Appendix VII-1

VII. Potential Future Demands for Water in the Clark Fork and Kootenai Basins.

1. Climate Change

Modeling Methods

The general procedures used in this section are similar to those described in the USBR (2011) West-Wide Climate Risk Assessments. Future temperature and precipitation projections were obtained from the Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections archive site maintained by USBR at: http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/. The root climate data sources for this archive are the World Climate Research Program Coupled Model Intercomparison Project3 (WCRP CMIP3) phase 3 multi-model climate projections (Meehl et al., 2007). The CMIP3 dataset consists of results from coupled atmosphere and ocean general circulation models, which simulate global climate responses to future greenhouse gas (primarily carbon dioxide) emissions. A range of modeled scenarios were available, based on how potential greenhouse gas emission rates and atmospheric concentrations might vary with global technological and economic developments during the 21st Century. In total, 112 climate projections, based on projections by 16 different CMIP3 models, were downloaded and used for this analysis. The CMIP3 and CMIP5 Climate and Hydrology Projections archive site contains statistically downscaled global-scale climate projections to a 12-kilometer (km) square grid (1/8° latitude by 1/8° longitude), which were used because raw CMIP3 dataset and climate models projections are too coarse for basin-scale water resources planning.

Hydrology projections also were downloaded from the same Reclamation Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections archive website, for the same 112 CMIP3 projections. The projections were developed using the University of Washington Variable Infiltration Capacity (VIC) hydrology model (Liang et al., 1994; Liang et al., 1996; Nijssen et al., 1997) to translate climate data to streamflow runoff. The VIC model also produces evapotranspiration and snow water equivalent output data. Input data to the VIC model is spatially downscaled precipitation, temperature, and wind speed data. Output includes runoff (both surface and subsurface runoff), evapotranspiration, and snow water equivalents over a grid corresponding to the watershed selected. The model solves the water balance for each grid cell, and then the gridded runoffs are linked and hydraulically routed to a watershed outflow point.

The 112 downscaled CMIP3 temperature, precipitation, and hydrologic projections were obtained from the USBR website for the 1950-2099 period. Because the period for this state water plan cycle is 20 years, discussions here will focus on comparing model results that are representative of the recent past (1950-1999) to those for a look-ahead period centered on the year 2035 (years 2010-2059).