BEFORE THE STATE WATER RESOURCES CONTROL BOARD

In the Matter of the State Water Resources Control Board (State Water Board) Hearing to consider Monterey Peninsula Water Management District's (MPWMD) Petitions to Change Permits 7130B and 20808 (Applications 11674B and 27614)	Hearing Date: September 24, 2007 Carmel River in Monterey County

TESTIMONY OF LARRY M. HAMPSON

WATER RESOURCES ENGINEER

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

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I, Larry M. Hampson, provide the following prepared testimony under penalty of perjury, under the laws of the State of California, in relation to Petitions for Change to Permits 7130B and 20808 (Applications 11674B and 27614) of the Monterey Peninsula Water Management District (MPWMD or District) pertaining to the MPWMD Phase 1 Aquifer Storage and Recovery Project (ASR Project).My testimony shall focus on the effects of the ASR project on the flood and erosion potential along the Carmel River and on effects to Carmel River lagoon volume.

Q1: PLEASE STATE YOUR NAME AND PERSONAL QUALIFICATIONS.

1. My name is Larry M. Hampson. My education includes a B.S. Degree in Engineering Science from Colorado State University and an M.B.A. Degree from the University of Colorado. I am registered in California as a Civil Engineer (C 45763) and as a Professional Engineer in Colorado (PE 25726). I have over 24 years of experience in water resources engineering in California and Colorado working with local, state, and federal agencies, with specific professional experience in the fields of hydrology, fluvial hydrodynamics, streambank erosion protection and river restoration, and riparian habitat mitigations. I am presently employed as the Water Resources Engineer for the Water Management District.

2. In my capacity as Water Resources Engineer, I am knowledgeable regarding Monterey Peninsula water issues in general and issues related to hydrology, erosion protection, and riparian habitat mitigation and restoration in the Carmel River Watershed in particular. I have participated in planning, engineering, and environmental impact investigations, and

construction and monitoring of streambank protection and habitat restoration projects. A list of projects is attached as Exhibit LH2. I am familiar with local, state, and federal regulations regarding permitting, construction and operation of these projects. I am also familiar with the Water Management District's responsibility and practice with respect to these projects within the Water Management District boundaries.

Q2: PLEASE DESCRIBE THE DOCUMENTS WHICH YOU HAVE REVIEWED TO PREPARE YOUR TESTIMONY.

3. I have reviewed: (1) Draft EIR/EA for Phase 1 ASR Project, March 2006 (Exhibit SWRCB-1); and (2) Final EIR/EA for Phase 1 ASR Project, August 2006 (Exhibit SWRCB-1). The Draft EIR/EA describes qualitative and quantitative effects of the Phase 1 ASR project on Carmel River flows and on storage in the Carmel Valley Aquifer .

Q3: PLEASE DESCRIBE YOUR PARTICIPATION IN MPWMD'S PETITIONS FOR CHANGE FOR THE PHASE 1 AQUIFER STORAGE AND RECOVERY PROJECT.

4. Although I have been aware of MPWMD's Petitions for Change, I have not had a direct role in preparing documents or conducting studies that are directly related to this project.

Q4: PLEASE DESCRIBE THE POTENTIAL FOR THE ASR PROJECT TO AFFECT THE CARMEL RIVER DURING FLOOD EVENTS.

5. Flooding of low-lying properties and some structures along the lower 15.5 miles of the Carmel River (from the Pacific Ocean to one mile above Esquiline Road) can begin when flow at the mouth of the river exceeds about 7,000 cubic feet per second (cfs). A flow of about

10,000 cfs near the mouth of the river is considered to be about the 10-year return interval flood. According to the 1983 Federal Emergency Management Agency Flood Insurance Study for Monterey County, the 100-year flood is estimated to have a peak magnitude ranging from about 25,000 cfs near Esquiline Road in Carmel Valley village to about 29,000 cfs at Highway 1 (RM 1). In 2003, Monterey County determined that there were 94 repetitive loss structures (two or more flood insurance claims of $1,000 or more within a 10-year period) in the Carmel River floodplain. Most of these losses were as a result of floods in January 1995, which was estimated to be a 10-year return interval flood, and in March 1995, which was estimated to have peaked at a magnitude of 16,000 cfs or about a 40-year return interval flood. Nearly 500 homes and business suffered damages as a result of the March 1995 flood. A flood in February 1998 was similar in magnitude to the March 1995 flood, but due to flood improvements made after 1995 there were fewer structures damaged, although some areas of the river experienced significant streambank erosion damage.

6. The Final EIR/EA describes that diversions from the Carmel River during the high flow season would occur between River Mile (RM, measured from the ocean) 5.5 and San Clemente Dam at RM 18.6. Peak diversions would be limited to 13.3 acre-feet (AF) per day, or less than seven cfs. During high flow season, ASR diversions would range from about 0.02% of the peak flow during a 100-year flood to less than 0.1 % of the peak flow during a 10-year flood. If these ASR diversions are carried out during high flow peaks, there would be an insignificant reduction in the magnitude of flow in the river and therefore no significant change in the potential for properties to be flooded.

Q5: PLEASE DESCRIBE THE POTENTIAL FOR THE ASR PROJECT TO AFFECT EROSION AND SEDIMENT TRANSPORT ALONG THE CARMEL RIVER.

7. The riverbed and streambanks of the Carmel River are generally composed of non-cohesive silts, sands, and gravels that are collectively described as sediment. When flow in the river is in the range of the two-year to five-year return period magnitude or about 2,000 to 5,000 cfs, which are also called "frequent flows" or "channel forming flows", the river works and re-works these sediments to form natural channels and low-lying floodplains. Frequent flow events carry sediment from the upper watershed and scour sediment from the river bed and banks. In a balanced system (i.e., from the perspective of water and sediment flow), frequent flows transport the majority of sediment over time and can result in a more complex ecosystem that provides opportunities for diversification of aquatic and plant species. This condition is sometimes referred to as "dynamic stability," which for the Carmel River describes a system that changes during high flows, but within a range that encourages ecosystem diversity and offers a wide range of habitats. In a dynamically stable system, there is a balance between erosion, deposition, sediment transport and river flows such that there is no net long term erosion (degradation) or deposition (aggradation) in the river.

8. Currently, and for the foreseeable future, the main stem of the Carmel River from the ocean to the upstream end of Los Padres Reservoir at about RM 27 is a supply-limited stream (i.e., the sediment supply is less than the sediment transport capacity) and does not appear to be in a dynamically stable state, although the river has adjusted somewhat to a lower sediment load by cutting into the bed and banks of the stream. In other words, the capacity of the Carmel River to move sediment now nearly always exceeds the supply of sediment from tributaries and the upper watershed and so the river must find other sources of sediment, such as from its bed and banks. ASR diversions during frequent flow events would represent a range of about 0.35% to 0.14% of flow and would not significantly reduce the sediment transport capacity or stream power and would certainly not reduce the flow of the stream to a point where the stream is dynamically stable.

9. In this unbalanced system, the presence of healthy streamside vegetation has been shown to be a critical factor influencing whether reaches of the river remain relatively stable during frequent flows or become totally unstable. Where streamside vegetation is present and in healthy condition, erosion during frequent flows is limited by the vegetation and eroded streambanks tend to recover and stabilize naturally as vegetation re-sprouts or new vegetation takes hold along the streambank. Where vegetation is non-existent or in poor condition as a result of human impacts, sustained frequent flows have caused episodes of erosion (i.e., extensive and continuous bed and bank erosion during frequent flow events) that have resulted in temporarily changing the river into a highly unstable, braided system of channels with poor quality conditions for aquatic and land-based species. Episodic erosion and degradation of streamside habitat is a result of several human activities, but a primary factor influencing the health of streamside vegetation is water extraction practices that directly affect the vigor and mortality of streamside vegetation. Thus, maintaining healthy streamside vegetation can make the difference between the Carmel River being a somewhat stable channel over short periods (one or two decades) or one that is unstable.

10. The health and vigor of streamside vegetation depends directly on access to adequate levels of surface and groundwater. Diversions by Cal-Am and other pumpers along the river during low flow season reduce the amount of water available to sustain healthy streamside vegetation and can result in reduced vigor and/or mortality and loss of diversity of streamside vegetation. MPWMD conducts an irrigation program along approximately eight miles of the lower Carmel River during low flow season to mitigate the effects that low flow season diversions have on soil moisture levels and to provide water for riparian plantings to replace vegetation lost as a result of diversions. However, it is clear that streamside vegetation benefits greatly from both perennial surface flow and from groundwater levels that maintain adequate moisture within the root zone of the vegetation and that irrigation cannot fully mitigate for the impacts of low flow season diversions.

11. The ASR Project would decrease Cal-Am's diversions from the Carmel Valley Aquifer during low flow season and would result both in increased streamflow and higher groundwater levels in the lower reaches of the Carmel River. Both of these effects would be beneficial to streamside vegetation, which in turn would increase streambank stability and provide shade and habitat for aquatic species. Reduced diversions during the low flow season could also reduce the need to irrigate some streamside areas.

Q6: PLEASE DESCRIBE THE POTENTIAL FOR THE ASR PROJECT TO AFFECT THE VOLUME OF WATER IN THE CARMEL RIVER LAGOON

12. The Carmel River Lagoon provides important habitat for feeding, rearing, and acclimatization of steelhead migrating to and from the ocean. California red-legged frogs have also been found in fringe areas of the lagoon. Normally, the volume of the lagoon fluctuates significantly throughout the year from as little as 10 AF at a water level of two feet (note: all elevations in this testimony are referenced to National Geodetic Vertical Datum "NGVD" 1929) to as much as 300 AF at a water level of about nine feet. With the river flowing freely to the ocean, water levels in the lagoon frequently fluctuate diurnally in response to tidal activity. Changes in the water level are a function of surface and groundwater inflows, ocean swell and tidal influence, and the configuration of the Carmel River State Beach, which lies at the mouth of the Carmel River and forms a barrier that creates a shallow lagoon before the river enters the ocean. In general, the quantity of aquatic habitat is directly related to the water level in the lagoon. However, both the quality and quantity of aquatic habitat is affected by surface inflows both from the river and from wave overtopping along the barrier beach, groundwater inflows, and outflow over and through the beach.

13. During the summer and fall, when Carmel River flows are not high enough to maintain an open channel through the beach to the ocean, the barrier beach is built up by wind

and wave action. In general, inflows of less than 10 cfs are associated with a closed lagoon. Flows in summer and fall are frequently less than 10 cfs and often there is no flow to the lagoon during this period. At flows between 10 cfs and 20 cfs, the lagoon rarely opens. Between about 20 cfs and 200 cfs – flows that are normally associated with winter and spring – the lagoon is open intermittently to the ocean. At flows above 200 cfs, the lagoon remains open to the ocean 100% of the time.

14. The most significant effects on lagoon volume from water extraction activities in Carmel Valley occur during the low flow season after ocean waves push sand across the mouth of the river and block outflow, which normally occurs in spring or early summer when river flows drop below about 20 cfs. The maximum volume of the lagoon just after final closure for the low flow season typically ranges from about 75 AF (or a level of just above five feet) up to about 250 AF (or a level just above eight feet). After closure and during the low flow period, the lagoon level slowly drops as water flows out through the sand berm at a higher rate than surface and groundwater flows into the lagoon. This process often takes six to 12 weeks after final closure and the time to reach a stable level depends both on the water level at final closure and the nature of the spring/summer recession of the river. Water extraction in Carmel Valley during this period reduces inflow to the lagoon and accelerates the drop in volume. Eventually, the lagoon level stabilizes at about 2.5 to 3.5 feet, which corresponds to a volume of about 15 to 30 AF. This generally occurs in mid-summer and the condition (low water level) may last for several weeks to several months until ocean waves overtopping the beach begin filling the lagoon with salt water in the fall.

15. As proposed, the ASR project would allow Cal-Am to decrease water extraction in Carmel Valley between June 1 and November 30 – the period of the year when the volume of the lagoon normally shrinks as surface and groundwater inflows drop. Operation of the ASR project during this period would allow more surface and groundwater to flow into the lagoon, thus slowing the loss of volume after final closure. This would be beneficial to aquatic species

(it should be noted that the lagoon water level and water quality is also affected by wave overwash, which often occurs beginning in fall and continues through the winter).

16. During the time of year proposed for diversion (December 1 to May 31), the water level in the lagoon would not be significantly affected by ASR diversions due to the requirement for meeting instream flows for steelhead before diversions can be carried out. As proposed, no diversions would occur below 40 cfs inflow to the lagoon and most diversions would occur at greater than 60 cfs inflow. At a 40 to 60 cfs inflow, the volume in the lagoon is determined primarily by whether the mouth of the river is open or closed and at these inflows, the lagoon frequently cycles between being practically empty and relatively full. At its lowest level (normally about two feet), the lagoon holds about 10 AF (see LH-3). With the mouth closed and an inflow of 40 cfs to 60 cfs, the lagoon level can increase from two feet to the nine-foot level in three to four days. A water surface elevation of at least six feet, which corresponds to a volume of about 100 AF, is desired to maintain habitat value for steelhead (see LG-4). As the lagoon level approaches about nine feet, which corresponds to a volume of about 300 AF, the beach often breaches on its own, first with a trickle over the sand and then with a torrent that cuts a large channel down through the sand to the level of the ocean. The lagoon is quickly evacuated and the volume is reduced to a fraction of what it was before breaching. More recently, when the level in the lagoon rises above eight feet, bulldozers have been used to create a temporary outflow channel through the beach in an attempt to stabilize the water level above the desired elevation of six. With the mouth closed and an inflow of 40 cfs, or about 79.3 AF per day, and a proposed maximum rate of diversion of 13.3 AF/day, the time it would take for the lagoon to rise from its lowest point to the desired water level of six feet would be a little more than four hours longer than if there were no diversion (note: this estimate ignores the rate of outflow through the sand berm which is not yet well defined); however, continued diversions at or near the lowest minimum instream requirements would also result in extending the time that the lagoon level remains above the desired six foot level, but below the level at which the barrier beach is

breached or a temporary outflow channel is created. Diversions at flow rates between 40 cfs and 200 cfs would have progressively less effect on filling time and on the amount of time the lagoon is above an elevation of six but below an elevation that leads to a change in the in the barrier beach and lagoon. Diversions at more than 200 cfs inflow would not have a significant effect on lagoon volume, as the primary influence on lagoon level with the mouth open is the combined effect of tides, wave height and period on the configuration and vertical location of the outlet channel through the beach.

Executed on ________________, 2007, at Monterey, California.

MONTEREY PENINSULA WATER
MANAGEMENT DISTRICT

By: Larry Hampson
Water Resources Engineer

13766 Center Street, Suite 228
Carmel Valley, CA 93923
Telephone: (831) 659-2543
Facsimile: (831) 659-2598
Email: larry@mpwmd.dst.ca.us

U:MPWMD/PUC-ASR/Testimony of Larry Hampson