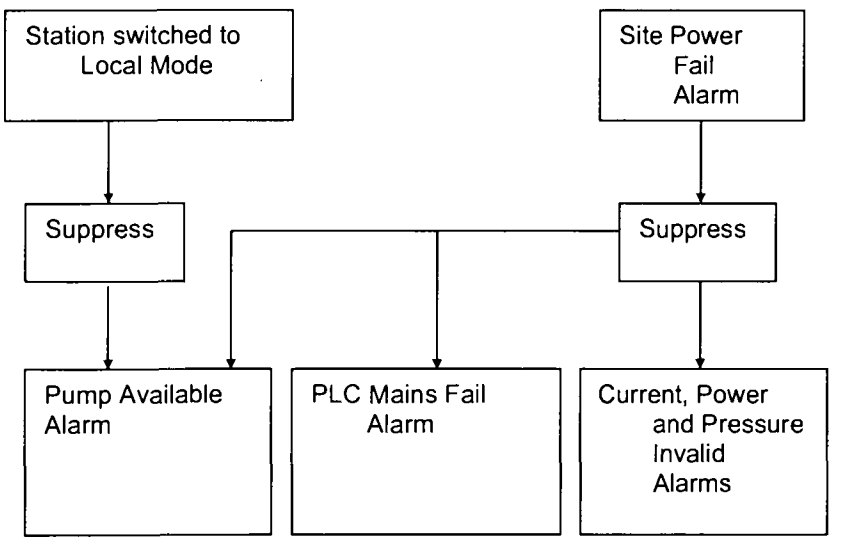
If site power fails, the following secondary alarms are suppressed:

- Pump unavailable
- PLC power fail
- Motor current invalid
- Motor power invalid
- Site pressure invalid

When the station is switched to Local mode, the site is under the control of the on site technician. An alarm is triggered at the SCADA system to indicate the station is in local control. All pump alarms are suppressed as the on site technician has assumed responsibility for the station.

Note: Wet well and PLC alarms are not suppressed.

Alarm Suppression Tree



No Suppression

Wet well
- Level invalid
- Wet well high
- Surcharge imminent
- Surcharge occurring

PLC
- PLC stopped
- PLC failed
- PLC Battery low

2.8 PLC Functionality

2.8.1 PLC Calculations

The following calculations are performed by the pump station PLC:

1. Wet Well Level Calculations
2. Wet Well Volume
3. Station Inflow
4. Station Volume Pumped
5. Station Surcharge Duration
6. Station Pressure mAHD
7. Pump Hour Run per day
8. Pump Flow (kL) per day
9. Pump Starts per day
10. Pump kW hours per day

A brief description of the listed items are given below:

2.8.1.1 Wet Well Level Calculations

The onsite wet well level indicator mounted on the switchboard shows well level in percentage (%) of full range. This value is transmitted to control room for ease of comparison with the on site technician.

The operator requires the wet well level in mAHD to be able to do a meaningful comparison between different sites.

The following formulas are used to calculate these values.

WWL (mAHD) = WWL (meters) + WWLZero Level (mAHD)

$$\text{WWL (\%)} = \frac{[WWL(mAHD) - WWLZero(mAHD)]}{WWLRange(m)}$$

2.8.1.2 Wet Well Volume

The wet well level is calculated using a wet well levels versus volume look up table. The look up table has a maximum of 32 point specification of the non-linear relationship of the wells "Level versus Volume". Volume in wet well is an interpolation of the well versus volume look up table values.

		Water Height (mAHD)	Stored Volume (m^3)	Remaining Storage Capacity [m^3]	Comments	% Level	% Volume
1	Wet Well Low	-0.25	0.0	24.9	BWL	0%	0%
2	Stop Duty A	-0.10	1.5	23.4		6%	6%
3	Stop Duty B	0.05	3.1	21.9		12%	12%
4	Start Duty A	0.25	5.1	19.8		20%	20%
5	Duty A Full Speed	1.25	15.3	9.7		61%	61%
6	Start Duty B	1.40	16.8	8.1		67%	67%
7	Incoming Sewer	-0.25	0.00	24.9		0%	0%
8	High Level Alarm	1.65	19.3	5.6	TWL	78%	78%
9	Station Inhibited Stop	1.50	17.8	7.1		71%	71%
10	Station Inhibited Start	1.70	19.8	5.1		80%	80%
12	Surcharge Imminent Alarm	1.90	21.9	3.1		88%	88%
13	Surcharge Occurring Alarm	2.18	24.7	0.2		99%	99%
14	Overflow Level	2.20	24.9	0.0		100%	100%

2.8.1.3 Total Inflow

The total volume pumped in kilolitres since the start of the year is updated in two seconds increment calculated by integrating the inflow, if the wet well level and flow are valid, using the following calculation algorithm:

Total Inflow = (Inflow x 2)/1000 + Total Inflow

The Inflow rate is the change in volume plus the volume pumped out of the well and is updated in two second increments calculated, if the wet well level and flow are valid, using the following calculation algorithm.

Inflow = ((Volume Now – Volume Old) + (Flow x 2)) / 2

Volume now = Current wet well level volume

Volume old = Previous (2 seconds ago) wet well level volume

Flow = Flow in engineering units

The wet well volume is calculated, if the wet well level is valid, using the wet well level as a reference and interpolation of a level vs. volume vs. surcharge flow lookup table.

2.8.1.4 Total Volume Pumped

The total volume pumped in Kilolitres since the start of the year is updated in two second increments calculated by integrating the inflow if the wet well level and flow are valid.

2.8.1.5 Station Surcharge Duration

While the surcharge occurring alarm is active, a timer is accumulated to measure the duration of the surcharge event. This figure is stored until a new surcharge occurring alarm is triggered, at which time the timer is reset to zero.

2.8.1.6 Station Pressure (mAHD)

The pressure probe measures the pressure in kPA. This allows the CRO to compare different sewerage sites. The pressure, in mAHD, is calculated and sent back to the MITS SCADA system.

Pressure (mAHD) = Pressure $\frac{(kPA)}{k}$ + Pressure Elevation (mAHD)

k = 9.803 (Pressure constant to convert from kPA to metres)

Pressure Elevation = Site Specific Pressure Elevation of Pressure Gauge

2.8.1.7 Pump Hrs Run/day

The VFD of each pump has a Modbus communication card connected to the PLC.

This card provides the PLC with information regarding Current, Speed, kW hours per day and hours run per day.

2.8.1.8 Pump kL/day

The station magnetic flowmeter will provide flow readings via an analogue 4–20 mA signal connected to the PLC.

2.8.1.9 Pump Starts/day

The number for starts per day counter is incremented every time a pump starts. This counter is reset at midnight.

2.8.1.10 Pump kW hrs/day

The VFD of each pump has a Modbus communication card connected to the PLC.

This card provides the PLC with information regarding Current, Speed, kW hours per day and hours run per day.

2.8.2 Site Attention Indicator

The operator will be able to initiate and cancel the site attention indicator. When a site attention indication is generated, officers on site will be required to acknowledge the attention indicator and then contact the operator.

The site attention indicator digital output is latched by an operator generating a site attention indicator flag.

The output is unlatched if any of the following occurs:

- site attention indicator reset by the operator;
- site attention indicator reset pushbutton digital input being pressed; and
- site attention alarm timer expires.

The site attention alarm timer is enabled by the site attention alarm indicator digital output.

The site attention alarm flag is latched if the site attention alarm expires. The alarm is unlatched when the next site attention indicator output is set.

2.8.3 Local Indication Lamp

The local indication lamp output displays the status of the pump.

Lamp Off Pump stopped but available

Lamp On Pump running

Lamp Flashing Pump Fault

2.8.4 Pump Hours Run

An hours run counter shall be kept for all pumps in the PLC.

A cyclometer type hours run meter has also been mounted on the front door of each pump starter Panel.

An electronic hours run meter also exists in the VFD for the Pumps, these totalise the pump hours run time during its operation.

3. MITS SCADA SYSTEM – OPERATOR INTERFACE

The SCADA Screen shall follow the format and standards of the existing Screens.

Live points from PLC fed back to picture

- Wet well level in metres AHD and % full
- Pump duty A start level (in metres AHD and % full), pump duty A stop level, and wet well high level
- Status of each pump (available, running)
- Delivery pressure in metres AHD
- Delivery Flow
- Site power status
- Local/Remote control status
- Station inflow (when pumps are not running)
- Wet well volume
- Time (in minutes) to surcharge (when pumps are unavailable)

MITS database points in the picture

The Inlet level (metres AHD), Overflow Control Level (metres AHD) and the Site Level (metres AHD) are stored in the MITS database and not in the PLC. These values are displayed in the main station picture.

3.1 PLC Input/Output Listing

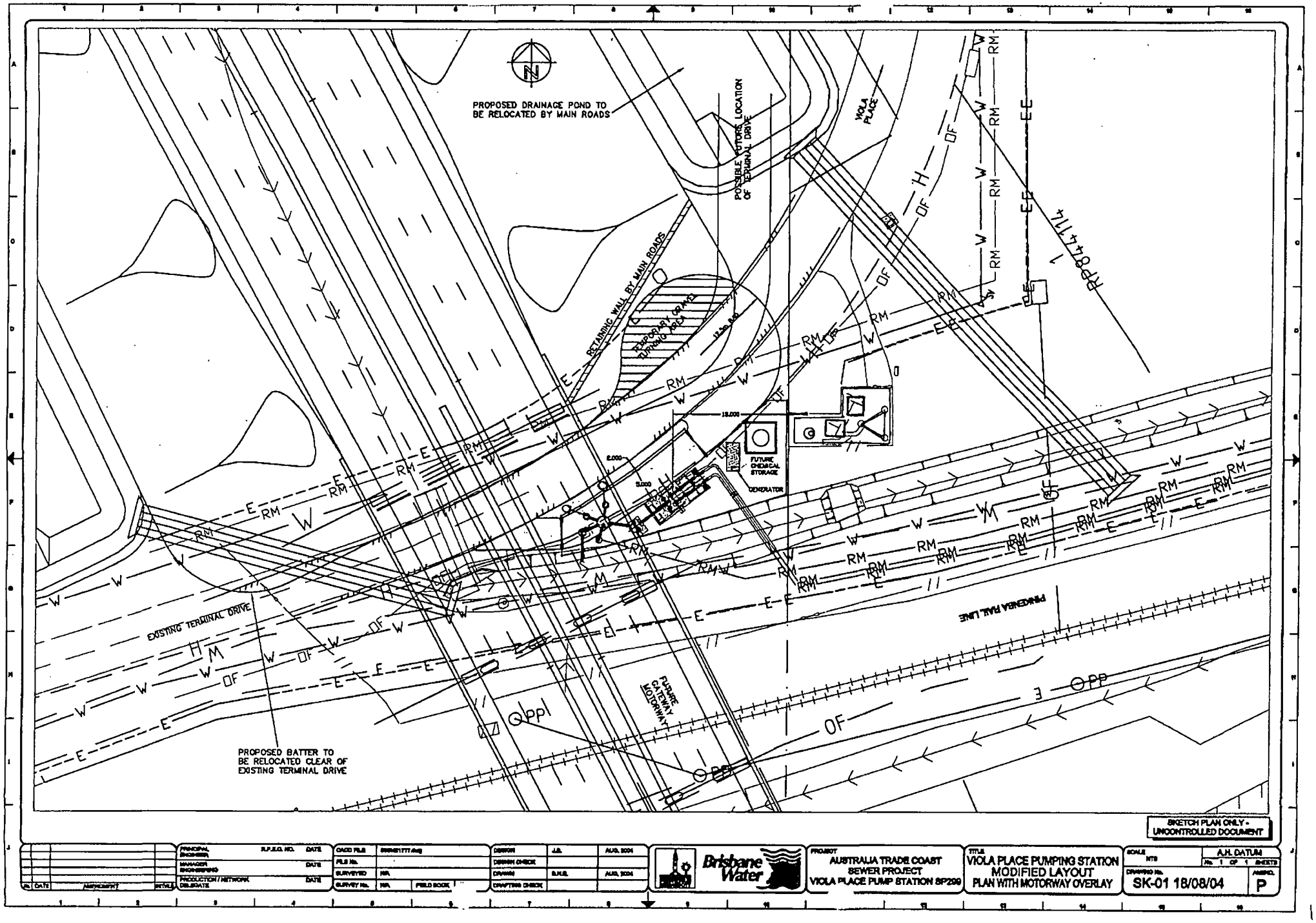
Refer to electrical drawings.

ATTACHMENTS

PARSONS BRINCKERHOFF

Appendix I

Gateway Motorway Overlay


PROPOSED DRAINAGE POND TO BE RELOCATED BY MAIN ROADS
POSSIBLE MOTOR LOCATION OF TERMINAL DRIVE
VIOLA PLACE
RETAINING WALL BY MAIN ROADS
TEMPORARY DRAINS DURING WORKS
FUTURE CHEMICAL STORAGE
GENERATOR
EXISTING TERMINAL DRIVE
PROPOSED BATTER TO BE RELOCATED CLEAR OF EXISTING TERMINAL DRIVE
FUTURE GATEWAY MOTORWAY
PRESSURE MAIN LINE
SKETCH PLAN ONLY - UNCONTROLLED DOCUMENT
Brisbane Water
AUSTRALIA TRADE COAST SEWER PROJECT
VIOLA PLACE PUMP STATION SP299
VIOLA PLACE PUMPING STATION
MODIFIED LAYOUT
PLAN WITH MOTORWAY OVERLAY
SK-01 18/08/04
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