**DIVISION OF WATER RESOURCES**

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**M E M O R A N D U M**

TO: Record

FROM: Craig Miller

SUBJECT: Water Budget data and processes

The Division of Water Resources has developed a number of datasets which will be used in the water budgeting process which are listed here.

Input data for water budgets includes the following

* PRISM weather grids for Utah including the Colorado River Basin and the Bear River Basin.
	+ Normals grids for 1971-2000 (~800 meter grid cells).
	+ Monthly grids for 1960 to 2009 (~4000 meter grid cells).
* Groundwater use from USGS groundwater reports allocated annual to each water budget study area from 1989 to 2009.
	+ Water Rights irrigation wells were used to proportion water from USGS groundwater use areas to water budget study areas.
	+ USGS groundwater use areas were modified to spatially account for where their study wells were actually located in association with irrigated agriculture.
* Irrigated agriculture induced increases in riparian water use were estimated for each water budget study area.
* Irrigation and system delivery efficiencies for each study area were determined from USU data created for a previous study.
* Yearly irrigated land use was estimated for each 12-digit HUC within the state.
* Temperature and weather data were extracted for irrigated lands within each study area and ET was calculated for each year and month from 1989 to 2009 using the Blainey-Criddle equation.
* Soil moisture holding capacity was calculated for each water budget study area using the STATSGO database and the Water Resources irrigated land use database.
* Reservoir data.
	+ A geographic database of all significant water impoundments was created which includes Bear Lake, Lake Powell, Great Salt Lake, and the Bear River Bird Refuge and others.
	+ Weather data was extracted for each of the reservoirs of the state from PRISM data for the 1989 to 2009 period. ET is calculated for those reservoirs using Bob Hill’s “E-LAKE” crop coefficients.
	+ Stage-area-capacity curves were extracted from previous Water Resources models, the Water Rights database and from tables maintained by the Bureau of Reclamation.
* Surface flows.
	+ Monthly flows are tabulated into text files for USGS stream gauges.
	+ A database of correlation coefficients and base stations has been created to extend or fill in important records.
	+ USGS stream-stats flows have been estimated for significant study area “pour points”.
	+ Water Resources “Area-Altitude” flow estimates have also been created for many of those same pour points.
	+ For flows estimated from either stream-stats or area-altitude, monthly flows are calculated as a proportion of the flow of a base station.
* Annual municipal potable water use is estimated for the 1989-2009 period for the following categories within public community and non-community systems. Indoor water use is assumed to be a constant for each month. Outdoor water use is assumed to vary as the grass demand from the nearest Bob Hill weather station.
	+ Indoor residential
	+ Outdoor residential
	+ Commercial
	+ Institutional
	+ Industrial
* Annual secondary water use is estimated for water systems for the period from 1989 to 2009.
* Annual self-supplied industry water use is estimated for 1989 to 2009.
* A database of previous water budget models is kept on file for reference to aid in the creation of our newer models.
* GIS maps prepared by Aaron are used to help construct

Water Budget Output

* The input data
* Surface flows.
* Pumped groundwater.
* Agricultural and municipal depletions.
* Monthly reservoir operational data.
* Basin outflow.
* Estimates of yield and natural depletions.