

WATER SYSTEM MASTER PLAN

9. HYDRAULIC MODEL UPDATE

The District's hydraulic model as developed previously by others was provided to Brown and Caldwell on a compact disc for this analysis. The District's hydraulic model is an MWH Soft InfoWater model, Version 6.5. The model has 12,700 pipes and 10,500 nodes. This section describes the updates performed on the District's system hydraulic model. For this master plan analysis, the hydraulic model was updated from a static model to an extended period model. The model was then used to evaluate the District's distribution system and other water system facilities.

9.1 Diurnal Demand

The hydraulic model was updated with the average annual buildout demands as developed in Section 3. A diurnal time pattern was established to simulate system demands over a 24-hour period. The time pattern used in all extended period maximum day analysis is illustrated on Figure 9-1. These diurnal curves are based on the maximum day water consumption period for the District occurring July 6, 2008 through July 12, 2008. The peaking factor on the diurnal curve is multiplied times the average maximum day demand to simulate the hourly demands over the maximum day demand period. As illustrated on this figure, the District's peak hour demand periods occur around 6 a.m. and 9 p.m. A peak hour factor (peak hour rate to maximum day rate) of 1.7 is used for estimating future peak hour demands for the NSA (including the McClellan service area and Arbors at Antelope service area). A peak hour factor of 1.5 is used for estimating future peak hour demands for the SSA. This is based on SCADA data for July 2008. The peak hour peaking factors used in this analysis for the NSA and SSA were slightly increased from the actual SCADA results to normalize lower than normal peak demands in 2008.

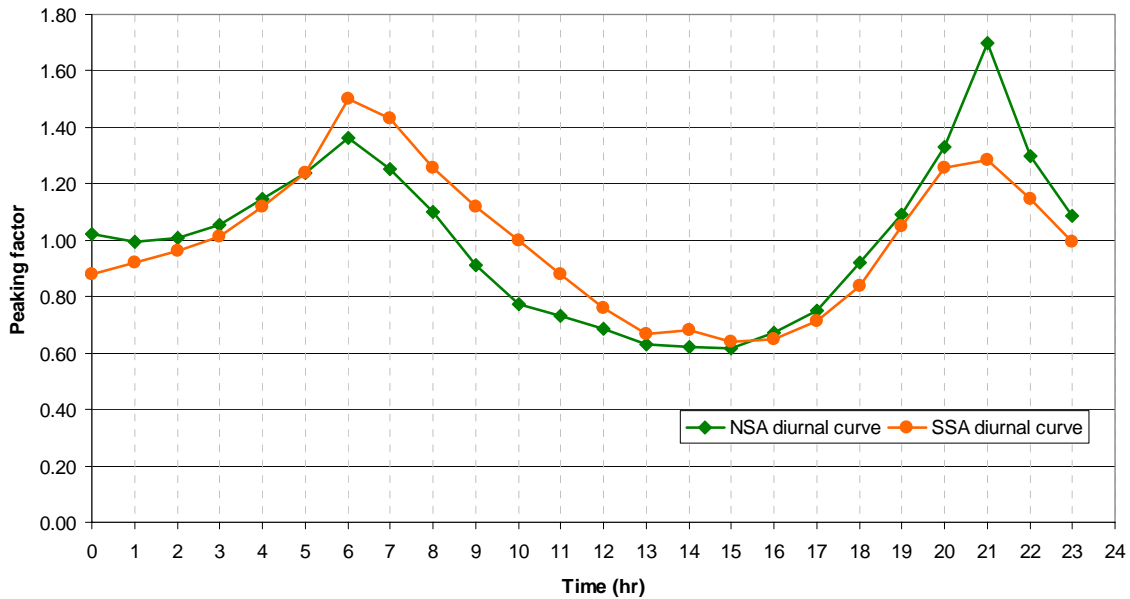


Figure 9-1. NSA and SSA Maximum Day Diurnal Curves for 24 Hour Period

9.2 Model Updates and Calibration

The pressure settings for the well pumps that operate as variable frequency drives (VFD) were updated based on the pump operation control set points, as included in Appendix P.

The distribution mains in the hydraulic model were updated per the District's water main replacement program to add new mains that have been installed since the hydraulic model was developed by others in 2006. Approximately 60,000 feet of distribution mains that the District has installed since 2006 were updated in the model. The District demands were then reallocated to each node based on the Thiessen polygon method of demand distribution. Thiessen polygons define individual areas of influence around each of the demand nodes. The polygon boundaries define the demand area that is closest to each demand node relative to all other nodes. The polygons are mathematically defined by the perpendicular bisectors of the lines between all demand nodes.

The extended period simulation model was operationally calibrated based on the July 6, 2008 through July 12, 2008 maximum day event. SCADA data for this time period was used to calibrate the well operating on and off settings in the model as well as compare model pressures to system pressures. A 24-hour simulation was run for the model and the model results were compared with the District's SCADA data. Wells on-off settings were adjusted so that model results matched the SCADA data.