

## Hydromodification Management Requirements

### What Developers, Builders and Project Applicants Need to Know

#### What is Hydrograph Modification (Hydromodification)?

Land development can adversely affect the runoff hydrograph (flow pattern) from a site by increasing the impervious area, decreasing natural vegetation, changing grading and soil compaction, and creating new drainage facilities. These development activities:

- Decrease site infiltration;
- Increase volume, duration, and frequency of flows, and;
- Increase connectivity of runoff to creeks.

Overall, these effects can cause stream channel erosion and harm beneficial uses of the stream.



#### Hydromodification Control Requirements

In the Santa Clara Valley, development projects must comply with the Municipal Regional Stormwater NPDES Permit (MRP) issued to the member agencies of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) by the San Francisco Bay Regional Water Quality Control Board. SCVURPPP is an association of 13 cities, Santa Clara County, and the Santa Clara Valley Water District that share these permit requirements.

Unless the project is exempted (see back page), hydromodification controls are required under Permit Provision C.3.g. The requirements are:

- Increases in runoff peak flow, volume, and duration shall be managed for all projects that add and/or replace 1 acre or more of impervious surface.

- Post-project runoff shall not exceed estimated pre-project rates and durations.
- These conditions apply to areas where such increases in runoff flow or volume can cause increased erosion of creek beds and banks.

#### The Plan for Santa Clara Valley

To help local agencies and developers meet the requirements, SCVURPPP completed a Hydromodification Management Plan (HMP) in 2005 which provides management options for maintaining pre-project runoff patterns. The HMP is not designed to correct existing erosion problems, but to prevent worsening of creek channel erosion problems from new or redevelopment projects. Some HMP applicability requirements and exemptions were revised in the MRP, effective December 1, 2009 (see page 2 for the latest requirements.)

#### Designing Hydromodification Controls

To meet hydromodification management (HM) standards for flow controls, on-site, off-site, and/or in-stream control measures may be implemented.

On-site controls designed to provide flow duration control to the pre-project condition are considered to comply with the HM requirements. (Flow duration is the number of times a flow value occurs during a long time period.) Flow duration controls detain flows on-site in a way that runoff leaving the site would match flow and durations of runoff for the pre-project condition. Stormwater treatment and site design measures, such as grassy swales, bioretention, and detention in landscaping, also help to detain and infiltrate increased flows.



## Santa Clara Valley Urban Runoff Pollution Prevention Program

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Designing flow duration controls involves simulating the runoff from a project site, pre- and post-project, using a hydrologic model and a long-term continuous rainfall record, and generating flow-duration curves for the period of record. A flow duration control structure, such as a detention basin or underground vault, is sized using an iterative process of adjusting the structure's dimensions and the weir and/or orifice sizes in the outlet structure to match the pre-project flows.



The iterative process is complete when pre- and post-project flow duration curves match from the stream's critical flow (estimated to be about 10% of the pre-project 2-year peak flow) to the pre-project 10-year peak flow. The stream's critical flow is the minimum flow that initiates erosion. The post-project runoff calculations should take into account planned stormwater treatment measures that also may detain or infiltrate runoff.

If requirements cannot be fully met on the project site, the applicant may have an opportunity to contribute to an off-site or in-stream flow control project to mitigate the hydromodification impacts.

### Projects That May Be Exempt

Projects that meet the following criteria are exempt from HM requirements.

- Projects that add or replace less than 1 acre of impervious area;
- Projects that do not increase the amount of impervious surface over pre-project conditions.
- Individual single family homes that are not part of a larger plan of development;
- Projects that drain into tidally influenced areas, directly to the Bay, or to channels continuously hardened to the Bay or the Sunnyvale East or West Channels;
- Projects in a subwatershed or catchment with more than 65% impervious surface.

Exempt areas for the last two criteria are depicted on the SCVURPPP HMP Applicability Map. To determine whether your project site may be exempt, contact City or County staff for a detailed HMP applicability map, or visit this website: [http://www.scvurppp-w2k.com/hmp\\_maps.htm](http://www.scvurppp-w2k.com/hmp_maps.htm).

### Bay Area Hydrology Model (BAHM)

The Bay Area Hydrologic Model (BAHM) is a user-friendly tool developed to help developers design, and municipal staff review, flow control facilities in the Bay Area. Members of the Alameda County and San Mateo County municipal stormwater programs have joined with SCVURPPP to fund the program. The BAHM and user manual are available for download at <http://www.bayareahydrology.com/>.

### Resources on the Web

The following resources provide useful information for selecting and incorporating stormwater controls in development projects and using continuous simulation hydrologic models.

#### *SCVURPPP C.3 Stormwater Handbook*

[http://www.scvurppp-w2k.com/c3\\_handbook\\_2012.shtml](http://www.scvurppp-w2k.com/c3_handbook_2012.shtml)

*Hydromodification Management Plan – Final Report, SCVURPPP, April 2005.* [http://www.scvurppp-w2k.com/nd\\_wp.shtml](http://www.scvurppp-w2k.com/nd_wp.shtml)

*California Stormwater Quality Association Introduction to Hydromodification* (available <http://www.casqa.org/> in Member Library/Technical Reports)

*Army Corps of Engineers' Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS)* <http://www.hec.usace.army.mil/software/hec-hms>

*EPA Hydrologic Simulation Program – Fortran (HSPF)*

<https://www.epa.gov/exposure-assessment-models/hspf> *EPA Stormwater Management Model (SWMM)*

<https://www.epa.gov/water-research/storm-water-management-model-swmm> **For More Information:**

- Contact your local stormwater program or planning department;
- Contact SCVURPPP, at (408) 720-8811, or <http://www.scvurppp.org>
- Contact the San Francisco Bay Regional Water Quality Control Board at (510) 622-2300. Ask for staff assigned to the Santa Clara Valley stormwater program.