

Review and Comparison of Aamodt Capital Costs

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Introduction

In September 2006, CH2M HILL completed a review of cost estimates provided by the United States Bureau of Reclamation (USBOR) for facilities proposed as part of the Aamodt Settlement (*Aamodt Settlement Study Report*, April 2004, USBOR). CH2M HILL's review was completed to provide an independent analysis of the estimated costs, examine the engineering adequacy of the proposed project, and to update costs based on May 2006 engineering and construction costs. Full details of this review can be found in the report *Review of Technical Information on Proposed Aamodt Water Project*, September 2006, CH2M HILL.

Subsequently, HKM Engineering (HKM) was tasked by the Northern Pueblo Tributary Water Rights Association to advance the USBOR design, examine opportunities for reducing costs, and to address changes in the final settlement. This work resulted in an increase in the total capacity of the system (to reflect the final settlement amount of 4,000 ac-ft/yr) and changes to the layout of the system. HKM's capital costs were based on October 2006 planning and construction costs and presented in their April 2007 report, *Pojoaque Regional Water System Engineering Report*, April 2007, HKM.

This memorandum presents CH2M HILL's original comparison to the USBOR costs and updates and compares these costs to HKM's capital cost estimate in their April 2007 report.

CH2M HILL Comparison to USBOR Capital Costs

Table 1 below was presented in the September 2006 CH2M HILL report. The table included USBOR costs (with updates and clarifications subsequent to their 2004 report) indexed to reflect costs through May 2006. Cost estimates prepared by the USBOR and its consultants were evaluated by CH2M HILL. In general, the total costs are quite similar given the high level of planning and design completed.

These costs should be considered a "Level 4" estimate indicating about 1 to 5 percent of engineering design is complete – save for the trunk line which could be considered approximately 10 percent complete. A Level 4 design implies uncertainty that could result in overall costs at 15-30 percent less than the estimate or 20-50 percent above the estimate.

TABLE 1

Summary Cost Comparison of CH2M HILL and USBOR Estimates for Capital Construction and Engineering Costs
Aamodt Regional Water System, Alternative 2

Facility	CH2M HILL (May 2006)			USBOR (Spring 2005), Escalated ^a		
	Pueblo Only	Non-Pueblo	Combined	Pueblo Only	Non-Pueblo	Combined
Diversion	\$1,847,000	\$462,000	\$2,309,000	\$1,847,000	\$462,000	\$2,309,000
WTP	\$11,557,000	\$2,889,000	\$14,446,000	\$11,025,000	\$2,697,000	\$13,722,000
Trunk Line	\$22,629,000	\$5,657,000	\$28,286,000	\$21,886,000	\$5,471,000	\$27,357,000
Distribution ^b	\$18,599,000	\$25,026,000	\$43,625,000	\$19,925,000	\$21,083,000	\$41,008,000
Water Meters + Connections ^c	\$7,758,000	\$14,363,000	\$22,121,000	\$7,758,000	\$14,363,000	\$22,121,000
Wells ^d	\$7,560,000	\$3,024,000	\$10,584,000	\$9,192,000	\$5,325,000	\$14,517,000
Field Cost Total	\$69,950,000	\$51,421,000	\$121,371,000	\$71,633,000	\$49,401,000	\$121,034,000
Engineering Design, Construction Services, Surveying, Geotechnical, Administrative, Legal @ 30%	\$20,985,000	\$15,426,000	\$36,411,000	\$21,490,000	\$14,820,000	\$36,310,000
Total Construction Cost	\$90,935,000	\$66,847,000	\$157,782,000	\$93,123,000	\$64,221,000	\$157,344,000

^a USBOR 2005 estimate increased by 8% to reflect construction cost increases through May 2006.

^b Distribution total includes all proposed service areas. Apportionment and number of water meters not well defined.

^c Water meter cost estimate based on Aamodt Settlement report population projection for 2040 assuming 2.3 people per meter; assumes \$1,500 pipe cost per connection, plus the markup for field and contract costs resulting in \$2,268 per connection.

^d Plans for wells are not well defined. CH2M HILL assumed \$1 million per well plus piping allowance.

Note: Detailed estimates available in CH2M HILL files. Field costs include 5% for mobilization, 20% for unlisted items, and a 20% contingency.

Comparison to HKM April 2007 Capital Costs

HKM's April 2007 capital cost estimate included a number of design changes that resulted in an altered cost basis. CH2M HILL compared estimated costs for the original design completed by the USBOR to HKM's April, 2007 report to provide an independent analysis of the reasonableness of HKM's results. The following paragraphs discuss changes to the CH2M HILL costs in Table 1 made in order to provide a reasonable comparison to the HKM estimate. Table 2 presents the results of the comparison.

Increased System Capacity

The CH2M HILL comparison completed through May 2006 reflected an annual average demand of 3,200 ac-ft/yr. The Aamodt Settlement, signed in 2006, calls for a total supply of 4,000 ac-ft/yr reflected in HKM's April, 2007 report.

To compare CH2M HILL's May 2006 costs to HKM's April 2007 costs, the CH2M HILL estimate was escalated "upsized" to reflect the increased capacity. This escalation was not a rigorous engineering design upgrade, but rather the application of an economy of scale adjustment based on upsizing water systems. A factor of 1.2 was applied to each of the systems that would increase in size and costs because of the higher demand. These items included the diversion structure, water treatment plant, and trunk line. Because distribution system design was driven by fire flows, no increase was anticipated or applied.

Service Connections

CH2M HILL and HKM agreed to both the individual cost basis of service connections and the projected total number of potential connections. CH2M HILL provided HKM an estimate of non-pueblo hook-ups over time that was used with the cost per service connection to arrive at HKM's service connection estimate. This estimate was adopted by CH2M HILL as reasonable and is included in both the CH2M HILL and HKM columns in the table below.

Wells

HKM's costs include an update to the expected cost of dual use wells. This estimate was derived from a detailed analysis provided by John Shomaker and Associates. The estimate completed by HKM is at a much greater level of detail than the estimate completed by CH2M HILL. This estimate was adopted by CH2M HILL as reasonable and is included in both the CH2M HILL and HKM columns in the table below.

TABLE 2.

Summary Cost Comparison of CH2M HILL "Upsized" and HKM April 2007

	CH2M HILL "Upsized" to 4,000 ac-ft/yr			HKM April 2007		
	Pueblo	Non-Pueblo	Combined	Pueblo	Non-Pueblo	Combined
Diversions	\$2,216,400	\$554,400	\$2,770,800	\$1,736,627	\$189,716	\$1,926,342
WTP	\$13,868,400	\$3,466,800	\$17,335,200	\$14,773,487	\$3,437,580	\$18,211,067
Trunk Line	\$27,154,800	\$6,788,400	\$33,943,200	\$16,182,288	\$4,539,707	\$20,721,995
Distribution	\$18,599,000	\$25,026,000	\$43,625,000	\$35,147,705	\$23,626,877	\$58,774,581
Service Connections	\$8,059,560	\$9,786,810	\$17,846,370	\$8,059,560	\$9,786,810	\$17,846,370
Wells	\$8,603,397	\$4,280,760	\$12,884,157	\$8,603,397	\$4,280,760	\$12,884,157
Other	\$0	\$0	\$0		\$0	\$0
Field Cost	\$78,501,557	\$49,903,170	\$128,404,727	\$84,503,063	\$45,861,449	\$130,364,511
Non-Contract Costs	\$23,550,467	\$14,970,951	\$38,521,418	\$26,195,949	\$14,217,049	\$40,412,998
Total	\$102,052,024	\$64,874,121	\$166,926,145	\$110,699,012	\$60,078,498	\$170,777,509

Notes:

1. Costs shown do not include the O&M capital costs shown in the April, 2007 HKM report, the Pojoaque barrier dam, RT channel modifications, or the Red Pipe.
2. The Bishop's lodge extension is added into the combined and non-pueblo columns

Table 3 shows the differences in the upsized CH2M HILL and HKM estimates. The numbers in Table 3 are the upsized CH2M HILL cost minus the HKM costs. The numbers shown in Table 3 reflect about a 2 percent difference in total costs. Total Pueblo costs are about \$9MM greater in the HKM estimate and Non-Pueblo costs are about \$5MM less.

These differences are primarily due to the addition of new service areas in the Pueblo areas and the reduction in the amount of trunk line. Where possible, HKM used distribution lines to also provide transmission of water – eliminating a significant portion of the trunk line. These dual-use lines are used for transmission and distribution and become necessary for the “Indian Only” system; thus, shifting some of the incremental costs from the non-pueblo portion to the pueblo portion of the system.

TABLE 3.
Difference in CH2M HILL “Upsized” and HKM April, 2007 Costs

	Pueblo	Non-Pueblo	Combined
Diversion	\$479,774	\$364,685	\$844,458
WTP	-\$905,087	\$29,220	-\$875,866
Trunk Line	\$10,972,512	\$2,248,694	\$13,221,206
Distribution	-\$16,548,705	\$1,399,124	-\$15,149,581
Service Connections	\$0	\$0	\$0
Wells	\$0	\$0	\$0
Other	\$0	\$0	\$0
Field Cost	-\$6,001,506	\$4,041,722	-\$1,959,784
Non-Contract Costs	-\$2,645,482	\$753,902	-\$1,891,580
Total	-\$8,646,988	\$4,795,623	-\$3,851,364