EXECUTIVE SUMMARY

This plan, prepared in compliance with the Sacramento Areawide Stormwater Permit[1], describes the process and standards by which urban development projects in Sacramento County will be required to assess and mitigate for adverse impacts to local creeks. These impacts are not already addressed by existing local regulations for flood protection and stormwater quality treatment, thus warranting the need for additional requirements.

What is the Problem Being Addressed?

When urbanization takes place, most of the natural vegetated pervious ground cover is converted to impervious surfaces such as building rooftops and paved highways, streets, and parking lots. In this transformation, the natural absorption and infiltration capabilities of the land are lost and runoff leaving the area can be significantly greater in volume, velocity, and peak flow rate than in the predevelopment condition. In addition, urbanization may reduce or eliminate vegetation such as grasses, shrubs and trees, which intercept rain and increase evapotranspiration. Runoff durations can also be extended as a result of flood control and other efforts to control peak flow rates by detaining the peak volume in stormwater detention facilities. This change in runoff characteristics from a watershed caused by changes in land use conditions (i.e., urbanization) is known as hydromodification. When development projects do not address and mitigate for this change in runoff characteristics, a variety of problems can result, such as: excess sediment flowing into streams; downstream erosion and sedimentation; flooding; disruption of natural drainage patterns, stream flows and riparian habitat; and elevated water temperatures**.**

Conventional flood control and drainage approaches have focused on managing runoff from large storm events (e.g., 100-year return interval events or Q_{100}), while disregarding the runoff from the smaller, more frequently occurring events. Runoff from such large events can damage a creek's stability and resources. However, studies in the last decade have shown that 95% of the "work" done on the receiving stream channels (erosion and transport of sediment from beds and banks, which leads to habitat degradation and other adverse impacts) is actually due to the smaller events (e.g., some percentage of the 2-year return interval event (Q_2) up to the 10-year (Q_{10}) event. In order to protect receiving streams from increased potential for erosion and other adverse impacts, new hydromodification management approaches must be employed to control the runoff from the smaller storm events, with consideration towards maintaining (or reproducing) the pre-project hydrology.

[1] The Stormwater Permit was issued to Sacramento County and the Cities of Sacramento, Citrus Heights, Elk Grove, Folsom, Galt and Rancho Cordova (hereafter jointly referred to as the Sacramento Stormwater Quality Partnership (Partnership) in September 2008 (Order R5-2008-0142), by the Central Valley Regional Water Quality Control Board (Regional Water Board).

What is the Purpose and Scope of this Plan and When Will It Be Implemented?

This Hydromodification Management Plan (HMP) describes how the agencies in the Sacramento Stormwater Quality Partnership intend to implement hydromodification management in accordance with the Stormwater Permit, to protect receiving streams from increased potential for erosion and other adverse impacts. It defines the areas and types of projects in the urbanized area of Sacramento County that will be subject to the requirements, describes the standards and how they were developed, and introduces processes and tools for complying with the standards. Key requirements of the plan are summarized starting on the next page.

This HMP plan is not intended to be a "manual" for applicants on how to perform hydromodification analysis and mitigation. Additional design guidance will be developed and provided on hydromodification analysis and mitigation in the future by the Partnership as described later in this Summary.

This HMP is not the end-all; it represents the first step towards establishing new requirements to address hydromodification impacts in the county. The HMP is being submitted to the Regional Water Board, which will conduct a public review process, work with the Partnership to address any comments, and ultimately approve the plan. Within six months of Regional Water Board's approval of the HMP, the agencies in the Partnership will amend their development standards to add hydromodification management and Low Impact Development requirements. The new requirements will become effective twelve months after HMP approval, at the same time that technical guidance is published to assist the development community. This timing is expected to help ensure compliance.

How Was the HMP Developed?

Work began in 2009 when the Partnership conducted a pilot study in the Elder Creek Watershed of Sacramento County and used the local results to inform their HMP Work Plan. Approval of the work plan by the Regional Water Board on January 29, 2010 set in motion the regulatory timeline for subsequent development of this HMP by January 29, 2011. The Partnership then retained a consultant team to assist them in preparing this document. During the process, other hydromodification management approaches in the state were studied and adapted for use in Sacramento, various technical experts were consulted, and local data was collected and analyzed through various means, including limited field investigations. The results of the local analysis showed that a large proportion of the streams sampled in the county appear to be highly susceptible to hydromodification impacts, while a small proportion of the streams sampled appear to exhibit medium to low susceptibility (i.e., the beds and banks of the stream are more resilient to erosion).

When the first draft technical documents were available in December 2010, the Partnership hosted a series of meetings and workshops with stakeholders (local agency personnel, development and design community, environmental groups and regulators). This process is described at the end of the HMP in Chapter 8 and Appendices G and H.

After submittal of the HMP on January 28, 2011, the Partnership continued to work with various stakeholder groups to answer their questions regarding HMP and address their concerns. Upon receiving the Regional Water Board's comment letter for HMP on April 29, 2011, The Partnership facilitated additional meetings with Regional Water Board and stakeholders to resolve the remaining issues. The process is documented in the reply to Regional Water Board's letter as included in Appendix I and also Chapter 8.

What are the Requirements?

Chapter 2 includes a flowchart (Figure 2-1) which illustrates the steps a project applicant will use to determine applicability and design hydromodification management measures for the a given project:

1. Determine if the project is subject to the requirements (explained below)
2. Select design approach (standard vs. alternative design approach)
3. Assess susceptibility of the project's receiving stream using the methodology specified in Chapter 4, OR elect not to perform the analysis and default to the conservative "high susceptibility" stream flow range for the design.
4. Determine design flow range for designing hydromodification management measures. The lower limit of the range is the critical flow presumed to create erosion in the local creeks and is stated as a percentage of the 2-year return interval flow:
    - low susceptibility stream: 0.45 Q_2 (45% of the 2-year return interval flow) to Q_{10}
    - high susceptibility stream: 0.25 Q_2 to Q_{10}

    (Chapter 5 discusses the methods that were used to determine these flow ranges)
5. Size hydromodification management measures to meet the performance goals using the sizing factors developed for Sacramento County, or use continuous simulation modeling[2], to meet the performance goals. BMP sizing tools will be provided by the Partnership at the time of implementation.

What Areas and Projects are Subject to the Requirements?

Chapter 3 presents a flow chart and map (Figure 3-1 and Figure 3-7, respectively) to assist a project applicant in initially determining if the project will require hydromodification management measures. The initial determination should be verified by consulting the appropriate permitting agency. Applicability will be determined using these criteria (see Chapter 3 for more details):

[2] Continuous simulation modeling, in the context of hydrologic modeling, is a type of modeling that takes into account antecedent soil moisture conditions over long periods of time. It analyzes for changes in infiltration parameters and hence runoff, typically over periods of measured precipitation in excess of 30 years, and is generally considered to be a more reasonable representation of runoff than that generated through more typically used event-based hydrologic runoff models. The output from continuous simulation models are long term runoff time series which can be manipulated to generate flow duration curves, which are required for hydromodification analyses.

1. *A project located in an area labeled "exempt" on the Applicability Map is not subject to the requirements.* The following "exempt" areas within the urbanized/urbanizing portion of the county are indicated on the Applicability Map:
    a. Areas that discharge directly to receiving waters which are resilient to erosion (e.g., Sacramento or American Rivers).
    b. Areas with 5 percent or less developed area. For the most part, the receiving streams in these highly urbanized areas were previously impacted by hydromodification and development occurring here in the future is not expected to worsen existing erosion problems or further degrade habitat in the receiving streams.
    c. Three special drainage areas (North Natomas Basin, City of Sacramento; Metro Air Park, Sacramento County; and Shed B/Whitelock drainage corridors, City of Elk Grove) with engineered receiving channels which are resilient to erosion or with hydromodification mitigation already in place.

2. *An "approved" project is not subject to the requirements.* For the purposes of this HMP, a project is considered "approved" and may be exempt from hydromodification management requirements if one of several criteria are satisfied no later than twelve months after approval of the HMP by the Regional Water Board. The criteria relate to the status of the project's tentative map, permits and entitlements; whether it discharges to a creek segment with a valid permit from another regulatory agency; and if the project is a public project with completed design plans or an awarded contract for construction.

3. *A "Priority Project" is subject to the requirements.* Various categories of projects and associated thresholds were previously approved by the Regional Water Board and established by the Partnership in 2006 to be subject to stormwater quality requirements. These projects will also be subject to hydromodification management requirements.

4. *A project that discharges directly to an exempted creek(s) and/or channel(s) is not subject to the requirements.* "Exempted" creeks or channels generally have linings which prevent erosion, were built in an area where natural stream channels did not historically exist, and/or were designed and constructed for stability and resiliency in accordance with local or national standards.

5. *An infill project meeting specified criteria is not subject to the requirements.* The criteria generally involve the size of the project (8 acres maximum), it's consistency with the local General Plan, the lack of protected habitat on the site, and the location of the site in proximity to transit stops. The intent of this exemption is to promote sustainable infill development and is consisted with State CEQA Guidelines which provide a categorical exemption for such projects.

What Tools and Guidance Will Be Available?

Several tools and guidance will be available to project applicants for assistance in complying with the new hydromodification management requirements:

- The field based stream susceptibility assessment tool provided in Chapter 4 can be used to assess the susceptibility of Sacramento County streams to the effects of hydromodification. The tool is a locally adapted version of the Southern California Coastal Water Research Project's assessment tool.

- A BMP Sizing Calculator will be available for use by project applicants and local agency plan reviewers to size various types of hydromodification management measures for development projects of limited scales. The calculator will be an easy-to-use, desktop-based software tool. It will incorporate sizing factor tables which have been developed using continuous simulation hydrologic modeling and integrating local data such as long term precipitation, soil characteristics, vegetative cover, and topography. Chapter 6 presents the sizing factor tables, along with a functional definition of the calculator. A flow duration control pond sizing algorithm is also in development and will also be included in the sizing calculator. The tool itself will be developed and beta tested with local project data in Spring/Summer 2011.

- Another BMP sizing tool (Sacramento Area Hydrology Model) will be developed for Hydromodification management implementation for development projects of all scales. This tool is similar to Bay Area Hydrology Model (BAHM) which is a dynamic BMP sizing tool using continuous simulation modeling. The Sacramento Area Hydrology Model will provide more BMP design options and run continuous simulation modeling in the background for every project with a user-friendly interface. This tool development is not part of the task for this HMP. The Partnership intends to develop this complementary tool during the same time as when the Design Manual is being updated. The Partnership intends to have both the BMP Sizing Calculator and the Sacramento Area Hydrology Model developed and ready for use at the time of implementation of the HMP criteria and LID requirements.

- The Partnership will update the 2007 *Stormwater Quality Design Manual for Sacramento and South Placer Regions* to incorporate technical guidance for selecting and designing hydromodification management measures. The updated manual will be available approximately one year following approval of this HMP by the Regional Water Board.

Is There An Alternative Compliance Option?

The project applicant can elect to follow an alternative design approach (Chapter 7). The applicant can propose an in-stream improvement project which will be subject to the approval of the local permitting agency as well as applicable state and federal regulatory agencies such as the California Department of Fish and Game, Regional Water Board and U.S. Army Corps of Engineers. An in-lieu program may also

be developed by the Partnership in the future in accordance with the Stormwater Permit. An applicant choosing this option - when available - would need to demonstrate infeasibility of using hydromodification management measures on the project site and would then contribute funds for appropriate mitigation to be performed elsewhere in the watershed/county.