Comment by Geoffrey Fleissner, CA Registered Civil Engineer, 11/1/18

Additional Post-Development Runoff from Hagar Site

Prior to the Public Hearing on Tuesday, October 23rd at Louden Nelson a brief presentation was made in reference to the Draft Environmental Impact Report (EIR) on the Student Housing West Project. During this presentation, the statement was made that no additional runoff would be created at the Hagar Site by the introduction of impervious surfaces such as rooftops, parking areas, drive aisles, paved walkways, etc. Since this statement was very misleading I would like to explain what the storm water mitigation measures in the Draft EIR are intended to do and what they are not intended to do. It is important to understand the principles at work and the function of proposed storm water mitigation measures in light of concern from local neighborhoods about exacerbating current issues with flooding, ponding and erosion. The Draft EIR specifically mentions "areas that have experienced flooding from surface ponding include the area near the McLaughlin Drive sinkholes and on Moore Creek at Highview Dirve south of the campus."

Mitigation measures usually work in two ways: filtering runoff and releasing runoff in a controlled manner. The bioswales mentioned in the Draft EIR filter runoff by passing it through a special planting medium. Detention structures hold storm water runoff in a pond, vessel or rock filled trench where it exits during normal operation through a sized orifice. The orifice is designed to release runoff from the detention volume at the pre-development rate. Thus, the retention and detention structures such as those proposed in the improvement projects described in the Draft EIR are designed to hold the additional runoff caused by increases in impervious surfacing and release it at the same rate that runoff had been generated before the project.

In order to shed light on the effects of development, especially at the Hagar Site, a bit of background on Hydrology may be useful. Storm water runoff is usually quantified using the rational method, where the amount of runoff is calculated using the simple formula $Q = C I A$. The rate of runoff is the product of a runoff coefficient (C), the rainfall intensity (I), and the area receiving the rainfall (A). Thus, if the area is 100 percent impervious ($C = 1.0$) all of the rainfall that strikes the area in question results in runoff. The accepted values for runoff coefficients in the County of Santa Cruz Design Criteria for pervious surfaces (bare land) and impervious surfaces (rooftops, impervious pavement, etc.) are 0.2 and 0.9 respectively.

Furthermore, the discussion of rainfall intensities relies upon convention of quantifying precipitation for storms of a specified recurrence interval and duration. For example, a two-year storm is the most intense storm that will recur on average every two years. A ten-year storm is the most intense storm likely to recur every 10 years. Intuitively, it can be understood that a rain event with a longer recurrence interval will be more intense. The duration of the storm further refines the estimation of the intensity of the "design" storm. Thus the 10 year, 90 minute storm is the most intense storm with a duration of 90 minutes that recurs every 10 years. The rainfall intensity ("I" from the equation above) has been established through statistical means for storms of various recurrence intervals and durations in a given area.

The Draft EIR describes the hydrologic impacts of development of the two sites. It quantifies the increase of impervious surface at the 13-acre Heller Site from approximately 6.0 acres to about 7.9. The Draft EIR states the intuitive hydrologic impact as "there would be an increase in the total volume of storm water runoff that would be generated on the project site" (about 20 percent). One of the project goals is adherence to the Long Range Development Plan (LRDP) mitigation measure HYD-3C to limit post-development runoff rates to pre-development rates for 2 to 10 year storms. Thus, the concluding statement regarding runoff from the Heller Site is that "despite a 32 percent increase in impervious surface area on the site with implementation of control measures included in the proposed project, the rate or amount of surface runoff leaving the site would not increase."

A similar presentation is made about the Hagar Site. In this case, no impervious surfaces exist already at the site. The planned development would introduce about 7.1 acres of impervious surface to the 15-acre site. Thus, 47 percent of the site would be converted from bare land to rooftops, walkways, parking stalls, drive aisles, etc. If no mitigation measures were present, the increase in impervious surfaces would cause a 266 percent increase in storm water runoff. The Hagar Site is to be designed for storm water mitigation similar to the Heller site, following the HYD-3C design guidelines. The effect of the mitigation measures is explained in a similar fashion to the discussion of the Heller Site. The report concludes, "the proposed project would not result in an increased downstream discharge of storm water that could lead to substantial off-site flooding or other changes."

But the summary of hydrologic impacts is really only referring to the range of storms stated in the HYD-3C guidelines. The report is stating that no additional runoff will be created **for a range of storms with a recurrence interval from 2 to 10 years**. But what will happen in the more intense storms with longer recurrence intervals? For example, even with the design mitigation measures in place, what will happen during the 15 year or 25 year storm as opposed to the 2 year or the 10 year storm?

In terms of mitigation, nothing will happen during these more intense storms. The release structure for detention volumes under ideal conditions will release the detained volume of water at the specified rate, usually the pre-development rate. But the detention and/or retention volumes (and the release structures) are sized for the 2 or 10 year storms. During more intense rain events (e.g. a 20 year storm or a 30 year storm) the volume of runoff exceeds the capacity for retention and/or detention causing the overflow condition of the system. The overflow condition is to simply release all of the additional runoff without mitigation.

Thus, the following sequence will occur during the less frequent, longer recurrence interval storms with greater rainfall intensities than the mitigation measures are designed for. First, the runoff will start collecting in the retention and/or detention structures. These will begin to infiltrate and/or release at the predevelopment rate. But since the rainfall is more intense than the design storm the retention and/or detention structures will fill up. Once full, the overflow condition will occur and all runoff in excess of the design storm will simply be released without mitigation. Under these conditions, any increase in impervious surfaces will result in increased runoff.

It should also be noted that release structures are prone to clogging by trash, tree leaves, or other debris. An impaired release structure also results in the detention structure filling up and eventually triggering the overflow condition. It is even possible for infiltration rates to be reduced by the buildup of sediment at the bottom of retention structures. The reduced infiltration rate caused by sediment buildup can also result in an overflow condition and unmitigated release of storm water. The overflow condition results in the increase in runoff rate described earlier simply based on the rational method. Thus, the Heller Site under these conditions would be releasing runoff at 120 percent of the current rate at that site. The Hagar Site would release runoff at 266 percent of the current rate. Unfortunately, there is no easy solution to this simple fact. Since mitigation measures rely upon storing the increased runoff from development, it is easy to understand that mitigating more intense, larger storms will cause large increases in the cost of the measures, their size, their impact on the project, ultimately affecting the overall feasibility of the project.

Despite the fact that design intensities are known in various areas from statistical analysis, larger, more intense storms can occur more often than expected. In the last 25 years the Santa Cruz Mountains have experienced storms corresponding to a recurrence interval of 70 to 80 years at least twice, based on flood levels in local water bodies. Thus, the development of the Hagar site will cause additional runoff leading to detrimental downstream impacts despite the design methodology described in the Draft EIR. For this reason, I oppose the development of the East Meadow of the UCSC campus.

I also oppose the development of the East Meadow for some of the reasons stated in public comment during the recent hearings. I am concerned about the impact to native plant and animal species of the development and all of its appurtenant construction activities (road work, utilities, etc.). I feel that the development will spoil the pristine natural beauty of the meadow, and will in fact “pave the way” for further development. The buildings will be an eyesore in the natural setting and will have a much greater impact than what was shown in the project renderings presented before the public hearings. I believe the high rate of speed of vehicle traffic in that area makes it a poor choice for a facility for child care, which experience episodic congestion at times when children are dropped off or picked up. I feel that other locations (either remote or offsite) will better serve not only the staff and families of the child care center and housing units but all of the students and staff of the University.