Water Resource Management Plan 2019

Methodology for Estimating Scheme Costs

South Staffs Water

November 2017

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1. Context

Atkins was appointed by South Staffs Water (SSW) in September 2016 to prepare and evaluate conceptual schemes to improve water availability as part of the PR19 Trading & Resources project. In turn, the outputs of this project are informing the company's 2019 Water Resource Management Plan (WRMP19) submissions.

Conceptual scheme designs were developed and a process of screening carried out to identify those which were suitable for further progression. Schemes passing this screening exercise have been subject to lifecycle cost assessment and this document seeks to demonstrate the principles used to estimate the capital and operational costs for each scheme.

This document refers to the price estimation spreadsheet prepared by Atkins and known as the 'Pricing Workbook'. The spreadsheet includes user variable 'global' parameters that can be adjusted to better reflect company specific cost profiles as they become available from SSW.

This report focusses on the methodology for estimating prices of the WRMP conceptual schemes including assumptions, unit rates and the overall principals of project pricing. To maintain the concise nature of this document, the operation of the Pricing Workbook will not be described.

The outputs of the Pricing Workbook are to be included in the SSW Decision Making Framework (DMF), also referred to as the Multi-Criteria Analysis (MCA) tool. Reference is made to specific outputs which have been adapted to ensure consistency with the principles of the DMF.

2. Pricing Approach

2.1. Overview

Atkins has prepared conceptual engineering schemes to provide additional deployable output into the SSW supply network. Appraisal of the lifecycle costs of each scheme includes consideration of both capital expenditure (capex) and operational expenditure (opex).

Capex, or capital expenditure, is defined as the total capital cost of the scheme. This comprises the design, construction and commissioning of a scheme to a stage where it is fully implemented.

Opex, or operations expenditure, comprise several different considerations to the ongoing cost of operating the equipment. Opex includes:

- Fixed operating costs which are not dependent on plant output, and;
- Variable operating costs such as chemical usage, energy usage and other costs which are dependent on plant output and capital renewal frequencies.

Atkins have developed the Pricing Workbook to facilitate consistent estimation of capex and opex across the many different types and sizes of WRMP conceptual schemes. The way in which the Pricing Workbook calculates the estimated price is subject to a separate report, however the underlying principles of the Pricing Workbook are demonstrated in the following sections.

Nomenclature

The Pricing Workbook describes assets in the following manner:

- Main Category E.g. Raw Water, Distribution etc.
- Sub Category E.g. Intake, Borehole, etc
- Component E.g. Intake Pumping, Drill New Borehole, Headworks etc.

For the purpose of this document, all assets identified as required for a scheme and priced by the Pricing Workbook are considered ‘components’ and are referred to as such in this document.

Asset life categories

The estimation of opex, in particular capital renewal costs, requires consideration of an assumed asset life. The asset life varies for each component, however these can broadly be classified in groups to enable a manageable strategic level assessment of opex costs.

The asset life categories that are considered by the Pricing Workbook are:

- Pipeline assets
- Civils assets and buildings
- Mechanical and electrical
- Dams and reservoirs

Some components have constituent parts which span more than one asset life category. For example a pumping station will have a civil aspect as well as a mechanical and electrical aspect. In such cases, the proportion of cost attributed to each asset life category has been estimated and input to the Pricing Workbook allowing the capital renewal of short life asset constituents to be appropriately accounted for.

The proportional split by cost of each component into the different asset life categories is shown in Appendix A.

Capital cost and oncosts

The estimated cost of constructing the scheme has been derived from a series of unit rates.

The overall project cost will include a number of non-construction costs such as:

- Feasibility, outline and detailed design.
- Internal client costs including operational support.
- Project management and assurance.
- Third party fees and costs.

These non-construction elements of a scheme are termed oncosts and have been applied as a simple multiplier of the estimated construction cost. Oncost rates have been applied as discussed with South Staffs Water and demonstrated in Table 2-1.

Table 2-1 Applied Oncost Rates

Oncost Type	Rate (As a % of construction cost)
Design Costs	10%
Other oncosts (South Staffs Water specific)	14%
TOTAL	**24%**

Pricing tolerances and risk

Pricing of risk items has been included as an optimism bias factor applied to the project total cost. Optimism bias is a simple multiplier to the total project costs which compensates for engineers’ tendency for underestimation (optimism) of project pricing and provides a contingency for risk items that is set at a level appropriate to the stage of the scheme development.

The estimated prices for each scheme are provided as high, mid and low estimates reflecting different levels of optimism bias applied.

2.2. Capital Costs

The capital costs have been estimated by including scheme components in the Pricing Workbook. Each scheme is priced using a standard set of assumed rates for each component type. These rates have been derived from professional judgement and experience of similar projects within the water industry.

The rates are demonstrated in the Pricing Workbook and can be modified as previous experience of outturn costs specific to SSW are better defined. For the purpose of transparency and ease of review, the pricing rates and curves for each component are included in Appendix B.

There are two different types of rate model that are applied depending on the specific component. These are described in Table 2.2.

Table 2-2 Rate Model Descriptions

Rate Model	Description
Fixed Price Assets	These prices are per quantity of the specific component that are not changed by the size or rating of the component.
Variable Price Assets	These prices are derived as a base price plus a value which is dependent on the size or rating of the component. The base price and associated multipliers are often shown for particular ranges of component size/rating to represent economies of scale when constructing apparatus.

The estimated capex of the scheme is the sum of the estimated price of each component with appropriate adjustments for oncosts and optimism bias.

The DMF tool requires the capex to be distributed across an appropriate spend profile. There are varying levels of complexity between different schemes that dictates the delivery programme and spend profile for each scheme. A series of spend profiles have been developed and applied to the schemes consistently as shown in Appendix C.

2.3. Operating Costs

The opex estimation is more complex than capex estimation and is dependent on both the components that are input for each scheme and any site specific information that is available.

Fixed Operating Costs

Following consultation with SSW, the DMF tool requires only staff costs to be included within the Fixed Operating Costs field. All materials, hire and contract services (MHCS) costs associated with servicing the new assets are therefore excluded from the calculation.

Fixed operating costs associated with annual asset servicing have been estimated by assuming a staff input to each asset component based on a full time equivalent (FTE) as shown in Appendix D. These staff costs are aggregated for input to the DMF model.

Major servicing of assets, comprising infrequent asset overhauls and consumable renewals have not been included as these would fall within the MHCS costs that are not input into the DMF tool.

Fixed operating costs are represented in units £/Ml.

Capital Renewals

In accordance with the input requirements of the DMF model, capital renewal costs have been prepared for each scheme considering an 80 year horizon with year-by-year granularity. The capital renewal frequency is expressed as a function of asset life and renewal cost distribution across the appropriate future AMP period.

The life of each asset has been estimated based on the asset life category as demonstrated in Table 2-3.

Table 2-3 Assumed Asset Life

Asset Life Category	Assumed DMF Asset life
Pipeline assets	>100 years
Civils assets and buildings	60 years
Mechanical and electrical	25 years
Dams and reservoirs	>100 years

Assets classed as pipelines, dams or reservoirs are considered to have an asset life outside the design horizon of the DMF. As such capital renewal of these items has been omitted from the opex estimation.

The capital renewal cost of a component has been assumed to be the entire construction cost of the portion of the component within each asset life category. Oncosts for capital renewal works are expected to be minimal as the asset will be designed with future renewal requirements in mind. As such, capital renewal costs exclude all oncosts.

To represent the AMP investment cycles for capital renewal planning, the capital renewal costs have been further divided and profiled over a period as defined by the assumptions presented below.

Mechanical and Electrical Apparatus

- Full renewal every 25 years as two investment periods starting in years 15 and 25.
- Within the first renewal intervention (15 years from new/renewal) invest 50% of the asset cost.
- Within the second renewal intervention (25 years from new/renewal) invest 50% of the asset cost.
- The renewal intervention investment will be smoothed over a five year period as shown in Table 2-4.

Table 2-4 Mechanical and Electrical asset Renewal - Investment Smoothing

Intervention Start Year	Intervention (% of asset cost)	Intervention Programme Year 1	Intervention Programme Year 2	Intervention Programme Year 3	Intervention Programme Year 4	Intervention Programme Year 5
15	50	5%	15%	60%	15%	5%
25	50	5%	15%	60%	15%	5%
40	50	5%	15%	60%	15%	5%
50	50	5%	15%	60%	15%	5%
65	50	5%	15%	60%	15%	5%
75	50	5%	15%	60%	15%	5%

Civils assets and Buildings Apparatus

- Full renewal every 25 years as three investment periods starting in years 20, 40 and 60.
- Within the first renewal intervention (20 years from new/renewal) invest 15% of the asset cost.
- Within the second renewal intervention (40 years from new/renewal) invest 15% of the asset cost.
- Within the third renewal intervention (60 years from new/renewal) invest 70% of the asset cost.
- The renewal intervention investment will be smoothed over a five year period as shown in Table 2-5.

Table 2-5 Civils assets and Buildings Asset Renewal - Investment Smoothing

Intervention Start Year	Intervention (% of asset cost)	Intervention Programme Year 1	Intervention Programme Year 2	Intervention Programme Year 3	Intervention Programme Year 4	Intervention Programme Year 5
20	15	10%	25%	35%	25%	5%
40	15	10%	25%	35%	25%	5%
60	70	10%	20%	40%	20%	10%

Capital renewal costs are represented in units of £/year for the appropriate future year. These costs are not discounted.

Variable Operating Costs: Chemical Usage

Chemical usage for each scheme has been derived through examination of the raw water source and assuming the same chemical usage costs as existing treatment plants drawing from that source. Where this is not known an appropriate estimation has been made based on the source of the raw water.

Appendix E shows assumed chemical usage costs for existing SSW sites and assumed values for different new raw water sources.

There is an aspiration to use conceptual design chemical dosing rates along with the chemical purchase costs to better define chemical costs for each scheme. However, further understanding and integration with the baseline model is required to ensure that these costs are not misrepresented.

Chemical usage costs are represented in units £/Ml.

Variable Operating Costs: Electricity Usage

Electrical usage has been estimated for the following distinct areas:

- Borehole pumps
- Pumping stations
- Treatment Processes
- Site ancillaries

<u>Borehole Pumps</u>

Electrical usage from borehole pumps has been calculated from the borehole depth as follows:

$$\text{Electrical Usage } [kWh/Ml] = \frac{Flowrate\left[\frac{m^3}{s}\right] \times Gravity\left[\frac{m}{s^2}\right] \times Density\left[\frac{kg}{m^3}\right] \times Depth\ of\ BH[m] \times 24\left[\frac{h}{d}\right]}{Pump\ Efficiency\ [decimal] \times 1000\left[\frac{W}{kW}\right] \times Daily\ Output\ \left[\frac{Ml}{d}\right]}$$

The pump efficiency (inclusive of motor and shaft efficiency) is assumed to be 80%.

Example: The electrical usage of a borehole site producing 9Ml/d from a borehole of depth 236.9m is therefore estimated to be 807kWh per Ml as follows:

$$\text{Electrical Usage } = \frac{\frac{9 \times 1000}{24 \times 60 \times 60} \times 9.81 \times 1000 \times 236.9 \times 24}{0.8 \times 1000 \times 9}$$

$$\text{Electrical Usage } = 807\ kWh/Ml$$

Pumping Stations

Electrical usage from transfer pumping stations is estimated in a similar way:

$$\text{Electrical Usage }[kWh/Ml] = \frac{Flowrate\left[\frac{m^3}{s}\right] \times Gravity\left[\frac{m}{s^2}\right] \times Density\left[\frac{kg}{m^3}\right] \times Pump\ Lift\ [m] \times 24\left[\frac{h}{d}\right]}{Pump\ Efficiency\ [decimal] \times 1000\left[\frac{W}{kW}\right] \times Daily\ Flow\left[\frac{Ml}{d}\right]}$$

The pump efficiency (inclusive of motor and shaft efficiency) is assumed to be 80%.

Example: The electrical usage of a pumping station site transferring 5Ml/d from an elevation of 50mAOD to an elevation of 75mAOD and ensuring a minimum of 5m pressure in the pipeline at the outlet is therefore estimated to be 102kWh per Ml as follows:

$$\text{Electrical Usage } = \frac{\frac{5\times 1000}{24\times 60\times 60}\times 9.81\times 1000\times\big((75-50)+5\big)\times 24}{0.8\times 1000\times 5}$$

$$\text{Electrical Usage } = 102\ kWh/Ml$$

Treatment Processes

The electrical usage of new treatment facilities may be subject to significant study, identifying individual component electrical usages, efficiency and interstage pumping. Some of these factors will be site dependant and a generic approximation has been sought for the development of the WRMP19 opex estimation.

This approximation has been applied consistently across all schemes that include treatment process proposals. Whilst not an absolute calculation, the outputs of this methodology are considered commensurate with the current development stage of the schemes.

The electrical usage approximation has been derived for each treatment process component as shown in Appendix F. Due to the nature of treatment process assets, there are two subsets depending on the sensitivity of the electrical usage to the component sizing and throughput.

For example, the rating of a chemical dosing pump is unlikely to vary significantly as any increase in plant design flowrate will be accompanied by a larger number of chemical dosing units, rather than an increased size of dosing plant and pump. However, the electrical usage of a pressure filtration plant will be heavily dependent on the flowrate that needs to be pumped at high pressure through the process. As such, the electrical usage assumption has been assumed either by the quantity of the particular component or by the design flowrate of the apparatus, as indicated in Appendix F.

Site Ancillaries

Minor electrical usage at sites for heating, lighting etc have been excluded from the opex estimate as they are expected to be negligible compared with other electrical usage in the scheme and within the tolerances of the strategy level assessment.

Variable Operating Costs: Other

No other variable operating costs have been identified at this stage with the WRMP schemes.

2.4. Specifically Priced Items

A small number of schemes warrant the inclusion of a component that has not been listed in the Pricing Workbook. These have been captured as ‘Other’ costs and are shown within the appropriate ‘Other’ field for each Main Category section. All ‘Other’ costs are described in the scheme notes for clarity.

Capex estimation includes ‘Other’ items as part of the overall calculation, however the estimation of opex requires additional consideration. As each item in the ‘Other’ field will be scheme specific, it is not appropriate to make general assumptions about the opex associated with these items.

Provision is made within the Pricing Workbook to enable a bespoke input of opex parameters which are incorporated into the total scheme opex costs alongside that of other scheme components.

2.5. Envelope and Baseline

The integrated nature of water resource and supply systems means that it is important to define the boundary within which the capex and opex prices have been estimated. This is not necessarily a geographic boundary and should be considered a function boundary or envelope.

The envelope being considered varies for each scheme and is broadly aligned with the area of functional influence that the scheme exerts over the existing apparatus and network. The following sections provide clarity on how the scheme envelope has been determined.

Capex Envelope

The estimation of capital works required for a scheme to be implemented has been determined through communication with SSW, professional judgement and the scheme concept requirements. All capital works required to distribute water into supply have been included within the capex estimate. Table 2-6 demonstrates the envelope.

Table 2-6 Capex Envelope by Main Category

Main Category	Envelope Inclusions	Envelope Exclusions
Raw Water	- Capture, abstraction or other means of promoting a raw water source into a usable resource. - Methodology for conveying raw water from source to appropriate treatment or blending site.	- Third party works required to enable raw water availability. - Additional pumping and augmentation of surface water storage resources except those explicitly and required in the scheme description.
Treatment	- All treatment needs to meet expected requirements for wholesome water using the raw water quality projections provided by SSW.	- Any activities to improve or augment existing treatment capability unless explicitly required and stated in the scheme description.
Distribution	- All distribution infrastructure to convey water into supply through the existing supply network. - Existing network reinforcements or upgrades to enable scheme to effectively supply water to customers or otherwise meet the intention of the scheme.	- Capital maintenance of existing apparatus to recover operational capability back to original design rating unless explicitly required and stated in the scheme description.
Power	- Notional connection to the power grid. Provision of kiosk, meter and transformer units as appropriate.	- Upgrades to the power grid or power production facilities.
Land	- Land purchase - Compensation for land sterilisation.	- Activities to render the land usable for the purpose of the scheme, such as de-vegetation or remediation of contaminated ground.

Opex Envelope

The estimation of operational activities required by the scheme is a direct function of the capital works that are implemented and an outline understanding of the SSW distribution methodology. All operational costs associated with the new assets arising from the proposed capital works are included. Table 2-7 demonstrates the envelope.

Table 2-7 Opex Envelope by Main Category

Main Category	Envelope Inclusions	Envelope Exclusions
Raw Water	- New abstraction pumping from surface water or groundwater sources. - Additional abstraction from existing groundwater sources where explicitly stated in the scheme description.	- Mechanisms and costs incurred by third parties to provide raw water.
Treatment	- All new treatment processes that are proposed.	- Increased opex of existing processes. - Consequential impacts such as booster chlorination throughout the network. - Opex changes as a result of changing the predominant water source for an area or offsetting water production from one site to another.
Distribution	- Transfer pumping from new or upgraded apparatus.	- Changes in existing asset efficiency as a result of operating transfer pumps in different manners. - Increase to opex as a result of operating existing assets for longer durations.
Power	- None. Included within other Main Category items.	- Any power related opex other than electricity charges. For example capital renewal of power apparatus.
Land	- None	- Ongoing lease or rental agreements with landowners.

Baseline

SSW are preparing a baseline scenario representative of their current asset operating costs. It is important to maintain transparency regarding the operating costs being applied to the proposed scheme to ensure that there are no overlaps or duplication of operating cost provision.

It is not possible to specify a single methodology to approach to combining of baseline and proposed scenarios and this needs to be established on a scheme by scheme basis. The Pricing Workbook provides an estimation of the opex costs associated with the new apparatus that is being installed as part of each scheme. However the Pricing Workbook is not intelligent enough to recognise if these costs are in addition to, in substitution to, or of no consequence to the baseline scenario which SSW are developing. This level of judgement requires an understanding of both the baseline scenario parameters and the proposed scheme parameters.

Two example schemes and how proposed and baseline opex should be integrated are demonstrated below in Tables 2–8 and 2–9. These examples show how it is critically important to understand the context of the proposed scheme and the way in which the baseline scenario opex has been derived.

Table 2-8 Approach to Baseline Opex - Example 1

Example 1: A scheme to increase an existing borehole output from 5Ml/d to 7Ml/d.			
Opex Type	**a. Entirely new borehole on alternative site for total 7Ml/d**	**b. Entirely new borehole on alternative site for additional 2Ml/d**	**b. New borehole pumps within existing borehole to give 7Ml/d output.**
Fixed Opex (£)	Replaces baseline opex	Addition to baseline opex	Baseline is unchanged.
Capital Renewal (£)	Replaces baseline opex	Addition to baseline opex	Replaces baseline opex for pump renewal. All other capital renewal opex remains unchanged.
Energy Usage (kWh/Ml)	Replaces baseline opex	Addition to baseline opex	Replaces baseline opex
Chemical Usage (£k/Ml)	Replaces baseline opex	Addition to baseline opex	Replaces baseline opex
Other Opex (£k/Ml)	None	None	None

Table 2-9 Approach to Baseline Opex - Example 2

Example 2: A scheme to increase treatment output from 15Ml/d to 20Ml/d.			
Opex Type	**a. Entirely new treatment works for 20Ml/d**	**b. Minor improvements e.g increase size of contact tank only**	**c. Transfer partial flow by gravity to a treatment site with spare capacity**
Fixed Opex (£)	Replaces baseline opex	Addition to baseline opex	Baseline is unchanged
Capital Renewal (£)	Replaces baseline opex	Replaces baseline opex for contact tank increase. All other capital renewal opex remains unchanged.	Baseline is unchanged
Energy Usage (kWh/Ml)	Replaces baseline opex	Baseline is unchanged	Baseline is unchanged
Chemical Usage (£k/Ml)	Replaces baseline opex	Baseline is unchanged	Baseline is unchanged
Other Opex (£k/Ml)	None	None	None

3. DMF Input Data

3.1. DMF Inputs

The DMF tool requires certain pricing information to be estimated for each scheme. Within the 'Totex' tab of the DMF tool, these are broadly grouped as follows:

- Capital investment
- Asset Life
- Capital Renewals
- Operating Costs

Capital Investment

The total construction period field is completed based on the delivery spend profile as described in Section 2.2. All schemes have either a 5 or 10 year delivery period.

The construction phase expenditure fields have been populated in accordance with the spend profile described in Section 2.2.

It should be noted that the scheme total costs have been input to these fields and costs are not restricted to only the construction period spend.

Low, medium and high estimates of construction spend have been derived using varying levels of confidence tolerance as demonstrated in Table 3-1.

Table 3-1 Confidence Ranges (Capital Investment Costs)

Estimate	Range Definition
Low Estimate	Mid estimate costs minus 47%
Mid Estimate	The raw cost of assets plus design fee and oncost
Max Estimate	Mid estimate costs plus 59%

Asset Life

The overall asset life of the project has been calculated using the costs proportion of components within each asset life category, assigned as described in Section 2.1. These proportions have been used to derive the asset life of the scheme.

Example: A scheme comprising 70% cost proportion for pipelines and 30% cost proportion for pumping station:

Components	Scheme Price %	Asset Life Category	Asset Life (yrs)	Combined Asset Life*
Pipeline	70 %	100% Pipeline	100	79
Pumping Station	30 %	35% Civils assets and Buildings	40	
		65% Mechanical and Electrical	25	

* - The combined asset life is estimated as follows:

$$Combined\ Asset\ Life\ [Yrs] = \left(\frac{70}{100}\times\frac{100}{100}\times 100\right) + \left(\frac{30}{100}\times\frac{35}{100}\times 40\right) + \left(\frac{30}{100}\times\frac{65}{100}\times 25\right)$$

$$Combined\ Asset\ Life\ [Yrs] = 79\ Yrs$$

It is not clear how the asset life field is utilised by the DMF tool. It is highlighted that the scheme asset life should be considered a function of the capital renewal frequency meaning there is an argument for maintaining a constant asset life for all schemes at the design horizon of 100 years subject to the prescribed rates of capital renewal being implemented.

Capital Renewals

The derivation of capital renewal costs is described in Section 2.3. These were applied into the DMF inpuot sheet without confidence ranges assigned and only the Mid estimate was input.

Low, medium and high estimates of operating costs have been derived using varying levels of confidence tolerance as demonstrated in Table 3-2.

Table 3-2 Confidence Ranges (Capital Renewal Costs)

Estimate	Range Definition
Low Estimate	Not required
Mid Estimate	The calculated or inferred value
Max Estimate	Not required

Operating Costs

The DMF provides separate fields for fixed and variable operating costs. Variable operating costs are further sub divided into costs attributed to energy, chemical and other factors. The derivation of these operating costs is described in Section 2.3.

Low, medium and high estimates of operating costs have been derived using varying levels of confidence tolerance as demonstrated in Table 3-3.

Table 3-3 Confidence Ranges (Operating Costs)

Estimate	Range Definition
Low Estimate	Mid estimate costs minus 20%
Mid Estimate	The calculated or inferred value
Max Estimate	Mid estimate costs plus 20%

3.2. Integrating with Baseline Scenario

As described in Section 2.5 it is critically important to understand the baseline scenario that is being input to the DMF tool and the implications of the outputs of the Pricing Workbook in terms of how the opex parameters for each scheme should be represented in the DMF tool.

It is strongly advised that the DMF opex input data is reviewed again at a component level once the baseline scenario has been derived to prevent any misrepresentation of proposed costs.

Appendices

Appendix A. Asset Life Categorisation

Raw Water Component	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
River Intake	-	100	-	-
Intake Pumping Station (all sizes)	-	25	75	-
New Borehole drilling	100*	-	-	-
Borehole Pumps	-	-	100	-
Headworks	-	-	100	-
Refurbish existing borehole	100*	-	100	-
Abandon existing borehole	100*	-	-	-
Borehole Building	-	100	-	-
Raw water pipeline	100	-	-	-
Pumping Stations	-	35	65	-
Small Pumping station peripheries	-	-	100	-
Large pumping station peripheries	-	25	75	-

Treatment Component	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
Chemical dosing	-	10	90	-
Contact Tank	-	90	10	-
UV disinfection	-	60	40	-
Pressure Filtration	-	60	40	-
Clarification	-	90	10	-
Nitrate Plant	-	60	40	-
Rapid Gravity Filter	-	90	10	-
GAC Adsorption	-	90	10	-
Polymer dosing	-	40	60	-
Centrifuge	-	90	10	-
Sludge Holding	-	60	40	-
Surge Vessels	10	10	80	-

General and Distribution Components	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
Potable water pipeline	100	-	-	-
Pumping Stations	-	35	65	-
Small Pumping station peripheries	-	-	100	-
Large pumping station peripheries	-	25	75	-

Land Components	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
Land for new borehole	-	-	100	-
Land for new treatment works	-	-	100	-
Land for new storage lagoon	-	100	-	-
Linear land compensation	100	-	-	-

Power Components	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
Power Supplies (all sizes)	-	-	100	-

Dams/Reservoir Components	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
Dams / Reservoirs	-	-	-	100

Other Components	Pipeline (%)	Civils assets and Buildings (%)	Mechanical and Electrical (%)	Dams and Reservoirs (%)
Any scheme specific items included in ‘Other’ costs	Set by item	Set by item	Set by item	Set by item

Appendix B. Basic Prices

REMOVED FROM PUBLIC DOMAIN VERSION

Appendix C. Spend Profiles

Spend Profile	Description
Profile A:	5 year spend profile – generic Generic one AMP scheme comprising feasibility, outline and detailed design carried out within the first two years, followed by construction spend across the remainder of the AMP.
Profile B:	10 year spend profile – generic Generic two AMP scheme typically comprising of only design and planning activities in the first AMP following by construction in the second AMP. Used for all schemes considered undeliverable within a 1 AMP timescale.
Profile C:	10 year spend profile – complex scheme Used for major new water treatment works schemes with a longer construction period than Profile B.
Profile D:	10 year spend profile – significant scheme Used for dams and reservoir associated schemes where proportionally low cost activities (such as planning, investigation and consultation) is required at early stages before design can commence.
Profile E:	5 year spend profile – expedited complex scheme Scheme which would be expected to be within Profile B-D but can be expedited due to known existing information or prior design knowledge. Typically used for schemes involving increasing outputs at borehole sites.

Year	Profile A % of Capex	Profile B % of Capex	Profile C % of Capex	Profile D % of Capex	Profile E % of Capex
1	5 %	2 %	1 %	1 %	10 %
2	10 %	3 %	2 %	1 %	15 %
3	20 %	5 %	3 %	3 %	25 %
4	30 %	5 %	4 %	5 %	25 %
5	35 %	5 %	5 %	7 %	25 %
6	-	5 %	10 %	8 %	-
7	-	10 %	10 %	15 %	-
8	-	15 %	20 %	20 %	-
9	-	25 %	25 %	20 %	-
10	-	25 %	20 %	20 %	-

Appendix D. Operating Cost Parameters

REMOVED FROM PUBLIC DOMAIN VERSION

Appendix E. Chemical Usage Cost

REMOVED FROM PUBLIC DOMAIN VERSION

Appendix F. Treatment Process Electrical Usage Estimation

F.1. Fixed Rated Component

Component	kW Rating per Qty
0-500kW Intake Pumping	500
501-1000kW Intake Pumping	1000
Small PS Peripheries	3
Large PS Peripheries	5
Chemical dosing	2
Contact tank	5
Clarification	5
Polymer dosing	2
Centrifuge	3
Sludge Holding	2
Surge Vessel	1

F.2. Variable Rated Components

Component	kW Rating per Ml
UV disinfection	4
Pressure filtration	20
Nitrate Plant	70
RGF	10
GAC - RGF type	10
Interstage Pumping – excluded	0

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