TECHNICAL MEMORANDUM

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To:	Contra Costa Clean Water Program
Date:	August 31, 2023
Subject:	2023 Addendum to 2017 Hydromodification Management Applicability Mapping Methodology

Contents

1. Introduction

On September 11, 2017, PSOMAS, a consultant to the Contra Costa Clean Water Program (CCCWP), delivered a technical memorandum to the CCCWP entitled "HMP Applicability Mapping Methodology," detailing the methods used to develop a 2017 Draft Hydromodification Management (HM) Applicability Map for Contra Costa Permittees under provision C.3.g of the Municipal Regional Stormwater NPDES Permit, Order No. R2-2015-0049 (MRP 2.0).

This document serves as an addendum to the PSOMAS technical memorandum, documenting updates to the HM Applicability Map made by Lotus Water in 2023 using the output of the PSOMAS effort as a starting point. Lotus Water received the "HMP_Subbasins" GIS layer described in Section 4, "Project Outputs" of

the PSOMAS memorandum, as well as other supporting layers like channels and storm drains, but the "HMP_Review" GIS layer was not provided.

Lotus Water worked with CCCWP staff and affected Permittees to revise the map to respond to comments made by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) in 2020, make other general improvements to the map, including symbology and data updates, and to incorporate additional Permittee input.

2. Response to SFBRWQCB Comments

On July 10, 2020, Keith H. Lichten, Chief of the Watershed Management Division of the SFBRWQCB, sent a memo to Karin Graves of the Contra Costa Clean Water Program entitled "Memo to CCCWP Regarding Their Hydromodification Technical Report and Hydromodification Applicability Map, Submitted September 29, 2017". This memo included four specific comments on the 2017 Draft HM Applicability Map:

- A large section that drains to Marsh Creek is identified as hardened but does not appear to be hardened.
- A section that drains to Walnut Creek is identified as hardened but does not appear to be hardened.
- A section identified as hardened is ambiguous as to whether it drains to Pine Creek or Walnut Creek.
- Several areas on the map are labeled as "To Be Determined" and should be resolved.

After discussion with relevant Permittees, these comments were addressed in the updated 2023 Draft HM Applicability Map as follows:

- Based on changes in the HM applicability language in recent permit cycles and SFBRWQCB's clarifying response to comments on HM applicability during the 2022 Municipal Regional Stormwater NPDES Permit negotiations, the area draining to Marsh Creek has been re-designated as HM applicable.
- Based on changes in the HM applicability language in recent permit cycles and SFBRWQCB's clarifying response to comments on HM applicability during the 2022 Municipal Regional Stormwater NPDES Permit negotiations, the area draining to Walnut Creek has been re-designated as HM applicable.
- Subbasin boundaries have been refined in the area between Pine Creek and Walnut Creek. This entire area is now all HM applicable, regardless of drainage to Pine Creek or Walnut Creek, due to the change in HM applicability of the Walnut Creek watershed, as noted above in item 2.
- All areas previously labeled "To Be Determined" have been assigned HM applicability categories with input from Contra Costa Public Works Flood Control Division and subsequent applicable Permittee review. Contra Costa Public Works Flood Control Division conducted the initial assessment and determination.

3. Other General Map Improvements

In addition to the updates in response to SFBRWQCB comments, the consultant team revised and improved the 2023 Draft HM Applicability Map in several areas.

3.1 Subbasin Refinement

The basis of the 2023 Draft HM Applicability Map is a countywide subbasin layer. These subbasins were initially delineated by PSOMAS as described in the 2017 memorandum. They have been generated algorithmically, largely based on surface topography (which may not accurately reflect stormwater drainage delineations based on subsurface storm drain infrastructure), leading to some geographical boundary issues that Lotus Water took steps to resolve. The topological process is most accurate in upland, mountainous, and/or undeveloped areas and less accurate in flat, highly urbanized, or industrial/commercial areas, and along the bay shore.

The 2017 geospatial algorithms resulted in small "sliver" gaps between subbasins where HM applicability was "null." All gaps between subbasins were filled by merging gap areas with the most adjacent subbasins.

Some subbasins consisted of multipart geometry, i.e., a single subbasin feature consisting of several non-adjacent areas. All multipart geometry was converted to single-part geometry, so all subbasins are single, contiguous areas.

Contra Costa County Flood Control & Water Conservation District maintains a countywide map of drainage areas[1]. These drainage areas are generally much larger than the subbasins generated by PSOMAS in 2017. However, the *boundaries* of these drainage areas can serve as a useful supplement to the initial subbasin delineation. A GIS process aligned existing subbasin boundaries with these greater drainage area boundaries.

After these initial refinements were made, all subbasins with a total area of fewer than 5 acres, or an area-to-perimeter factor of fewer than 75 feet (indicating an unrealistically elongated subbasin shape), were eliminated by merging them with the most adjacent subbasins.

The resulting subbasin layer is now more topologically consistent and more consistent with Contra Costa County's official drainage areas.

Storm drain data was used as a reference in some cases to refine subbasin boundaries in response to Permittee comments. Storm drain data was provided by individual Permittees and consisted of over 20 distinct GIS data layers. These data are disparate in completeness, schema, resolution, and CAD/GIS program of origin. Furthermore, these data are exclusive of privately-operated storm drain pipes, common in commercial and industrial areas and near receiving water outfalls (subbasins are ideally defined to a specific outfall). This makes the data unsuitable for automated, countywide subbasin mapping processes.

However, using the existing subbasins as a starting point, additional subbasin refinement work was requested in specific areas and was conducted using an individual-subbasin process of assessing storm drain

[1]https://www.contracosta.ca.gov/DocumentCenter/View/61290/County-Zones-and-Drainage-Areas-PDF?bidId=

pipes, elevation data, imagery, and other data. This refinement should be strategically targeted and was generally requested in areas that are:

- Topologically flat,
- Far from open channels and/or in areas with dense storm drain networks,
- Urban, commercial, or industrial,
- Expecting high levels of future development and/or
- Near HM Applicable/Exempt boundaries.

3.2 >70% Impervious Areas

The HM applicability category of "less than 70% impervious" was recalculated with the new subbasin geometry and more recent imperviousness data. The data used for the 2017 map was the 2016 edition of the National Land Cover Database Percent Developed Imperviousness dataset; the updated 2019 edition was used to generate the 2023 map[2].

3.3 Web Map Application Updates

Several updates were made to the web map application of the 2023 Draft HM Applicability Map for aesthetic and user experience reasons not directly related to technical HM applicability concerns.

City limit geometry was updated to reflect several recent annexations and to conform to the coastline rather than extending into the Bay.

The Creeks and Drainages layer is now visible at all map scales, distinguishes between tributaries and named channels, and includes symbology to describe whether a channel is "concrete" or "non-concrete." This data is sourced from Contra Costa County Public Works and was not specifically developed or refined based on the MRP definition of "hardened channel." It provides useful context but should not be understood as definitive about hydromodification applicability.

Unincorporated areas are highlighted with a semitransparent white fill that can be toggled on and off in the Layers section. This helps users understand city limits in areas with complex boundaries and unincorporated exclaves, such as southern Walnut Creek and northern Richmond / San Pablo.

Subbasin boundaries are not shown by default but can be toggled on in the Layers section. Typical users of the HM Applicability Map will most likely be concerned with where a potential project falls in the HM categories rather than with intra-category subbasin delineations.

Users can select from numerous base maps (e.g., satellite imagery, satellite imagery with labels, streets, topographic, etc.)

[2] Dewitz, J., and U.S. Geological Survey, 2021, National Land Cover Database (NLCD) 2019 Products (ver. 2.0, June 2021): U.S. Geological Survey data release, https://doi.org/10.5066/P9KZCM54

4. Updates Based on Permittee Input

After the updates described in Sections 2 and 3 were made, relevant Permittees reviewed draft maps and associated designations and provided additional feedback and changes.

4.1 Contra Costa County (Unincorporated Areas)

Based on a review of drainage data, including culverts, several subbasins along the bay shore between Hercules and Martinez had minor boundary changes and were recategorized as Hardened (HM exempt).

4.2 City of Concord

A single subbasin in a commercial area along Pine Creek had its boundaries redrawn using City drainage data. As with all cases when any subbasin changed shape, the percent imperviousness within the basin was recalculated; the subbasin remained greater than 70% impervious and therefore remained classified as HM exempt.

4.3 City of Oakley

Based on a review of City drainage data, portions of northern Oakley (and portions of neighboring Antioch) were found to drain directly to the Bay through enclosed storm drain pipes and not to Marsh Creek. These subbasins have been recategorized as Hardened (HM exempt).

Subbasin boundaries around the City's eastern portion near the Bay Lands margin were adjusted based on existing City drainage data without changing HM categorization.

4.4 City of Hercules

A portion of the Refugio Creek line was adjusted to reflect the current alignment. No changes were made to HM categorization.

Subbasin boundaries around the line of tidal influence were adjusted based on existing City drainage data.

4.5 City of Pittsburg

Several subbasin boundaries were adjusted based on existing City drainage data. No changes were made to HM categorization. The city limits layer was updated.

4.6 City of Martinez

The city limits layer was updated.

5. Project Outputs

The primary deliverable outputs are updated countywide GIS layers, documentation of responses to SFBRWQCB comments, and an interactive web map application that can be used to determine HM applicability for development projects.

The output GIS layers consist of the following:

- HMP_Subbasins_2023: a revised countywide subbasins layer that includes a "Notes" column where the details of changes made above are documented.

- CCC_Cities_Shoreline: a revised city limits layer that includes annexations made since 2017 and clips city limits to the approximate Bay shoreline (for aesthetic purposes).

The responses to SFBRWQCB comments were tracked in an Excel spreadsheet hosted on the Contra Costa Public Works internal SharePoint site[3]. The spreadsheet tracks responses to comments 1-3 as described above in Section 2, as well as HM applicability categorization input from the Contra Costa Public Works Flood Control Division regarding each subbasin listed as To Be Determined in the Draft 2017 Map (per comment 4 described in Section 2).

The revised 2023 web map application is hosted by the CCCWP and is located at the following web address:

https://cccwp.maps.arcgis.com/apps/instant/sidebar/index.html?appid=c0219fc1ec89460093aaf2ec72ecb1bc

A high-resolution static PDF map is provided in Attachment A.

[3]https://cccpublicworks.sharepoint.com/:x:/r/sites/CCCWP-Consulting/Shared%20Documents/H%26A/HMP%20Map%20Update%20Task/CCCWP_Lotus_HMP_AppMap_GISDecisionForm.xlsx