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Wastewater Servicing Strategy

Property:
Black Hill Development Site

Applicant:
Coal and Allied

Date:
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project management • town planning • engineering • surveying
visualisation • economic analysis • social impact • urban planning

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Executive Summary

ADW Johnson has been engaged by Coal and Allied (C&A) to prepare a local wastewater servicing strategy for C&A's Black Hill Development Site to determine the wastewater infrastructure required to service the development. The developable area within C&A's Black Hill Development Site will net approximately 23 industrial sites, each averaging about 6 ha in size.

The proposed development is located south west corner of the intersection of the Sydney-Newcastle Freeway (M1) and John Renshaw Drive, Black Hill. The study area for the strategy includes C&A's proposed development site and a potential development site adjoining to the west. An existing creek runs from south to north through the site from approximately RL22.0 m to RL12.0 m. Ground elevations within the site range from approximately RL 12.0 m to RL 42.0 m AHD.

C&A's proposed development site is 183 ha in size which consists of approximately 154 ha of industrial development, with the remainder proposed as environmental conservation area. The proposed environmental conservation area will enable the existing creek and natural flow regime through the site to be maintained. The 154 ha of industrial land is proposed to be divided into 23 industrial lots.

The development to the west of C&A's site is approximately 300 ha in size with approximately 191 ha of the site proposed industrial development. The total study area is therefore approximately 483 ha in size.

The Black Hill development site lies within the Morpeth wastewater treatment works (WWTW) catchment. This strategy details three possible options for wastewater treatment of the study area, being Option A, B and C.

From the options investigated, Option A was discounted due to the significantly higher costs and the extent of construction work required proceeding with this option. Option B and C are similar options with the key difference being that Option B pumps directly to Morpeth WWTW whereas Option C pumps to Beresfield 5 WWPS which then pumps to Morpeth WWTW. Option C was found to have significant cost benefits in comparison to Option B. Option C proposes the following infrastructure:

- Internal WWPS (WWPS 1) and internal DN375 and DN450 carrier mains
- External DN375 rising main constructed to Beresfield 5 WWPS

A Net Present Value (NPV) analysis of the infrastructure proposed for Option C indicated the works have an NPV of \$10,455,961.

It is assumed the infrastructure for Option C can be staged, with Stage 1 involving the construction of all gravity mains, ultimate pump station civils and the use of interim pumps, while Stage 2, the ultimate state, will involve the upgrade of the pumps and associated electrical works to their ultimate state.

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Appendix E	Output from HWC Estimating Guidelines
Appendix F	Net Present Value Analysis

1.0 Background

ADW Johnson has been engaged by Coal and Allied to prepare a wastewater servicing strategy for the Coal and Allied Black Hill Development Site.

1.1 DEVELOPMENT DESCRIPTION

Coal and Allied's (C&A) Black Hill development site is approximately 183 hectares (ha) in size, 154 ha of which is to be developed as industrial land. The proposed development site is situated to the south west of the Sydney-Newcastle Freeway (M1) and John Renshaw Drive intersection. Adjoining to the west is a proposed development which is approximately 300 ha in size, 191 ha of which is to be developed as industrial land. The C&A proposed development site and the proposed western development have been included in this strategy.

Figure 1 below shows the proposed Coal and Allied Black Hill development site.



Figure 1: Proposed Black Hill Development Site

C&A are proposing to develop 23 industrial sites throughout the proposed development. C&A's proposed development will also include detention basins of various sizes and a section of open space through the centre of the development.

C&A's proposed site is bound to the east by the Sydney-Newcastle Freeway (M1), to the south by existing rural land, to the west by rural landscape which is currently proposed to be rezoned as a mix of industrial and environmental conservation, and to the north by John

Renshaw Drive. Appendix B contains Exhibit A which shows an overall regional plan, and Exhibit B which highlights the two developable areas.

1.2 PLANNING CONTEXT

C&A's proposed development is currently zoned pursuant to the Newcastle Local Environmental Plan (LEP) 2012 as a combination of IN2 (light industrial) and E2 (environmental conservation).

The rural land to the south of the site falls within the coverage of the Newcastle LEP, and has not been proposed to change from the current E4 (environmental living) zoning within the near future.

The land adjoining to the west of the C&A site is currently in the process of being rezoned to a combination of IN1 (general industrial) and E2 (environmental conservation). Appendix B contains Exhibit C which depicts zoning plan of the proposed site and the surrounding area.

1.3 STUDY AREA

The study area is located to the south west of the Sydney-Newcastle Freeway (M1) and John Renshaw Drive intersection. The site is bound to the east by the Sydney-Newcastle Freeway (M1), to the south by existing rural land, to the west by rural landscape land and to the north by John Renshaw Drive.

The topography of C&A's proposed development site is undulating with a valley and creek located through the centre of the proposed development. An existing creek runs from south to north from approximately RL22.0 m to RL12.0 m (Exhibit D within Appendix B shows the existing creek line). Ground elevations within the study area range from approximately RL 12.0 m to RL 42.0 m AHD.

The study area includes both C&A's proposed development site in addition to the potential development adjoining to the west of C&A's site. The proposed western development is approximately 300 ha in size, with approximately 191 ha of land to be developed as future industrial land.

C&A's proposed development site and the potential western development site are shown on a regional plan in Exhibit A located in Appendix B, with a local plan providing an aerial photo of the site in Exhibit B.

1.4 PROJECTED DEVELOPMENT IN THE STUDY AREA

At present it is understood that C&A's site is the only proposed development which is zoned to be developed within the study area. It is noted however, the potential adjoining development to the west of C&A's site is currently undergoing a rezoning process to enable development of a similar nature to proceed.

As such, for the purposes of this strategy it is assumed that the development will be rezoned to the proposed combination of IN1 (general industrial) and E2 (environmental conservation) similar to the existing zoning of C&A's development site.

Development staging proposed for C&A's development site is in accordance with Section B3 of the approved concept plan – "Indicative Staging Plan". The modelling contained in

this report has been based on the ultimate development as the construction of the development will occur as one stage. As the proposed development is an industrial development the timing of the various stages outlined in Exhibit B is unknown. Hence the modelling has been completed as per the ultimate development. At the concept design stage it is assumed that the staging of the proposed development will be better understood and therefore the design of any infrastructure can be made more detailed at that point in time.

It has been assumed that the potential western development site will not be constructed until 10 years after the construction of C&A's proposed development. As such this strategy has been completed considering a Stage 1 which includes only the construction of C&A's proposed development and an ultimate Stage where both C&A's development and the adjoining western development by others have been constructed.

2.0 Options Development

2.1 POINTS OF CONNECTION AND AVAILABLE CAPACITY

Hunter Water Corporation (HWC) has indicated that the nearest wastewater connection point is Beresfield 21 Wastewater Pumping Station (WWPS). Beresfield 21 WWPS pumps to Morpeth WWTW via Beresfield 16A WWPS, Thornton 1 WWPS and Berry Park 1 WWPS. It is noted that there is very limited capacity within this system and as a result significant augmentation would be required to generate sufficient capacity to cater for the proposed Black Hill development. A second option which involves pumping directly to the Morpeth WWTW has been outlined by HWC in order to avoid significant augmentation to the existing system (Appendix A contains HWC preliminary servicing advice). The existing trunk wastewater system is shown in Exhibit F in Appendix B.

2.2 DESIGN WASTEWATER LOADING

Design sewage loadings have been determined in accordance with the Sewerage Code of Australia, Hunter Water Edition Version 1 (WSA 02-2002). Ultimate development of C&A's proposed Black Hill Development Site and the adjacent proposed western development are anticipated to yield approximately 2419 ET. A summary of the theoretical design sewerage loadings for ultimate development of the study area can be seen in Table 1.

Table 1: Theoretical Design Sewerage Loads

Development	Developable Area (ha)	ET	ADWF (L/s)	r	PDWF (L/s)	SA (L/s)	PWWF (L/s)
Catchment 1	196	1372	15.1	2.1*	31.7	113.6	145.3
Catchment 2	150	1047	11.5	2.1*	24.2	86.7	110.9
Total		2419					256.2

*r factor of 2.1 adopted for entire study area

Loads and factors presented in the above table are based on the anticipated ultimate development of two light industrial sites which comprise 345 ha of developable industrial land or 2419 ET assuming 7 ET/ha. Appendix C contains detailed calculations of the theoretical design wastewater loads.

2.3 DESIGN CODE / OPTIONS ASSUMPTIONS

In developing options the design requirements specified in the following manuals have been adhered to unless otherwise stated:

- Sewerage Code of Australia, Hunter Water Edition Version 1 (WSA 02-2002);
- Hunter Water Corporation Water and Sewer Design Manual, Section 4 – Small to medium submersible sewage pumping stations and sewer rising mains.

The number of ET for C&A's proposed development site and the adjoining western development site was calculated based on 7ET/ha of developable industrial land.

Civil infrastructure has been sized for ultimate demands.

The proposed adjacent western development will be rezoned to light industrial and commence development 10 years after C&A's proposed site.

This strategy is limited to major wastewater infrastructure. Minor reticulation gravity mains have not been considered and will require investigation and design as part of the staged development.

3.0 Servicing Options

Three options have been examined as part of this servicing strategy to transport wastewater from the study area to Morpeth WWTW propose the following:

- Option A: Construction of an internal WWPS and rising main discharging to Beresfield 21 (B21) WWPS plus augmentation of downstream infrastructure as required;
- Option B: Construction of an internal WWPS and rising main discharging directly to Morpeth WWTW; and
- Option C: Construction of an internal WWPS and rising main discharging to Beresfield 5 (B5) WWPS plus augmentation of downstream infrastructure as required.

In addition to the internal WWPS required to transport wastewater from the study area to HWC existing network, a second internal WWPS is required to enable realisation of full development over the western development site. This strategy is limited to a high level assessment and commentary of the second WWPS which provides sufficient information to guide the future design of WWPS 2. A detailed assessment and preliminary sizing has not been prepared as it is considered to be beyond the scope of this strategy.

The topography of the study area divides the site into two wastewater catchments. Catchment 1 which drains to WWPS 1 encompasses C&A's entire development site plus a small portion of the adjacent western development. The gross catchment area including environmental conservation and developable land is approximately 196 ha. Catchment 2 which drains to WWPS 2 encompasses the remaining portion of developable land over the western development site and is approximately 150 ha excluding environmental conservation land.

The study area is expected to yield 2419 ET from the 345 ha of developable industrial land. Each of the three options is expected to service the same developable study area.

Option A, Option B and Option C are detailed in the following sections.

3.1 OPTION A – DISCHARGING TO EXISTING BERESFIELD 21 WWPS

Option A proposes the following infrastructure to service the study area:

- Internal gravity carrier mains
- WWPS 1 and rising main discharging to Beresfield 21 WWPS
- WWPS 2 and rising main discharging to WWPS 1
- Upgrades downstream of Beresfield 21 WWPS

A summary of the pipe diameters and lengths associated with the infrastructure required to service Catchment 1 are presented below in Table 2. It is noted that due to the limited information available pertaining to the development of the western development site, the infrastructure associated with servicing Catchment 2 has not be accounted for in the pipe quantities below. The quantities of each diameter have been estimated on the basis of the current development layout.

Table 2: Option A Pipe Quantities

Description	Nominal Diameter (mm)	Length (m)
Gravity Carrier Main (PVC)	DN375	497
Gravity Carrier Main (PVC)	DN450	181
WWPS 1 Rising Main (DICI)	DN375	1515

Note that the pipe lengths within Table 2 do not include lengths of existing rising main or carrier main external to the study area which require augmentation as part of Option A, or any pipework required within the adjoining potential western development site.

3.1.1 Infrastructure required to service Catchment 1

WWPS 1 is the most downstream pump station servicing the study area and will ultimately pump all gravity flows from Catchment 1 in addition to pump flows from WWPS 2. As a result, the ultimate flow being received at WWPS 1 is approximately 257 L/s (the infrastructure proposed to service Catchment 1 is shown on Exhibit E within Appendix B).

It is proposed to provide ultimate civil works and stage the installation of pumps and electrical at WWPS 1. A pump flow of 146 L/s has been selected as the interim capacity which will cater for the entire development of Catchment 1. Upon construction and prior to commissioning of WWPS 2, ultimate pumps would be required at WWPS 1 increasing the capacity from 146 L/s to 257 L/s. Connection of WWPS 2 to WWPS 1 would attract a reimbursement from the developer of the western parcel against the cost of providing WWPS 1 and rising main. A DN375 rising main has been selected at WWPS 1 as this will provide capacity for the ultimate flow of 257 L/s whilst ensuring velocities are acceptable for the interim discharge capacity. The advantages of installing interim pumps include a reduction in energy consumption and carbon emissions, operating costs and a lower upfront capital cost.

Due to the length of the rising main and low early stage flows, detention times at WWPS 1 exceed the recommended maximum of 4 hours during the years leading up to ultimate development. As a result, temporary septicity control measures may be required to prevent stored effluent turning septic. If it is established as part of the pump station detail design that septicity control is required, the likely form would be by ferrous chloride dosing. The final details will need to be determined during detail design.

The key details of WWPS 1 for Option A for both the interim and ultimate development scenarios are provided in Table 3.

Table 3: WWPS 1 Key Details for Option A

Parameter	Interim Value	Ultimate Value	Comment
Gravity Flow (PWWF)	145.3 L/s	145.3 L/s	Gravity flow is based on full development of Catchment 1 (1372 ET)
WWPS 1 Duty	145.3 L/s @ 8.0 m	256.2 L/s @ 16.1 m	Stage 1 Interim capacity will cater for full development of Catchment 1, ultimate capacity to cater for receiving additional 110.9 L/s pump flow from WWPS 2.
Rising Main Details	DN375 x 1515 m	DN375 x 1515 m	Sized to suit ultimate duty of WWPS 1. Discharges to access chamber H6010 which discharges to existing Beresfield 21 WWPS. Rising main velocities are satisfactory at both interim and ultimate stages ($V_{\text{interim}} = 1.15 \text{ m/s}$; $V_{\text{ultimate}} = 2.03 \text{ m/s}$).
Rising Main Detention Time	4.7 hours	2.3 hours	Temporary septicity control may be required during early stages of development
Wet Well Diameter	DN4600	DN4600	Well sized to meet min/max criteria in both interim and ultimate cases, control depths of 0.7m and 1.5m respectively.
Wet Well Depth	5.3 m	5.3 m	Approximate depth based on preliminary grading of gravity mains throughout catchment.

The proposed rising main alignment is through an existing industrial subdivision to the north of C&A's proposed development site. Details of the final route will need to be determined as part of the pump station detail design. For the purposes of costing the rising main in this strategy, it is assumed the main will be constructed using ductile iron cement lined (DICL) pipework, however this would be confirmed as part of the detailed design and water hammer assessment.

The required emergency storage volume for Catchment 1 has been calculated based on 4 hours gravity catchment ADWF plus 15 minutes PDWF of Catchment 2 (allowing for pumped inflow from WWPS 2). The results for both the interim and ultimate scenarios are presented in Table 4.

Table 4: Emergency Storage Requirements for Catchment 1

WWPS	Interim Value	Ultimate Value	Comment
Total emergency storage required	217.4 m ³	239.2 m ³	Ultimate is based on 4 hours ADWF plus 15 mins PDWF (24.2 L/s) from WWPS 2.
Emergency storage available in wet well	47.4 m ³	47.4 m ³	Calculated from FAL to overflow level of DN4600 wet well.
Emergency storage required in gravity pipework and access chambers	170 m ³	191.8 m ³	Gravity mains and access chambers will need to provide the required capacity, to be determined as part of detail design.

Table 4 indicates that a significant amount of emergency storage will be required for WWPS 1. The addition of an online storage is an alternative to achieve the required amount of emergency storage. Additionally an emergency relief structure would be required for the

new pump station. The emergency relief structure would be required to be designed at the concept design stage.

3.1.2 Downstream upgrades external to Catchment 1

Option A considers connecting WWPS 1 to Beresfield 21 (B21) WWPS via a 1515 m long DN375 rising main. This option requires the least amount of new rising main to be constructed, however as there are multiple pump stations downstream of B21 WWPS there are additional issues which need to be considered. HWC have provided advice which highlights insufficient capacity within the system from B21 WWPS through to Morpeth WWTW. Table 5 provides the details of B21 WWPS, Beresfield 16A WWPS, Thornton 1 WWPS and Berry Park 1 WWPS. These pump stations are connected in series and therefore, any change to the most upstream station impacts on all receiving stations downstream (Refer to Appendix A for HWC correspondence).

Table 5: Existing WWPS Details

WWPS	Beresfield 21	Beresfield 16A	Thornton 1	Berry Park 1
Catchment Gravity Load (ET)	118	658	395	194
Incoming Pumped Flow (L/s)	0	92	138	250
Current Duty Capacity (L/s)	38	137	500	545
Ultimate Duty Capacity (L/s)	54	237	1160	1640
Spare Capacity (L/s)	0	0	0	0

Table 5 shows that there is no capacity allocated within the system for C&A's proposed development site or the potential adjoining western development site. In order to proceed with this option a number of pump stations, rising mains and carrier mains would require upgrading. Table 6 summarises the required upgrades for existing infrastructure downstream of the study area assuming the ultimate capacity of 257 L/s from WWPS 1 is discharged to Beresfield 21 WWPS.

Table 6: Option A Upgrades required to existing infrastructure

WWPS	Beresfield 21	Beresfield 16A	Thornton 1	Berry Park 1
Pump Upgrade Required	Yes	Yes	Yes	Yes
Existing Duty Capacity	54 L/s	237 L/s	1160 L/s	1640 L/s
Required Duty Capacity	314 L/s	497 L/s	1420 L/s	1900 L/s
Rising Main Upgrade Required (Length)	Yes (approx. 3208m)	Yes (approx. 2202m)	Yes (approx. 1209 m)	No
Existing Rising Main Size	Part DN200 and part DN250	DN300	DN500 and DN600	N/A
Required Rising Main Size	DN450	DN375 in combination with existing DN300	Dual DN600	N/A
Carrier Main Upgrade Required (Length)	No	Yes (approx. 651 m)	Yes (approx. 1070m and 1043m)	No
Existing Carrier Main Size	N/A	DN675	DN825 and DN1050	N/A
Required Carrier Main Size	N/A	DN750 ¹	DN900 ¹ and DN1200 ¹	N/A

Table 6 Notes:

1. To enable costing of Option A, it has been assumed that the carrier main size will require upgrading one pipe diameter. If Option A is the preferred option, the required carrier main diameters must be confirmed at detailed design stage.

From Table 6 it is evident that significant upgrades are required to HWC existing network infrastructure to enable Option A to be realised. These upgrades not only require a substantial outlay in capital costs, but also present a high level of construction difficulty and potential disturbances to the operation of the existing infrastructure and therefore stakeholders. It is also noted that Beresfield 16A is a series pumping station further complicating the upgrading.

3.2 OPTION B – DISCHARGING TO EXISTING MORPETH WWTW

Option B proposes the following infrastructure to service the study area:

- Internal gravity carrier mains
- WWPS 1 and rising main discharging to Morpeth WWTW
- WWPS 2 and rising main discharging to WWPS 1

A summary of the pipe diameters and lengths associated with the infrastructure required to service Catchment 1 are presented below in Table 7. It is noted that due to the limited information available pertaining to the development of the western development site, the infrastructure associated with servicing Catchment 2 has not be accounted for in the pipe quantities below. The quantities of each diameter have been estimated on the basis of the current development layout.

Table 7: Option B Pipe Quantities

Description	Nominal Diameter (mm)	Length (m)
Gravity Carrier Main (PVC)	DN375	497
Gravity Carrier Main (PVC)	DN450	181
WWPS 1 Rising Main (DCL)	DN375	10443

3.2.1 Infrastructure required to service Catchment 1

The internal infrastructure required to service Catchment 1 under Option B is similar to that presented for Option A in Section 3.1.1. The key difference is the discharge location of WWPS 1 and therefore the length of the rising main. The proposed staging of the works and pump station flows discussed in Section 3.1.1 are identical to that of Option B.

The length of rising main required for Option B is significantly greater than that required for Option A. In order to pump directly to Morpeth WWTW, the rising main from WWPS 1 is required to be approximately 10,443m long and navigate its way through existing developed areas and along the Raymond Terrace railway corridor. This would have a high level of construction difficulty and would require lengthy negotiations with land owners and authorities to obtain relevant approvals and permits.

Given the length of the rising main, it is expected that rising main detention times will be excessive and as such, septicity control will be required. It is understood that there are existing pump stations throughout HWC's network which employ septicity control through ferrous chloride dosing. As this is the currently accepted method of dealing with septicity

issues, the provision of a ferrous chloride dosing facility at WWPS 1 will be required and should be assessed as part of the pump station detail design.

Additionally it is understood that HWC is unsure if Morpeth WWTW inlet works has the capacity to accept flows from a new rising main. It is also understood that a design is currently being undertaken for upgrading the inlet works and therefore there is the possibility for the connection of the new main. For the purposes of this strategy it has been assumed that there will be capacity in the future and therefore this option has been evaluated, however as this option is not the preferred option the current capacity situation at Morpeth WWTW inlet works is not relevant.

The key details of WWPS 1 for Option A for both the interim and ultimate development scenarios are provided below in Table 8.

Table 8: WWPS 1 Key Details for Option B

Parameter	Interim Value	Ultimate Value	Comment
Gravity Flow (PWWF)	145.3 L/s	145.3 L/s	Gravity flow is based on full development of Catchment 1 (1372 ET)
WWPS 1 Duty	145.3 L/s @ 46.3 m	256.2 L/s @ 94.5 m	Stage 1 Interim capacity will cater for full development of Catchment 1, ultimate capacity to cater for receiving additional 110.9 L/s pump flow from WWPS 2.
Rising Main Details	DN375 x 10,443m	DN375 x 10,443m	Sized to suit ultimate duty of WWPS 1. Discharges directly to Morpeth WWPS. Rising main velocities are satisfactory at both interim and ultimate stages ($V_{\text{interim}} = 1.15 \text{ m/s}$; $V_{\text{ultimate}} = 2.04 \text{ m/s}$).
Rising Main Detention Time	24.5 hours	14.2 hours	Septicity control will be permanently required
Wet Well Diameter	DN4600	DN4600	Well sized to meet min/max criteria in both interim and ultimate cases, control depths of 0.7m and 1.5m respectively.
Wet Well Depth	5.3 m	5.3 m	Approximate depth based on preliminary grading of gravity mains throughout catchment.

The required emergency storage volume and emergency relief structure are the same as that for Option A, therefore refer to Table 4 for details.

3.3 OPTION C – DISCHARGING TO EXISTING BERESFIELD 5 WWPS

Option C proposes the following infrastructure to service the study area:

- Internal gravity carrier mains
- WWPS 1 and rising main discharging to Beresfield 5 WWPS
- WWPS 2 and rising main discharging to WWPS 1
- Augmentation of Beresfield 5 WWPS to cater for increase in flow

A summary of the pipe diameters and lengths associated with the infrastructure required to service Catchment 1 are presented in Table 9. It is noted that due to the limited information available pertaining to the development of the western development site, the infrastructure associated with servicing Catchment 2 has not be accounted for in the pipe quantities

below. The quantities of each diameter have been estimated on the basis of the current development layout.

Table 9: Option C Pipe Quantities

Description	Nominal Diameter (mm)	Length (m)
Gravity Carrier Main (PVC)	DN375	497
Gravity Carrier Main (PVC)	DN450	181
WWPS 1 Rising Main (DICI)	DN375	7177

3.3.1 Infrastructure required to service Catchment 1

The internal infrastructure required to service Catchment 1 under Option C is similar to that presented for Option A in Section 3.1.1. The key difference is the discharge location of WWPS 1 and therefore the length of the rising main. The proposed staging of the works and pump station flows discussed in Section 3.1.1 are identical to that of Option C.

The rising main length required for Option C is significantly more than that required for Option A. As a result there is a need to implement ferrous chloride dosing at WWPS 1 in both stage 1 and at the ultimate state in order to mitigate the potential for septicity issues. The potential for odour issues due to the extended detention time will also need to be considered, however this should be investigated at the design stage.

The key details of WWPS 1 for Option C are provided below in Table 10.

Table 10: WWPS 1 Key Details for Option C

Parameter	Interim Value	Ultimate Value	Comment
Gravity Flow (PWWF)	145.3 L/s	145.3 L/s	Gravity flow is based on full development of Catchment 1 (1372 ET)
WWPS 1 Duty	145.3 L/s @ 35.9 m	256.2 L/s @ 69.9 m	Stage 1 Interim capacity will cater for full development of Catchment 1, ultimate capacity to cater for receiving additional 110.9 L/s pump flow from WWPS 2.
Rising Main Details	DN375 x 7,177m	DN375 x 7,177m	Sized to suit ultimate duty of WWPS 1. Discharges to Beresfield 5 WWPS. Rising main velocities are satisfactory at both interim and ultimate stages ($V_{interim} = 1.15$ m/s; $V_{ultimate} = 2.04$ m/s).
Rising Main Detention Time	16.9 hours	9.8 hours	Septicity control will be permanently required
Wet Well Diameter	DN4600	DN4600	Well sized to meet min/max criteria in both interim and ultimate cases, control depths of 0.7m and 1.5m respectively.
Wet Well Depth	5.3 m	5.3 m	Approximate depth based on preliminary grading of gravity mains throughout catchment.

Similar to Option B the alignment of the proposed rising main is to be constructed through existing residential areas and through private property. Construction of a main through a built up environment increases the possibility of service clashes.

The required emergency storage volume and emergency relief structure are the same as that for Option A; therefore refer to section 3.1.1 of the strategy for emergency storage details.

3.3.2 Existing Beresfield 5 WWPS Capacity

Option C considers connecting WWPS 1 to B5 WWPS via a 7177 m long DN375 rising main. The proposed DN375 rising main has been discussed in section 3.3.1 of the strategy in regard to length and extended detention times.

Advice from HWC has indicated that B5 WWPS is currently in the process of re-evaluation as at the end of 2014 the pump flow is expected to be reduced which will reduce the pump capacity to around 300 L/s. The configuration of B5 WWPS is currently unknown by HWC, however it has been indicated that the operation of the rising mains to Morpeth WWTW will not change.

As the timing of the changes to B5 WWPS by HWC are still unknown an assessment of the existing B5 WWPS has been completed in addition to an assessment of a new B5 WWPS in section 3.3.3 of the strategy.

Table 11 outlines the existing details associated with B5 WWPS. Note that the figures in Table 11 have been referenced from 'local wastewater servicing strategy' for Farragher Land, Raymond Terrace Road, Thornton North, completed by ADW Johnson in 2009.

Table 11: B5 WWPS existing details

WWPS	Beresfield 5
Gravity PWWF (L/s)	36
Total Pumped Flow (L/s)	265*
Duty Capacity (L/s)	590
Spare Duty Capacity (L/s)	289

*265 L/s pumped flow is the total predicted pumped flow in the year 2021 from Beresfield 12 WWPS and Beresfield 14 WWPS. The current pumped flow is approximately 118 L/s.

There is a spare duty capacity of approximately 289 L/s as shown in Table 11. It is understood that HWC plan to downgrade B5 WWPS. The study area is anticipating an interim PWWF of 146 L/s and an ultimate PWWF of 257 L/s. This option would result in B5 WWPS having a pumped flow of 525 L/s, a gravity flow of 36 L/s and hence a spare duty capacity of 32 L/s. This option therefore benefits both the development and HWC as the existing B5 WWPS would not need downsizing, the DN600 rising main pumping from B5 WWPS to Morpeth WWTW would not require augmentation and no other existing WWPS or the WWTW would require augmentation.

3.3.3 Beresfield 5 WWPS Upgrade

It is understood that HWC currently have business case approval and funding for the delivery of Beresfield 5A adjacent to the existing Beresfield 5 WWPS and abandonment of the existing drywell station. It is understood from discussions with HWC that these works are required due to existing operational issues at Beresfield 5 and due to the age and limited future operational life of the asset. The timing of delivery of these works is not known. With the recent upgrades to the broader Beresfield wastewater transportation system, significant proportions of the existing pumped flow to Beresfield 5 have been redirected to the

Thornton 1 and Berry Park 1 WWPS's with more diversions programmed for the end of 2014. Under the current HWC strategy, Beresfield 5A duty would be limited to approximately 300l/s to cater for the projected loads from the existing Beresfield wastewater catchment with some limited growth. Given that the Black Hill industrial development area owned by Coal and Allied is zoned for industrial purposes and the intention is to move to preparation of Development Application(s) and the balance of the land considered in the Black Hill strategy is going through the rezoning process, industrial development is expected to proceed in the medium term. Consequently to cater for this projected growth, the civil design of Beresfield 5A should allow for the projected 260l/s duty from Black Hill with due consideration for any mechanical and electrical upgrades in the detailed design. Stage 1 of the Beresfield 5A delivery should allow for the Stage 1 duty of the Black Hill WWPS of 146l/s with due consideration to the upgrading to the ultimate Black Hill duty of 260l/s. A preliminary assessment of detention times in the existing DN600 CICL Beresfield 5 rising main that will be used for the upgraded Beresfield 5A station indicates that under a flow of 300l/s detention times are around the critical 4 hours. This is reduced to less than 3 hours under a flow of 450l/s. that is, projected Beresfield catchment flows plus the stage 1 duty of the Black Hill WWPS.

The key details of B5 WWPS upgrade for Option C are provided below in Table 12. Assuming that ultimate civil infrastructure is provided with the HWC works and only an electrical and mechanical upgrade is required to service the Black Hill development area.

Although the design has been completed assuming HWC will construct Beresfield 5a with enough capacity to cater for the proposed development, the costings has been completed for a new wastewater pumping station, Beresfield 5b as a conservative approach.

Table 12: B5 WWPS Upgrade Key Details for Option C

Parameter	Interim Value	Ultimate Value	Comment
Gravity Flow (PWWF)	36 L/s	36 L/s	Gravity flow is based on future and existing developments within the gravity catchment (416 ET)
Incoming Pumped Flow	410.3 L/s	521.2 L/s	Interim and ultimate is 265 L/s from Beresfield 12 and 14 WWPS's assuming worst case and interim and ultimate from WWPS 1
B5 WWPS Discharge	446.3 L/s	557.2 L/s	Interim discharge will cater for full development of Catchment 1; ultimate discharge will cater for the additional 110.9 L/s pump flow from WWPS 2.
Wet Well Diameter	DN6600	DN6600	Well sized to meet min/max criteria in both interim and ultimate cases, control depths of 1.2m and 1.5m respectively. Note that well sized as circular but will be a custom well which is to be determined at detailed design.
Wet Well Depth	5.4 m	5.4 m	Approximate depth based on preliminary grading of gravity mains throughout catchment.

Table 12 shows that the civil works for the ultimate will be constructed at the interim stage and an upgrade to the mechanical/electrical would need to occur at the ultimate stage.

As advised by HWC the rising main from the existing B5 WWPS to Morpeth WWTW is to remain and therefore it has been assumed that this existing rising main will be used if B5 WWPS requires upgrading to cater for the development.

The required emergency storage volume for B5 WWPS has been calculated based on 4 hours gravity catchment ADWF plus 15 minutes PDWF of Catchment 1 (allowing for pumped inflow from WWPS 1). The results for both the interim and ultimate scenarios are presented in Table 13.

Table 13: Emergency Storage Requirements for B5 WWPS

WWPS	Interim Value	Ultimate Value	Comment
Total emergency storage required	94.5 m ³	94.5 m ³	Ultimate is based on 4 hours ADWF plus 15 mins PDWF (31.7 L/s) from WWPS 1.
Emergency storage available in wet well	97.5 m ³	97.5 m ³	Calculated from FAL to overflow level of DN6600 wet well.
Emergency storage required in gravity pipework and access chambers	0 m ³	0 m ³	Gravity mains and access chambers will not need to provide any capacity.

3.4 OPTION CONSTRAINTS

3.4.1 Technical Constraints

The infrastructure proposed in all options can be constructed and operated within Hunter Water's design and operating guidelines. All of C&A's proposed development site and adjacent western development site will be serviced adequately in accordance with Hunter Water guidelines by all three options. All infrastructures within each option has been sized and optimized in accordance with Hunter Water's guidelines.

3.4.2 Community/Stakeholder Constraints

The construction of the rising main external to C&A's proposed development in each of the three options is required to be constructed through residential and industrial areas which are already established. As a result there will be potential for noise complaints during the construction of each of the options.

Additionally Option A would require the upgrade of 4 existing pumping stations. During the upgrade of the pumping stations a shutdown period would be required for a duration of time. The shutdown of the existing pump stations will therefore require either a bypass arrangement or a sucker truck to remove incoming effluent. This process will not affect any residents.

3.4.3 Environmental Constraints

The proposed wastewater infrastructure required for each option is to be constructed in both proposed future development sites and residential/industrial areas which are already

established. Construction of infrastructure in both proposed future development sites and existing development areas will require the appropriate erosion and sedimentation methods in order to remove the impact of construction on the environment.

3.5 COST ESTIMATES

A cost comparison of the investigated options was made by estimating the capital cost of the required infrastructure using Hunter Water's Estimating Guidelines and carrying out a Net Present Value (NPV) assessment. Appendix E contains the capital cost estimates for Option A, Option B and Option C. The NPV assessment considered the following:

- Capital cost of the infrastructure
- Staging of the infrastructure dependent on the anticipated rate of development
- Operation and maintenance costs of the infrastructure
- Replacement costs of infrastructure with a finite lifespan

Based on the above, each option was assessed over a 30 year period at a discount rate of 7%. A sensitivity analysis was also undertaken for discount rates of 4% and 10%. The NPV summary is shown in Table 14 and an assessment can be found in detail form within Appendix F.

Table 14: Summary of cost estimates and NPV

Option	Infrastructure	Year required	Capital Cost	NPV (at 7%)
Option A	Internal WWPS, internal DN375 and internal DN450 carrier main, external DN375 rising main to Beresfield 21 WWPS, upgrades to existing rising mains and upgrades to existing pump stations.	Year 1	\$15,581,904	\$16,359,676
	Pump upgrades for internal WWPS	Year 10	\$534,854	
Option B	Internal WWPS, internal DN375 and internal DN450 carrier main and external DN375 rising main to Morpeth WWTW.	Year 1	\$8,702,106	\$10,382,277
	Pump upgrades for internal WWPS	Year 10	\$1,155,857	
Option C	Internal WWPS, internal DN375 and internal DN450 carrier main and external DN375 rising main to Beresfield 5 WWPS. Beresfield 5b construction (refer section 3.3.3).	Year 1	\$7,792,402	\$10,455,961
	Pump upgrades for internal WWPS and upgrades to Beresfield 5b (refer section 3.3.3).	Year 10	\$1,919,338	

It can be seen in Table 14 that Option C is slightly more than Option B but considerably less than Option A when comparing NPV's. Option C is \$5,977,399 or 37% less than Option A and \$73,684 or 1% more than Option B. Option A, Option B and Option C all require the infrastructure to be built upfront with only a pump upgrade required after year 10 for WWPS 1 and Option C will require a pump upgrade after year 10 for B5 WWPS.

3.6 SOCIAL IMPACT

The infrastructure proposed for each option provides a wastewater service to both C&A's proposed development site as well as the potential western development site, whilst having minimal impact on visual amenity with only a single WWPS located within each of the proposed sites. The odours generated from the proposed internal WWPS's will exit through the vent stack which will be located away from future industrial sites.

Construction of the internal infrastructure will not affect existing residential or industrial areas as the site is isolated from these existing areas. The construction of regional infrastructure through existing residential and industrial areas will affect the existing areas in terms of construction noise.

3.7 ENVIRONMENTAL IMPACT

The construction of the proposed infrastructure for each option will have minimal impact on the surrounding environment provided adequate environmental controls are implemented during construction.

3.8 TECHNICAL ASSESSMENT

An assessment of technical matters for Option A, Option B and Option C is provided below:

- **Performance:** Option A, Option B and Option C provides an adequate wastewater service to C&A's proposed development and the adjoining western development.
- **System Reliability:** Option A, Option B and Option C satisfy HWC's requirements in relation to failures as the proposed WWPS 1 has a minimum of 4 hrs ADWF and 15 min PDWF of emergency storage.
- **Flexibility and Adaptability:** The proposed internal WWPS within C&A's proposed development site is flexible as it is designed to cater for the proposed western development site at its ultimate state in addition to C&A's proposed development at its ultimate state. Each of the three options will require ferrous chloride dosing in initial stage of development and potentially during the WWPS's ultimate state depending upon which option is selected.
- **Constructability:** The proposed internal infrastructure for each of the three options will utilise standard construction techniques and is therefore expected to have a high level of constructability. The regional infrastructure will require the construction of rising mains through fully developed areas for each of the three options. The construction in developed areas can be difficult due to existing services; however with service location and the correct construction methods used the issue of service clashes can be avoided.
- **Maintainability:** The proposed infrastructure is similar to that which exists throughout Hunter Water's existing water supply network and is therefore expected to have a high level of maintainability.

3.9 COMPARISON OF OPTIONS

A comparison of options summary table is provided in Appendix D. A detailed comparison of Options A, Option B and Option C is provided in further detail below.

- Option A, Option B and Option C will provide a flexible wastewater service to both C&A's proposed development site and the potential western development site.
- Option A requires the augmentation of a significant amount of existing rising mains, carrier mains and the upgrades of 4 existing pumping stations. Due to the extensive work required for Option A, the NPV of Option A is significantly more than that of the other two options. Due to the extent of work required and the significant cost this option has been dismissed as a possible option.
- Option B requires a significant amount of new rising main which has an alignment through a large portion of existing residential and industrial areas. The construction of this option will prove difficult because of all of the existing services within the existing areas, however with careful service location and construction techniques service clashes can be avoided.
- Option C similar to Option B requires the alignment of the new rising main through existing residential and industrial areas. This option does however require approximately 3200 m less rising main yet achieving a similar goal. Additionally Option C would require HWC to deliver the ultimate civil works for B5 WWPS.
- Option B and Option C will require consent from land owners in order to enable construction of a portion of the proposed rising main through sections of private land.
- Option C in comparison to Option B is a similar cost. The NPV of Option C is \$10,455,961 which is \$73,684 or less than 1% more than Option B.

4.0 Recommended Option

After assessment of the considered options detailed throughout section 3.0, Option C is considered to be superior in comparison to Option A and Option B.

Option A, Option B and C provide an effective solution to provide wastewater services to C&A's proposed industrial development site and the potential adjoining western development site. It meets the technical requirements as specified in the *Sewerage Code of Australia, Hunter Water Edition Version 1 (WSA 02-2002)*.

The infrastructure required for Option C is similar to that of Option B and the quantity of upgrades required for Option C is significantly less than that for Option A. Option C also requires the civil works for B5 WWPS to be completed to ultimate by HWC. Each of the three options has flexibility which enables the future connection of the potential adjacent western development to be made.

In conclusion, Option C provides the overall best outcome when assessing the infrastructure life cycle costs and constructability.

Appendix A – Correspondence with Hunter Water

Table 2 – Review of Black Hill Wastewater Servicing Strategy Issue B

Hunter Water Review Comments				Consultant Response	Hunter Water Response
1	Planning	General	No information about the expected roll out of the development. Please include a table containing staging with expected timing to provide context to plan in Exhibit B: Local Plan and Aerial.	As the proposed development is an industrial development the timing of the various stages outlined in Exhibit B is unknown. Hence the modelling has been completed as per the ultimate development. At the concept design stage it is assumed that the staging of the proposed development will be better understood and therefore the design of any infrastructure can be made more detailed at that point in time.	
2	Planning	16	Option C: Upgrades not mentioned regarding Beresfield 5 WWPS. Confirm if the upgrades to either existing down scaled Beresfield 5 WWPS or proposed new Beresfield 5A WWPS has been costed for both interim and ultimate development. If yes, please specify in the table.	Beresfield 5A WWPS has been costed for the interim and the ultimate development. Will specify in the table.	
3	Operations	11	Need to ensure Morpeth WWTW inlet works has capacity to accept flows from the new main. A design is currently being undertaken for upgrading the inlet works. This may require further consultation with Hunter Water's Wastewater Treatment Planning team.	One of the reasons Option C is the preferred option is due to the ability to adopt the existing duty of Beresfield 5 WWPS and therefore use the existing rising main. The ability to use Beresfield 5 WWPS will avoid the upgrade of the inlet works at Morpeth WWTW.	
4	Operations	16	It is unclear if cost to upgrade Beresfield 5 WWPS has been included in the capital/NPV cost. Appendix E/F appear to show that it has, but there is no mention in the report from section 3.3.3 (p13) onwards.	The cost to upgrade Beresfield 5 WWPS has been included. It will be included in the amended strategy.	
5	Operations	Appendix E and F	The cost estimates (as well as the report body), do not appear to include odour control measures and associated costs? This needs to be included.	Will include in the amended strategy.	
6	Operations	General	For the new WWPS, need to include an Emergency Relief Structure as part of the design of the WWPS.	The emergency relief structures will be dealt with at the concept design stage.	



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ABN 46 228 513 446

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enquiries@hunterwater.com.au

28 January 2014

Our Ref: 2007-842/2

Coal and Allied
C/- ADW Johnson
2 Bounty Close
Tuggerah 2259

Attention: Allison Cameron

Dear Allison

PRELIMINARY SERVICING ADVICE FOR PROPOSED DEVELOPMENT – BLACK HILL

Thank you for your request for Hunter Water's preliminary servicing advice for the provision of water and sewer services to a proposed industrial development at Lot 30 DP 870411, Lenaghans Drive, Black Hill.

The preliminary servicing advice offered in this correspondence is based on an estimated development loading of approximately 2,150 Equivalent Tenements (ET) on the water supply system and 910 ET on the wastewater system. Noted elsewhere in this correspondence is the need to complete developer funded water and wastewater servicing strategies. The completion of servicing strategies will be the most appropriate means to ascertain likely connection arrangements, staging, necessary augmentation works and required system configuration.

General information on water and sewer issues relevant to the proposal is included in this correspondence. This information is based on Hunter Water's knowledge of its system performance and other potential development in the area at the present time.

Preliminary servicing advice is not a commitment by Hunter Water and may be subject to significant change prior to the development proceeding. General information on the provision of Hunter Water funded and delivered infrastructure may also be provided. This advice may also change substantially due to a range of factors.

If you proceed with a development application you will need to lodge a further application with Hunter Water to then determine the formal requirements that shall apply. Hunter Water will then issue a **Notice of Formal Requirements**. You will need to comply with each of the requirements in this Notice for the issue of a Section 50 Compliance Certificate for the specific development.

In this instance, Hunter Water's preliminary advice is as follows:

Water

The site of the proposed development falls within the Chichester Trunk Gravity Main Water Supply System. The development may be serviced by the DN500 main on John Renshaw Drive or the DN500 CICL main in Lenaghans Drive.

As identified in the Maryland Minmi Water Servicing Strategy (*Hunter Water Corporation, 2006*), approximately 2,900m of DN450mm trunk main from John Renshaw Drive to Lenaghans Drive will have to be constructed in order to provide security of supply to the development and maintain service levels in the Maryland and Minmi area. The lead-in developer would be required to fund the upgrade and any subsequent developments following the construction of the trunk main would be liable to pay a reimbursement.

Figure 1 shows possible connection points that may be suitable, however, these would have to be confirmed as part of a developer-funded water strategy as mentioned elsewhere in this correspondence.

A developer-funded strategy will be required to investigate the infrastructure required to service this development and confirm necessary augmentations to Hunter Water's existing water supply system. This strategy should consider the outcomes of the servicing strategy mentioned above, and should address, but not be limited to, the following matters:

- Estimate water demands for the development;
- Development staging and timing;
- Security of supply for the development;
- Investigate various servicing options;
- Adjacent development areas;
- Existing asset constraints;
- Alternative connection points;
- Present preliminary design and costing of the water distribution infrastructure proposed to service this development; and
- Present capital, operational and life cycle costs.

Wastewater Transportation

The site of the proposed development is located remote from existing wastewater infrastructure. The nearest possible sewer connection point is in the Beresfield 21 Wastewater Pumping Station (WWPS) catchment area, which pumps to Morpeth Wastewater Treatment Works (WWTW) via Beresfield 16A WWPS, Berry Park 1 WWPS and Thornton 1 WWPS.

There is very limited opportunity within this system to connect initial development loading. These assets were configured at the time to cater for the known development and would require significant augmentation to cater for the likely loading derived from the development lot in question. Accordingly it may become necessary to upgrade this system or pump directly to the treatment works. The optimal staging and configuration should be ascertained via completion of a wastewater servicing strategy discussed below. Detailed asset data can be provided in the future as an input for the servicing strategy.

It will be necessary to complete a developer-funded sewer servicing strategy to ascertain the optimal means to connect to Hunter Water's sewer system and any system augmentations required. The strategy should address, but not be limited to, the following matters:

- Estimate loads from this development and any other surrounding developments that can potentially transfer flows to the future wastewater transportation infrastructure associated with the subject development;
- Existing asset constraints;
- Development sub-catchments and how the full development area is to be serviced;
- Staging and timing of the development;
- Self-cleansing and odour control in the interim before full development is realized, and ultimate development;
- Impacts on the downstream wastewater transportation system;
- Preliminary design and costing of the wastewater transport infrastructure proposed to service this development; and
- Capital, operational and life cycle costs (NPV 7% - 30 years).

Wastewater Treatment

The development lot is likely to connect to the Morpeth Waste Water Treatment Works (WWTW), however, due to the location of the development lot, other wastewater treatment catchments may present an opportunity for servicing.

Beside Morpeth WWTW, the nearest WWTW is Shortland WWTW. Any assessment of capacity at this WWTW can be provided in the future as an input for the servicing strategy.

Hunter Water's treatment facilities are upgraded over time to meet growth in the catchment.

Financial Contribution

Dependent on the connection points and utilisation of infrastructure, it may be necessary to pay a reimbursement towards capacity uptake in infrastructure assets constructed by other developers. Hunter Water administers reimbursements for a maximum period of 15 years following hand over to Hunter Water.

It is not possible to calculate reimbursement values at this time due to the tentative nature of information, connection points etc, and accordingly such calculations are usually deferred until definitive information is available.

Environmental Assessment

Please note that a Review of Environmental Factors will be required for any works external to a particular development site, or where the service design includes infrastructure or activities that may have environmental impacts that would not have been specifically addressed in the consent authorities assessment and determination of the proposed development. Examples may be the construction of new or augmented water and sewer pump stations, sewer vents, trunk mains, reservoirs, development in a Wastewater Treatment Plant buffer zone, or development in a water reserve. Furthermore, a Controlled Activity Approval will be required from the NSW Office of Water for any excavation within 40m of a water body or should groundwater be present.

Prior to commencement of environmental assessment please contact the Hunter Water Developer Services Group to confirm the scope and need for such an assessment. It is recommended to meet and agree these matters prior to the developer engaging the services of a design or environmental consultant.

Should you require further clarification or assistance please do not hesitate to contact me on 4979 9545.

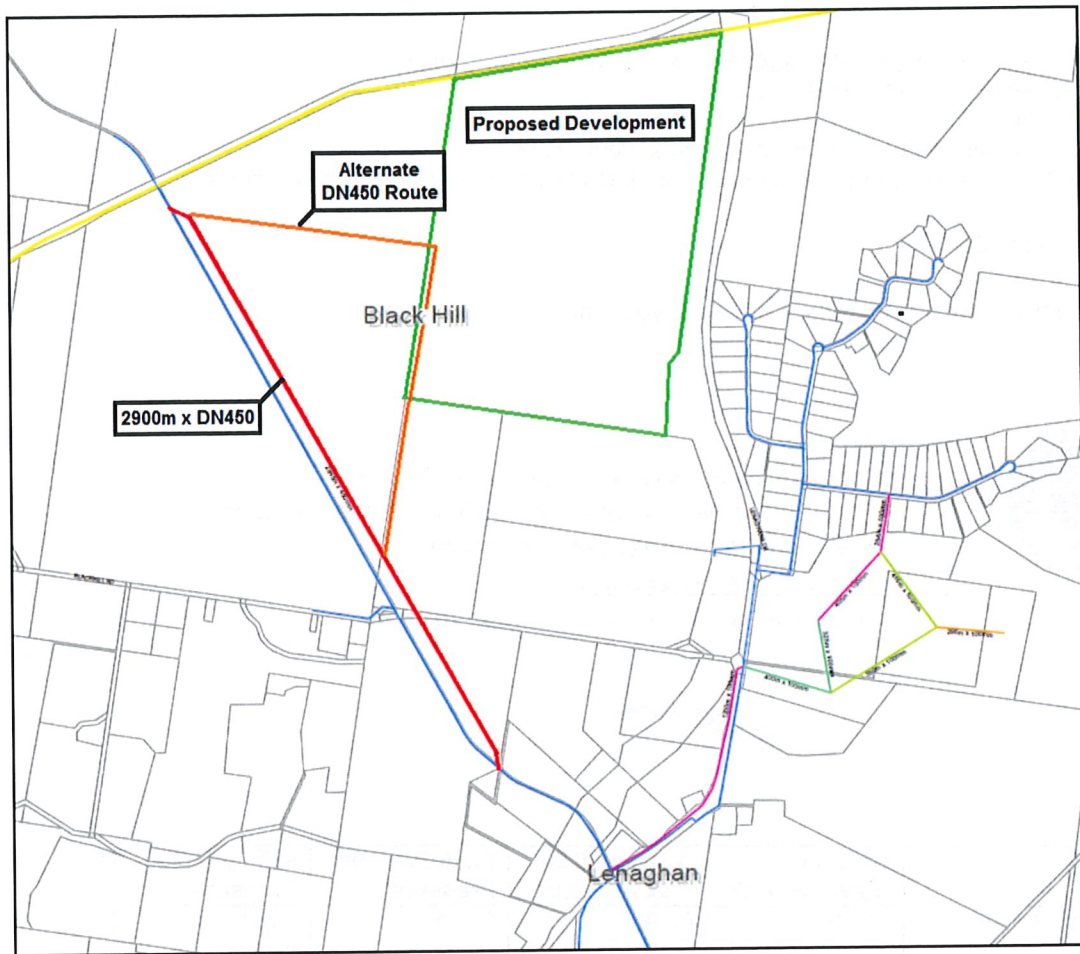
Yours Sincerely



Malcolm Withers
Senior Developer Services Engineer

Attention: **Figure 1** – Water connection points and lead in trunk mains.

Figure 1 – Water connection points and lead in trunk mains.



Jason Yeo

From: Malcolm Withers [<mailto:malcolm.withers@hunterwater.com.au>]

Sent: Wednesday, 5 March 2014 12:32 PM

To: Ben Everitt

Cc: Jason Yeo; Allison Cameron; Hugh Williams; Paul McKoy

Subject: Response to information request - Black Hill Water and Wastewater Strategies

Good afternoon Ben,

Please see below Hunter Water's response to your information request.

Regards



Malcolm Withers

Senior Developer Services Engineer | Hunter Water Corporation

36 Honeysuckle Drive Newcastle NSW 2300 | PO Box 5171 HRMC NSW 2310

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Water

Location	Ground Elevation (m)	Average Day Max Pressure	Peak Day Min Pressure	95 th %ile Min Pressure
Near John Renshaw Dr	34.08	63.92	63.91	63.91
Near Black Hill Rd	34.14	60.05	55.19	56.45

Wastewater

	Beresfield 21 WWPS	Beresfield 16A WWPS	Thornton 1 WWPS	Berry Park 1 WWPS	
	SSBER389	SSBER399	SSTHO424	SSBEP425	
Current gravity load (ET)	118	658	395	194	
Incoming Pumped inflow (L/s)	0	92 L/s (54+38)	138 L/s (54+84)	250	
Current Station Duty & Pump Configuration	38 L/s	137 L/s Beresfield No. 16A WWPS will be a duplex series pumping station configuration comprising of two sets of two pumps	500 L/s – Dual Pump Operation The station uses one pump during normal dry weather operation, and during wet weather or increased flow conditions the station has the capability to operate more than one pump.	545 L/s – Single Pump Operation The station uses one pump during normal dry weather operation, and during wet weather or increased flow conditions the station has the capability to operate more than one pump.	Most stations within Hunter Water's area of operations generally require 1 pump set to convey max PDWF flows. There is however the possibility that PLC codes could be changed at each Waste Water pumping station.

Ultimate Station Capacity (L/s)	54 L/s	237 L/s	1160 L/s	1640 L/s	To achieve Ultimate capacity the stations will need to be modified.
Unallocated Spare Capacity (ET)	0	0	0	0	As the stations were not sized to accommodate this development they may need to augmented beyond the ultimate sizing identified above. There may be some spare capacity to permit interim connections, but this would need to be coordinated with Hunter Water to determine the most suitable staging plan to accommodate catchment wide development

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Jason Yeo

From: Ben Everitt
Sent: Tuesday, 25 February 2014 10:01 AM
To: Paul McKoy
Cc: Jason Yeo; Allison Cameron
Subject: Black Hill Water and Wastewater Strategies
Attachments: DOC250214.pdf

Paul,

As you are aware, we are currently preparing water and wastewater servicing strategies in the Black Hill area. At this point in time we require some additional info to enable us to model water options for the proposed development. Would it be possible to provide the following information at the two locations shown on the attached sketch:

- Ground Elevation
- Average Day Maximum Pressure
- Peak Day Minimum Pressure
- 95th %ile Minimum Pressure

Further to above, we require the following information for Beresfield 21 WWPS, Beresfield 16A WWPS, Thornton 1 WWPS and Berry Park 1 WWPS.

- Estimated gravity load at each station (ET)
- Incoming pumped flow from any upstream pump stations (where applicable)
- Station duty and pump configuration
- Confirmation of any spare capacity and if this has been allocated

If you can provide this info as soon as possible it would be much appreciated. Thanks in advance.

Regards,

Ben Everitt

Civil Engineer

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From: [Hugh Williams](mailto:Malcolm.Withers@hunterwater.com.au)
To: [Jason Yeo](mailto:Jason.Yeo@hunterwater.com.au)
Subject: FW: Hunter Water to ADWJ - response to queries regarding Hunter Water comments
Date: Thursday, 22 May 2014 1:10:27 PM
Attachments: [image001.png](#)
[image002.png](#)

From: Malcolm Withers [<mailto:malcolm.withers@hunterwater.com.au>]
Sent: Monday, 12 May 2014 10:44 AM
To: Hugh Williams
Subject: Hunter Water to ADWJ - response to queries regarding Hunter Water comments

Hi Hugh,

Please see responses to the queries you raised.

MINMI - Water

1. Stoney Pinch does not dominate South Wallsend Reservoir during normal operation. South Wallsend reservoir is supplied by Wallsend WPS with the majority of flows provided via Shortland Junction. Please disregard the comment "Stoney Pinch may dominate during minimum night flows/very low demands."
6. As above, Stoney Pinch does not dominate this area during normal operation. Please use a minimum HGL of 84m supplied from South Wallsend.

There is sufficient capacity in the water network to supply the dual reservoirs at Cameron Park for the Minmi development. Cameron Park 2 WPS will require a developer-funded pump station upgrade at a future date (yet to be determined) to provide peak day capacity at ultimate development of Minmi. This should be allowed for as part of this option study.

MINMI - Sewer

1. Emergency storage upgrades for the existing customers will be provided by Hunter Water. The developer must include sufficient emergency storage for any future connections.

BLACK HILL - Water

2. Boundary conditions on the DN200 at the southern end of the development can be found in the table below. These values are based on zero flow being received from the Beresfield/Stoney Pinch system.

Location	Height of Node (m)	Maximum Residual Pressure (m)	Minimum Residual Pressure (m)
Southern Boundary (DN200)	34	57	47

3. Hunter Water accepts that the impact on the Outlook Estate during a failure in Maryland is likely to be negligible, if not improving the current situation.

Regards



Malcolm Withers
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From: Hugh Williams [<mailto:hughw@adwjohanson.com.au>]
Sent: Thursday, 1 May 2014 12:55 PM
To: Malcolm Withers
Cc: Allison Cameron
Subject: Minmi and Blackhill servicing

Mal
Further to our discussion this morning can you please confirm the following noting that the PHF from the entire development area for Minmi is of the order of 150l/s and 71l/s for Blackhill;

1	General		It is noted that the Developer preferred the option of connecting the Minmi area from the 500mm (Walka) main that runs through the wetlands. This main is predominantly fed from the South Wallsend system, not Stoney Pinch.			Stoney Pinch may dominate during minimum night flows /very low demands. As stated above, Stoney Pinch will only supply to HGL of 32m during the day.	Stoney Pinch has a site level of about RL90. How can Stoney dominate South Wallsend yet only supply at HGL32 given the reservoir levels are comparable?
6	7	3.1.2	The minimum HGL assumed (90m) is too high. South Wallsend provides a minimum HGL of 84m at this location on a peak day.	Higher areas will receive less pressure from this connection point. Lower section of high pressure system may need to be extended.	Determine if any changes are required to system levels, reservoir sizes, etc.		As per 1 above how can Stoney dominate at HGL32?
1	14	Table 16	Minmi 2 WWPS currently has only 1.8 hrs (6 m ³) emergency storage	Additional emergency storage is required to achieve 4 hours	Increase emergency storage allowance	Please confirm our discussion that the ES requirement relates to the development only and that any existing system inadequacies will be addressed separately by HWC	

Blackhill

2	General		In the event of a failure or shutdown of the trunk main between Beresfield and Stoney Pinch for maintenance or other work (note: the mine has in the past has carried out diversions), the main supply could be out of service for longer than 5 hours. Is the supply from South Wallsend (through a 200mm) sufficient?			If the failure scenario requires modelling, can HWC please provide the pressure boundary condition to be adopted noting that the DN200 appears to connect to a DN500 south of the M1 at Lenaghan
3	General		What are the impacts on supply to the Maryland / Fletcher / Minmi area's in the event of failure of the 500mm from South Wallsend through Maryland? Note currently the supply from Stoney Pinch only provides water to a HGL of 32m. Will the increased demand from the new development impact this contingency. Any reduction in 32m will result in no supply to the Outlook Estate subdivision.			Refer to items in the Minmi comments. Also, the demand area for the Blackhill site is supplied off the DN500 offtake of the DN900 to the North of John Renshaw drive and not off the DN200 thus the friction losses will be negligible. The proposal is to also duplicate the DN200 with a DN300 through the site that will better connect the DN500 north of Lenaghans Drive to the DN500 south of the M1 at Lenaghan.

Regards,

Hugh Williams
Senior Civil Engineer
ADW Johnson - Central Coast Office

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Fax: (02) 4305 4399
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Appendix B – Exhibits

Exhibit A – Regional Plan

Exhibit B – Local Plan with Aerial Photo

Exhibit C – Zoning Plan

Exhibit D – Existing Watercourses

Exhibit E – Option A, Option B and Option C Internal Infrastructure

Exhibit F – Option A, Option B and Option C Regional Infrastructure

LEGEND:

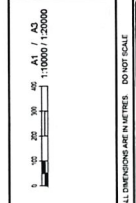
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- ADJACENT WESTERN DEVELOPMENT SITE BOUNDARY
- STUDY AREA

Contour Interval 2m



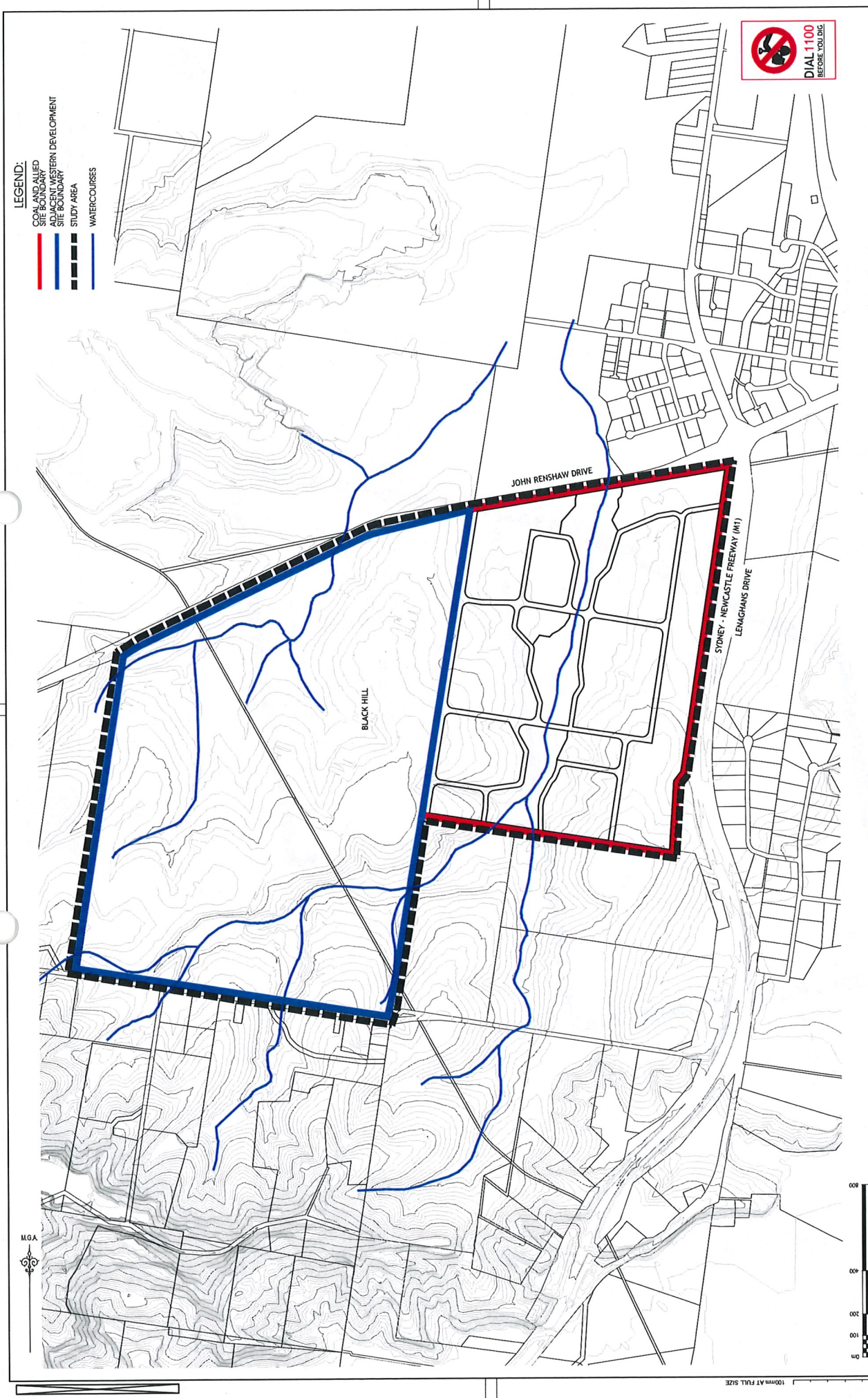
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SCALE 1:10000


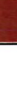
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A	07/03/2014	Local Wastewater Servicing Strategy	JT	JT	AC	HW	Central Coast 2000 Bay Street S.0. Box 1077 Tuggerah N.S.W. 2259 Phone: (02) 4305 4300 Fax: (02) 4305 4309 www.centralcoast.nsw.gov.au ABN: 62 129 445 398	"BLACK HILL SITE" LOT 30 D.P. 875411 JOHN RENSHAW DRIVE, BLACK HILL	BLACK HILL - WASTEWATER SERVICING STRATEGY
EXHIBIT B: LOCAL PLAN & AERIAL									PLAN TITLE
DISCIPLINE									PROJECT NO
190057E -									190057E -
REP									DISCIPLINE
011									NUMBER
A									REV
A									REV

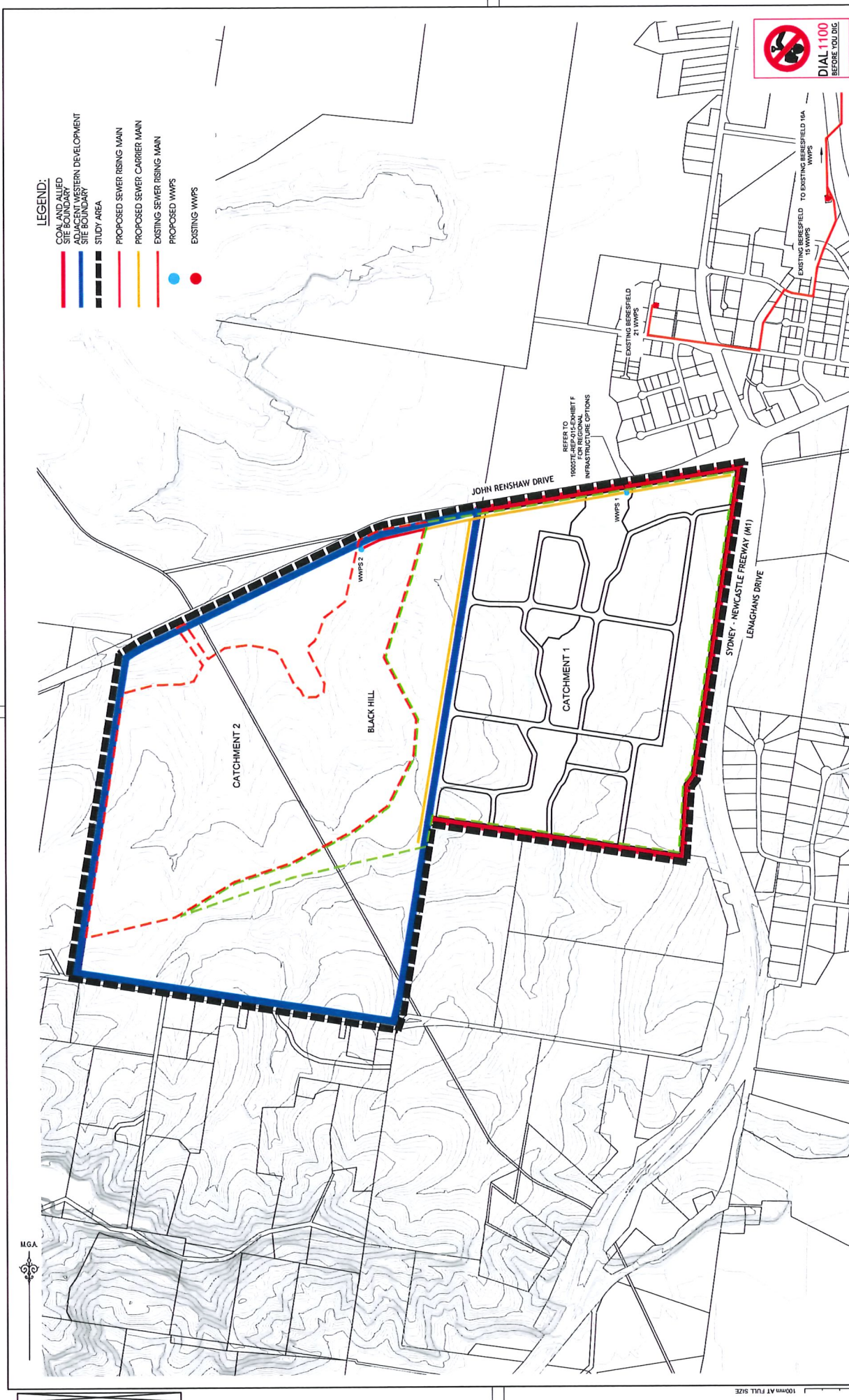


DESIGN	DRAWN	CHECKED	APPROVED
JT	JT	AC	HW

DISCIPLINE: B1



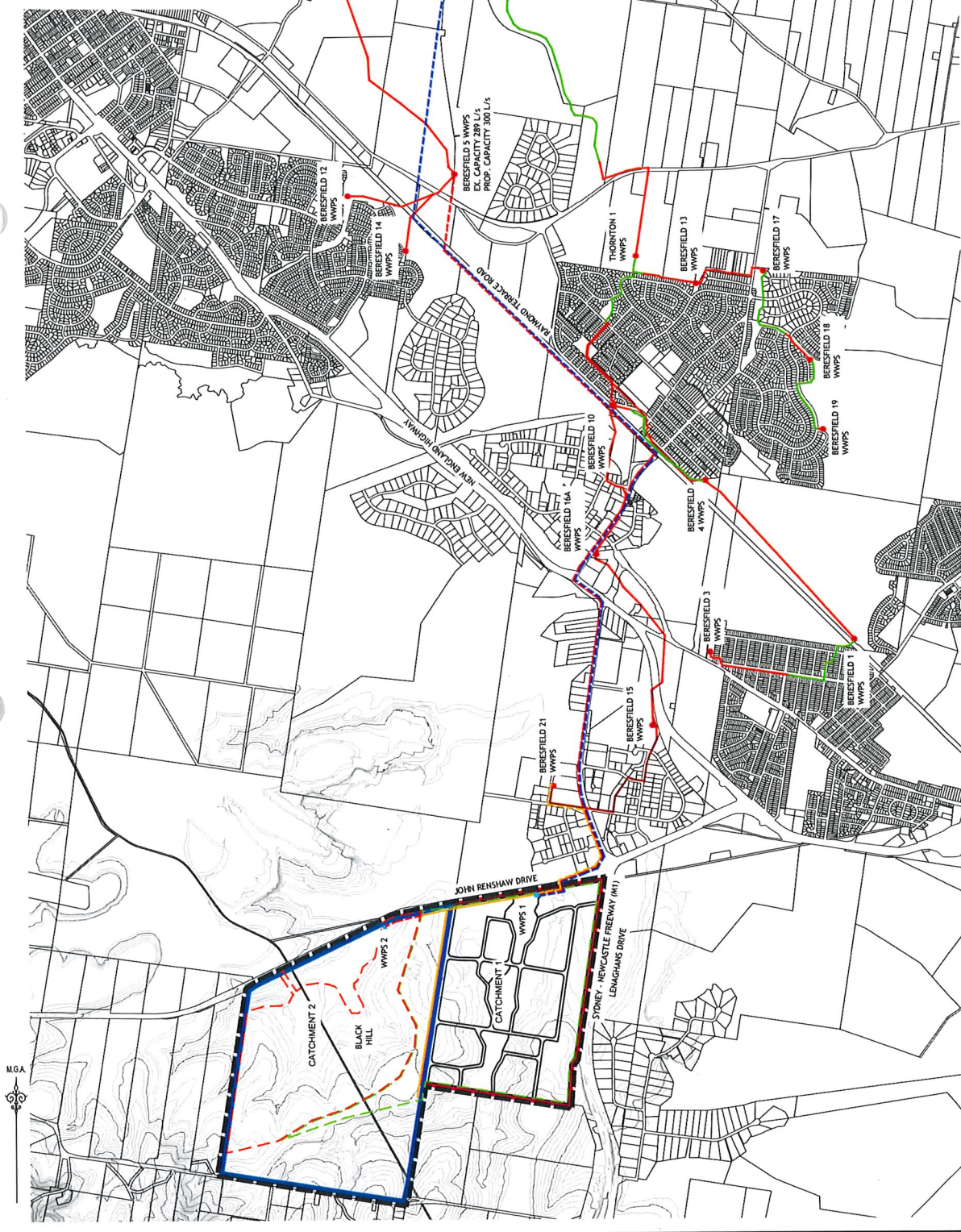
Bar Scale 1: 8000 (A1), 1: 16000 (A3)															
REV	DATE	AMENDMENT	DESIGN	DRAWN	CHECKED	APPROVED	 	Central Coast 2 Bourne Court, Wollongong N.S.W. 2509 Phone: (02) 4305 4300 Fax: (02) 4305 4399 email: sales@adwjohnson.com.au www.adwjohnson.com.au ABN 62 129 445 398	CLIENT	PROPERTY DESCRIPTION "BLACK HILL SITE" LOT 30 D.P. 870411 JOHN RENSHAW DRIVE, BLACK HILL	PROJECT BLACK HILL - WASTEWATER SERVICING STRATEGY PLAN TITLE EXHIBIT D: EXISTING WATERCOURSES	PROJECT No 190057E -	DISCIPLINE REP -	NUMBER 013	REV. A
A	07/02/2014	Dist Wastewater Servicing Strategy	JT	JT	AC	HW									
DESIGN FILE IS:							ALL DIMENSIONS ARE IN METRES. DO NOT SCALE.								





MGA

- LEGEND:**
- COAL AND ALLIED SITE BOUNDARY
 - COAL AND ALLIED SITE BOUNDARY
 - COAL AND ALLIED SITE BOUNDARY
 - STUDY AREA
 - OPTION A PROPOSED DN375 SEWER RISING MAIN
 - OPTION B PROPOSED DN375 SEWER RISING MAIN
 - OPTION C PROPOSED DN375 SEWER RISING MAIN
 - EXISTING SEWER RISING MAIN
 - EXISTING SEWER CARRIER MAIN
 - PROPOSED WWPS
 - EXISTING WWPS



Bar Scale 1: 16000 (A1), 1: 32000 (A3)

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Appendix C — Detailed Load Calculations

	Catchment 1	Catchment 2	Total
Area (ha)	196	150	345
ET (Assuming 7ET/ha)	1372	1047	2419

Study Area						
Stage	Unit (Area)	ET	ADWF (l/s)	r	PDWF (l/s)	PWWF (l/s)
Catchment 1	196	1372	15.1	2.1	31.7	145.3
Catchment 2	150	1047	11.5	2.1	24.2	110.9
TOTAL	345	2419	26.6	2.1	54.7	256.2

r factor of 2.1 adopted for entire study area

Catchment 1 Interim WWPS Analysis

Project:	Black Hill - WWPS 1
Client:	Coal and Allied
Prepared by:	ADW Johnson
Designer:	J.Y.
Date:	24/02/2014
Description:	Preliminary pump station and rising main assessment

	DN450 RM	DN450 RM	DN450 RM
Option:	A	B	C
Year required:	1	1	1
Discharge location:	B21 WWPS	Morpeth WWTW	B5 WWPS

Sewage Loads

Receiving pump flow (l/s)	0	0	0
Estimated ADWF for pump flow (l/s) **	0.0	0.0	0.0
Gravity Catchment Area (ha)	196.0	196.0	196.0
Gravity Catchment (ET)	1372	1372	1372
ADWF (l/s)	15.1	15.1	15.1
Diversity factor 'r'	2.1	2.1	2.1
PDWF (l/s)	31.7	31.7	31.7
SA (l/s)	113.6	113.6	113.6
PWWF (l/s)	145.3	145.3	145.3
Design WWPS load (l/s)	145.3	145.3	145.3
4 hours ADWF (gravity) (m3)	217.4	217.4	217.4

WWPS Parameters (10 starts per hour)

Station DN	4600	4600	4600
Design duty flow (l/s)	145.3	145.3	145.3
Surface level (mAHD)	12	12	12
Lowest MH surface level (mAHD)	12	12	12
Local 1:100 flood level (mAHD)	0	0	0
Estimated sewer entry level to well (mAHD)	9	9	9
TWL (mAHD)	8.85	8.85	8.85
MTWL (mAHD)	9	9	9
FAL (mAHD)	9.15	9.15	9.15
Required control volume (m3)	13.1	13.1	13.1
Required control depth (m)	0.80	0.80	0.80
BWL (mAHD)	8.05	8.05	8.05
Min pump submergence (mm)	700	700	700
Floor level (mAHD)	6.75	6.75	6.75
Wet well depth (m)	5.3	5.3	5.3
Emergency storage volume available in wet well (m3)	47.4	47.4	47.4
Station pipework DN	300	300	300
Station pipework velocity (m/s)	1.78	1.78	1.78
Velocity OK?	Check Velocity	Check Velocity	Check Velocity
Station minor loss (assumed K=4.65) (m)	0.75	0.75	0.75

Rising Main - Assume DICL

SRM DN	375	375	375
SRM ID (mm)	401	401	401
RM Velocity at duty (m/s)	1.15	1.15	1.15
Min desirable slime velocity (m/s)	1.08	1.08	1.08
Absolute min slime velocity (m/s)	0.65	0.65	0.65
Min slime velocity OK?	Slime OK	Slime OK	Slime OK
Absolute min slime velocity OK?	Slime OK	Slime OK	Slime OK
Solids velocity OK?	Solids OK	Solids OK	Solids OK
SRM Length (m)	1515	10443	7177
IL highpoint (mAHD)	11.3	21.2	21.2
Design discharge (l/s)	145.3	145.3	145.3
Detention Time (hrs)	3.8	24.5	16.9
TWL (mAHD)	8.85	8.85	8.85
Pipe roughness TWL 'k' (mm)	0.000270	0.000270	0.000270
Friction factor 'f'	0.01895	0.01895	0.01895
Minor loss "k"	10	10	10
Minor loss (m)	0.7	0.7	0.7
Friction loss to discharge	4.8	33.3	22.9
Static lift (m)	2.45	12.35	12.35
Duty Head TWL (m)	8.0	46.3	35.9

** Estimated ADWF for pump flow was determined by taking the pump duty flow rate and multiplying this by the estimated number of ADWF pump starts per hour (approx. 4) and a pump run time of 90 seconds. This value is converted to L/s by dividing by 3600.

Catchment 1 Ultimate WWPS Analysis

Project:	Black Hill - WWPS 1
Client:	Coal and Allied
Prepared by:	ADW Johnson
Designer:	J.Y.
Date:	24/02/2014
Description:	Preliminary pump station and rising main assessment

	DN450 RM	DN450 RM	DN450 RM
Option:	A	B	C
Year required:	10	10	10
Discharge location:	B21 WWPS	Morpeth WWTW	B5 WWPS

Sewage Loads

Receiving pump flow (l/s)	110.9	111.9	112.9
Estimated ADWF for pump flow (l/s) **	11.1	11.2	11.3
Gravity Catchment Area (ha)	150.0	150.0	150.0
Gravity Catchment (ET)	1047	1047	1047
ADWF (l/s)	15.1	15.1	15.1
Diversity factor 'r'	2.1	2.1	2.1
PDWF (l/s)	31.7	31.7	31.7
SA (l/s)	113.6	113.6	113.6
PWWF (l/s)	145.3	145.3	145.3
Design WWPS load (l/s)	256.2	257.2	258.2
24 hours ADWF (gravity) (m3)	239.2	239.2	239.2

WWPS Parameters (10 starts per hour)

Station DN	4600	4600	4600
Design duty flow (l/s)	256.2	257.2	258.2
Surface level (mAHD)	12	12	12
Lowest MH surface level (mAHD)	12	12	12
Local 1:100 flood level (mAHD)	0	0	0
Estimated sewer entry level to well (mAHD)	9	9	9
TWL (mAHD)	8.85	8.85	8.85
MTWL (mAHD)	9	9	9
FAL (mAHD)	9.15	9.15	9.15
Required control volume (m3)	23.1	23.1	23.2
Required control depth (m)	1.40	1.40	1.40
BWL (mAHD)	7.45	7.45	7.45
Min pump submergence (mm)	700	700	700
Floor level (mAHD)	6.75	6.75	6.75
Wet well depth (m)	5.3	5.3	5.3
Emergency storage volume available in wet well (m3)	47.4	47.4	47.4
Station pipework DN	300	300	300
Station pipework velocity (m/s)	3.15	3.16	3.17
Velocity OK?	Velocity OK	Velocity OK	Velocity OK
Station minor loss (assumed K=4.65) (m)	2.35	2.37	2.38

Rising Main - Assume DICL

SRM DN	375	375	375
SRM ID (mm)	401	401	401
RM Velocity at duty (m/s)	2.03	2.04	2.04
Min desirable slime velocity (m/s)	1.08	1.08	1.08
Absolute min slime velocity (m/s)	0.65	0.65	0.65
Min slime velocity OK?	Slime OK	Slime OK	Slime OK
Absolute min slime velocity OK?	Slime OK	Slime OK	Slime OK
Solids velocity OK?	Solids OK	Solids OK	Solids OK
SRM Length (m)	1515	10443	7177
IL highpoint (mAHD)	11.3	21.2	21.2
Design discharge (l/s)	256.2	257.2	258.2
Detention Time (hrs)	2.3	14.2	9.8
TWL (mAHD)	8.85	8.85	8.85
Pipe roughness TWL 'k' (mm)	0.000060	0.000060	0.000060
Friction factor 'f'	0.01454	0.01453	0.01453
Minor loss "k"	10	10	10
Minor loss (m)	2.1	2.1	2.1
Friction loss to discharge	11.5	80.0	55.4
Static lift (m)	2.45	12.35	12.35
Duty Head TWL (m)	16.1	94.5	69.9

** Estimated ADWF for pump flow was determined by taking the pump duty flow rate and multiplying this by the estimated number of ADWF pump starts per hour (approx. 4) and a pump run time of 90 seconds. This value is converted to L/s by dividing by 3600.

Catchment 1 Interim WWPS Analysis

Project:	Black Hill - WWPS 1
Client:	Coal and Allied
Prepared by:	ADW Johnson
Designer:	J.Y.
Date:	29/04/2014
Description:	Preliminary pump station and rising main assessment

Option:	C
Year required:	1
Discharge location:	Morpeth WWTW

Sewage Loads

Receiving pump flow (l/s)	410.3
Estimated ADWF for pump flow (l/s) **	41.1
Gravity Catchment Area (ha)	-
Gravity Catchment (ET)	416
ADWF (l/s)	4.6
Diversity factor 'r'	2.6
PDWF (l/s)	11.9
SA (l/s)	24.1
PWWF (l/s)	36.0
Design WWPS load (l/s)	446.3
4 hours ADWF (gravity) (m3)	94.5

WWPS Parameters (10 starts per hour)

Station DN ***	6600
Design duty flow (l/s)	446.3
Surface level (mAHD)	6.2
Lowest MH surface level (mAHD)	6.2
Local 1:100 flood level (mAHD)	6.2
Estimated sewer entry level to well (mAHD)	3.2
TWL (mAHD)	3.05
MTWL (mAHD)	3.2
FAL (mAHD)	3.35
Required control volume (m3)	40.2
Required control depth (m)	1.20
BWL (mAHD)	1.85
Min pump submergence (mm)	700
Floor level (mAHD)	0.85
Wet well depth (m)	5.4
Emergency storage volume available in wet well (m3)	97.5
Station pipework DN	450
Station pipework velocity (m/s)	2.47
Velocity OK?	Velocity OK
Station minor loss (assumed K=4.65) (m)	1.44

Floor level in WWPS lowered to ultimate state

** Estimated ADWF for pump flow was determined by taking the pump duty flow rate and multiplying this by the estimated number of ADWF pump starts per hour (approx. 4) and a pump run time of 90 seconds. This value is converted to L/s by dividing by 3600.

*** Well size has been determined as circular, however a custom well will be required. The custom well will be determined at the detailed design stage.

Catchment 1 Ultimate WWPS Analysis

Project:	Black Hill - WWPS 1
Client:	Coal and Allied
Prepared by:	ADW Johnson
Designer:	J.Y.
Date:	24/02/2014
Description:	Preliminary pump station and rising main assessment

DN450 RM

Option:	C
Year required:	10
Discharge location:	Morpeth WWTW

Sewage Loads

Receiving pump flow (l/s)	521.2
Estimated ADWF for pump flow (l/s) **	52.2
Gravity Catchment Area (ha)	-
Gravity Catchment (ET)	416
ADWF (l/s)	4.6
Diversity factor 'r'	2.6
PDWF (l/s)	11.9
SA (l/s)	24.1
PWWF (l/s)	36.0
Design WWPS load (l/s)	557.2
4 hours ADWF (gravity) (m3)	94.5

WWPS Parameters (10 starts per hour)

Station DN ***	6600
Design duty flow (l/s)	557.2
Surface level (mAHD)	6.2
Lowest MH surface level (mAHD)	6.2
Local 1:100 flood level (mAHD)	6.2
Estimated sewer entry level to well (mAHD)	3.2
TWL (mAHD)	3.05
MTWL (mAHD)	3.2
FAL (mAHD)	3.35
Required control volume (m3)	50.1
Required control depth (m)	1.50
BWL (mAHD)	1.55
Min pump submergence (mm)	700
Floor level (mAHD)	0.85
Wet well depth (m)	5.4
Emergency storage volume available in wet well (m3)	97.5
Station pipework DN	450
Station pipework velocity (m/s)	3.08
Velocity OK?	Velocity OK
Station minor loss (assumed K=4.65) (m)	2.25

** Estimated ADWF for pump flow was determined by taking the pump duty flow rate and multiplying this by the estimated number of ADWF pump starts per hour (approx. 4) and a pump run time of 90 seconds.

This value is converted to L/s by dividing by 3600.

*** Well size has been determined as circular, however a custom well will be required. The custom well will be determined at the detailed design stage.

Appendix D – Options Review

Table D1 below summarises the options which were assessed to service Coal and Allied's Black Hill Development Site.

Table D1: Options assessed

Option Description	Demand Assessment	Constraints	Infrastructure Description	Financial Assessment	Social Impact	Environmental Impact	Technical Assessment	Option Recommendation
Option A: Internal WWPS, internal DN375 and internal DN450 carrier main, external DN375 rising main to Beresfield 21 WWPS, upgrades to existing rising mains and upgrades to existing pump stations.	Meets required loads for C&A's proposed development and the adjacent western development.	Constraints exist in the form of construction through existing developments. Construction through existing development must be managed with erosion and sediment control measures.	Internal WWPS, internal DN375 and internal DN450 carrier main, external DN375 rising main (1515 m) to Beresfield 21 WWPS, upgrades to existing rising mains and upgrades to existing pump stations.	The capital cost of the required infrastructure for this option is significantly higher than Option B and C. NPV estimate \$16,235,585.	This option will provide the study area an adequate wastewater service; however construction within existing development areas will negatively impact upon the community.	There are no environmental impacts as long as correct construction methods including erosion and sediment control are implemented.	This option meets all of the performance requirements whilst having a high constructability and maintainability rating.	Option A is recommended to be discarded as it is \$5,903,715 more expensive than Option C based on NPV.
Option B: Internal WWPS, internal DN375 and internal DN450 carrier main and external DN375 rising main to Morpeth WWTW.	Meets required loads for C&A's proposed development and the adjacent western development.	Constraints exist in the form of construction through existing developments. Construction through existing development must be managed with erosion and sediment control measures.	Internal WWPS, internal DN375 and internal DN450 carrier main and external DN375 rising main (10443 m) to Morpeth WWTW.	The capital cost of the required infrastructure for this option is significantly higher than Option C. NPV estimate \$10,258,187.	This option will provide the study area an adequate wastewater service; however construction within existing development areas will negatively impact upon the community.	There are no environmental impacts as long as correct construction methods including erosion and sediment control are implemented.	This option meets all of the performance requirements whilst having a high constructability and maintainability rating.	Although Option B's cost is \$73,683 less expensive than Option C based on NPV, it is recommended that Option B be discarded due to constructability.
Option C: Internal WWPS, internal DN375 and internal DN450 carrier main and external DN375 rising main to Beresfield 5 WWPS. Construction and upgrades of Beresfield 5b station.	Meets required loads for C&A's proposed development and the adjacent western development.	Constraints exist in the form of construction through existing developments. Construction through existing development must be managed with erosion and sediment control measures.	Internal WWPS, internal DN375 and internal DN450 carrier main and external DN375 rising main (7177 m) to Beresfield 5 WWPS. Construction of Beresfield 5b station and upgrades at ultimate stage.	Minimises life cycle and O&M costs as a result of lower capital costs. NPV estimate \$10,331,870.	This option will provide the study area an adequate wastewater service; however construction within existing development areas will negatively impact upon the community.	There are no environmental impacts as long as correct construction methods including erosion and sediment control are implemented.	This option meets all of the performance requirements whilst having a high constructability and maintainability rating.	It is recommended Option C be adopted. This is the more logical option.

Appendix E – Output from Pipeline Estimating Guidelines

Option A – Year 1

Option B – Year 1

Option C – Year 1

Option A – Year 10

Option B – Year 10

Option C – Year 10

PROJECT DESCRIPTION: 190057E Wastewater Option A Stage 1

Item No.	Item Description	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	\$ 190,010.00	\$ 190,010.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max \$>	Item	Lump Sum	\$ 30,000.00	\$ 30,000.00	Payment: 100% after completion.
HW0003	Site Disestablishment <Insert Min \$>	Item	Lump Sum	\$ 30,000.00	\$ 30,000.00	Payment: 100% after completion.
HW0004	Preparation and Implementation of the Construction EMP	Item	Lump Sum	\$ 51,000.00	\$ 51,000.00	Payment: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	\$ 106,000.00	\$ 106,000.00	Payment: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Safety Management Plan.
HW0006	Preparation and Implementation of the Traffic Control Plan.	Item	Lump Sum	\$ 39,000.00	\$ 39,000.00	Payment: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	\$ 95,805.01	\$ 95,805.01	Payment: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	\$ 5,111.73	\$ 5,111.73	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					Measurement: Actual metres (effective length) of pipe delivered to site. Submit: Relevant Quality Records including Compliance Certificates. <i>Note: Limits of Accuracy to be inserted for each pipe size.</i>
026DSS	Nominal DN375 DICL pipe	497	m	\$ 252.00	\$ 125,244.00	
02DDSS	Nominal DN450 DICL pipe	181	m	\$ 304.00	\$ 55,024.00	
04BDSS	Nominal DN750 DICL pipe	651	m	\$ 729.00	\$ 474,579.00	
05AGSS	Nominal DN900 GRP pipe	1070	m	\$ 700.00	\$ 749,000.00	
078GSS	Nominal DN1200 GRP pipe	1043	m	\$ 950.00	\$ 990,850.00	
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to 1.5 m depth to invert in OTR.					Measurement: Actual metres of pipe installed with design depth of excavation up to and including 1.5m. Retention: 10% <or other appropriate percentage> until satisfactory testing. Submit: Relevant Quality Records including as constructed lengths, levels and coordinates. Limits of Accuracy: <To be inserted>.
026D03	Nominal DN375 DICL (Trench type 3)	497	m	\$ 111.25	\$ 55,291.25	
02DD03	Nominal DN450 DICL (Trench type 3)	181	m	\$ 125.25	\$ 22,670.25	
04BD03	Nominal DN750 DICL (Trench type 3)	651	m	\$ 218.32	\$ 142,126.32	
05AG03	Nominal DN900 GRP (Trench type 3)	1070	m	\$ 223.50	\$ 239,145.00	
078G03	Nominal DN1200 GRP (Trench type 3)	1043	m	\$ 288.20	\$ 300,592.60	
HWG027	Preparation of line sheets	3442	each	\$ 1.00	\$ 3,442.00	Measurement: Length of pipelines constructed as per design. Limits of Accuracy: <To be inserted>.
HWG029	Miscellaneous					
HWG000	Sub Total				\$3,163,076	

Sewer Pipeline - Rising - section will be present if one or more rising mains are specified

Item	Construction of Sewer Rising Mains	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HWR001	Service Location	Item	Lump Sum	\$ 9,722.16	\$ 9,722.16	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWR004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					Measurement: Actual metres (effective length) of pipe delivered to site. Submit: Relevant Quality Records including Compliance Certificates. <i>Note: Limits of Accuracy to be inserted for each pipe size.</i>
126DSS	Nominal DN375 DICL pipe	3717	m	\$ 252.00	\$ 936,684.00	
12DDSS	Nominal DN450 DICL pipe	3208	m	\$ 304.00	\$ 975,232.00	
13CDSS	Nominal DN600 DICL pipe	1209	m	\$ 514.00	\$ 621,426.00	
HWR005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to 1.5 m depth to invert in OTR.					Measurement: Actual metres of pipe installed with design depth of excavation up to and including 1.5m. Retention: 10% <or other appropriate percentage> until satisfactory testing. Submit: Relevant Quality Records including as constructed lengths, levels and coordinates. Limits of Accuracy: <To be inserted>.
126D03	Nominal DN375 DICL (Trench type 3)	3717	m	\$ 137.95	\$ 512,760.15	
12DD03	Nominal DN450 DICL (Trench type 3)	3208	m	\$ 161.95	\$ 519,535.60	
13CD03	Nominal DN600 DICL (Trench type 3)	1209	m	\$ 176.53	\$ 213,424.77	
HWR027	Preparation of line sheets	8134	m	\$ 1.00	\$ 8,134.00	Measurement: Length of pipelines constructed as per design. Limits of Accuracy: <To be inserted>.
HWR029	Miscellaneous					
HWR000	Sub Total				\$3,796,919	

WWPS 1

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0401	WWPS 1 4.6m dia 2 Pump(s)					

	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 341,250.00	\$ 341,250.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0402	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 12,825.00	\$ 25,650.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0403	Pumping Station Electricals					
HW0403.01	Pit and Conduit System	Item	Lump Sum	\$ 4,812.50	\$ 4,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.02	LV Station Power Supply	Item	Lump Sum	\$ 6,875.00	\$ 6,875.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.05	Switchboard	Item	Lump Sum	\$ 51,375.00	\$ 51,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 10,737.50	\$ 10,737.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0406	Service Location	Item	Lump Sum	\$ 1,269.60	\$ 1,269.60	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0415	Acid sulphate soil					
HW0415.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0430	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0431	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW4SP	Sub Total				\$499,407	

Beresfield 21 WWPS - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0501	Beresfield 21 WWPS 3m dia 2 Pump(s)					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 1,937.00	\$ 1,937.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0502	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 31,125.00	\$ 62,250.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0503	Pumping Station Electricals					
HW0503.01	Pit and Conduit System	Item	Lump Sum	\$ 10,812.50	\$ 10,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.02	LV Station Power Supply	Item	Lump Sum	\$ 13,687.50	\$ 13,687.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.03	Station By-Pass arrangements	Item	Lump Sum	\$ 6,800.00	\$ 6,800.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.04	Electrical Demolition works	Item	Lump Sum	\$ 1,000.00	\$ 1,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.05	Switchboard	Item	Lump Sum	\$ 90,125.00	\$ 90,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 24,375.00	\$ 24,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0506	Service Location	Item	Lump Sum	\$ 648.00	\$ 648.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0515	Acid sulphate soil					
HW0515.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0530	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0531	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW5SP	Sub Total				\$269,073	

Beresfield 16A - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0601	Beresfield 16A 4.6m dia 2 Pump(s)					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 2,921.00	\$ 2,921.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0602	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 31,125.00	\$ 62,250.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0603	Pumping Station Electricals					
HW0603.01	Pit and Conduit System	Item	Lump Sum	\$ 10,812.50	\$ 10,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0603.02	LV Station Power Supply	Item	Lump Sum	\$ 13,687.50	\$ 13,687.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0603.03	Station By-Pass arrangements	Item	Lump Sum	\$ 6,800.00	\$ 6,800.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.

HW0603.04	Electrical Demolition works	Item	Lump Sum	\$ 1,000.00	\$ 1,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0603.05	Switchboard	Item	Lump Sum	\$ 90,125.00	\$ 90,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0603.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0603.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0603.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 24,375.00	\$ 24,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0606	Service Location	Item	Lump Sum	\$ 1,523.52	\$ 1,523.52	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0615	Acid sulphate soil					
HW0615.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0630	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0631	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW6SP	Sub Total				\$270,932	

Thornton 1 - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0701	Thornton 1 4.6m dia 4 Pump(s)					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 2,921.00	\$ 2,921.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0702	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	4	Lump Sum	\$ 31,125.00	\$ 124,500.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0703	Pumping Station Electricals					
HW0703.01	Pit and Conduit System	Item	Lump Sum	\$ 12,388.75	\$ 12,388.75	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.02	LV Station Power Supply	Item	Lump Sum	\$ 32,000.00	\$ 32,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.03	Station By-Pass arrangements	Item	Lump Sum	\$ 9,500.00	\$ 9,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.04	Electrical Demolition works	Item	Lump Sum	\$ 1,750.00	\$ 1,750.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.05	Switchboard	Item	Lump Sum	\$ 253,675.00	\$ 253,675.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 17,875.00	\$ 17,875.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 35,812.50	\$ 35,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 41,650.00	\$ 41,650.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.09	Building Services (Electrical)	Item	Lump Sum	\$ 13,125.00	\$ 13,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0703.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 34,025.00	\$ 34,025.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0706	Service Location	Item	Lump Sum	\$ 1,523.52	\$ 1,523.52	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0715	Acid sulphate soil					
HW0715.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0730	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0731	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW7SP	Sub Total				\$595,296	

Berry Park 1 - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0802	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	4	Lump Sum	\$ 31,125.00	\$ 124,500.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0803	Pumping Station Electricals					
HW0803.01	Pit and Conduit System	Item	Lump Sum	\$ 12,388.75	\$ 12,388.75	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.02	LV Station Power Supply	Item	Lump Sum	\$ 32,000.00	\$ 32,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.03	Station By-Pass arrangements	Item	Lump Sum	\$ 9,500.00	\$ 9,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.04	Electrical Demolition works	Item	Lump Sum	\$ 1,750.00	\$ 1,750.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.05	Switchboard	Item	Lump Sum	\$ 253,675.00	\$ 253,675.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 17,875.00	\$ 17,875.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 35,812.50	\$ 35,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 41,650.00	\$ 41,650.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.09	Building Services (Electrical)	Item	Lump Sum	\$ 13,125.00	\$ 13,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0803.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 34,025.00	\$ 34,025.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0806	Service Location	Item	Lump Sum	\$ 3,840.00	\$ 3,840.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0815	Acid sulphate soil					

HW0815.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0830	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0831	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW8SP	Sub Total				\$594,691	

Item No.	Item Description	Qty	Unit	Amount	Application of Schedule of Rates
HW0013	Work as Constructed Information <Insert Min \$>	Item	Lump Sum	\$ 92,608.00	\$ 92,608.00 Payment: 100% at Practical Completion.

A.	TOTAL ESTIMATED CONTRACT AWARD SUM	\$ 9,823,816.48
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B.	PRE-CONSTRUCTION COST (Table 10)	
HW0016	Design	\$ 982,381.65
HW0017	Project Management of Design	\$ 206,476.33
HW0024	Community Consultation	
	Sub Total(B1)	\$ 1,188,857.98
	Pre construction contingency (30% of B1)	\$ 356,657.39
	TOTAL PRE-CONSTRUCTION COST (B)	\$ 1,545,515.37

C.	CONSTRUCTION COST	
	Total Estimated Contract Award Sum (A)	\$ 9,823,816.48
HW0022	Pump Station HV Power Supply	\$ 187,500.00
HW0023	Construction Management (Table 11)	\$ 785,905.32
	Sub Total (C1)	\$ 10,797,221.80
	Construction contingency (Table 12) (30% of C1)	\$ 3,239,166.54
	TOTAL CONSTRUCTION COST (C)	\$ 14,036,388.34

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	\$ 15,581,903.71
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PROJECT DESCRIPTION: 190057E Wastewater Option A Ultimate Upgrades

Item No.	Item Description	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	\$ 4,248.00	\$ 4,248.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max \$>	Item	Lump Sum	\$ 12,000.00	\$ 12,000.00	Payment: 100% after completion.
HW0003	Site Disestablishment <Insert Min \$>	Item	Lump Sum	\$ 12,000.00	\$ 12,000.00	Payment: 100% after completion.
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	\$ 3,000.00	\$ 3,000.00	Payment: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	\$ 5,000.00	\$ 5,000.00	Payment: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	\$ 4,200.00	\$ 4,200.00	Payment: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	\$ 2,923.82	\$ 2,923.82	Payment: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

WWPS 1 - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0102	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 19,687.50	\$ 39,375.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0103	Pumping Station Electricals					
HW0103.01	Pit and Conduit System	Item	Lump Sum	\$ 4,812.50	\$ 4,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.02	LV Station Power Supply	Item	Lump Sum	\$ 9,500.00	\$ 9,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.03	Station By-Pass arrangements	Item	Lump Sum	\$ 2,500.00	\$ 2,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.04	Electrical Demolition works	Item	Lump Sum	\$ 1,000.00	\$ 1,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.05	Switchboard	Item	Lump Sum	\$ 67,475.00	\$ 67,475.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 12,312.50	\$ 12,312.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0106	Service Location	Item	Lump Sum	\$ 1,269.60	\$ 1,269.60	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0115	Acid sulphate soil					
HW0115.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0130	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0131	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW1SP	Sub Total				\$195,682	

Item No.	Item Description	Qty	Unit	Amount \$	Application of Schedule of Rates
HW0012	Preconstruction record				

A. TOTAL ESTIMATED CONTRACT AWARD SUM \$ 239,053.92

B.	PRE-CONSTRUCTION COST (Table 10)			
HW0016	Design			\$ 47,810.78
HW0017	Project Management of Design			\$ 19,562.16
HW0024	Community Consultation			\$ 67,372.94
	Sub Total(B1)			\$ 20,211.88
	Pre construction contingency (30% of B1)			\$ 87,584.82
	TOTAL PRE-CONSTRUCTION COST (B)			\$ 87,584.82

C.	CONSTRUCTION COST			
	Total Estimated Contract Award Sum (A)			\$ 239,053.92
HW0022	Pump Station HV Power Supply			\$ 100,000.00
HW0023	Construction Management (Table 11)			\$ 5,000.00
	Sub Total (C1)			\$ 344,053.92
	Construction contingency (Table 12) (30% of C1)		Preliminary Estimate	\$ 103,216.18
	TOTAL CONSTRUCTION COST (C)			\$ 447,270.10

TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate) \$ 534,854.92

PROJECT DESCRIPTION: 190057E Wastewater Option B Stage 1

Item No.	Item Description	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	\$ 104,027.00	\$ 104,027.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max \$>	Item	Lump Sum	\$ 30,000.00	\$ 30,000.00	Payment: 100% after completion.
HW0003	Site Disestablishment <Insert Min \$>	Item	Lump Sum	\$ 30,000.00	\$ 30,000.00	Payment: 100% after completion.
HW0004	Preparation and Implementation of the Construction EMP	Item	Lump Sum	\$ 15,000.00	\$ 15,000.00	Payment: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	\$ 32,000.00	\$ 32,000.00	Payment: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Safety Management Plan.
HW0006	Preparation and Implementation of the Traffic Control Plan.	Item	Lump Sum	\$ 10,200.00	\$ 10,200.00	Payment: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	\$ 52,813.49	\$ 52,813.49	Payment: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	\$ 535.65	\$ 535.65	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					Measurement: Actual metres (effective length) of pipe delivered to site. Submit: Relevant Quality Records including Compliance Certificates. Note: Limits of Accuracy to be inserted for each pipe size.
026DSS	Nominal DN375 DI/CL pipe	497	m	\$ 252.00	\$ 125,244.00	
02DSS	Nominal DN450 DI/CL pipe	181	m	\$ 304.00	\$ 55,024.00	
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to 1.5 m depth to invert in OTR.					Measurement: Actual metres of pipe installed with design depth of excavation up to and including 1.5m. Retention: 10% <or other appropriate percentage> until satisfactory testing. Submit: Relevant Quality Records including as constructed lengths, levels and coordinates. Limits of Accuracy: <To be inserted>.
026D03	Nominal DN375 DI/CL (Trench type 3)	497	m	\$ 111.25	\$ 55,291.25	
02D03	Nominal DN450 DI/CL (Trench type 3)	181	m	\$ 125.25	\$ 22,670.25	
HWG027	Preparation of line sheets	678	each	\$ 1.00	\$ 678.00	Measurement: Length of pipelines constructed as per design. Limits of Accuracy: <To be inserted>.
HWG029	Miscellaneous					
HWG000	Sub Total				\$259,443	

Sewer Pipeline - Rising - section will be present if one or more rising mains are specified

Item	Construction of Sewer Rising Mains	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HWR001	Service Location	Item	Lump Sum	\$ 10,965.15	\$ 10,965.15	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWR004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					Measurement: Actual metres (effective length) of pipe delivered to site. Submit: Relevant Quality Records including Compliance Certificates. Note: Limits of Accuracy to be inserted for each pipe size.
126DSS	Nominal DN375 DI/CL pipe	10443	m	\$ 252.00	\$ 2,631,636.00	
HWR005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to 1.5 m depth to invert in OTR.					Measurement: Actual metres of pipe installed with design depth of excavation up to and including 1.5m. Retention: 10% <or other appropriate percentage> until satisfactory testing. Submit: Relevant Quality Records including as constructed lengths, levels and coordinates. Limits of Accuracy: <To be inserted>.
126D03	Nominal DN375 DI/CL (Trench type 3)	10443	m	\$ 137.95	\$ 1,440,611.85	
HWR027	Preparation of line sheets	10443	m	\$ 1.00	\$ 10,443.00	Measurement: Length of pipelines constructed as per design. Limits of Accuracy: <To be inserted>.
HWR029	Miscellaneous					
HWR000	Sub Total				\$4,093,656	

WWPS 1

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0401	WWPS 1 4.6m dia 2 Pump(s)					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 341,250.00	\$ 341,250.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0402	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 42,562.50	\$ 85,125.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0403	Pumping Station Electricals					
HW0403.01	Pit and Conduit System	Item	Lump Sum	\$ 10,812.50	\$ 10,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.02	LV Station Power Supply	Item	Lump Sum	\$ 14,375.00	\$ 14,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.05	Switchboard	Item	Lump Sum	\$ 137,187.50	\$ 137,187.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.

HW0403.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 12,437.50	\$ 12,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.09	Building Services (Electrical)	Item	Lump Sum	\$ 11,062.50	\$ 11,062.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 26,625.00	\$ 26,625.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0406	Service Location	Item	Lump Sum	\$ 1,269.60	\$ 1,269.60	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0415	Acid sulphate soil					
HW0415.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0430	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0431	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW4SP	Sub Total				\$697,582	

Item No.	Item Description	Qty	Unit		Amount \$	Application of Schedule of Rates
HW0013	Work as Constructed Information <insert Min \$>	Item	Lump Sum	\$ 88,968.00	\$ 88,968.00	Payment: 100% at Practical Completion.

A.	TOTAL ESTIMATED CONTRACT AWARD SUM	\$ 5,413,689.74
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B.	PRE-CONSTRUCTION COST (Table 10)	
HW0016	Design	\$ 541,368.97
HW0017	Project Management of Design	\$ 118,273.79
HW0024	Community Consultation	
	Sub Total(B1)	\$ 659,642.77
	Pre construction contingency (30% of B1)	\$ 197,892.83
	TOTAL PRE-CONSTRUCTION COST (B)	\$ 857,535.60

C.	CONSTRUCTION COST	
	Total Estimated Contract Award Sum (A)	\$ 5,413,689.74
HW0022	Pump Station HV Power Supply	\$ 187,500.00
HW0023	Construction Management (Table 11)	\$ 433,095.18
	Sub Total (C1)	\$ 6,034,284.92
	Construction contingency (Table 12) (30% of C1)	\$ 1,810,285.48
	TOTAL CONSTRUCTION COST (C)	\$ 7,844,570.39

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	\$ 8,702,105.99
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PROJECT DESCRIPTION: 190057E Wastewater Option B Ultimate Upgrade

Item No.	Item Description	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	\$ 9,981.00	\$ 9,981.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max \$>	Item	Lump Sum	\$ 15,000.00	\$ 15,000.00	Payment: 100% after completion.
HW0003	Site Disestablishment <Insert Min \$>	Item	Lump Sum	\$ 15,000.00	\$ 15,000.00	Payment: 100% after completion.
HW0004	Preparation and Implementation of the Construction EMP	Item	Lump Sum	\$ 3,000.00	\$ 3,000.00	Payment: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	\$ 5,000.00	\$ 5,000.00	Payment: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	\$ 4,200.00	\$ 4,200.00	Payment: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	\$ 5,790.57	\$ 5,790.57	Payment: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

WWPS 1 - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0102	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 65,437.50	\$ 130,875.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0103	Pumping Station Electricals					
HW0103.01	Pit and Conduit System	Item	Lump Sum	\$ 10,975.00	\$ 10,975.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.02	LV Station Power Supply	Item	Lump Sum	\$ 23,437.50	\$ 23,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.03	Station By-Pass arrangements	Item	Lump Sum	\$ 9,500.00	\$ 9,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.04	Electrical Demolition works	Item	Lump Sum	\$ 1,750.00	\$ 1,750.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.05	Switchboard	Item	Lump Sum	\$ 183,000.00	\$ 183,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 22,362.50	\$ 22,362.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.09	Building Services (Electrical)	Item	Lump Sum	\$ 13,125.00	\$ 13,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 28,625.00	\$ 28,625.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0106	Service Location	Item	Lump Sum	\$ 1,269.60	\$ 1,269.60	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0115	Acid sulphate soil					
HW0115.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0130	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0131	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW1SP	Sub Total				\$482,357	

Item No.	Item Description	Qty	Unit	Amount \$	Application of Schedule of Rates
HW0012	Preconstruction record				

A. TOTAL ESTIMATED CONTRACT AWARD SUM \$ 540,328.67

B.	PRE-CONSTRUCTION COST (Table 10)		
HW0016	Design	\$	81,049.30
HW0017	Project Management of Design	\$	26,209.86
HW0024	Community Consultation		
	Sub Total(B1)	\$	107,259.16
	Pre construction contingency (30% of B1)	\$	32,177.75
	TOTAL PRE-CONSTRUCTION COST (B)	\$	139,436.91

C.	CONSTRUCTION COST		
	Total Estimated Contract Award Sum (A)	\$	540,328.67
HW0022	Pump Station HV Power Supply	\$	187,500.00
HW0023	Construction Management (Table 11)	\$	54,032.87
	Sub Total (C1)	\$	781,861.54
	Construction contingency (Table 12) (30% of C1)	\$	234,558.46
	TOTAL CONSTRUCTION COST (C)	\$	1,016,420.00

TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate) \$ 1,155,856.91

PROJECT DESCRIPTION: 190057E Wastewater Option C Stage 1

Item No.	Item Description	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	\$ 90,952.00	\$ 90,952.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max \$>	Item	Lump Sum	\$ 30,000.00	\$ 30,000.00	Payment: 100% after completion.
HW0003	Site Disestablishment <Insert Min \$>	Item	Lump Sum	\$ 30,000.00	\$ 30,000.00	Payment: 100% after completion.
HW0004	Preparation and Implementation of the Construction EMP	Item	Lump Sum	\$ 18,000.00	\$ 18,000.00	Payment: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Construction EMP.
HW0005	Preparation and Implementation of the Safety Management Plan.	Item	Lump Sum	\$ 37,000.00	\$ 37,000.00	Payment: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Safety Management Plan.
HW0006	Preparation and Implementation of the Traffic Control Plan.	Item	Lump Sum	\$ 14,400.00	\$ 14,400.00	Payment: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	\$ 46,276.02	\$ 46,276.02	Payment: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

Sewer Pipeline - Gravity - section will be present if one or more gravity mains are specified

Item	Construction of Sewer Gravity Mains	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HWG001	Service Location	Item	Lump Sum	\$ 535.65	\$ 535.65	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWG004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					Measurement: Actual metres (effective length) of pipe delivered to site. Submit: Relevant Quality Records including Compliance Certificates. Note: Limits of Accuracy to be inserted for each pipe size.
026DSS	Nominal DN375 DICL pipe	497	m	\$ 252.00	\$ 125,244.00	
02D0SS	Nominal DN450 DICL pipe	181	m	\$ 304.00	\$ 55,024.00	
HWG005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to 1.5 m depth to invert in OTR.					Measurement: Actual metres of pipe installed with design depth of excavation up to and including 1.5m. Retention: 10% <or other appropriate percentage> until satisfactory testing. Submit: Relevant Quality Records including as constructed lengths, levels and coordinates. Limits of Accuracy: <To be inserted>.
026D03	Nominal DN375 DICL (Trench type 3)	497	m	\$ 111.25	\$ 55,291.25	
02D003	Nominal DN450 DICL (Trench type 3)	181	m	\$ 125.25	\$ 22,670.25	
HWG027	Preparation of line sheets	678	each	\$ 1.00	\$ 678.00	Measurement: Length of pipelines constructed as per design. Limits of Accuracy: <To be inserted>.
HWG029	Miscellaneous					
HWG000	Sub Total				\$259,443	

Sewer Pipeline - Rising - section will be present if one or more rising mains are specified

Item	Construction of Sewer Rising Mains	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HWR001	Service Location	Item	Lump Sum	\$ 7,535.85	\$ 7,535.85	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HWR004	Supply all pipe materials including detector tape, pipe protection wrapping, rubber rings and lubricant for following pipe sizes:					Measurement: Actual metres (effective length) of pipe delivered to site. Submit: Relevant Quality Records including Compliance Certificates. Note: Limits of Accuracy to be inserted for each pipe size.
126DSS	Nominal DN375 DICL pipe	7177	m	\$ 252.00	\$ 1,808,604.00	
HWR005	Clear, excavate, lay, join, bed, backfill & test pipelines (installation). Up to 1.5 m depth to invert in OTR.					Measurement: Actual metres of pipe installed with design depth of excavation up to and including 1.5m. Retention: 10% <or other appropriate percentage> until satisfactory testing. Submit: Relevant Quality Records including as constructed lengths, levels and coordinates. Limits of Accuracy: <To be inserted>.
126D03	Nominal DN375 DICL (Trench type 3)	7177	m	\$ 137.95	\$ 990,067.15	
HWR027	Preparation of line sheets	7177	m	\$ 1.00	\$ 7,177.00	Measurement: Length of pipelines constructed as per design. Limits of Accuracy: <To be inserted>.
HWR029	Miscellaneous					
HWR000	Sub Total				\$2,813,384	

WWPS 1

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0401	WWPS 1 4.6m dia 2 Pump(s)					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 341,250.00	\$ 341,250.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0402	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 33,412.50	\$ 66,825.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0403	Pumping Station Electricals					
HW0403 01	Pit and Conduit System	Item	Lump Sum	\$ 10,812.50	\$ 10,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403 02	LV Station Power Supply	Item	Lump Sum	\$ 14,375.00	\$ 14,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403 05	Switchboard	Item	Lump Sum	\$ 90,125.00	\$ 90,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.

HW0403.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0403.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 24,437.50	\$ 24,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0406	Service Location	Item	Lump Sum	\$ 1,269.60	\$ 1,269.60	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0415	Acid sulphate soil					
HW0415.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0430	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0431	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW4SP	Sub Total				\$606,532	

B5 WWPS

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0501	B5 WWPS 7m dia 2 Pump(s)					
	Clear, excavate & backfill in OTR conditions, supply and construct pipework, pump station, includes sliding aluminium hatch covers, screens & ancillary metal work & fittings. Supply & place formwork, reinforcement, concrete, roof slab, thrust blocks.	Item	Lump Sum	\$ 369,000.00	\$ 369,000.00	Payment: <Insert appropriate percentages to reflect the value of work at key milestones eg excavation, pump well, metalwork etc>. Submit: Relevant Quality Records.
HW0502	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 42,562.50	\$ 85,125.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0503	Pumping Station Electricals					
HW0503.01	Pit and Conduit System	Item	Lump Sum	\$ 10,812.50	\$ 10,812.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.02	LV Station Power Supply	Item	Lump Sum	\$ 14,375.00	\$ 14,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.05	Switchboard	Item	Lump Sum	\$ 137,187.50	\$ 137,187.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 12,437.50	\$ 12,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.09	Building Services (Electrical)	Item	Lump Sum	\$ 11,062.50	\$ 11,062.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0503.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 26,625.00	\$ 26,625.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0506	Service Location	Item	Lump Sum	\$ 2,940.00	\$ 2,940.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0515	Acid sulphate soil					
HW0515.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0530	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0531	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW5SP	Sub Total				\$727,003	

Item No.	Item Description	Qty	Unit		Amount \$	Application of Schedule of Rates
HW0013	Work as Constructed Information <small><Insert Min \$></small>	Item	Lump Sum	\$ 62,840.00	\$ 62,840.00	Payment: 100% at Practical Completion.

A. TOTAL ESTIMATED CONTRACT AWARD SUM \$ 4,735,829.77

B. PRE-CONSTRUCTION COST (Table 10)	
HW0016 Design	\$ 588,299.57
HW0017 Project Management of Design	\$ 123,659.91
HW0024 Community Consultation	
Sub Total (B1)	\$ 691,959.49
Pre construction contingency (30% of B1)	\$ 207,587.85
TOTAL PRE-CONSTRUCTION COST (B)	\$ 899,547.33

C. CONSTRUCTION COST	
Total Estimated Contract Award Sum (A)	\$ 4,735,829.77
HW0022 Pump Station HV Power Supply	\$ 187,500.00
HW0023 Construction Management (Table 11)	\$ 378,866.38
Sub Total (C1)	\$ 5,302,196.15
Construction contingency (Table 12) (30% of C1)	\$ 1,590,658.85
Preliminary Estimate	
TOTAL CONSTRUCTION COST (C)	\$ 6,892,855.00

TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate) \$ 7,792,402.33

PROJECT DESCRIPTION: 190057E Wastewater Option C Ultimate Upgrade

Item No.	Item Description	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0001	All work not included elsewhere in this schedule	Item	Lump Sum	\$ 18,978.00	\$ 18,978.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0002	Site Establishment <Insert Max >	Item	Lump Sum	\$ 15,000.00	\$ 15,000.00	Payment: 100% after completion.
HW0003	Site Disestablishment <Insert Min >	Item	Lump Sum	\$ 15,000.00	\$ 15,000.00	Payment: 100% after completion.
HW0004	Preparation and implementation of the Construction EMP	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: Maximum of 30% on submission of complying Construction EMP, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Construction EMP.
HW0005	Preparation and implementation of the Safety Management Plan.	Item	Lump Sum	\$ 10,000.00	\$ 10,000.00	Payment: Maximum of 30% on submission of complying plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion. Submit: Safety Management Plan.
HW0006	Preparation and implementation of the Traffic Control Plan.	Item	Lump Sum	\$ 8,400.00	\$ 8,400.00	Payment: Maximum of 30% on submission of complying Traffic Control Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.
HW0007	Preparation and Implementation of Quality Management Plan	Item	Lump Sum	\$ 10,288.85	\$ 10,288.85	Payment: Maximum of 30% on submission of complying Quality Management Plan, then 10% per month up to maximum of 80%. Remainder at Practical Completion.

WWPS 1 - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0102	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 54,000.00	\$ 108,000.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0103	Pumping Station Electricals					
HW0103.01	Pit and Conduit System	Item	Lump Sum	\$ 10,975.00	\$ 10,975.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.02	LV Station Power Supply	Item	Lump Sum	\$ 14,375.00	\$ 14,375.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.03	Station By-Pass arrangements	Item	Lump Sum	\$ 9,500.00	\$ 9,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.04	Electrical Demolition works	Item	Lump Sum	\$ 1,750.00	\$ 1,750.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.05	Switchboard	Item	Lump Sum	\$ 166,037.50	\$ 166,037.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 22,362.50	\$ 22,362.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.09	Building Services (Electrical)	Item	Lump Sum	\$ 13,125.00	\$ 13,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0103.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 26,625.00	\$ 26,625.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0106	Service Location	Item	Lump Sum	\$ 1,269.60	\$ 1,269.60	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0115	Acid sulphate soil					
HW0115.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>
HW0130	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0131	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW1SP	Sub Total				\$431,457	

B5 WWPS - UPGRADE

Item	Pump Station - Name	Qty	Unit	Rate \$/Unit	Amount \$	Application of Schedule of Rates
HW0202	Pumps for Pumping Stations - Supply and install pumps and associated fittings, connection to pipework, testing and commissioning.	2	Lump Sum	\$ 65,437.50	\$ 130,875.00	Payment: <Insert appropriate percentages for key milestones eg installation, precommissioning, commissioning>. Submit: Relevant Quality Records including those for pump test.
HW0203	Pumping Station Electricals					
HW0203.01	Pit and Conduit System	Item	Lump Sum	\$ 10,975.00	\$ 10,975.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.02	LV Station Power Supply	Item	Lump Sum	\$ 23,437.50	\$ 23,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.03	Station By-Pass arrangements	Item	Lump Sum	\$ 9,500.00	\$ 9,500.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.04	Electrical Demolition works	Item	Lump Sum	\$ 1,750.00	\$ 1,750.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.05	Switchboard	Item	Lump Sum	\$ 183,000.00	\$ 183,000.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.06	PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,437.50	\$ 14,437.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.07	PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450.00	\$ 28,450.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.08	Stainless Steel Generator Box Cable Tray & Metering Box	Item	Lump Sum	\$ 22,362.50	\$ 22,362.50	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.09	Building Services (Electrical)	Item	Lump Sum	\$ 13,125.00	\$ 13,125.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0203.11	Installation/Cabling (Electrical)	Item	Lump Sum	\$ 28,625.00	\$ 28,625.00	Payment: Percentage of work completed. Submit: Relevant Quality Records.
HW0206	Service Location	Item	Lump Sum	\$ 2,940.00	\$ 2,940.00	Payment: Maximum of 10% shall be due each month until 70% of the amount has been paid. Remainder at Practical Completion.
HW0215	Acid sulphate soil					
HW0215.01	Initial testing for acid sulphate soils and prepare and submit report	5	per test	\$ 110.00	\$ 550.00	Submit: Result for each test. Limits of Accuracy: <To be inserted>

HW0230	Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000.00	\$ 8,000.00	Payment: 50% at completion of satisfactory precommissioning. Remainder at Practical Completion. Submit: Relevant Quality Records.
HW0231	Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 6,000.00	\$ 6,000.00	Payment: 100% at Practical Completion. Submit: Complying Work As Constructed Information.
HW2SP	Sub Total				\$484,028	

Item No.	Item Description	Qty	Unit	Amount	Application of Schedule of Rates
HW0012	Preconstruction record				

A.	TOTAL ESTIMATED CONTRACT AWARD SUM	\$ 999,151.45
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B.	PRE-CONSTRUCTION COST (Table 10)	
HW0016	Design	\$ 149,872.72
HW0017	Project Management of Design	\$ 39,974.54
HW0024	Community Consultation	
	Sub Total(B1)	\$ 189,847.26
	Pre construction contingency (30% of B1)	\$ 56,954.18
	TOTAL PRE-CONSTRUCTION COST (B)	\$ 246,801.44

C.	CONSTRUCTION COST	
	Total Estimated Contract Award Sum (A)	\$ 999,151.45
HW0022	Pump Station HV Power Supply	\$ 187,500.00
HW0023	Construction Management (Table 11)	\$ 99,915.15
	Sub Total (C1)	\$ 1,286,566.60
	Construction contingency (Table 12) (30% of C1)	\$ 385,969.98
	TOTAL CONSTRUCTION COST (C)	\$ 1,672,536.57

	TOTAL PRELIMINARY PROJECT ESTIMATE (B+C) (Preliminary Estimate)	\$ 1,919,338.01
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Appendix F — Net Present Value Analysis

Summary of options

Option	NET PRESENT VALUE (30yrs 7% Discount)		NET PRESENT VALUE (30yrs 4% Discount)		NET PRESENT VALUE (30yrs 10% Discount)	
OPTION A	\$	16,359,675.59	\$	16,674,728.48	\$	16,159,342.56
OPTION B	\$	10,382,277.41	\$	11,160,691.30	\$	9,901,323.05
OPTION C	\$	10,455,960.54	\$	11,573,559.42	\$	9,749,381.71

Option	CAPITAL COST	
OPTION A	\$	16,116,757.98
OPTION B	\$	9,857,962.89
OPTION C	\$	9,711,740.34

[illegible]

[illegible]

