# Integrated Monitoring Plan

## City of Walnut

**Submitted to:**

California Regional Water Quality Control Board, Los Angeles Region
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Los Angeles, CA 90013

**Submitted by:**

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**Attachment B: Aquatic Toxicity Monitoring Methods**

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## 1.0- Municipal Separate Storm Sewer System Permit

On November 8, 2012 the Los Angeles Regional Water Quality Control Board adopted Order R4-2012-0175 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4. Order R4-2012-0175 became effective 50 days later on December 28, 2013. Order R4-2012-0175 serves as the National Pollution Discharge Elimination System (NPDES) permit for Coastal Watershed storm water and non-storm water discharges originating from the Los Angeles County Region, excluding the City of Long Beach. The permit covers the land areas of the Los Angeles County Flood Control, unincorporated areas of Los Angeles County and 84 Cities within the County of Los Angeles. Permittees are subject to the requirements set forth in the MS4 permit for all storm water and non- storm water discharges into the MS4. The City of Walnut is located in the Los Angeles Region and is identified in the MS4 Permit as a permittee under Order R4-2012-0175.

The MS4 permit regulates municipal discharges of storm water and non-storm water from the MS4s of the permittees. Storm water and non-storm water discharges have been identified as a transport mechanism for pollutants into the receiving waters of the Los Angeles Region. Pollutants originating from various land uses are mobilized by surface flow of water which is then directed into the MS4 and eventually deposited into receiving water bodies. In many cases pollutant deposition into receiving water bodies has a noticeable impact on the local ecological system of the water body and recreational uses. It is the intent of the MS4 Permit to protect water quality and mitigate existing and potential sources of pollutants that are cause for impairment of receiving water bodies.

Conditions of the MS4 Permit require that all permittees develop a monitoring plan on an individual or joint basis that will address water quality issues with in the permittee's jurisdictional area. The monitoring program option selected will be utilized in conjunction with the City's watershed management plan to provide real water quality data for use in the assessment of program effectiveness and compliance with applicable water quality standards.

Attachment E of the MS4 Permit is the Monitoring and Reporting Program (MRP) which outlines the requirements that shall be included in a permittee's MRP. The MRP is a critical portion of the City of Walnut's overall approach for maintaining water quality and/or mitigating water quality issues.

## 1.1- Integrated Monitoring Plan

The objectives of the MRP are to assess the water quality of receiving water and discharges from the municipal separate storm water sewer system (MS4). The monitoring plan developed based on the MRP requirements will monitor chemical, physical, and biological impacts of discharges originating from the MS4. The data gathered from monitoring will be used to assess compliance with applicable TMDLs and WQBELs as established for wet weather or dry weather conditions. The program will also be used to characterize pollutant loads, identify pollutant sources and to measure and improve the effectiveness of pollutant control implementation practices. The MRP allows Permittees flexibility in how a monitoring program is implemented. The customizable monitoring programs allow the permittee to devote resources to areas that will result in the most effective use of available funds. Due to the configuration of the City of Walnut's MS4 and topography of the City, there is limited comingling of storm water prior

to its discharge into receiving water bodies. As a result, the City of Walnut has selected the individual Integrated Monitoring Report (IMP) option for compliance with the MRP section of the MS4 Permit. The City's IMP will be synchronized with its Watershed Management Plan (WMP) to provide an effective NPDES program in compliance with Order R4-2012-0175. This IMP was developed by RKA Consulting Group for the City of Walnut.

## 1.2- Purpose and Scope

The IMP will be utilized to assess the impact from MS4 discharges to receiving water bodies. Results from the IMP will be the basis for determining compliance with water quality based effluent limitations for pollutants causing impairment to a receiving water body. The objectives of the IMP as identified in the MRP portion of the MS4 Permit are outlined below:

- Assess the chemical, physical and biological impacts of discharges from the municipal storm water sewer system (MS4) on receiving waters.
- Assess compliance with receiving water limitations and water quality-based effluent limitations (WQBELs) established to implement Total Maximum Daily Load (TMDL) wet weather and dry weather waste load allocations (WLAs).
- Characterization pollutant loads in MS4 discharges.
- Identify sources of pollutants in MS4 discharges.
- Measure and improve the effectiveness of pollutant controls implemented under this order.

The IMP is organized into five subsections. Each of the sub sections focuses on an individual monitoring requirement set forth in the MS4 Permit.

- Receiving water monitoring
- Storm water outfall monitoring
- Non-storm water outfall monitoring
- New development/re-development effectiveness tracking
- Regional studies

## 1.3- City of Walnut

The City of Walnut is a General Law city that was incorporated on January 19, 1959. The City's has a jurisdictional area of 8.9 square miles and an approximate population of 30,000. The City has a rural charm which is preserved by a well-defined general plan. The City is located in the San Gabriel Valley region of Los Angeles County north of State Route 60 and west of State Route 57. The City's location with respect to the San Gabriel River Watershed is highlighted in Los Angeles County's map of the watershed (Figure 1-1).

Land use in the City is primarily devoted to residential development consisting of 3,760 acres or 65% of the City. The remaining land use in the City is composed of 1,680 acres of open space or 29% of the jurisdictional area, 255 acres of commercial use or 4.5% of the jurisdictional area, and 86 acres of agricultural use or 1.5% of the jurisdictional area. Figure 1-2 is a map of the City of Walnut's land use.

***Figure 1-1: San Gabriel River Watershed Management Area***

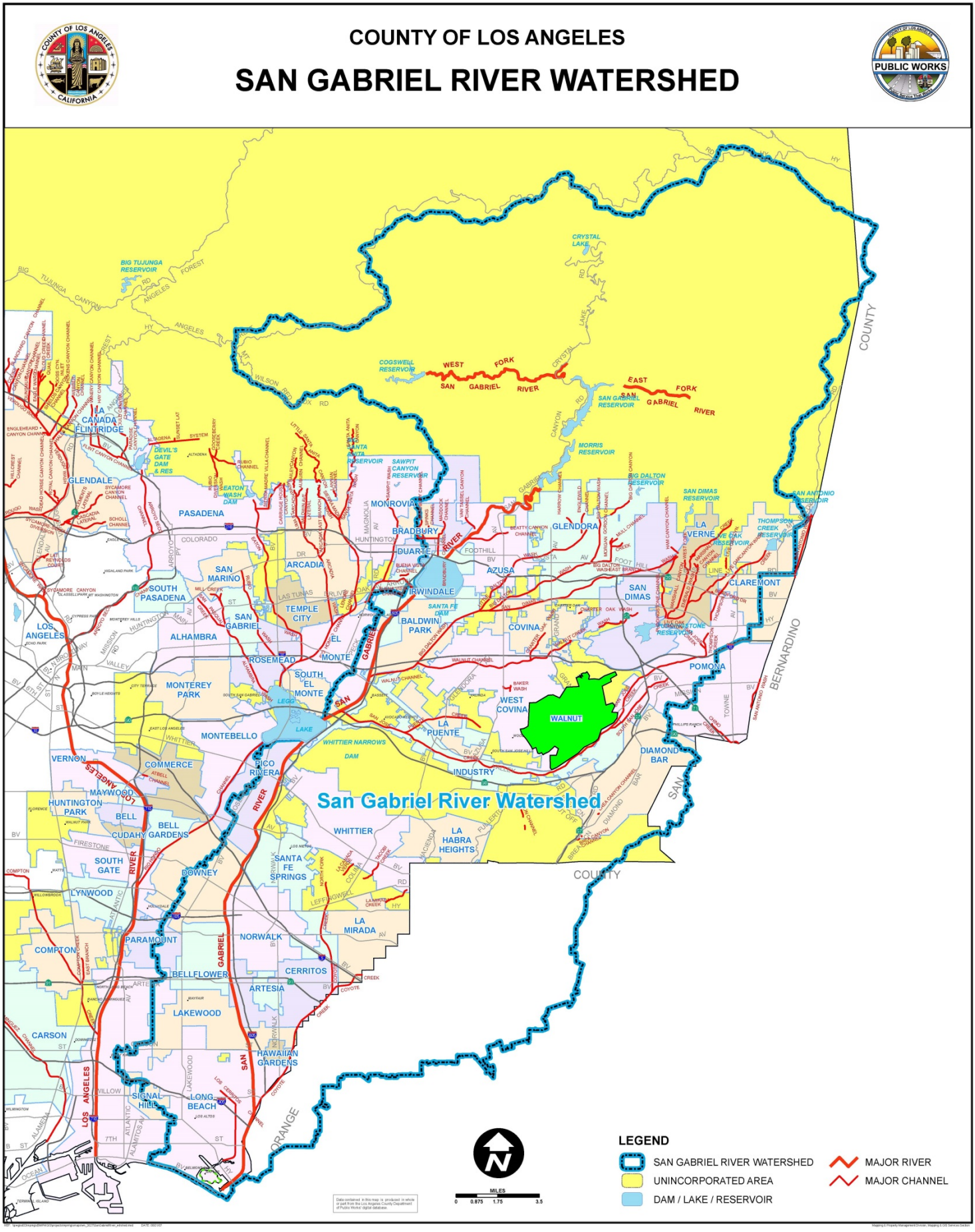


*Figure 1-2: City of Walnut Land Use Map*

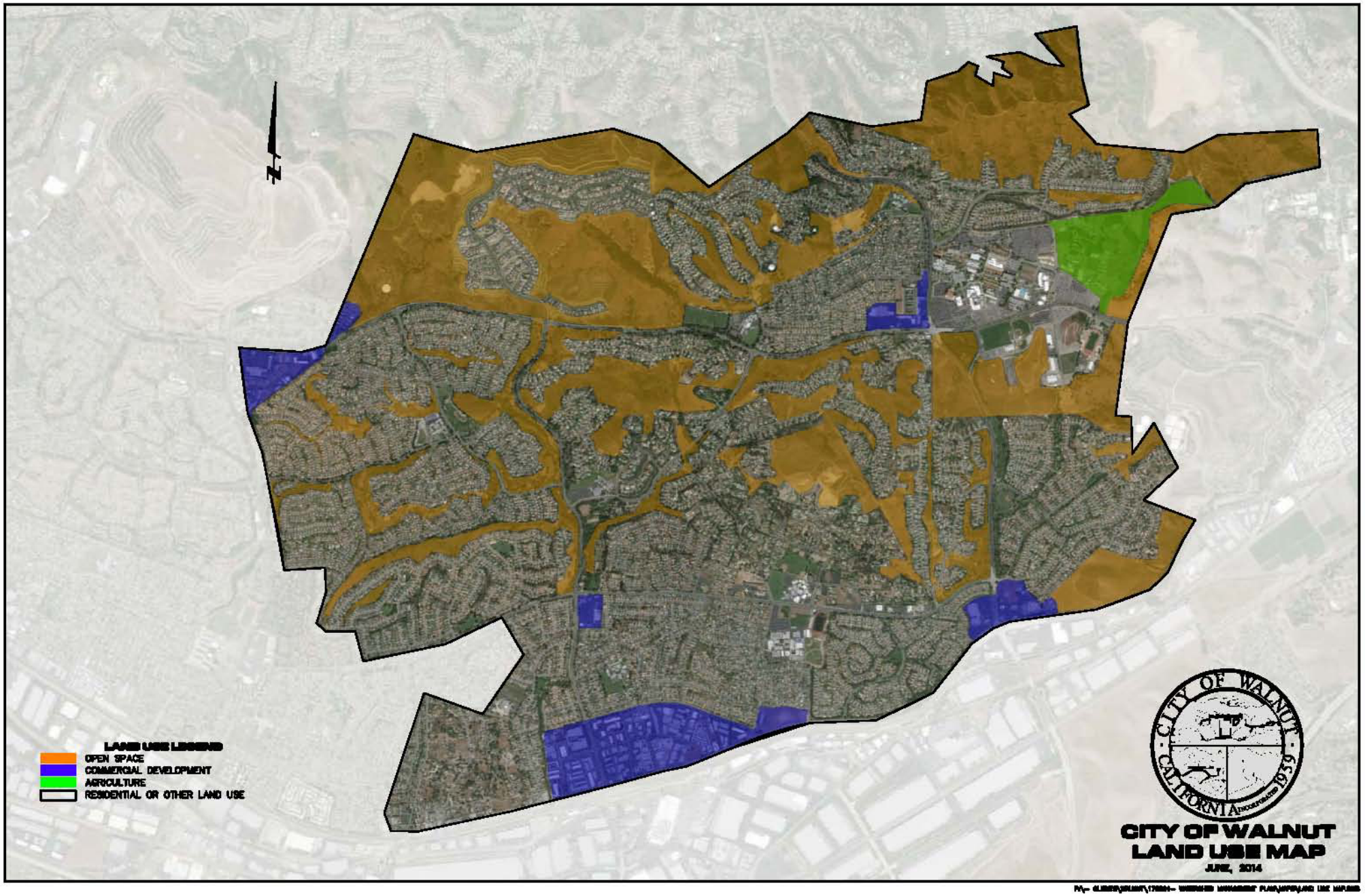


Table 1-1 compares the land uses of the City of Walnut with those of the entire San Gabriel River Watershed.

***Table 1-1***

| Watershed Land Use | | |
|---|---|---|
| Land Use | City of Walnut | San Gabriel River Watershed |
| Residential | 65% | 26% |
| Open Space | 29% | 50% |
| Agriculture/Other | 1.5% | 9% |
| Commercial/Industrial | 4.5%* | 15% |

**There are no current industrial land uses in the City of Walnut.*

The City boundary extends from the San Jose Hills to the north to Valley Boulevard in the south, and from Nogales Street to the west to the easterly boarder of the City with unincorporated areas of Los Angeles County and the City of Pomona. Other cities identified as MS4 Permittees bordering or in close proximity to the City of Walnut include: City of La Puente, City of Industry, City of West Covina, City of Diamond Bar, City of Pomona, and unincorporated areas of Los Angeles County (see Figure 1-1 for San Gabriel River Watershed Map).

## 1.4- Walnut Watershed Characteristics

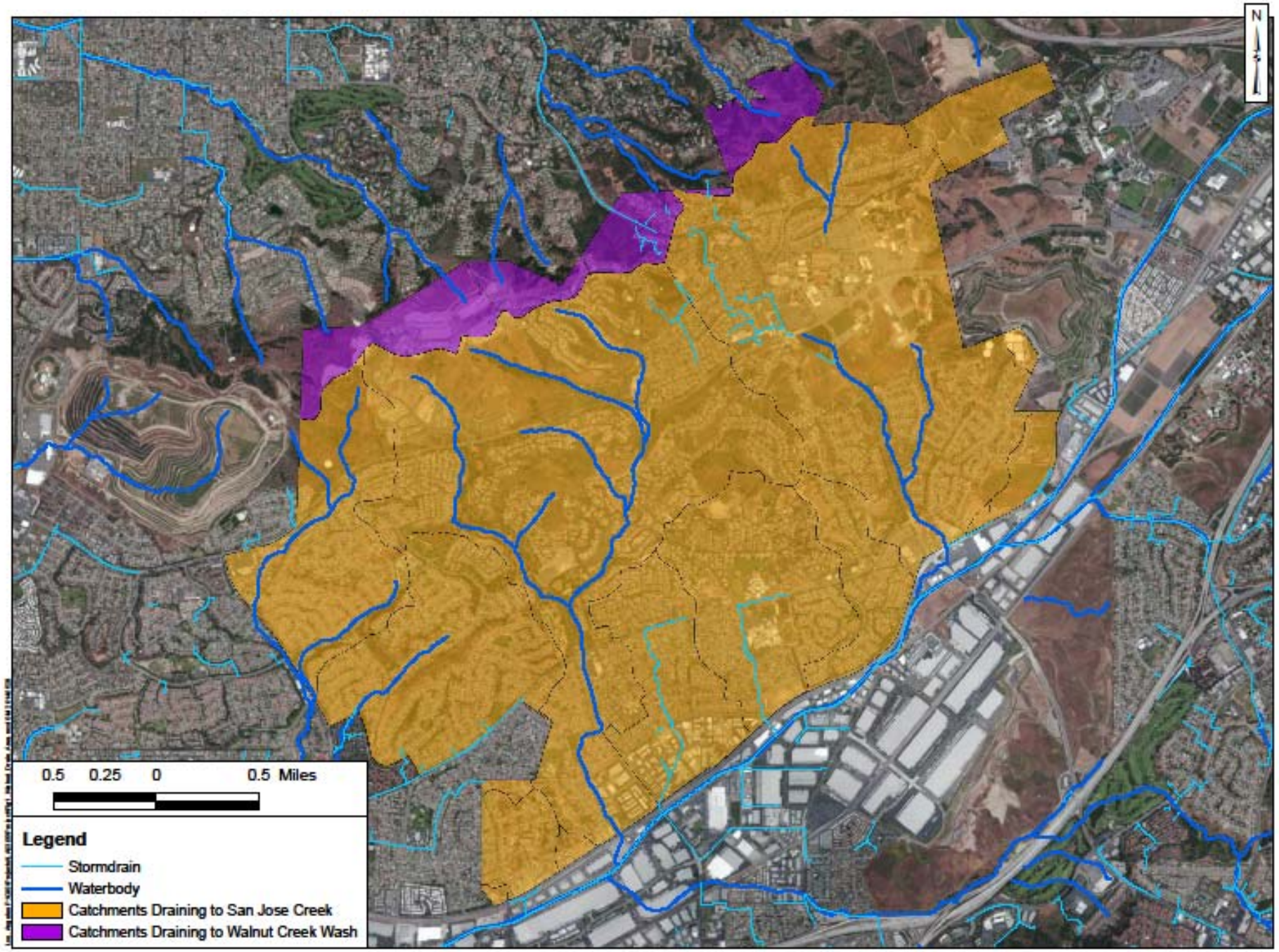
The City of Walnut drains to the San Gabriel River Watershed and is part of the San Gabriel River Watershed Management Area (SGRWMA). The City drains to the San Gabriel River through two sub-watersheds in the SGRWMA. Reach 1 of the San Jose Creek is located to the south of the City and Walnut Creek Wash is located to the north. Both water bodies connect to Reach 3 of the San Gabriel River which runs parallel with State Route 605 and eventually drains directly to the Pacific Ocean. Figure 1-3 shows the two respective watersheds, storm drains, and water bodies in the general vicinity of the City.

### 1.4.1- San Jose Creek Reach 1

Due to the topography and location of the San Jose Hills formation, approximately 93% of the City drains to the South and is tributary to Reach 1 of the San Jose Creek. Storm water and non-storm water flows are captured by catch basins and then carried through a network of storm drains and open channels to multiple outfalls located in San Jose Creek Reach 1.

The San Jose Creek transports runoff for the City of Walnut's outfalls approximately 12 miles to its confluence with San Gabriel River Reach 3 just north of the interchange of State Route 60 and State Route 605. The San Jose Creek is channelized from the area adjacent to the City of Walnut to approximately three quarters of a mile east of Workman Mill Road where the Creek is transitioned to soft bottomed. A number of other upstream and downstream permittees contribute runoff that reaches Reach 1 of the San Jose Creek in addition to the City of Walnut. The Creek extends north east to connect with Thomson Wash which originates at easterly limits of Los Angeles County. Thompson Creek Dam is located at the very top of Thomson Wash.

*Figure 1-3: City of Walnut Drainage Areas*



### 1.4.2- Walnut Creek Wash

The remaining 7% of the City of Walnut's jurisdictional area drains to the Walnut Creek Wash. A majority of the City's tributary area to Walnut Creek Wash watershed is open space with a small portion of residential development. With a majority of the tributary area land use categorized as open space, MS4 discharges originating from this area are minimal. The existing MS4 flows drain to the north of the City into unincorporated Los Angeles County and eventually into Walnut Creek Wash.

Walnut Creek Wash originates at the Puddingstone Dam, and is soft bottom up to a quarter mile east of Covina Hills Road where it transitions to a channelized wash. The channelized wash returns to a soft bottom channel at Baldwin Park Boulevard and continues as such to confluence with the San Gabriel River. The confluence of Walnut Creek Wash and the San Gabriel River is located south west of the interchange of State Route 10 and State Route 605. The City of Walnut contributes a very small portion of flow to the Walnut Creek Wash which is primarily composed of flow from a number of other permittees in the SGRWMA.

### 1.4.3- City of Walnut MS4 System

The City of Walnut's storm drain system consists of 644 City owned catch basins and 142 Los Angeles County Flood Control owned catch basins. A majority of the City's storm drain system outlets connect directly to Reach 1 of the San Jose Creek.

There is one storm drain outfall that contains flows originating from the Walnut Creek Wash watershed area of the City of Walnut. This singular outfall is an underground storm drain that drains to the north of the City into unincorporated Los Angeles County and eventually into Walnut Creek Wash. The referenced storm drain carries a relatively small amount of the total City run off and has 13 catch basins connected the line from the City of Walnut.

There are two open soft bottom creeks in the City which for much of their extents run in or adjacent to parks. Lemon Creek drains portions of the western side of the city and begins in the San Jose hills in the Vicinity of the Three Oaks Development and extends south to its confluence with Reach 1 of the San Jose Creek. Snow Creek begins near the intersection of Grand Avenue and Temple Avenue at Mount. San Antonio Community College located in the north eastern section of the City. Snow Creek travels south along Grand Boulevard to just south of Snow Creek Park where it connects to an underground reinforced concrete box (RCB). The RCB eventually connects directly with Reach 1 of San Jose Creek in the City of Industry near the intersection of Somerset Drive and Valley Boulevard.

## 1.5- Established Water Quality Targets

It is the intent of the IMP to provide assessable water quality monitoring data for use in determining the effectiveness of the WMP and for determining compliance with effluent limitations, WQBELS or other numeric targets as established by TMDLs or the Los Angeles Region Basin Plan.

Table 1-1 identifies all applicable water bodies and their respective pollutant water quality targets that have been established. These pollutants will be the central focus of the monitoring program in addition to the standard base line water quality related parameters required under the MS4 Permit and the first year monitoring program required pollutants identified in Table E-2 of Attachment E in the MS4 Permit (See Attachment A).

***Table 1-1***

| **Watershed Specific Pollutants with Established Numeric Targets** | | | |
|---|---|---|---|
| **Water Body** | **TMDL** | **303(d) List** | **Other Pollutants of Concern** |
| San Gabriel River Reach 2 | • Lead | • Coliform Bacteria<br>• Cyanide | • None Identified |
| San Jose Creek Reach 1 | • Selenium | • Ammonia<br>• Coliform Bacteria<br>• pH<br>• Total Dissolved Solids<br>• Toxicity | • None Identified |
| Walnut Creek Wash | N/A | • Benthic-Micro invertebrate Bio-assessments<br>• Indicator Bacteria<br>• pH | • None Identified |

The City of Walnut is subject to one TMDL. The San Gabriel River and Impaired Tributaries Metals and Selenium TMDL was established by the USEPA on March 26, 2007 and is focused on metals and selenium that have been identified as exceeding allowable concentrations in the San Gabriel River and Tributaries. Table 1-2 identifies the TMDL established water body specific pollutant and the allowable WLA for wet and/or dry weather conditions.

***Table 1-2***

| **San Gabriel River and Impaired Tributaries Metals and Selenium TMDL** | | | |
|---|---|---|---|
| **Water Body** | **Pollutant** | **Weather Conditions** | **WLA** |
| San Gabriel River Reach 2 | Lead | Wet | 81.34 µg/L x Daily Storm Volume (L) |
| San Jose Creek Reach 1 | Selenium | Dry | 5 µg/L |

The San Gabriel River and impaired Tributaries Metals and Selenium TMDL was established by the USEPA and does not include a timeline for compliance with the WLAs nor does it have any interim milestones established. The City of Walnut proposed BMP implementation schedule and Compliance is identified in the WMP. The proposed compliance schedule is based on the implementation schedule of the BMP program.

Other pollutants required to be included in the monitoring program have been identified by the CWA 303(d) list as creating impairment on the identified receiving water bodies. WLAs for the 303(d) list pollutants are based on the limits identified in the Basin Plan for the Los Angeles Region with the intent of preserving beneficial uses of the specific water body listed.

The City of Walnut drains directly to Reach 1 of the San Jose Creek and the Walnut Creek Wash. Both water bodies have been identified on the 303(d) list as having pollutants found during water quality investigations. Table 1-3 identifies all of the applicable numeric targets for 303(d) listed pollutants that will be monitored under this plan. Numeric targets are established by the Los Angeles Region Basin Plan.

***Table 1-3***

| **Numeric Targets for 303(d) Listed Pollutants** | | |
|---|---|---|
| **Water Body** | **303(d) Listed Pollutant** | **WQBEL** |
| San Jose Creek Reach 1 | Ammonia | LA Region Basin Plan Table 3-2, 3-4 |
| San Jose Creek Reach 1 | Coliform Bacteria | See Table 1-4 |
| San Jose Creek Reach 1 | pH | 6.5-8.5 |
| San Jose Creek Reach 1 | TDS | 750mg/L |
| San Jose Creek Reach 1 | Toxicity | See Section XIII of MS4 Permit Attachment E, Attachment B of this document |
| Walnut Creek Wash | Benthic-Miro Invertebrate Bio-assessment | See Attachment C |
| Walnut Creek Wash | Indicator Bacteria | See Table 1-4 |
| Walnut Creek Wash | pH | 6.5-8.5 |

***Table 1-4***

| **Coliform Bacteria WQBEL** | | |
|---|---|---|
| Water Body | Recreational Use | Bacteria WQBEL |
| San Jose Creek Reach 1 | REC1(P),High Flow Suspension | 4000/100ml Not more than 10% allowed to exceed in 30 days |
| Walnut Creek Wash | REC1 (I), REC2(I) | 400/100ml Not more than 10% allowed to exceed in 30 days |

Other potential pollutants of concern have not been identified due to a lack of conclusive monitoring data. It is anticipated that if other pollutants of concern exist, the inclusion of Table E-2 of Attachment E in the MS4 permit with first year monitoring requirements will serve as an adequate process for screening and identifying the other unidentified pollutants of concern should they exist in MS4 discharges from the City of Walnut.

## 2.0- Receiving Water Monitoring

The primary goal of receiving water monitoring is to determine whether the applicable receiving water quality goals are being achieved. MS4 discharges can impact the receiving water quality and potentially contribute pollutants mobilized by storm water or non-storm water flows captured the MS4. Over time, results of the monitoring will be analyzed for trends in pollutant concentrations in the receiving water body. As a result of MS4 discharges exceeding allowable pollutant limits, beneficial uses identified in the Los Angeles Region Basin Plan may be impacted. Results from the receiving water monitoring program will also be used to determine if beneficial uses are fully supported as determined by water chemistry as well as aquatic toxicity and bio-assessment monitoring.

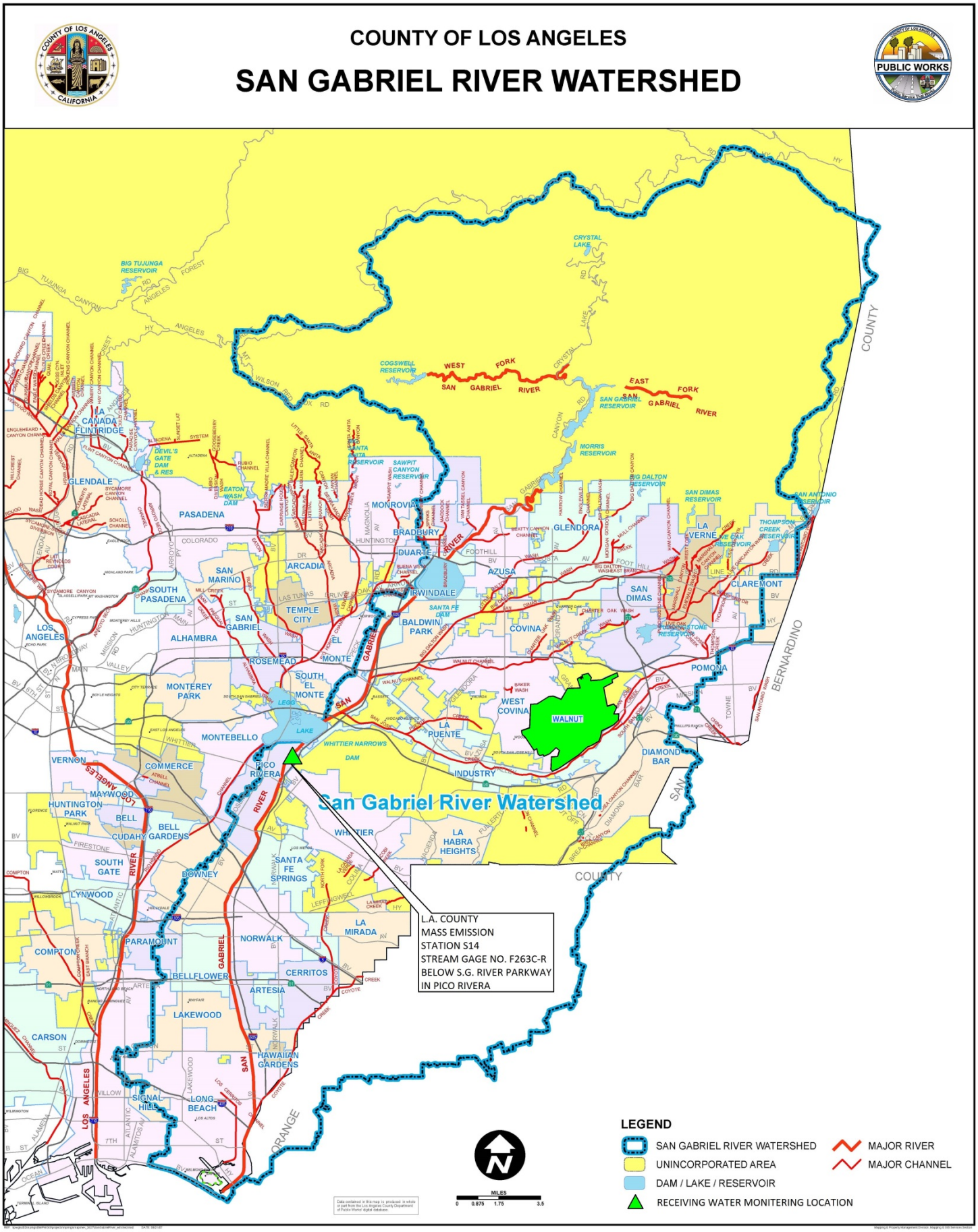
The City of Walnut is located in the San Gabriel River Watershed Management Area. The City primarily drains to Reach 1 of the San Jose Creek with a relatively small portion of the City draining to Walnut Creek. Both the San Jose Creek and Walnut Creek are tributary to Reach 3 of the San Gabriel River which eventually flows into the Pacific Ocean.

Permittees have been directed to utilize previously designated mass emission stations for receiving water sampling. The closest station with respect to the City of Walnut is located in Reach 2 of the San Gabriel River. Los Angeles County monitoring station S14 is located below San Gabriel River Parkway in Pico Rivera. The upstream tributary area is 450 square miles at this location. The City of Walnut is directly tributary to San Jose Creek Reach 1 which is located upstream of monitoring station S14. Figure 2-1 notes the approximate location of station S14 in on a map of the San Gabriel River Watershed Map developed by Los Angeles County. Receiving water monitoring data from station S14 will be utilized in this IMP, however due to vast size of area that drains to the station, all data will be supplemental to results of outfall monitoring from the City. The City of Walnut reserves the right to change the receiving water monitoring location should a more representative alternative location be identified at a later date. Changes to the proposed receiving water monitoring location will be at the discretion of the City.

## 2.1- TMDL Monitoring

TMDL monitoring and tracking is a critical component of the IMP. The City of Walnut is named in Table K-9 of the MS4 Permit as being subject to the San Gabriel River and Impaired Tributaries Metals and Selenium TMDL. The San Gabriel River Metals TMDL is a USEPA established TMDL and does not have an implementation schedule for complying with the recommended Waste Load Allocations. Table 1-2 highlights the applicable TMDL Waste Load Allocations (WLAs) established for the City of Walnut. TMDL WLAs have been established for San Jose Creek Reach 1 and San Gabriel River Reach 2. As previously mentioned, the City plans to utilize the monitoring data from mass emissions station S14 identified in Figure 2-1 as a supplement to the data that is gathered directly from the City's major outfalls. This arrangement will allow the City to better establish its direct contribution to water quality in the watershed.

***Figure 2-1: Mass Emission Monitoring Station Location***



## 2.2- Wet Weather Receiving Water Monitoring Requirements

Minimum required receiving water monitoring frequencies are defined in section VI.C of Attachment E in the MS4 Permit. Wet weather is defined as when the flow with the receiving water is at least 20% greater that the base flow or as defined in an approved IMP, CIMP or TMDL. In an effort to simplify the wet weather definition the City of Walnut will utilize the definition in Attachment A of the MS4 Permit, which defines the wet season as the time period between October 1st and April 15th unless a storm event that is qualified to be targeted as the first event of the year is forecasted within a reasonable amount of time prior to October 1st.

Wet weather monitoring will occur at least three times per year for all applicable parameters with the exception for aquatic toxicity. Aquatic toxicity monitoring will be conducted at a minimum of twice per year. The first wet weather event with a predicted rainfall of .25 inches with a 70% probability 24 hours prior to rain fall will be targeted for monitoring. At a minimum two additional rainfall events with a minimum separation of three dry days (less than .1 inch of rain per day) between monitoring will be monitored to meet the minimum requirement of three storm events per year. Receiving water monitoring shall be coordinated to start as soon as possible following storm water outfall monitoring to better reflect the potential impact from MS4 discharges.

## 2.3- Dry weather Receiving Water Monitoring Requirements

Dry weather monitoring requirements are defined in section VI.D of Attachment E in the MS4 Permit. Monitoring shall take place a minimum of two times per year for all parameters, or more if required by a TMDL monitoring plan. At least one of the monitoring events shall take place during the historically driest month of the year. Typically the driest month of the year is in August, which will be utilized for the time period of which at least one of the monitoring events occurs. Receiving Water Monitoring Parameters for monitoring San Gabriel River Reach 2 are identified in Table 2-1.

***Table 2-2***

| **Receiving Water Monitoring Parameters** | | |
|---|---|---|
| **Water Body** | **Monitoring Parameter** | **Source of Monitoring Requirement** |
| San Gabriel River Reach 2 | Flow | Minimum Parameter |
| | Lead | TMDL |
| | Selenium | TMDL |
| | Coliform Bacteria | 303(d) |
| | pH | Minimum Parameter |
| | *Toxicity | Minimum Parameter |
| | Cyanide | 303(d) |
| | Total Suspended Solids | Minimum Parameter |
| | Hardness | Minimum Parameter |
| | Dissolved Oxygen (DO) | Minimum Parameter |
| | Temperature | Minimum Parameter |
| | Specific Conductivity | Minimum Parameter |
| | **Additional Screening Parameters | Minimum Parameter |

** Per section VI.C.d.vi of attachment E of the MS4 Permit, aquatic toxicity is only required to be monitored twice per year*

*** Additional Screening Parameters are included in Appendix A of this document. Per section VI.C.e of attachment E of the MS4 Permit, these parameters are only required to be monitored in the first year. If not detected no further monitoring is required.*

***Table 2-3***

| **Receiving Water Beneficial Uses** | | |
|---|---|---|
| **Beneficial Use** | **Water Body** | |
| | **San Gabriel River Reach 2** | **San Jose Creek Reach 1** |
| MUN | P(1) | P(1) |
| GWR | I | I |
| REC1 | E(2) | P(2) |
| REC2 | E | I |
| WILD | E | E |
| WARM | I | I |
| COLD | | |
| RARE | E | |
| WET | | |

P: Potential beneficial use

I: Intermittent beneficial use

E: Existing beneficial use

(1) Use may be reviewed by SWRCB

(2) Access restricted by LACDPW

## 3.0- Outfall Monitoring

Outfall monitoring will play a key role in determining the water quality of both storm water and non-storm water discharges from the City of Walnut's MS4. Similarly to the receiving water monitoring program, the outfall monitoring program will be utilized to determine whether the applicable water quality goals are being achieved. MS4 discharges can impact the receiving water quality and potentially contribute pollutants mobilized by storm water or non-storm water flows deposited to the receiving water body. Over time, results of the monitoring will be analyzed for trends in pollutant concentrations. The program will also be utilized in the elimination of prohibited non –storm water discharges.

The City of Walnut has conducted an inventory of its MS4 outfalls based on storm drain as-built records from the City's files and the Los Angeles County Storm Drain Records. The findings from the MS4 outfall inventory process are outlined in Table 3-1.

## 3.1- Storm Water Outfall Based Monitoring

Storm water outfall monitoring will be utilized to determine compliance with wet weather TMDL and WQBEL requirements. The outfalls chosen for monitoring have representative drainage areas for the land uses found within the City of Walnut.

### 3.1.1- Outfall Monitoring Site Selection

Outfall locations selected for storm water monitoring were considered based on a number of criteria. Per the MRP section of the MS4 Permit, the City of Walnut must monitor at least one location per sub watershed drainage area (HUC-12). Within the jurisdictional boundaries of the City of Walnut there are three HUC-12 areas as shown in igure 3-1. The County of Los Angeles developed HUC-12 equivalent areas which are based on more detailed information of the existing topography and storm drain systems. When comparing both sub-watershed boundaries it is apparent that some differences exist, however in regards to the monitoring requirement of one outfall per sub-water shed, there effectively is no difference in the number of HUC-12 boundaries in the City's jurisdiction. To simplify the outfall location selection, the City of Walnut will utilize the USGS established HUC-12 boundaries per the requirements of the MS4 Permit for determining locations.

Other parameters that were taken into account when selecting the storm water outfall monitoring locations includes correlation between the outfall drainage area land use and the land uses within the City's jurisdiction. A majority of the City is devoted to signal family residential development and open space. Figure 3-3 is a map of the land uses with in the City. Establishing an outfall that accurately reflects the City's land use limits the available monitoring sites to a few key points. Land uses within individual HUC-12 sub watersheds with in the City's boundaries do not reflect the City's land use in all cases. Due to the limited commercial and agricultural land uses in the City and the centralized concentration of open space, not all of the potential HUC-12 based outfall monitoring locations will reflect the City's overall land use.

*Table 3-1*

| City of Walnut Outfall Inventory | | | | | |
|---|---|---|---|---|---|
| **ID No.** | **Outlet Coordinates** | **Outlet Location Description** | **Plan Reference No.** | **Size (in)** | **Outlet Material** |
| 1 | 34°00'12.04"N117°52'15.01"W | 250' E/Int. of E Valley Blvd and Fairway Dr | RDD 0127 | 48 | RCP |
| 2 | 34°00'41.63"N 117°52'25.06"W | 80' E/Int. of E Calle Baja Dr and Camino De Teodoro | MTD 0199 | 21 | RCP |
| 3 | 34°00'42.16"N 117°52'45.61"W | W/Int. of La Puente Rd and Paseo Del Caballo | MTD 0201 | 60 | RCP |
| 4 | 34°00'47.46"N 117°52'48.96"W | S/Int. of Avenida Del Sol and Acaso Dr | MTD 0829 | ≤36 | RCP |
| 5 | 34°00'59.23''N 117°53'03.07''W | 150' S/Int. of Bel Air Dr and Mandeville Dr | MTD 907-1 | - | - |
| 6 | 34°00'59.33''N 117°53'03.76''W | 150' S/Int. of Bel Air Dr and Mandeville Dr | MTD 907-1 | 72 | RCP |
| 7 | 34°01'04.22''N 117°53'17.69''W | 150' N/Int. of Shakespeare Dr and S Nogales St | MTD 404 | 24 | RCP |
| 8 | 34°01'12.87''N 117°53'24.73''W | Int. of Shadow Oak Dr and S Nogales St | MTD 404 | 60 | RCP |
| 9 | 34°01'15.19''N 117°53'26.40''W | 225'N/Int. of Shadow Oak Dr and S Nogales St | MTD 404 | 18 | RCP |
| 10 | 34°01'22.37''N 117°53'32.12''W | 200' S/Int. of Sutter Creek Dr and Nogales Ave | MTD 404 | 18 | RCP |
| 11 | 34°01'23.71''N 117°53'34.39''W | Int. of Sutter Creek Dr and Nogales Ave | MTD 918 | 27 | RCP |
| 12 | 34°14'18.60''N 117°53'33.87''W | 250' N/Int. of Sutter Creek Dr and Nogales Ave | MTD 404 | 78 | RCP |
| 13 | 34°01'40.20''N 117°53'37.36''W | 100' W/Int. of Amar Rd and S. Manu Ln | MTD 0657 | 18 | RCP |
| 14 | 34°01'40.20''N 117°53'37.36''W | Int. of Amar Rd and S Manu Ln | MTD 0657 | 30 | RCP |
| 15 | 34°01'45.87''N 117°53'22.89''W | Int. of Amar Rd and E Magdalena Rd | MTD 0685 | 36 | RCP |
| 16 | 34°03'06.60''N 117°51'45.75''W | N Grand Ave at N City Limit | RDD 0058 | 33 | RCP |
| 17 | 34°01'56.51''N 117°49'33.24''W | 1,350' E/Int. of E Valley Blvd and Faure Ave | RDD 0251 | 30 | RCP |
| 18 | 34°01'41.16''N 117°50'03.36''W | Snow Creek connection; 500' E/Int. of E Valley Blvd and N Grand Ave | RDD 0251 | 30 | RCP |
| 19 | 34°01'32.71''N 117°50'12.92''W | Snow Creek connection; 650' W/Int. of E Valley Blvd and N Grand Ave | MTD 1675 | 30 | RCP |
| 20 | 34°01'23.69''N 117°50'16.68''W | Int. of Somerset Dr and Valley Blvd | MTD 1146 | 48 | RCP |
| 21 | 34°01'21.48''N 117°50'17.55''W | San Jose Creek; 280' S/Int. of Valley Blvd and Somerset Dr | San Jose Creek | 18 | RCP |
| 22 | 34°01'10.97''N 117°50'27.96''W | 400' S/W/Int. of Valley Blvd and Brea Cyn Rd | MTD 1146 | 24 | RCB |
| 23 | 34°01'05.99''N 117°50'38.95''W | 550' E/Int. of Valley Blvd and Morningside Dr | MTD 1146 | 60 | RCP |
| 24 | 34°00'56.41''N 117°50'59.82''W | Int. of Valley Blvd and Pierre Rd | BI 8301 - Line A | 102 | RCP |
| 25 | 34°00'35.12''N 117°51'30.68''W | Int. of Valley Blvd S Lemon Ave | RDD 0127 | 96 | RCP |
| 26 | 34°00'28.29''N 117°51'44.1''W | Lemon Creek culvert; W/Valley Blvd and Lemon Creek Dr | - | 168 | RCB |

***See Figure 3-2 for a map of these locations***

Prospective storm water monitoring outfall locations were first selected based on HUC-12 boundaries. The list of outfalls was further refined on the basis of having a similar representative land use in the drainage area as the land use in the city. The best available outfall of each HUC-12 area was then selected for further investigation.

Storm water outfall monitoring locations selected by the City ideally do not include drainage from adjacent jurisdictions. However, the intermingling design of the MS4 system does not always allow this to be possible. Due to the topography of the City, there are only a few locations that drain into the City from other jurisdictions. Conditions in the City of Walnut yielded only one of the potential storm water monitoring locations as being identified to include storm water from jurisdictions.

The final parameters reviewed in selecting the proposed storm water outfall location were the location conditions and potential safety concerns. Ideal outfall monitoring sites would allow for safe access and accurate sampling practices with little impact to surrounding communities and traffic.

Outfall monitoring locations selected to be included in this portion of the IMP are at manmade structures, and are relatively accessible. None of the selected monitoring locations are located in the path of traffic, however to allow for safe access, adequate safety practices and traffic control measures must be utilized when field crews are conducting sampling or maintenance. The proposed storm water outfall monitoring locations are listed in Table 3-2 below. Figure 3-2 illustrates the geographical locations on a map of the City.

***Table 3-2***

**Storm Water Outfall Monitoring Locations**

| Outfall Number | Receiving Water Body | Location Description | Latitude Longitude | HUC-12 | Size | Shape |
|---|---|---|---|---|---|---|
| M1 | San Jose Creek Reach 1 | N/E Corner of Grand Ave and La Puente Rd. | 34°01'53.82" N 117°50'15.35" W | 18071060502 | 9'2"x11' | RCB |
| M2 | San Jose Creek Reach 1 | S/W Corner of Nogales St. and Shakespeare Dr. | 34°01'00.52" N 117°53'17.41" W | 18071060501 | 108" | RCP |
| M3 | Walnut Creek Reach1 | Center median of Grand Ave and N'ly City Limits | 34°03'06.32" N 117°51'45.23" W | 18071060402 | 33" | RCP |

Storm water outfall monitoring site M1 will serve as a primary monitoring location for a majority of the City of Walnut. M1 is the largest of the selected monitoring site and has a drainage area of approximately 1,315 Acres (23% of the City). M1 is located approximately 325' north of La Puente Rd. on the east side of Grand Ave. in Snow Creek Park. The point where monitoring will take place is a manhole to the 9'2" X 11' reinforced concrete box. The point of monitoring is located approximately 1,500' north of the City limits. Further upstream of the selected location is an open earthen channel commonly referred to as Snow Creek. Further downstream from the monitoring location, the RCB merges with Reach 1 of the San Jose Creek. Table 3-3 demonstrates that the drainage area to monitoring site M1 is relatively similar to the land use in the City of Walnut.

*Figure 3-1: City of Walnut HUC-12 Boundaries*

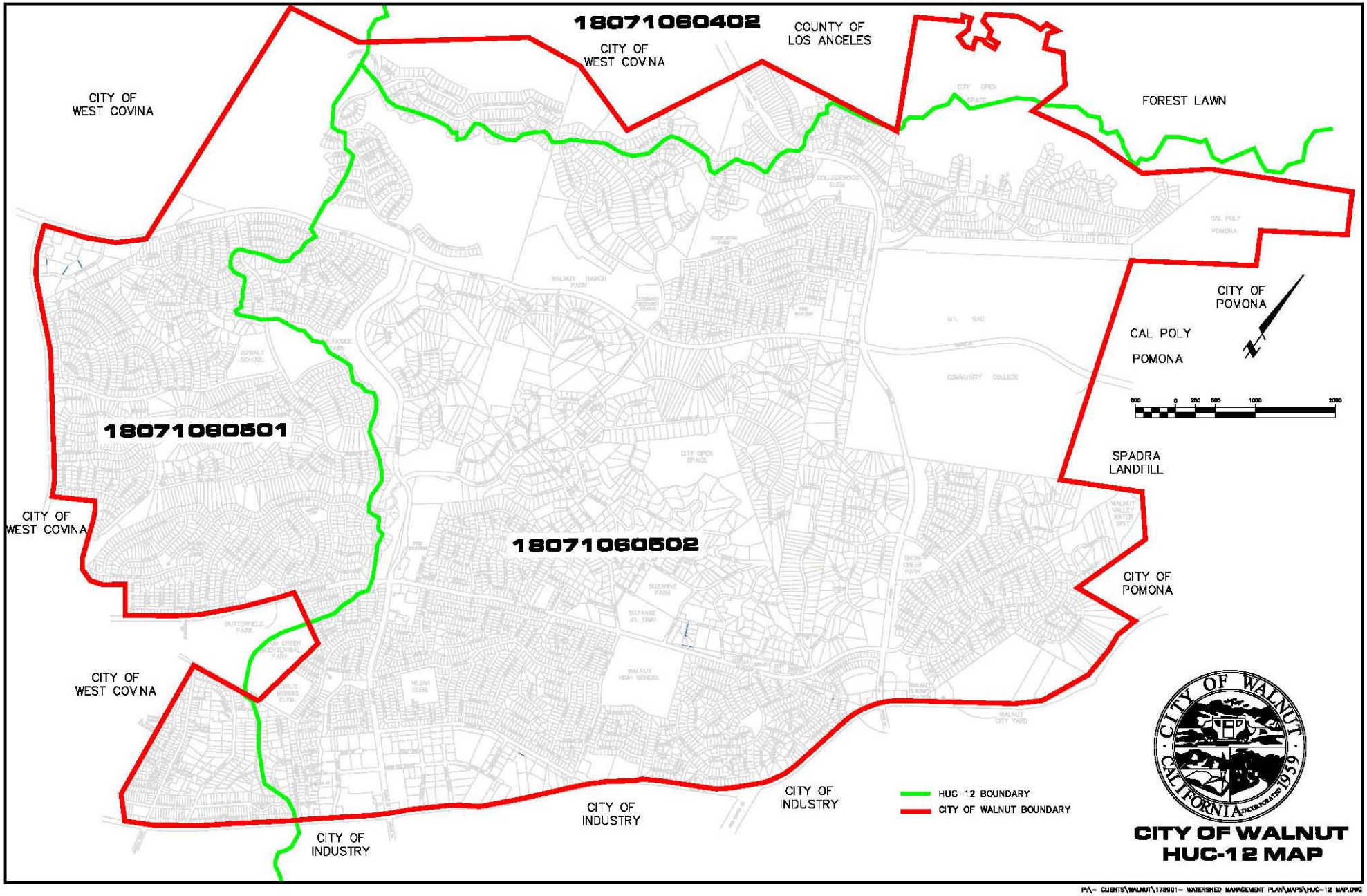


***Figure 3-2: Outfall Inventory Map***

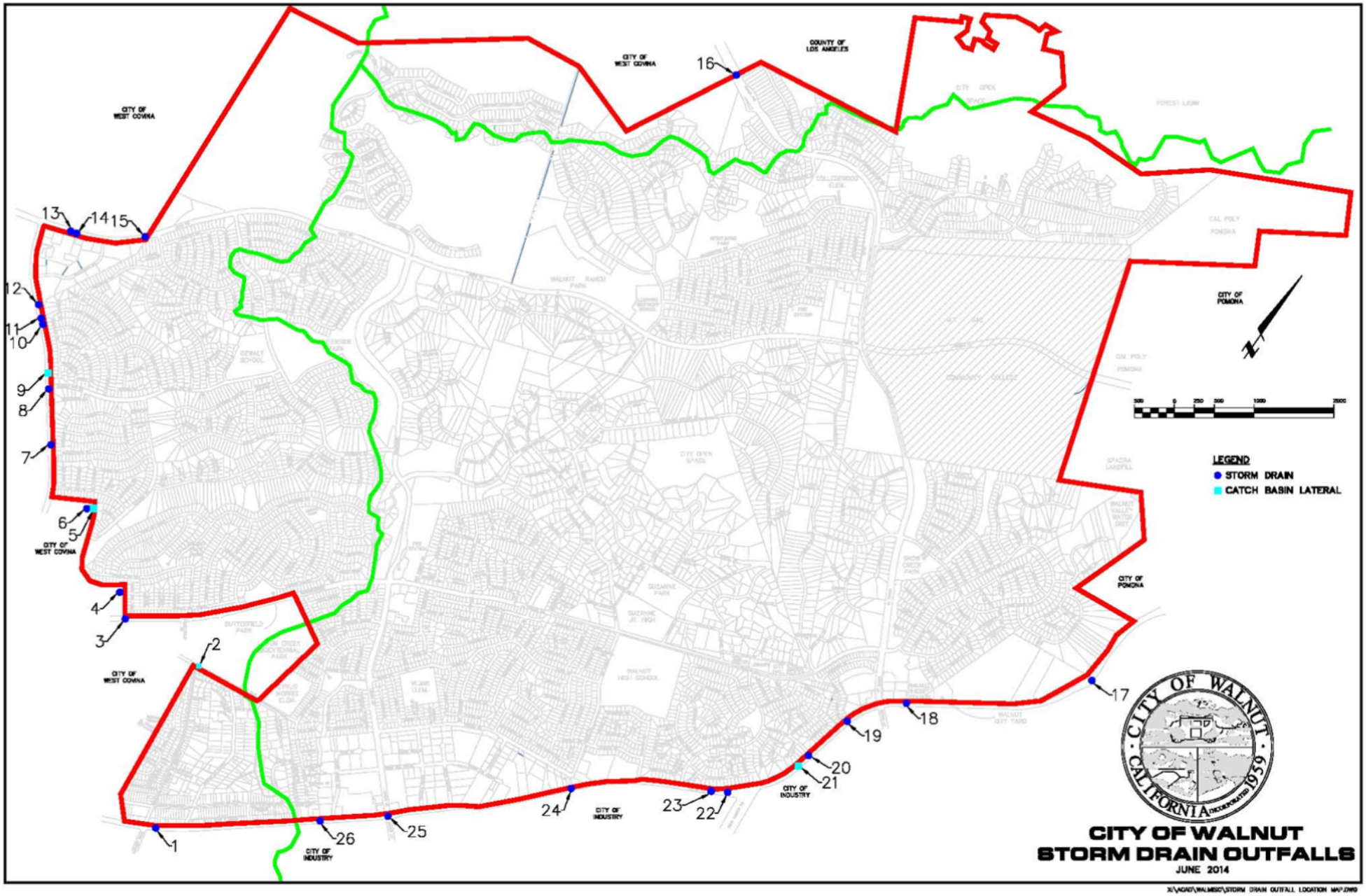


***Table 3-3***

| Land Use in Drainage Area for Monitoring Location M1 | | |
|---|---|---|
| **Land Use Type** | **M1 Drainage Area Land Use** | **City of Walnut Drainage Area** |
| Commercial | 4.5% | 4.5% |
| Agriculture | 6.5% | 1.5% |
| Open Space | 26% | 29% |
| Residential/Other | 63% | 65% |

Storm water outfall monitoring location M2 may serve as an alternative monitoring site for the City. M2 is the second largest of the selected storm water monitoring sites and has a drainage area of 855 Acres (15% of the City). M2 is located at the south western corner of Nogales Street and Shakespeare Drive at an outlet structure to a 108" RCP storm drain. The outlet site may also be identified as the starting point for the Giano Channel. The monitoring location is located approximately 200' outside of the City limits. This particular location transports storm water from both the City of Walnut and the City of West Covina. Should the mixed storm water sources cause issue with other sites are available for this HUC-12, however the alternative sites have a drainage area that is less reflective of the City's land use. The table below demonstrates the similarities of the respective land use for the drainage area of monitoring site M2 and the land use in the City of Walnut.

***Table 3-4***

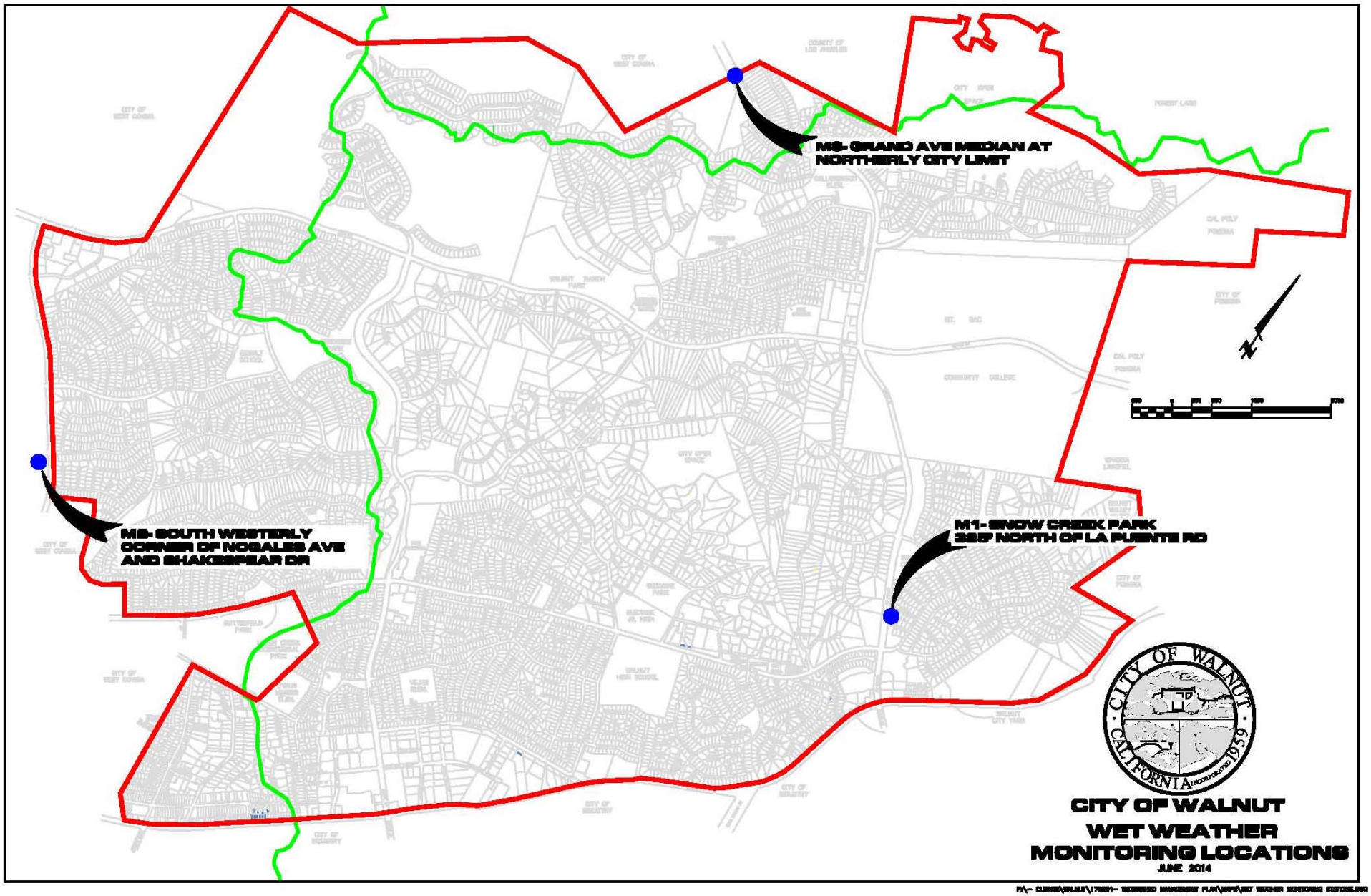
| Land Use in Drainage Area for Monitoring Location M2 | | |
|---|---|---|
| **Land Use Type** | **M2 Drainage Area Land Use** | **City of Walnut Drainage Area** |
| Commercial | 9.5% | 4.5% |
| Agriculture | 0.0% | 1.5% |
| Open Space | 22.5% | 29% |
| Residential/Other | 68% | 65% |

Storm water outfall location M3 will serve as the storm water monitoring location for the northerly portion of the City. This drainage area is the only are in the City of Walnuts jurisdictional area that drains to the Walnut Creek. The approximate drainage area for M3 is 56 Acres (.9% of the City). The scale of storm water flow that is transported by the storm drain at M3 is much lower than the other two sites, however this site is proposed because it is the only location where flow is draining from the City of Walnut to the Walnut Creek watershed. The monitoring site is located in the center median of Grand Avenue approximately 20' away from the City limit in the jurisdictional area of the City of Walnut. The outfall is a manhole to a 30" RCP. Table 3-5 demonstrates the land use differences between the City of Walnut and the drainage area of M3. The land use is not representative of the City of Walnut, but M3 is the only site for monitoring that exists for the Walnut Creek watershed.

***Table 3-5***

| Land Use in Drainage Area for Monitoring Location M3 | | |
|---|---|---|
| **Land Use Type** | **M1 Drainage Area Land Use** | **City of Walnut Drainage Area** |
| Commercial | 0.0% | 4.5% |
| Agriculture | 0.0% | 1.5% |
| Open Space | 26% | 29% |
| Residential/Other | 54% | 65% |

*Figure 3-4: Monitoring Locations*



The City of Walnut proposes to monitor one outfall location for each of the sub watersheds that it is tributary to instead of the HUC-12 based requirement. The locations proposed to be monitored by the City of Walnut only include M1 and M3. It is anticipated that the results from M1 would be similar to those found at M2 and both drain to Reach 1 of the San Jose River. Monitoring site M1 offers a better representation of land use and larger drainage area than M2. The City may consider monitoring at all three wet weather outfall monitoring locations at a later date during the permit term, however for the first year and foreseeable future of the monitoring program the City will only monitor outfalls M1 and M3 for storm water flows as an attempt to maximize available funds for monitoring an minimize redundant data collection.

### 3.1.2 Monitoring Requirements for Storm Water Outfall Monitoring

Section VIII.B of Attachment E in the MS4 Permit outlines the minimum requirements for Storm water outfall monitoring. Storm water discharges shall be monitored a minimum of three times per year for all parameters except for aquatic toxicity. Storm water monitoring shall take place during wet weather conditions. Wet weather conditions are defined as when the receiving water is flowing at least 20% greater than the base flow or as otherwise defined by a TMDL monitoring plan or this document. Monitoring events shall target the first qualifying wet weather event of the season and at least two additional events in the same season. The first wet weather event to be targeted shall be forecasted at least 24 hours in advance with 70% probability of rainfall of at least .25- inches. The two additional events to be monitored shall be separated by a minimum of three dry condition days between events. Monitoring Parameters are identified in Table 3-6.

***Table 3-6***

| **Outfall Monitoring Parameters** | |
|---|---|
| **Monitoring Parameter** | **Source of Monitoring Requirement** |
| Flow | Minimum Parameter |
| Lead | TMDL |
| Selenium | TMDL |
| Coliform Bacteria | 303(d) |
| pH | Minimum Parameter |
| *Toxicity | Minimum Parameter |
| Cyanide | 303(d) |
| Total Suspended Solids | Minimum Parameter |
| Hardness | Minimum Parameter |
| Dissolved Oxygen (DO) | Minimum Parameter |
| Temperature | Minimum Parameter |
| Specific Conductivity | Minimum Parameter |
| **Additional Screening Parameters | Minimum Parameter |

** Per section VI.C.d.vi of attachment E of the MS4 Permit, aquatic toxicity is only required to be monitored twice per year, Aquatic Toxicity Monitoring Methods shall conform to section XII of Attachment E of the MS4 Permit.*

*** Additional Screening Parameters are included in Appendix A of this document. Per section VI.C.e of attachment E of the MS4 Permit, these parameters are only required to be monitored in the first year. If not detected no further monitoring is required.*

### 3.1.3- Storm Water Outfall Monitoring Sampling Methods #

Sampling of storm water at outfalls will take place during the first 24 hours of an event or before the event ends if less than 24 hours. A minimum of three grab samples separated by 15 minutes of each hour for a 24 hour event or for the duration of the storm if less than 24 hours, will be taken to create a flow weighted composite sample of the discharge from an outfall. Continuous sampler equipment may be selected for use in this monitoring plan. Grab samples may be utilized for specific pollutants at the discretion of the sampling lab/consultant.

Sampling and analysis will be conducted by a contracted water sampling consultant. Tasks conducted by the consultant will conform to the following requirements which will be verified by the City:

- Consultants shall demonstrate that required pollution detection limits can be met with reasonable accuracy and precision.
- All equipment utilized in gathering and analyzing samples shall be cleaned and maintained in a manner that prevents sample contamination.
- Sample analysis shall be conducted in accordance with EPA established or Regional Board accepted methods and procedures applicable to pollutant(s) being analyzed.
- An adequate QA/QC program shall be in place to ensure precise and accurate results.

## 3.2- Non- Storm Water Outfall Based Monitoring

Non-storm water outfall monitoring will be utilized to determine compliance with dry weather TMDL and WQBEL requirements. Outfalls will be screened to determine the presence of dry weather flows. Dry weather monitoring will also be utilized to aid in the elimination of illicit discharges. Outfalls determined to have dry weather flows will be prioritized and investigated to determine the source of the flows and if the flows are categorized as a prohibited discharge.

### 3.2.1- Outfall Screening Procedure

Upon approval of the IMP, the City of Walnut will commence the screening process of outfalls for dry weather flows. Outfalls found to have consistent significant dry weather flows will be prioritized based on the receiving water, observed dry weather flow volume, observed water quality and the size of the outfall.

The initial stage of screening will be comprised of a visual assessment of all outfalls. This will take place during the first dry season that this IMP is in effect. Each outfall will be visited and inspected at least once for flow during dry weather conditions. If flow is present, pictures and general notes will be taken of the flow characteristics. Outfalls where dry weather flow is considered to be substantial will be visited at least two additional times to confirm initially observed flow characteristics are consistent.

Each outfall found to have significant dry weather flows shall be recorded and tracked over the duration of the MS4 Permit. Field inspection reports shall be kept on file in an electronic format for future reference. Field reports shall include the following information at a minimum.

- Date and Time of Visual inspection
- Outfall ID Number (Reference Outfall inventory)
- Outfall Structure Description
- Receiving Water Description at Discharge Point
- Latitude/Longitude
- Nearest Street Address
- Parking, Access, and Safety Considerations
- Photographs of Outfall
- Photographs of Non-storm Water Discharge
- Estimated Discharge Rate
- All Diversions Upstream or Downstream of the outfall
- Observed Characteristics of Discharge

Following the initial visual screening process, the field reports of outfalls with non-storm water discharges will be compiled and reviewed for the purpose of prioritizing source investigations. The MS4 Permit requires that prioritization be determined by the classification parameters below. The prioritization levels have been classified in to tiers in ascending numeric values with Tier 1 being the first outfalls to be monitored.

**Tier 1 Prioritization –** Outfalls discharging directly to receiving waters with WQBELS or receiving water limitations in the TMDL provisions for which final compliance has passed.

**Tier 2 Prioritization –** All major outfalls and other outfalls that discharge to a receiving water subject to a TMDL shall be prioritized according to TMDL compliance schedules.

**Tier 3 Prioritization –** Outfalls to which monitoring data exists and indicate recurring exceedances of one or more of the Action Levels identified in Attachment G of the MS4 permit.

**Tier 4 Prioritization -** All other major outfalls identified to have significant non-storm water discharges.

Prioritization of outfall investigations within each Tier will be based on best professional judgment with flow volume, outfall drainage area, and observed discharge water quality among other parameters taken into account.

## 3.2.2- Source Investigation

Non-storm water outfall source investigations will be scheduled to ensure that at least 25% of the outfalls with non-storm water discharges will undergo a source investigation within three years of the effective date of the MS4 Permit (Effective Date December 28, 2013), and 100% complete within 5 years of the effective date of the permit.

Source investigations shall include both desktop level analysis of potential sources and field investigations to trace sources of dry weather flows. Based on the source investigation results the City of Walnut will proceed with actions described in Table 3-7.

***Table 3-7***

| Dry Weather Flow Monitoring | |
|---|---|
| **Dry Weather Flow Source** | **Action** |
| Illicit Discharge | The City of Walnut will proceed with implementing proceedures to eliminate the discharge consistent with IC/ID requirements. Actions shall be documented and reported in the next Annual Report. |
| NPDES Permitted Discharge | If the source is determined to be a NPDES permitted discharge, a discharge subject to Record of Decision approved by the USEPA pursuant section 121 of CERCLA, a conditionally exempt essential non-storm water discharge, or entirely comprised of natural flows as defined in Part III.A.d of the MS4 Permit, then document the source and report to the Regional Board in the next Annual Report. |
| The Source is Unknown or a Conditionally Exempt, but Non-Essential, Non-Storm Water Discharge | The City of Walnut Shall conduct monitoring as required by the MS4 permit and further described in this document. |
| Discharge is Comprised of more than one source | The City of Walnut will attempt to quantify the relative contribution from the City's jurisdictional boundary and classify the contributions as authorized, conditionally exempt essential, natural, illicit discharge, conditional exempt non-essential, or unknown |
| Source is Identified as Originating from Up-Stream Jurisdiction | The City shall inform the up-stream jurisdiction and the Regional Water Board within 30 days of determination of the presence of the discharge, all available characterization data, contribution determination efforts, and efforts taken to identify its source. |

Before a source of non-storm water discharge is classified as unknown, it shall be investigated to a reasonable extent. Investigation procedures shall include field inspections and desktop studies. Monitoring for indicator parameters shall be conducted if initial investigations yield no results. Video inspection of the storm drain may be utilized by the City in the source investigation. Other means determined to be potentially effective in locating the source of unknown flows will also be evaluated. A description of all efforts to identify a source of dry weather flows will be included in the next Annual Report for sources to be classified as unknown. All MS4 outfalls requiring no further action shall be maintained in the Storm Drains, Channels and Outfalls map and associated database.

## 3.2.3- Monitoring Non-Storm Water Discharges Exceeding Criteria

Within 90 days after completing the source identification or after the Executive Officer of the Regional Water Board approves the IMP, whichever is later, the City of Walnut will move forward with implementing monitoring activities. Dry weather monitoring activities will be limited to two outfalls that have been determined to convey significant discharges comprised of either unknown or conditionally exempt non-storm water discharges, or containing discharges attributed to illicit discharges per dry season. The following parameters shall be monitored:

- Flow
- Pollutants assigned a WQBEL or RWL to implement TMDL Provisions applicable to the receiving water body
- Other Pollutants identified on the CWA 303(d) list for receiving water
- Pollutants identified in a TIE conducted in response to observed aquatic toxicity during dry weather at the nearest downstream receiving water monitoring station during the last sample event or, where the TIE conducted on the receiving water sample was inconclusive, aquatic toxicity. If the discharge exhibits aquatic toxicity, then a TIE shall be conducted.
- Other parameters in Table E-2 identified as exceeding the lowest applicable water quality objective in the nearest downstream receiving water monitoring station per Part VI.D.1.d. of the MS4 Permit.

The frequency of monitoring during the first year shall be at least four times per outfall in the first year for outfalls that have been identified as having non-storm water discharges of unknown origin. Monitoring will then be reduced to at least twice per year for the second year. Dry weather outfall monitoring frequency will continue at a minimum of two sampling events for the remainder of the MS4 Permit cycle. Dry weather monitoring frequency may be increased from two times per year should the City deem it necessary to further trace flow source, BMP effectiveness or any other reason that would aid the City in improving water quality.

The City will evaluate the results of the first year of dry weather monitoring and consider submitting a request to the Executive Officer of the Regional Water Quality Board to eliminate the monitoring requirements for specific pollutants found to not be a threat to the receiving waters.

## 3.2.4- Sampling Methods

Non storm water discharges shall be monitored during days when precipitation is less than 0.1 –inch and those not less than three days after a rain event of greater than 0.1-inch. A minimum of three grab samples separated by 15 minutes for each hour during a 24 hour period, will be taken to create a flow weighted composite sample of the discharge from an outfall. Continuous sampler equipment may also be selected for use in this monitoring plan. Samples will then be taken from the site to a City selected lab for analysis.

Sampling and analysis will be conducted by a contracted water sampling consultant. Tasks conducted by the consultant will conform to the following requirements which will be verified by the City:

- Consultants shall demonstrate that required pollution detection limits can be met with reasonable accuracy and precision.
- All equipment utilized in gathering and analyzing samples shall be cleaned and maintained in a manner that prevents sample contamination.
- Sample analysis shall be conducted in accordance with EPA established or Regional Board accepted methods and procedures applicable to pollutant(s) being analyzed.
- An adequate QA/QC program shall be in place to ensure precise and accurate results.

## 4.0- New Development/Redevelopment Effectiveness Tracking

The objective of the new development/re-development tracking system is to track BMP effectiveness. This program will be utilized to adjust and hone BMP implementation and design with the intent to improve the effectiveness of BMPs. The City of Walnut will keep a database of the information outlined below for use in evaluating the effectiveness of the new development and re-development in the City.

**New Development Re-development Tracking Parameters**

- Name of project developer and project
- Project Location & Map
- Date of Certificate of Occupancy
- $85^{th}$ Percentile Storm Event (inches/24 hours)
- Other Design Criteria required to meet hydromodification requirements for drainages to natural water bodies
- Project Design Storm (inches/ 24 Hours)
- Project Design Storm Volume (MGD)
- Percent of Design Storm volume to be retained on site
- Flow Through BMPs provide one year, one hour Isohyetal map published by Los Angeles County
- Percent of design Storm to be infiltrated at an offsite mitigation or ground water replenishment site
- Percent of Design Storm to Volume to be retained or treated with Biofiltration at an offsite retrofit project
- Location Maps of Offsite Mitigation, groundwater replenishment, or retrofit sites,
- Documentation of issuance of requirements to the developer

As the City's database of new development and re-development effectiveness builds, the City will evaluate the effectiveness of certain BMPs and re-evaluate what BMPs will be allowed for consideration in new development or re-development projects.

## 5.0- Regional Studies

Regional Studies are required to further characterize the impact on beneficial uses of receiving waters from discharges originating at the MS4 outlets. These studies will include the Southern California Storm water Monitoring Coalition (SMC) Regional Watershed Monitoring Program and special studies as specified in approved TMDLs. The City is not named as a member of the SMC, but the County of Los Angeles is. The City of Walnut will meet the Permit requirement of participating in the SMC via the County of Los Angeles's participation.

## 6.0- Special Studies

Per the MS4 Permit each permittee shall be responsible for conducting special studies required in an effective TDML or an approved TMDL Monitoring Plan. The City of Walnut is subject to one TMDL which is the San Gabriel River and Impaired Tributaries Metals and Selenium TMDL. No special studies were classified as required in the final TMDL. A number of potential special studies are identified in the TMDL, but at this time no special studies have been considered for further development by the City of Walnut. In the event that monitoring data would suggest that a special study would benefit the City, further investigation of potential study(ies) will be reviewed pending available budget to do so.

## 7.0- Annual Reporting

On an annual basis, the City of Walnut will submit an annual report to the Regional Water Quality Control Board on or before December 15$^{th}$. The report will document and present key NPDES information that was gathered for previous fiscal year (June 1 to July 30). The report shall include information that will allow the Regional Board to assess the results of the pervious years NPDES program. The report topics discussed shall include:

- Participation in one or more Watershed Management Plan
- The Impact of storm water and non-storm water discharges on the receiving water
- Compliance with receiving water limitations, numeric water quality based effluent limitations and non-storm water action levels
- Effectiveness of control measures in reducing discharges of pollutants from the MS4 to receiving waters
- Whether the quality of MS4 discharges and the health of receiving waters is improving, staying the same, or declining as a result of watershed management program efforts, an/or TMDL implementation measures or other minimum control measures
- Whether changes in water quality can be attributed to pollutant controls imposed on new development, re-development or retrofit projects.

Other key information will be presented will provide the Regional Board a clear and representative view of how the Watershed Management Plan and Integrated Monitoring Plan are being implemented. Section XVI through XVIII of Attachment E to the MS4 Permit discusses in detail the required annual reporting requirements.

## 8.0- Adaptive Management Process

The City of Walnut will utilize the MS4 Permit required adaptive management process to review and potentially modify the IMP in an effort to improve the effectiveness of the plan. The adaptive management process will take place every two years from the date of approval by the Regional Water Quality Control Board. The review process of the plan will include consideration of the following items:

- Progress toward achieving interim and/or final water quality-based effluent limitations and/or receiving water limitations in Part VI.E and Attachment L through R, according to established compliance schedules.
- Progress toward achieving improved water quality in MS4 discharges and achieving receiving water limitations through implementation of the watershed control measures based on an evaluation of outfall-based monitoring data and receiving water monitoring data.
- Achievement of interim milestones.
- Re-evaluation of water quality priorities identified for the WMA based on more recent water quality data for discharges from the MS4 and the receiving water(s) and a reassessment of sources of pollutants in MS4 discharges.
- Availability of new information and data from sources other than the monitoring program with in the WMA that informs the effectiveness of the actions implemented by the IMP.
- Regional Water Board recommendations.
- Recommendations for modifications to the Watershed Management Program solicited through a public participation process.

The findings of the adaptive management review process can result in modifications to the IMP including changes to compliance deadlines, interim milestones necessary to improve the effectiveness of the program. Modifications to compliance deadlines established by TMDLs will not be allowed through the adaptive management process. Proposed modifications to the IMP shall be reported by the City of Walnut in the Annual Report. Proposed modifications identified through the adaptive management process shall be implemented upon approval by the Regional Board Executive Officer within 60 days of their submittal if the Regional Board Executive has not expressed any objections to the modifications.

## 9.0- References

Los Angeles Regional Water Quality Control Board (Regional Board), 2012. Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4. November 8. http://www.waterboards.ca.gov/losangeles/water_issues/programs/stormwater/municipal/la_ms4/2012/Order%20R4-2012-0175%20-%20A%20Final%20Order%20revised.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 1994. "Water Quality Control Plan Los Angeles Region." June. http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/electronics_documents/bp1_introduction.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2007. "Total Maximum Daily Loads for Metals and Selenium San Gabriel River and Impaired Tributaries." March. http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/Established/San%20Gabriel%20River%20Metals%20TMDL/final_sangabriel_metalstmdl_3-27-07.pdf

Los Angeles County Department of Public Works, 2014. "San Gabriel River Watershed." June. http://ladpw. org/wmd/watershed/sg/

# Attachment A

## MS4 Permit Table E-2

| CONSTITUENTS | MLs |
|---|---|
| **CONVENTIONAL POLLUTANTS** | **mg/L** |
| Oil and Grease | 5 |
| Total Phenols | 0.1 |
| Cyanide | 0.005 |
| pH | 0 – 14 |
| Temperature | N/A |
| Dissolved Oxygen | Sensitivity to 5 mg/L |
| **BACTERIA (single sample limits)** | MPN/100ml |
| Total conform (marine waters) | 10,000 |
| Enterococcus (marine waters) | 104 |
| Fecal coliform (marine & fresh waters) | 400 |
| E. coli (fresh waters) | 235 |
| **GENERAL** | **mg/L** |
| Dissolved Phosphorus | 0.05 |
| Total Phosphorus | 0.05 |
| Turbidity | 0.1 NTU |
| Total Suspended Solids | 2 |
| Total Dissolved Solids | 2 |
| Volatile Suspended Solids | 2 |
| Total Organic Carbon | 1 |
| Total Petroleum Hydrocarbon | 5 |
| Biochemical Oxygen Demand | 2 |
| Chemical Oxygen Demand | 20-900 |
| Total Ammonia Nitrogen | 0.1 |
| Total Kjeldahl Nitrogen | 0.1 |
| Nitrate-Nitrite | 0.1 |
| Alkalinity | 2 |
| Specific Conductance | 1umho/cm |
| Total Hardness | 2 |
| MBAS | 0.5 |
| Chloride | 2 |
| Fluoride | 0.1 |
| Methyl tertiary butyl ether (MTBE) | 1 |
| Perchlorate | 4 µg/L |
| **METALS (Dissolved & Total)** | **µg/L** |
| Aluminum | 100 |
| Antimony | 0.5 |
| Arsenic | 1 |
| Beryllium | 0.5 |
| Cadmium | 0.25 |
| Chromium (total) | 0.5 |
| Chromium (Hexavalent) | 5 |
| Copper | 0.5 |
| Iron | 100 |
| Lead | 0.5 |
| Mercury | 0.5 |
| Nickel | 1 |
| Selenium | 1 |
| Silver | 0.25 |
| Thallium | 1 |
| Zinc | 1 |

| SEMIVOLATILE ORGANIC COMPOUNDS | |
|---|---|
| **ACIDS** | **µg/L** |
| 2-Chlorophenol | 2 |
| 4-Chloro-3-methylphenol | 1 |
| 2,4-Dichlorophenol | 1 |
| 2,4-Dimethylphenol | 2 |
| 2,4-Dinitrophenol | 5 |
| 2-Nitrophenol | 10 |
| **ACIDS** | **µg/L** |
| 4-Nitrophenol | 5 |
| Pentachlorophenol | 2 |
| Phenol | 1 |
| 2,4,6-Trichlorophenol | 10 |
| **BASE/NEUTRAL** | **µg/L** |
| Acenaphthene | 1 |
| Acenaphthylene | 2 |
| Anthracene | 2 |
| Benzidine | 5 |
| 1,2 Benzathracene | 5 |
| Benzo(a)pyrene | 2 |
| Benzo(g,h,i)perylene | 5 |
| 3,4 Benzoflouranthene | 10 |
| Benzo(k)flouranthene | 2 |
| Bis(2-Chloroethoxy) methane | 5 |
| Bis(2-Chloroispropyl) ether | 2 |
| Bis(2-Chloroethyl) ether | 1 |
| Bis(2-Ethylhexl) phthalate | 5 |
| 4-Bromophenyl phenyl ether | 5 |
| Butyl benzyl phthalate | 10 |
| 2-Chloroethyl vinyl ether | 1 |
| 2-Chloronaphthalene | 10 |
| 4-Chlorophenyl phenyl ether | 5 |
| Chrysene | 5 |
| Dibenzo(a,h)atnthracene | 0.1 |
| 1,3-Dichlorobenzene | 1 |
| 1,4-Dichlorobenzene | 1 |
| 1,2-Dichlorobenzene | 1 |
| 3,3-Dichlorobenzidine | 5 |
| Diethyl phthalate | 2 |
| Dimethyl phthalate | 2 |
| di-n-Butyl Phthalate | 10 |
| 2,4-Dinotrotoluene | 5 |
| 2,6-Dinotrotoluene | 5 |
| 4,6 Dinitro-2-methylphenol | 5 |
| 1,2 Diphenylhydrazine | 1 |
| di-n-Octyl phthalate | 10 |
| Fluoranthene | 0.05 |
| Fluorene | 0.1 |
| Hexachlorobenzene | 1 |
| Hexachlorobutadiene | 1 |
| Hexachloro-cyclopentadiene | 5 |
| Hexachloroethane | 1 |

| | |
|---|---|
| Indeno(1,2,3-cd)pyrene | 0.05 |
| Isophorone | 1 |
| Naphthalene | 0.2 |
| Nitrobenzene | 1 |
| N-Nitroso-dimethyl amine | 5 |
| N-Nitroso-diphenyl amine | 1 |
| N-Nitroso-di-n-propyl amine | 5 |
| Phenanthrene | 0.05 |
| **BASE/NUETRAL** | **µg/L** |
| Pyrene | 0.05 |
| 1,2,4-Trichlorobenzene | 1 |
| **CHLORINATED PESTICIDES** | **µg/L** |
| Aldrin | 0.005 |
| alpha-BHC | 0.01 |
| beta-BHC | 0.005 |
| delta-BHC | 0.005 |
| gamma-BHC (lindane) | 0.02 |
| alpha-chlordane | 0.1 |
| gamma-chlordane | 0.1 |
| 4,4'-DDD | 0.05 |
| 4,4'-DDA | 0.05 |
| 4,4'-DDT | 0.01 |
| Dieldrin | 0.01 |
| alpha-Endosulfan | 0.02 |
| beta-Endosulfan | 0.01 |
| Endosulfan sulfate | 0.05 |
| Endrin | 0.01 |
| Endrin aldehyde | 0.01 |
| Heptachlor | 0.01 |
| Heptachlor Epoxide | 0.01 |
| Toxaphene | 0.05 |
| **POLYCHLORINATED BIPHENYLS** | **µg/L** |
| Aroclor-1016 | 0.5 |
| Aroclor-1221 | 0.5 |
| Aroclor-1232 | 0.5 |
| Aroclor-1242 | 0.5 |
| Aroclor-1248 | 0.5 |
| Aroclor-1454 | 0.5 |
| Aroclor-1260 | 0.5 |
| **ORGANOPHOSPHATE PESTICIDES** | **µg/L** |
| Altrazine | 2 |
| Chlorpyrifos | 0.05 |
| Cyanazine | 2 |
| Diazinon | 0.01 |
| Malathion | 1 |
| Prometryn | 2 |
| Simazine | 2 |
| **HERBICIDES** | **µg/L** |
| 2,4-D | 10 |
| Glyphosate | 5 |
| 2,4,5-TP-SILVEX | 0.5 |

# Attachment B

## Aquatic Toxicity Monitoring Methods

## Aquatic Toxicity Monitoring Methods

**The following requirements related to monitoring methods for aquatic toxicity are from section XII of Attachment E of the MS4 Permit.**

A. Aquatic Toxicity Monitoring as required in Parts VI (Receiving water Monitoring), VIII (Storm Water Outfall Based Monitoring), and IX (Non-storm Water Outfall Based Monitoring) of this MRP, shall be conducted according to the procedures described in this Part. When the State Water Board's *Policy for Toxicity Assessment and Control* is fully approved and in effect, the Regional Water Board Executive Officer may direct the Permittiee(s) to replace current toxicity program elements with standardized procedures in the policy.

B. The Permittee(s) shall collect and analyze samples taken from receiving water monitoring locations to evaluate the extent and causes of toxicity in receiving waters.

C. Toxicity samples may be flow-weighted composite samples, or grab samples, for wet and dry event sampling.

D. The total sample volume shall be determined both by the specific toxicity test method used and the additional volume necessary for TIE studies. Sufficient sample volume shall be collected to perform both the required toxicity tests and TIE studies.

E. Holding Times. Al toxicity tests shall be conducted as soon as possible following sample collection. The 36-hour sample holding time for the test initiation shall be targeted. However, no more than72 hours shall elapse before the conclusion of sample collection and test initiation.

F. Definition of Chronic Toxicity. Chronic toxicity measures a subleathal effect (e.g., reduced growth, reproduction) to experimental test organisms exposed to an effluent or receiving waters compared to that of the control organisms.

**G. Chronic Toxicity Monitoring Programs**

1. Freshwater Test Species and Methods**.**

   If samples are collected in receiving waters with salinity <1 ppt, or from outfalls discharging to receiving waters with salinity <1 ppt, then the Permittee(s) shall conduct the following critical life stage chronic toxicity tests on undiluted samples in accordance with species and short-term test methods in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA/821/R-02/013, 2002; Table IA, 40 CFR Part 136). In no case shall the following test species be substituted with another organism unless written authorization from the Regional Water Board Executive Officer is received.

   i. A static renewal toxicity test with the fathead minnow, *Pimephales promelas* (Larval Survival and Growth Test Method 1000.0[4]).

   ii. A static renewal toxicity test with the daphnid, *Ceriodaphnia dubia* (Survival and Reproduction Test method 1002.0[5]).

   iii. A static renewal toxicity test with the green alga, *Selenastrum capricornutum* (also named *Raphidocelis subcapitata*) (Growth Test Method 1003.0).

2. Marine and Estuarine Test Species and Methods.

If samples are collected in receiving waters with salinity ≥1 ppt, or from outfalls discharging to receiving waters with salinity ≥1 ppt, then the Permittee(s) shall conduct the following critical life stage chronic toxicity tests on undiluted samples in accordance with species and short-term test methods in *Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136, 1995). Artificial sea salts shall be used to increase sample salinity. In no case shall the following test species be substituted with another organism unless written authorization from the Regional Water Board Executive Officer is received.

a. A static renewal toxicity test with the topsmelt, *Antherinops affinis* (Larval Survival and growth Test Method 1006.01[5]);
b. A static non-renewal toxicity test with the purple sea urchin, *Strongylocentrotus purpuratus* (Fertilization Test Method 1008.0; and
c. A static non-renewal toxicity test with the giant kelp, *Macrocystis pyrifera* (Germination and Growth Test Method 1009.0).

3. Test Species Sensitivity Screening.
   To determine the most sensitive test species, the Permittee(s) shall conduct two wet weather and two dry weather toxicity tests with a vertebrate , an invertebrate, and a plant. After this screening period, subsequent monitoring shall be conducted using the most sensitive test species is sensitive to such toxicant(s) and a test species is sensitive to such toxican(s), then monitoring shall be conducted using only that test species. Sensitive test species determinations shall also consider the most sensitive test species used for proximal receiving water monitoring. After the screening period, subsequent monitoring shall be conducted using the most sensitive test species. Rescreening shall occur in the fourth year of the permit term.
4. Chronic toxicity test biological endpoint data shall be analyzed using the Test of Significant Toxicity t-test approach specified in the *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document* (U.S. Environmental protection Agency, Office of Wastewater Management, Washington D.C. EPA 833-R-10-003). For this monitoring program, the critical chronic in stream waste concentration (IWC) is set at 100% receiving water for receiving water samples and 100% effluent for wet- and dry-weather outfall samples. A 100% receiving water/outfall effluent sample and a control shall be tested.

H. Quality Assurance
1. If the receiving water or outfall effluent test does not meet all test acceptability criteria (TAC) specified in the test methods manuals (*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms* (EPA/821/R-02/013, 2002) and *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136, 1995)), then the Permittee(s) must re-sample and re-test at the earliest time possible.
2. Control water, including brine controls, shall be laboratory water prepared and used as specified in the test methods manuals.

3. If organisms are not cultured in-house, then concurrent testing with a reference toxicant shall be conducted. If organisms are cultured in-house, then monthly reference toxicant testing is sufficient. Reference toxicant tests and effluent toxicity tests shall be conducted using the same tests conditions (e.g., same test duration, etc.).

I. Toxicity Identification Evaluation (TIE).

1. A toxicity test sample is immediately subject to TIE procedures to identify the toxic chemical(s), if either the survival or sublethal endpoint demonstrates a Percent Effect value equal to or greater than 50% at the IWC. Percent Effect is defined as the effect value-denoted as the difference between the mean control response and the mean IWC response, divided by the mean control response-multiplied by 100.
2. A TIE shall be performed to identify the causes of toxicity using the same species and test method and, as guidance, U.S. EPA manuals: *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I* (EPA/600/6-91/005F, 1992); *Methods for Aquatic Toxicity Identification Evaluations, Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity* (EPA/600/R-92/081, 1993); and *Marine Toxicity Identification Evaluation (TIE): Phase I Guidance Document* (EPA/600/R-96-054, 1996).
3. The TIE should be conducted on the test species demonstrating the most sensitive toxicity response at a sampling station. A TIE may be conducted on a different test species demonstrating a toxicity response with the caveat that once the toxicant(s) are identified, the most sensitive test species triggering the TIE shall be further tested to verify that the toxicant has been identified and addressed.
4. A TIE Prioritization Metric (see Appendix 5 in SMC Model Monitoring Program) may be utilized to rank sites for TIEs.

J. Toxicity Reduction Evaluation (TRE)

1. When a toxicant or class of toxicants is identified through a TIE conducted at a receiving water monitoring station, Permittees shall analyze for the toxicant(s)during the next scheduled sampling event in the discharge from the outfall(s) upstream of the receiving water location.
2. If the toxicant is present in the discharge from the outfall at levels above the applicable receiving water limitation, a TRE shall be performed for that toxicant.
3. The TRE shall include all reasonable steps to identify the source(s) of toxicity and discuss appropriate BMPs are identified, the Permittee(s) shall submit a TRE Corrective Action Plan to the Regional Water Board Executive Officer for approval. At minimum, the plan shall include a discussion of the following:
    a. The potential sources of pollutant(s) causing toxicity.
    b. A list of municipalities and agencies that may have jurisdiction over sources of pollutant(s) causing toxicity.
    c. Recommended BMPs to reduce the pollutants(s) causing toxicity.
    d. Proposed post-construction control measures to reduce the pollutant(s) causing toxicity.

e. Follow-up monitoring to demonstrate that the toxicants have been reduced or eliminated.

K. Chronic Toxicity Reporting

1. Aquatic toxicity monitoring results submitted to the Regional Water Board shall be consistent with the requirements identified in Part XIV.L and M and Part XVIII.A.5 and A.7 of the MRP.
2. The Annual Report in Part XVIII of the MRP shall include:
    a. A full laboratory report for each chronic toxicity test prepared according to the appropriate test methods manual chapter on Report Preparation including.
        i. The chronic toxicity test results for the t-test, reported as “Pass” of “Fail”, and the “Percent Effect”.
        ii. The dates of sample collection and initiation of each toxicity test.
        iii. Test Species with biological endpoint values for each concentration tested.
        iv. Reference toxicant test results.
        v. Water quality measurements for each toxicity test (e.g., pH, dissolved oxygen, temperature, conductivity, hardness, salinity, chlorine, ammonia).
        vi. TRE/TIE testing results.
        vii. A printout of CETIS (Comprehensive Environmental Toxicity Information System) program results.
    b. All results for receiving water or outfall effluent parameters monitored concurrently with the toxicity test.
    c. TIEs (Phases I, II, and III) that have been completed or are being conducted, by monitoring station.
    d. The development, implementation, and results for each TRE Corrective Action Plan, beginning the year following the identification of each pollutant or pollutant or pollutant class causing chronic toxicity.

# Attachment C

## Stream Bioassessment Proceedure

# CALIFORNIA STREAM BIOASSESSMENT PROCEDURE

**(Protocol Brief for Biological and Physical/Habitat Assessment in Wadeable Streams)**

The California Stream Bioassessment Procedure (CSBP) is a standardized protocol for assessing biological and physical/habitat conditions of wadeable streams in California. The CSBP is a regional adaptation of the national Rapid Bioassessment Protocols outlined by the U.S. Environmental Protection Agency in "Rapid Bioassessment Protocols for use in Streams and Rivers" (**EPA/841-B-99-002**). The CSBP is a cost-effective tool that utilizes measures of the stream's benthic macroinvertebrate (BMI) community and its physical/habitat characteristics to determine the stream's biological and physical integrity. The purpose of this Protocol Brief is to introduce the techniques of bioassessment to aquatic resource professionals and help standardize data for statewide bioassessment efforts. The Protocol Brief is only a summary and does not contain all the necessary information that may be required to understand the concepts of bioassessment and to implement a successful monitoring program. Additional information and updates on bioassessment can be obtained by visiting the **DFG Aquatic Bioassessment Laboratory website at** www.dfg.ca.gov/cabw/cabwhome.html.

## History of the CSBP

The CSBP was originally developed in 1993 to measure biological response from point-source discharges of chemical contaminants, inorganic sediment and elements of organic enrichment. The method was based on sampling the single richest habitat in a stream reach; this was the most common technique at the time (Rosenberg and Resh 1993, Loeb and Spacie 1994, Lenat and Barbour 1994) and consistent with the U.S. EPA's Rapid Bioassessment Protocols (RBP) (Plafkin et al. 1989). In 1995, the CSBP was adapted for use in ambient and non-point source pollution monitoring programs and this version was reviewed by a Technical Advisory Committee assembled by DFG and the U.S. EPA. The 1996 edition of the CSBP was widely distributed in California and accepted as the state's standardized RBP protocol (Davis et al. 1996 U.S. EPA 2002). A 1999 revision added quality assurance and control (QA/QC) techniques to ensure high quality field collections, laboratory analysis and taxonomic consistency.

As of 2003, the CSBP is the most often used RBP protocol in California (Barbour and Hill, 2003). This unique protocol allows the user to produce biological and physical/habitat data that can be used to measure differences between sites, compare to a regional Index of Biological Integrity (IBI) (Ode *et al.* 2003) and help diagnose response to individual stressors. In addition to the high gradient riffle based procedure, the 2003 edition of the CSBP describes techniques for use in unique channels and a technique for low gradient channels that blends elements of the CSBP with those of a multi-habitat technique recommended by the U.S. EPA (Barbour et al. 1999).

The CSBP 2003 has four notable changes to the existing protocol; 1) the stream reach for the assessment is no longer defined by a set of five pool-riffle sequences, but rather by a discreet length of 100 m (300 ft); 2) the area of benthos sampled has been reduced from 1.6 $m^2$ (18 $ft^2$) to 0.8 $m^2$ (9 $ft^2$); 3) although 3 independent samples will be collected at each reach, there is now an option to composite the 3 samples in the laboratory and reduce the total number of BMIs identified at each reach from 900 to 500; and 4) there is a new QA/QC procedure to collect a set of duplicate samples

at 10% of the reaches for projects with more than 20 sites. These changes were based on experiences gained from several years of field testing, changes in the national RBP (Barbour et al. 1999), recommendations from Barbour and Hill (2003) and methods comparison studies conducted by DFG. **Data collected with these modifications can easily be made compatible with previous CSBP data and these changes make the CSBP more consistent with other BMI protocols used in the western US.**

## OVERVIEW OF THE CSBP

The CSBP can be used to measure biological and physical/habitat condition in all freshwater lotic environments (streams and rivers) shallow enough to allow safe wading (≤1.5 m). The CSBP samples benthic macroinvertebrates with a 0.5mm mesh net from the richest habitat along 3 randomly selected transects within a 100 m (300 ft) reach of stream or river. The 3 transects are placed within shallow-fast water habitat (usually riffle) for high gradient channels and throughout the entire reach for low gradient channels. At each transect, three 0.09 $m^2$ (1 $ft^2$) areas of stream benthos are sampled and composited into a single sample. In low gradient channels, the 3 collections along the transect are selected to represent the relative proportions of the different richest habitat categories present (submerged vegetation, hard substrate of natural rock or concrete, soft substrate of sand or mud, stream bank vegetation and woody debris). Physical/habitat is measured using a qualitative U.S. EPA procedure throughout the entire reach and additional quantitative measures within the vicinity of the BMI samples. Taxonomic identification of the BMI samples is performed on a fixed count of 300 organisms from the 3 samples (total of 900 for the entire reach) or 500 from the composite of the 3 samples. There are two standard levels of taxonomic identification: one standardized for the state by the California Bioassessment Laboratory Network (CAMLnet; www.dfg.ca.gov/cabw/camlnetste.pdf) and a more precise level based on the U.S. EPA's Environmental Monitoring and Assessment Program (EMAP).

## CALIFORNIA DEPARTMENT OF FISH AND GAME SCIENTIFIC COLLECTING PERMIT

Anyone who collects fish, amphibians, or invertebrates from the waters of the state must have a DFG Scientific Collecting Permit in their possession. The permit can be obtained from the DFG License and Revenue Branch in Sacramento (916-227-2225). Those conducting bioassessment in California should specify on the permit application that they will take freshwater invertebrates (authorization 5), incidental fish (authorization 6) and amphibians (authorization 8). It is also advisable to contact the local Game Warden and District Fisheries Biologist at the closest Regional Office prior to collecting.

## FIELD PROCEDURES FOR COLLECTING BMI SAMPLES

The CSBP can be used to sample BMIs from all streams and rivers where the access and depth (≤1.5 m) do not require the use of a boat. The step-by-step procedures described in this document have been divided into three sections: high gradient channels, low gradient channels and considerations for unusual channel conditions. **Contact DFG or visit the DFG Aquatic Bioassessment Laboratory website for more information on Rapid Bioassessment procedures for boatable streams and rivers and lentic or still water environments.**

### CSBP for High Gradient Channels

High gradient channels usually have greater than a 1% slope and will always contain pool-riffle sequences with a ratio high enough to contain at least 3 riffles per 100 m (300 ft) reach. Riffle substrate could be rock, sand or mud, but must be at least 1 m (3 ft) wide with flow velocities greater than 0.3 m/sec (1 ft/sec).

**Biological and Physical/Habitat Equipment List**

Measuring tape (300 ft or 100 m)
D-shaped kick net (0.5 mm mesh)
Standard size 35 sieve (0.5 mm)
Wide-mouth 500 ml plastic jars
White enameled pan and forceps
95% ethanol
California Bioassessment Worksheet (CBW)
Physical/Habitat Quality Form
Chain of Custody Form (COC)
Random Number Table
pH, temp, DO and conductivity meter
Stadia rod and hand level or clinometer
Densiometer

Step 1. Measure a 100 m (300 ft) reach of channel and count the number of riffles greater than 1 m (3 ft) wide and 1 m (3 ft) long. Randomly choose 3 of the riffles within the stream reach.

Step 2. Starting with the downstream riffle, place the measuring tape along the bank of the entire riffle while being careful not to walk in the stream. Select one transect from all possible 1/3 m (1 ft) marks using a random number table. For riffles longer than 10 m (30 ft), randomly place the transect within the top third of the riffle.

Step 3. Inspect the transect before collecting BMIs by imagining a line going from one bank to the other, perpendicular to the flow. Choose 3 locations along that line where you will place your net to collect BMIs. If the substrate is fairly similar and there is no structure along the transect, the 3 locations will be on the side margins and the center of the stream. If the substrate is structurally complex along the transect, then place the 3 collections to reflect it.

Step 4. Collect BMIs at the 3 locations along the transect by placing the D-shaped net on the substrate and disturbing an area as wide as the net and 1 ft upstream. Excavate the 0.09 $m^2$ ($1ft^2$) area to an approximate depth of 10-15 cm (4-6 in) by kicking or by using a tool to loosen the substrate. Pick-up and scrub large rocks by hand under water in front of the net. If the substrate is sand or mud, a hand rake can be used to prevent substrate from filling the net. Maintain a consistent sampling effort (approximately 1-3 minutes) at each area. Combine the 3 collections within the net to make one "composite" sample.

Step 5. Place the contents of the net in a standard size 35 sieve (0.5 mm mesh) or white enameled tray. Remove the larger twigs, leaves and rocks by hand after carefully inspecting for clinging organisms. If the pan is used, place the material through the sieve to remove excess water before placing the material in the jar. Place the sampled material in a jar and completely fill with 95% ethanol. Never fill a jar more than 2/3 full with course sampled material or 1/2 full with sand or mud. **Gently** agitate jars that contain primarily mud or sand to help mix the alcohol, taking care to not damage any organisms present.

Step 6. Place a label containing descriptive information about the sites (see box) in each jar. An additional label can be taped to the outside of the jar to help with the sample log-in process at the laboratory. A Chain of Custody (COC) should accompany the samples during transportation to the laboratory.

**Bioassessment Sample Label**
Project Name:
Site Name/Code:
County:
Riffle/Reach Number:
Transect Number:
Date/Time:
Sampled by:

Step 7. Proceeding upstream, Repeat Steps 2 through 5 for the next two riffles within the stream reach.

Step 8. **QA/QC Repeat Sampling Procedure. For projects with 20 or more sites, duplicate samples must be collected at 10% of the reaches.** For reaches containing more than six riffles, randomly choose 3 riffles for the primary set of samples and randomly choose 3 more riffles for the duplicate set of samples. For reaches that contain 6 or less riffles, measure the entire length of all riffle habitat and randomly select 3 transects from the total length for the primary samples and randomly select 3 for the duplicate samples. For both methods, start at the downstream riffle or transect, proceeding upstream collecting the 6 samples designating them as primary or duplicate.

**CSBP for Low Gradient Channels**

Low gradient channels usually have less than a 1% grade and will never have more than two riffles. These channels can be as deep as 1.5 m, but with low enough water velocity to allow safe wading. **Channels greater than 1.5 m deep, with swift water velocities and/or which can not be accessed on at least one bank will require a boat**.

Step 1. Measure a 100 m (300 ft) section of channel trying to avoid large human-made structures such as bridges or dams. The stream reach can be less than 100 m (300 ft) if access or obstacles are a problem, especially if the channel is morphologically homogeneous.

Step 2. Without entering the water, survey the entire reach for approximate percentages of 5 generalized habitat categories: a. submerged vegetation, b. hard substrate of natural rock or concrete, c. soft substrate of sand or mud, d. stream bank vegetation and e. woody debris. Record the proportions and make note if it was difficult to determine depth and habitat type (e.g. water was highly turbid).

Step 3. Determine how many 2 m (6 ft) intervals can be established along the entire length of the reach. Randomly select 3 of the intervals and using a range finder or measuring tape, locate the three points on the bank of the reach.

Step 4. Starting with the downstream point, establish a transect across the channel perpendicular to the flow. Sample BMIs at 3 locations along that transect, choosing areas representing the generalized habitats identified in Step 2. Collect BMIs by placing the D-shaped kick-net on the substrate or vegetation and disturb a 0.09 $m^2$ (1 $ft^2$) portion of habitat upstream of the kick-net. Maintain a consistent sampling effort (approximately 1-3 minutes) at each site. Combine the 3 collections within the kick-net to make one "composite" sample. Note the 3 generalized habitats that were sampled along the transect on the field form.

Step 5. Place the contents of the kick-net in a standard size 35 sieve (0.5 mm mesh) or white enameled tray. Remove the larger twigs, leaves and rocks by hand after carefully inspecting for clinging organisms. If the pan is used, place the material through the sieve to remove excess water before placing the material in the jar. Place the sampled material and label (see box) in a jar and completely fill with 95% ethanol. Never fill a jar more than 2/3 full with course sampled material or 1/2 full with sand or mud. **Gently** agitate jars that contain primarily mud or sand to help mix the alcohol, taking care to not damage any organisms present.

Step 6. Place a label containing descriptive information about the sites (see page 4 box) in each jar. An additional label can be taped to the outside of the jar to help with the sample log-in process at the laboratory. A Chain of Custody (COC) should accompany the samples during transportation to the laboratory.

Step 7. Proceeding upstream, Repeat Steps 4 and 5 for the next two transects within the reach. Try to choose generalized habitats for the 9 collections (3 areas along 3 transects) in proportion to what was determined in Step 2.

Step 8. **QA/QC Repeat Sampling Procedure. For projects with 20 or more sites, duplicate samples must be collected at 10% of the reaches.** After determining how many 2 m (6 ft) intervals can be established along the entire length of the reach, randomly select 3 of the intervals for collecting the primary samples and randomly select 3 more intervals for the duplicate samples. Starting with the downstream transect, proceed upstream collecting the 6 samples and designating them as primary or duplicate.

## PROTOCOL CONSIDERATIONS FOR UNUSUAL CHANNEL CONDITIONS

**CSBP for Intermittent or Ephemeral Channels:** Intermittent or ephemeral channels will have flowing water during the rainy season and be dry during mid to late summer. These channels can be sampled using the CSBP for high or low gradient streams, but must be sampled in a spring (March through May) index period or at the end of the wet period.

**CSBP for No Flow Conditions in High and Low Gradient Channels:** Although this is very problematic for sampling BMIs, sometimes sampling areas in high gradient streams have pocket water with little or no flow. In this case, put the net at the downstream portion of the sampling area, disturb the substrate and push the water into the net with vigorous hand motions. Strained water from the surface of a nearby pool with a bucket can be used to move organisms into the net by pouring the water into the pocket area in front of the net. In low gradient channels, low flow or no flow conditions can be quite common. In this case, put the net downstream of the sampling area, get in front of the net and agitate the substrate with a twisting foot motion for 30 seconds. At 5-10 second intervals throughout the agitation, step aside and swiftly move the net in a "figure eight" motion through the cloud of suspended substrate.

**CSBP for Bifurcated or Braided Channels:** Low gradient channels can have two or more channels flowing through a typically wide riparian corridor. There is no need to extend the transect through islands or sand bars separating these bifurcated or braided high gradient channels. Use the

standard procedure for sampling the dominant channel or randomly selected one channel if there are more than 2 similar channels >1 m (>3 ft) wide.

**CSBP for Channels <1 M (3 ft) Wide (the "Spot-Sampling" modification):** High gradient channels <1 m (<3 ft) wide can not be sampled using the 1/3 m (1 ft) wide D-frame net at three places along the transect. In this case, divide the channel into an upper, middle and lower section, relative to the flow. Each section should be approximately 30 m long, but could be divided by natural breaks in the morphology of the channel. Survey each section, without stepping into the channel for all 0.09 $m^2$ (1 $ft^2$) areas where the substrate and flow resemble a riffle. Randomly select 3 of these "sampleable areas" in the lower section and composite them into one sample. Proceed upstream and repeat for each section.

**CSBP for Large Boulder Channels:** High gradient channels that are dominated by boulder substrates too large to move, but with enough gravel substrate in patches between the boulder can be sampled similarly to the previous modification. After dividing the channel into three sections, count the patches of substrate small enough to sample and randomly select three patches. Composite the three samples and proceed upstream to sample the next two sections.

**CSBP for Channels Immediately Below Water Impoundments:** High gradient channels immediately below a water impoundment structure that prevents gravels and fines from moving downstream will often not contain shallow-fast water habitats with gravel or cobble substrates. These channels can be sampled either using the modification for large boulder channels or by using the low gradient procedure where 3 transects are chosen randomly from the entire reach.

**CSBP for Cement Channels:** Cement channels in urban areas will typically have uniform shape and depth with no natural habitat. These channels should be sampled using the low gradient protocol of 3 randomly selected transects along 100 m (300 ft) of channel. The 3 collections can be simply taken from the left margin, center and right margin of the channel. Try to avoid human made habitats such as shopping carts and other transient debris.

**CSBP for Channels with Gradient Controls:** Some low gradient urban streams will have low level dams to control the gradient. The channel will be transformed into small impoundments separated by extremely high gradient sections of large boulders to dissipate the energy. Do not sample the high gradient sections. Sample the impounded areas using the low gradient protocol or if the impoundments are too deep to wade, sample along the littoral zone of one bank. Divide the bank into upper, middle and lower sections, randomly pick three points at 1 m (3 ft) intervals and at each point, take a 0.09 $m^2$ (1$ft^2$) sweep through the vegetation trying to disturb the sediment if present. Composite the 3 collections and repeat for each section.

**CSBP for Channels with Three or Fewer Riffles:** High gradient channels that are wider than 1 m (3 ft), but have 3 or fewer riffles within the 100 m (300 ft) reach will not allow for an independent sample from several riffles. In these cases, measure the entire length of all riffle habitat and select the 3 transects randomly from the total length.

**CSBP for Channels with Continuous Riffle Habitat:** Stream reaches (usually very high gradient) that have continuous riffle habitat should be sampled using the low gradient procedure where 3 transects are chosen randomly from the entire reach.

**CSBP for Channels with Transitional Gradient:** Large watersheds can have wide channels where the gradient transitions from high to low. Riffle pool sequences can be present, but further apart than in higher gradient channels. In these cases, expand the reach length to 40 times the average width to allow for an adequate number of riffles to sample. If riffle habitat is limited to one or two riffles in a greater than 100 m (300 ft) transitional gradient reach, then consider the riffle to be hard substrate and use the low gradient procedures.

## FIELD PROCEDURES FOR MEASURING CHEMICAL AND PHYSICAL/HABITAT QUALITY

The EPA's physical/habitat scoring criteria is a nationally standardized method (Barbour et al. 1999). It is used to measure the physical integrity of a stream and can provide a stand alone evaluation or used in conjunction with a bioassessment sampling event. DFG recommends that this procedure be conducted on every 100 m (300 ft) reach as part of a bioassessment program. A detailed description of the scoring criteria is available through the DFG Aquatic Bioassessment Laboratory website. **This procedure is an effective measure of a stream's physical/habitat quality, but can produce inconsistent measures if QA/QC measures are not regularly implemented. This procedure requires field training prior to its use and field audits throughout the program.**

The following list of quantitative measures of chemical and physical/habitat characteristics are considered minimal and should be measured when rapid bioassessments are not part of an existing chemical or fisheries habitat program where a more extensive list of parameters are measured. The information produced from measuring chemical and physical/habitat characteristics can be used to classify stream reaches and to help explain data anomalies.

**Reach-Wide Parameters:**

- GPS coordinates at the top and bottom of the reach
- Water temperature, specific conductance, pH, alkalinity and dissolved oxygen at the center of the reach using approved standardized procedures and instruments
- Reach length, average width and gradient
- Visually estimated substrate composition using the following categories: fines (<0.25 cm) (<0.1in.), gravel (0.25-0.8 cm) (0.1-2 in.), cobble (0.8-25 cm) (2-10 in.), boulder (>25 cm) (>10 in.) and bedrock (solid)

**Sample Site Specific Parameters:**

- Average length, width and depth for each of the 3 randomly chosen riffles (for unmodified high gradient protocol only)

- Water velocity immediately upstream of the three composite samples along each of the 3 transects

- Percent cover upstream of the three composite samples along each of the 3 transects. Measure this parameter using a densiometer 1/3 m (1 ft) above the water surface and averaged for each transect

- Substrate consolidation at the three sample excavations along the 3 transects. Estimates are obtained while collecting the BMI sample by noting whether the substrate is loosely, moderately or tightly cemented

- Pebble count and percent embeddedness immediately upstream of the 3 transects where BMI samples were collected. Measure this parameter by establishing a transect approximately 1/3 m (1 ft) upstream of the sample transect, randomly choosing 10 points along the transect, reaching down to the point at the end of a wooden dowel or tip of the boot and measure the width of the particle. For every third particle (3 on each transect), estimate percent embeddedness by noting how much of the particle was surrounded by fine substrate.

## LABORATORY PROCEDURES FOR ANALYZING BMI SAMPLES

DFG recommends that taxonomic identification of BMI samples collected using the CSBP is performed by a professional or permanent university laboratory with extensive experience with California taxa. **These bioassessment laboratories should participate in the California Bioassessment Laboratories Network (CAMLnet) to ensure that they are aware of the standardized level of taxonomy and QA/QC procedures recommended for bioassessments conducted in California.** To ensure a high quality product, all contracts to a bioassessment laboratory should require:

1. A Laboratory Standard Operation Procedure (SOP) document and Quality Assurance Protection Plan (QAPP)

2. A list of all taxonomists that will work on the samples including their education, years of experience and any specialized training they have received.

3. Internal QA/QC documentation for sub-sampling and taxonomic validation (can be specified to provide this information upon request);

4. Be able and willing to perform taxonomy consistent with the CAMLnet Taxonomic Effort Standards (www.dfg.ca.gov/cabw/camlnetste.pdf ).

Project managers are encouraged to subject all laboratory data to an external review by an independent laboratory at the rate of 10% to 20% (depending on experience and nature of the project) of the project samples. The DFG Aquatic Bioassessment Laboratory performs this QC procedure and can be contacted about information on the procedure requirements and costs.

**Taxonomic Level of BMI Identification**

There are two levels of taxonomic identification for samples collected using the CSBP. It is the ultimate responsibly of the contractor or project manager to guarantee that the level of taxonomy reported is consistent with the CSBP standards.

**CSBP Level 1** is used for most state-wide rapid bioassessment projects and it is imperative when comparing data to the Southern California IBI. In general, Level 1 taxonomic effort is to genera where possible for most taxonomic groups, order for oligochaetes and family for chironomids.

**CSBP Level 2** is based on the taxonomic effort levels established by the U.S. EPA for the Western Pilot EMAP. In general, Level 2 taxonomic effort identifies insects to species level where possible and the Dipteran Family: Chironomidae to genus.

**Compositing Samples or Data**

There will always be 3 samples collected at each sampling reach when using the CSBP. Depending on the objectives of the project, the samples can be processed as individual samples and subsampled for 300 organisms/sample (900 organisms total per site) or **composited at the laboratory** and subsampled for 500 organisms.

**Subsampling**

The CSBP requires fixed count subsampling with a +/- 10% accuracy. The total count of BMIs must come from at least 3 randomly selected grids within a subsampling tray. The last grid must be fully counted to get an estimate of relative abundance. The debris from processed grids should be put in a clean "remnant" jar and the remaining contents of the tray should be placed back into the original sample jar. If a "large and rare" survey is preformed on the sample, it should be conducted after the subsampling procedure and counted separately.

**Data Production, Storage and Analysis**

DFG has developed a Microsoft Access® database based loosely on the U.S. EPA's Environmental Data Analysis System (EDAS). The structure of the CalEDAS database is available through the DFG Aquatic Bioassessment Laboratory website, but it does not currently come with end-user support. Whether using the DFG database or other software, the laboratory analysis should produce a BMI taxa list that is consistent with CAMLnet (see above) for all samples and a list of common or project specific biological metrics. Many common biological metrics are listed in the U.S. EPA's RBP document (Barbour et al 1999) and several other sources of bioassessment literature. When BMI samples are processed independently, there are two options for calculating metrics depending on the needs of the project:

1. Calculate metrics for all three samples independently and calculate metric averages at each site

2. The three samples can be composited in the analysis stage, and a 500 count subsample of the 900 organisms can be used to generate one set of **cumulative** metrics for each site.

## QA/QC CONSIDERATIONS FOR USING THE CSBP

All private and public entities conducting bioassessment using the CSBP should have a Standard Operating Procedures document (SOP) and a Quality Assurance Protection Plan (QAPP). Large programs and laboratories can have a quality assurance officer and some smaller operations may only have a field or laboratory supervisor. In either case, those individuals responsible for assuring the quality of samples collected in the field and processed in the laboratory should be trained on all aspects of the CSBP. Two 3-day courses on bioassessment concepts and the use of the CSBP are available through the American Fisheries Society (CalNeva AFS) and the Society of Environmental Toxicology and Chemistry (NorCal and SoCal SETAC). Information on these courses can be found at www.slsii.org

The details of a QAPP should be tailored for particular bioassessment operations. Depending on the nature of the project, appropriate boiler plate for QAPPs may be available through Regional Water Quality Control Boards or the State Water Resources Control Board. These agencies should be contacted before developing a QAPP and initiating a bioassessment program.

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