

22 September 2014

Project No. 1378110270\_3000-3080-308-L-Rev0-314

Manuherikia Catchment Water Strategy Group

c/- Kate Scott  
BTW South Limited  
PO Box 302  
Cromwell 9342

## **MT IDA DAM – UPDATED INFORMATION – SEPTEMBER 2014**

Dear Kate

On 4 June we submitted our indicative cost estimate for Mt Ida Dam based on the design by Pickens (2005) (*ref: 1378110270\_3000-3080-308-L-Rev0-309*). This letter<sup>1</sup> is in response to your query about providing construction cost estimates of Pickens design (2005) based on updated 2014 unit rates. The summary follows:

- The Mt Ida reports by Hamilton (2006) and Pickens (2005) estimated a dam at Mt Ida as costing approximately \$10 M and a distribution system estimate / upgrade of approximately \$12 M. The total cost was therefore around \$22 M. This is understood (*Compass pers.comm.*) to translate to \$11,000 per hectare (assuming 2,000 hectares irrigated).
- The unit rates provided by Pickens (2005) were updated to 2014 unit rates, no changes to design or construction methods were included in the cost estimate. The updated unit rates increase the cost of the dam to \$14 M.
- The updated estimate does not include costs for items such as consenting, bonds and insurance, construction management, or additional field explorations, which are typically included in construction cost estimates. Also, a contingency of 35 percent is more appropriate at this early design stage. Adding the additional items listed above and increasing the contingency to 35 percent increases the cost of the dam to approximately \$20 M. A summary of the dam cost estimate is included in Table 1 below and details of the cost estimate are included in Appendix A.
- With no cost increase to the distribution system (\$12 M) and assuming a dam cost of \$20 M, the total cost is around \$32 M which equates to a total cost of approximately \$16,000 per hectare.
- This cost estimate does not take into account the additional design features that are anticipated due to the estimated foundation conditions described in Golder's 23 May 2014 summary letter (*ref: 1378110270\_3000-3080-308-LR-Rev0*).

---

<sup>1</sup> This letter is subject to the attached limitations.



**Table 1: Mt Ida Dam Updated Unit Rate Cost Estimates.**

Item (from Pickens 2005)	Description	Cost Estimate*
Dam Foundation and Preparation	Includes items such as stripping, excavation and dewatering.	\$410,000
Diversion (EO to dam earthworks, and part of the outlet)	Includes items such as excavation, concrete and temporary works for diversion.	\$1,160,000
Bulk Earthworks for Dam (excluding filters and armour)	Includes items such as stripping and excavation.	\$6,440,000
Filters/Drainage and Armour	Includes items such as selecting and processing valley gravels and quarrying and placing armour.	\$1,180,000
Outlet Works and Spillways	Includes items such as valves, pipes, and concrete placement.	\$560,000
Ancillary Works	Includes items such as road relocation and security fencing.	\$360,000
Additional Field Explorations	Includes items such as field explorations and laboratory testing	\$500,000
<b>Base Construction Cost (BCS)</b>		<b>\$10,610,000</b>
Site Establishment	10 % of BCS	\$1,060,000
Consenting	2 % of BCS	\$220,000
Bonds and Insurance	5 % of BCS	\$530,000
Construction Management	7 % of BCS	\$750,000
Engineering and Design	12 % of BCS and Site Establishment	\$1,400,000
<b>Direct Construction Cost (DCS)</b>		<b>\$14,520,000</b>
Contingencies	35 % of DCS	\$5,080,000
<b>Total Estimated Preliminary Project Costs</b>		<b>\$19,600,000</b>

\*Costs are rounded up to the nearest \$10,000

Based on the updated 2014 unit rate costs, consenting costs, bonds and insurance cost, construction management cost, and increased contingency, the cost of the dam doubled from the 2006 cost estimate.

Yours sincerely

**GOLDER ASSOCIATES (NZ) LIMITED**



Tim McMorran  
Principal Engineering Geologist

RA/TM/sb

CC: Allan Kane

Attachments: Report Limitations  
Appendix A: Mt Ida Dam Updated Cost Estimate with 2014 Rates Only

## Report Limitations

This Report / Document has been provided by Golder Associates (NZ) Limited (“Golder”) subject to the following limitations:

- i) This Report / Document has been prepared for the particular purpose outlined in Golder’s proposal and no responsibility is accepted for the use of this Report / Document, in whole or in part, in other contexts or for any other purpose.
- ii) The scope and the period of Golder’s Services are as described in Golder’s proposal, and are subject to restrictions and limitations. Golder did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Report / Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Golder in regards to it.
- iii) Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Report / Document. Accordingly, if information in addition to that contained in this report is sought, additional studies and actions may be required.
- iv) The passage of time affects the information and assessment provided in this Report / Document. Golder’s opinions are based upon information that existed at the time of the production of the Report / Document. The Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- v) Any assessments, designs and advice made in this Report / Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Report / Document.
- vi) Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Golder for incomplete or inaccurate data supplied by others.
- vii) The Client acknowledges that Golder may have retained subconsultants affiliated with Golder to provide Services for the benefit of Golder. Golder will be fully responsible to the Client for the Services and work done by all of its subconsultants and subcontractors. The Client agrees that it will only assert claims against and seek to recover losses, damages or other liabilities from Golder and not Golder’s affiliated companies. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any legal recourse, and waives any expense, loss, claim, demand, or cause of action, against Golder’s affiliated companies, and their employees, officers and directors.
- viii) This Report / Document is provided for sole use by the Client and is confidential to it. No responsibility whatsoever for the contents of this Report / Document will be accepted to any person other than the Client. Any use which a third party makes of this Report / Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Report / Document.



## APPENDIX A

---

Item	Description	Unit	Quantity	Unit Rate (Pickens 2005)	Unit Rate (2014)	Total Cost (Pickens 2005)	Total Cost (2014)	Comments/Assumptions
<b>1.0</b>	<b>Dam Foundation Preparation</b>							
1.1	Strip to Waste/Stockpile							
1.1.a	Valley Floor	m3	4500	\$ 4.00	\$ 6.50	\$ 18,000	\$ 29,250.00	Location of waste dumps unknown, Allow extra cost to haul to waste stockpile
1.1.b	Right Abut. Working off Fill	m3	7000	\$ 5.00	\$ 8.50	\$ 35,000	\$ 59,500.00	Steep slope, working off fill, Excavation rate likely to be low
1.1.c	Left Abut./Saddle Area	m3	11000	\$ 4.00	\$ 6.50	\$ 44,000	\$ 71,500.00	As for 1.1a,
1.2	Cutoff Subexcavation to toe area fill	m3	36000	\$ 6.00	\$ 6.50	\$ 216,000	\$ 234,000.00	As for 1.1a, Bulk excavation, rate will depend on haul
1.3	Dewatering Cutoff	LS	1	\$ 5,000.00	\$ 10,000.00	\$ 5,000	\$ 10,000.00	Details unknown, Assume 2 days using 3 plant items
						<b>Totals</b>	<b>\$ 318,000</b>	<b>\$ 404,250</b>
<b>2.0</b>	<b>Diversion (EO to dam earthworks, and part of the outlet)</b>							
2.1	Excavate stream to left bank and channel d/s of conduit to adjacent windrow	m3	1000	\$ 2.50	\$ 4.50	\$ 2,500	\$ 4,500.00	May require regular maintenance
2.2	Excavate conduit bench	m3	800	\$ 5.00	\$ 8.50	\$ 4,000	\$ 6,800.00	Trim excavation, low production rate
2.3	Diversion Conduit							
2.3.a	Supply and lay pipe 1200 dia	m	150	\$ 1,500.00	\$ 2,500.00	\$ 225,000	\$ 375,000.00	If not founded on rock will require cement stabilisation or site concrete to level
2.3.b	reinforced concrete surround and headwalls	m3	560	\$ 800.00	\$ 1,200.00	\$ 448,000	\$ 672,000.00	Assume concrete haunch to 60%
2.3.c	drainage surround	m3	500	No cost	\$ 120.00		\$ 60,000.00	Filter gravel likely requires import, typically \$100+ in place
2.3.d	temporary screen and final plug	LS	1	\$ 5,000.00	\$ 15,000.00	\$ 5,000	\$ 15,000.00	Screen details unknown, assume concrete plug and secondary grouting
2.4	Temporary rock cut left bank to toe area fill	m3	1000	\$ 5.00	\$ 15.00	\$ 5,000	\$ 15,000.00	Assume rock excavation using pick or breaker, production slow
2.5	Cement Stabilised backfill to channel in core zone	m3	130	\$ 30.00	\$ 50.00	\$ 3,900	\$ 6,500.00	Assume bucket mixing using 5% cement
						<b>Totals</b>	<b>\$ 693,400</b>	<b>\$ 1,154,800</b>
<b>3.0</b>	<b>Bulk Earthworks for Dam (excluding filters and armour)</b>							
3.1	Strip borrows to waste/stockpile	m3	25000	\$ 3.50	\$ 3.50	\$ 87,500	\$ 87,500.00	
3.2	Excavate left abutment clay slopes to waste/stockpile	m3	10000	\$ 4.00	\$ 6.50	\$ 40,000	\$ 65,000.00	As for 1.1a
3.3	Terrace gravel sourced fill (or clay)	m3	670000	\$ 4.75	\$ 8.50	\$ 3,182,500	\$ 5,695,000.00	Assume 400mm maximum layers to 98% standard compaction, and tested
3.4	EO to 3.3 to mix in clay to core zone working in gravel borrow	m3	21000	\$ 3.00	\$ 8.50	\$ 63,000	\$ 178,500.00	Clay core can be problematic, mixing, moisture sensitive, weather dependant (rate needs to reflect this)
3.5	Clay blanket	m3	35000	\$ 5.00	\$ 8.50	\$ 175,000	\$ 297,500.00	As above clays problematic, slow placement
3.6	Resurface and grass borrow downstream of embankments and downstream face of dam	m3	25000	\$ 3.50	\$ 4.50	\$ 87,500	\$ 112,500.00	Increase to allow for seeding
						<b>Totals</b>	<b>\$ 3,635,500</b>	<b>\$ 6,436,000</b>
<b>4.0</b>	<b>Filters/Drainage and Armour</b>							
4.1	Select and Process valley floor gravels and stockpile	m3	17000	\$ 10.00	\$ 25.00	\$ 170,000	\$ 425,000.00	Rate will depend on yield and grading requirements, washing will increase cost considerably
4.2	Construct Chimney Drain							
4.2.a	vertical drain ex 4.21 processed source	m3	11000	\$ 7.00	\$ 10.00	\$ 77,000	\$ 110,000.00	Assume placing rate only
4.2.b	EO to (a) to add imported sand	m3	1650	\$ 60.00	\$ 100.00	\$ 99,000	\$ 165,000.00	Dam filter sand typically \$100+, assume process+import + place+\$135
4.2.c	additional coarse base drain/filter	m3	200	\$ 10.00	\$ 10.00	\$ 2,000	\$ 2,000.00	Assume process cost only as by product from 4.1
4.3	Place coarse armour filter ex 4.1 processed source	m3	4000	\$ 4.00	\$ 6.00	\$ 16,000	\$ 24,000.00	
4.4	Quarry and place schist coarse armour including auxiliary spillway area						\$ -	
4.4.a	200 armour	m3	6000	\$ 30.00	\$ 30.00	\$ 180,000	\$ 180,000.00	Assume no or minimal blasting
4.4.b	300 armour	m3	6500	\$ 35.00	\$ 35.00	\$ 227,500	\$ 227,500.00	Assume no or minimal blasting
4.5	Construct 3 base outlet drains with inlets, filter surround and monitoring outlets	m	200	\$ 130.00	\$ 200.00	\$ 26,000	\$ 40,000.00	Details unknown
						<b>Totals</b>	<b>\$ 797,500</b>	<b>\$ 1,173,500</b>
<b>5.0</b>	<b>Outlet works and spillways</b>							
5.1.a	supply and fix three inlet pipe system with screens, valves, and hoise system	LS	1	\$ 150,000.00	\$ 200,000.00	\$ 150,000	\$ 200,000.00	Update 2005 est
5.1.b	downstream butterfly valve and anchorage	LS	1	\$ 20,000.00	\$ 30,000.00	\$ 20,000	\$ 30,000.00	Valve size not specified, include installation
5.2	Service Spillway							
5.2.a	Local rock excvaton and trimming (EO to bulk fill)	m3	5000	\$ 8.00	\$ 15.00	\$ 40,000	\$ 75,000.00	Production slow
5.2.b	cement stabilised fill for chute including rock overbreak repair	m3	1000	\$ 30.00	\$ 40.00	\$ 30,000	\$ 40,000.00	Working on slope, again slow production
5.2.c	bellmouth intake concrete	m3	18	\$ 1,000.00	\$ 1,600.00	\$ 18,000	\$ 28,800.00	Speacial form etc
5.2.d	1.5 dia pipe to head of chute	m	25	\$ 1,200.00	\$ 2,000.00	\$ 30,000	\$ 50,000.00	
5.2.e	chute concrete	m3	36	\$ 1,000.00	\$ 1,300.00	\$ 36,000	\$ 46,800.00	Will require import to site
5.2.f	flip bucket concrete	m3	10	\$ 800.00	\$ 1,300.00	\$ 8,000	\$ 13,000.00	
5.2.g	anchoring and drainage	LS	1	\$ 15,000.00	\$ 20,000.00	\$ 15,000	\$ 20,000.00	Details unknown
5.2.h	plunge pool excavation (assume free to dam fill)	LS	1	\$ -	\$ 5,000.00	\$ -	\$ 5,000.00	Cost should be included
5.2.i	spillway book or coarse screen	LS	1	\$ 5,000.00	\$ 10,000.00	\$ 5,000	\$ 10,000.00	Details unknown
5.3	Auxiliary spillway							
5.3.a	gabion side walls and filter	m3	70	\$ 100.00	\$ 500.00	\$ 7,000	\$ 35,000.00	
5.3.b	rockfill (incl armour)	m3	1	\$ -	\$ 5,000.00	\$ -	\$ 5,000.00	
5.3.c	Sand fuse plug/filters	m3	25	\$ -	\$ 50.00	\$ -	\$ 1,250.00	
						<b>Totals</b>	<b>\$ 359,000</b>	<b>\$ 559,850</b>
<b>6.0</b>	<b>Ancillary Works</b>							
6.1	Reroute Mt ida road past auxiliary spillway	LS	1	\$ 10,000.00	\$ 20,000.00	\$ 10,000	\$ 20,000.00	
6.2	Dam instrumentation (position, internal pressures)	LS	1	\$ 75,000.00	\$ 100,000.00	\$ 75,000	\$ 100,000.00	
6.3	Possible suspended deck for vehicle turning at right abutment	PS	1	\$ 15,000.00	\$ 20,000.00	\$ 15,000	\$ 20,000.00	
6.4	Running course to dam crest 3m wide x 100 thick	m3	230	\$ 45.00	\$ 60.00	\$ 10,350	\$ 13,800.00	
6.5	Crest Access Barrier and local security fencing	PS	1	\$ 5,000.00	\$ 10,000.00	\$ 5,000	\$ 10,000.00	
6.6	Buttress left abutment downstream area							
6.6.a	prepartion	LS	1	\$ 5,000.00	\$ 7,000.00	\$ 5,000	\$ 7,000.00	
6.6.b	drainage ex selected valley floor gravels	m3	1000	\$ 5.00	\$ 15.00	\$ 5,000	\$ 15,000.00	
6.6.c	buttress fill and rehabilitation ex selected strippings EO to 1.0 items	m3	6000	\$ 2.50	\$ 5.00	\$ 15,000	\$ 30,000.00	Details of these items unknown, 2005 increased to account for increased cost
6.7	culvert Base of infilled transverse gully right abutment	LS	1	\$ 15,000.00	\$ 20,000.00	\$ 15,000	\$ 20,000.00	
6.8	Access track to downstream of base of dam EO to earthworks	LS	1	\$ 10,000.00	\$ 15,000.00	\$ 10,000	\$ 15,000.00	
6.9	Allowance for minor items unforeseen/unscheduled	LS	1	\$ 50,000.00	\$ 100,000.00	\$ 50,000	\$ 100,000.00	
						<b>Totals</b>	<b>\$ 215,350</b>	<b>\$ 350,800</b>
						<b>Total Base Costs</b>	<b>\$ 6,018,750</b>	<b>\$ 10,079,200</b>
<b>7.0</b>	<b>Site Establishment</b>			10% of base cost		\$ 601,875	\$ 1,007,920	
<b>8.0</b>	<b>Engineering</b>			12% of base cost and site establishment		\$ 794,475	\$ 1,330,454	
<b>9.0</b>	<b>Contingency</b>			15% of base cost, site estab., and engineering		\$ 1,112,265	\$ 1,862,636	
						<b>Total Cost</b>	<b>\$ 8,527,365</b>	<b>\$ 14,280,211</b>

Item	Description	Unit	Quantity	Unit Rate (Pickens 2005)	Unit Rate (2014)	Total Cost (Pickens 2005)	Total Cost (2014)	Comments/Assumptions	
<b>1.0</b>	<b>Dam Foundation Preparation</b>								
1.1	Strip to Waste/Stockpile								
1.1.a	Valley Floor	m3	4500	\$ 4.00	\$ 6.50	\$ 18,000	\$ 29,250.00	Location of waste dumps unknown, Allow extra cost to haul to waste stockpile	
1.1.b	Right Abut. Working off Fill	m3	7000	\$ 5.00	\$ 8.50	\$ 35,000	\$ 59,500.00	Steep slope, working off fill, Excavation rate likely to be low	
1.1.c	Left Abut./Saddle Area	m3	11000	\$ 4.00	\$ 6.50	\$ 44,000	\$ 71,500.00	As for 1.1a,	
1.2	Cutoff Subexcavation to toe area fill	m3	36000	\$ 6.00	\$ 6.50	\$ 216,000	\$ 234,000.00	As for 1.1a, Bulk excavation, rate will depend on haul	
1.3	Dewatering Cutoff	LS	1	\$ 5,000.00	\$ 10,000.00	\$ 5,000	\$ 10,000.00	Details unknown, Assume 2 days using 3 plant items	
	<b>Totals</b>					\$ 318,000	\$ 404,250		
<b>2.0</b>	<b>Diversion (EO to dam earthworks, and part of the outlet)</b>								
2.1	Excavate stream to left bank and channel d/s of conduit to adjacent windrow	m3	1000	\$ 2.50	\$ 4.50	\$ 2,500	\$ 4,500.00	May require regular maintenance	
2.2	Excavate conduit bench	m3	800	\$ 5.00	\$ 8.50	\$ 4,000	\$ 6,800.00	Trim excavation, low production rate	
2.3	Diversion Conduit								
2.3.a	Supply and lay pipe 1200 dia	m	150	\$ 1,500.00	\$ 2,500.00	\$ 225,000	\$ 375,000.00	If not founded on rock will require cement stabilisation or site concrete to level	
2.3.b	reinforced concrete surround and headwalls	m3	560	\$ 800.00	\$ 1,200.00	\$ 448,000	\$ 672,000.00	Assume concrete haunch to 60%	
2.3.c	drainage surround	m3	500	No cost	\$ 120.00		\$ 60,000.00	Filter gravel likely requires import, typically \$100+ in place	
2.3.d	temporary screen and final plug	LS	1	\$ 5,000.00	\$ 15,000.00	\$ 5,000	\$ 15,000.00	Screen details unknown, assume concrete plug and secondary grouting	
2.4	Temporary rock cut left bank to toe area fill	m3	1000	\$ 5.00	\$ 15.00	\$ 5,000	\$ 15,000.00	Assume rock excavation using pick or breaker, production slow	
2.5	Cement Stabilised backfill to channel in core zone	m3	130	\$ 30.00	\$ 50.00	\$ 3,900	\$ 6,500.00	Assume bucket mixing using 5% cement	
	<b>Totals</b>					\$ 693,400	\$ 1,154,800		
<b>3.0</b>	<b>Bulk Earthworks for Dam (excluding filters and armour)</b>								
3.1	Strip borrows to waste/stockpile	m3	25000	\$ 3.50	\$ 3.50	\$ 87,500	\$ 87,500.00		
3.2	Excavate left abutment clay slopes to waste/stockpile	m3	10000	\$ 4.00	\$ 6.50	\$ 40,000	\$ 65,000.00	As for 1.1a	
3.3	Terrace gravel sourced fill (or clay)	m3	670000	\$ 4.75	\$ 8.50	\$ 3,182,500	\$ 5,695,000.00	Assume 400mm maximum layers to 98% standard compaction, and tested	
3.4	EO to 3.3 to mix in clay to core zone working in gravel borrow	m3	21000	\$ 3.00	\$ 8.50	\$ 63,000	\$ 178,500.00	Clay core can be problematic, mixing, moisture sensitive, weather dependant (rate needs to reflect this)	
3.5	Clay blanket	m3	35000	\$ 5.00	\$ 8.50	\$ 175,000	\$ 297,500.00	As above clays problematic, slow placement	
3.6	Resurface and grass borrow downstream of embankments and downstream face of dam	m3	25000	\$ 3.50	\$ 4.50	\$ 87,500	\$ 112,500.00	Increase to allow for seeding	
	<b>Totals</b>					\$ 3,635,500	\$ 6,436,000		
<b>4.0</b>	<b>Filters/Drainage and Armour</b>								
4.1	Select and Process valley floor gravels and stockpile	m3	17000	\$ 10.00	\$ 25.00	\$ 170,000	\$ 425,000.00	Rate will depend on yield and grading requirements, washing will increase cost considerably	
4.2	Construct Chimney Drain								
4.2.a	vertical drain ex 4.2.1 processed source	m3	11000	\$ 7.00	\$ 10.00	\$ 77,000	\$ 110,000.00	Assume placing rate only	
4.2.b	EO to (a) to add imported sand	m3	1650	\$ 60.00	\$ 100.00	\$ 99,000	\$ 165,000.00	Dam filter sand typically \$100+, assume process+import + place+\$135	
4.2.c	additional coarse base drain/filter	m3	200	\$ 10.00	\$ 10.00	\$ 2,000	\$ 2,000.00	Assume process cost only as by product from 4.1	
4.3	Place coarse armour filter ex 4.1 processed source	m3	4000	\$ 4.00	\$ 6.00	\$ 16,000	\$ 24,000.00		
4.4	Quarry and place schist coarse armour including auxiliary spillway area								
4.4.a	200 armour	m3	6000	\$ 30.00	\$ 30.00	\$ 180,000	\$ 180,000.00	Assume no or minimal blasting	
4.4.b	300 armour	m3	6500	\$ 35.00	\$ 35.00	\$ 227,500	\$ 227,500.00	Assume no or minimal blasting	
4.5	Construct 3 base outlet drains with inlets, filter surround and monitoring outlets	m	200	\$ 130.00	\$ 200.00	\$ 26,000	\$ 40,000.00	Details unknown	
	<b>Totals</b>					\$ 797,500	\$ 1,173,500		
<b>5.0</b>	<b>Outlet works and spillways</b>								
5.1.a	supply and fix three inlet pipe system with screens, valves, and hoise system	LS	1	\$ 150,000.00	\$ 200,000.00	\$ 150,000	\$ 200,000.00	Update 2005 est	
5.1.b	downstream butterfly valve and anchorage	LS	1	\$ 20,000.00	\$ 30,000.00	\$ 20,000	\$ 30,000.00	Valve size not specified, include installation	
5.2	Service Spillway								
5.2.a	Local rock excvaton and trimming (EO to bulk fill)	m3	5000	\$ 8.00	\$ 15.00	\$ 40,000	\$ 75,000.00	Production slow	
5.2.b	cement stabilised fill for chute including rock overbreak repair	m3	1000	\$ 30.00	\$ 40.00	\$ 30,000	\$ 40,000.00	Working on slope, again slow production	
5.2.c	bellmouth intake concrete	m3	18	\$ 1,000.00	\$ 1,600.00	\$ 18,000	\$ 28,800.00	Speacial form etc	
5.2.d	1.5 dia pipe to head of chute	m	25	\$ 1,200.00	\$ 2,000.00	\$ 30,000	\$ 50,000.00		
5.2.e	chute concrete	m3	36	\$ 1,000.00	\$ 1,300.00	\$ 36,000	\$ 46,800.00	Will require import to site	
5.2.f	flip bucket concrete	m3	10	\$ 800.00	\$ 1,300.00	\$ 8,000	\$ 13,000.00		
5.2.g	anchoring and drainage	LS	1	\$ 15,000.00	\$ 20,000.00	\$ 15,000	\$ 20,000.00	Details unknown	
5.2.h	plunge pool excavation (assume free to dam fill)	LS	1	\$ -	\$ 5,000.00	\$ -	\$ 5,000.00	Cost should be included	
5.2.i	spillway book or coarse screen	LS	1	\$ 5,000.00	\$ 10,000.00	\$ 5,000	\$ 10,000.00	Details unknown	
5.3	Auxiliary spillway								
5.3.a	gabion side walls and filter	m3	70	\$ 100.00	\$ 500.00	\$ 7,000	\$ 35,000.00		
5.3.b	rockfill (incl armour)	m3	1	\$ 5,000.00	\$ -	\$ -	\$ 5,000.00		
5.3.c	Sand fuse plug/filters	m3	25	\$ -	\$ 50.00	\$ -	\$ 1,250.00		
	<b>Totals</b>					\$ 359,000	\$ 559,850		
<b>6.0</b>	<b>Ancillary Works</b>								
6.1	Reroute Mt ida road past auxiliary spillway	LS	1	\$ 10,000.00	\$ 20,000.00	\$ 10,000	\$ 20,000.00		
6.2	Dam instrumentation (position, internal pressures)	LS	1	\$ 75,000.00	\$ 100,000.00	\$ 75,000	\$ 100,000.00		
6.3	Possible suspended deck for vehicle turning at right abutment	PS	1	\$ 15,000.00	\$ 20,000.00	\$ 15,000	\$ 20,000.00		
6.4	Running course to dam crest 3m wide x 100 thick	m3	230	\$ 45.00	\$ 60.00	\$ 10,350	\$ 13,800.00		
6.5	Crest Access Barrier and local security fencing	PS	1	\$ 5,000.00	\$ 10,000.00	\$ 5,000	\$ 10,000.00		
6.6	Buttress left abutment downstream area								
6.6.a	preparation	LS	1	\$ 5,000.00	\$ 7,000.00	\$ 5,000	\$ 7,000.00		
6.6.b	drainage ex selected valley floor gravels	m3	1000	\$ 5.00	\$ 15.00	\$ 5,000	\$ 15,000.00		
6.6.c	buttress fill and rehabilitation ex selected strippings EO to 1.0 items	m3	6000	\$ 2.50	\$ 5.00	\$ 15,000	\$ 30,000.00	Details of these items unknown, 2005 increased to account for increased cost	
6.7	culvert Base of infilled transverse gully right abutment	LS	1	\$ 15,000.00	\$ 20,000.00	\$ 15,000	\$ 20,000.00		
6.8	Access track to downstream of base of dam EO to earthworks	LS	1	\$ 10,000.00	\$ 15,000.00	\$ 10,000	\$ 15,000.00		
6.9	Allowance for minor items unforeseen/unscheduled	LS	1	\$ 50,000.00	\$ 100,000.00	\$ 50,000	\$ 100,000.00		
	<b>Totals</b>					\$ 215,350	\$ 350,800		
<b>7.0</b>	<b>Field Explorations</b>								
7.1	Field Explorations	LS	1		\$ 500,000.00	\$ -	\$ 500,000		
	<b>Totals</b>					\$ -	\$ 500,000		
	<b>Total Base Costs</b>					\$ 6,018,750	\$ 10,579,200		
<b>8.0</b>	<b>Site Establishment</b>								
<b>9.0</b>	<b>Consenting</b>								
<b>10.0</b>	<b>Bonds and Insurance</b>								
<b>11.0</b>	<b>Construction Management</b>								
<b>12.0</b>	<b>Engineering</b>								
	<b>Total Direct Construction Cost</b>						\$ 7,415,100	\$ 14,514,662	
<b>13.0</b>	<b>Contingency</b>								
				15% of base cost (Pickens), 35% of direct cost (recommended)		\$ 1,112,265	\$ 5,080,132		
	<b>Total Cost</b>					\$ 8,527,365	\$ 19,594,794		