

## PERFORMANCE MEASURE INFORMATION SHEET #22

### SOFT CONSTRAINTS FOR ARROW LAKES RESERVOIR: CULTURE & HERITAGE

Objective / Location	Performance Measure	Units	Description	MSIC
Culture & Heritage Soft Constraint/ Arrow Reservoir	Archaeological site protection	# days elevation is at or below 1430 ft over year	Sum of # days per year that the reservoir water level is at or below a major escarpment	7 days per year

### Description

There are known historic trails and archaeological sites within the drawdown zone of Arrow Lakes Reservoir, and it is expected that other sites of significance to both First Nations and non-First Nations exist within areas affected by reservoir operations. Unlike Kinbasket Reservoir where most archaeological sites were historically along the riverbank and are now permanently inundated, historical use of the shoreline in Arrow Lakes changed over time. Sites were established along a series of terraces, which are now susceptible to erosion as reservoir water levels change.

The WUP Consultative Committee examined several ways in which reservoir operations could affect existing archaeological sites. These impacts can be direct through active erosion of a site by wave action at the edge of the water or under water, or indirect through preventing vegetation growth and exposing sites to wind erosion. Since water erosion can occur at sites located at, slightly above or slightly below the reservoir level, the only operation that could fully address direct operational impacts is through keeping water levels below the critical elevation.

An Arrow soft constraint for water erosion was developed to estimate the frequency that water levels on Arrow Lakes Reservoir are between 1430 and 1444 ft. The lower threshold is the elevation at the base of major escarpment in which intact archaeological sites are believed to exist. .

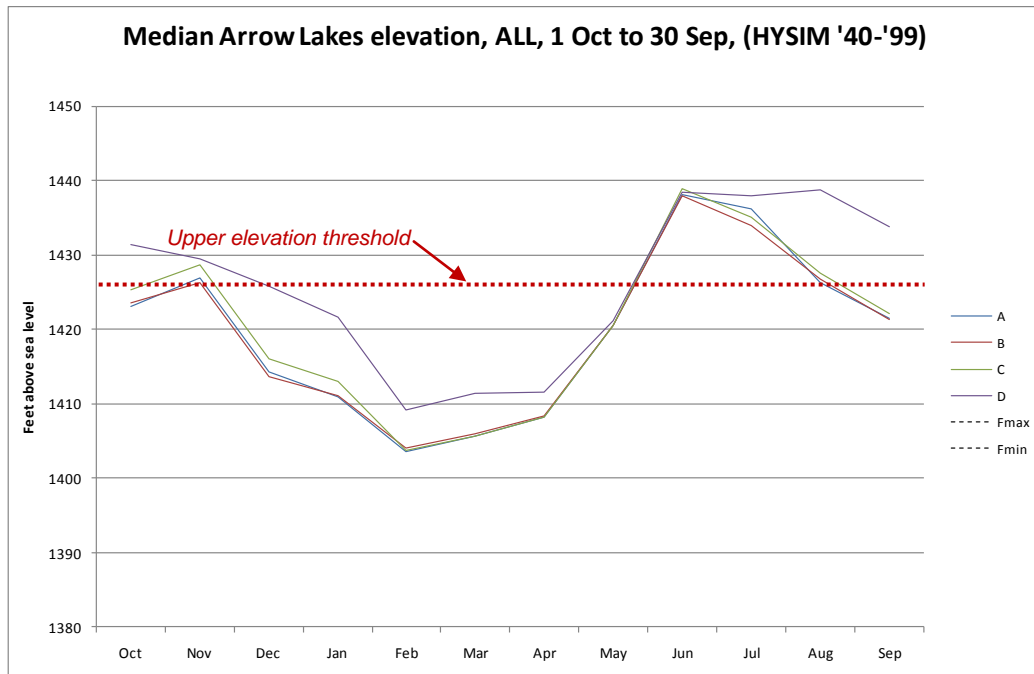
At the final consultative meeting, those Committee members representing First Nations interests emphasized the need to maintain reservoir levels at or below 1430 ft for as long as possible to minimize erosion of these archaeological sites. In articulating their objective for site protection, it was noted that the target would be to maintain these lower reservoir levels for 80 per cent of the time. However, there was a willingness to relax this constraint provided physical works projects aimed at site protection are underway. This was viewed by the First Nations representatives as a priority in the immediate future. It was agreed that the best protection for existing archaeological sites would be achieved through revegetation of the drawdown zone, which would stabilize the soils against wind erosion, wave action and runoff. Revegetation of exposed areas would also help to conceal sites from pot hunters and protect surface archaeological materials from foot and vehicular traffic.

### Calculation

For each scenario:

1. Assemble the simulated results for Arrow Reservoir elevations over 60 years (1940-2000; Figure 1).

2. Count the number of days over the year that the reservoir is at or below 1430 ft each of the 60 years.
3. Summarize all statistics (Figure 2).



**Figure 1. HYSIM Simulated Arrow Lakes Reservoir Elevations. Median over 60 years showing the elevation target for protection of heritage and cultural sites**

**Key Assumptions and Uncertainties**

- Each scenario is simulated using the same set of system constraints, input assumptions (e.g., load forecasts) and historic basin inflows (1940 – 2000).

**Results**

Regardless of the statistics used, scenario D (no NTS) would perform significantly worse for protecting the escarpment from wave action than the “with NTS” scenarios (A, B and C), as it would maintain higher reservoir levels particularly during the July through October period.

**Figure 2. Culture & Heritage – HYSIM Results for all NTS scenarios**

