Statement of
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Thank you for the opportunity to testify about the value of the US Geological Survey surface water data program. My name is Michael McDonald. For 20 years my partner and I have been operating McDonald Morrissey Associates; a ground water hydrology firm located in Reston, Virginia and Concord, New Hampshire. Although we are ground-water hydrologists, rather than surface water hydrologists, we rely heavily on the USGS surface water data program in the conduct of our investigations. I am pleased to have this opportunity to testify about the importance of that USGS program to my business and to the people who depend upon it.

Our clients are primarily large companies engaged in manufacturing, mining, chemicals and spring water. Other clients have been states and regional government agencies. Most of our clients are involved in conflicts in which a lot of money and/or water is at stake. Our projects have been distributed throughout the United States and represent all of the major hydrogeologic regions.

Our company serves our clients by developing mathematical models of ground-water flow systems. Such models have been used for a variety of purposes including: allocation of responsibility for remediating ground-water contamination, determining the impacts of pumping on the ground-water system and nearby streams, determining the adequacy of a municipal water supply, identifying the sources of contaminants in the ground and predicting the fate of contaminants in the ground.

As members of this committee, I'm sure you are familiar with the concept of the hydrologic cycle. I would like, however, to review that concept and explain why surface water data are so helpful in understanding ground-water systems. Generally, in the United States under natural conditions, when water hits the ground as rain it has one of three fates: 1) it runs off on the surface to a nearby stream causing high water in the stream for a few hours, 2) it stays at or close to the land surface where it falls and is evaporated or transpired by plants within a few days, or 3) it infiltrates deeply into the ground then moves slowly through the ground until it discharges into a stream usually after many years.

The water, when it infiltrates, is referred to as recharge; when it discharges to the stream after moving through the ground it is called base flow. Estimating recharge as it enters the ground is difficult; estimating base flow is easy. Therefore, ground-water hydrologists use base flow as a means of estimating recharge from precipitation. In systems influenced by humans base flow is used to estimate impacts of changes in pumping by municipalities, pumping for irrigation, leakage from canals and farming practices. Base flow is frequently used as a target for model calibration. In other cases it permits estimation of direct recharge to the ground from a river.

The following representative examples of our projects were selected to highlight issues related to our reliance on the products of the USGS stream flow program:

On the High Plains a water compact among three states governs rights to river flow among the states. In 1943 when the compact was initiated irrigation was from surface water sources routed to fields by canals. In the intervening years the practice of pumping water from the ground became common. One state claimed that irrigation pumping by the other two states was intercepting water that otherwise would have flowed into the first state. The settlement of the dispute entailed development of a mathematical model that would be used by the three states to establish and allocate the impacts of pumping. The availability of generally accepted surface water data within states and among states permitted definition of long term trends in base flow that corresponded to the growth of irrigation pumping between the 1940's and the 1990's. The trends in base flow were used to test alternative strategies for estimating precipitation recharge, irrigation pumping, and seepage from irrigation canals.

In the arid Southwest two companies had to determine the allocation of cost for remediating contaminated ground water. One of those companies engaged McDonald Morrissey Associates to develop a model to assist in establishing relative responsibilities of the two companies. Unlike the High Plains, where precipitation is the source of water into the ground and the river is a sink for water from the ground, the Southwest precipitation is a negligible source for recharge and leaky canals are the major source for recharge with the river being occasionally a source for recharge. On the rare occasions when there is water in the river channel it seeps into the ground adjacent to the river and alters the direction of ground water flow. Surface water data collected by the USGS permitted reasonable and reliable estimates of recharge from the river.

In the Far West our client had to pump large quantities of water to provide a dry work place for a mine, to understand the impact of pumping on water in storage and to ensure compliance with water rights. Sparse surface water data complicated the effort. We had to rely on a technique, developed in the 1940's when there was very little surface water data, to estimate recharge. If there had been more surface water data our analyses would have been more accurate and more defensible.

In the Northern Midwest, we evaluated two competing interpretations of the impact of pumping by a spring-water company on flow in a nearby stream. The impact of pumping

is dependent on ground-water recharge from precipitation and the hydraulic properties of the subsurface sediments. Those characteristics are interdependent and difficult to determine from field data. Fortunately, a generalized estimate of ground-water recharge was available. That estimate was cited by both experts removing one point of contention in a contentious situation. The generalized recharge estimate was based on analysis of long-term daily stream flow records collected by the USGS.

I have cited these examples of projects in which we have been involved because our analysis has hinged on the availability of long term, reliable surface water data. In my experience USGS surface water data is generally accepted as reliable and the product of a disinterested third party.

In Summary:

- My work relies heavily on the USGS surface water data program
- Availability of that data reduces the cost and increases the quality of our projects
- Our projects relate directly to the operation of contaminant cleanup, irrigation by groundwater, day-to-day management of municipal and spring-water supply wells and mine dewatering wells
- The USGS stream flow program provides long term data collected in a consistent manner throughout the United States which makes it universally accepted
- There is such confidence in the QA/QC of the USGS program that in both industrial and interstate disputes it is accepted without argument.

Thank you for the opportunity to testify. If you have any questions I will be happy to try to answer them for you.