

Current and Future Water Use in the North Saskatchewan River Basin

Report Prepared for the North Saskatchewan Watershed Alliance (NSWA)
by AMEC Earth and Environmental
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Key Findings and Messages

Why was this report prepared?

- The NSWA is preparing an *Integrated Watershed Management Plan* for the North Saskatchewan River basin in Alberta. An accurate understanding of current and projected water use patterns in the basin is fundamentally important to this planning process.
- The annual water use statistics presented in this report depict only a portion of the overall water management story. Water quality and ecological effects are not directly addressed in this type of analysis, nor are these water use statistics discussed in the context of water supply estimates.
- In order to provide the reader some context on this matter, the NSWA presents some simple comparisons below between water use and the (average) total annual volume of discharge in the NSR. The NSWA recognizes that these comparisons are limited in scope.
- Future analyses will examine the effects of water use on river flow patterns throughout the various seasons of the year and will also consider climate change effects on river supply.

How was the work done and what information does it provide?

- The NSWA contracted with a consulting firm (AMEC Earth and Environmental) to review Government of Alberta water use statistics and other data sources to produce a comprehensive and current report for the NSR basin.
- Current water use patterns were assessed and water use forecasts up to 2025 (based on low/medium/high population and economic growth scenarios) were prepared.
- The report provides current water use data and future estimates for each of twelve sub-basins in the watershed. Water use statistics are also broken down by “Sector” (purpose).
- All data are presented in terms of *annual* statistics

How is water use regulated in Alberta?

- All surface and groundwater diversions (withdrawals), except those intended for individual household and traditional agricultural purposes, require a license or a registration under Alberta's *Water Act*.
- Each license or registration creates a water **allocation**, which specifies the maximum amount of water that may be diverted for a particular purpose.

Is all of the *allocated* water actually diverted and used?

- No, many licensees are not presently diverting or using the full amount of their **allocations**.
- Once a quantity of water is actually diverted, only a portion may actually be **used** (or consumed) by the activity in question. The balance is generally returned to the original source where it remains available for other users.

What terms in the report are most important to understand?

- **Allocation** – the licensed maximum volume, as well as the rate and timing, of a water diversion
- **Actual water use** – the amount of water actually being *consumed* (and lost) and not returned to the source.
- Several other water use statistics are identified in the report and the reader is advised to *carefully* note the terminology used.

How much surface water has been allocated within the North Saskatchewan River basin and what is the actual use?

- Current annual surface water **allocations** total about 2 billion cubic metres - or approximately 27% of the river's average total annual discharge as measured at the Alberta- Saskatchewan boundary (estimated at 7.3 billion cubic metres).
- Many licensees' actual water use volumes are much less than their allocations.
- The report identifies that current actual **use** is about 0.19 billion cubic metres per year, or 2.6% of the average annual discharge.
- Both river flow and use will vary throughout the year so these percentage depictions will vary accordingly.

How much groundwater has been allocated in the North Saskatchewan River basin and what is the actual use?

- Groundwater **allocations** total 0.025 billion cubic metres (or a little more than 1% of the surface water allocations).
- Limited data are available on actual groundwater **use**. The report estimates that current actual **use** is about 60% of total allocations.

Water Allocation and Use by Sector

How are water allocation and use statistics categorized in the report?

- Water license statistics are broken down into six major categories or sectors: industrial, petroleum, municipal, commercial, agricultural and “other”.
- The “other” category includes water diverted for activities such as the maintenance of wetlands, land drainage and lake level stabilization.
- Allocations and actual use are quantified for each sector, by annual volumes, for both surface and groundwater.

What are the report’s findings on surface water use?

- A summary of surface water use statistics by sector is presented in Table 1

Industrial

- The largest portion of water allocated in the NSR basin (84%) is to the industrial sector.
- The majority of the industrial allocation is for thermal power plant cooling processes.
- Most of the water diverted by the industrial sector is eventually returned to its source.
- Despite these large return flows, the industrial sector accounts for almost half of the actual water use (49%) because of significant evaporative losses involved in cooling processes.

Municipal

- Municipal allocations are the next largest - at 8% of the total. Most of the water withdrawn for municipal use is eventually returned as treated wastewater effluent. Therefore, actual water use by this sector is very small and represents only 4% of actual water use.

Petroleum

- The third largest sector is Petroleum at 5% of allocations, most of which is consumed. Actual use is therefore next highest after Industry - at 18% of the current use. This category includes upgraders.

Commercial, Agricultural, Other

- The remaining three sectors (Commercial, Agricultural and Other) account for only 4% of allocations in total. However, actual use in these sectors is high and accounts for the remaining 31% of the current total use.

Table 1. Annual surface water allocations and use (billions of m3)

	Allocation		Actual Use	
Industrial	1.660	84%	0.092	49%
Municipal	0.158	8%	0.007	4%
Petroleum	0.089	5%	0.034	18%
Agriculture	0.016	1%	0.016	9%
Commercial	0.014	1%	0.011	6%
Other	0.034	2%	0.026	14%
TOTALS	1.971	100%	0.187	100%

What are the Report’s findings on groundwater use?

- A summary of groundwater water use statistics is presented in Table 2
- The Agricultural sector accounts for 45% of groundwater allocations.
- The report assumes that most of this allocated water is eventually used (for stock watering). Actual water use for agriculture therefore represents 54% of total groundwater use in the basin
- The Municipal sector accounts for 24% of groundwater allocations and 15% of the actual use.
- The Petroleum sector is 19% of allocations and represents 10% of actual use.

Table 2. Annual groundwater allocations and use (billions of m3)

	Allocation	Actual Use
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Municipal	0.006	24%		0.002	15%
Agriculture	0.011	45%		0.008	54%
Commercial	0.001	6%		0.000	0%
Petroleum	0.005	19%		0.001	10%
Industrial	0.001	3%		0.002	12%
Other	0.001	3%		0.001	9%
TOTAL	0.024	100%		0.015	100.0%

Geographic patterns in water allocation and use

Where does water use occur in the North Saskatchewan River basin?

- The watershed was subdivided into twelve sub-basins for the purposes of this study
- Patterns in development and water use vary widely across the basin.
- Water allocation and use is almost negligible in the upstream sub-basins
- The study identified that 95% of the total water allocations in the NSR basin and 84% of the actual water use are located in the four central sub-basins surrounding the Capital Region.
- Large water allocations and the resulting evaporation losses from thermal power plant cooling processes occur in the two sub-basins upstream of the Capital Region.
- Within the Capital Region there are also large allocations for cooling, other industrial, municipal and petroleum purposes.
- The allocation and use of water is very small downstream of the Capital Region

Future water use projections

What assumptions were made in projecting future water allocations and use?

- Since the extent of future water conservation initiatives remains unknown, future water use projections were based on a “business as usual” approach.
- Future water use was projected for low/medium/high rates of population and economic growth.
- Projections were made for each use category and each sub-basin at five year intervals up to 2025.

How much will surface water use increase?

- Based on a medium growth rate, annual surface water use is expected to increase from 0.19 to about 0.26 billion cubic metres by the year 2025.
- In relation to the annual river discharge of 7.3 billion cubic metres, actual water use is therefore projected to increase from 2.6% to 3.5% - assuming average river discharge rates remain unchanged

What changes are expected in the patterns of surface water use?

- Nearly all of the projected increase in surface water use will be in the Petroleum sector, and will be due to bitumen upgrader and coal gasification projects planned for the Capital Region.
- Annual water use in the Petroleum sector is projected to increase by 0.086 billion cubic metres by 2025.
- Annual water use in the Industrial category will decline by 0.026 billion cubic metres by 2010 due to closure of one thermal power plant upstream of the Capital Region.
- Annual water use in all the other sectors combined will increase by about 0.012 billion cubic metres by 2025.
- Most of the increase in water use will occur in the Capital Region.

What changes are expected in groundwater use?

- Annual groundwater use is expected to increase from 0.015 to 0.017 billion cubic metres, or by about 13 %, in the period up to 2025.

Where can I get a copy of the report?

- The report is posted on the NSWa website www.nswa.ab.ca

- A limited number of printed copies and CDs can be obtained by contacting the NSW office at 780-496-6962