

3.0 CLINE

The Cline Sub-basin is about 3,900 km² in area and occupies approximately 7 percent of the North Saskatchewan River Basin and is the uppermost reach of the basin. In 2005, the sub-basin had a population of about 350 people, which represents less than 1 percent of the Basin population, with a population density of 0.1 people per square kilometer. The Cline Sub-basin consists of all or parts of two rural municipalities.

Total allocations in the sub-basin in 2005 were only 60 dam³. An overview of current surface and groundwater allocations is provided in Figure 3-1. It shows that the commercial sector accounts for 99 percent of total allocations or 59 dam³ in 2005. Agricultural registrations account for the remaining allocations (0.6 dam³). Allocations of surface water (49 dam³) account for 82 percent of total allocations in the Cline sub-basin.

Figure 3-1 Distribution of Active Water Allocations in the Cline Sub-basin

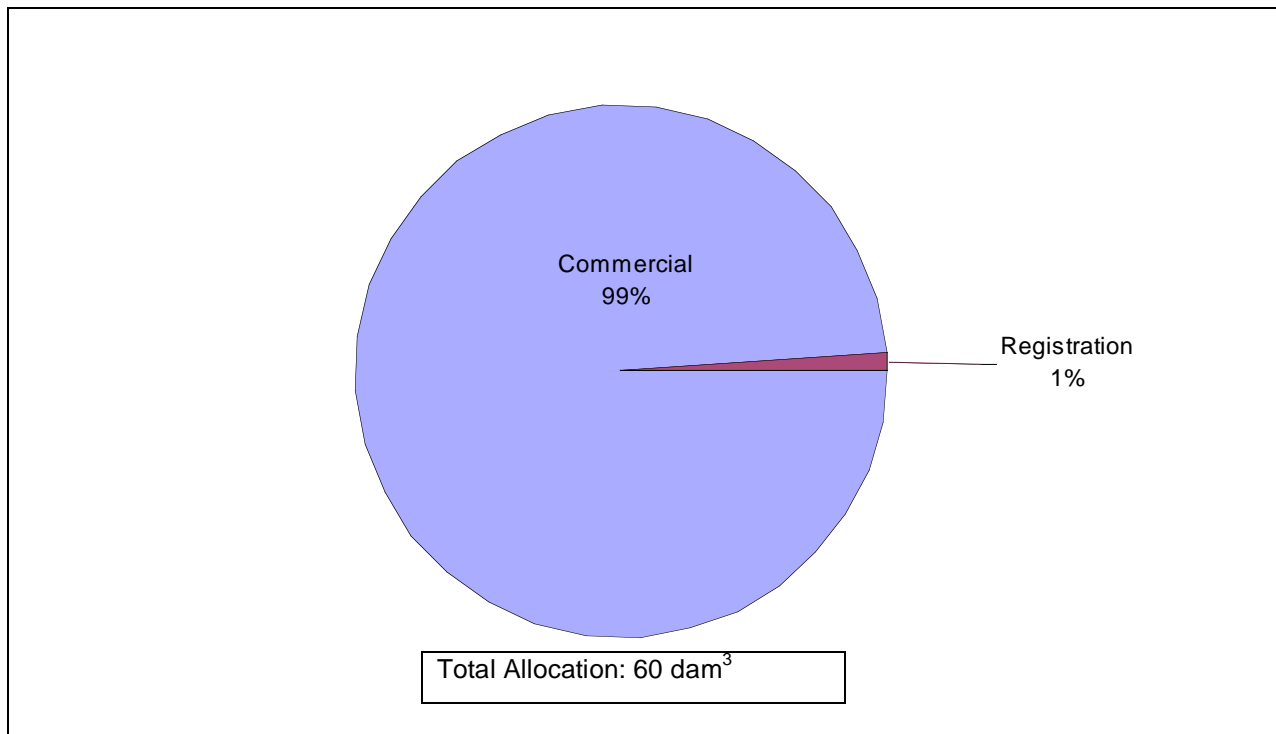


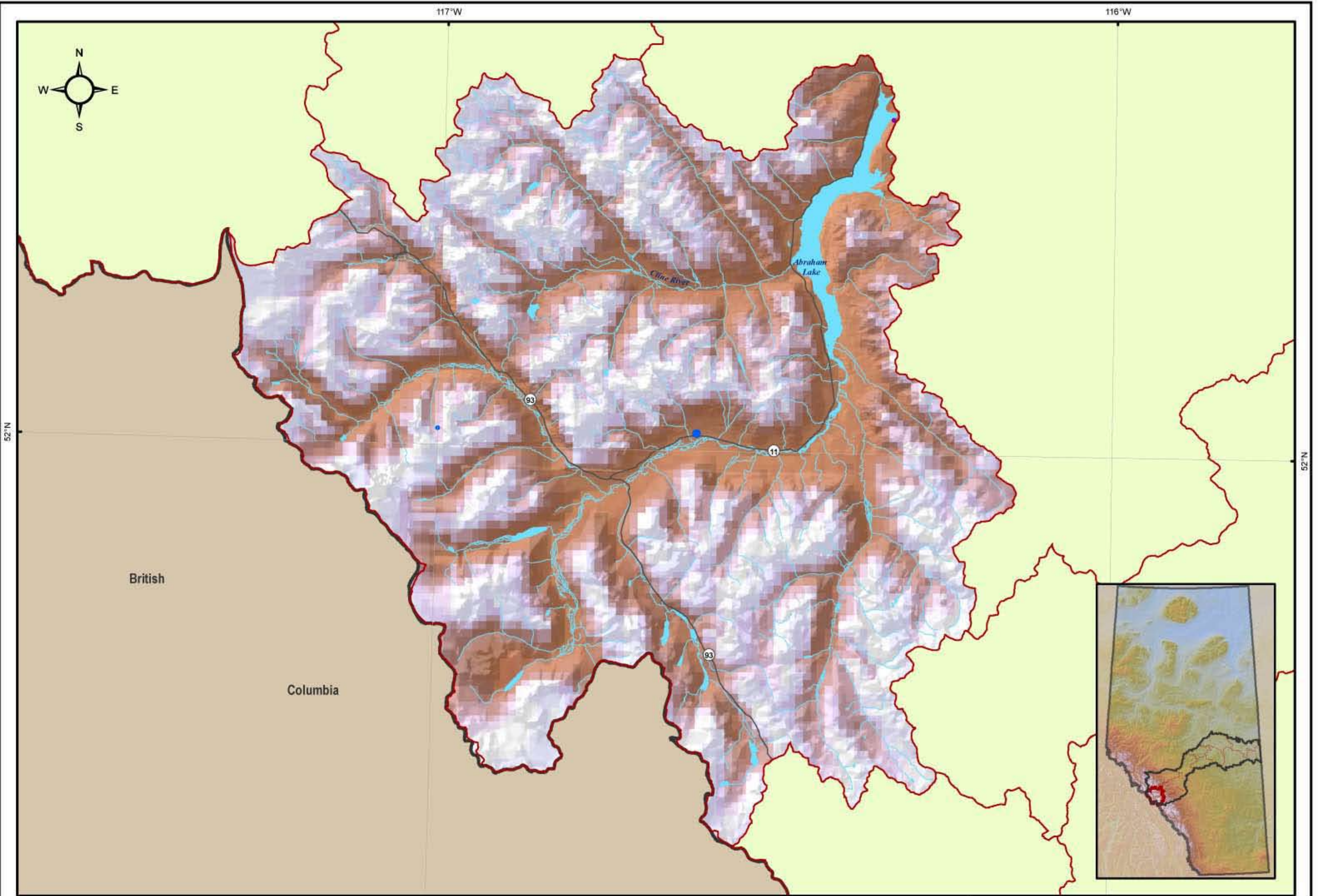
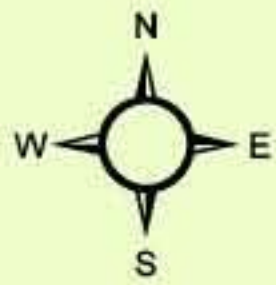
Figure 3-2 shows the location, allocation and sector of all active surface water licences in the Cline Sub-basin. The locations of registrations issued in this sub-basin are provided in Figure 3-3.



Figure 3-2 Cline Sub-basin Surface Water Licences

117°W

116°W



British

Columbia

Abraham Lake

Cline River

93

11

93

| Legend | | Industry Category - Maximum Allowable Diversion (dam ³ /yr) | | | | | | |
|--------|-------------|--|----------------------|----------------------|----------------------|----------------------|----------------------|--|
| ★ | Settlement | Commercial | Other | Petroleum | Municipal | Industrial | Agriculture | |
| — | Major Road | ● 0.01 - 10.00 | ● 0.01 - 10.00 | ● 0.01 - 10.00 | ● 0.01 - 10.00 | ● 0.01 - 10.00 | ● 0.01 - 10.00 | |
| — | Watercourse | ● 10.01 - 100.00 | ● 10.01 - 100.00 | ● 10.01 - 100.00 | ● 10.01 - 100.00 | ● 10.01 - 100.00 | ● 10.01 - 100.00 | |
| — | Waterbody | ● 100.01 - 1000.00 | ● 100.01 - 1000.00 | ● 100.01 - 1000.00 | ● 100.01 - 1000.00 | ● 100.01 - 1000.00 | ● 100.01 - 1000.00 | |
| — | Sub Basin | ● 1000.01 - 10000.00 | ● 1000.01 - 10000.00 | ● 1000.01 - 10000.00 | ● 1000.01 - 10000.00 | ● 1000.01 - 10000.00 | ● 1000.01 - 10000.00 | |
| | | ● > 10000.01 | ● > 10000.01 | ● > 10000.01 | ● > 10000.01 | ● > 10000.01 | ● > 10000.01 | |

North Saskatchewan Watershed Alliance

CLINE SUBBASIN SURFACE WATER LICENSES

DATE: MAY 2007
 AMEC PROJECT: EE27047
 GIS FILE: SW_SB_CLINE.MXD
 PDF FILE: SW_SB_CLINE.PDF
 PREPARED BY: amec

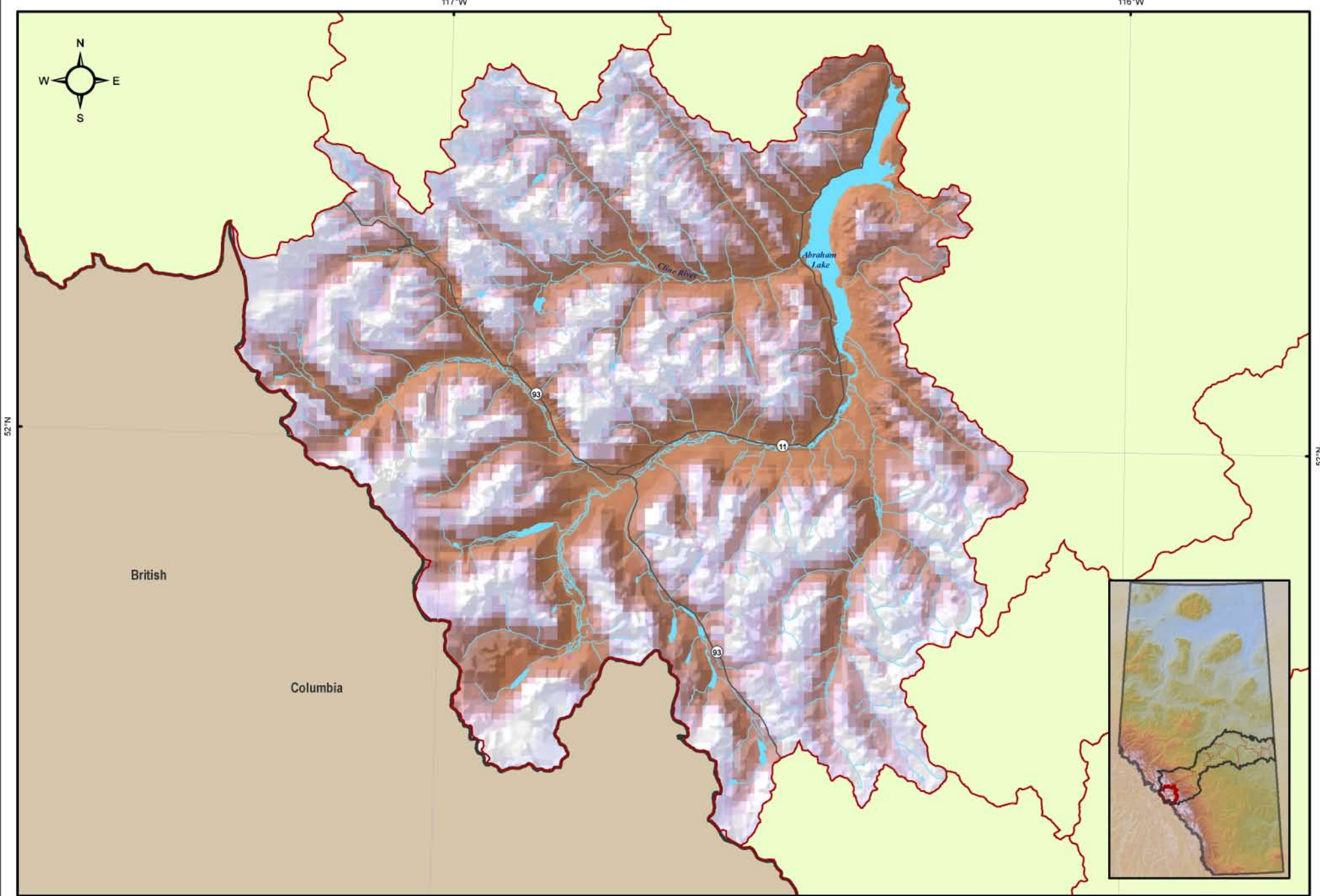
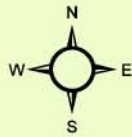
Scale: 1:500,000
 PROJECTION: 10TM | DATUM: NAD83

FIGURE 3-2

Figure 3-3 Cline Sub-basin Registrations

117°W

116°W



British

Columbia

Legend

- ★ Settlement
 - Major Road
 - Watercourse
 - Waterbody
 - Sub Basin
- Industry Category - Maximum Allowable Diversion (dam³/yr)
- Groundwater Registrations
 - 0.01 - 6.25
 - Surface Water Registrations
 - 0.01 - 6.25

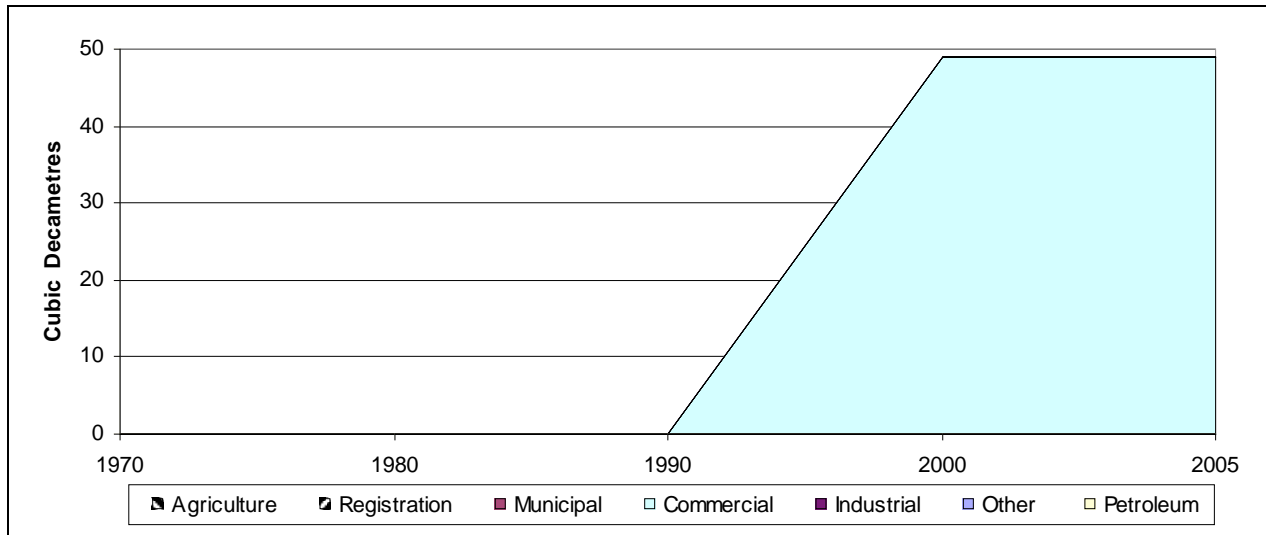


CLINE SUBBASIN REGISTRATIONS

| | |
|---------------------------|-------------------------------|
| DATE: MAY 2007 | 0 2 4 Kilometers 1:500,000 |
| AMEC PROJECT: EE27047 | PROJECTION: 10TM/DATUM: NAD83 |
| GIS FILE: RG_SB_CLINE.MXD | |
| PDF FILE: RG_SB_CLINE.PDF | |
| PREPARED BY: amec | FIGURE 3-3 |

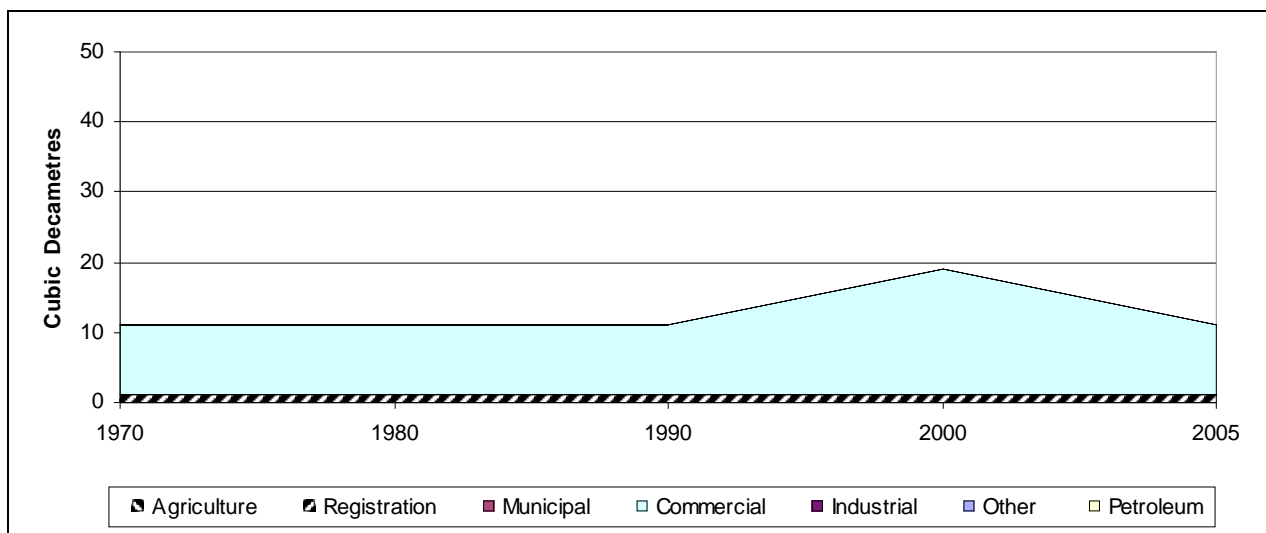
An historical perspective on water allocated among the sectors is provided in Figure 3-4 (surface water) and Figure 3-5 (groundwater). For surface water, the entire allocations are for the commercial sector. These allocations were issued in early 2000 and have remained unchanged since that time.

Figure 3-4 Historical Trends in Surface Water Allocation in the Cline Sub-basin



For groundwater, the allocations are for registrations and commercial sector. Registration allocations date from the 1970s and have remained unchanged since that time. Commercial sector allocations also date from the 1970s and after an increase during the 1990s, allocations currently are at level similar to the 1970s.

Figure 3-5 Historical Trends in Groundwater Allocation in the Cline Sub-basin



3.1 Municipal and Residential Sector

3.1.1 Population

There were 348 people living in the Cline Sub-basin in 2006, down from 499 in 2001 (a decline of 30 percent). The entire population is rural, with the majority living in Improvement District No. 9 (258), and the remainder living in Clearwater County (88).

3.1.2 Allocations

There are no municipal water licences in the Cline Sub-basin.

3.1.3 Licensed Water Use

There are no municipal water licences in the Cline Sub-basin.

3.1.4 Actual Water Use

There is no information about municipal water use in the Cline Sub-basin. If unlicensed rural residential water use is the same as the per capita use estimated for the neighbouring Ram Sub-basin (26 m³ per capita per year), and if the proportion of rural residents relying on groundwater is also the same as that estimated for Ram Sub-basin (75 percent), then municipal water use in Cline Sub-basin is estimated to be 9 dam³, of which 7 dam³ is estimated to be groundwater and 2 dam³ is estimated to be surface water.

3.1.5 Future Water Use Forecasts

The Alberta Finance Census Division population projections do not have the level of spatial disaggregation necessary to accurately represent the rapidly declining population trend in the Cline Sub-basin. Use of the low population growth estimate based on the census division population projection predicts modest growth over the next two decades, which contradicts the downward population trend in the sub-basin over the last five years. Thus, the census division population projections were not used for the Cline Sub-basin. It is predicted that the population over the next two decades will not rise above the 2006 population, and will likely fall. Municipal water use will remain at 9 dam³ per year or fall. In either case, the municipal water use value for Cline Sub-basin is and will remain negligible.

3.2 Agriculture Sector

Allocations for the agriculture sector in the Cline Sub-basin are small, with only two registrations, all from groundwater, amounting to 0.6 dam³. However, based on the 2001 Census of Agriculture animal population for the sub-basin, livestock water use is estimated to be about 128 dam³. It is assumed that this water use comes from groundwater sources and is domestic and/or exempted agricultural use. Based on AAFRD's assessment, future changes in livestock populations, particularly cattle, are unlikely, so livestock water use is expected to

remain unchanged at 128 dam³ for the duration of the forecast period. There is no irrigation water use; this is also expected to remain unchanged over the forecast period.

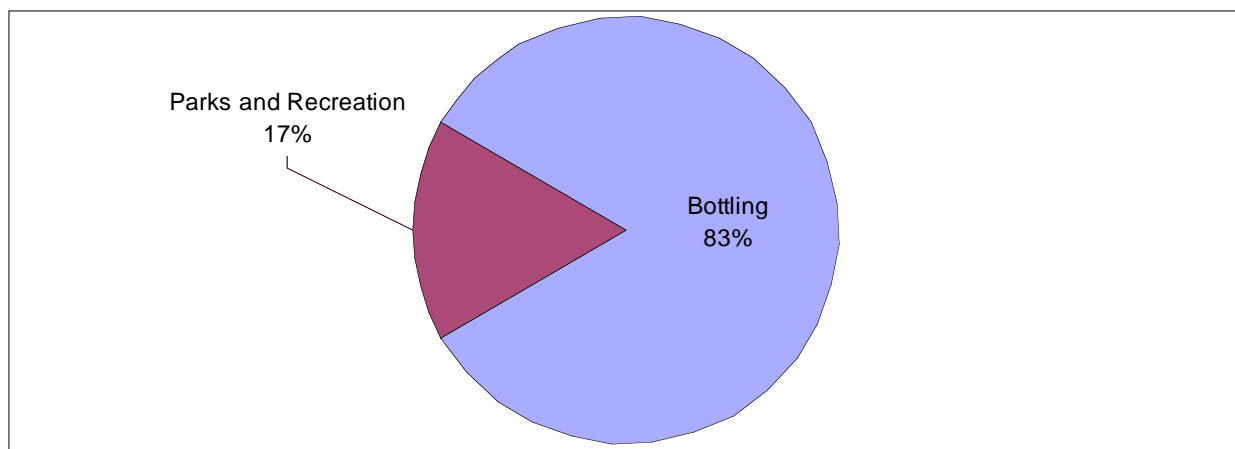
3.3 Commercial Sector

There are four licences that allow diversion of 59 dam³ of water in the Cline sub-basin. This allocation accounts for 51 percent of total allocations in the sub-basin.

3.3.1 Water Allocations

Figure 3-6 shows how this allocation is distributed among the various commercial sector activities. Bottling and parks and recreation account for 83 percent and 17 percent of allocations, respectively. Licences issued for the commercial sector allow maximum withdrawal of about 50 dam³ of surface water issued for bottling purposes and this represents about 85 percent of total allocation for commercial purposes. The remaining allocations come from groundwater and are issued for parks and recreation.

Figure 3-6 Water Allocation for Commercial Activities in the Cline Sub-basin



3.3.2 Licensed Water Use

Table 3-1 provides a summary of licensed allocations, use and return for various activities within the commercial sector in the Cline sub-basin. The table shows that all of the allocations are licensed to be used; there are no allowances for return flow.



Table 3-1 Licensed Commercial Allocations, Reported and Actual Water Use, Cline Sub-basin

| Activity | Source | Number of Licences | Licensed Allocation and Use (dam ³) | | | Reported Actual Water Use (dam ³) | | |
|----------------------|--------------------|--------------------|---|-------------|------------|---|--------------|-----------------------|
| | | | Allocation | Water Use | Return | Licensees Reporting | Reported Use | Percent of Allocation |
| Bottling | Surface | 2 | 49.3 | 49.3 | 0.0 | 0 | N/A | N/A |
| | Groundwater | 0 | 0.0 | 0.0 | 0.0 | 0 | N/A | N/A |
| | Subtotal | 2 | 49.3 | 49.3 | 0.0 | 0 | N/A | N/A |
| Parks and Recreation | Surface | 0 | 0.0 | 0.0 | 0.0 | 0 | N/A | N/A |
| | Groundwater | 2 | 9.9 | 9.9 | 0.0 | 0 | N/A | N/A |
| | Subtotal | 2 | 9.9 | 9.9 | 0.0 | 0 | N/A | N/A |
| Total | Surface | 2 | 49.3 | 49.3 | 0.0 | 0 | N/A | N/A |
| | Groundwater | 2 | 9.9 | 9.9 | 0.0 | 0 | N/A | N/A |
| | Total | 4 | 59.2 | 59.2 | 0.0 | 0 | N/A | N/A |

3.3.3 Actual Water Use

At the present time Alberta Environment's Water Use Reporting System contains no information on actual water use in 2005 by any of the licensees in commercial sector in the Cline sub-basin. Given the lack of information on actual water use, it is assumed that all licensees are withdrawing and using the full amount of water to which they are entitled. This may overstate actual water use in the sub-basin since the commercial sector accounts for about 50 percent of total allocations.

3.3.4 Future Water Use Forecasts

Forecasts of future water use assume that current water use and the proportion of surface and groundwater uses do not change over the duration of the forecast period across all growth scenarios. This assumption is reasonable given that there are limited opportunities for large scale economic and demographic factors to significantly change water use. Further, the allocations have remained unchanged since the mid 1990s which indicates that large changes in water use are not expected. Table 3-2 provides a summary of projected water use according to water source. Water use is expected to be 59 dam³ and consists mostly of surface water.

Table 3-2 Projected Water Use for Commercial Activities, Cline Sub-basin
 (dam³)

| Scenario | Source | 2005 | 2010 | 2015 | 2020 | 2025 |
|--------------------------|--------------|-----------|-----------|-----------|-----------|-----------|
| Low, Medium, High Growth | Surface | 49 | 49 | 49 | 49 | 49 |
| | Groundwater | 10 | 10 | 10 | 10 | 10 |
| | Total | 59 | 59 | 59 | 59 | 59 |

Due to lack of data, it is assumed that actual water use data is equal to licensed allocations for the commercial sector activities in the Cline sub-basin. Water use is expected to remain unchanged at 59 dam³ and is expected to consist mostly of surface water for the duration of the forecast period.

3.4 Petroleum Sector

There are no active petroleum water licences in the Cline Sub-basin. Petroleum water demand is not expected to change over the forecast period.

3.5 Industrial Sector

There are no industrial water licences in the Cline Sub-basin. No industrial water use outside municipalities is expected for the period to 2025.

3.6 Other Sector

There are no active other sector water licences in the Cline Sub-basin. Other sector water demand is not expected to change over the forecast period.

3.7 Summary

Table 3-3 provides a summary of licensed allocations and estimated water use for each of the water use sectors in the Cline Sub-basin. In total, existing licences and registrations allow a maximum of 60 dam³ of water to be withdrawn and all of the water can be used. Figure 3-7 shows the allocations, licensed use and actual use for the different sectors. Actual use (196 dam³) is 3.3 times the licensed use, and this is due to the fact that there are many small domestic and agricultural water users in the sub-basin who are allowed to take water without requiring a licence or registration. The largest water user is the agriculture sector (stockwatering).

Figure 3-7 Water Allocations and Actual Use, by Sector, Cline Sub-basin

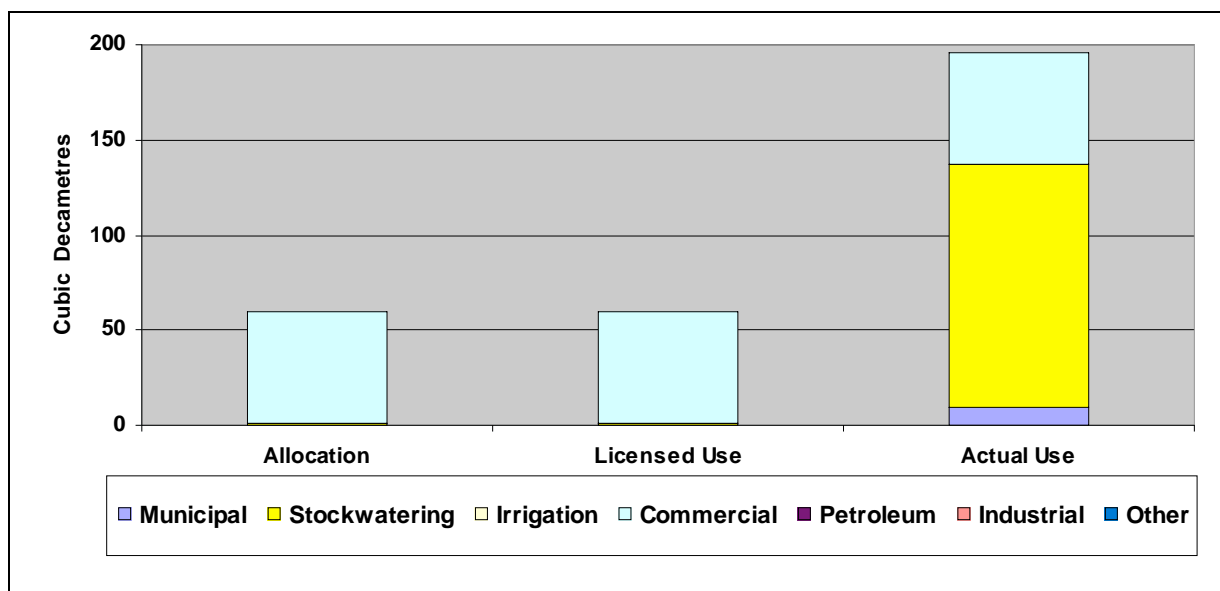


Figure 3-8 shows the forecasts to 2025 for all of the sectors. Water use is not expected to change from the current levels over the forecast period across all the forecast scenarios (Tables 3-4 to 3-6).



Table 3-3 Summary of Allocations and Estimated Water Use, Cline Sub-basin

| Sector | | Licensed Allocation and Use (dam ³) | | | | Estimated Water Use (dam ³) | | |
|--|---------------|--|-----------|----------|-------------------------|--|----------------------------|-------------------------|
| | | Allocation | Water Use | Return | Percent of Total Use | Use | Percent of Licensed Use | Percent of Total Use |
| Municipal | | 0 | 0 | 0 | 0% | 9 | N/A | 5% |
| Agricultural | Stockwatering | 1 | 1 | 0 | 1% | 128 | 20984% | 65% |
| | Irrigation | 0 | 0 | 0 | 0% | 0 | 0% | 0% |
| Commercial | | 59 | 59 | 0 | 99% | 59 | 100% | 30% |
| Petroleum | | 0 | 0 | 0 | 0% | 0 | N/A | 0% |
| Industrial | | 0 | 0 | 0 | 0% | 0 | N/A | 0% |
| Other | | 0 | 0 | 0 | 0% | 0 | N/A | 0% |
| Total | | 60 | 60 | 0 | 100% | 196 | 329% | 100% |
| Notes: Rural households and small agricultural users can take water without having to acquire licences or registrations | | | | | | | | |

Figure 3-8 Forecast Water Use in Cline Sub-basin: Medium Scenario

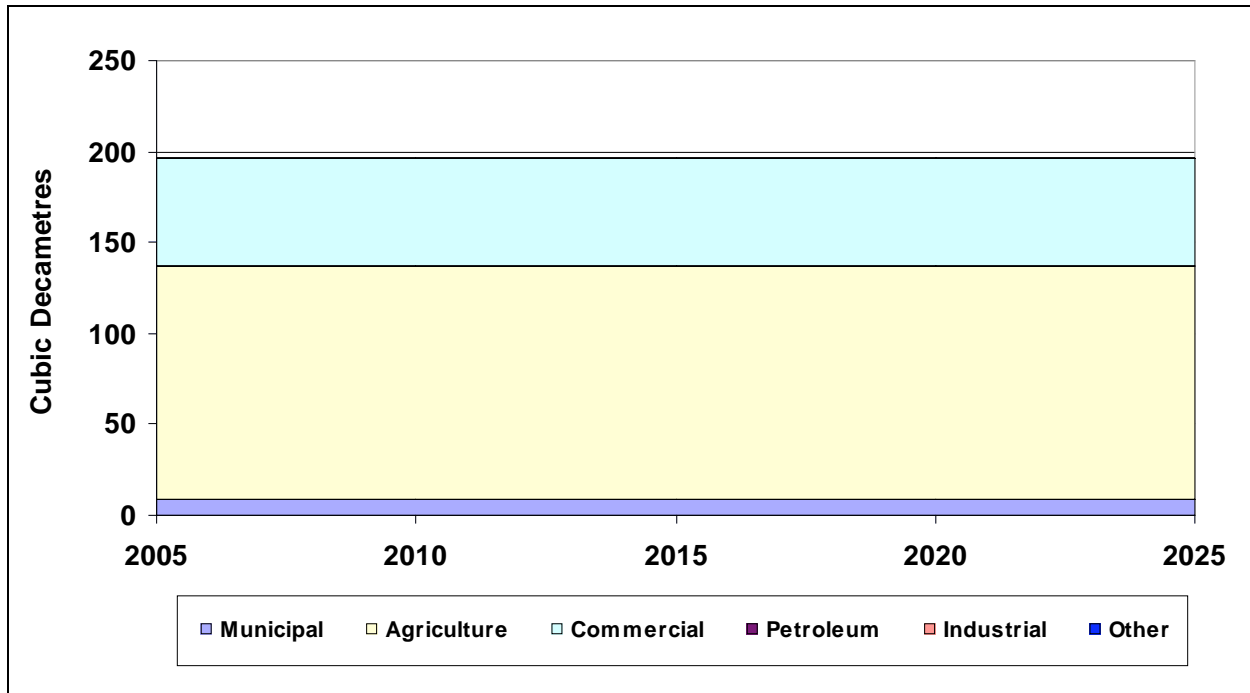


Table 3-4 Forecast Water Use, By Sector, Cline Sub-basin: Low Scenario
(dam³)

| Source | Sector | 2005 | 2010 | 2015 | 2020 | 2025 |
|---------------|--------------|------|------------|------------|------------|------------|
| Surface Water | Municipal | 2 | 2 | 2 | 2 | 2 |
| | Agricultural | 0 | 0 | 0 | 0 | 0 |
| | Commercial | 49 | 49 | 49 | 49 | 49 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 51 | 51 | 51 | 51 |
| Groundwater | Municipal | 7 | 7 | 7 | 7 | 7 |
| | Agricultural | 128 | 128 | 128 | 128 | 128 |
| | Commercial | 10 | 10 | 10 | 10 | 10 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 145 | 145 | 145 | 145 |
| Total | Municipal | 9 | 9 | 9 | 9 | 9 |
| | Agricultural | 128 | 128 | 128 | 128 | 128 |
| | Commercial | 59 | 59 | 59 | 59 | 59 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 196 | 196 | 196 | 196 |

Table 3-5 Forecast Water Use, By Sector, Cline Sub-basin: Medium Scenario
(dam³)

| Source | Sector | 2005 | 2010 | 2015 | 2020 | 2025 |
|---------------|--------------|------|------------|------------|------------|------------|
| Surface Water | Municipal | 2 | 2 | 2 | 2 | 2 |
| | Agricultural | 0 | 0 | 0 | 0 | 0 |
| | Commercial | 49 | 49 | 49 | 49 | 49 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 51 | 51 | 51 | 51 |
| Groundwater | Municipal | 7 | 7 | 7 | 7 | 7 |
| | Agricultural | 128 | 128 | 128 | 128 | 128 |
| | Commercial | 10 | 10 | 10 | 10 | 10 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 145 | 145 | 145 | 145 |
| Total | Municipal | 9 | 9 | 9 | 9 | 9 |
| | Agricultural | 128 | 128 | 128 | 128 | 128 |
| | Commercial | 59 | 59 | 59 | 59 | 59 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 196 | 196 | 196 | 196 |

Table 3-6 Forecast Water Use, By Sector, Cline Sub-basin: High Scenario
(dam³)

| Source | Sector | 2005 | 2010 | 2015 | 2020 | 2025 |
|---------------|--------------|------|------------|------------|------------|------------|
| Surface Water | Municipal | 2 | 2 | 2 | 2 | 2 |
| | Agricultural | 0 | 0 | 0 | 0 | 0 |
| | Commercial | 49 | 49 | 49 | 49 | 49 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 51 | 51 | 51 | 51 |
| Groundwater | Municipal | 7 | 7 | 7 | 7 | 7 |
| | Agricultural | 128 | 128 | 128 | 128 | 128 |
| | Commercial | 10 | 10 | 10 | 10 | 10 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 145 | 145 | 145 | 145 |
| Total | Municipal | 9 | 9 | 9 | 9 | 9 |
| | Agricultural | 128 | 128 | 128 | 128 | 128 |
| | Commercial | 59 | 59 | 59 | 59 | 59 |
| | Petroleum | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 0 | 0 | 0 | 0 | 0 |
| | Other | 0 | 0 | 0 | 0 | 0 |
| | Total | | 196 | 196 | 196 | 196 |

