

DISCUSSION PAPER NO. 6

Capital Regional District

Core Area and West Shore Sewage Treatment Triple Bottom Line Analysis

Issued: March 22, 2007

1 Objective

The Steering Committee previously established wastewater management goals and criteria to be used in the evaluation and screening of wastewater management options presented in Discussion Paper No. 5. A Triple Bottom Line (TBL) methodology was selected as the means of evaluating how well any one option would achieve the Capital Regional District (CRD) goals. Using the results of the TBL evaluation, the relative value of each option in achieving the social, economic, and environmental goals can be seen for decision-making purposes.

The purpose of this discussion paper is to present the consultant team's evaluation of each of the five wastewater management options, using the TBL methodology and the goals and criteria presented in Discussion Paper No. 2. This evaluation and the results were presented for discussion with the Steering Committee at the March 10, 2007 workshop.

2 The TBL Approach

2.1 The Framework

The TBL framework provides a very robust structure for evaluating wastewater management options. It is designed to provide decision makers with a framework to understand the cost and benefits of alternatives across a spectrum of social, economic, and environmental goals and objectives. In this way, a more balanced view of alternatives is created, rather than one that relies on cost or easily quantifiable factors.

The TBL outcome should not be used as a final decision. A TBL evaluation is best used as a guide for decision makers. It is a tool that can be used to look at numerous options (often, a large number of options). It allows decision makers to vary or weigh criteria to discover those criteria that have the greatest influence on differentiating alternatives. It can suggest potential mitigation measures to reduce the impacts of an alternative; however, it remains only a tool. The TBL approach is not a substitute for the application of policies that may have more global importance than just wastewater management.



2.2 Goals and Criteria

The Steering Committee reviewed a set of goals and criteria during Workshop No. 1 to guide the development of a series of potential wastewater management options that will meet the Ministry of Environment's regulatory and policy requirements (see Discussion Paper No. 2).

These goals and criteria are contained in Attachment A to this paper. They are presented as a hierarchy for the Social, Economic, and Environmental elements of a TBL evaluation.

2.3 The Scoring Process

A scoring system was used to measure how well each of the options achieves the goals defined in Discussion Paper No. 2 for this evaluation. A simple scoring of 1 to 5 was used, with "1" representing the least accomplishment or "achievement" of the stated goal, and "5" representing the greatest achievement of the stated goal.

The criteria developed for each of the goals was used to determine the rating given. In some cases, a natural scale, such as cost estimates or other directly measurable factors, was used to rank and then rate the alternatives. In other cases, a judgement had to be applied in scoring each alternative. The rating was done on a "relative" basis. In other words, the rating is not an absolute score but a rating that reflects how well one option does against another option.

The ratings are shown in Appendix B, including a notation as to why a rating was given for each goal for each option.

2.4 Weighting the Objectives

The TBL methodology allows for weighting of the objectives to reflect the importance of any one objective relative to the other objectives in the evaluation. The weighting can be "nested" within each of the TBL elements (Social, Economic, and Environmental). The weight between each of these elements can be the same, while the weight between objectives within the elements can vary, depending on the importance of the objectives. The weight between the TBL elements (Social, Economic, and Environmental) can be varied, depending on the relative importance of each element. The consultant team gave equal weight to each of the elements and chose to vary the weighting between the TBL elements only as a sensitivity test. This approach does not impose our judgement (or bias) of the importance of each element to the CRD.

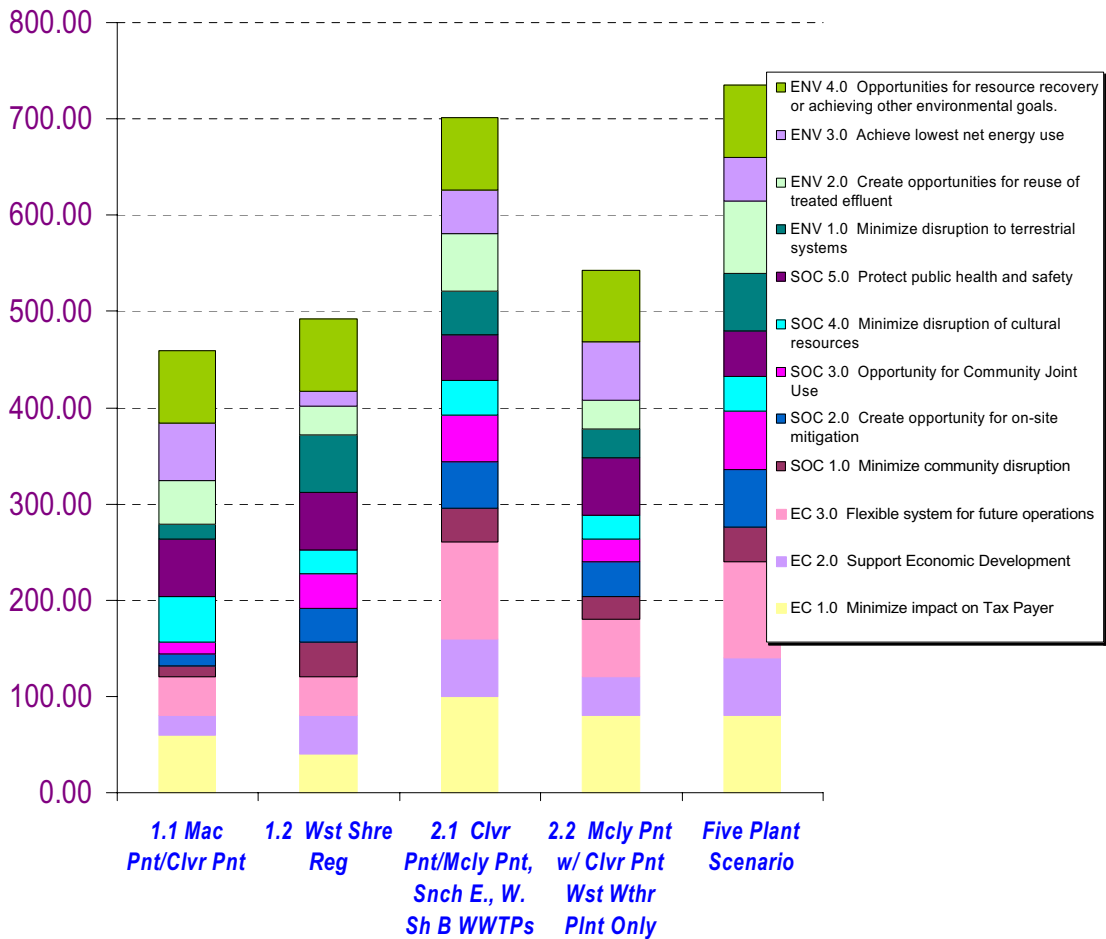
A total of 180 points (or 60 points for each TBL element) was used for weighting in the Base Case. In a sensitivity analysis, the weighting of the elements was changed to emphasize one element over each of the others. The result of the sensitivity analysis showed no change in the rank of the five options. The results of the Base Case, equal weighting of all elements, is shown in Attachment C.

The overall results of the sensitivity tests are discussed in Section 3 of this paper and presented in Attachment D.

3 TBL Evaluation

The rating of how each of the five options met a particular goal was first carried out. This was done by reviewing the relevant criteria and applying an overall rating. The ratings are shown in Appendix B. The weighting for each objective was assigned and applied to the ratings. The Weights are shown in Attachment E. The results of the TBL Base Case evaluation are shown below in graphic form. The presentation of the numerical ratings for each option is shown in Attachment C.

**Triple Bottom Line
 Base Case - All TBL Elements Weighted Equal**



4 Discussion

4.1 The Base Case

The TBL evaluation resulted in two of the five wastewater systems, Option 2-1 and Option 3-1, achieving the goals and objectives better than any of the other options. Option 2-2 was a close third to the higher scoring alternatives.

4.2 Sensitivity to Element Weighting

The sensitivity to weighting does not change the relative position of any of the options (Attachment D).

When Social objectives are weighted 20% greater than the Economic or Environmental objectives, there is little shift in the relative position of each alternative. Option 2-2 declined in its performance relative to the other alternatives in this analysis.

When Economic objectives are weighted 20% greater than the other objectives, the ranking does not change. However, the relative position of the preferred alternatives became much closer, and Option 2-2 did not shift relative to the two best performing options.

When the Environmental objectives are weighted 20% greater than the other objectives, Options 2-1 and 2-2 move slightly apart, with Option 3-1 showing a bit better performance. However, both Options 2-1 and 2-2 remain distinctly better system performers than any of the other options.

4.3 Low Ratings – What do They Mean?

While one examines how the goals would be achieved by each option, it is important to note those goals that are ranked low and are thus not achieved particularly well. These “lower ratings” indicate opportunities for mitigation and areas where more attention should be given during preliminary design and environmental assessment stages of the project.

The lowest scoring goals for all the options were:

- support economic development
- minimize community disruption
- lowest net energy.

In a developed urban situation, such as the core area of the CRD, it is difficult to demonstrate that any of the options would definitively support additional economic development. Community disruption during construction and during operations can be mitigated through numerous measures that will be assessed during preliminary design. Moving from no wastewater treatment to a higher level of wastewater treatment will require additional energy expenditure. The selected wastewater management strategy however can be optimized through the application of energy saving

measures, through biogas utilization or wastewater heat recovery.

5 The Conclusions

The five options that have developed are not definitive schemes, but rather possible strategies. As discussed in previous discussion papers, they are not “black and white” and in fact may well be blended in terms of the concepts they represent. With this in mind, it is possible to draw several conclusions from the high ranking of Options 2-1 and 3-1. These are:

- The development patterns, the coastal geography, the existing infrastructure with its significant wet weather flow issue and opportunities for future reuse all make a more decentralized approach attractive. This is reinforced by the economic analysis that shows that this approach is cost effective.
- The Clover Point plant should be a wet weather facility only. This will allow the site to continue with its current usage as a public park. All works would be located underground, in a similar manner to the existing preliminary treatment works.
- A secondary treatment plant at the Macaulay Point site is the most realistic option for the “centralized” plant. Based on the decentralized wastewater management strategy, this plant would be smaller, as the flow reaching the plant would be reduced. Additional land is required from the DND. The timing of this is uncertain. It will be very important that the CRD work with the District of Esquimalt and DND to develop a site layout that accommodates both the needs for wastewater treatment, as well as the needs of the community and the DND activities.
- The number of decentralized “liquid stream treatment only” plants needs to be considered in more detail in the latter stages of planning. This strategic direction provides the flexibility to incorporate concepts of reuse / recycling in local developments in the future decades. The critical component of this direction is to ensure that decisions on the conveyance system and “centralized” treatment facilities are compatible with concept that decentralized facilities will accommodate the major share of the future growth.

The conclusions can now be used to develop a response to the Ministry of Environment and to form a strategic path forward in more detailed planning and public consultation on the future wastewater management direction.

Attachment A

Sustainability Criteria

Social/Community	Economic	Environmental
Goal 1.0: Minimize community disruption	Goal 1.0: Minimize impact on tax payers	Goal 1.0: Minimize disruption to natural areas
Criteria 1.1 – No detectable odours	Criteria 1.1 – Lowest life-cycle costs	Criteria 1.1 – Avoid removal or diminishing of wetlands and wetland values
Criteria 1.2 – Meet or do better than community standards for noise decibels	Criteria 1.2 – Site/conveyance configuration provides opportunity for phased implementation	Criteria 1.2 – Avoid disruption of rare or endangered species or rare habitats
Criteria 1.3 – Minimize traffic disruption during construction	Criteria 1.3 – Opportunity to optimize existing wastewater infrastructure	Criteria 1.3 – Avoid removal or disruption of fish spawning and rearing areas
Criteria 1.4 – Minimize traffic disruption during operations	Criteria 1.4 – Opportunity for partnerships in energy and waste management	Criteria 1.4 – Avoid sensitive marine and terrestrial habitat areas
Criteria 1.5 – No detectable vibration		Criteria 1.5 – Avoid critical green / blue space areas
		Criteria 1.6 – Avoid removal of land from the Agricultural Land Reserve
Goal 2.0: Create opportunity for on-site mitigation	Goal 2.0: Support economic development	Goal 2.0: Create opportunities for reuse of treated effluent
Criteria 2.1 – Site can be screened and or buffered from view	Criteria 2.1 – Site provides opportunity for future expansion to support community growth	Criteria 2.1 – Treatment technology and site/conveyance configuration maximizes potential for water reuse
Criteria 2.2 – Restoration of brown-field/redevelopment possible	Criteria 2.2 – Site provides opportunity for future expansion to meet regulatory requirements	Criteria 2.2 – Site/configuration provides proximity to identified reuse sites
	Criteria 2.3 – Site provides opportunity for re-development of existing land uses	Criteria 2.3 – Site/configuration provides opportunity for stream and groundwater augmentation
	Criteria 2.4 – Support opportunities for environmental research or operator training	Criteria 2.4 – Provide opportunity for environmental improvement or mitigation

Social/Community	Economic	Environmental
Goal 3.0: Site offers opportunity for community joint use	Goal 3.0: Flexible system for future operations	Goal 3.0: Achieve lowest net energy use
Criteria 3.1 – Community recreational opportunities can be developed on-site	Criteria 3.1 – Flow management options are increased	Criteria 3.1 – Site and conveyance configuration maximize use of gravity flow
Criteria 3.2 – Environmental education opportunities can be developed on-site	Criteria 3.2 – Total conveyance length and pump station requirements reduce asset “cost of ownership”	Criteria 3.2 – Treatment technology has lowest net energy requirements
		Criteria 3.3 – Site and conveyance configuration provide opportunities for energy development through heating and cooling systems
Goal 4.0: Minimize disruption of cultural resources		Goal 4.0: Opportunities for resource recovery or achieving other environmental goals
Criteria 4.1 – Avoid disruption or removal of historic, cultural, or archaeologically significant resources		Criteria 4.1 – Maximize use of biosolids in land reclamation, silviculture, and agriculture
		Criteria 4.2 – Provide opportunities for diversified biosolids use
Goal 5.0: Protect public health and safety		Criteria 4.3 – Reduce discharge of untreated wet weather flows
Criteria 5.1 – Minimize chemical use and storage		Criteria 4.4 – Reduce discharge of sanitary sewer overflows
Criteria 5.2 – Minimize overflows and spills		Criteria 4.5 – Reduce the emission of greenhouse gases
		Criteria 4.6 – Reduce the transportation requirements for site access or materials transport

Attachment B

Triple Bottom Line Evaluation – Ratings

Triple Bottom Line Categories	Criteria	Sub-Criteria	Ratings				
			1.1 Macaulay Point/Clover Point	1.2 West Shore Regional	2.1 Clover Point/Macaulay Point, Saanich East, West Shore B WWTPs	2.2 Macaulay Point with Clover Point as a Wet Weather Plant Only	3.1 Five Plant Scenario
Economic	1.0 Minimize impact on tax Payer	1.1 Lowest life-cycle costs					
		1.2 Provides opportunity for phased implementation	3.0	2.0	5.0	4.0	4.0
		1.3 Opportunity to optimize existing wastewater infrastructure					
		1.4 Opportunity for partnerships in energy and waste management					
	2.0 Support economic development	2.1 Opportunity for future expansion to support community growth					
		2.2 Opportunity for future expansion to meet regulatory requirements	1.0	2.0	3.0	2.0	3.0
		2.3 Opportunity for redevelopment of existing land uses					
		2.4 Opportunities for environmental research or operator training					
	3.0 Flexible system for future operations	3.1 Flow management options are increased	2.0	2.0	5.0	3.0	5.0
		3.2 Total conveyance length and pump station requirements reduce asset "cost of ownership"					

Triple Bottom Line Categories	Criteria	Sub-Criteria	Ratings				
			1.1 Macaulay Point/Clover Point	1.2 West Shore Regional	2.1 Clover Point/Macaulay Point, Saanich East, West Shore B WWTPs	2.2 Macaulay Point with Clover Point as a Wet Weather Plant Only	3.1 Five Plant Scenario
Social	1.0 Minimize community disruption	1.1 No detectable odours					
		1.2 Meet or be below community decibels standards					
		1.3 Minimize traffic disruption during construction	1.0	3.0	3.0	2.0	3.0
		1.4 Minimize traffic disruption during operations					
		1.5 No detectable vibration					
	2.0 Create opportunity for on-site mitigation	2.1 Screen or buffered from view	1.0	3.0	4.0	3.0	5.0
		2.2 Restoration of brownfield/redevelopment possible					
	3.0 Opportunity for Community Joint Use	3.1 Community recreational opportunities can be developed on-site	1.0	3.0	4.0	2.0	5.0
		3.2 Environmental education opportunities can be developed on-site					
	4.0 Minimize disruption of cultural resources	4.1 Avoids disruption or removal of historic, cultural, or archaeologically significant resources	4.0	2.0	3.0	2.0	3.0
5.0 Protect public health and safety	5.1 Minimizes chemical use and storage	5.0	5.0	4.0	5.0	4.0	
	5.2 Minimizes overflows and spills						

Triple Bottom Line Categories	Criteria	Sub-Criteria	Ratings				
			1.1 Macaulay Point/Clover Point	1.2 West Shore Regional	2.1 Clover Point/ Macaulay Point, Saanich East, West Shore B WWTPs	2.2 Macaulay Point with Clover Point as a Wet Weather Plant Only	3.1 Five Plant Scenario
Environmental	1.0 Minimize disruption to natural areas	1.1 Avoids removal or diminishing wetlands and wetland values					
		1.2 Avoids disruption of rare or endangered species or rare habitats					
1.3 Avoids removal or disruption of fish spawning and rearing areas		1.0	4.0	3.0	2.0	4.0	
1.4 Avoids sensitive marine and terrestrial habitat areas							
1.5 Avoid critical green / blue space areas							
1.6 Avoid removal of land from the Agricultural Land Reserve							
	2.0 Create opportunities for reuse of treated effluent	2.1 Treatment technology and site/ conveyance configuration maximizes potential for water reuse					
		2.2 Site/configuration provides proximity to identified reuse sites					
		2.3 Site / configuration provides opportunity for stream and groundwater augmentation	3.0	2.0	4.0	2.0	5.0
		2.4 Provide opportunity for environmental improvement or mitigation					

Triple Bottom Line Categories	Criteria	Sub-Criteria	Ratings				
			1.1 Macaulay Point/Clover Point	1.2 West Shore Regional	2.1 Clover Point/Macaulay Point, Saanich East, West Shore B WWTPs	2.2 Macaulay Point with Clover Point as a Wet Weather Plant Only	3.1 Five Plant Scenario
		3.1 Site and conveyance configuration maximizes use of gravity flow					
	3.0 Achieve lowest net energy use	3.2 Treatment technology has lowest net energy requirements	4.0	1.0	3.0	4.0	3.0
		3.3 Site and conveyance configuration provides opportunities for energy development through heating and cooling systems					
	4.0 Opportunities for resource recovery or achieving other environmental goals	4.1 Maximize use of biosolids in land reclamation, silviculture, and agriculture					
		4.2 Provides opportunities for diversified biosolids use					
		4.3 Reduce discharge of untreated wet weather flows	5.0	5.0	5.0	5.0	5.0
		4.4 Reduce discharge of sanitary sewer overflows					
		4.5 Reduce emissions of greenhouse gases					
		4.6 Reduce the transportation requirements for site access or materials transport					
		Sum	31.0	34.0	46.0	36.0	49.0

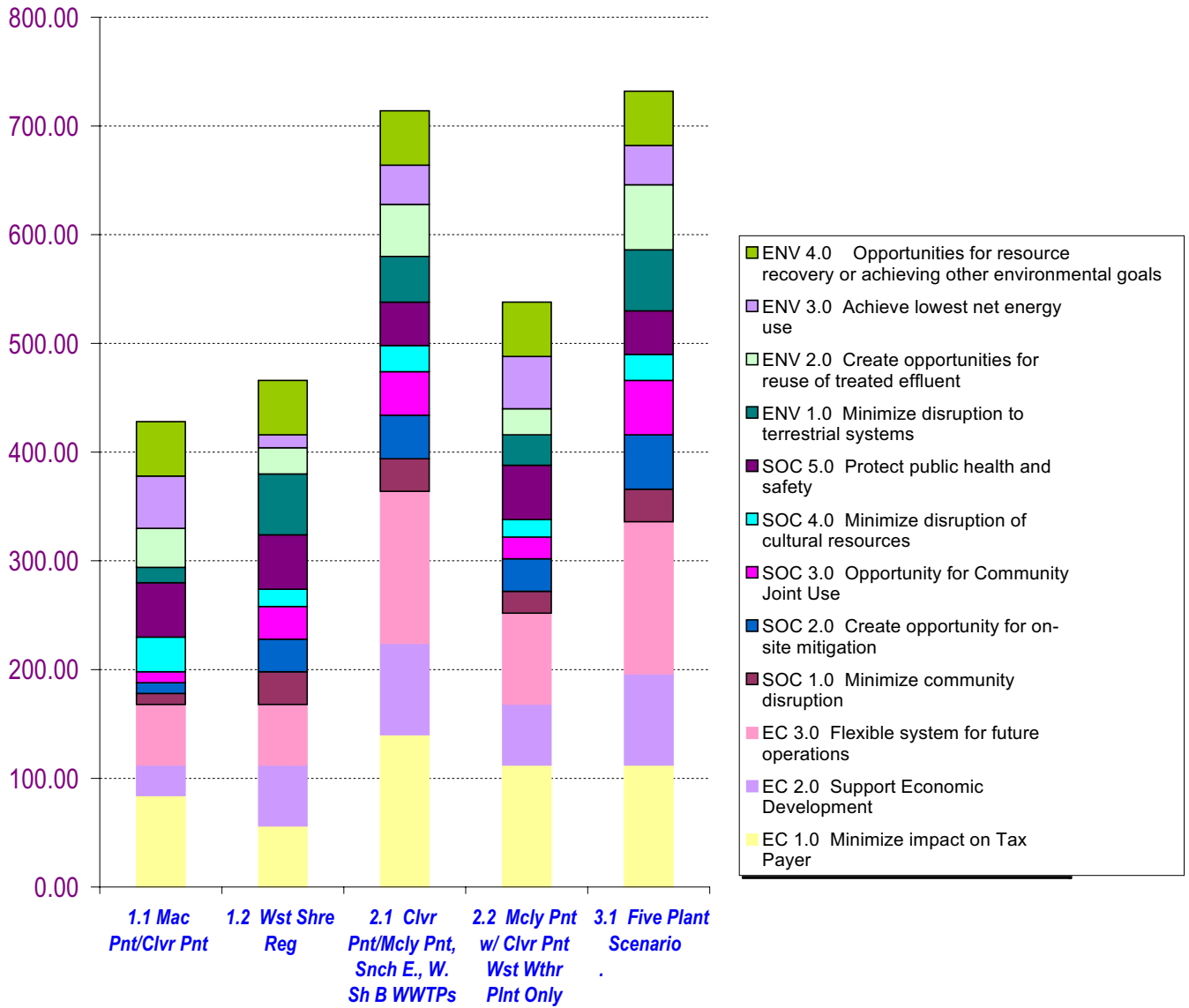
Attachment C

Triple Bottom Line Evaluation Base Case – Equal Weight Numerical Ratings

Triple Bottom Line Categories	Option 1-1 Macaulay Point/ Clover Point	Option 1-2 West Shore Regional	Option 2-1 Clover Point/ Macaulay Point, Saanich East, West Shore B WWTPs	Option 2-2 Macaulay Point with Clover Point as a Wet Weather Point Only	Option 3-1 Five Plant Scenario
Economic	120.00	120.00	260.00	180.00	240.00
Social	144.00	192.00	216.00	168.00	240.00
Environmental	195.00	180.00	225.00	195.00	255.00
SUM	459.00	492.00	701.00	543.00	735.00

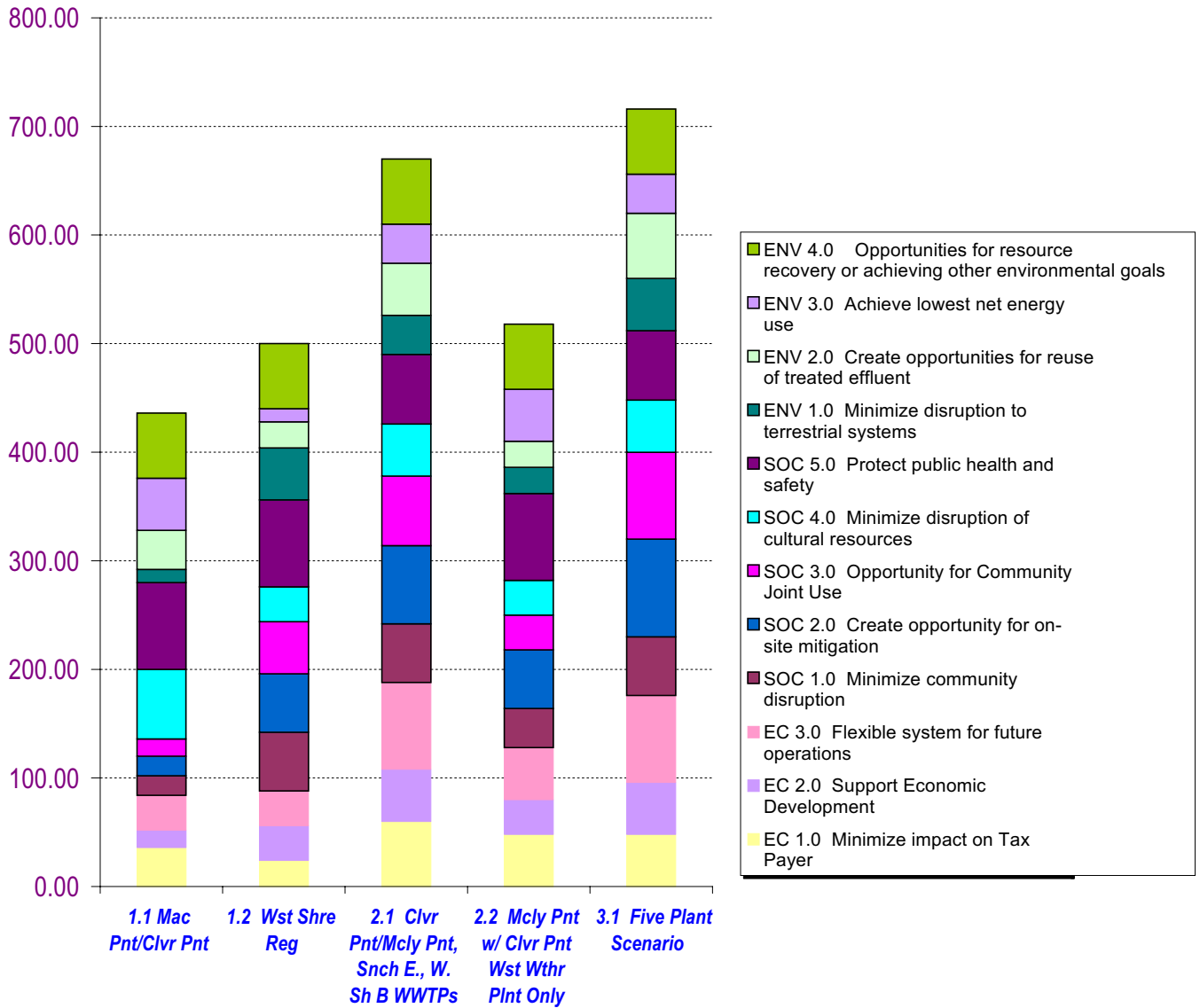
Attachment D1

Triple Bottom Line Evaluation Economic Criteria Increased 20%



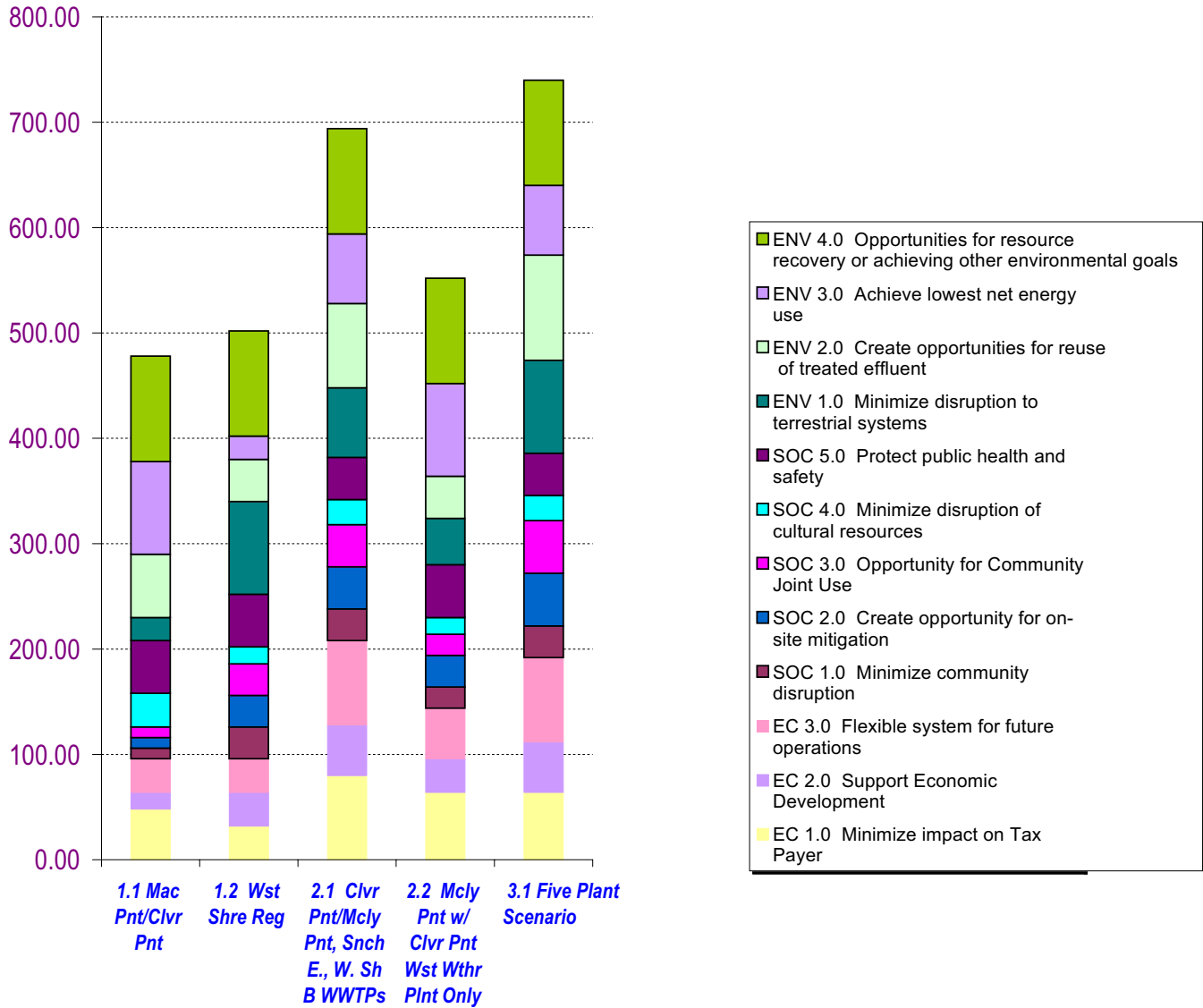
Attachment D2

Triple Bottom Line Evaluation Social Criteria Increased 20%



Attachment D3

Triple Bottom Line Evaluation Environmental Criteria Increased 20%



Attachment E

Triple Bottom Line Evaluation

Base Case

Weights

Categories	Criteria	Points
Economic	Minimize impact on tax payers	20.0
	Support economic development	20.0
	Flexible system for future operations	20.0
Social	Minimize community disruption	12.0
	Create opportunity for on-site mitigation	12.0
	Opportunity for community joint use	12.0
	Minimize disruption of cultural resources	12.0
	Protect public health and safety	12.0
Environmental	Minimize disruption to natural areas	15.0
	Create opportunities for re-use of treated effluent	15.0
	Achieve lowest net energy use	15.0
	Opportunities for resource recovery or achieving other environmental goals	15.0