To: City of Sammamish Planning Commission June 1, 2011

From: Gene Welch, Limnologist
4228 201st Ave. NE
Sammamish, WA 98074

Subject: Erosion and Lake Sammamish

Development on the west and east sides of Lake Sammamish has resulted in erosion that produced obvious changes to the lake's shoreline. Large deltas of coarse material (boulder size) have formed at the end of pipes leading down from west side developments. One can hear the rumbling of large boulders moving through pipes during runoff during large storms. In 1971, a pipe ruptured on the west side, eroding a ravine, emptying 7,000 cubic yards of sediment onto the lake's shore line and into a small bay. The county's solution was to dredge and pump the material farther into the lake - out of sight.

The cause for erosion is too much water at a time from developed areas onto steep slopes, which is the potential situation on the east side. That excess water is produced from too much impervious surface and too much forest removal. Derek Booth, an expert on hydrological effects of urban development, has found that removal of forest cover is as important (or more so) as impervious surface in generating excess runoff. He suggested that 10% impervious surface and 65% forest cover represent transitions to damage-causing runoff (Booth, 2000). The obvious measures then are to minimize impervious area and maximize forest retention to retain as much water at the site, which will reduce the rate of runoff and, therefore, the erosional force down slope. That is precisely the strategy of LID, as AMEC has recommended.

Tree retention should be strongly encouraged by the City, even in existing developments. While there is a tree removal ordinance that requires a permit for removing trees above a certain size, there is no education as to the many benefits of retaining trees. The City should strongly encourage tree retention by explaining the many benefits of trees - rainfall interception reducing runoff rate, energy saving by wind protection in winter and cooling from evapotranspiration in summer, habitat for wildlife, their emotionally soothing character and natural beauty.

Detention basins may help reduce runoff rate, but do not necessarily prevent down slope erosion. Booth's research on two streams draining the hillside below the Timberline development has shown down cutting of two meters over a period of ten years following development, despite the presence of a detention basin (Booth and Henshaw, 2000). Straight piping of runoff from developed areas directly into the lake is not an adequate solution either, because pipes can rupture, as did the one draining the west side cited above. Also, phosphorus, sediment, pesticides and metals, which are common in high concentrations in storm water draining impervious areas, are then discharged directly into the lake. LID, or even wet retention ponds, properly sized, would at least minimize transport of those pollutants into the lake.

Therefore, the best strategy is to retain the water, and pollutants, as much as possible on the site. In already developed areas, retain the trees and even encourage tree planting. As the trees grow and expand, their effect on water runoff loss will also increase.

Booth, D. B. 2000. Forest cover, impervious-surface area, and the mitigation of urbanization impact in King County, Washington. Prepared for KC Water and Land Resources, 17 pp.

Booth, D. B. and P. C. Henshaw. 2000. Rates of channel erosion in small urban streams. Amer. Geophysical Monographs.