



NWG – PR24 Reservoir Safety

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Northumbrian Water Group

Version control

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1 Executive Summary

Overall review of the project's performance criteria

Following the submission of PR24 Business Plans in October 2023 by the Water Companies, Ofwat return their Draft Determinations on the 11th of July 2023. The key observation of Ofwat from the NWG submission, is that the 3rd Party Assurance is insufficient and therefore adjusted in the Draft Determination in connection with this.

The reservoir safety programme is an area of concern given the difficulty to establish a defined scope of works prior to the Section 10 reports being produced. The scope of work can significantly vary, and there is often a large amount of temporary works to enable the required interventions.

NWG have requested a proposal from Aqua Consultants to undertake a cost assurance exercise to demonstrate NWG's position in terms of Cost Efficiency

We will benchmark each scheme individually providing a benchmark range for that scope of works. The findings of each will be pulled together into a single finding report and provide an expected cost envelope for the scheme.

1.1 Key Objectives

Key objectives are:

We have been provided with the iMOD estimates of 9 Reservoir Drawdown schemes within this programme. The scope of works is identified within the costings.

Due to timescales our proposed approach is to limit the scope of the activity to conducting a like-for like CAPEX benchmark against the scope of the nine projects included within the programme.

These schemes are:

- Cow Green
- Derwent
- East Hallington
- Fontburn

- Hury
- Lockwood Beck
- Scaling Dam
- Waskerley
- Whittle Dean Great Southern

1.2 Project Schedule

Project Timeline

We have acknowledged that whilst the final numbers will not change for NWG’s Draft Determination Response wording will need to be signed off by the board. This findings report may support NWG’s Investment case and therefore needs to be completed to allow this to be incorporated. We have developed the programme below, which we believe will allow this.

Programme



2 Methodology

2.1 Approach

Many of the Water Companies carry out high-level costing using cost models, especially at preliminary stages of a project or business planning. Cost models are developed from captured actual costs on historical projects, which has been assigned to process groups,

assets, and components. These are then plotted against an appropriate yardstick measure for that item of work, which will dictate the size of the work or asset, to find a trendline formula. This formula is then used to cost future work.

We have generated individual data sets, using historical cost data we have collected across the UK water industry, to allow us to cost the scope and provide three benchmark costs. This exercise gives us an industry comparison for the scoped work and gives us an insight into the cost efficiency of NWG costed PR24 Plan.

There is no governing influence on how Water Companies should capture and use their cost data and as a result different approaches have been witnessed to generate cost models. The key difference is how water companies capture Construction Indirect Costs (Preliminary/General Items etc). Some companies have taken the approach splitting costs into the following:

- Direct Works Cost
- Indirect Works Costs
- Project Oncosts

However, some water companies have taken the approach of splitting costs to:

- Construction Costs
- Project Oncosts

With either approach taken, effectively the same costs are captured. How this data is used can affect the end outcome.

We adopt the first example approach, as we believe that this enables us to model the Indirect and Project costs by the size of the project, though models based on the Direct Works cost. NWG also adopt this approach in their costing methodology. We have back dated our benchmark costs to align with the base date required for PR24 submissions.

2.2 Estimating Uncertainty

We have excluded the Estimating Uncertainty allowance from our benchmarking exercise as this was derived by Northumbrian Water prior to commencement of PR24 Business Plan costing. We envisage this to be the same as the Optimism Bias approach adopted by other Water Companies during PR24 Costing.

The HM Treasury Green Book looks at Optimism Bias for Project Estimates. This document provides Recommended Adjustment Ranges, with the aim to reduce the Optimisation Bias % through steps taken to address contributory factors.

The projects undertaken by Northumbrian Water fit within either two Project Types, Standard or Non-standard Civil Engineering. The Optimism Bias ranges are given in the table below.

Project Type	Optimism Bias (%)	
	Capital Expenditure	
	Upper	Lower
Standard Civil Engineering	44	3
Non-standard Civil Engineering	66	6

Table 1 – Northumbrian Water Project Types

The expectation is that as projects develop and more information is known the Optimism Bias is reduced. The schemes that are included in PR24 are at preliminary stages, so Optimism Bias would be higher in the range. However, we would expect competent Water Companies to aim to reduce this with good cost intelligence. The Optimism Bias Range compared to Northumbrian Water’s 30% Estimating Uncertainty, suggests that they have aimed to reduce uncertainty, and they have a satisfactory level of cost confidence.

3 Benchmarking

3.1 Benchmark Summary

Table 2 summarises the benchmarks generated for the 9 No. Reservoir Drawdown sites. Overall, the NWL outputs are within the benchmark envelope. The cost delta across the range of costs is consistent giving a satisfactory level of cost assurance.

Benchmark Summary

Target Cost Comparison		Target Price		Benchmark		
Assets	Target Cost		Low	Mean	High	
Cow Green	£ 7,995,258.23		£ 4,777,681.68	£ 6,826,452.09	£ 8,380,186.29	
Derwent	£ 9,906,387.73		£ 7,258,983.73	£ 9,510,765.37	£ 11,110,551.22	
East Hallington	£ 9,488,782.58		£ 7,907,797.99	£ 9,505,641.97	£ 10,607,985.98	
Fontburn	£ 7,622,280.83		£ 5,214,288.17	£ 6,996,839.55	£ 8,057,146.77	
Hury	£ 8,244,311.94		£ 6,823,501.54	£ 8,213,226.42	£ 9,142,235.46	
Lockwood	£ 7,541,326.04		£ 6,046,097.01	£ 7,348,218.30	£ 8,182,025.05	
Scaling Dam	£ 7,449,373.71		£ 5,820,807.75	£ 7,118,058.77	£ 7,990,688.56	
Waskerley	£ 8,408,516.81		£ 7,827,520.19	£ 8,706,106.15	£ 9,347,830.29	
Whittle Dene Great Southern	£ 9,488,782.58		£ 8,416,995.71	£ 9,615,749.76	£ 10,535,771.11	
Target Cost Total	£ 76,145,020.45		£ 60,093,673.77	£ 73,841,058.37	£ 83,354,420.72	
Project & Contract Overheads incl Risk	£ -	0.00%	£ -	£ 4,446.83	£ 13,340.49	
Total Project Cost	£ 76,145,020.45		£ 60,093,673.77	£ 73,845,505.20	£ 83,367,761.21	

£ 76,145,020.45

% from benchmark low	% from benchmark mean	% from benchmark high
26.71%	3.11%	-8.66%
1st Quartile	Benchmark variance	3rd Quartile
£66,969,589.48	38.73%	£78,606,633.20

Table 2 – Summary of Target Price vs Benchmark Range Comparison

3.2 Cost Envelope

Combining the values results in an overview cost envelope shown in figure 1.



Figure 1 – Cost Envelope using Total project Costs.

3.3 Cow Green

Benchmark Summary

Benchmark Summary

Target Cost Comparison		Target Price		Benchmark		
Assets	Target Cost			Low	Mean	High
Water Network Booster or Pumping Station	£196,273.29			£ 218,304.84	£ 336,699.00	£ 503,788.83
Pipework	£2,294,023.75			£ 1,768,685.25	£ 1,915,138.96	£ 2,024,000.89
Site Specifics	£753,211.78			£ 621,214.80	£ 805,809.82	£ 1,116,945.04
Chambers	£326,179.62			£ 122,546.34	£ 384,923.02	£ 526,701.87
MISC	£641,696.88			£ 641,696.88	£ 641,696.88	£ 641,696.88
DIRECT COSTS	£ 4,211,385.32					
Target Cost Total	£ 4,211,385.32			£ 3,372,448.11	£ 4,084,267.67	£ 4,813,133.51
Project & Contract Overheads incl Risk	£ 3,783,872.91	89.85%		£ 1,405,233.57	£ 2,742,184.42	£ 3,567,052.78
Total Project Cost	£ 7,995,258.23			£ 4,777,681.68	£ 6,826,452.09	£ 8,380,186.29
	£ 7,995,258.23					
				% from benchmark low	% from benchmark mean	% from benchmark high
				67.35%	17.12%	-4.59%
				Lower quartile	Benchmark variance	Upper quartile
				£5,802,066.89	75.40%	£7,603,319.19

Table 3 – Cow Green Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 2 – Cost Envelope using Total Project Costs.

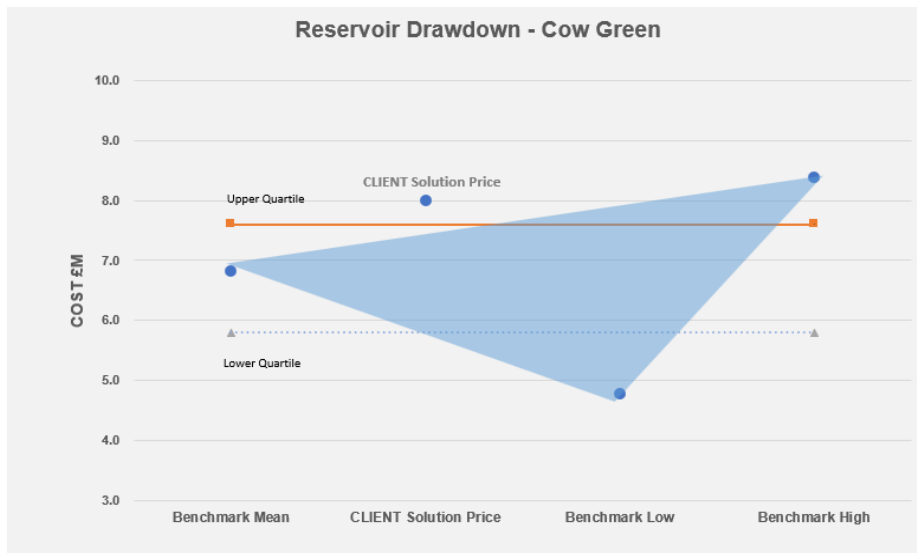


Figure 2 – Cost Envelope using Total project Costs.

3.4 Derwent

Benchmark Summary

Benchmark Summary

Target Cost Comparison		Target Price		Benchmark		
Assets	Target Cost			Low	Mean	High
Water Network Booster or Pumping Station	£ 196,273.28			£ 314,588.98	£ 396,227.73	£ 505,251.02
Pipework	£ 1,156,374.52			£ 954,167.59	£ 1,109,404.66	£ 1,356,915.00
Chambers	£ 280,518.71			£ 159,382.39	£ 189,296.03	£ 205,809.51
Site Specifics	£ 46,877.46			£ 19,464.84	£ 45,196.25	£ 62,490.01
MISC	£ 3,723,500.44			£ 3,723,500.44	£ 3,723,500.44	£ 3,723,500.44
DIRECT COSTS	£ 5,403,544.41					
Target Cost Total	£ 5,403,544.41			£ 5,171,104.24	£ 5,463,625.11	£ 5,853,965.98
Project & Construction Overheads Incl Risk	£ 4,502,843.32	83.33%		£ 2,087,879.49	£ 4,047,140.26	£ 5,256,585.24
Total Project Cost	£ 9,906,387.73			£ 7,258,983.73	£ 9,510,765.37	£ 11,110,551.22
	£ 9,906,387.73					
				% from benchmark low	% from benchmark mean	% from benchmark high
				36.47%	4.16%	-10.84%
				1st Quartile	Benchmark variance	3rd Quartile
				£8,384,874.55	53.06%	£10,310,658.29

Table 4 – Derwent Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 3 – Cost Envelope using Total Project Costs.

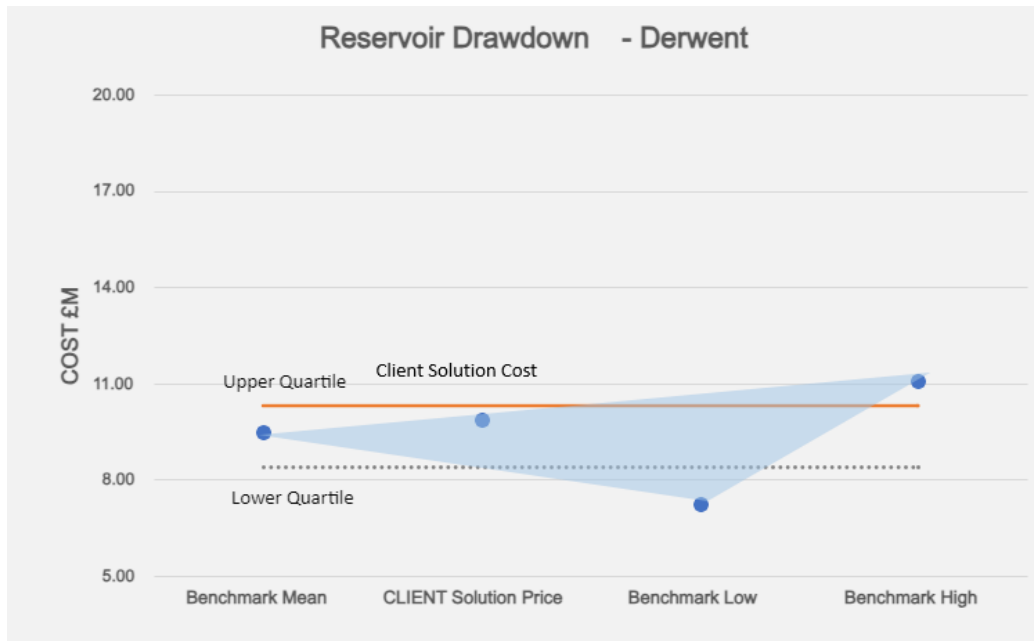


Figure 3 – Cost Envelope using Total project Costs.

3.5 East Hallington

Benchmark Summary

Benchmark Summary

Target Cost Comparison		Target Price		Benchmark		
Assets	Target Cost		Low	Mean	High	
Water Network Booster or Pumping Station	£ 165,477.49		£ 214,718.86	£ 228,369.53	£ 250,267.66	
Pipework	£ 18,387.84		£ 8,458.08	£ 11,105.43	£ 15,687.80	
SITE SPECIFICS	£ 6,457.38		£ 9,429.86	£ 13,327.33	£ 17,824.19	
MISC	£ 4,950,849.09		£ 4,950,849.09	£ 4,950,849.09	£ 4,950,849.09	
DIRECT COSTS	£ 5,141,171.80					
Target Cost Total	£ 5,141,171.80		£ 5,183,455.89	£ 5,203,651.38	£ 5,234,628.74	
Project & Contract Overheads incl Risk	£ 4,347,610.78	84.56%	£ 2,724,342.10	£ 4,301,990.59	£ 5,373,357.24	
Total Project Cost	£ 9,488,782.58		£ 7,907,797.99	£ 9,505,641.97	£ 10,607,985.98	

£ 9,488,782.58

% from benchmark	% from benchmark	% from benchmark
low	mean	high
19.99%	-0.18%	-10.55%
1st Quartile	Benchmark variance	3rd Quartile
£8,706,719.98	34.15%	£10,056,813.98

Table 5 –East Hallington Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 4 – Cost Envelope using Total Project Costs.

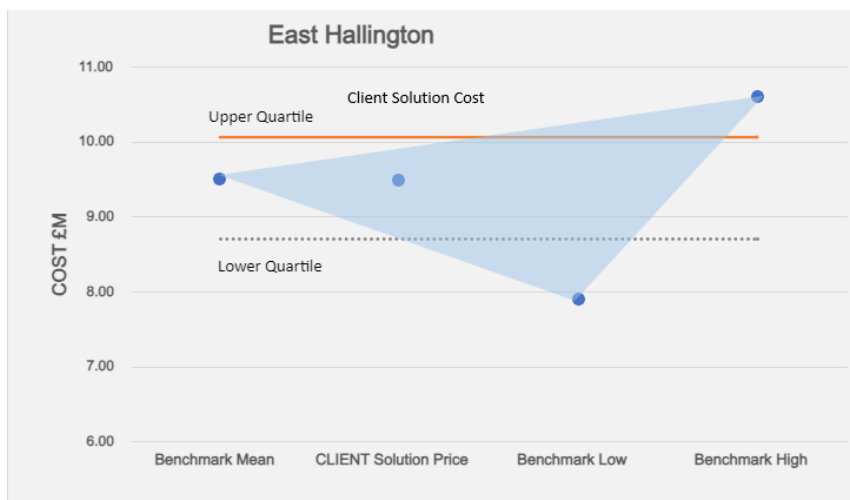


Figure 4 – Cost Envelope using Total project Costs.

3.6 Fontburn

Benchmark Summary

Benchmark Summary

Target Cost Comparison		Target Price		Benchmark		
Assets	Target Cost			Low	Mean	High
Water Network Booster or Pumping Station	£ 190,322.71			£ 112,773.21	£ 167,461.57	£ 265,372.11
Pipework	£ 646,576.70			£ 527,467.75	£ 580,578.16	£ 654,465.18
Chambers	£ 80,557.60			£ 50,367.60	£ 92,134.71	£ 116,385.26
Site specifics	£ 387,760.36			£ 318,122.28	£ 476,284.74	£ 574,267.13
MISC	£ 2,676,383.49			£ 2,676,383.49	£ 2,676,383.49	£ 2,676,383.49
Direct Costs	£ 3,981,600.86					
Target Cost Total	£ 3,981,600.86			£ 3,685,114.31	£ 3,992,842.68	£ 4,286,873.17
Project & Contract Overheads incl Risk	£ 3,640,679.97		91.44%	£ 1,529,173.86	£ 3,003,996.87	£ 3,770,273.60
Total Project Cost	£ 7,622,280.83			£ 5,214,288.17	£ 6,996,839.55	£ 8,057,146.77
		£ 7,622,280.83				
				% from benchmark low 46.18%	% from benchmark mean 8.94%	% from benchmark high -5.40%
				1st Quartile £6,105,563.86	Benchmark variance 54.52%	3rd Quartile £7,526,993.16

Table 6 –Fontburn Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 5 – Cost Envelope using Total Project Costs.



Figure 5 – Cost Envelope using Total project Costs.

3.7 Hury

Benchmark Summary

Benchmark Summary

Target Cost Comparison

Assets	Target Price		Benchmark		
	Target Cost		Low	Mean	High
Water Network Booster or Pumping Station	£ 182,350.30		£ 112,773.21	£ 167,461.57	£ 265,372.11
Pipework	£ 435,539.53		£ 582,381.14	£ 597,448.53	£ 611,433.16
Chambers	£ 100,292.04		£ 60,744.80	£ 116,816.84	£ 146,903.54
MISC	£ 3,647,221.82		£ 3,647,221.82	£ 3,647,221.82	£ 3,647,221.82
CONTINGENCY: SITE SPECIFICS					
Target Cost Total	£ 4,365,403.69		£ 4,403,120.97	£ 4,528,948.77	£ 4,670,930.64
Project & Contract Overheads incl Risk	£ 3,878,908.25	88.86%	£ 2,420,380.57	£ 3,684,277.65	£ 4,471,304.83
Total Project Cost	£ 8,244,311.94		£ 6,823,501.54	£ 8,213,226.42	£ 9,142,235.46

£ 8,244,311.94

% from benchmark low	% from benchmark mean	% from benchmark high
20.82%	0.38%	-9.82%
1st Quartile	Benchmark variance	3rd Quartile
£7,518,363.98	33.98%	£8,677,730.94

Table 7 –Hury Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 6 – Cost Envelope using Total Project Costs.



Figure 6 – Cost Envelope using Total project Costs.

3.8 Lockwood Beck

Benchmark Summary

Benchmark Summary

Target Cost Comparison

Assets	Target Price		Benchmark		
	Target Cost		Low	Mean	High
Pipework	£ 36,221.67		£ 82,363.91	£ 98,363.83	£ 128,819.99
Chambers	£ 100,292.04		£ 60,744.80	£ 116,816.84	£ 146,903.54
Outfall structure	£ 7,626.78		£ 3,065.89	£ 9,445.61	£ 18,441.97
Kiosks	£ 8,801.23		£ 9,017.88	£ 16,063.11	£ 19,585.72
MISC	£ 3,778,929.42		£ 3,778,929.42	£ 3,778,929.42	£ 3,778,929.42
Direct Costs	£ 3,931,871.14				
<i>Target Cost Total</i>	£ 3,931,871.14		£ 3,934,121.90	£ 4,019,618.82	£ 4,092,680.65
<i>Project & Contract Overheads incl Risk</i>	£ 3,609,454.90	91.80%	£ 2,111,975.11	£ 3,328,599.48	£ 4,089,344.40
Total Project Cost	£ 7,541,326.04		£ 6,046,097.01	£ 7,348,218.30	£ 8,182,025.05

£ 7,541,326.04	% from benchmark low	% from benchmark mean	% from benchmark high
	24.73%	2.63%	-7.83%
	1st Quartile	Benchmark variance	3rd Quartile
	£6,697,157.65	35.33%	£7,765,121.68

Table 8 – Lockwood Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 7 – Cost Envelope using Total Project Costs.



Figure 7 – Cost Envelope using Total project Costs.

3.9 Scaling Dam

Benchmark Summary

Benchmark Summary

Target Cost Comparison		Target Price		Benchmark		
Assets	Target Cost			Low	Mean	High
Water Network Booster or Pumping Station	£ 179,446.74			£ 112,773.21	£ 167,461.57	£ 265,372.11
Pipework	£ 32,575.15			£ 65,555.45	£ 73,816.61	£ 89,467.96
Chambers	£ 80,557.60			£ 50,367.60	£ 92,134.71	£ 116,385.26
MISC	£ 3,582,870.79			£ 3,582,870.79	£ 3,582,870.79	£ 3,582,870.79
Direct Costs	£ 3,875,450.28					
<i>Target Cost Total</i>	£ 3,875,450.28			£ 3,811,567.04	£ 3,916,283.68	£ 4,054,096.12
<i>Project & Contract Overheads incl Risk</i>	£ 3,573,923.43		92.22%	£ 2,009,240.71	£ 3,201,775.08	£ 3,936,592.43
Total Project Cost	£ 7,449,373.71			£ 5,820,807.75	£ 7,118,058.77	£ 7,990,688.56
	£ 7,449,373.71					

% from benchmark low	% from benchmark mean	% from benchmark high
27.98%	4.65%	-6.77%
1st Quartile	Benchmark variance	3rd Quartile
£6,469,433.26	37.28%	£7,554,373.66

Table 9 – Scaling Dam Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 8 – Cost Envelope using Total Project Costs.

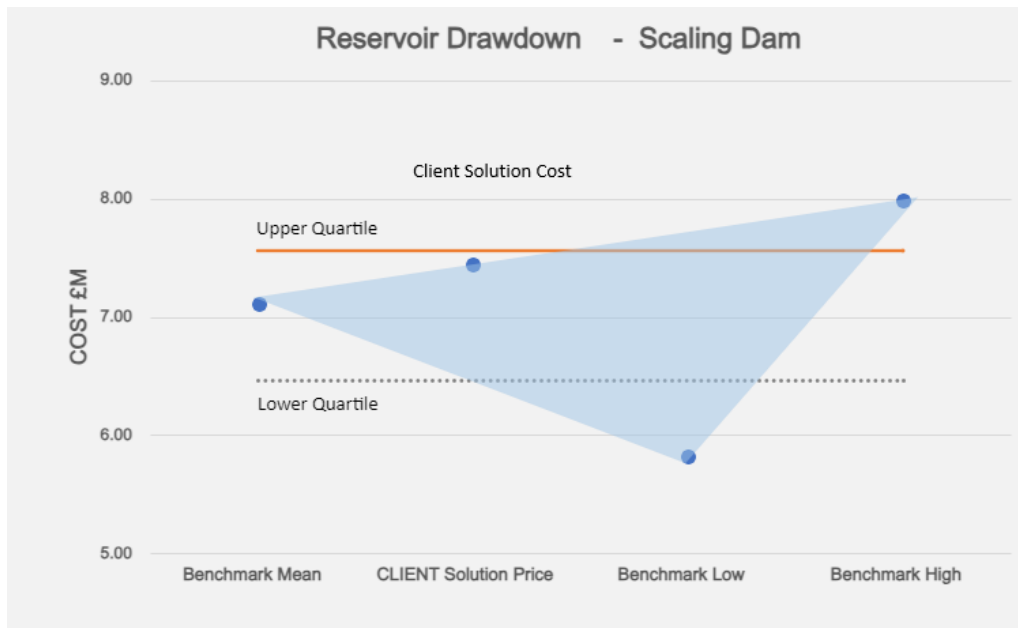


Figure 8 – Cost Envelope using Total project Costs.

3.10 Waskerley

Benchmark Summary

Benchmark Summary

Target Cost Comparison

Assets	Target Price		Benchmark		
	Target Cost		Low	Mean	High
Water Network Booster or Pumping Station	£ 182,350.30		£ 112,773.21	£ 167,461.57	£ 265,372.11
Pipework	£ 134,144.36		£ 229,335.34	£ 241,339.70	£ 259,745.75
Chambers	£ 100,292.04		£ 60,744.80	£ 116,816.84	£ 146,903.54
Site specifics	£ 277,174.77		£ 228,779.33	£ 340,719.77	£ 410,190.81
MISC	£ 3,773,229.61		£ 3,773,229.61	£ 3,773,229.61	£ 3,773,229.61
Direct Costs	£ 4,467,191.08				
Target Cost Total	£ 4,467,191.08		£ 4,404,862.28	£ 4,639,567.49	£ 4,855,441.82
Project & Contract Overheads incl. Risk	£ 3,941,325.73	88.23%	£ 3,422,657.91	£ 4,066,538.65	£ 4,492,388.46
Total Project Cost	£ 8,408,516.81		£ 7,827,520.19	£ 8,706,106.15	£ 9,347,830.29

£ 8,408,516.81

% from benchmark low	% from benchmark mean	% from benchmark high
7.42%	-3.42%	-10.05%
1st Quartile	Benchmark variance	3rd Quartile
£8,266,813.17	19.42%	£9,026,968.22

Table 10 – Waskerley Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 9 – Cost Envelope using Total Project Costs.

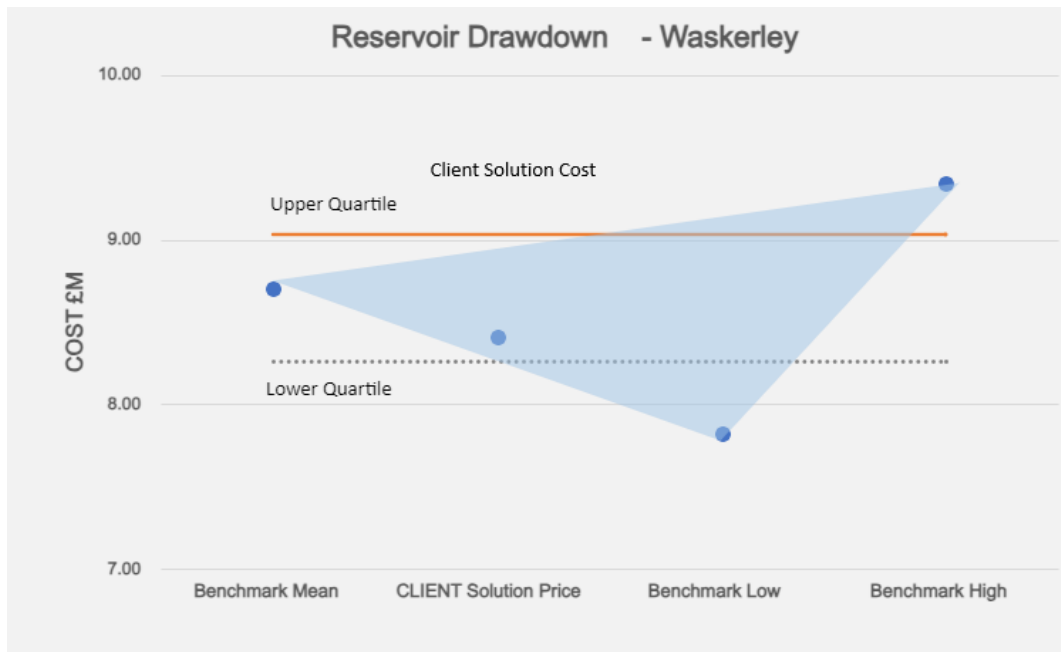


Figure 9 – Cost Envelope using Total project Costs.

3.11 Whittle Dene Great Southern

Benchmark Summary

Benchmark Summary

Target Cost Comparison

Assets	Target Price		Benchmark		
	Target Cost		Low	Mean	High
Water Network Booster or Pumping Station	£ 190,322.71		£ 180,648.91	£ 214,534.99	£ 265,372.11
MISC	£ 4,950,849.09		£ 4,950,849.09	£ 4,950,849.09	£ 4,950,849.09
Direct Costs	£ 5,141,171.80				
Target Cost Total	£ 5,141,171.80		£ 5,131,498.00	£ 5,165,384.08	£ 5,216,221.20
Project & Contract Overheads incl Risk	£ 4,347,610.78	84.56%	£ 3,285,497.71	£ 4,450,365.69	£ 5,319,549.91
Total Project Cost	£ 9,488,782.58		£ 8,416,995.71	£ 9,615,749.76	£ 10,535,771.11

£ 9,488,782.58

% from benchmark low	% from benchmark mean	% from benchmark high
12.73%	-1.32%	-9.94%
1st Quartile	Benchmark variance	3rd Quartile
£9,016,372.73	25.17%	£10,075,760.43

Table 11 – Whittle Dene Great Southern Benchmark Summary

Cost Envelope

A cost envelope has been generated from the low and high benchmarks and the NWL target price plotted against this as shown in figure 10 – Cost Envelope using Total Project Costs.



Figure 10 – Cost Envelope using Total project Costs.

4 Comments and Observations

4.1 Overheads and Risk

We have reviewed the contract and project overheads (including Risk) and what impact they have had on both an individual project level and on a programme level. We have provided examples showing the highest and lowest and then a comparison of the combined summary.

Cow green has the biggest difference, 20.34%, from the average project and contract overheads (including Risk) against NWL percentage.

Waskerley has the smallest difference, 0.08%, from the average project and contract overheads (including Risk) against NWL percentage.

The combined schemes summary shows a variance of 8.05% from the benchmark average when compared against the NWL project and contract overheads (including Risk) percentage.

4.2 Miscellaneous

Miscellaneous items have been unable to benchmark as there are no yardstick details, so for consistency we have used the same costs in our benchmarking. This presents both a risk as Ofwat is likely to strike these costs out as they are unable to provide any build up to the costs, however there may be an opportunity if there is any benchmarking evidence that can be provided in support of these items.

4.3 Final Observations

Pipework presents two different trends with smaller to medium pieces of pipe falling below the benchmark low value whilst the scheme, Cow Green, with the longest piece of pipework goes above the benchmark high value.

The schemes that are outside the cost envelope are Fontburn and Cow Green. Both schemes are above up the upper quartile. Cow green is the scheme that has the highest percentage from the benchmark mean with a value of 17.12% and the total project cost is

over the upper quartile cost of £7,603,319 with 4.59% lower than the benchmark high value. However, these total project costs are still placed in between the benchmark range.

5 Review and Feedback

The benchmark findings suggest that overall NWL costings sit close to the third quartile which suggests reasonable cost certainty at this stage.

Most of the individual project costs are within the cost envelopes, so it is suggested that it is unlikely that further efficiencies are available for these schemes.

Overall, as a package of works, the total project costs present a clear trend showing the mean variance being generally less than 5%, this is borne out when the combined summary is showing a mean of just 3.11%, which further supports cost certainty.

The Variance between the Low and high average benchmarks between 35–39%, this is slightly higher than the norm of 30% we would expect to see.