Summary Report

Planning and Technical Study on Water & Wastewater Servicing in the Calgary Region

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CALGARY REGIONAL PARTNERSHIP
Thinking regionally... acting locally

submitted by

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Summary Report – Revision 1

Planning and Technical Study on Water & Wastewater Servicing in the Calgary Region

Prepared for

Calgary Regional Partnership (CRP)

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Certification

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Executive Summary

This report provides a summary of the key findings of the Calgary Regional Partnership (CRP) Regional Servicing Study. The objectives of this project were to develop technical water and wastewater servicing solutions for the Calgary region that address the issues surrounding water supply, wastewater disposal, water conservation, and practices related to water and wastewater servicing and management.

Summary of Study Findings

Key findings of the study are summarized below:

- The Lieutenant Governor in Council (Alberta Provincial Cabinet) approved the Water Management Plan for the South Saskatchewan River Basin on August 30, 2006 through an Order in Council. The Plan recommended that the Province no longer accept applications for new license allocations of water in the Oldman, Bow, and South Saskatchewan sub-basins. Alberta Environment has the responsibility to consider the applications made prior to August 30, 2006, the date when the plan was approved. These reviews will be based on a series of criteria specific to the date on which an application was received and the regulatory rules in place at those times. Alberta Environment has stopped accepting applications, and respecting the recommendation of the plan, no new applications for licenses will be accepted after August 30, 2006.

- Population projections used for this study were primarily based on the Calgary Regional Economic Forecast (CREF) transportation model. It is important to note that the Calgary region does not have an overall regional land-use plan to provide a framework for servicing. The findings of this study should be revisited as the Regional Growth and Sustainability Framework project progresses.

- At today's water consumption rates, several communities face water licensing shortages within the 2030 planning horizon of this study, as their projected growth exceeds their existing licensed allocations.

If the water conservation objectives of the Alberta Environment Water for Life Strategy (30 percent reduction in water use by 2030) were adopted by all communities in the CRP, the following communities would face license shortages within the 2030 planning horizon of this study:

  - Okotoks (2012)
  - Strathmore (2015)
  - Cochrane (2031)

- Any new developments in the Municipal Districts of Rocky View, Bighorn, and Foothills, and the County of Wheatland that do not hold a water license will require water license transfers or external water supply.

- A comparison of the total projected municipal demand for the entire CRP region and the total existing municipal license capacity suggests that, as an aggregate, existing license capacity in the region is sufficient to meet projected municipal demands to at least 2075.
- For the Sheep River, insufficient water is available in the river itself to meet the projected municipal demand in 2075, even with a 30 percent water use reduction. Long-term supply strategies will need to consider water supply from the Bow or Highwood Rivers for future growth in the Sheep watershed or restrictions on growth in this area.
- For the Highwood River, projected municipal demands with 30 percent conservation will exceed the existing municipal license capacity on that river by 2010. Long-term supply strategies will need to consider water supply from the Bow River or significant water license transfers from agricultural/industrial users for future growth in the Highwood watershed or restrictions on growth in this area.
- Triple Bottom Line (TBL) scoring of water supply alternatives was most affected by licensing, operations, community safety, and implementation issues.
- The following water supply alternatives appear to be most cost-effective, based on the TBL analysis and project costs developed in this study.

TABLE 1
Summary of Most Cost-Effective water Supply Alternatives

Service Area	Most Cost-Effective Alternatives
A – Banff, Bighorn, Canmore	Independent systems in Banff and Canmore
B1 – Bearspaw	Regional supply from Calgary
B2 – Hwy 1, Cochrane	Regional supply from Calgary
B3 – Hwy 8	Regional supply from Calgary
C – Calgary North	Regional supply from Calgary
D – Calgary East	Regional supply from Calgary
E1 – South, Okotoks	Regional supply from Calgary or Regional supply from Okotoks*
E2 – South, High River	Independent Water Treatment Plants (WTPs)* or Regional supply from High River*

*These alternatives will require additional water license capacity.

- TBL scoring of wastewater servicing alternatives was most affected by source water contamination, operations, community safety, and water movement issues.
- Based on the TBL analysis and project costs developed in this study, the following wastewater servicing alternatives appear to be most cost-effective.

TABLE 2
Summary of Most Cost-Effective Wastewater Servicing Alternatives

Service Area	Most Cost-Effective Alternatives
A – Banff, Bighorn, Canmore	Independent systems in Banff and Canmore
B1 – Bearspaw	Regional servicing from Calgary
B2 – Hwy 1, Cochrane	Regional servicing from Calgary
B3 – Hwy 8	Regional servicing from Calgary
C1 – Crossfield	Regional servicing from Calgary
C – Calgary North	Regional servicing from Calgary
D – Calgary East	Sub-regional systems at Strathmore and Langdon
E1 – South, Okotoks	Sub-regional system at Okotoks or Independent wastewater treatment plants (WWTPs)
E2 – South, High River	Independent WWTPs

- The TBL results were unable to account for land-use issues and should be revisited upon completion of the CRP Regional Growth and Sustainability Framework project.
- The total estimated capital cost for the water and wastewater systems, as recommended, is in the order of $710,000,000.

Next Steps

This project represents the first step in the assessment of regional servicing options in the CRP. Further work is required before the alternatives listed above can be implemented. The key tasks required to move forward are summarized below:

- Individual communities should review the TBL results for their service area to critically assess which alternative is the most cost-effective for addressing the unique servicing challenges and overall goals of their communities.
- Communities that are interested in co-operating on regional systems should establish regional working groups to move forward on implementation. Discussion should include the following issues:
  - Which communities will be serviced by the regional system?
  - What governance structure will be used?
  - Are there land-use issues that need to be resolved by the regional partners?
  - What levels of growth will the regional system support?

  - Do the servicing alternatives follow the direction of the ongoing Regional Growth and Sustainability Framework project?
  - What grant opportunities are available?
- Opportunities exist for regional systems servicing the smaller communities in the Municipal Districts of Rocky View, Bighorn, and Foothills, and the County of Wheatland. Detailed analysis of these small systems was not within the scope of this regional study. These opportunities should be examined further on a sub-regional basis.
- Once general agreement has been reached by the regional partners, preliminary engineering tasks can begin for the required infrastructure in each area.

Contents

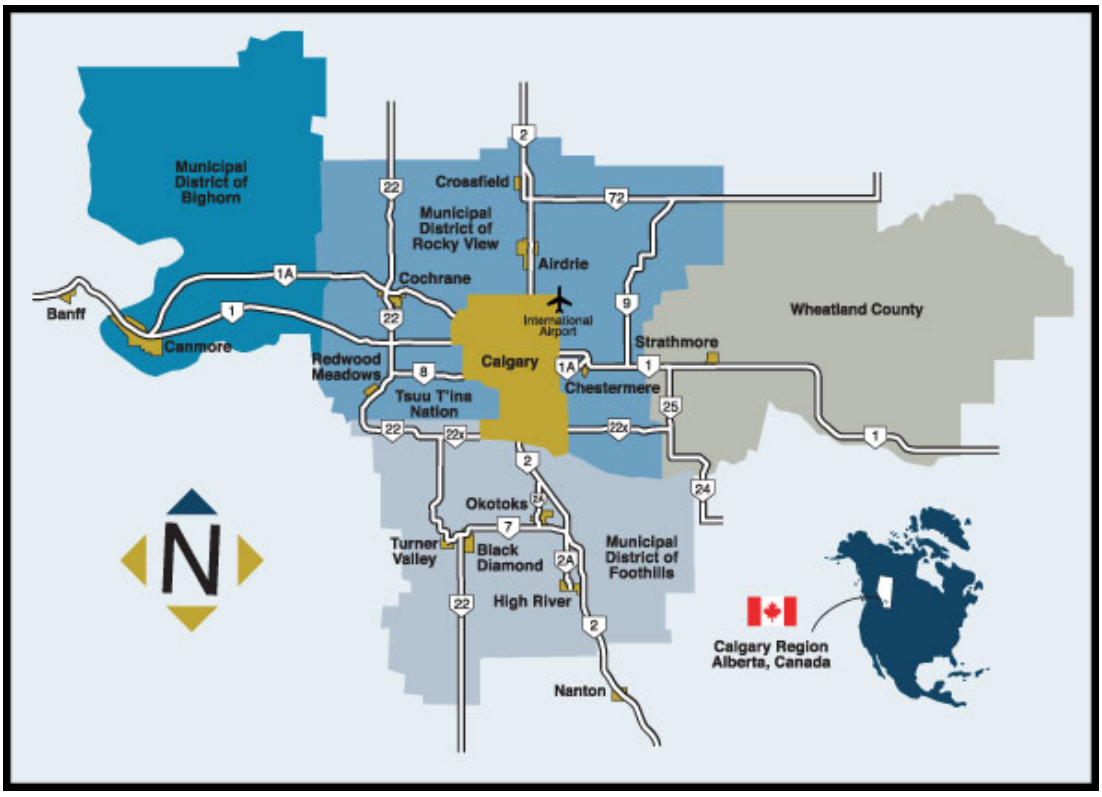
Tables

Figures

1. Introduction

This report summarizes the findings of the Calgary Regional Partnership (CRP) Regional Servicing Study. This regional water and wastewater master plan examined servicing options for the 19 CRP members, which are shown in Figure 1.

FIGURE 1
Map of Participating Members of the Calgary Regional Partnership



The objectives of this project were to develop large-scale sustainable water and wastewater servicing solutions for the Calgary region that address the issues surrounding water supply, wastewater disposal, water conservation, and practices related to water and wastewater servicing and management. Servicing alternatives were analyzed using a Triple Bottom Line (TBL) approach that includes the following criteria:

1. Economic – The recommended infrastructure and management systems should be cost effective to implement and should enhance the CRP member communities' abilities to attract municipal and industrial development.
2. Environmental – The recommended infrastructure and management systems should protect and preserve the local environment, minimize adverse impacts on water quality, minimize energy usage, and conserve resources.

3. Social - The recommended infrastructure and management systems should protect public health, minimize the risk of water quality degradation for potable and recreational uses, and ensure security of water supply.

Detailed background and technical information has been presented in a series of Technical Memoranda (TM) that are listed in Table 1. These TMs are attached to this Summary Report on a CD and are available on the calgaryregion.ca web site. The major findings of these TMs are highlighted in this report.

TABLE 1
List of Technical Memoranda

TM	Title
1.1	Existing Infrastructure and Operating Practices in the Calgary Region
2.1	Review of Water Management Initiatives within the Calgary Region
2.2	Review of External Initiatives
3.1	Population Projections
3.2	30-Year Water Usage and Wastewater Generation Projections
4.1	Short- and Long-Term Servicing Challenges
5.1	Short-List of Regional Servicing Alternatives
5.2	Analysis of Regional Servicing Alternatives
5.3	Decision Analysis
6.1	Summary of TBL Analysis

2. Review of Existing Resources and Infrastructure

TM 1.1, "Existing Infrastructure and Operating Practices in the Calgary Region", summarized the existing water resources and water and wastewater infrastructure within the region.

2.1 Water Resources

There are both surface water and groundwater resources being used in the region. Most of the larger communities in the Region obtain their drinking water from the Bow River and its tributaries. Some communities within the Municipal District of Rocky View obtain their drinking water from the Red Deer River. With the exception of Banff and Canmore, groundwater use is limited to smaller communities and private properties. Based on existing groundwater data, groundwater is not a viable, sustainable water source for the larger communities in the CRP, or on a regional basis.

It is important to recognize the difference between groundwater and groundwater under the direct influence of surface water (GUDI). True groundwater sources are licensed differently, and have reduced treatment requirements compared to GUDI groundwater sources. GUDI sources are licensed as and require the same treatment requirements as surface water sources. Most communities in the CRP with water supply wells adjacent to rivers are considered as GUDI groundwater sources.

For each community in the CRP, the availability of water licenses is an important consideration in evaluating the future capacity of water supply facilities. TM 1.1 summarizes the existing water license allocation and the approximate capacity remaining for the largest municipal water users in the CRP.

2.2 Water Infrastructure

The City of Calgary's two large water treatment plants (WTPs) supply the residents of Calgary, as well as the communities of Airdrie, Chestermere, and portions of the Tsuu T'ina Nation. Several other communities are considering a connection to the Calgary water supply. Most other incorporated communities are served by a local WTP. The Town of Crossfield receives treated water from the Anthony Henday WTP in Innisfail via a regional pipeline.

Several small regional systems are in place to serve small communities in rural areas, as well as to service rural or commercial properties in the areas adjacent to some communities. Rural residential areas have a large number of very small systems that serve individual properties and subdivisions.

2.3 Wastewater Infrastructure

There are two large wastewater treatment plants (WWTPs) in the City of Calgary, and a third is now under construction. These plants accept wastewater from Calgary, as well as the communities of Airdrie, Chestermere, Cochrane, portions of the Tsuu T'ina Nation, and several other small customers. The City of Calgary WWTPs treat wastewater to a "tertiary treatment" standard, the highest standard currently regulated in Alberta. This standard includes ammonia and phosphorous removal (nutrient removal) and effluent disinfection, as well as biochemical oxygen demand (BOD) and total suspended solids (TSS) removal. Tertiary treatment is also in place in Banff, Canmore, Heritage Pointe, Langdon, Nanton, and Okotoks.

Most of the larger incorporated communities in the Region use mechanical WWTPs or aerated wastewater lagoons. Lagoons treat to a "secondary treatment" standard, which is acceptable for discharges to less sensitive reaches of receiving streams.

For the smaller communities in the region, facultative sewage lagoons are used for wastewater treatment. Septic systems are used for wastewater treatment in some very small communities and rural residential areas.

3. Review of Water Management Initiatives

As part of this study, existing information on water and wastewater management from both inside and outside the Region was reviewed to determine how it may affect the recommendations developed in this study.

TM 2.1, "Review of Water Management Initiatives within the Calgary Region," provided an overview of water licensing and management in Alberta, summarized several key water management regulatory and guidance documents, reviewed environmental documents pertaining to local watersheds, and provided an overview of groundwater resources in the CRP.

Several Water Management Plans are being developed based on Alberta Environment's *Framework for Water Management Planning*. These plans will have a significant impact on water management. Once they are approved, they must be considered when decisions are being made on any new water licenses or approvals.

TM 2.1 identified several key issues that will affect the CRP Regional Servicing Study, including the following items:

- The Lieutenant Governor in Council (Alberta Provincial Cabinet) approved the Water Management Plan for the South Saskatchewan River Basin on August 30, 2006 through an Order In Council. The Plan recommended that the Province no longer accept applications for new license allocations of water in the Oldman, Bow, and South Saskatchewan sub-basins. Alberta Environment has the responsibility to consider the applications made prior to August 30, 2006, the date when the plan was approved. These reviews will be based on a series of criteria specific to the date on which an application was received and the regulatory rules in place at those times. **Alberta Environment has stopped accepting applications, and respecting the recommendation of the plan, no new applications for licenses will be accepted after August 30, 2006.**
- A regulatory framework is in place to allow the transfer of existing water licenses from license holders to others or to sell water to others. Although several water license transfers have occurred in the Old Man River basin, a viable market for water licenses has not been established for the Bow River basin.
- In 2005, approximately 46 percent of the average annual natural flows of the Bow River were either diverted or consumed, and many of the existing licenses were being underused. At the lowest reaches of the river, 68 percent of the average flows had been allocated for withdrawals. During low flow years, these allocations can be as high as 80 percent.
- Irrigation is the largest user of water in the basin, accounting for over 76 percent of the total allocations. As irrigation demands increase, it is likely that irrigation practices will become more efficient (i.e., more of the diverted water will be used rather than returned as drain water), and return flows to the river will decrease. This will cause further degradation to the aquatic environment as a result of less water being available in-stream.

- Current flows are insufficient to meet the instream flow needs (IFNs) in the Bow River downstream of the major water withdrawals. With the existing allocations, restoring the flows in these reaches will be difficult.
- Hydroelectric facilities, water withdrawals, diversions, and wastewater discharges have altered the natural flows in the Bow River. Current summer flows are lower than historical, natural summer flows, which has a negative impact on fish and riparian habitat. Current winter flows are higher than historical, natural winter flows, which can be beneficial to the habitat.
- Total pollutant loadings from both stormwater and wastewater effluents are approaching the provincially-regulated limits and the assimilative capacity of the Bow River during storm events.
- Key indicators increasingly suggest that the water quality in the Elbow River upstream of Calgary is deteriorating.

TM 2.2, "Review of External Initiatives," discussed the relevant water management initiatives from outside the Calgary region. Case studies from across North America were presented in the following areas:

- Regional Utility Governance Structures
- Water Supply Allocation and Trading
- Watershed Protection

The approaches described in these case studies were intended to provide background information on the water management strategies used by others. All aspects of the approaches may not be directly applicable to the servicing challenges in the CRP.

4. Population Projections

TM 3.3, "Population Projections," summarized historical population data and existing population projections for the planning horizons of 2010, 2020, and 2030. Information from the Calgary Region Economic Forecast (CREF) Model, federal and municipal census data, and planning documents provided by the individual CRP members were used. The population projections for 2010, 2020, and 2030 were used to determine the servicing constraints for each of the member communities.

The largest source of population forecast data was the CREF model. This model is constructed and maintained by the City of Calgary and is used primarily to develop population and traffic predictions for transportation planning purposes. The area covered by the CREF model includes all areas of the CRP, with the exception of: Banff, Canmore, Municipal District of Bighorn, Nanton, and portions of Wheatland County. Data from growth studies and utility master plans commissioned by individual CRP member municipalities, as well as published Area Structural Plans, were also used, where available.

Data from the CREF model was organized according to zones, which do not necessarily correspond to municipal boundaries. The population numbers presented in this study reflect the jurisdictional boundaries in effect at the time these numbers were assembled. It is recognized that the jurisdictional boundaries may change over time, as communities grow and annex land. However, since the timing and extent of these annexations cannot be accurately predicted, current boundaries were used.

The population numbers presented in this study should be viewed as an indication of the total population in a geographic area, rather than in specific communities. The intent of the Regional Servicing Study is to identify the growth areas in the Region and determine the right solutions for servicing these areas given the economic, social, and environmental implications of water and wastewater servicing. The intent of this study is not to determine which jurisdiction should or will have growth, but to compile the growth plans of each jurisdiction and recommend rational and appropriate servicing concepts.

It is important to note that the Calgary region does not have an overall regional land-use plan. Therefore, population projections for this study were based primarily on the CREF Model. Although this model provides a good basis for future population projections on a regional basis, the model assumes that growth will be concentrated around existing municipal centres. The CREF model does not accurately account for the degree of development currently planned in the Municipal Districts and Counties. For these areas, the CREF projections were augmented by community planning documents.

A summary of the population projections used in this study, broken down by community, is shown in Table 2.

TABLE 2
Summary of Population Projections

Community/Year	2005	2010	2020	2030	2075
Airdrie	27,069	41,989	49,900	63,500	64,500
Banff	8,352	9,090	10,750	11,500	11,500
Bighorn, Municipal District of	1,298	2,800	6,800	10,900	12,900
Black Diamond	1,866	3,110	4,190	5,285	8,000
Calgary	956,078	1,124,595	1,279,508	1,419,709	1,663,631
Canmore	15,232	18,300	24,100	29,900	45,400
Chestermere	7,904	15,050	32,259	44,671	50,000
Cochrane	12,688	17,000	27,700	45,200	54,000
Crossfield	2,603	3,500	3,750	3,850	5,750
Foothills, Municipal District of	17,682	29,917	35,097	36,458	100,045
High River	9,900	15,250	19,475	22,355	22,750
Nanton	2,100	2,600	3,500	4,100	4,300
Okotoks	15,420	21,600	30,000	30,000	30,000
Redwood Meadows	1,150	1,260	1,410	1,560	3,000
Rocky View, Municipal District of	35,396	46,558	65,326	88,683	144,624
Strathmore	9,653	12,500	20,000	33,000	33,000
Tsuu Tina Nation	1,292	2,060	3,250	4,270	5,600
Turner Valley	1,786	2,600	3,500	3,900	6,000
Wheatland County	7,889	9,600	11,800	14,000	11,310
Total Population:	**1,135,358**	**1,379,379**	**1,632,315**	**1,872,841**	**2,276,310**

5. Water Usage and Wastewater Generation

5.1 Water Usage

Water usage projections were made for the years 2010, 2020, and 2030 based on the 2005 populations and water usage rates. The projections were made using the population projections summarized in TM 3.1 and the water usage rates summarized in TM 1.1.

In addition to current water usage rates, various water conservation scenarios were included in the water usage projections. The first scenario projected that the per capita water usage rates in 2005 would be maintained as each community's population increases. The per capita consumption for the Region ranged from 338 to 778 L/c/d. The average water usage rate for all communities in the CRP was 449 L/c/d in 2005.

The second scenario was based on the Water for Life initiative to achieve an overall provincial improvement in water use efficiency and productivity of 30 percent by 2015 (from a 2005 baseline). A 30 percent reduction in water usage was applied to each of the member communities to reduce the regional average water usage rate from 449 L/c/d in 2005 to 314 L/c/d in 2015. The Water for Life initiative is not only targeting municipalities, but includes agricultural and industrial users, which may not be captured by this study.

The third scenario was not as aggressive as the first; it evaluated the impact of a 15 percent reduction in water usage in each community by 2030. If each community were to reduce their water usage by 15 percent, the average regional water usage rate would decrease from 449 L/c/d in 2005 to 382 L/c/d in 2030.

The last scenario looks at a conservation approach that is between the first two scenarios. A 30 percent reduction by 2030 was applied to each community. This reduces the regional average water usage to 314 L/c/d by 2030.

Some communities have adopted formal water conservation targets; these targets were used in the analysis, rather than the scenarios listed above.

Water usage projections for individual communities are detailed in TM 3.2, "30-Year Water Usage and Wastewater Generation Projections."

5.2 Wastewater Generation

Wastewater generation projections were made for the years 2010, 2020, and 2030 based on the 2005 populations and wastewater generation rates. The projections were made using the population projections summarized in TM 3.1 and the wastewater generation rates summarized in TM 1.1.

Current per capita wastewater generation data were used for future wastewater flow projections. To be conservative, the effects of water conservation programs on reducing wastewater flows were not considered. Reduced water usage will result in lower wastewater flows, but the relationship is non-linear and varies geographically. Reduction of

the inflow and infiltration (I/I) of groundwater and/or stormwater into the sanitary sewer system can also have dramatic impacts on the need for new infrastructure. Because of the site-specific nature and complexity of the required analysis, the effects of water conservation and I/I reduction are not included in this analysis

Wastewater generation projections for individual communities are detailed in TM 3.2, "30-Year Water Usage and Wastewater Generation Projections."

6. Servicing Challenges

TM 4.1, "Short-and Long-Term Servicing Challenges," identified the short- and long-term servicing challenges in the region. The capacities of existing water licenses, potable water treatment infrastructure, and wastewater treatment infrastructure were compared to the projected water supply and wastewater generation rates that were determined in TM 3.2.

6.1 Short-Term Water Supply Challenges

The Bow River and its tributaries are the main water supply for municipal users in the Region. The closing of the South Saskatchewan River Basin to new licenses per the Provincial Order In Council means that those communities with licenses for withdrawals from the Bow River and its tributaries, including the Elbow, Sheep, and Highwood Rivers, will need to find other means of securing water once they reach the limit of their existing licenses. Options may include transferring licenses or obtaining treated or raw water from other license-holders with excess capacity.

Table 3 provides an overview of when each community in the CRP will meet the limits of their existing licenses. It was assumed that those communities with supply agreements through the Anthony Henday System based in Innisfail or with the City of Calgary would not be limited by their existing supply agreements. Their demands would continue to be met and agreements reviewed as long as the supplier has sufficient capacity in their license.

It should be noted that information for the numerous small systems in the Municipal Districts of Rocky View, Foothills, and Big Horn, and the County of Wheatland are not specifically addressed in Table 1. None of the small systems in the unincorporated districts have license capacity for the level of growth projected in these areas. Any new developments in the Municipal Districts of Rocky View, Bighorn, and Foothills, and the County of Wheatland that do not hold a water license will require water license transfers or external water supply.

Those communities highlighted in red face immediate challenges related to water supply. Those in yellow face challenges between 2010 and 2020, and those in green will face challenges beyond 2020.

The years shown in the table are based on the population projections developed in TM 3.1 and the 2005 per capita water usage summarized in TM 1.1. These challenges identified in the table may occur sooner or later, depending on actual growth rates experienced and changes to the per capita demand through water conservation programs.

On a 30-year horizon, in almost all cases, water license shortfalls can be addressed by meeting the water conservation objectives of the Water for Life Strategy (30 percent reduction by 2030). The exceptions to this are the Town of Strathmore (which is entering into a water supply agreement with the City of Calgary), the Town of Okotoks, and the Town of Cochrane (by 2031).

TABLE 3
Water Supply Capacity Challenge

Per Capita Water Usage	Year of Exceedance of Existing License/Agreement			
	Maintain Existing	15% Reduction by 2030	30% Reduction by 2030	30% Reduction by 2015
Airdrie	---------- NA ----------			
Banff	-	-	-	-
Bighorn, Municipal District of	---------- NA ----------			
Black Diamond	2020	2026	-	-
Calgary*	- *			
Canmore	2028	-	-	-
Chestermere	---------- NA ----------			
Cochrane	2022	2025	2031	-
Crossfield	---------- NA ----------			
Foothills, Municipal District of	---------- NA ----------			
High River	2012	2016	-	-
Nanton	2025	-	-	-
Okotoks **	2012**			
Redwood Meadows	2006	2006	-	-
Rocky View, Municipal District of	---------- NA ----------			
Strathmore	2012	2013	2015	2019
Tsuu T'ina Nation	---------- NA ----------			
Turner Valley	2016	2019	-	-
Wheatland County	---------- NA ----------			

*Calgary has an approved plan to reduce use by 30% in 30 years.

**Okotoks has an approved plan to reduce use to 318L/c/d by buildout, which is projected to be reached between 2015 and 2017.

6.2 Long-Term Water Supply Challenges

Table 4 provides a summary of the projected municipal water demand for the entire CRP Region, assuming that the 30 percent conservation objective recommended in the Water for Life Strategy is achieved. Demands for the no-conservation scenario are included in TM 4.1.

TABLE 4
Summary of Water Licenses and Demand in CRP Region

		2005	2010	2020	2030	2075
30 percent Reduction in Per Capita Usage by 2030						
Bow River Basin (including tributaries)	CRP Municipal Demand	205,424,396	223,555,116	233,822,831	233,014,940	282,256,395
	CRP Existing Municipal Licenses	482,287,095				
	Total Licenses and Registrations	2,692,476,706				
Bow River (including Elbow River)	CRP Municipal Demand	198,730,223	214,893,591	223,887,775	223,470,396	271,505,680
	CRP Municipal Licenses	472,548,180				
	Total Licenses and Registrations	2,503,992,147				
Sheep River	CRP Municipal Demand	2,571,060	3,572,572	**4,705,193**	4,772,057	**5,445,968**
	CRP Municipal Licenses	**4,235,828**				
	Total Licenses and Registrations	**5,972,901**				
Highwood River	CRP Municipal Demand	3,805,016	**4,950,150**	5,404,759	5,297,164	5,808,218
	CRP Municipal Licenses	**4,840,217**				
	Total Licenses and Registrations	104,054,054				

Note: All volumes are in m3/yr

A comparison of the total projected municipal demand of 282,256,395 m^3/yr for the entire CRP Region and the total existing municipal licenses of 482,287,095 m^3/yr suggests that licensed water supply capacity in the Region is sufficient to meet long-term projected municipal demands. This is primarily due to the large license held by the City of Calgary.

For the Sheep River, insufficient water is available in the river itself to meet the projected municipal demand in 2075. The existing municipal licenses of CRP communities on the Sheep River of 4,235,828 m^3/yr are insufficient to meet the demands from users in the area, even if every community reduced its per capita water usage by 30 percent by 2030. The total licenses for all users on the Sheep River (including irrigation and agriculture users) amount to 5,972,901 m^3/yr, which would be just enough to meet municipal demands if a 30 percent reduction was achieved. It is unlikely that this much water could be made available to municipal users.

Table 4 also suggests that the projected municipal demands on the Highwood River will exceed the existing CRP municipal licenses by 2010. There are several, large, non-municipal water licenses on the Highwood River, but it is unclear whether they would be available for transfer to municipal users. Approximately 1 million m^3/year of licensed capacity would need to be transferred from non-municipal license-holders to meet the projected municipal demands in 2075.

In summary, long-term supply strategies will need to consider water supply from the Bow River for future growth in the Sheep and Highwood watersheds, or restrictions will need to be placed on growth in this area.

6.3 Water Treatment Challenges

Table 5 provides an overview of when each community in the CRP is expected to meet or exceed the existing capacity of its water treatment facilities.

Further information on the nature of infrastructure upgrades required by each community is provided in TM 4.1.

TABLE 5
Water Treatment Challenges

	Year of Exceedance of Existing Infrastructure Capacity			
Per Capita Water Usage	**Maintain Existing**	**15% Reduction by 2030**	**30% Reduction by 2030**	**30% Reduction by 2015**
Airdrie	-	-	-	-
Banff	**2010**	**2014**	-	-
Bighorn, Municipal District of	---------- NA ----------			
Black Diamond	**2007**	**2007**	**2007**	**2008**
Calgary*	-- *			
Canmore	**2015**	**2019**	-	-
Chestermere	**2013**	**2014**	**2016**	**2018**
Cochrane	**2006**	**2006**	**2006**	**2006**
Crossfield	-	-	-	-
Foothills, Municipal District of	---------- NA ----------			
High River	**2008**	**2008**	**2009**	**2010**
Nanton	**2025**	-	-	-
Okotoks**	2018 **			
Redwood Meadows	-	-	-	-
Rocky View, Municipal District of	---------- NA ----------			
Strathmore	**2006**	**2006**	**2006**	**2006**
Tsuu T'ina Nation	**2017**	**2020**	**2028**	**2029**
Turner Valley	-	-	-	-
Wheatland County	---------- NA ----------			

*Calgary has an approved plan to reduce use by 30% in 30 years

**Okotoks has an approved plan to reduce use to 318L/c/d by buildout, which is projected to be reached Between 2015 - 2017

6.4 Wastewater Treatment Challenges

Table 6 provides an overview of when each community in the CRP will exceed its existing WWTP capacity, based on the per capita wastewater generation rates and population projections summarized in the previous technical memoranda.

Further information on the nature of infrastructure upgrades required by each community is provided in TM 4.1.

TABLE 6
Wastewater Treatment Challenge

	Year of Exceedance of Existing Infrastructure Capacity
Airdrie	-
Banff	-
Bighorn, Municipal District of	NA
Black Diamond	2028
Calgary	2019
Canmore	-
Chestermere	2012
Cochrane	2011
Crossfield	2007
Foothills, Municipal District of	NA
High River	2010
Nanton	-
Okotoks	-
Redwood Meadows	-
Rocky View, Municipal District of	NA
Strathmore	2011
Tsuu T'ina Nation	-
Turner Valley	See Black Diamond
Wheatland County	NA

7. Development of Regional Servicing Alternatives

To address the servicing challenges presented above and in TM 4.1, regional servicing alternatives were developed. Large-scale regional systems, sub-regional systems, as well as individual water and WWTPs were considered. Because the overall area is large, it was broken down into five service areas that were considered separately:

1. Service Area A:
   - Banff
   - Municipal District of Bighorn
   - Canmore
2. Service Area B: Calgary West
   - Calgary
   - Cochrane
   - Redwood Meadows
   - Municipal District of Rocky View
   - Tsuu T'ina
3. Service Area C: Calgary North
   - Airdrie
   - Calgary
   - Crossfield
   - Municipal District of Rocky View
4. Service Area D: Calgary East
   - Calgary
   - Chestermere
   - Municipal District of Rocky View
   - Strathmore
   - Wheatland County
5. Service Area E: Calgary South
   - Black Diamond
   - Calgary
   - Municipal District of Foothills
   - High River
   - Nanton
   - Okotoks
   - Turner Valley

A short-list of alternatives, TM 5.1, "Short-List of Regional Servicing Alternatives," was prepared in March 2007 and approved by the CRP Project Management Committee. For each alternative, conceptual designs of the required water and wastewater infrastructure were developed, and capital and operations and maintenance (O&M) costs were presented in TM 5.2, "Analysis of Regional Servicing Alternatives."

8. Triple Bottom Line Decision Framework

The alternatives developed for each service area were evaluated using a TBL Decision Framework. As part of the value modeling process, the TBL approach was applied to incorporate ***environmental***, ***social***, and ***economic*** criteria that are most appropriately associated with the regional strategy.

A preliminary decision model and draft objectives for evaluating infrastructure options using TBL criteria were developed early in the study. At a Workshop with the CRP Project Management Committee on June 19, 2006, evaluation objectives were identified under the three major TBL categories. These objectives and their weightings were later validated at a workshop involving a broader group of stakeholders that included elected officials on July 14, 2006. The decision framework is shown in Table 7.

It should be noted that the economic objectives (F1 *Encourages development and settlement patterns that are aligned with Member and CRP vision and sustainability principles;* and F2 *Provides increased capacity or potential for diversification of assessment base*) proved to be difficult to evaluate in the absence of a regional land-use plan. It was agreed that these objectives would be omitted from the analysis and revisited at a later date when the Regional Growth and Sustainability Framework project, currently underway, was completed. Project life-cycle costs were used for the economic aspect of the TBL analysis.

To provide a consistent basis for estimating life-cycle costs, the following approach was used:

Life-Cycle Cost = Capital Cost + NPV (30 years of O&M)

The cost-benefit analysis considers the "full" life-cycle cost of each alternative under consideration. Once alternatives are selected, a more detailed implementation plan can be developed taking into account other factors, such as: government grants, financing alternatives, and a forecast implementation schedule. All infrastructure costs, therefore, assumed full construction in 2007. Details of the project cost analysis can be found in TM 5.2. Details of the TBL decision analysis can be found in TM 5.3.

Table 7

Decision Framework for Analysis of Servicing Options

	Objectives	Weighting (of 120)	Percentage	Performance Measures				
				1	2	3	4	5
#	**ENVIRONMENTAL**	**41**	**34%**	**Signifcant negative impact and/or increased risks**	**Some negative impact and/or increased risks**	**No real change to status quo (risk neutral)**	**Positive Impacts and/or reduction in risks**	**Significant positive impacts and/or reduction in risks**
E1	Reduces or avoids impact on greenfield lands or utilizes existing sites and utility/infrastructure corridors	8	7%	Significant use of and/or negative impact on greenfield lands. Very limited use of existing sites or utility corridors.	Relies on use of greenfield lands. Limited use of existing sites or utility corridors.	Minimal use of greenfield lands. Mostly uses existing sites or utility corridors.	Uses only existing sites and utility / infrastructure corridors.	No impact on greenfield lands and provides opportunities for reclamation of disturbed / contaminated sites
E2	Reduces or avoids impact on environmentally sensitive areas; Maintains or enhances in-stream flows	11	9%	Significant negative impact (or increased risk) to environmentally sensitive areas and/or significantly reduces flows below existing flows or WCOs determined by AENV.	Some negative impact (or increased risk) on environmentally sensitive areas and/or minimal reduction in flows below existing flows or WCOs determined by AENV.	Minimal impact or change to environmentally sensitive areas and/or change to the in-stream flows.	Some positive improvements (or reduction in risk) to environmentally sensitive areas and/or increases to in-stream flows.	Significant improvements to environmentally sensitive areas and / or increases to in-stream flows.
E3	Minimizes adverse effects on groundwater resources	9	8%	Significant increase in risk of contamination and/or depletion of groundwater resources (including alluvial aquifers)	Some increase to risk of contamination and/or depletion of groundwater resources (including alluvial aquifers)	No (or minimal) increase to risk of contamination and / or depletion of groundwater resources. (including alluvial aquifers)	Reduces the risk of contamination and / or depletion of groundwater resources (including alluvial aquifers). Potential opportunities for groundwater recharge.	Significant reduction or elimination of risk of contamination and/or depletion of groundwater resources (including alluvial aquifers). Groundwater recharge is part of alternative.
E4	Minimizes the use of energy (and green house gas emissions) to build and operate	7	6%	Significantly increases (over existing conditions) energy consumption and green house gas emissions required to operate, and requires significant energy consumption to build (relative to typical infrastructure projects).	Some increase in energy consumption and green house gas emissions required to operate.	Maintains existing energy consumption levels and green house gas emissions. (Or levels are comparable to typical infrastructure systems.)	Decrease (from existing conditions - or similar and typical infrastructure systems) in energy consumption and green house gas emissions required to operate.	Provides opportunities for use of alternative energy sources, and / or significantly reduces energy consumption and green house gas emissions.
E5	Minimizes water diversions between sub-basins, tributaries, and/or reaches	5	5%	Requires significant transfers between sub-basins (ie Red Deer River to Bow River).	No transfers between sub-basins, but requires significant transfers between tributary streams (ie Sheep River to Bow River).	Some diversions between tributary streams, but minimal impacts	No diversions between tributary streams required, but some transfers between reaches of same river (ie Bow River Reach 4 to Reach 5).	No diversions between tributary streams or reaches.
#	**SOCIAL**	**57**	**47%**	**Signifcant negative impact and/or increased risks**	**Some negative impact and/or increased risks**	**No real change to status quo (risk neutral)**	**Positive Impacts and/or reduction in risks**	**Significant positive impacts and/or reduction in risks**
S1	Facilitates management of risks to community health and safety due to flooding, explosion, traffic impacts and accidents, chemical spills, security, and disease vectors.	9	7%	Increases the coordination, effort, and resources required to manage a higher level of risk to community health and safety.	Increases the coordination, effort, and resources required to manage an existing level of risk to community health and safety.	Maintains existing coordination, effort, and resources required to manage an existing level of risk to community health and safety.	Decreases the coordination, effort, and resources required to manage an existing level of risk to community health and safety.	Decreases the coordination, effort, and resources required to manage a lesser level of risk to community health and safety.
S2	Minimizes the risk of water quality degradation or source contamination to downstream drinking and/or recreational water users	13	11%	Significant increase in risk to water quality and source water contamination for downstream users.	Some increase in risk to water quality and source water contamination for downstream users.	No change in risk to water quality and source water contamination for downstream users.	Reduces the risk of water quality degradation or source contamination to downstream users.	Significantly reduces (or no risk) of water quality degradation or source contamination and provides opportunities for significant improvements to water quality and source water for downstream users.
S3	Provides a reliable, robust system that can be adequately staffed with qualified operators	9	8%	Alternative provides a less reliable system, a lower level of service, and requires more (new) operators with higher qualifications.	Unproven technology or high maintenance operations required; requires specialized operators and there is a high risk of not having qualified operators available at all times	Unproven technology or high maintenance operations required; requires specialized operators and there is some risk that system may not be operated as intended over longer period of time.	More reliable and robust system, requiring less specialized operations and maintenance (that may not be available). Lower levels of training or specialization required.	Proven reliable and robust system; appropriately specialized operators are always or readily available.
S4	Provides security of water supply	19	16%	Junior water license priority, frequent supply restrictions. Inadequate license capacity.	Junior water license priority, supply restrictions possible in dry and wet years. Adequate license capacity.	Medium water license priority, supply restrictions possible in dry years. Adequate license capacity.	Senior water license priority, supply restrictions possible in severe drought years. Adequate license capacity.	Senior water license priority, no supply restrictions expected. Adequate license capacity.
S5	The alternative can be easily implemented on a technical, regulatory and administrative basis.	7	6%	Alternative requires unusual (or lengthy) regulatory approvals from various agencies and extensive non-local technical expertise to design, construct, and operate relative to typical infrastructure projects. High potential to be controversial with stakeholders.	Alternative requires more typical regulatory approvals and specialized technical/construction expertise. Potential for controversy with stakeholders.	Implementation is comparable to typical infrastructure projects but may require some level of expertise or additional administration requirements.	Alternative can use locally accessible technical expertise and requires normal regulatory approvals compared to typical infrastructure projects. Additional administrative requirements may be required.	Alternative can use locally accessible technical expertise and requires minimal regulatory approvals. Low potential for controversy, and minimal additional administrative requirements.
#	**ECONOMIC**	**22**	**18%**	**Signifcant negative impact and/or increased risks**	**Some negative impact and/or increased risks**	**No real change to status quo (risk neutral)**	**Positive Impacts and/or reduction in risks**	**Significant positive impacts and/or reduction in risks**
F1	Encourages development and settlement patterns that are aligned with Member and CRP vision and sustainability principles	14	12%	Encourages development and settlement patterns that are not aligned with Member and CRP visions and principles.	Encourages development that is not fully aligned with Member and CRP visions and principles, and/or limits flexibility in long term planning.	Encourages development that may not fully align with Member and CRP visions and principles, but allows for limited flexibility in long term planning.	Encourages development and settlement patterns that are mostly aligned with Member and CRP vision and principles, and provides for flexibility in long term planning.	Encourages development and settlement patterns that are aligned with Member and CRP vision and provides flexibility in long term planning.
F2	Provides increased capacity or potential for diversification of assessment base	8	7%	Eliminates potential development opportunities for diversification of the assessment base.	Reduces infrastructure capacity and reduces the potential for development that would help diversify the assessment base. Significantly limits infrastructure capacity.	No change from existing (and planned) capacity/potential for diversification of the assessment base.	Enhances the potential for future development that would help diversify the assessment base.	Strongly supports future development potential to diversify the assessment base; also provides flexibility in future land use planning.

9. Results of Triple Bottom Line Analysis

9.1 Water Results – General

For almost all of the service areas evaluated, the regional systems originating from the City of Calgary scored highest overall on the basis of the technical objectives. Regional systems originating from the City of Calgary also had the highest cost-benefit ratios for all service areas except the southern communities of service area E2 (High River and Nanton).

9.1.1 Key TBL Objectives

The most important objectives for differentiating water servicing alternatives were:

- S4 - Security of water supply
- S3 - Operational issues
- S1 - Community safety
- S5 - Implementation

Objective S4: Water supply security was weighted heavily by stakeholders during the TBL Framework development. For service areas in which communities do not have sufficient water license capacity for projected needs, this objective was the main differentiator between a local or sub-regional system and a large-scale regional system originating in the City of Calgary.

Objective S3: Operational issues and the provision of a reliable, robust system that can be adequately staffed with qualified operators was also an important evaluation criterion. Smaller communities and Alberta Environment have repeatedly expressed concern over the ability of smaller communities to attract and retain qualified operators in Alberta's current economy. Regional systems have an advantage over local WTPs because small communities do not have to hire highly qualified treatment plant operators.

Objective S1: Community safety and risk management issues were also relatively important in differentiating between local and regional systems. There is an inherent lower level of risk associated with fewer, larger water treatment facilities because there are fewer locations for chemical deliveries and spills and reduced traffic impacts and accidents.

Objective S5: Implementation and policy issues proved to be important for many service areas. Regional systems originating from the City of Calgary can be affected by the current Calgary servicing policies that restrict the type of outside development the City will serve. For these systems, servicing policies would make implementation difficult.

To provide services for the levels of growth assumed for this study, the environmental factors of the alternatives examined were relatively unimportant, since each alternative generally had a similar environmental footprint. This study did not consider the overall environmental impacts of the growth itself or where the growth is located. It is important to stress that land-use analysis is being done as part of the Regional Growth and Sustainability Framework (Regional Land-Use Planning) project currently being undertaken by the CRP.

9.2 Wastewater Results – General

For service areas west and north of Calgary, regional wastewater systems with treatment at the City of Calgary's WWTPs tended to be the best alternative from a TBL perspective, although sub-regional systems and independent WWTPs often cost less. For service areas D and E, there were only small differences in the technical scoring between alternatives, although, again, sub-regional systems and independent WWTPs often cost less. Long pipeline distances led to high costs for many of the regional alternatives.

The most important objectives for differentiating wastewater servicing alternatives were:

- S2 - Source water contamination
- S3 - Operational issues
- S1 - Community safety
- E5 - Water movement

Objective S2: The single most important variable for scoring the wastewater alternatives was minimizing the risk of water quality degradation or source contamination to downstream drinking and/or recreational water users. Alternatives in which wastewater effluent is discharged upstream of another community's drinking water facility scored lower.

Objective S3: Operational issues and the provision of a reliable, robust system that can be adequately staffed with qualified operators also proved to be an important evaluation criterion. Smaller communities and Alberta Environment have repeatedly expressed concern over the ability of smaller communities to attract and retain qualified operators in Alberta's current economy. Regional systems have an advantage over local WWTPs because small communities do not have to hire highly qualified treatment plant operators.

Objective S1: Community safety and risk management issues were also relatively important in differentiating between local and regional systems. There is an inherent lower level of risk associated with fewer, larger water treatment facilities because there are fewer locations for chemical deliveries and spills and reduced traffic impacts and accidents.

Objective E5: The movement of water from the point of wastewater generation to other reaches of the same river, or to other sub-basins, has negative environmental consequences. Some alternatives scored poorly, as wastewater return flows were discharged to lower reaches of the same river or to other sub-basins, and were, therefore, unable to meet instream flow needs.

9.3 Service Area A: Banff, Municipal District of Bighorn, Canmore

The Town of Banff and the Town of Canmore, the largest communities in this service area, have adequate drinking water and wastewater systems. Therefore, large-scale regional systems with external water supply or wastewater treatment were not considered. However, on a local level, it would be beneficial to examine servicing the existing unincorporated communities and areas of the Municipal District of Bighorn and future

growth areas on a sub-regional basis. That analysis is not within the scope of this study but could be part of the "next steps" process.

9.4 Service Area B1: Calgary West – Bearspaw

9.4.1 Water

Servicing the Bearspaw area with drinking water through a connection to the City of Calgary had a higher score in the TBL analysis than servicing this area through an expanded Rocky View Water Co-op WTP (see Figure 2). The main issues responsible for the difference in scores were water licensing, safety, and implementation issues. The life-cycle costs for these two alternatives are very close.

9.4.2 Wastewater

Providing wastewater treatment to the Bearspaw area through a connection to the City of Calgary had a higher score in the TBL analysis compared to maintaining the existing septic systems (see Figure 3). The main issues responsible for the difference in scores were operational issues, source water protection, and safety. It should be noted that the life-cycle costs for the septic system option are shown as zero, as no major public infrastructure is required.

9.5 Service Area B2: Calgary West – Hwy 1

9.5.1 Water

Servicing the Hwy 1 and Cochrane areas with drinking water through a regional system originating in the City of Calgary had a higher score in the TBL analysis than either a regional system from Cochrane or individual WTPs (see Figure 4). The main issues responsible for the difference in scores were licensing, operation, and safety issues. The life-cycle costs for the regional systems from both Calgary and Cochrane were essentially the same. Both regional systems had lower life-cycle costs than independent WTPs.

9.5.2 Wastewater

Providing wastewater treatment to the Hwy 1 and Cochrane areas through a connection to the City of Calgary had a higher score in the TBL analysis compared to an independent WWTP in the North Springbank area (see Figure 5). The main issues responsible for the difference in scores were operational issues, source water protection, and safety. The life-cycle costs for both alternatives were essentially the same.

FIGURE 2
Area B1: TBL Results for Water Alternatives

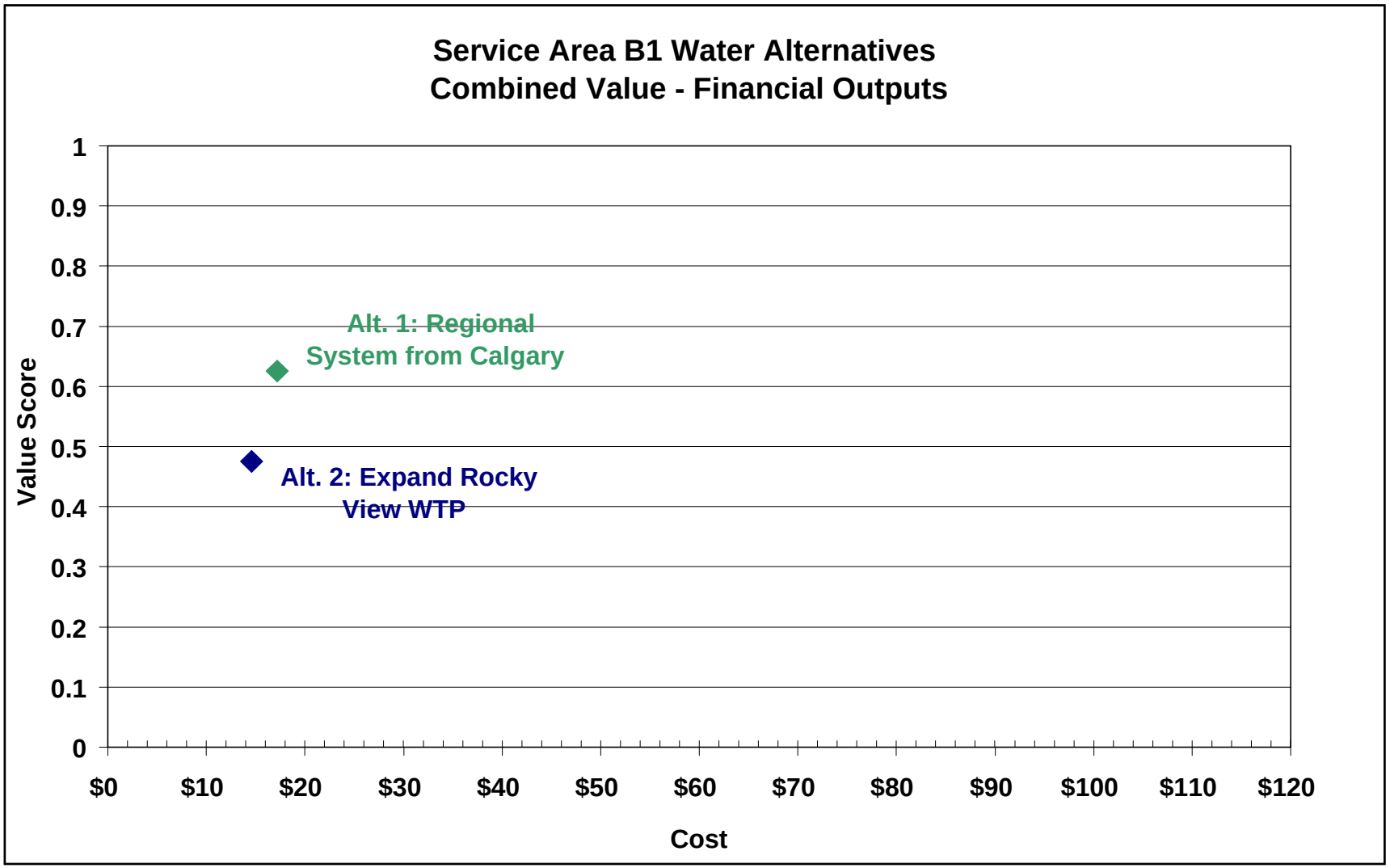


FIGURE 3
Area B1: TBL Results for Wastewater Alternatives

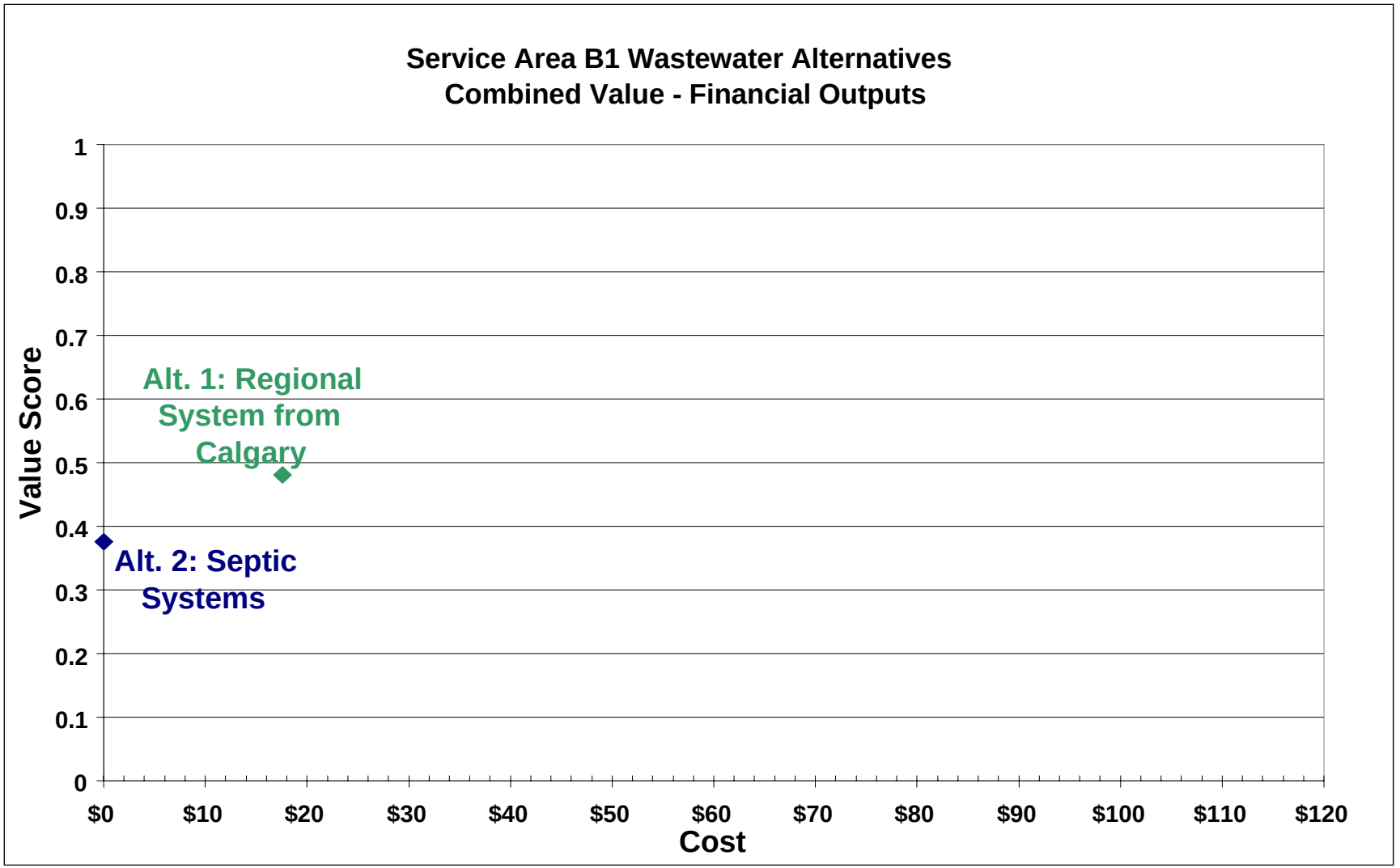


FIGURE 4
Area B2: TBL Results for Water Alternatives

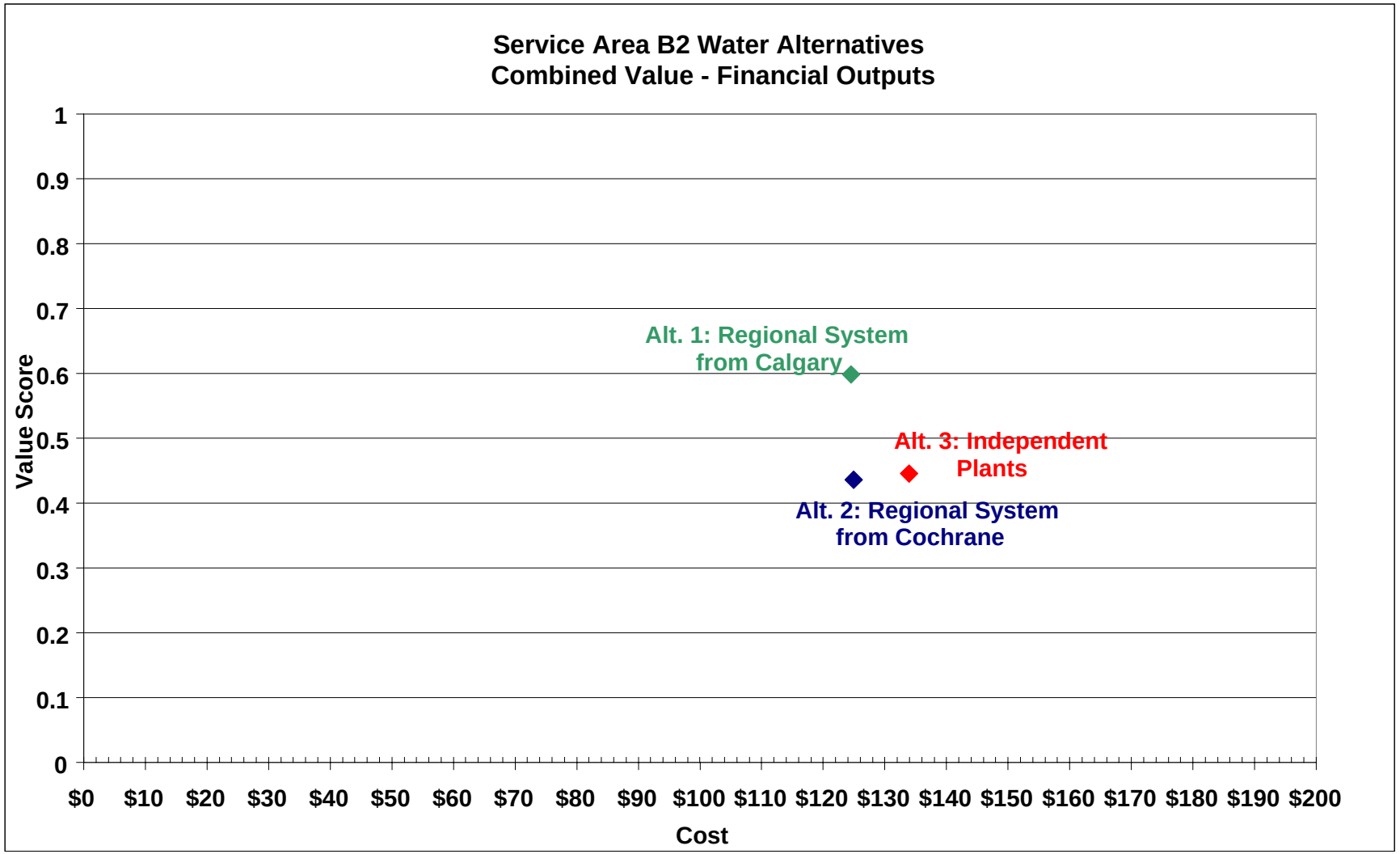
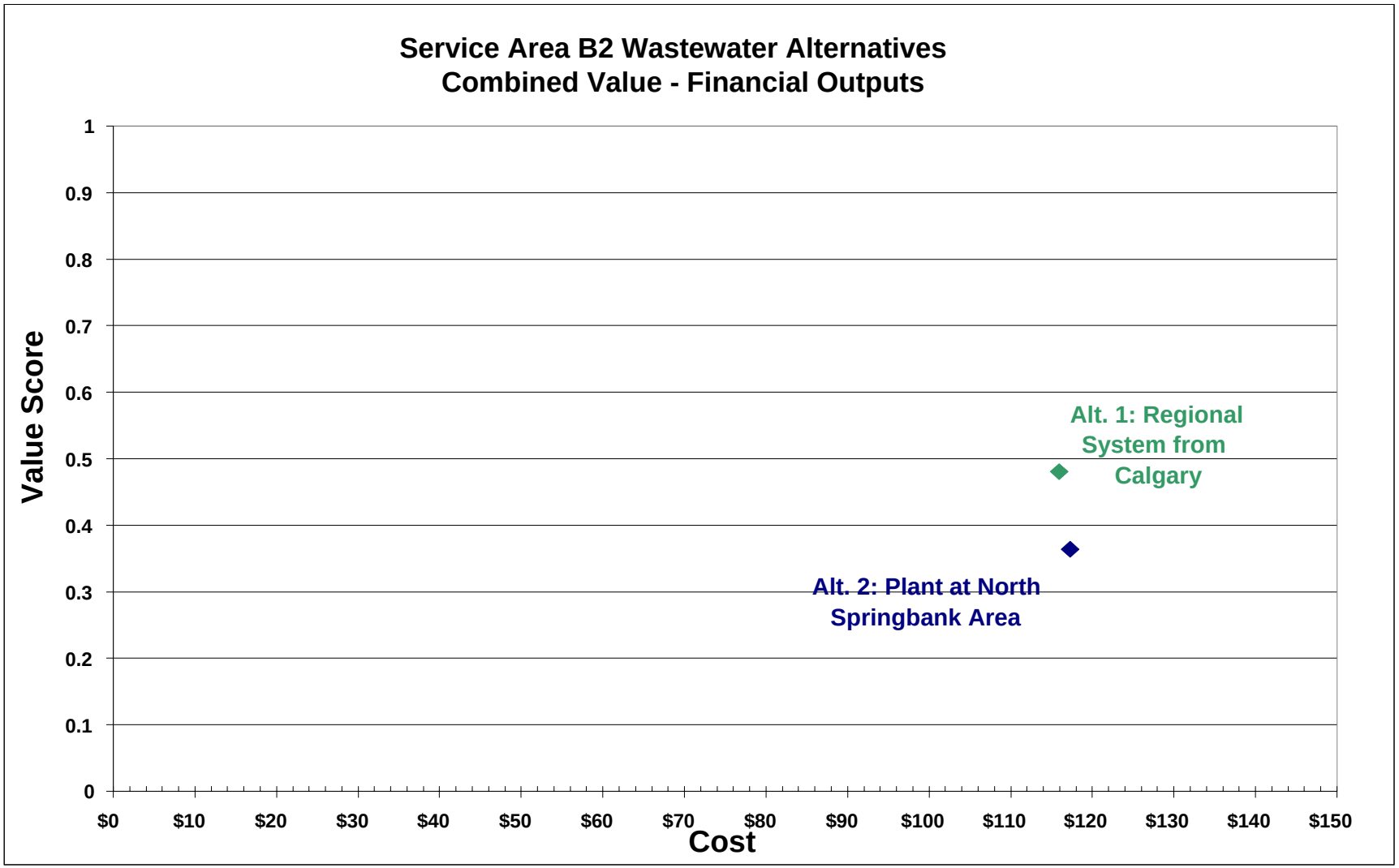


FIGURE 5
Area B2: TBL Results for Wastewater Alternatives



9.6 Service Area B3: Calgary West – Hwy 8

9.6.1 Water

Servicing the Hwy 8 area with drinking water through a regional system originating in the City of Calgary had a higher score in the TBL analysis and a significantly lower life-cycle cost than either a regional system from Cochrane or individual WTPs (see Figure 6). The main issues responsible for the difference in scores were licensing, operation, and safety issues.

9.6.2 Wastewater

Providing wastewater treatment to the Hwy 8 area through a connection to the City of Calgary had a higher score in the TBL analysis compared to independent WWTPs or a sub-regional system with a WWTP in the South Springbank area (see Figure 7). The main issues responsible for the difference in scores were operational issues, source water protection, and safety. The life-cycle cost for the independent WWTPs was less than that for the Calgary-based regional system or the South Springbank-based sub-regional system.

9.7 Service Area C: Calgary North

9.8 Water

Servicing the Calgary north area with drinking water through a regional system originating in the City of Calgary had a higher score in the TBL analysis and a significantly lower life-cycle cost than either a regional system from the Bow River through the Rocky View Water Co-op or from the Red Deer River through the Knee Hill system (see Figure 8). The main issues responsible for the difference in scores were licensing, water movement, and energy usage associated with long-distance pumping.

9.8.1 Wastewater Area C1: Calgary North – Crossfield

Providing wastewater treatment to the Crossfield area through a connection to the City of Calgary through the existing pipeline at Airdrie had a higher score in the TBL analysis compared to an upgraded, independent WWTP at Crossfield (see Figure 9). The main issues responsible for the difference in scores were operational issues, source water protection, and safety. However, the life-cycle cost for the independent WWTP was slightly less than that for the Calgary-based regional system.

9.9 Wastewater Area C2: Calgary North – Balzac

Providing wastewater treatment to the Balzac area through a connection to the City of Calgary had a higher score in the TBL analysis compared to a system providing treatment at an expanded WWTP at Langdon (see Figure 10). The main issues responsible for the difference in scores were operational issues, source water protection, and safety. Due to the relatively short wastewater pipeline required for the Calgary-based regional system, the life-cycle cost of this alternative was significantly less than the Langdon-based alternative.

FIGURE 6
Area B3: TBL Results for Water Alternatives

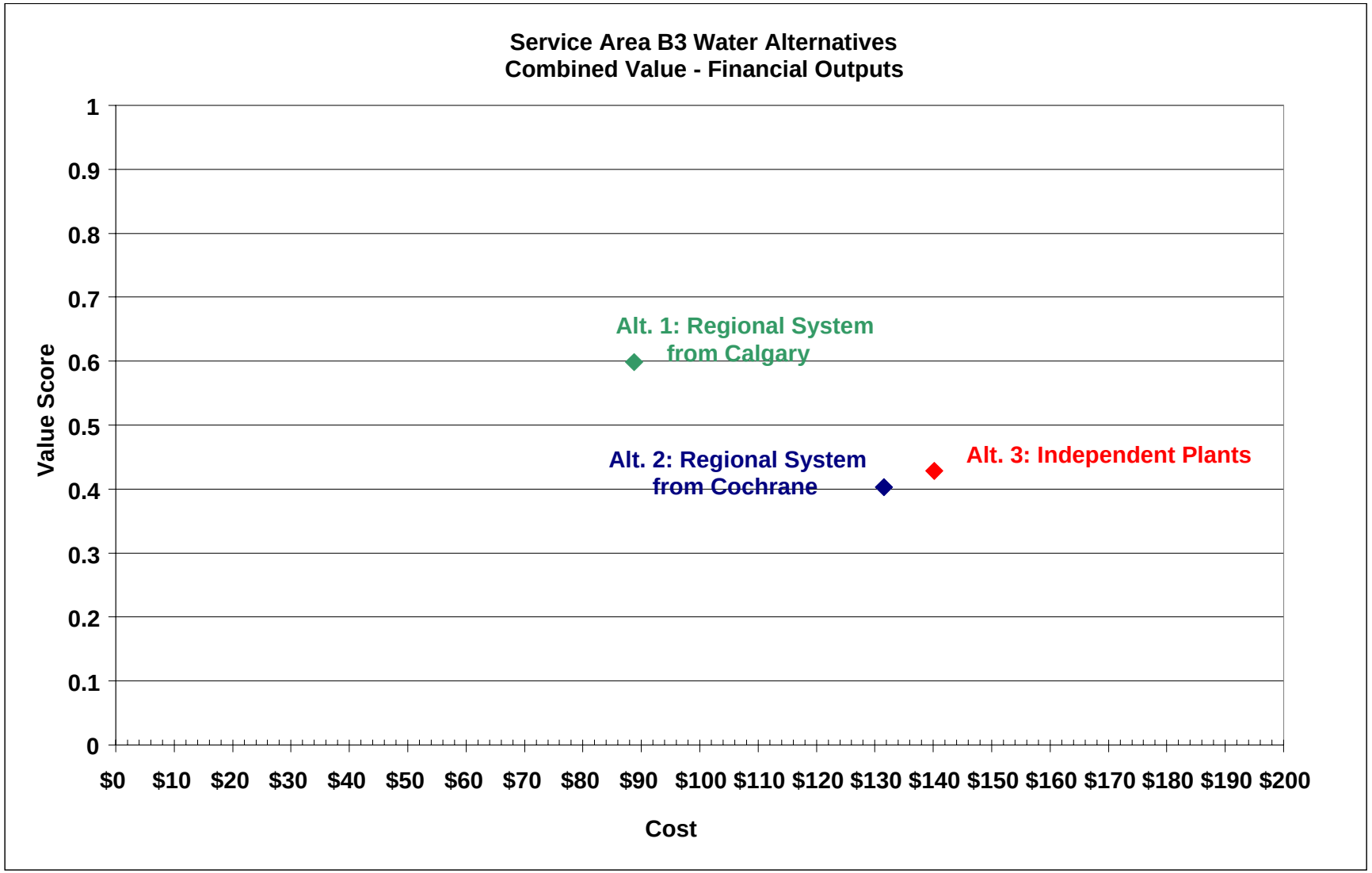


FIGURE 7
Area B3: TBL Results for Wastewater Alternatives

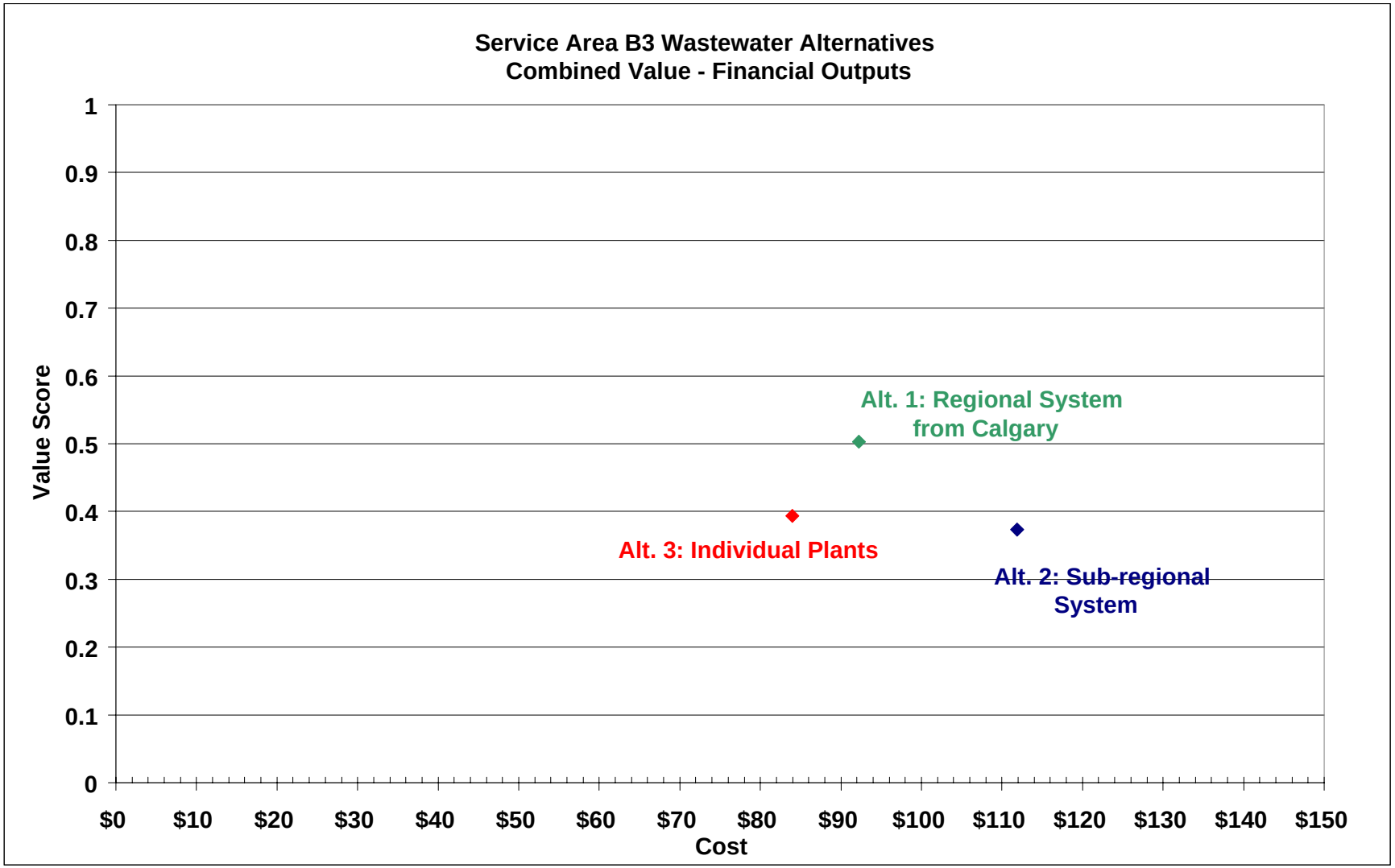


FIGURE 8
Area C: TBL Results for Water Alternatives

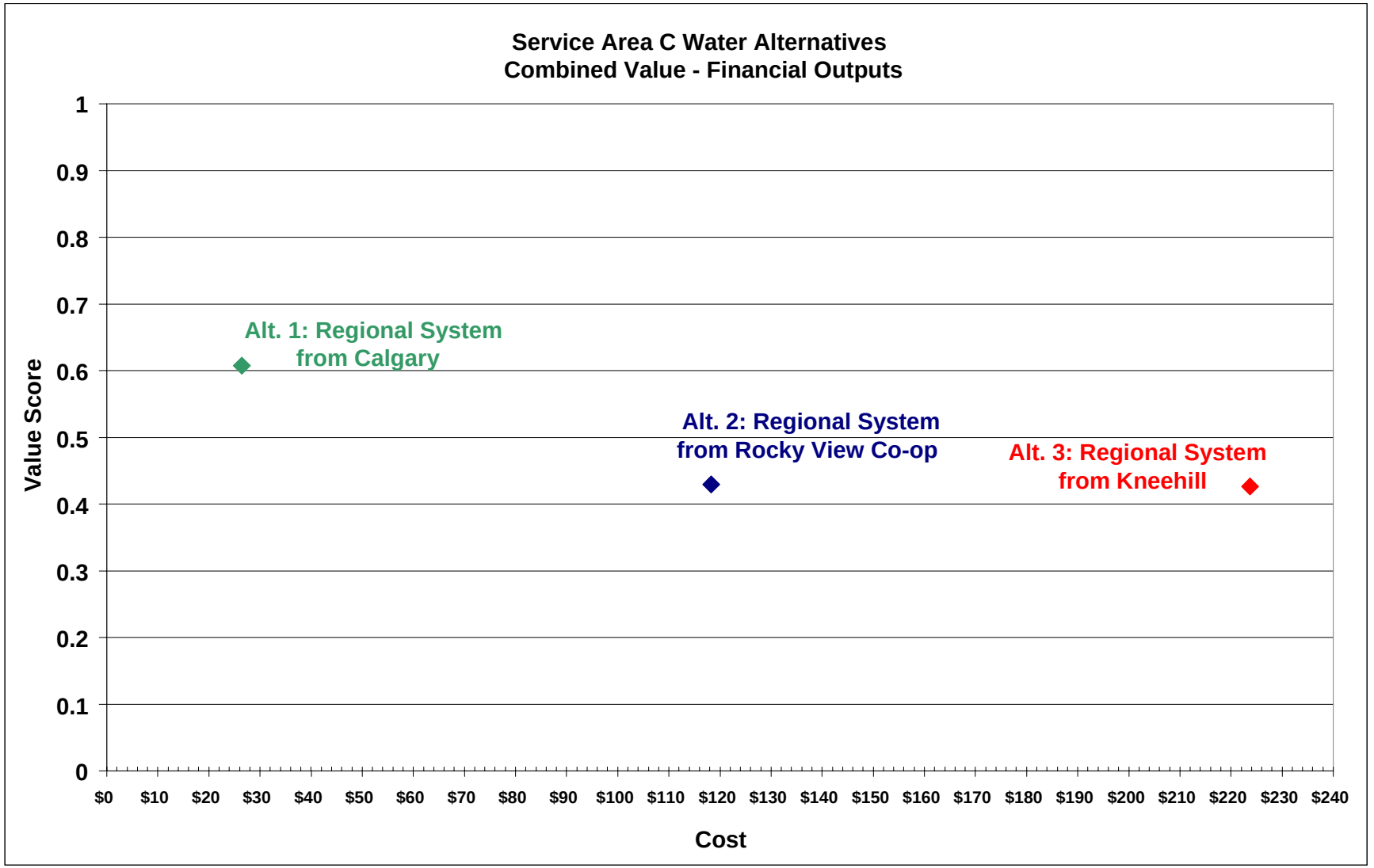


FIGURE 9
Area C1: TBL Results for Wastewater Alternatives

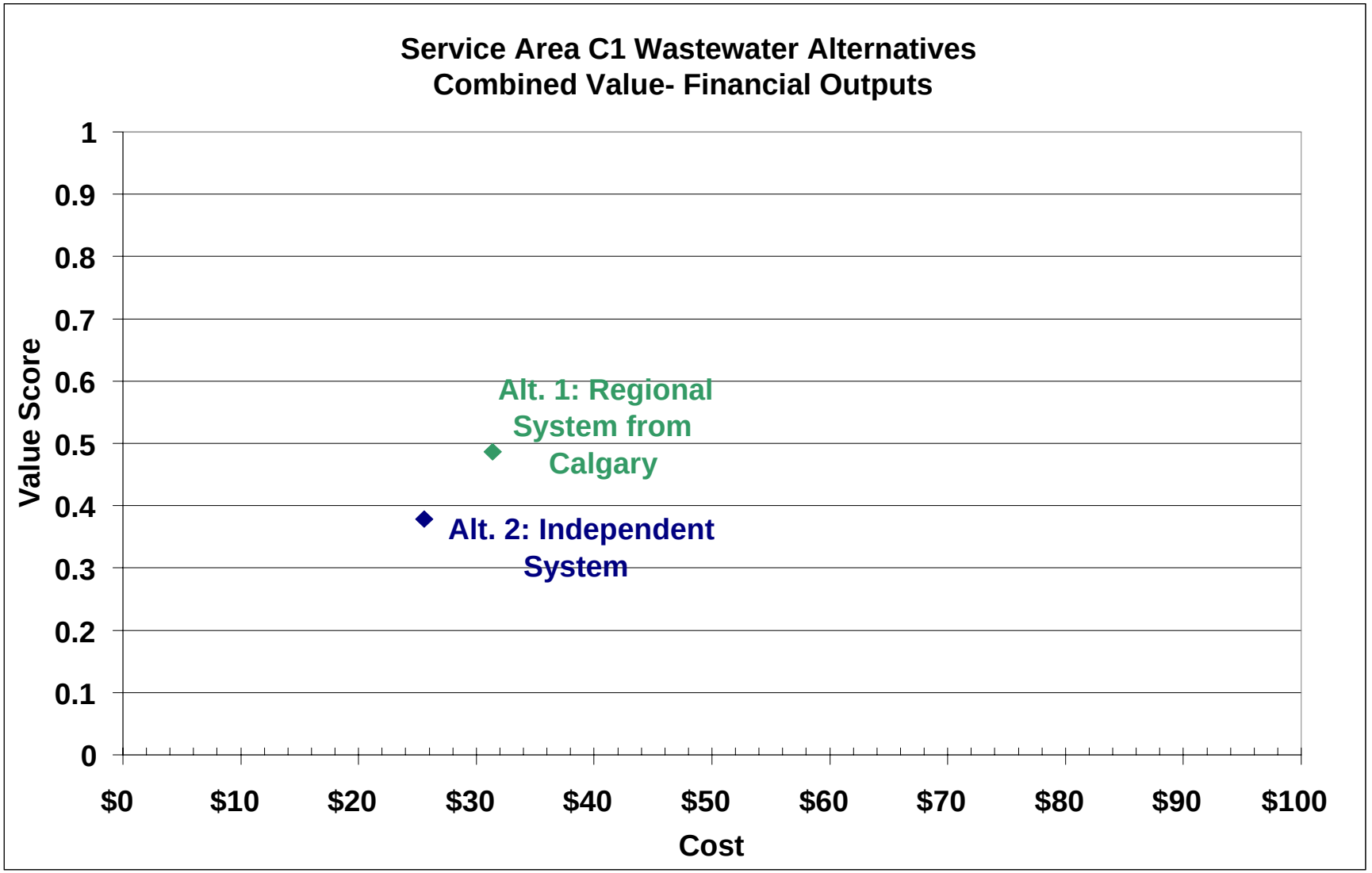
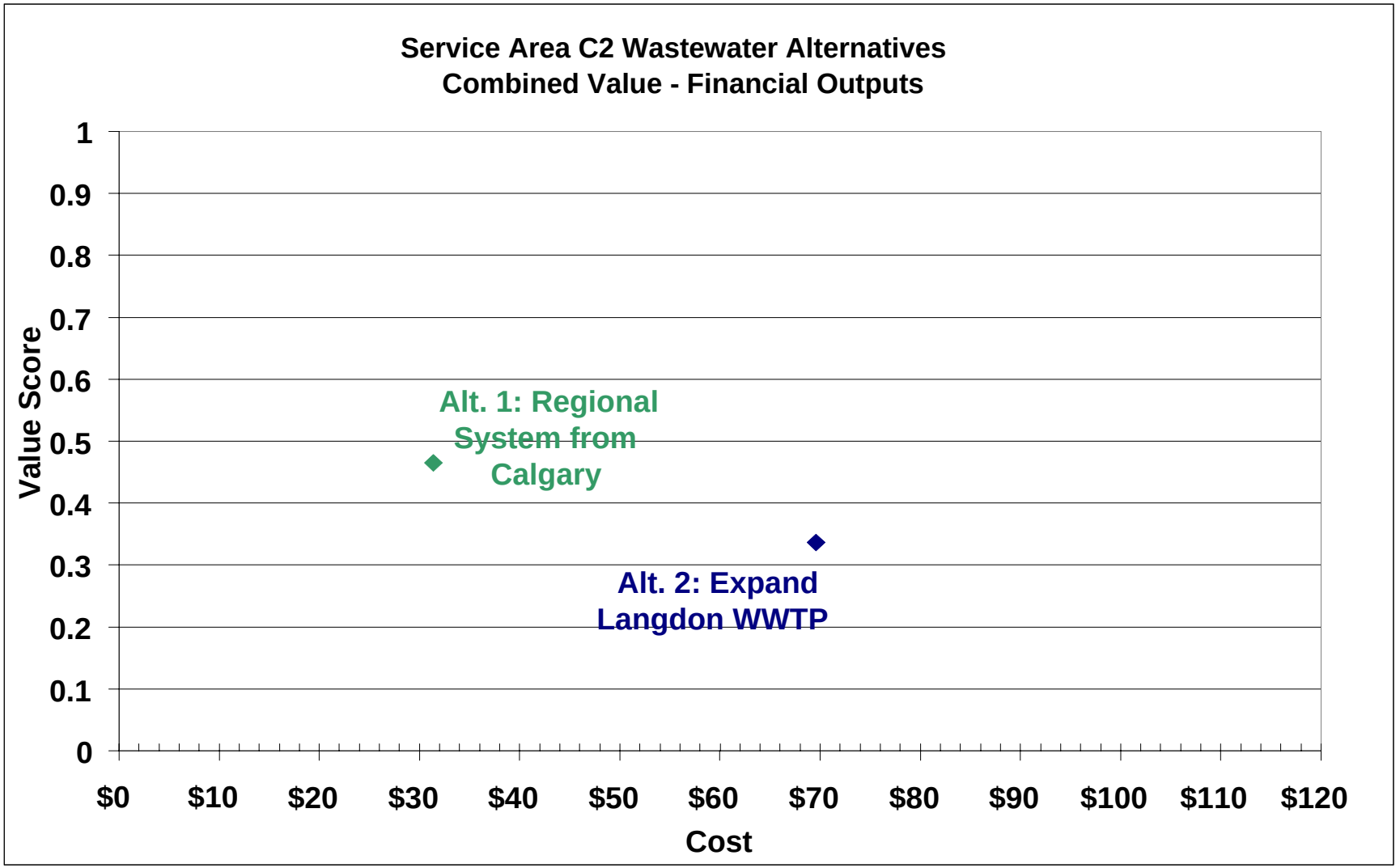


FIGURE 10
Area C2: TBL Results for Wastewater Alternatives



9.10 Service Area D: Calgary East

9.10.1 Water

To the east of the City of Calgary, the Town of Chestermere is currently part of a regional water supply system originating in the City of Calgary. Plans are in place to extend this regional system to service the Town of Strathmore, as well. Water supply alternatives in this service area concentrated on how to service future growth in the Municipal District of Rocky View and Wheatland County. A regional system from Calgary servicing the entire east area had the highest TBL scores and the lowest life-cycle costs (see Figure 11). The main issues responsible for the difference in scores were licensing, operations, and groundwater protection considerations.

9.10.2 Wastewater

Wastewater servicing alternatives in area D compared two regional systems based in the Town of Strathmore. The first alternative consisted of an expanded Strathmore WWTP to handle flows from Wheatland County and the eastern portions of the Municipal District of Rocky View. In the second alternative, the Strathmore WWTP would be upgraded to handle the projected growth in Strathmore and Wheatland County only. The Langdon WWTP would be upgraded to service growth in the Municipal District of Rocky View east and north of Calgary through the East Rocky View Transmission Line. For both alternatives, Chestermere would continue to be serviced by the City of Calgary.

The TBL scores for both alternatives are essentially the same (see Figure 12). The life-cycle cost for the two sub-regional systems was lower than the Strathmore-only alternative.

9.11 Service Area E1: Calgary South – Foothills North

9.11.1 Water

Servicing the Foothills north area with drinking water through a regional system originating in the City of Calgary had a higher score in the TBL analysis than either a regional system from Okotoks or individual WTPs (see Figure 13). The main issues responsible for the difference in scores were licensing and operation issues. The life-cycle costs for the regional systems from both Calgary and Okotoks were essentially the same. Both regional systems had lower life-cycle costs than independent WTPs.

9.11.2 Wastewater

Providing wastewater treatment to the Foothills north area through a regional system with treatment in Okotoks has essentially the same score in the TBL analysis compared to independent WWTPs (see Figure 14). The life-cycle costs for both alternatives were also essentially the same.

FIGURE 11
Area D: TBL Results for Water Alternatives

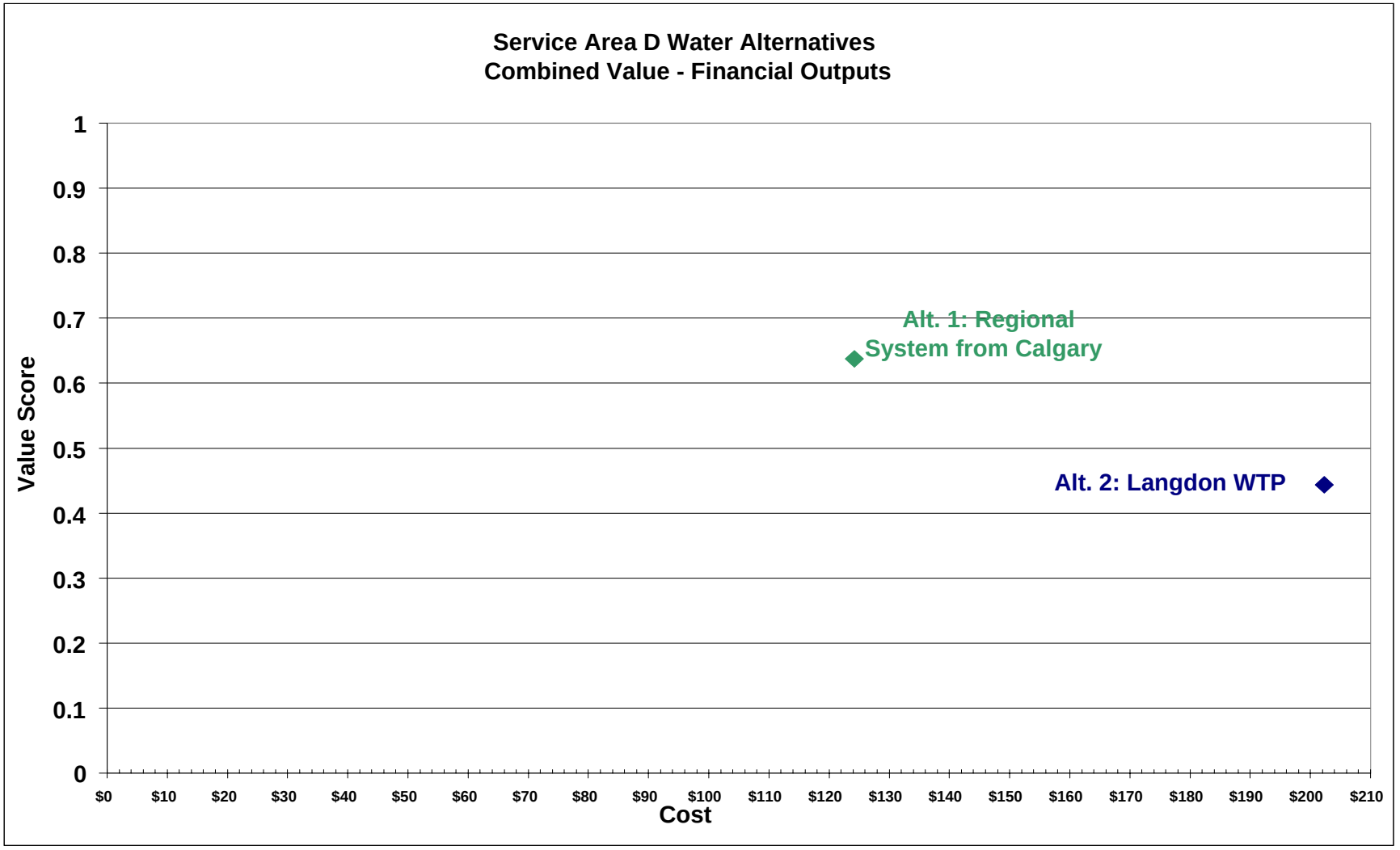


FIGURE 12
Area D: TBL Results for Wastewater Alternatives

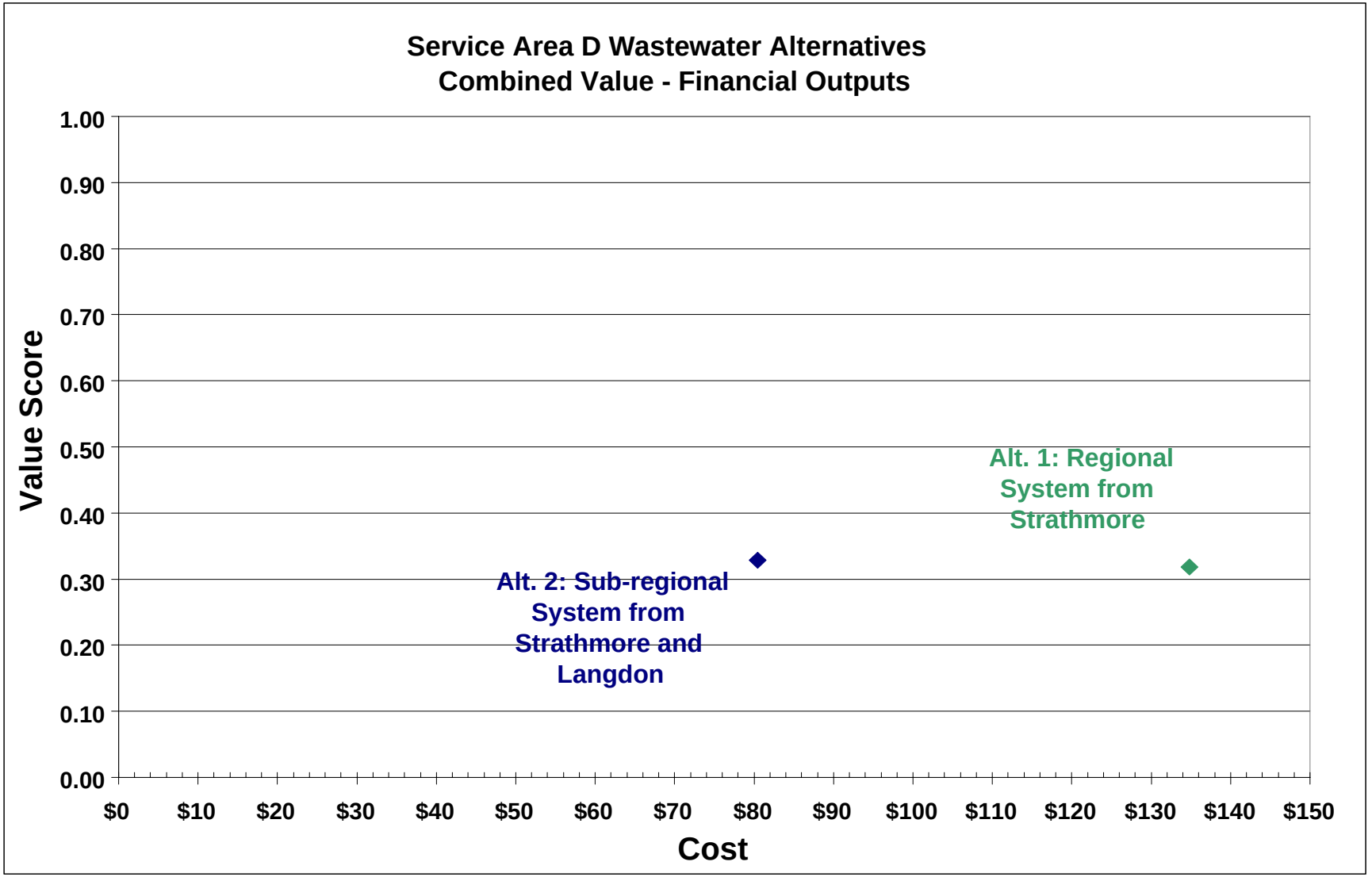


FIGURE 13
Area E1: TBL Results for Water Alternatives

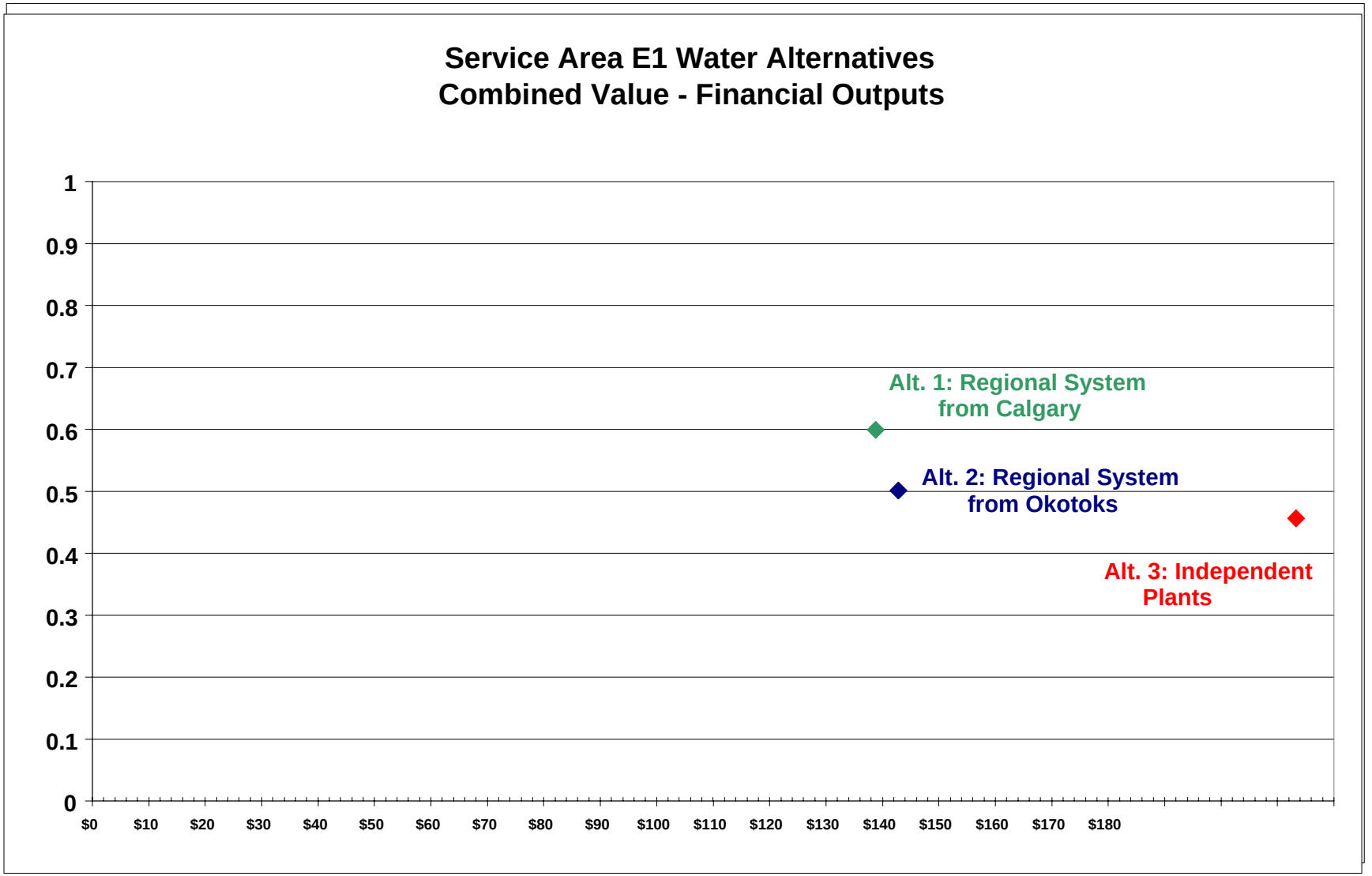
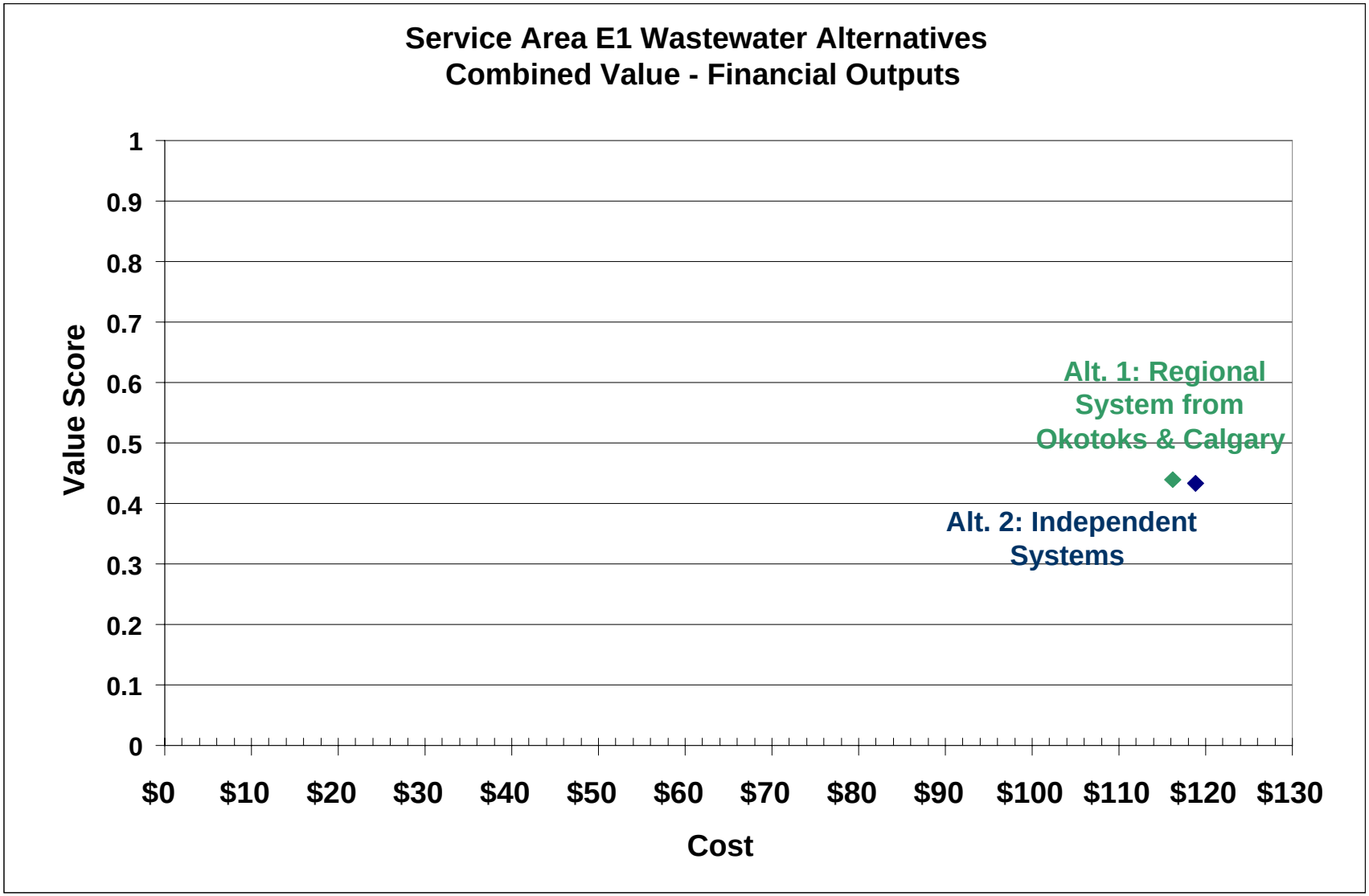


FIGURE 14
Area E1: TBL Results for Wastewater Alternatives



9.12 Service Area E2: Calgary South – High River

9.12.1 Water

Servicing the High River area with drinking water through a regional system originating in the City of Calgary had a higher score in the TBL analysis than either a regional system from High River or individual WTPs (see Figure 15). The main issues responsible for the difference in scores were licensing and water movement issues. Because of the long distances between communities, the life-cycle costs for the regional systems were higher than for the individual WTPs.

9.12.2 Wastewater

Providing wastewater treatment to the High River area through independent WWTPs has the highest score in the TBL analysis compared to regional systems based in Okotoks or High River (see Figure 16). Because of the long distances between communities, the life-cycle costs for the regional systems were higher than for the individual WTPs.

FIGURE 15
Area E2: TBL Results for Water Alternatives

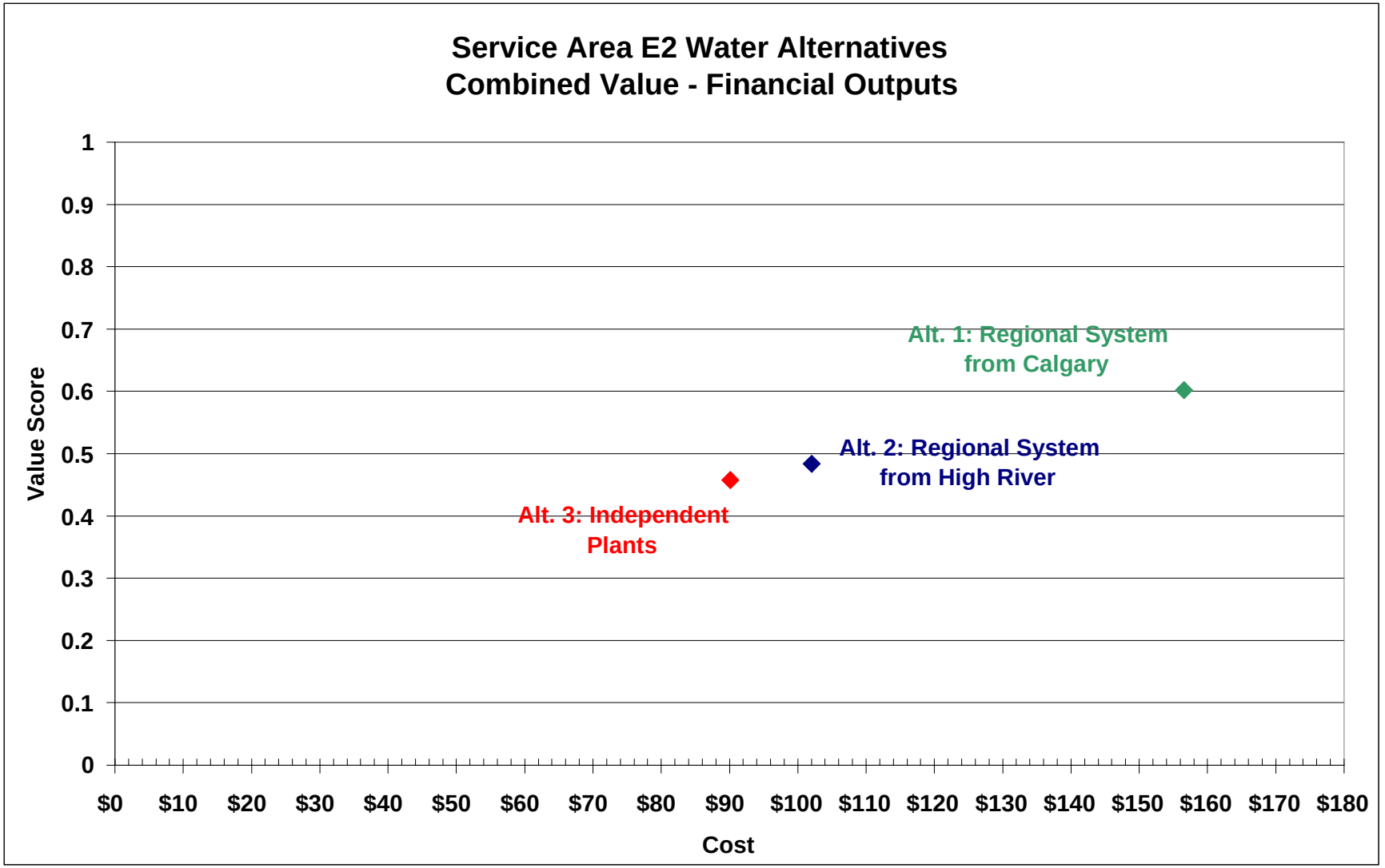
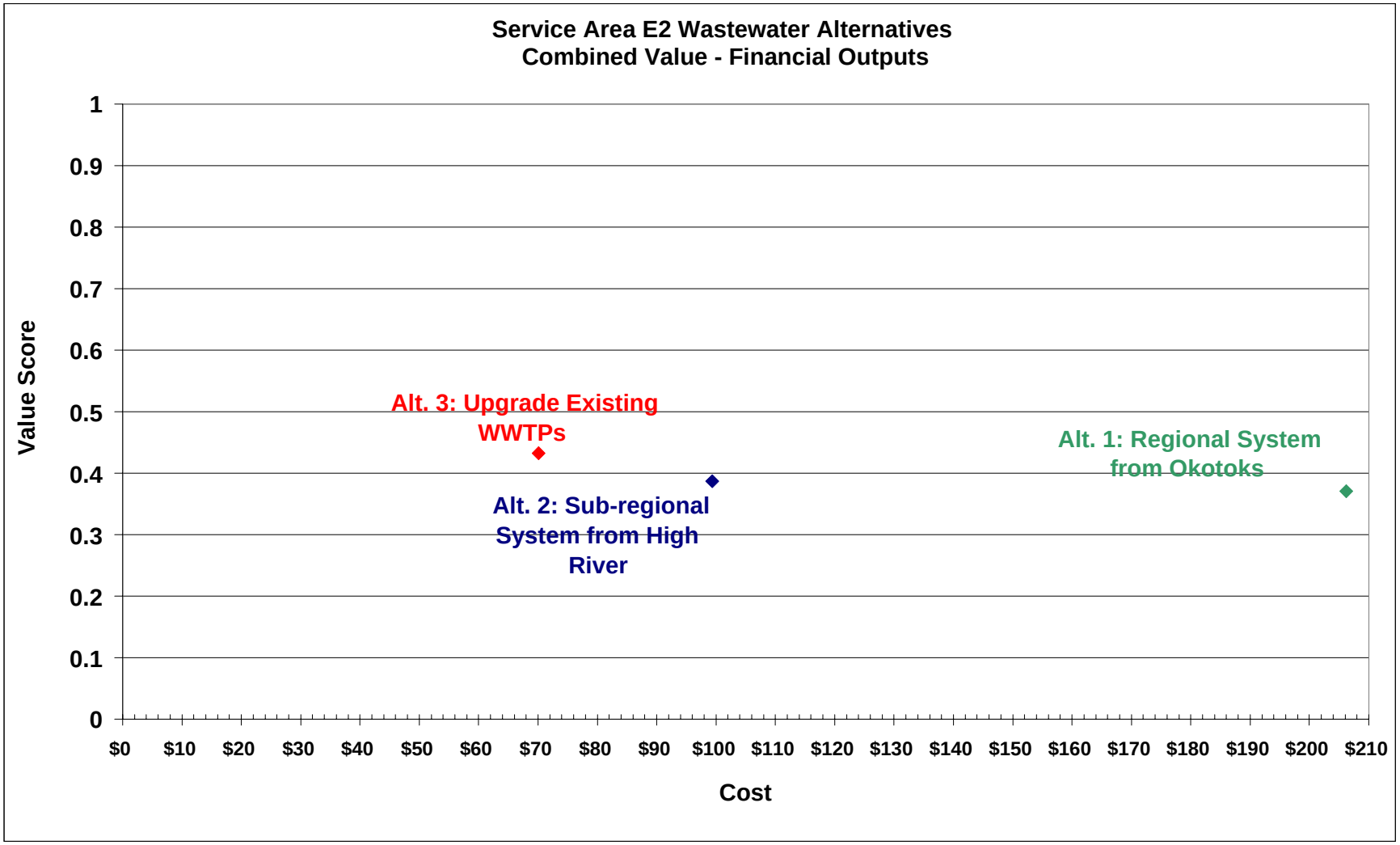


FIGURE 16
Area E2: TBL Results for Wastewater Alternatives



10. Next Steps

This study represents the first step in the assessment of regional servicing options in the CRP. The analysis conducted as part of this project was based on an assumed growth scenario that was developed without an overall regional land-use plan. Throughout the project, land-use issues were found to be very important to the project stakeholders, and the servicing alternatives described in this study need to be reconciled with the results of the CRP's Regional Growth and Sustainability Framework project.

Although the details of the servicing options may change as the Regional Growth and Sustainability Framework project evolves, the principle findings of this report will remain valid unless radical changes in settlement patterns are recommended. Because some CRP member communities face immediate water and wastewater servicing issues, it is important that steps continue to be taken towards the implementation of the findings of this study.

The key tasks required to move toward implementation are summarized below:

- Individual communities should review the TBL results for their service area and critically assess which alternative is the most cost-effective for addressing the unique servicing challenges and overall goals of their communities.
- Communities that are interested in cooperating on regional systems should establish regional working groups to work toward implementation. Discussion should focus on ways of working together and should include the following issues:
  - Which communities will be serviced by the regional system?
  - What governance structure will be used?
  - Are there land-use issues that need to be resolved by the regional partners?
  - What levels of growth will the regional system support?
  - Do the servicing alternatives follow the direction of the ongoing Regional Growth and Sustainability Framework project?
  - What grant opportunities are available?
- Opportunities exist for regional systems servicing the smaller communities in the Municipal Districts of Rocky View, Bighorn, and Foothills, and the County of Wheatland. Detailed analysis of these small systems was not within the scope of this regional study. These opportunities should be examined further on a sub-regional basis.

Once general agreement has been reached by the regional partners, preliminary engineering tasks can begin for the required infrastructure in each area. These will include:

- Detailed service population estimates
- Identification of pipeline routes and treatment plant sites
- Land acquisition
- Public consultation and education efforts
- Preliminary engineering reports

As project implementation proceeds, other ancillary work is recommended to ensure the overall sustainability of the region. This includes:

- Watershed Protection: Watershed protection issues have been identified by CRP stakeholders as being very important. The CRP should become more involved with existing watershed protection groups, such as the Bow River Basin Council, to ensure that land-use decisions made by CRP members consider the overall health of the watershed.
- Stormwater Management: Non-point sources of pollution, such as those resulting from stormwater discharges, represent significant pollutant loads in the Region's rivers. Stormwater loads are directly related to land-use policies. It is recommended that stormwater be managed on a regional basis.
- Water and Wastewater Treatment Residuals: Water and wastewater treatment processes produce solid residuals (sludges and biosolids) that require treatment and disposal. Projects that look for sustainable, regional solutions to residuals disposal or beneficial re-use should be encouraged.
- Long-Term Provincial Water Policy: The CRP members should take an active role in developing long-term water use policy in the Province of Alberta. The CRP should engage in dialogue with Alberta Environment and Alberta Sustainable Resource Development in the areas of watershed management, off-stream storage, and response to climate change.
- Water Conservation: The degree of water conservation in place varies widely among CRP members. A regional water conservation initiative should be undertaken to help all member communities reduce water use by 30 percent, in accordance with the Water for Life Strategy. This group could also monitor advances in water conservation technology, identify wastewater reuse opportunities, and lobby for changes in existing plumbing codes to reduce regional water consumption.
- Public Health: Water quality issues are important to public health. The CRP should continue to work with health care agencies, such as the Calgary Health Region, to educate the public regarding water quality issues.