

# Appendix 8.11.A – Chandler KBS report on P removal programme cost

Wessex Water

September 2018

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# CHANDLERKBS

Cost Assuredness Report  
PR19 Phosphorus Removal Estimates  
Wessex Water  
July 2018



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## Executive Summary

ChandlerKBS was commissioned by Wessex Water (WW) to provide independent assurance on the costing methodology used to price its Phosphorus (P) removal programme, which forms part of the PR19 business plan.

We are satisfied that the methodology adopted by WW in the costing of the phosphorus removal programme is robust and that the results are representative.

The P-removal programme consists of 63 projects in total.

WW prepared 27 estimates based on first principles, 5 of which were benchmarked by ChandlerKBS. As the estimates are based on early stage design solutions, we acknowledge that there may be several contributing factors which may affect the out-turn cost of each project. Although the differences in estimates for individual projects fluctuated, the variance of the overall total of the sample assessed was under 5%. This comparison provides a sufficient level of confidence in the overall programme.

The remaining 36 projects were estimated based on cost curves. Given the scope, scale and type of schemes within the whole P-removal programme, we consider that the use of cost curves is an appropriate and acceptable approach. Having reviewed the methodology, we are satisfied that the cost curves have been accurately modelled from a reliable data source derived from PR19 estimates based on first principles along with recent historical project outturn costs from AMP5 and target costs from AMP6. The resulting scheme estimates are therefore robust and representative when taken at a programme level.

## 1. Introduction

ChandlerKBS was commissioned by WW to provide an independent assurance on the costing methodology used to price its P-removal programme, which forms part of the PR19 business plan.

Part of the commission is to provide a summary table which compares the WW in-house estimates with ChandlerKBS's benchmark estimates.

The purpose of this report is to outline the methodology of the exercise and to explain the rationale behind the assurance statement.

ChandlerKBS has over 25-years' experience within the utilities sector providing cost and project management services. We work with various utility companies and regulators in providing estimating, cost management and benchmarking services across the UK. We work with utility companies and assist in preparing regulatory business plan submissions. We have access to final actual project cost data and we maintain an in-house unit cost estimating database which is populated with costs sourced from a number of water companies.

## 2. Methodology

The total number of planned P-removal projects is 63. WW's Engineering and Construction (E&C) team prepared detailed in-house estimates for 27 of those projects. The remaining 36 projects were priced by WW's Asset and Compliance (A&C) team based on models compiled from historical projects costs (from AMP5 and AMP6) and the results from the E&C estimates.

For the purposes of the assurance process, we have classified or listed the projects as follows:

Group		Nr
1	Estimates prepared by WW (E&C) and independently by ChandlerKBS	5
2	Estimates prepared by WW (E&C)	22
3	Estimated prepared by WW (A&C)	36
	Total	63

### Group 1

5 project estimates were previously prepared by ChandlerKBS. At that point in time, ChandlerKBS did not have visibility of any internal estimates prepared by the E&C team.

The 5 treatment sites were as follows:

- Broadway
- Cerne Abbas
- Holdenhurst
- Palmesford
- Templecombe

The ChandlerKBS team that prepared the estimates has extensive experience in working in the water industry and have been involved in the preparation of cost estimates for previous and current business plan submissions for various water companies. The team members are all highly experienced in working with unit cost models, both in their compilation and utilisation.

ChandlerKBS utilised its in-house database of water industry construction costs to build up the estimates based on designs and schedules of work provided by WW.

As the data points are largely based on project outturn costs, we consider that much of the risk is contained within the model rates. We have also included an allowance for contractor's risk in each estimate. We are therefore confident that the design and development risk is adequately covered in our estimates.

The cost models conform to the Ofwat guidelines in that the data points are all from projects undertaken within the last 10 years. This ensures that exposure to distortion by indexation of very old data or obsolete technology is mitigated.

WW's E&C team used the ChandlerKBS estimates as an independent benchmark. The actual estimates used the overall P-removal programme are those prepared by WW's E&C team.

For the purpose of this assurance exercise, WW's E&C team provided ChandlerKBS with its in-house estimates for the same 5 projects.

This assurance exercise was undertaken by Mark Thomas, Associate. Mark was not involved in the initial 5 project estimates previously prepared by ChandlerKBS.



The estimates were accompanied by supporting documents which were in the form of standardised and detailed first-principles resource build ups, which provided back-up to each cost item in WW's final estimate schedules. The build ups are consistent throughout the five projects, i.e. the source labour, plant and materials rates are the same throughout and are derived from projects delivered in AMP5 and AMP6. For a number of specialist M&E cost items, the WW costs were derived from supplier quotations.

We have not reviewed the source AMP5/6 data used to derive any of the rates.

The major cost items included in the ChandlerKBS estimates are generally in line with those included in the WW estimates but there are some exceptions. For example, a final settlement tank and a sludge storage tank were included in the ChandlerKBS estimate for Palmesford but were not included in the WW estimate and, conversely, the WW estimate contained a greater amount of additional M&E cost items.

For the initial estimating commission, WW provided ChandlerKBS with quotes for a number of asset types to incorporate into the estimates. To provide assurance that WW has not influenced the benchmarks, we have checked the proportions of the quoted costs compares to the total direct construction cost. At their highest, the quotes represented 18% of the total construction costs (Broadway) but on average they represented 4%. It is worth noting that these quotes would have been sought by ChandlerKBS via the supply chain were they not provided by WW directly. By providing the quotes directly, WW were facilitating the estimating procedure and reducing the burden to the suppliers.

We checked the difference between the overheads and profit (OH&P) percentage allocated in the ChandlerKBS estimates to that applied by WW. The ChandlerKBS allocation is 8% for both civils and M&E work, whereas WW's allocation is 8% for civils work and 10% for M&E. Both are a fair representation of the potential fees charged by contractors.

As an added level of comparison, we reviewed the M&E and Civil cost proportions for each project. These were based on the construction costs only and reported as percentage proportions. The Civils:M&E ratios in the ChandlerKBS estimates were generally in line with those in WW's estimates. These comparisons are shown on Table 2 in Section 3.

We have prepared a summary table which compares the WW estimates with the ChandlerKBS benchmark estimates. As requested by WW, the table comprised the following categories for comparison:

- Construction cost element
- 3<sup>rd</sup> party costs
- Risk allowance
- Design and project management
- Corporate overheads

The first three categories were extracted from the estimate schedules prepared by ChandlerKBS and WW.

We applied an uplift to account for design and project management costs which were in line with our report entitled “Non-Construction Cost Benchmarks” submitted to WW in May 2018. Two of the projects in the sample were greatly in excess of £2million, therefore the percentage used was 27.46% (as a proportion of the total project cost excluding corporate overhead). As three of the projects were very close to the £2m mark (under £2m before the overhead was added) we applied 37.33% (the <£2m allocation in the report) to two of the projects and £27.46% to the other project.

WW’s design and project management costs were reported in their estimate schedules.

A 4% Corporate Overhead addition was applied to both sets of estimates.

See Section 3 for the results.

### **Group 2**

During a visit to WW’s offices we were provided with evidence that the remainder of the estimates prepared by the E&C team were prepared on the same basis as the sample of 5 projects. We have had visibility of 10 of the remaining project estimates and we reviewed each project on a step by step basis to ascertain whether all estimates were prepared using the same approach. We are satisfied that this is the case.

### **Group 3**

During a second visit to WW’s offices we had visibility of the procedure followed by WW (A&C) in preparing the 36 estimates based on cost curves. The cost curves were

modelled on historical AMP5 and AMP6 project cost data (inflated using RPI) and the results from the estimates prepared by WW E&C (Group 1 and 2).

### 3. Results

Table 1: Comparison Summary (Group 1 – 5 Projects)

Cost Source (£m)	ChandlerKBS (£m)	Wessex Water (£m)	% Difference in Benchmarked Costs
Construction	36.58	36.21	1.0%
3rd Party	0.40	0.64	-38.1%
Risk	1.76	6.73	-73.9%
Design and Project Management	15.33	7.99	92.0%
Company Overhead	2.16	2.15	0.6%
TOTAL	56.22	53.72	4.7%

The difference between the overall totals of the 5 projects for both sets of estimates is less than 5%, which is easily within the accuracy range provided in the ACE table (below). However, on an individual project basis the differences are more apparent. This is to be expected due to the difference in the estimating approach. On a programme level it is expected that the differences will fluctuate between the two estimating methodologies, as has been demonstrated by the sample. See Appendix A for individual project tables.

Table 2: ACE Cost Table

Class	Level of Definition	End Usage	Accuracy Range Low	Accuracy Range High
Class 5	0% to 2%	Concept Screening	-20% to -50%	+30% to +100%
Class 4	1% to 15%	Study or Feasibility	-15% to -30%	+20% to +50%
Class 3	10% to 40%	Budget Authorisation	-10% to -20%	+10% to +30%
Class 2	30% to 70%	Bid or Tender	-5% to -15%	+5% to +20%
Class 1	50% to 100%	Check Estimate or Bid/Tender	-3% to -10%	+3% to +15%

Although the difference in the estimate for individual projects fluctuated, the variance in the overall total for the sample was less than 5%. The overall total estimate comparison was as follows:

Wessex Water	£53.72m
ChandlerKBS	£56.22m

The above comparison/benchmark provides a sufficient level of confidence.

As the estimates are based on early stage design solutions, we acknowledge that there may be several contributing factors which may affect the out-turn cost of each project.

The overall accuracy for the sample of 5 schemes is within the recommended range set out by the Association of Consultancy and Engineering (ACE) in its banding table. Due to the level of design detail available to price, ChandlerKBS considers that the estimates are in the range of Class 3 and Class 4 (therefore with a low accuracy range being -12.5% to -25% and high accuracy range being +15% to +40%).

Using the WW estimates as a basis, the expected range would be as follows:

Low Accuracy Range: £40m to £47m  
High Accuracy Range: £62m to £75m

The overall difference between the two sets of results falls easily within this range.

The ACE cost table is a widely recognised guide within the industry.

Table 3: Civils:M&E Ratio Comparison

Project	ChandlerKBS		Wessex Water	
	Civil %	M&E %	Civil %	M&E %
Broadway	33%	67%	35%	65%
Cerne Abbas	43%	57%	48%	52%
Holdenhurst	20%	80%	21%	79%
Palmesford	44%	56%	21%	79%
Templecombe	36%	64%	36%	64%

There was good correlation between the Civils to M&E ratios of four of the projects. The Palmesford project was weighted more heavily in favour of M&E in the WW estimate. The overall cost difference in the Palmesford comparison was approximately 10%, which represents circa £1.5m in cost but is easily within the ACE table's accuracy range.

#### 4. Conclusion

We are satisfied that the methodology adopted by WW in the costing of the P-removal programme is robust and representative

With regard to Group 1 and 2, having had visibility of 15 project build ups in total out of a total of 27, our coverage of the estimates prepared by the WW's E&C is circa 55%. We consider that the sample is both of a sufficient size and representative. Based on the information available, we are therefore satisfied that the methodology and results for the projects in these groups are robust and representative. Group 1 and 2 represents circa 43% of the total number of P removal projects.

The estimated project costs in Group 3, prepared by the WW's A&C team, were based on cost curves which were modelled on the costs of historical projects from AMP5 and AMP6 and on the estimates from Groups 1 and 2. We had visibility of the cost curves, and we are satisfied that the procedure followed by WW was acceptable. The data points were not widely scattered, and the resulting cost curves were well defined.



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## **Appendix A**

### **Project Comparison Summaries**

### Summary Table

Cost Source	ChandlerKBS (£m)	Wessex Water (£m)	% Difference in Benchmarked Costs
Construction	36.58	36.21	1.0%
3rd Party	0.40	0.64	-38.1%
Risk	1.76	6.73	-73.9%
Design and Project Management	15.33	7.99	92.0%
Company Overhead	2.16	2.15	0.6%
TOTAL	56.22	53.72	4.7%

## Broadway

Cost Source	ChandlerKBS	Wessex Water	% Difference in Benchmarked Costs
	(£m)	(£m)	
Construction	1.59	2.02	-21.1%
3rd Party	0.06	0.09	-34.8%
Risk	0.05	0.42	-88.1%
Design and Project Management	0.64	0.68	-4.8%
Company Overhead	0.09	0.13	-29.7%
TOTAL	2.43	3.33	-26.9%



## Cerne Abbas

Cost Source	ChandlerKBS	Wessex Water	% Difference in Benchmarked Costs
	(£m)	(£m)	
Construction	1.48	1.44	2.3%
3rd Party	0.04	0.07	-36.5%
Risk	0.05	0.30	-84.8%
Design and Project Management	0.93	0.48	92.6%
Company Overhead	0.10	0.10	4.5%
TOTAL	2.60	2.39	8.7%

## Holdenhurst

Cost Source	ChandlerKBS (£m)	Wessex Water (£m)	% Difference in Benchmarked Costs
Construction	22.16	21.81	1.6%
3rd Party	0.16	0.23	-29.9%
Risk	1.12	3.96	-71.8%
Design and Project Management	8.87	4.36	103.4%
Company Overhead	1.29	1.27	2.2%
TOTAL	33.60	31.63	6.2%

## Palmesford

Cost Source	ChandlerKBS	Wessex Water	% Difference in Benchmarked Costs
	(£m)	(£m)	
Construction	9.93	8.90	11.6%
3rd Party	0.09	0.17	-47.5%
Risk	0.50	1.63	-69.2%
Design and Project Management	3.98	1.78	123.7%
Company Overhead	0.58	0.52	11.6%
TOTAL	15.08	12.99	16.1%

## Templecombe

Cost Source	ChandlerKBS	Wessex Water	% Difference in Benchmarked Costs
	(£m)	(£m)	
Construction	1.42	2.04	-30.6%
3rd Party	0.05	0.09	-46.3%
Risk	0.04	0.42	-89.6%
Design and Project Management	0.90	0.68	31.5%
Company Overhead	0.10	0.14	-28.6%
TOTAL	2.51	3.38	-25.8%



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