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**DATE:** March 3, 2008  
**TO:** Project File  
**FROM:** Aaron Keno  
**RE:** Updated Cost Estimate for Dredging the South Fork Rivanna Reservoir

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## **Background**

On December 1, 2004, Gannett Fleming issued a Technical Memorandum entitled “Concept Development – Dredging the South Fork Rivanna Reservoir (SFRR)” as part of the alternatives analyses for selecting a project that would expand the Rivanna Water and Sewer Authority’s (RWSA) Urban raw water system to satisfy projected water demands over the next 50 years. RWSA recently requested that Gannett Fleming review and update the project cost estimates based on current costs.

Gannett Fleming utilized techniques similar to those previously applied to estimate 2007 costs including published estimating referenced materials, contractor interviews, and judgment based on other recent projects. The same assumptions regarding projects logistics were applied. **No new investigations were completed.** Contractor interviews occurred in late 2007. Since the 2004 report was issued, there has been some community interest in the potential for using dredged material for fill at the Albemarle County airport. This subject may need to be reviewed under a separate study.

During the last three years, heavy construction costs and real estate have continued to escalate and the bid environment on similar projects has been very volatile. Although this makes estimating costs difficult, it does provide a strong basis to confirm that the 2004 costs presented in the referenced memorandum are now outdated and costs have increased.

## **Updated Project Cost Estimates**

Tables 4 through 7 were excerpted from the referenced report and presented below in a slightly different format but with no changes in content for the 2004 estimates. The updated 2007 cost estimates are presented side-by-side for each item in the estimate. An explanation for each line item is presented below each table.

Tables 4 through 6 summarize the cost estimates for the three reuse and/or disposal scenarios. Costs are presented in both 2004 and 2007 dollars and provide the total cost for dredging and disposal or reuse of all 5,000,000 cubic yards of material.

The initial restoration dredging and disposal work would be conducted over a 50 year period, therefore, the costs could be divided into initial (or one-time costs) and annual costs for the 50 year period. One-time costs would include land acquisition, dewatering basin construction, environmental mitigation and permitting, and engineering. The remainder of the costs could occur on some periodic basis (herein assumed to be annual) and be proportional to the volume of sediment removed.

Table 7 summarizes the cost estimate for continued annual dredging after the 50 year period is complete. Since predicting the usefulness of dredged material for reuse during this period is difficult, only a no reuse scenario is shown. This work would continue for as long as the condition of the initial volume of the reservoir was desired to be maintained.

**Table 4**  
**Cost Estimate for Dredging a 50/50% Mixture of Sand and Silt/Clay**  
**with 50% Reuse of Dredged Material**

	<b>Item</b>	<b>Quantity</b>	<b>Unit Cost (2004)</b>	<b>Cost (2004)</b>	<b>Unit Cost (2007)</b>	<b>Cost (2007)</b>
1	Land Acquisition for Dewatering Facility	40 Acres	\$16,500/Ac	\$660,000	\$40,200/Ac	\$1,608,000
2	Dewatering Basins Construction	1	L.S.	\$450,000	L.S.	\$560,000
3	Environmental Mitigation and Permitting	1	L.S.	\$150,000	L.S.	\$175,000
4	Hydraulic Dredging	5.0 M CY	\$5/CY	\$25,000,000	\$7/CY	\$35,000,000
5	Land Acquisition for Disposal	225 Acres	\$16,500/Ac	\$3,712,500	\$40,200/Ac	\$9,045,000
6	Hauling Costs for Reused Dredged Material	2.5 M CY	\$12/CY	\$30,000,000	\$20/CY	\$50,000,000
7	Disposal Costs for Unusable Dredged Material	2.5 M CY	\$16/CY	\$40,000,000	\$24/CY	\$60,000,000
8	Mobilization/Demobilization	50 Years	\$40,000/Yr	\$2,000,000	\$60,000/Yr	\$3,000,000
	Engineering/Permitting and CM (25% of Dewatering Basin Construction only)	1	L.S.	\$112,500	L.S.	\$140,000
	<b>Subtotal</b>			\$102,085,000		\$159,528,000
	<b>Project Contingencies (25%)</b>			\$25,521,250		\$39,882,000
	<b>Total Project Cost</b>			\$127,606,250		<b>\$199,410,000</b>
	Average Cost per MGD of Safe Yield (Provides 5.5 MGD)			\$23.2M/MGD		\$36.3M/MGD

**Assumptions for 2007 estimates presented by line item:**

- 1- Based on a 2007 average land value per acre derived from the Albemarle County real estate assessments. Ten representative properties were selected. A unit cost average of \$40,200/Acre was calculated.
- 2- Based on RS Means "construction cost index" average increase of 7.5% per year over the last 3 years.
- 3- Based on professional services industry criteria estimated at 4.0% per year.
- 4- Based on discussion with several dredging contractors. Cost does not include mobilization, demobilization, dewatering and disposal.
- 5- Same assumption as 1.
- 6- 2007 R.S Means Construction Data adjusted to Charlottesville, VA, unit cost for loading and hauling within a 20 mile round trip is \$34/CY. Contractor interviews produced a wide range with a low end at \$16-\$20 per CY. See also "Note 1." below. Use \$20 per CY based on judgment.
- 7- A unit cost of \$36.5/CY is derived using the Means Reference and based on the same assumption as number 6 including backfill and compaction. See also "Note 1." below. Use \$24 per CY based on judgment.
- 8- Based on discussion with several dredging contractors.

**Note:**

1. Hauling cost presented in line items 6 and 7 are based on 6 CY dump trucks. Larger trucks may reduce the cost. For 12 CY Dump Trucks within 20 mile round trip 2007 costs are \$28/CY for unusable dredged

material and \$26/CY for reusable dredged material based on Means Reference Material. Larger trucks could reduce the cost but may not be feasible for all disposal sites if secondary roads are required, may damage roads, and pose higher transportation traffic risks.

**Table 5**  
**Cost Estimate for Dredging a 50/50% Mixture of Sand and Silt/Clay**  
**with 20% Reuse of Dredged Material**

	<b>Item</b>	<b>Quantity</b>	<b>Unit Cost (2004)</b>	<b>Cost (2004)</b>	<b>Unit Cost (2007)</b>	<b>Cost (2007)</b>
1	Land Acquisition for Dewatering Facility	40 Acres	\$16,500/Ac	\$660,000	\$40,200/Ac	\$1,608,000
2	Dewatering Basins Construction	1	L.S.	\$450,000	L.S.	\$560,000
3	Environmental Mitigation and Permitting	1	L.S.	\$150,000	L.S.	\$175,000
4	Hydraulic Dredging	5.0 M CY	\$5/CY	\$25,000,000	\$7/CY	\$35,000,000
5	Land Acquisition for Disposal	360 Acres	\$16,500/Ac	\$5,940,000	\$40,200/Ac	\$14,472,000
6	Hauling Costs for Reused Dredged Material	1.0 M CY	\$12/CY	\$12,000,000	\$20/CY	\$20,000,000
7	Disposal Costs for Unusable Dredged Material	4.0 M CY	\$16/CY	\$64,000,000	\$24/CY	\$96,000,000
8	Mobilization/Demobilization	50 Years	\$40,000/Yr	\$2,000,000	\$60,000/Yr	\$3,000,000
	Engineering/Permitting and CM (25% of Dewatering Basin Construction only)	1	L.S.	\$112,500	L.S.	\$140,000
	<b>Subtotal</b>			\$110,312,500		\$170,955,000
	<b>Project Contingencies (25%)</b>			\$27,578,125		\$42,738,750
	<b>Total Project Cost</b>			\$137,890,625		<b>\$213,693,750</b>
	Average Cost per MGD of Safe Yield (Provides 5.5 MGD)			\$25.1M/MGD		\$38.9M/MGD

**Assumptions for 2007 estimates presented by line item:**

- 1- Based on a 2007 average land value per acre derived from the Albemarle County real estate assessments. Ten representative properties were selected. A unit cost average of \$40,200/Acre was calculated.
- 2- Based on RS Means "construction cost index" average increase of 7.5% per year over the last 3 years.
- 3- Based on professional services industry criteria estimated at 4.0% per year.
- 4- Based on discussion with several dredging contractors. Cost does not include mobilization, demobilization, dewatering and disposal.
- 5- Same assumption as 1.
- 6- 2007 R.S Means Construction Data adjusted to Charlottesville, VA, unit cost for loading and hauling within a 20 mile round trip is \$34/CY. Contractor interviews produced a wide range with a low end at \$16-\$20 per CY. See also "Note 1." below. Use \$20 per CY based on judgment.
- 7- A unit cost of \$36.5/CY is derived using the Means Reference and based on the same assumption as number 6 including backfill and compaction. See also "Note 1." below. Use \$24 per CY based on judgment.
- 8- Based on discussion with several dredging contractors.

**Note:**

1. Hauling cost presented in line items 6 and 7 are based on 6 CY dump trucks. Larger trucks may reduce the cost. For 12 CY Dump Trucks within 20 mile round trip 2007 costs are \$28/CY for unusable dredged

material and \$26/CY for reusable dredged material based on Means Reference Material. Larger trucks could reduce the cost but may not be feasible for all disposal sites if secondary roads are required, may damage roads, and pose higher transportation traffic risks.

**Table 6**  
**Cost Estimate for Dredging a 50/50% Mixture of Sand and Silt/Clay**  
**with No Reuse of Dredged Material**

	<b>Item</b>	<b>Quantity</b>	<b>Unit Cost (2004)</b>	<b>Cost (2004)</b>	<b>Unit Cost (2007)</b>	<b>Cost (2007)</b>
1	Land Acquisition for Dewatering Facility	40 Acres	\$16,500/Ac	\$660,000	\$40,200/Ac	\$1,608,000
2	Dewatering Basins Construction	1	L.S.	\$450,000	L.S.	\$560,000
3	Environmental Mitigation and Permitting	1	L.S.	\$150,000	L.S.	\$175,000
4	Hydraulic Dredging	5.0 M CY	\$5/CY	\$25,000,000	\$7/CY	\$35,000,000
5	Land Acquisition for Disposal	450 Acres	\$16,500/Ac	\$7,425,000	\$40,200/Ac	\$18,090,000
6	Disposal Costs for Unusable Dredged Material	5.0 M CY	\$16/CY	\$80,000,000	\$24/CY	\$120,000,000
7	Mobilization/Demobilization	50 Years	\$40,000/Yr	\$2,000,000	\$60,000/Yr	\$3,000,000
	Engineering/Permitting and CM (25% of Dewatering Basin Construction only)	1	L.S.	\$112,500	L.S.	\$140,000
	<b>Subtotal</b>			\$115,797,500		\$178,573,000
	<b>Project Contingencies (25%)</b>			\$28,949,375		\$44,643,250
	<b>Total Project Cost</b>			\$144,746,875		<b>\$223,216,250</b>
	Average Cost per MGD of Safe Yield (Provides 5.5 MGD)			<b>\$26.3M/MGD</b>		<b>\$40.6M/MGD</b>

**Assumptions for 2007 estimates presented by line item:**

- 1- Based on a 2007 average land value per acre derived from the Albemarle County real estate assessments. Ten representative properties were selected. A unit cost average of \$40,200/Acre was calculated.
- 2- Based on RS Means "construction cost index" average increase of 7.5% per year over the last 3 years.
- 3- Based on professional services industry criteria estimated at 4.0% per year.
- 4- Based on discussion with several dredging contractors. Cost does not include mobilization, demobilization, dewatering and disposal.
- 5- Same assumption as 1.
- 6- 2007 R.S Means Construction Data adjusted to Charlottesville, VA, unit cost for loading, hauling, backfilling, and compacting within a 20 mile round trip is \$36.5/CY. See also "Note 1." below. Use \$24 per CY based on judgment.
- 7- Based on discussion with several dredging contractors.

**Note:**

1. Hauling cost presented in line item 6 is based on 6 CY dump trucks. Larger trucks may reduce the cost. For 12 CY Dump Trucks within 20 mile round trip 2007 costs are \$28/CY for unusable dredged material and \$26/CY for reusable dredged material based on Means Reference Material. Larger trucks could reduce the cost but may not be feasible for all disposal sites if secondary roads are required, may damage roads, and pose higher transportation traffic risks.

**Table 7**  
**Annual Estimated Cost Dredging Beyond 2055 of a 50/50% Mixture of**  
**Sand and Silt/Clay with No Reuse of Dredged Material**

	<b>Item</b>	<b>Quantity</b>	<b>Unit Cost (2004)</b>	<b>Cost (2004)</b>	<b>Unit Cost (2007)</b>	<b>Cost (2007)</b>
1	Hydraulic Dredging	75,000 CY	\$5/CY	\$375,000	\$7/CY	\$525,000
2	Land Acquisition for Disposal	6.75 Acres	\$16,500/Ac	\$111,375	\$40,200/Ac	\$271,350
3	Disposal Costs for Unusable Dredged Material	75,000 CY	\$16/CY	\$1,200,000	\$24/CY	\$1,800,000
4	Mobilization/Demobilization	1 Year	\$40,000/Yr	\$40,000	\$60,000/Yr	\$60,000
	<b>Subtotal</b>			\$1,726,375		\$2,656,350
	<b>Project Contingencies (25%)</b>			\$431,594		\$664,088
	<b>Total Project Cost</b>			\$2,157,969		\$3,320,438

**Assumptions for 2007 estimates presented by line item:**

- 1- Based on discussion with several dredging contractors. Cost does not include mobilization, demobilization, dewatering and disposal.
- 2- Based on a 2007 average land value per acre derived from the Albemarle County real estate assessments. Ten representative properties were selected. A unit cost average of \$40,200/Acre was calculated.
- 3- 2007 R.S Means Construction Data adjusted to Charlottesville, VA, unit cost for loading, hauling, backfilling, and compacting within a 20 mile round trip is \$36.5/CY. See also “**Note 1.**” below. Use \$24 per CY based on judgment.
- 4- Based on discussion with several dredging contractors.

**Note:**

1. Hauling cost presented in line item 3 is based on 6 CY dump trucks. Larger trucks may reduce the cost. For 12 CY Dump Trucks within 20 mile round trip 2007 costs are \$28/CY for unusable dredged material and \$26/CY for reusable dredged material based on Means Reference Material. Larger trucks could reduce the cost but may not be feasible for all disposal sites if secondary roads are required, may damage roads, and pose higher transportation traffic risks.

**Limitations**

The foregoing Engineer's Estimates are opinions of probable construction cost and are provided solely for the Rivanna Water and Sewer Authority's internal information and budgeting purposes. Gannett Fleming does not represent nor guarantee that the estimates of probable costs will accurately predict contractors' bid amounts or actual project costs. Actual bids submitted may be substantially higher or lower than the estimate due to variations in material, equipment and construction costs, market conditions, competitive bidding and other factors. These Estimates are prepared solely for the benefit of the client for the purpose stated above and no other parties may rely upon the Estimates for any reason. Nothing contained herein shall confer any rights upon or create any duties on the part of the Engineer toward any third party.