Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option A.1A

Wood Chips
Campus System
Boiler Plant Location A

EXISTING CONDITIONS

Existing Fuel Type:	Natural Gas	Fuel Oil	Propane	Electricity
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	42,138	0	0
Annual Heating Costs:	$0	$120,936	$0	$0

ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)

Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	5,646,492,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	4,517,193,600	0	0

WOOD FUEL COST

	Wood Chips	Wood Pellets	Cord Wood
$/ton:	$85.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%

PROJECTED WOOD FUEL USAGE

Estimated Btu content of wood fuel (Btu/lb) - **Assumed Western Hemlock, 50% MC**	3700	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	872		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	785		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	31		

Project Capital Cost	**-$2,673,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$2,673,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	70000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	117.1 years
Net Present Value (30 year analysis):	$2,335,846
Net Present Value (20 year analysis):	$1,116,128

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		42138	gallons	$120,936	$128,192	$135,884	$144,037	$152,679	$161,840	$171,550	$181,843	$192,754	$204,319	$273,425	$365,904	$489,662	$655,278
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$85.00	90%	785	tons	$66,711	$68,713	$70,774	$72,897	$75,084	$77,337	$79,657	$82,047	$84,508	$87,043	$100,907	$116,979	$135,611	$157,210
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	4214	gallons	$12,094	$12,819	$13,588	$14,404	$15,268	$16,184	$17,155	$18,184	$19,275	$20,432	$27,342	$36,590	$48,966	$65,528
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$12,110	$12,837	$13,607	$14,423	$15,289	$16,206	$17,178	$18,209	$19,302	$20,460	$27,380	$36,640	$49,033	$65,617
Annual Operating Cost Savings					***$22,821***	***$26,480***	***$32,920***	***$37,219***	***$41,842***	***$46,813***	***$52,154***	***$57,889***	***$64,045***	***$70,648***	***$111,462***	***$168,702***	***$248,332***	***$358,400***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***22,821***	***26,480***	***32,920***	***37,219***	***41,842***	***46,813***	***52,154***	***57,889***	***64,045***	***70,648***	***111,462***	***168,702***	***248,332***	***358,400***
Accumulated Cash Flow					***22,821***	***49,301***	***82,221***	***119,440***	***161,282***	***208,096***	***260,250***	***318,139***	***382,184***	***452,832***	***922,925***	***1,644,323***	***2,716,335***	***4,274,093***

Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option A.2A

Wood Chips
Campus System Less Vocational Education
Boiler Plant Location A

EXISTING CONDITIONS

Existing Fuel Type:	Natural Gas	Fuel Oil	Propane	Electricity
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	40,938	0	0
Annual Heating Costs:	$0	$117,492	$0	$0

ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)

Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	5,485,692,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	4,388,553,600	0	0

WOOD FUEL COST

	Wood Chips	Wood Pellets	Cord Wood
$/ton:	$85.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%

PROJECTED WOOD FUEL USAGE

Estimated Btu content of wood fuel (Btu/lb) - **Assumed Western Hemlock, 50% MC**	3700	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	847		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	762		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	30		

Project Capital Cost	**-$2,549,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$2,549,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	70000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	117.9 years
Net Present Value (30 year analysis):	$2,250,020
Net Present Value (20 year analysis):	$1,072,870

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		40938	gallons	$117,492	$124,542	$132,014	$139,935	$148,331	$157,231	$166,665	$176,665	$187,264	$198,500	$265,638	$355,484	$475,718	$636,618
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$85.00	90%	762	tons	$64,812	$66,756	$68,759	$70,821	$72,946	$75,134	$77,389	$79,710	$82,101	$84,565	$98,033	$113,648	$131,749	$152,733
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	4094	gallons	$11,749	$12,454	$13,201	$13,993	$14,833	$15,723	$16,666	$17,666	$18,726	$19,850	$26,564	$35,548	$47,572	$63,662
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$12,110	$12,837	$13,607	$14,423	$15,289	$16,206	$17,178	$18,209	$19,302	$20,460	$27,380	$36,640	$49,033	$65,617
Annual Operating Cost Savings					***$21,621***	***$25,151***	***$31,453***	***$35,603***	***$40,068***	***$44,868***	***$50,026***	***$55,565***	***$61,511***	***$67,890***	***$107,328***	***$162,655***	***$239,644***	***$346,082***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***21,621***	***25,151***	***31,453***	***35,603***	***40,068***	***44,868***	***50,026***	***55,565***	***61,511***	***67,890***	***107,328***	***162,655***	***239,644***	***346,082***
Accumulated Cash Flow					***21,621***	***46,772***	***78,225***	***113,828***	***153,896***	***198,764***	***248,790***	***304,355***	***365,866***	***433,756***	***886,113***	***1,581,351***	***2,615,542***	***4,119,428***

Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option A.3A

Wood Chips
School Only Less Vocational Education
Boiler Plant Location A

EXISTING CONDITIONS

	Natural Gas	Fuel Oil	Propane	Electricity
Existing Fuel Type:				
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	36,414	0	0
Annual Heating Costs:	$0	$104,508	$0	$0
ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)				
Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	4,879,476,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	3,903,580,800	0	0

WOOD FUEL COST

	Wood Chips	Wood Pellets	Cord Wood
$/ton:	$85.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%
PROJECTED WOOD FUEL USAGE			
Estimated Btu content of wood fuel (Btu/lb) - **Assumed Western Hemlock, 50% MC**	3700	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	754		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	678		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	27		

Project Capital Cost	**-$750,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$750,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	70000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	43.9 years
Net Present Value (30 year analysis):	$1,926,455
Net Present Value (20 year analysis):	$909,790

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		36414	gallons	$104,508	$110,779	$117,425	$124,471	$131,939	$139,856	$148,247	$157,142	$166,570	$176,564	$236,283	$316,200	$423,147	$566,266
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$85.00	90%	678	tons	$57,649	$59,379	$61,160	$62,995	$64,885	$66,831	$68,836	$70,901	$73,029	$75,219	$87,200	$101,089	$117,189	$135,855
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	3641	gallons	$10,451	$11,078	$11,743	$12,447	$13,194	$13,986	$14,825	$15,714	$16,657	$17,656	$23,628	$31,620	$42,315	$56,627
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$12,110	$12,837	$13,607	$14,423	$15,289	$16,206	$17,178	$18,209	$19,302	$20,460	$27,380	$36,640	$49,033	$65,617
Annual Operating Cost Savings					***$17,098***	***$20,141***	***$25,922***	***$29,512***	***$33,376***	***$37,533***	***$42,002***	***$46,803***	***$51,959***	***$57,492***	***$91,742***	***$139,859***	***$206,890***	***$299,644***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***17,098***	***20,141***	***25,922***	***29,512***	***33,376***	***37,533***	***42,002***	***46,803***	***51,959***	***57,492***	***91,742***	***139,859***	***206,890***	***299,644***
Accumulated Cash Flow					***17,098***	***37,239***	***63,161***	***92,673***	***126,049***	***163,582***	***205,584***	***252,387***	***304,346***	***361,839***	***747,332***	***1,343,946***	***2,235,554***	***3,536,340***

Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option A.4A

Wood Chips
Campus System Including Another Large Load Such As DOT
Boiler Plant Location A

EXISTING CONDITIONS

Existing Fuel Type:	Natural Gas	Fuel Oil	Propane	Electricity
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	62,000	0	0
Annual Heating Costs:	$0	$177,940	$0	$0

ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)

Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	8,308,000,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	6,646,400,000	0	0

WOOD FUEL COST

	Wood Chips	Wood Pellets	Cord Wood
$/ton:	$85.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%

PROJECTED WOOD FUEL USAGE

Estimated Btu content of wood fuel (Btu/lb) - **Assumed Western Hemlock, 50% MC**	3700	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	1,283		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	1,155		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	46		

Project Capital Cost	**-$3,196,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$3,196,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	140000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	104.5 years
Net Present Value (30 year analysis):	$3,204,906
Net Present Value (20 year analysis):	$1,518,980

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		62000	gallons	$177,940	$188,616	$199,933	$211,929	$224,645	$238,124	$252,411	$267,556	$283,609	$300,626	$402,305	$538,375	$720,467	$964,148
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$85.00	90%	1155	tons	$98,156	$101,101	$104,134	$107,258	$110,476	$113,790	$117,204	$120,720	$124,341	$128,072	$148,470	$172,118	$199,532	$231,312
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	6200	gallons	$17,794	$18,862	$19,993	$21,193	$22,465	$23,812	$25,241	$26,756	$28,361	$30,063	$40,231	$53,838	$72,047	$96,415
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$24,220	$25,673	$27,214	$28,846	$30,577	$32,412	$34,357	$36,418	$38,603	$40,919	$54,759	$73,280	$98,065	$131,233
Annual Operating Cost Savings					***$30,570***	***$35,637***	***$43,599***	***$49,538***	***$55,932***	***$62,810***	***$70,204***	***$78,149***	***$86,680***	***$95,836***	***$152,512***	***$232,147***	***$343,103***	***$496,664***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***30,570***	***35,637***	***43,599***	***49,538***	***55,932***	***62,810***	***70,204***	***78,149***	***86,680***	***95,836***	***152,512***	***232,147***	***343,103***	***496,664***
Accumulated Cash Flow					***30,570***	***66,206***	***109,805***	***159,343***	***215,275***	***278,085***	***348,289***	***426,438***	***513,118***	***608,954***	***1,250,353***	***2,241,147***	***3,720,214***	***5,876,662***

Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option A.1B

Wood Chips
Campus System
Boiler Plant Location B

EXISTING CONDITIONS

Existing Fuel Type:	Natural Gas	Fuel Oil	Propane	Electricity
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	42,138	0	0
Annual Heating Costs:	$0	$120,936	$0	$0

ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)

Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	5,646,492,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	4,517,193,600	0	0

WOOD FUEL COST

	Wood Chips	Wood Pellets	Cord Wood
$/ton:	$85.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%

PROJECTED WOOD FUEL USAGE

Estimated Btu content of wood fuel (Btu/lb) - **Assumed Western Hemlock, 50% MC**	3700	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	872		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	785		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	31		

Project Capital Cost	**-$2,770,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$2,770,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	70000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	121.4 years
Net Present Value (30 year analysis):	$2,335,846
Net Present Value (20 year analysis):	$1,116,128

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		42138	gallons	$120,936	$128,192	$135,884	$144,037	$152,679	$161,840	$171,550	$181,843	$192,754	$204,319	$273,425	$365,904	$489,662	$655,278
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$85.00	90%	785	tons	$66,711	$68,713	$70,774	$72,897	$75,084	$77,337	$79,657	$82,047	$84,508	$87,043	$100,907	$116,979	$135,611	$157,210
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	4214	gallons	$12,094	$12,819	$13,588	$14,404	$15,268	$16,184	$17,155	$18,184	$19,275	$20,432	$27,342	$36,590	$48,966	$65,528
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$12,110	$12,837	$13,607	$14,423	$15,289	$16,206	$17,178	$18,209	$19,302	$20,460	$27,380	$36,640	$49,033	$65,617
Annual Operating Cost Savings					***$22,821***	***$26,480***	***$32,920***	***$37,219***	***$41,842***	***$46,813***	***$52,154***	***$57,889***	***$64,045***	***$70,648***	***$111,462***	***$168,702***	***$248,332***	***$358,400***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***22,821***	***26,480***	***32,920***	***37,219***	***41,842***	***46,813***	***52,154***	***57,889***	***64,045***	***70,648***	***111,462***	***168,702***	***248,332***	***358,400***
Accumulated Cash Flow					***22,821***	***49,301***	***82,221***	***119,440***	***161,282***	***208,096***	***260,250***	***318,139***	***382,184***	***452,832***	***922,925***	***1,644,323***	***2,716,335***	***4,274,093***

Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option A.1C

Wood Chips
Campus System Including Sewer Plant
Boiler Plant Location C

EXISTING CONDITIONS

Existing Fuel Type:	Natural Gas	Fuel Oil	Propane	Electricity
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	49,138	0	0
Annual Heating Costs:	$0	$141,026	$0	$0

ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)

Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	6,584,492,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	5,267,593,600	0	0

WOOD FUEL COST

	Wood Chips	Wood Pellets	Cord Wood
$/ton:	$85.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%

PROJECTED WOOD FUEL USAGE

Estimated Btu content of wood fuel (Btu/lb) - **Assumed Western Hemlock, 50% MC**	3700	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	1,017		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	915		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	37		

Project Capital Cost	**-$3,196,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$3,196,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	140000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	180.5 years
Net Present Value (30 year analysis):	$2,284,993
Net Present Value (20 year analysis):	$1,055,333

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		49138	gallons	$141,026	$149,488	$158,457	$167,964	$178,042	$188,725	$200,048	$212,051	$224,774	$238,261	$318,846	$426,688	$571,005	$764,134
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$85.00	90%	915	tons	$77,794	$80,127	$82,531	$85,007	$87,557	$90,184	$92,890	$95,676	$98,547	$101,503	$117,670	$136,412	$158,138	$183,326
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	4914	gallons	$14,103	$14,949	$15,846	$16,796	$17,804	$18,872	$20,005	$21,205	$22,477	$23,826	$31,885	$42,669	$57,101	$76,413
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$24,220	$25,673	$27,214	$28,846	$30,577	$32,412	$34,357	$36,418	$38,603	$40,919	$54,759	$73,280	$98,065	$131,233
Annual Operating Cost Savings					***$17,710***	***$21,394***	***$27,872***	***$32,220***	***$36,908***	***$41,957***	***$47,392***	***$53,238***	***$59,523***	***$66,276***	***$108,199***	***$167,335***	***$249,981***	***$364,637***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***17,710***	***21,394***	***27,872***	***32,220***	***36,908***	***41,957***	***47,392***	***53,238***	***59,523***	***66,276***	***108,199***	***167,335***	***249,981***	***364,637***
Accumulated Cash Flow					***17,710***	***39,104***	***66,977***	***99,197***	***136,105***	***178,061***	***225,453***	***278,691***	***338,214***	***404,490***	***855,789***	***1,566,188***	***2,639,884***	***4,218,911***

Haines Borough Biomass Boiler Project

Haines, Alaska

Date: December 15, 2009
Analyst: CTA Architects Engineers - Nathan Ratz

Option B.1

Pellets
Campus System
Boiler Plant Location A

EXISTING CONDITIONS

	Natural Gas	Fuel Oil	Propane	Electricity
Existing Fuel Type:				
Fuel Units:	dkt	gallons	galllons	kwh
Current Fuel Unit Cost:	$0.00	$2.87	$0.00	$0.00
Estimated Average Annual Fuel Usage:	0	42,138	0	0
Annual Heating Costs:	$0	$120,936	$0	$0
ENERGY CONVERSION (to 1,000,000 Btu; or 1 dkt)				
Fuel Heating Value (Btu/unit of fuel):	1000000	134000	90500	3413
Current Annual Fuel Volume (Btu):	0	5,646,492,000	0	0
Assumed efficiency of existing heating system (%):	80%	80%	80%	100%
Net Annual Energy Produced (Btu):	0	4,517,193,600	0	0

WOOD FUEL COST

	Wood Pellets	Wood Chips	Cord Wood
$/ton:	$325.00	$0.00	$0.00
Assumed efficiency of wood heating system (%):	70%	70%	70%
PROJECTED WOOD FUEL USAGE			
Estimated Btu content of wood fuel (Btu/lb)	8200	0	0
Tons of wood fuel to supplant net equivalent of 100% annual heating load.	393		
Tons of wood fuel to supplant net equivalent of 90% annual heating load.	354		
25 ton chip van loads to supplant net equivalent of 90% annual heating load.	14		

Project Capital Cost	**-$2,258,000**

Project Financing Information	
Percent Financed	**0%**
Amount Financed	$0
Amount of Grants	$2,258,000
Interest Rate	5.00%
Term	10
Annual Finance Cost (years)	$0

Additional Power Use	
Est. Pwr Use	70000 kWh
Elec Rate	$0.173 /kWh

Additional Maintenance					
Type	Hr/Wk	Wk/Yr	Total Hr	Wage/Hr	Total
Annual Biomass	5.0	40	200	$20.00	$4,000
Annual ESP	1.0	40	40	$20.00	$800
1st 2 Year Learning	3.0	40	120	$20.00	$2,400

Simple Payback: Total Project Cost/Year One Operating Cost Savings:	-88.3 years
Net Present Value (30 year analysis):	$926,646
Net Present Value (20 year analysis):	$176,661

Inflation Factors	
O&M Inflation Rate	2.0%
Current Fuel Inflation Rate	6.0%
Wood Fuel Inflation Rate	3.0%
Discount Rate for Net Present Value Calculation	3.0%

Cash flow Descriptions	Unit Costs	Heating Source Proportion	Annual Heating Source Volumes	Heating Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20	Year 25	Year 30
Existing Heating System Operating Costs																		
Displaced heating costs	$2.87		42138	gallons	$120,936	$128,192	$135,884	$144,037	$152,679	$161,840	$171,550	$181,843	$192,754	$204,319	$273,425	$365,904	$489,662	$655,278
					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Biomass System Operating Costs																		
Wood Fuel ($/ton, delivered to boiler site) (90% of total heat rqmnt)	$325.00	90%	354	tons	$115,094	$118,547	$122,103	$125,766	$129,539	$133,425	$137,428	$141,551	$145,798	$150,172	$174,090	$201,818	$233,962	$271,227
Small load existing fuel (10% of total heat rqmnt)	$2.87	10%	4214	gallons	$12,094	$12,819	$13,588	$14,404	$15,268	$16,184	$17,155	$18,184	$19,275	$20,432	$27,342	$36,590	$48,966	$65,528
Additional Operation and Maintenance Costs					$4,800	$4,896	$4,994	$5,094	$5,196	$5,300	$5,406	$5,514	$5,624	$5,736	$6,333	$6,993	$7,720	$8,524
Additional Operation and Maintenance Costs First 2 years					$2,400	$2,448												
Additional Electrical Cost	$0.17				$12,110	$12,837	$13,607	$14,423	$15,289	$16,206	$17,178	$18,209	$19,302	$20,460	$27,380	$36,640	$49,033	$65,617
Annual Operating Cost Savings					***-$25,562***	***-$23,354***	***-$18,409***	***-$15,650***	***-$12,612***	***-$9,275***	***-$5,617***	***-$1,615***	***$2,755***	***$7,519***	***$38,279***	***$83,863***	***$149,980***	***$244,383***
Financed Project Costs - Principal and Interest					***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***				
Displaced System Replacement Costs (year one only)					***0***													
Net Annual Cash Flow					***(25,562)***	***(23,354)***	***(18,409)***	***(15,650)***	***(12,612)***	***(9,275)***	***(5,617)***	***(1,615)***	***2,755***	***7,519***	***38,279***	***83,863***	***149,980***	***244,383***
Accumulated Cash Flow					***(25,562)***	***(48,916)***	***(67,325)***	***(82,975)***	***(95,587)***	***(104,862)***	***(110,479)***	***(112,094)***	***(109,339)***	***(101,820)***	***23,062***	***344,266***	***952,343***	***1,972,273***

Sensitivity Analysis

Line No.	Project Cost	Fuel Oil Usage Gallons	Fuel Oil Unit Cost per Gal	Wood Fuel Cost $/ton	Simple Payback yrs	Fuel Oil & Elec Inflation	Wood Fuel Inflation	Year 1 Operating Savings	NPV 30 yr at 3%	NPV 20 yr at 3%	ACF YR 10	ACF YR 20	ACF YR 30	YR ACF=PC
1	**Option A.1A Main Campus**													
2	Base Economic Case													
3	$2,673,000	42,138	$2.87	$85	117.1	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	25
4														
5	Sensitivity of Wood Fuel Cost and Fuel Oil Inflation													
6	$2,673,000	42,138	$2.87	$75	87.2	5.0%	3.0%	$30,669	$1,934,494	$1,036,001	$484,485	$1,495,403	$3,426,784	27
7	$2,673,000	42,138	$2.87	$75	87.2	6.0%	3.0%	$30,669	$2,564,441	$1,268,524	$542,805	$1,855,213	$4,647,484	24
8	$2,673,000	42,138	$2.87	$75	87.2	8.0%	3.0%	$30,669	$4,244,898	$1,825,323	$669,115	$2,723,520	$7,958,154	20
9	$2,673,000	42,138	$2.87	$75	87.2	11.0%	3.0%	$30,669	$8,353,890	$2,955,705	$885,355	$4,507,350	$16,251,769	17
10	$2,673,000	42,138	$2.87	$85	117.1	5.0%	3.0%	$22,821	$1,705,899	$883,605	$394,512	$1,284,514	$3,053,393	29
11	$2,673,000	42,138	$2.87	$85	117.1	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	25
12	$2,673,000	42,138	$2.87	$85	117.1	7.0%	3.0%	$22,821	$3,096,385	$1,377,949	$514,320	$2,051,558	$5,764,024	23
13	$2,673,000	42,138	$2.87	$85	117.1	8.0%	3.0%	$22,821	$4,016,303	$1,672,927	$579,142	$2,512,630	$7,584,763	21
14	$2,673,000	42,138	$2.87	$85	117.1	11.0%	3.0%	$22,821	$8,125,296	$2,803,308	$795,382	$4,296,460	$15,878,378	17
15	$2,673,000	42,138	$2.87	$95	178.5	5.0%	3.0%	$14,973	$1,477,305	$731,208	$304,539	$1,073,624	$2,680,002	30
16	$2,673,000	42,138	$2.87	$95	178.5	6.0%	3.0%	$14,973	$2,107,252	$963,731	$362,859	$1,433,434	$3,900,701	26
17	$2,673,000	42,138	$2.87	$95	178.5	8.0%	3.0%	$14,973	$3,787,709	$1,520,531	$489,169	$2,301,740	$7,211,372	22
18	$2,673,000	42,138	$2.87	$95	178.5	11.0%	3.0%	$14,973	$7,896,702	$2,650,912	$705,409	$4,085,571	$15,504,987	18
19														
20	Sensitivity of Fuel Oil Unit Cost													
21	$2,673,000	42,138	$3.25	$85	71.8	6.0%	3.0%	$37,232	$2,992,152	$1,488,759	$642,783	$2,174,448	$5,413,416	23
22	$2,673,000	42,138	$3.75	$85	47.6	6.0%	3.0%	$56,194	$3,855,713	$1,979,064	$892,719	$2,871,980	$6,912,525	20
23	$2,673,000	42,138	$4.25	$85	35.6	6.0%	3.0%	$75,156	$4,719,274	$2,469,369	$1,142,654	$3,569,512	$8,411,634	18
24	$2,673,000	42,138	$5.00	$85	25.8	6.0%	3.0%	$103,600	$6,014,615	$3,204,827	$1,517,557	$4,615,810	$10,660,298	15
25														
26	Sensitivity of Project Cost													
27	$2,405,700	42,138	$2.87	$85	105.4	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	24
28	$2,138,400	42,138	$2.87	$85	93.7	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	23
29	$1,871,100	42,138	$2.87	$85	82.0	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	22
30	$1,400,000	42,138	$2.87	$85	61.3	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	19
31	$1,000,000	42,138	$2.87	$85	43.8	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	16
32														
33	**Option A.1A Main Campus with 25% Matching Funds Financed**													
34	$2,673,000	42,138	$2.87	$85	117.1	6.0%	3.0%	$22,821	$1,597,630	$377,912	-$412,582	$778,909	$3,408,678	28
35														
36	**Option A.2A Campus Less Vocational Education**													
37	$2,549,000	40,938	$2.87	$85	117.9	6.0%	3.0%	$21,621	$2,250,020	$1,072,870	$433,756	$1,581,351	$4,119,428	25
38														
39	**Option A.3A School Building Only Less Vocational Education**													
40	$2,289,000	36,414	$2.87	$85	133.9	6.0%	3.0%	$17,098	$1,926,455	$909,790	$361,839	$1,343,946	$3,536,340	26
41														
42	**Option A.4A Adding A Larger Load Such as DOT to Campus**													
43	$3,196,000	62,000	$2.87	$85	104.5	6.0%	3.0%	$30,570	$3,204,906	$1,518,980	$608,954	$2,241,147	$5,876,662	24
44														
45	**Option A.1.B Campus and Boiler Plant Location B**													
46	$2,770,000	42,138	$2.87	$85	121.4	6.0%	3.0%	$22,821	$2,335,846	$1,116,128	$452,832	$1,644,323	$4,274,093	26
47														
48	**Option A.1.C Adding Sewer Plant to Campus and Boiler Plant Location C**													
49	$3,196,000	49,138	$2.87	$85	180.5	6.0%	3.0%	$17,710	$2,284,993	$1,055,333	$404,490	$1,566,188	$4,218,911	27
50														
51	**Option B.1 Campus with Pellet Boiler and Boiler Plant Location A**													
52	$2,258,000	42,138	$2.87	$325	-88.3	6.0%	3.0%	-$25,562	$926,646	$176,661	-$101,820	$344,266	$1,972,273	>30

NPV: Net Present Value ACF: Accumulated Cash Flow YR ACF=PC : Year Accumulated Cash Flow equals Project Cost