CITY OF TRACY

CITYWIDE STORM DRAINAGE MASTER PLAN






November 2012

WSID CDO/BBID ACL
WSID0013

Stantec

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184010207

Executive Summary

This report is a Citywide Storm Drainage Master Plan (SDMP) for the City of Tracy's General Plan Sphere of Influence, excluding Tracy Hills. This SDMP includes hydrologic and hydraulic analyses; a conceptual plan for new storm drainage infrastructure needed to serve new development and existing development areas; opinions of probable cost for new and upgraded storm drainage infrastructure; drainage policies; impact fee program area descriptions; and documentation regarding existing conditions, facilities, studies, regulations, and agreements.

This SDMP is intended to be utilized as a guideline document for the identification of storm drainage facilities needed to serve future land development projects under the buildout condition for the City's Sphere of Influence and storm drainage facility upgrades needed to correct existing deficiencies, as well as serving as a reference document for existing storm drainage facilities and their functional characteristics.

In general, new development projects will be required to provide site-specific or project-specific storm drainage solutions that are consistent with the overall infrastructure approach presented in this SDMP. The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions. Modifications and refinement to the storm drainage facilities master plan represented herein may be considered by the City during the Specific Plan and development review process for new development. However, any significant modifications to the elements of this SDMP must be approved by the City and will require that a formal "Supplement" be adopted by the City Council.

The following information is provided and presented in this SDMP:

- A delineation of primary watersheds and sub-basins within primary watersheds.
- Hydrologic analyses for primary watersheds and sub-basins.
- Hydraulic analyses to determine capacities, water surface elevations and hydraulic grade line elevations (HGLs) for major existing storm drainage facilities.
- Identification of storm drainage facility upgrades needed to correct existing deficiencies.
- Graphic representations of the existing and proposed storm drainage infrastructure.
- Typical cross-sections of selected proposed storm drainage infrastructure components.
- Listings and locations for existing and proposed "interflow crossover" facilities between storm drainage systems that may assist the City in future storm water management activities.

- Opinions of probable cost for proposed storm drainage infrastructure.
- References to drainage agreements between the City and other entities.
- Guidelines for the planning and design of joint-use facilities.
- Drainage policies to be applied to new development, including the use of Low Impact Development (LID) practices, smart growth/sustainability and responsibilities for maintenance.
- References to new regulations that impact City storm drainage facility planning and management.
- Identification of existing and proposed impact fee program areas.

The study area for this SDMP is the City's Sphere of Influence area, plus local and offsite sub-basins that impact the City's Sphere of Influence area (see Figure 1-1).

The Tracy Hills future service area is self-contained with respect to storm drainage concerns and is incorporated into this SDMP by reference only. Tracy Hills is proposed to drain to an existing sand and gravel extraction pit as a point of terminal drainage and is disconnected from the remainder of the study area. Information related to internal storm drainage that will serve Tracy Hills was originally provided in a separate report prepared by Nolte Associates, Inc., entitled *Tracy Hills Storm Drainage Master Plan, Volumes 1 – 3, December 2000*. The original separate report is currently undergoing further review and revision.

Existing and proposed storm drainage infrastructure represented herein reflects the storm drainage facility needs to serve the City's Sphere of Influence Area under *ultimate buildout* land use conditions (per the City's General Plan, as supplemented by additional land use assumptions provided by City staff), plus *existing* land use conditions for local and offsite sub-basins of impact that are located outside of the City's Sphere of Influence area.

In this SDMP, new master plan level storm drainage facilities that are being recommended have been sized based on the following criteria:

- Detention basins: 100-year 24-hour storm.
- Detention basin pump stations (when needed): provide the desired function and attenuation during the 100-year 24-hour storm.
- Open channels, channel parkways, and greenbelt parkways: 100-year 24-hour storm.
- Underground storm drains: 100-year 24-hour storm in new development areas and in existing development areas served by 100-year 24-hour storm capacity systems. 10-year 24-hour storm in existing development areas served by 10-year 24-hour storm capacity systems.

In recent years, the City has shifted towards the establishment and use of sustainable practices related to development, infrastructure, and City processes. The shift has incorporated input from City staff, outside professionals, and the public and resulted in the adoption of a formal Sustainability Action Plan and updates to the General Plan that include many sustainability principles.

The SDMP incorporates sustainability practices in two main ways. First, the infrastructure identified assumes that the Manual of Stormwater Quality Control Standards for New Development and Redevelopment (SWQC Manual) adopted by the Tracy City Council in August 2008 will be enforced and that the overall demand on the storm drainage system imposed by new development will be reduced as a result of implementation of measures contained the SWQC Manual (see Section 1.3.2 for a more detailed discussion). Second, master plan storm drainage facilities will mimic existing storm drainage conditions and promote groundwater recharge, where feasible (see Section 5.1).

In this SDMP, five (5) major watersheds have been defined that cover the entire Sphere of Influence and additional contiguous areas (see Figure 2-1). They are:

- Eastside Channel Watershed
- Westside Channel Watershed
- Lammers Watershed
- Mountain House Watershed
- Tracy Hills Watershed

The proposed storm drainage infrastructure recommended in this SDMP includes a combination of the following components:

- Detention facilities
- Open channels, channel parkways, and greenbelt parkways
- Underground storm drains
- Pumping facilities (serving applicable detention basins)
- Percolation facilities, where feasible
- Interflow crossovers between systems
- Irrigation tailwater ditches
- Gravel extraction pit
- Temporary retention facilities

The proposed storm drainage infrastructure plan and major existing storm drainage infrastructure are represented on Figures 5-1a and 5-1b of this SDMP (with larger versions located in the pocket at the end of the report). The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions, including adjustments to alignments of linear storm drainage conveyance facilities and adjustments to configurations of detention facilities.

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APPENDICES

1.0 Introduction

This report is a Citywide Storm Drainage Master Plan (SDMP) for the City of Tracy's General Plan Sphere of Influence, excluding Tracy Hills. This SDMP includes hydrologic and hydraulic analyses; a conceptual plan for new storm drainage infrastructure needed to serve new development and existing development areas; opinions of probable cost for new and upgraded storm drainage infrastructure; drainage policies; impact fee program area descriptions; and documentation regarding existing conditions, facilities, studies, regulations, and agreements.

This SDMP is intended to be utilized as a guideline document for the identification of storm drainage facilities needed to serve future land development projects under the buildout condition for the City's Sphere of Influence and storm drainage facility upgrades needed to correct existing deficiencies, as well as serving as a reference document for existing storm drainage facilities and their functional characteristics.

In general, new development projects will be required to provide site-specific or project-specific storm drainage solutions that are consistent with the overall infrastructure approach presented in this SDMP. The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions. Modifications and refinements to the storm drainage facilities master plan represented herein may be considered by the City during the Specific Plan and development review process for new development. However, any significant modifications to the elements of this SDMP must be approved by the City and will require that a formal "Supplement" be adopted by the City Council.

The following information is provided and presented in this SDMP:

- A delineation of primary watersheds and sub-basins within primary watersheds.
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- Opinions of probable cost for proposed storm drainage infrastructure.

- References to drainage agreements between the City and other entities.
- Guidelines for the planning and design of joint-use facilities.
- Drainage policies to be applied to new development, including the use of Low Impact Development (LID) practices, smart growth/sustainability and responsibilities for maintenance.
- References to new regulations that impact City storm drainage facility planning and management.
- Identification of existing and proposed impact fee program areas.

1.1 STUDY AREA

The study area for this SDMP is the City's Sphere of Influence area, plus local and offsite sub-basins that impact the City's Sphere of Influence area (see Figure 1-1).

The Tracy Hills future service area is self-contained with respect to storm drainage concerns and is incorporated into this SDMP by reference only. Tracy Hills is proposed to drain to an existing sand and gravel extraction pit as a point of terminal drainage and is disconnected from the remainder of the study area. Information related to internal storm drainage that will serve Tracy Hills was originally provided in a separate report prepared by Nolte Associates, Inc., entitled *Tracy Hills Storm Drainage Master Plan, Volumes 1 – 3, December 2000*. The original separate report is currently undergoing further review and revision.

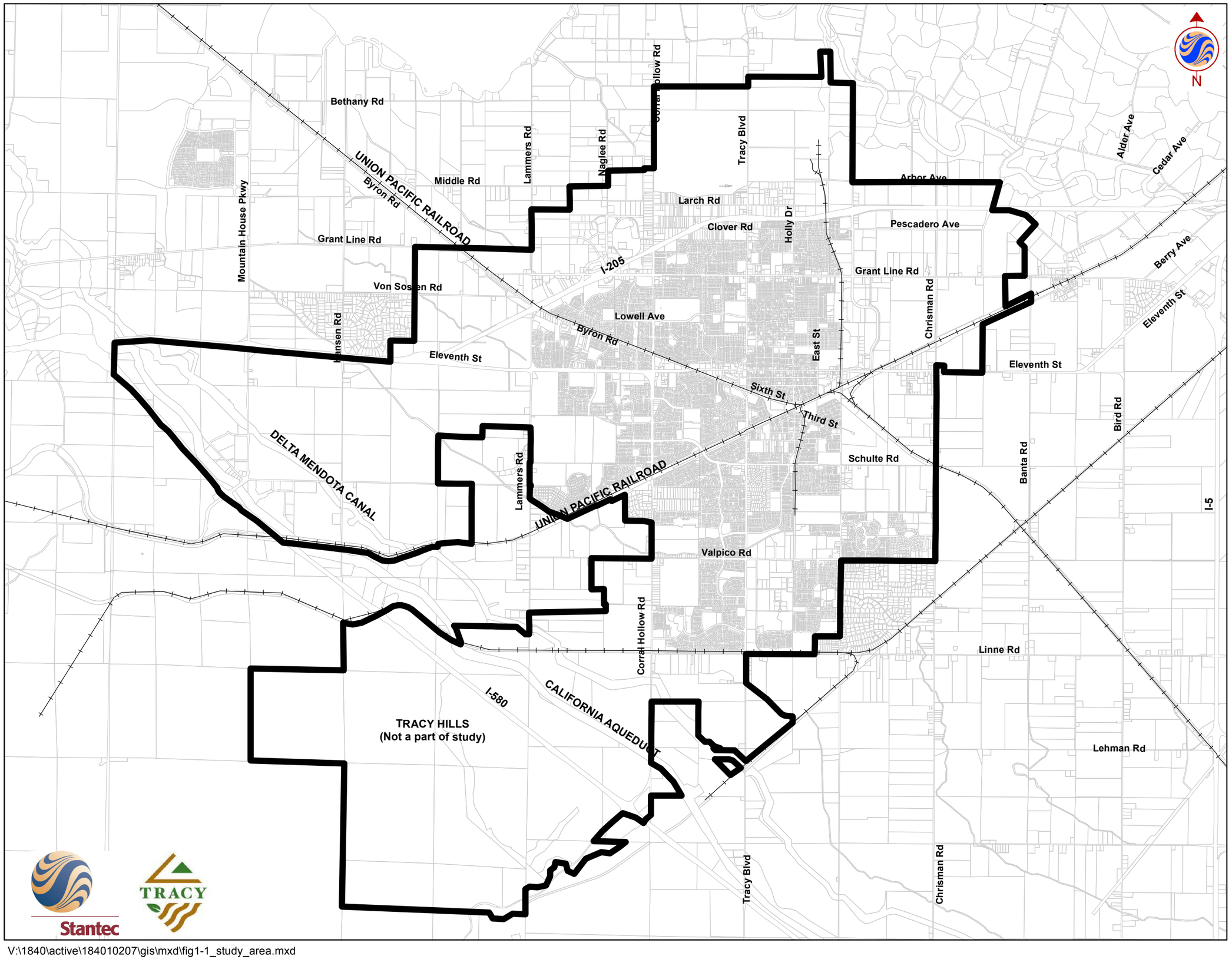
Existing and proposed storm drainage infrastructure represented herein reflects the storm drainage facility needs to serve the City's Sphere of Influence Area under *ultimate buildout* land use conditions (per the City's General Plan, as supplemented by additional land use assumptions provided by City staff), plus *existing* land use conditions for local and offsite sub-basins of impact that are located outside of the City's Sphere of Influence area.

1.2 PREVIOUS STUDIES

There are a number of previous studies that provide information that has been incorporated into the preparation of this SDMP. These studies are identified and described in the following subsections.

1.2.1 1994 Storm Drainage Master Plan

The 1994 Storm Drainage Master Plan (1994 SDMP) prepared for the City by Cella Barr Associates is the most recent previous version of the Storm Drainage Master Plan completed for the City of Tracy and will be replaced by this SDMP (see Appendix A for master infrastructure plan from the 1994 SDMP). There have been a number of "supplements" to the 1994 SDMP that have been completed since 1994 that reflect changes in conditions and



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CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 1-1

Title
STUDY AREA MAP

NOVEMBER 2012
184010207
SCALE 1" = 5000'

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assumptions that have occurred in certain areas of the City after its adoption. The 1994 SDMP study area was the City's former General Plan/Urban Management Plan area, which had different boundaries than the City's current Sphere of Influence area. Much of the storm drainage infrastructure represented in 1994 SDMP has been constructed within the areas of the City that are currently developed. However, the majority of proposed storm drainage facilities represented therein to serve areas within the City's Sphere of Influence that are currently undeveloped are no longer considered to be appropriate solutions due to changes in regulations, environmental considerations, and updated City goals and policies.

1.2.2 Recent Technical Reports for Service Areas

Subsequent to the City's adoption of the 1994 SDMP, several storm drainage technical reports have been prepared for various service areas in the City that have supplemented information presented in the 1994 SDMP. These supplemental technical reports are briefly described in the following subsections.

1.2.2.1 Plan "C"

Plan "C" is a consortium of residential development projects that have been substantially completed, extending from Byron Road to Linne Road. Projects included Huntington Park, Westgate, Lyon Crossroads, Alden Meadows, Sterling Park, San Marco, Gabriel Estates, Redbridge, Edgewood Estates, Pebblebrook, Glenbriar, Larkspur Estates, and Eastlake. With the exception of Eastlake, all of these development projects are located in the Westside Channel Watershed (defined in Section 2.2). The Eastlake development is located in the Eastside Channel Watershed (defined in Section 2.2). The most recent technical report prepared for Plan "C" is entitled *Plan "C" Storm Drainage Analysis Update, Final Report, May 2000* by Stantec. The storm drainage infrastructure that serves Plan "C" development projects has been constructed.

1.2.2.2 Tracy Hills

Tracy Hills is a large future development area located in the southernmost portion of the City's Sphere of Influence. A separate SDMP document was previously prepared by Nolte Associates, Inc., entitled *Tracy Hills Storm Drainage Master Plan, Volumes 1 – 3, December 2000* and was reviewed by the City and Stantec. The original separate SDMP document is currently undergoing further review and revision. The proposed Tracy Hills development will include several onsite detention basins and an offsite conveyance facility that will deliver all storm runoff discharged from the development to an existing gravel extraction pit located on the east side of Tracy Blvd., across from the Tracy Municipal Airport or to an alternate existing gravel extraction pit. Storm runoff from Tracy Hills will not impact other existing or proposed development areas within the City's Sphere of Influence.

1.2.2.3 South ISP Sub-Basin

The South ISP Sub-basin is located in the Westside Channel Watershed (defined in Section 2.2) and is roughly a 1½ square mile area that is approximately bounded by Linne Road on the south, Tracy Blvd. on the west, ½ mile north of Valpico Road on the north, and MacArthur Drive on the east. The most recent technical report prepared for this sub-basin is entitled *Updated Storm Drainage Technical Report for the South ISP Sub-basin, Revised Final Report, October 2008* by Storm Water Consulting, Inc. and Stantec. It includes a mix of Industrial Specific Plan (ISP), Plan "C", and Infill properties. The South ISP Sub-basin includes two (2) internal sub-basin zones, and each zone has its own existing and proposed storm drainage facilities and terminal detention basins that discharge to the City's Westside Channel system to the north. The majority of the storm drainage facilities serving the portion of the South ISP Sub-basin south of Valpico Road (Zone 2) have been constructed. Storm drainage impact fees have been established and periodically updated by the City for this sub-basin.

1.2.2.4 South MacArthur

The South MacArthur Sub-basin is located in the Eastside Channel Watershed (defined in Section 2.2) and consists of an area in excess of 2-square miles generally bounded by Linne Road and the Union Pacific Railroad on the south, MacArthur Drive on the west, Eleventh Street on the north, and Chrisman Road on the east. The most recent technical report prepared for this sub-basin is entitled *Storm Drainage Analysis for South MacArthur Planning Area, Final Report, Revised December 1999* by Cella Barr Associates. It includes a mix of properties of varying proposed land uses and the Eastlake Development (a Plan "C" property). An initial phase of a proposed open channel and an initial phase of DET 4 (the detention basin serving the South MacArthur Sub-basin) have been constructed. DET 4 currently discharges by gravity to the City's Eastside Channel (described in Section 2.2). Storm drainage impact fees have been established and periodically updated by the City for this sub-basin. Per this SDMP, the Rocha property located on the west side of MacArthur Drive south of Schulte Road has recently been added to the South MacArthur Sub-basin (described in Section 8.2).

1.2.2.5 Downtown Specific Plan Study Area

The Downtown Specific Plan study area consists of approximately 420 acres generally defined by an area bounded on the north by Eleventh Street, on the east by MacArthur Drive, on the south by Schulte Road, and on the west by Tracy Blvd. The majority of the area resides in the Eastside Channel Watershed but minor portions are located in the Westside Channel Watershed. The most recent technical report prepared for this area is entitled *Storm Drainage Technical Report for the Downtown Specific Plan Area, Final Report, July 2008* by Storm Water Consulting, Inc. and Stantec. The technical report presents storm drainage upgrades and recommended approaches needed to accommodate redevelopment of the City's downtown area, including two (2) future joint-use detention basins in the "bowtie" area. A storm drainage impact fee analysis is included in the technical report.

1.2.2.6 Northeast Industrial Area

The Northeast Industrial Area (NEI) consists of about 870 acres in an area generally bounded by I-205 and Pescadero Avenue on the north, Paradise Road and beyond on the east, the Union Pacific Railroad on the south, and the Eastside Channel (east of MacArthur Drive) on the west. The entire NEI area resides in the Eastside Channel Watershed. The most recent technical report prepared for the NEI area is entitled *Northeast Industrial Area Updated Storm Drainage Analysis, Draft Technical Report, March 2008* by Storm Water Consulting, Inc. and Stantec. The technical report presents storm drainage upgrades and recommended approaches needed to accommodate development of the NEI area. Though several properties in the NEI area have been developed in recent years, few of the recommended storm drainage infrastructure upgrades have been constructed at present, and temporary retention basins are being used as an interim storm drainage solution. The storm drainage infrastructure plan for NEI includes storm drains, an open channel, a terminal detention basin (DET NEI), and a pump station and force main that will extend underneath I-205, then west along Arbor Avenue to discharge to the Eastside Channel to the west. Excess capacity is to be provided within NEI storm drainage facilities to accommodate storm runoff generated by the future development of additional upstream areas to the south of the Union Pacific Railroad. Previous technical studies (including the March 2008 draft report cited above) have assumed that several existing dairies within the overall NEI area would not redevelop to industrial uses in the future. The City has recently changed this assumption, and the required storm drainage infrastructure that will serve the area has been modified in this SDMP to reflect future industrial uses for the existing dairies. Storm drainage impact fees have been established and periodically updated by the City for the NEI area.

1.2.2.7 Tracy Gateway

Tracy Gateway is a proposed 538-acre mixed-use development project to be located at the southwest corner of Eleventh Street and Lammers Road. The Tracy Gateway Sub-basin also includes an additional 328 acres within the Cordes Ranch planning area that drain to the project under existing conditions. The Tracy Gateway Sub-basin resides within the Lammers Watershed (defined in Section 2.2) that currently contains only limited development and does not have a permanent outfall. The most recent technical report prepared for Tracy Gateway is entitled *Tracy Gateway Project Storm Drainage Analysis and Supplement to the SDMP, Final Technical Report, April 2002* by Stantec. The technical report presents storm drainage upgrades needed to accommodate the development of the Tracy Gateway Sub-basin, with the primary solution consisting of an interconnected lake system with supplemental storage capabilities to accept and attenuate storm runoff. Tracy Gateway has established a separate, interim drainage agreement with the West Side Irrigation District (WSID) to discharge up to 12 cfs into their nearby Upper Main Canal, which may provide an interim outfall solution for the Tracy Gateway Sub-basin until an outfall serving the overall Lammers Watershed is identified, constructed, and operational. Storm drainage impact fees have been established and periodically updated by the City for Tracy Gateway.

1.2.2.8 Presidio

The Presidio development is an existing residential development project of about 150 acres located on the south side of Eleventh Street, about ½ mile west of Corral Hollow Road. The Presidio Sub-basin includes additional upstream properties to the west and south, as well as a portion of the downstream Berg/Byron planning area on the north side of Eleventh Street. The Presidio Sub-basin is located in the Westside Channel Watershed and is completely served by existing public storm drainage infrastructure. The most recent technical report prepared for the Presidio Sub-basin is entitled *Presidio Sub-basin Storm Drainage Analysis and Fee Justification Study, Final Report, October 1999* by Cella Barr Associates. The technical report and constructed storm drainage infrastructure includes storm drains within the Presidio development that accommodate onsite runoff and provide additional capacity for storm drainage contributions from the future development of contiguous upstream properties to the west and south within the Presidio Sub-basin. An existing joint-use detention basin (DET CP) serving the Presidio Sub-basin is located within the Tracy Community Park and includes a natural area with potential overflow into two (2) existing soccer fields during the more significant storm events. DET CP has an outfall storm drain that extends through the Berg/Byron planning area on the north side of Eleventh Street and connects with the City's Westside Channel Outfall pipelines in Byron Road to the north.

1.2.2.9 Infill Properties

There are numerous undeveloped properties (or properties not fully developed to General Plan proposed land uses) that are interspersed throughout urbanized development areas within the City's Sphere of Influence that have been identified as Infill Properties. These Infill Properties are located in the Westside Channel Watershed and the Eastside Channel Watershed. The most recent technical report prepared for Infill Properties is entitled *Storm Drainage Analysis - Infill Properties, Final Technical Report, August 2011* by Storm Water Consulting, Inc. and Stantec. The technical report identifies several storm drainage capital improvement projects (CIPs) that would generally represent a fair share service to Infill Properties. Storm drainage impact fees have been established and periodically updated by the City for Infill Properties.

1.2.2.10 Ellis Program

There are several properties in the southernmost portion of the Westside Channel Watershed (defined in Section 2.2) that compose the Ellis Program Sub-basin. The boundary of the Ellis Program Sub-basin is generally bordered by Corral Hollow Road on the east, the Delta Mendota Canal (south of Linne Road) on the south, Lammers Road on the west and Valpico Road on the north. Properties included in the Ellis Program Sub-basin are the Ellis Specific Plan, the South Linne future service Area, St. Bernard's Church, an LDS Church, and a limited number of contiguous undeveloped and developed parcels. The most recent technical report prepared for the Ellis Program Sub-basin is entitled *Ellis Program Sub-basin – Final Storm Drainage Technical Report, September 2012* by Storm Water Consulting, Inc. and Stantec. The technical report identifies program storm drainage improvements that will serve development within the Ellis Program Sub-basin and includes an impact fee analysis. Runoff generated by development within the Ellis Program Sub-basin is proposed to be attenuated by two (2) proposed detention

basins (DET 3A and DET SL) and will discharge to existing downstream storm drainage facilities that serve the Westside Channel Watershed.

1.2.2.11 Other Future Service Areas

There are also technical reports that have been prepared for the Cordes Ranch and Catellus future service areas by developer retained consultants for the purpose of analyzing storm drainage conditions and exploring drainage solutions for future development. A Storm Drainage Technical Report is currently being prepared for the Cordes Ranch Specific Plan by Storm Water Consulting, Inc. and Stantec, but it is a Draft Version as of November 2012.

1.3 STANDARDS, REGULATIONS, AND POLICIES

The design of a citywide storm drainage system is based upon many factors, and the purpose of this Section is to define some of the more important elements so that a uniform set of criteria can be followed. Specifically, the City's proposed storm drainage system needs that are identified in this SDMP have been evaluated primarily using the design criteria defined herein. It is important to note that the criteria used at the master planning level (as in the development of this SDMP) are in some cases different than those used at a site design level (i.e., using City Engineering Design and Construction Standards, hereinafter referred to as "City Design Standards"). For instance, the design capacities for master plan underground storm drains differ in many instances from the design capacities for "onsite" underground storm drains, and the HEC-HMS computer program has been used in this SDMP for hydrologic modeling, whereas the Rational Method is used to determine design flow rates for individual development projects per City Design Standards.

1.3.1 Storm Drainage Facility Design Capacities

Existing City storm drainage facilities include open channels, channel parkways, underground storm drains, detention and retention basins, and pumping facilities. The following is a description of their general design capacities:

- Open channels, channel parkways and detention basins are intended to have a 100-year 24-hour return period storm design capacity under built out conditions for their contributing watersheds. Pumping facilities serving detention basins are sized to provide the desired function and attenuation during a 100-year 24-hour return period storm.
- Underground storm drains are intended to have either a 10-year or a 100-year return period storm capacity depending upon their location and function and their contributing watershed.

- The City Outfall Channel on the north side of Grant Line Road (see Section 2.2.1) is an open channel that has a 10-year return period storm capacity (plus additional capacity provided by freeboard) as the 10-year peak discharge is all that will effectively be delivered to this channel by contributing storm drains.
- Some of the City's older, historical storm drains have a capacity that is less than a 10-year return period storm capacity.
- Temporary retention ponds that are utilized as a temporary measure to control storm runoff until such time as sufficient downstream facilities are constructed to accommodate the desired flows have a capacity equivalent to the runoff volume generated from 2 times a 10-year, 48-hour storm.

In this SDMP, new master plan level storm drainage facilities that are being recommended have been sized based on the following criteria:

- Detention basins: 100-year 24-hour storm.
- Detention basin pump stations (when needed): provide the desired function and attenuation during the 100-year 24-hour storm.
- Open channels, channel parkways and greenbelt parkways: 100-year 24-hour storm.
- Underground storm drains: 100-year 24-hour storm in new development areas and in existing development areas served by 100-year 24-hour storm capacity systems. 10-year 24-hour storm in existing development areas served by 10-year 24-hour storm capacity systems.

Detention basin sizing represented in this SDMP accounts for the acreage required to accommodate the storage volumes needed for flood control only, and additional land will be required to incorporate provision for joint-use recreation facilities and differential grading, if such facilities are proposed.

Onsite storm drainage facilities serving individual future development projects or phases of future development projects are not presented herein and shall be designed in consideration of master plan storm drainage infrastructure presented in this SDMP, but in conformance with the City Design Standards.

1.3.2 Manual of Stormwater Quality Control Standards for New Development and Redevelopment

The City adopted a Manual of Stormwater Quality Control Standards for New Development and Redevelopment (SWQC Manual) in August 2008. The SWQC Manual has the following goals:

- Assist new development in reducing urban runoff pollution to prevent or minimize water quality impacts.

- Provide standards for developers, design engineers, agency engineers, and planners to use in the selection, design, and implementation of General Site Design Control Measures for Low Impact Design (LID) and appropriate site-specific source and treatment control measures.

- Provide maintenance procedures to ensure that the selected control measures will be maintained to provide effective, long-term pollution control.

LID is an approach to managing stormwater runoff that mimics the natural pre-development hydrology of a development site by using design techniques that infiltrate, filter, store, treat, evaporate, and detain stormwater runoff close to the source. Almost all areas of site design can incorporate LID measures, including residential landscaping, open space, streetscapes, parking lots, sidewalks, and medians. LID can be used in combination with traditional storm drain systems to infiltrate the smaller, more frequent storms, while allowing the larger storms to flow to pipes and basins for flood control (possibly with lower off-site costs than traditional non-LID systems). LID techniques offer great benefits to stormwater quality, especially for the smaller return interval storm events. LID will help reduce the amount of runoff entering the City's system and will aid in recharging ground water.

The infrastructure identified in this SDMP assumes that LID practices will be implemented with new development and redevelopment in conformance with the SWQC Manual and that the rates and volumes of runoff will be reduced when compared against developed condition runoff production in the absence of said measures. The methodology for incorporating the runoff reduction is described in Section 3.5.

1.3.3 Sustainability Practices

In recent years, the City has shifted towards the establishment and use of sustainable practices related to development, infrastructure, and City processes. The shift has incorporated input from City staff, outside professionals, and the public and resulted in the adoption of a formal Sustainability Action Plan and updates to the General Plan that include many sustainability principles.

The SDMP incorporates sustainability practices in two main ways. First, the infrastructure identified assumes that the SWQC Manual will be enforced and that the overall demand on the storm drainage system imposed by new development will be reduced as a result of implementation of measures contained in the SWQC Manual (see Section 1.3.2 for a more detailed discussion). Second, master plan storm drainage facilities will mimic existing storm drainage conditions and promote groundwater recharge, where feasible (see Section 5.1).

1.3.4 Storm Water Management Program

The Clean Water Act (CWA) was amended in 1972 to prohibit the discharge of pollutants to Waters of the United States from any point source unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Section 402(p) was added to

the CWA in 1987 to establish the framework for regulating municipal and industrial stormwater discharges under the NPDES program through a two-phase implementation plan. Phase I regulations were promulgated in 1990 and require large and medium size municipalities (population over 100,000) to comply with the NPDES municipal program. Phase II regulations were promulgated in 1999 and require small municipalities obtain coverage under the NPDES municipal program. The City of Tracy is subject to the Phase II municipal program and has prepared a Storm Water Management Program (SWMP) to comply with the regulations (General Permit Number CAS000004, Water Quality Order No. 2003-0005-DWQ).

The intent of the SWMP is to implement Best Management Practices to reduce the discharge of pollutants from the City to the Maximum Extent Practicable. The City's current SWMP, dated September 2003, includes six program categories:

1. Public Education and Outreach

2. Public Involvement and Participation

3. Illicit Discharge Detection and Elimination

4. Construction Site Storm Water Runoff Control

5. Post-Construction Storm Water Management in New Development and Redevelopment

6. Pollution Prevention and Good Housekeeping for Municipal Operations

The State Water Resources Control Board (SWRCB) is in the process of creating a new Water Quality Order to replace Water Quality Order No. 2003-0005-DWQ. The new Water Quality Order is likely to include additional requirements that Phase II municipalities will need to comply with.

1.3.5 Water Quality Orders (SWRCB)

The SWRCB has adopted an NPDES General Permit for construction activities, known as the Construction General Permit (CGP). On July 1, 2010, a new CGP (Order No. 2009-0009-DWQ) became effective, superseding a former CGP (Water Quality Order No. 99-08-DWQ). The CGP requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a Construction Site Monitoring Program (CSMP) to demonstrate that the site is in compliance with the CGP. Depending on the construction site risk level, the CSMP includes varying levels of visual monitoring and water quality sampling and analysis.

A summary of the differences between the former CGP and the new CGP follows:

Rainfall Erosivity Waiver: The current CGP includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their site's given location and time frame compute to be less than or equal to 5.

Technology-Based Numeric Action Levels: The current CGP includes NALs [numeric action levels] for pH and turbidity.

Technology-Based Numeric Effluent Limitations: The current CGP contains daily average NELs [numeric effluent limitations] for pH during any construction phase where there is a high risk of pH discharge and daily average NELs turbidity for all discharges in Risk Level 3. The daily average NEL for turbidity is set at 500 NTU [turbidity] to represent the minimum technology that sites need to employ (to meet the traditional Best Available Technology Economically Achievable (BAT)/Best Conventional Pollutant Control Technology (BCT) standard) and the traditional, numeric receiving water limitations for turbidity.

Risk-Based Permitting Approach: The current CGP establishes three levels of risk possible for a construction site. Risk is calculated in two parts: (1) Project Sediment Risk, and (2) Receiving Water Risk.

Minimum Requirements Specified: The current CGP imposes more minimum BMPs and requirements than were previously only required as elements of the SWPPP or were suggested by guidance.

Project Site Soil Characteristics Monitoring and Reporting: The current CGP provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.

Effluent Monitoring and Reporting: The current CGP requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to determine compliance with the NELs and evaluate whether NALs included in the current CGP are exceeded.

Receiving Water Monitoring and Reporting: The current CGP requires some Risk Level 3 dischargers to monitor receiving waters and conduct bioassessments.

Rain Event Action Plan: The current CGP requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.

Annual Reporting: The current CGP requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary

purpose of this requirement is to provide information needed for overall program evaluation and pubic information.

Certification/Training Requirements for Key Project Personnel: The current CGP requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.

Linear Underground/Overhead Projects: The current CGP includes requirements for all Linear Underground/Overhead Projects (LUPs).

The SWRCB has also issued a statewide General Permit (Water Quality Order No. 97-03-DWQ) for regulating storm water discharges associated with industrial activities. This General Permit requires the implementation of management measures that will achieve the performance standard of best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT). It also requires the development of a SWPPP, a monitoring plan, and the filing of an annual report.

The SWRCB has recently issued a draft Water Quality Order to replace the current General Permit for industrial facilities. The draft Order contains several significant changes from the current General Permit, including additional certification, sampling, and inspection requirements. The draft Order is targeted for adoption in the near future.

1.3.6 SB 5 and AB 162 Legislation (California)

Senate Bill No. 5 (SB 5) became law in the State of California in October of 2007 and contains new regulations pertaining to floodplain management for portions of the State that drain to the Sacramento-San Joaquin Valley, including the City of Tracy and San Joaquin County. It requires that the State develop and adopt a Central Valley Flood Protection Plan (Flood Protection Plan) by the year 2012. Much of the emphasis of the Flood Protection Plan will be placed on areas protected by levees and subject to potentially disastrous flooding if there is a levee failure.

In addition, SB 5 establishes a requirement that “urban areas” and “urbanizing areas” begin applying a 200-year return period storm level of flood protection standard (urban level of flood protection) to new development no later than 36 months after the Flood Protection Plan is adopted by the State. “Urban area” is defined as a developed area in which there are 10,000 residents or more, and hence, the City would currently be classified as an “urban area”. The California Department of Water Resources (DWR) has indicated that the 200-year standard will only be required to be applied to floodplain areas (flooding sources) mapped by the Federal Emergency Management Agency (FEMA). For the City’s Sphere of Influence area, the only floodplains mapped by FEMA are those areas subject to flooding from Old River and the San Joaquin River system, which is limited to the northernmost areas in the Sphere of Influence, mostly north of I-205. DWR has also published maps that depict “Preliminary 100- and 200-Year

Floodplains Based Upon Best Available Data", and information contained on Panel E2 of these maps for San Joaquin County dated October 15, 2008 is provided in the vicinity of the City on Figure 1-2. DWR has published a Public Draft of a report entitled *Urban Level of Flood Protection Criteria* that is currently under public review and is expected to be finalized and adopted in the near future.

Assembly Bill No. 162 (AB 162) also became law in the State of California in October of 2007. AB 162 requires that community general plan updates include the following additions by certain mandated time frames:

- The conservation element shall identify rivers, creeks, streams, flood corridors, riparian habitats, and land that may accommodate floodwater for purposes of groundwater recharge and stormwater management.

- The safety element shall identify information regarding flood hazards; establish a set of comprehensive goals, policies and objectives based on the identified flood hazard information for the protection of the community from the unreasonable risks of flooding; and establish a set of feasible implementation measures designed to carry out the goals, policies and objectives.

Each applicable County or City shall submit the draft element of or draft amendment to the safety element to the Central Valley Flood Protection Board and to every local agency that provides flood protection to territory in the County or City.

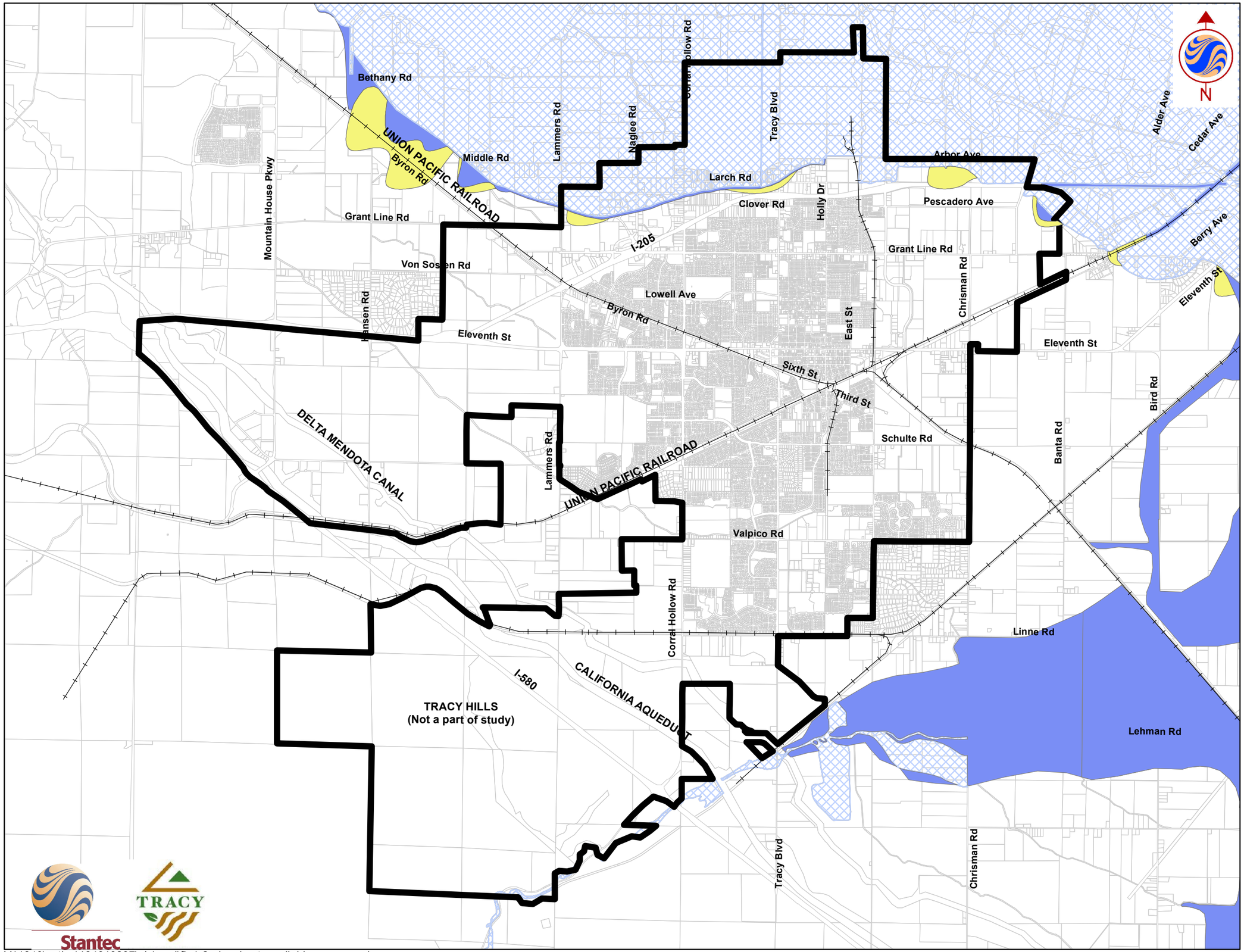
1.4 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

1.4.1 Climate

The Tracy area is typical to that of San Joaquin County and the broader Central Valley, with two distinct weather seasons; wet and cool winters along with dry and hot summers. Average high temperatures in the winter are in the 50s, and summer high temperatures average in the low 90s.

1.4.2 Precipitation

Precipitation records obtained from various rain gage data monitored by the California Department of Water Resources in the Tracy area at elevations ranging from 61 ft to 625 ft indicate that the amount of normal annual rainfall in the Tracy area averages about 12 inches per year. Approximately 95 percent of this rainfall typically occurs from early fall through mid-spring (generally October through May), although infrequent summer showers do occur. Storm events during the rainy season consist of either individual storms or clusters of storms. Major storms of greater magnitude and duration generally occur during the rainy season; however, high intensity thunderstorms (though relatively infrequent) can occur in any season.



Legend

- Sphere of Influence
- 100-year FEMA Floodplain
- 100-yr Other Available Floodplain Data
- 200-yr Available Floodplain Data
- Railroad

Source: State of California Department of Water Resources (DWR), October 2008

Client/Project

CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 1-2

Title

DWR BEST AVAILABLE MAPS

NOVEMBER 2012
184010207
SCALE 1" = 5000'

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1.4.3 Topography

The Study Area is located within a portion of the broad valley floor of the San Joaquin Valley, and generally slopes from southwest to northeast at an average topographic gradient ranging from 0.2 to 0.3 percent. The southern and southwestern portions of the Study Area contain steeper transitional slopes between the hills to the south and the valley floor. The ground surface elevations above mean sea level range from about 5 feet in the northeast area to about 240 feet in the southwestern area of the City, excluding Old River, which is somewhat lower in elevation (Figure 1-3). The high elevation in the offsite watersheds extending upgradient into the hills to the southwest is about 2,150 feet.

Over the years, several datums have been used within the City that differ from each other by a few feet. However, with the preparation of detailed hydraulic information for major existing storm drainage facilities in this SDMP, the City's 2006 Geodetic Control Network has been used, which is based on the North American Vertical Datum of 1988, or NAVD 88 (see Section 4.0 for additional detail relating to hydraulic grade line and water surface elevation computations).

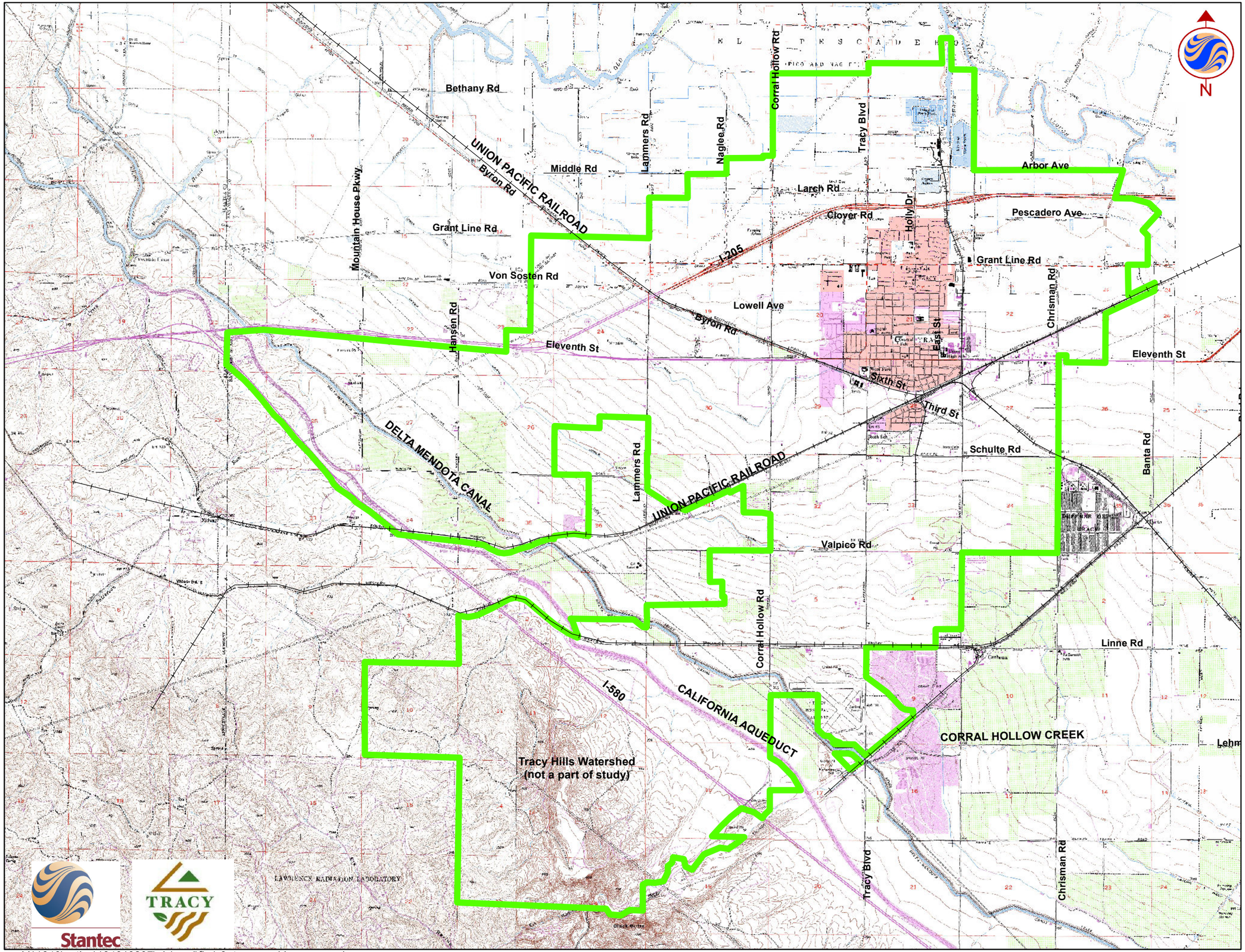
1.4.4 Major Drainage Features

There are a number of major drainage features within the study area or that have an impact on the study area. These major drainage features are depicted on Figure 1-4 and are described below:

- *California Aqueduct* – The California Aqueduct traverses across the southwestern portion of the study area and perpendicular to the direction of drainage flow dictated by topography. Storm runoff is collected on the upstream side of the aqueduct and is delivered to overchutes that cross over the aqueduct and culverts that pass underneath the aqueduct. The California Aqueduct tends to consolidate runoff to fewer locations and often limits the flow rates discharged to lands below the aqueduct.

- *Delta Mendota Canal* – The Delta Mendota Canal runs generally parallel to and just downslope from the California Aqueduct in the Tracy area. It further reduces the number of locations where storm runoff is concentrated. Storm runoff passes over or under the canal via overchutes and culverts and further limits the rates discharged to lands below the canal. The Delta Mendota Canal also contains a significant number of locations where local drainage flow that is collected on the upstream side of the canal simply enters the canal directly via drain inlets and is not released to downstream lands.

- *Union Pacific Railroad* – There are several Union Pacific Railroad lines in the study area. The railroad beds are generally elevated and runoff is often collected on the upstream side of railroad beds and is delivered to a limited number of bridge and culvert crossings of the railroad tracks.



Legend

- Sphere of Influence
- Railroad

Source: USGS 7.5 minute quads: Tracy, Midway, Clifton Court Forebay, and Union Island

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CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 1-3

Title

TOPOGRAPHIC MAP

NOVEMBER 2012
184010207
SCALE 1" = 5000'

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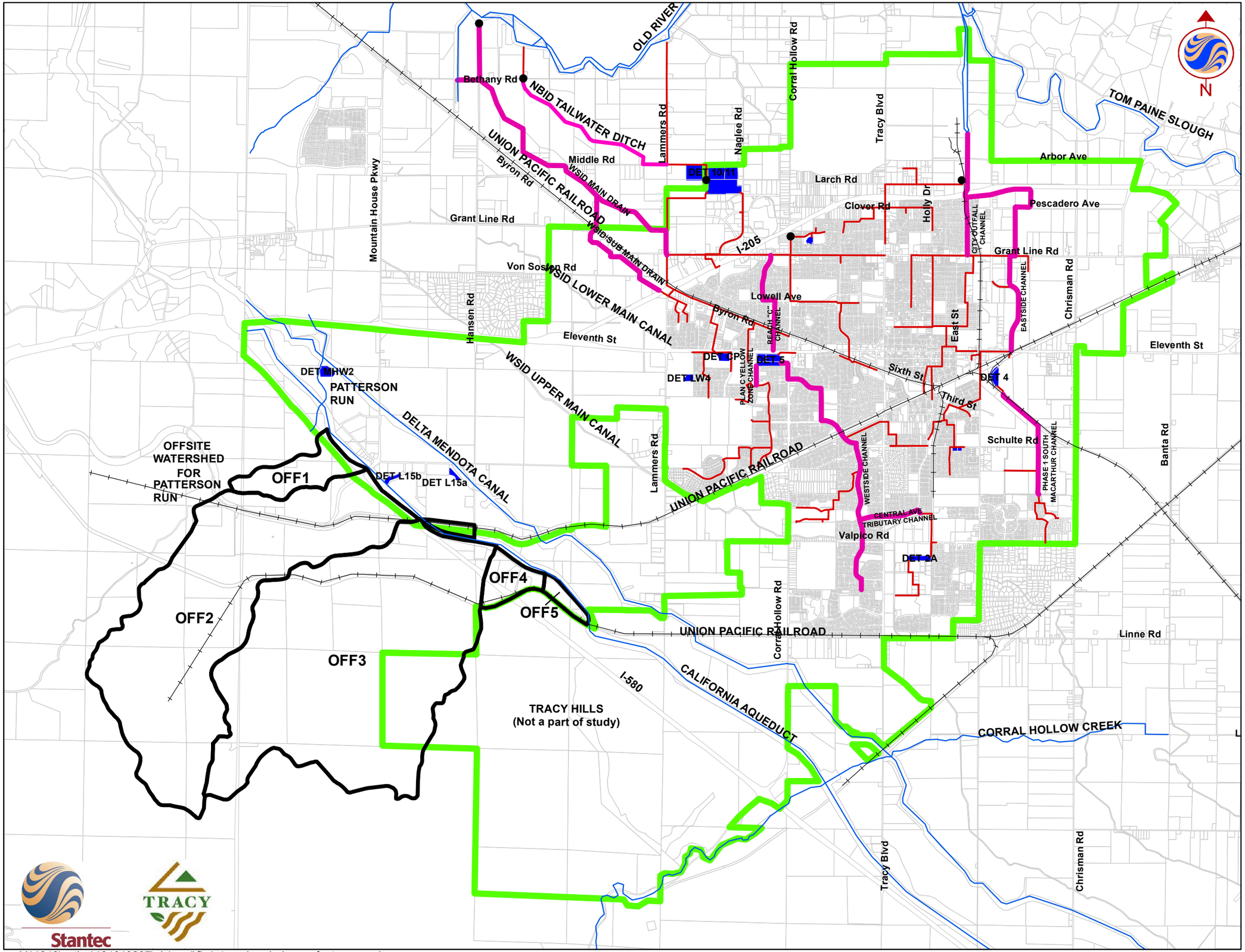

Legend

- Sphere of Influence
- Offsite Sub-basins
- Existing Detention Basins
- Existing Channels
- Existing Storm Drains*
- Railroad
- Existing Pump Stations

*Not All Secondary Storm Drains are Shown

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Client/Project
CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 1-4

Title
MAJOR DRAINAGE FEATURES MAP
NOVEMBER 2012
184010207
SCALE 1" = 5000'

- *West Side Irrigation District (WSID) Upper Main Canal* – Similar to the California Aqueduct and the Delta Mendota Canal, though considerably smaller in size and capacity, the WSID Upper Main Canal extends along an alignment that is perpendicular to the direction of drainage flow dictated by topography. Local drainage flows are intercepted by the WSID Upper Main Canal and existing tailwater ponds discharge to the canal at several locations in the southwest and south central portions of the Study Area.

- *Offsite Watersheds* – The hills to the southwest of the Study Area drain into the Study Area and are intercepted by the aqueducts, canals, and railroads described above. Some flow paths are well defined as they pass through the Study Area and some lose definition as they continue downstream. Corral Hollow Creek is a local drainage path in the vicinity of the Study Area that has been mapped by FEMA, and there is a FEMA mapped floodplain associated with Old River (see below and Section 1.4.5). Corral Hollow Creek extends east, to the south of the Study Area and does not impact the City's Sphere of Influence.

- *WSID Tailwater Ditches* – WSID retains several tailwater ditches that collect irrigation tailwater and urban runoff from designated portions of the City and convey it to their intake area connecting to Old River at Wicklund Road. The main tailwater ditch is the WSID Main Drain and a secondary ditch, the WSID Sub-Main Drain, is a significant tributary to the WSID Main Drain.

- *Naglee Burk Irrigation District (NBID) Tailwater Ditches* – NBID retains a network of irrigation tailwater ditches that generally extend northwesterly to the north of the WSID Main Drain. Irrigation tailwater is discharged to Old River via a pumping facility located on the south side of Bethany Road west of Reeve Road.

- *City Storm Drainage Facilities* – The City has completed several major storm drainage facilities that collect, convey, and store storm runoff. The major components of these facilities include the Westside Channel System, the Eastside Channel System, the City Outfall Channel (that drains to the Eastside Channel), trunk line storm drains, and a number of detention basins, the largest being DET 10/11 near Tracy Mall.

- *Old River* – Old River is located to the north of the Study Area and is a part of the San Joaquin River system of interconnected waterways that interact with the Delta area. Old River is contained by levees, and in the event of a levee failure there are northern portions of the Study Area, mostly north of I-205, that would be subjected to flooding according to Flood Insurance Rate Maps published by FEMA (see Section 1.4.5). With regard to water quality, Old River is included on the Section 303(d) list of water quality limited segments requiring TMDLs published by the State Water Resources Control Board. The listed "pollutant/stressor" is *low dissolved oxygen* and the proposed TMDL completion year is 2019.

1.4.5 Floodplain Areas

As stated in the previous subsection, there is a regulatory floodplain area that extends across the northern portion of the City's Sphere of Influence. The 100-year floodplain for this area is mapped per FEMA Flood Insurance Rate Map Panel Nos. 590, 595, and 615 for San Joaquin County, California and Incorporated Areas dated October 16, 2009. The flood zone designations for the floodplain are Zone AE (Elevation 13) for areas west of the Sugar Cut (which is about ¼ mile west of the alignment of MacArthur Drive), Zone AE (Elevation 22) east of the Sugar Cut north of I-205, and Zone AE (Elevation 24) east of Paradise Road south of I-205. The elevations referenced with the flood zone designations are elevations of the base flood (or 100-year flood) under NAVD 88 datum. These floodplain areas are depicted on Figure 1-5.

Per the City's Municipal Code (Title 9 Building Regulations, Chapter 9.52 Floodplain Regulations), all new construction and substantial construction pertaining to buildings shall have the lowest floor, including basement, elevated to or above the base flood elevation. The Floodplain Regulations of the City's Municipal Code contain many other provisions and requirements associated with development in a floodplain area mapped by FEMA.

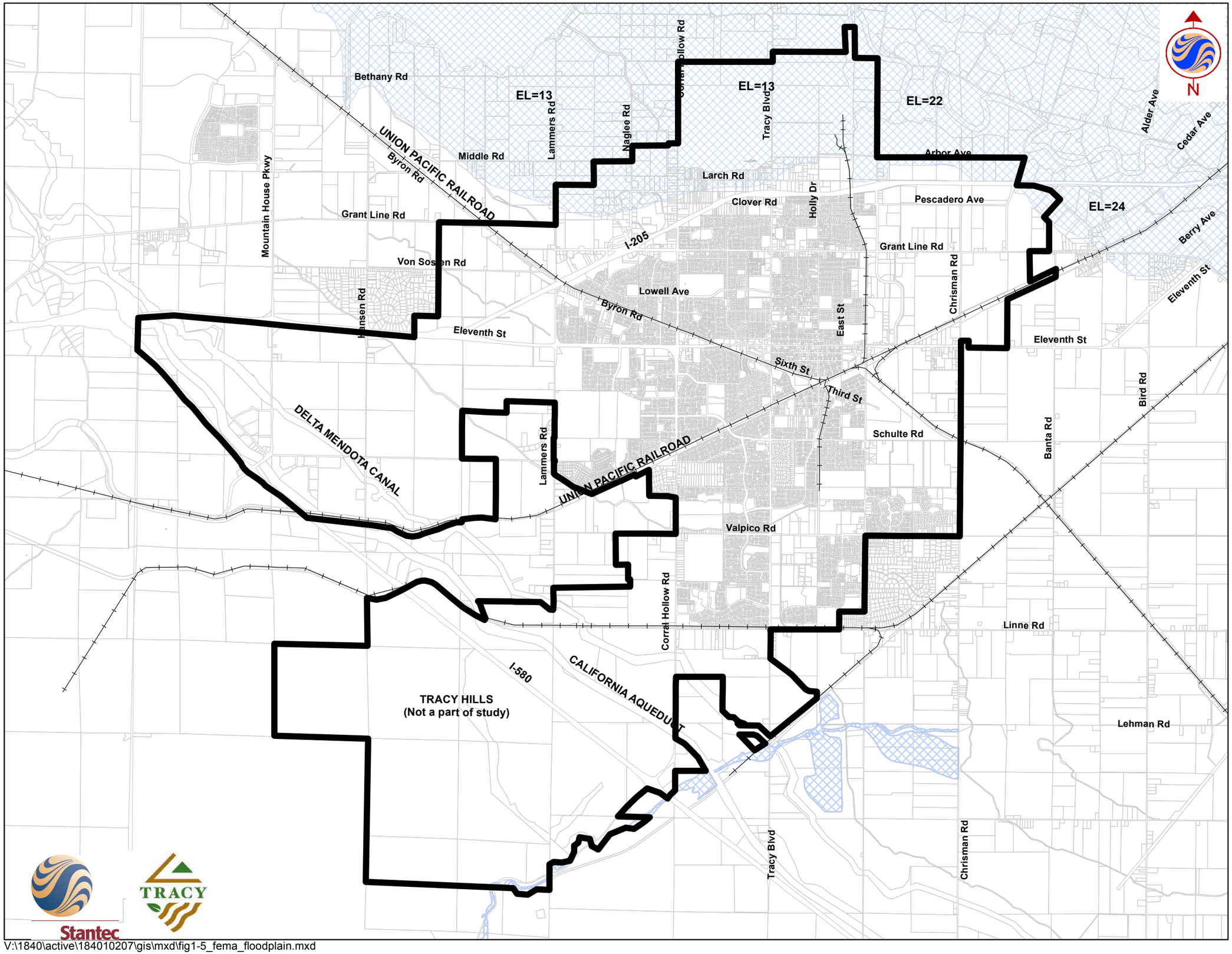
1.4.6 Soils and Permeability

The Study Area contains many separate soil types, and the Natural Resources Conservation Service 2007 *Soil Survey for San Joaquin County, California* was the primary resource used to define and estimate the general permeability and potential percolation rates of those soils.

In general, the soils in the southern portion of the City often have a high permeability while soils in the northern portion have a low permeability. As part of the development process, site-specific subsurface soil investigations should always be completed to confirm a given site's ability to allow percolation from a proposed detention basin. The soil conditions as they relate to the hydrologic modeling completed for master planning purposes are discussed in Sections 3.3 and 3.4.

1.4.7 Groundwater

In the upland (southern) portions of the Study Area, groundwater is generally present below the ground surface at depths of 100 feet or more. As the topography falls to the lower lying, flatter topographic areas in the central and northern portions of the Study Area, depths to groundwater become very shallow and are often as shallow as 4 to 8 feet below ground surface. In these lower lying areas, the depth to groundwater is often influenced by existing underground tile drains that were installed years ago to support agricultural practices.



Legend

- Sphere of Influence
- 100-year Floodplain
- EL = 13 — 100-year flood elevation; NAVD 88
- Railroad

Source: FEMA Flood Insurance Rate Map Panel Numbers 06077C0590, 06077C0595, and 06077C0615, October 16, 2009

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CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 1-5

Title

FEMA FLOODPLAIN MAPPING

NOVEMBER 2012
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SCALE 1" = 5000'

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1.4.8 Potential Contamination Sites

Over the past several years, the City has encountered contaminated soils during or prior to some of their public works projects. Known and suspected locations where contaminated soils may require extensive remediation measures during construction of open channels, detention basins, or underground storm drains include the following:

- Byron Road – Oil pipelines have leaked into surrounding soils (identified during construction of underground storm drains associated with the Westside Channel Outfall System).
- Schulte Road, East of Lathrop Parkway – Contaminated soils encountered with construction of the Westside Channel in this area.
- "Tar Pit" Site – Potential contaminated soils within a 34.2 acre site located on the north side of Valpico Road roughly ¼ miles west of MacArthur Drive.

Major proposed storm drainage upgrades represented in this SDMP generally avoid extending within these areas, except as required for facility crossings. In addition, Chevron has provided the City with a map showing the alignments of their Historical Old Valley Pipeline (OVP) and their Historical Tidewater Associated Oil Company Pipeline (TAOC). Though contaminated soils are not necessarily present along all alignments of the OVP and TAOC, this possibility should be investigated when planning projects that require excavation and trenching in these areas. The locations of the areas identified in this subsection as potentially containing contaminated soils are shown on Figure 1-6.

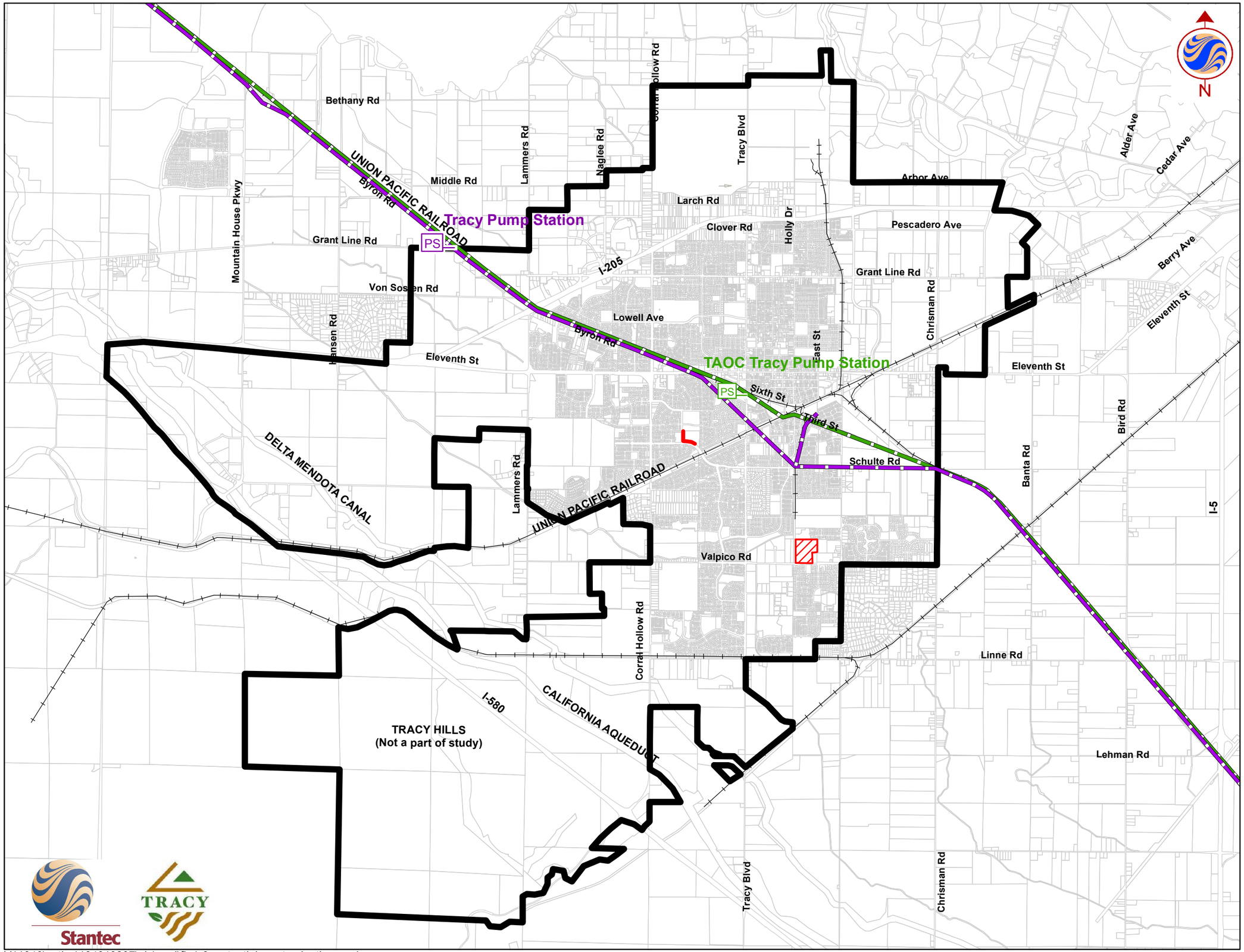
1.4.9 Existing Drainage Conditions

Existing drainage conditions within the City's Sphere of Influence are variable, and are characteristically different between developed areas and undeveloped areas. Though more detailed descriptions are provided in other sections of this SDMP, the following general characterizations of existing drainage conditions may be made.

1.4.9.1 Developed Areas

Existing developed areas of the City generally drain from south to north toward Old River. Drainage facilities serving existing developed areas of the City generally include the following components:

- Surface drainage via streets
- Underground storm drains
- Open channels and channel parkways
- Irrigation tailwater facilities that accept urban runoff



Legend

- Sphere of Influence
- PS — Historical Old Valley Pipeline Pump Station
- PS — Historical Tidewater Associated Oil Company Pipeline Pump Station
- Historical Old Valley Pipeline (OVP)
- Historical Tidewater Associated Oil Company Pipeline (TAOC)
- Segment of Existing Westside Channel
- "Tar Pit" Site

Source: Historical Chevron Pipeline Alignments Map, April 29, 2009 and Other References

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CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 1-6

Title

POTENTIAL CONTAMINATION SITES

NOVEMBER 2012
184010207
SCALE 1" = 5000'

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- Detention basins, including joint-use park and recreation facilities
- Pumping facilities
- Temporary retention basins

Generally, storm drainage is accommodated well for the majority of the City's developed areas, with flooding being limited to a few local problem areas. The completion of several, major storm drainage infrastructure upgrade projects over the past 20 years have accommodated the storm drainage needs for new development and have eliminated the majority of prior problem areas.

Temporary retention basins are an interim measure that is often employed for an acceptable period of time when a given project cannot be reasonably be connected to a suitable public facility. At such time when connection to a suitable public facility becomes possible, applicable temporary retention basins are filled and decommissioned.

1.4.9.2 Undeveloped Areas

Undeveloped areas within the City's Sphere of Influence predominantly consist of agricultural lands that drain from south to north and from southwest to northeast, also toward Old River. These agricultural areas are typically drained by tailwater ponds, tailwater ditches, and tailwater ponds that drain to tailwater ditches. The larger tailwater ditches are owned and operated by WSID, NBID, and other Irrigation Districts.

2.0 Watersheds

2.1 EXISTING OUTFALLS SERVING DEVELOPED AREAS

Presently, the majority of storm drainage generated by existing developed areas within the City's Sphere of Influence discharges to one of four (4) outfalls that eventually discharge to Old River to the north. Watersheds and outfall locations are shown in Figure 2-1:

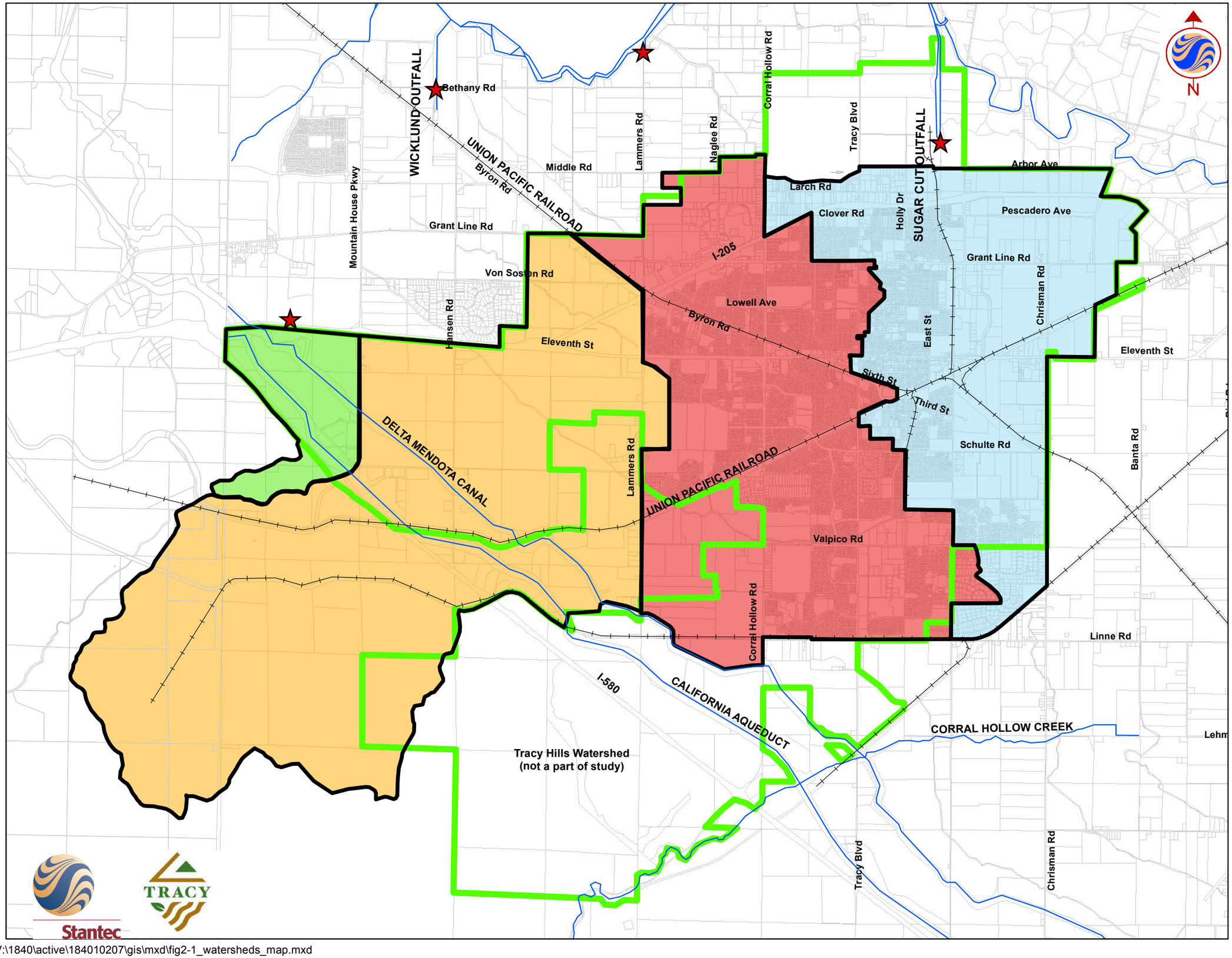
- *Sugar Cut* – The Sugar Cut originates west of the alignment of MacArthur Drive and adjacent to the Holly Sugar Plant north of Arbor Avenue. The Sugar Cut is the outfall for the City's Eastside Channel and the majority of existing developed areas within the Eastside Channel Watershed.

- *18" Storm Drain Force Main (Lammers Road)* – This storm drain force main is a discharge pipeline that serves a pump station draining the City's DET 10/11 terminal detention basin located on the west side of Naglee Road on the south side of Middle Road (near Tracy Mall). The storm drain force main discharges to Old River at the alignment of Lammers Road. DET 10/11 is a terminal detention basin serving the majority of the Westside Channel Watershed, including the I-205 Specific Plan area.

- *West Side Irrigation District (WSID) Main Drain* – The WSID Main Drain is an agricultural irrigation tailwater ditch that extends from the intersection of Lammers Road and Grant Line Road northwest to the Wicklund Outfall (the WSID intake pump station area) on the east side of Wicklund Road at Bethany Road. In conjunction with irrigation tailwater, the WSID Main Drain currently collects and conveys storm runoff generated from about a 2-square mile area within the Westside Channel Watershed.

- *Patterson Run* – In the far west portions of the City's Sphere of Influence west of Mountain House Parkway (Patterson Pass Road), a drainage channel/corridor known as Patterson Run collects runoff generated from a large offsite watershed that extends upstream to the southwest and receives a small attenuated discharge from the existing Golden Gate Auto Auction development and a portion of the Patterson Pass Business Park development. Patterson Run discharges into downstream storm drainage facilities that are currently operated by the Mountain House Community Services District (CSD) north of I-205 or will be as development of the Mountain House community continues in the future.

Some of the developed areas within the City's Sphere of Influence are not presently connected to facilities that drain to any of the above outfalls and are currently draining to temporary retention ponds until future facility connections are funded and constructed.



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CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 2-1

Title
WATERSHEDS AND OUTFALLS

NOVEMBER 2012
184010207
SCALE 1" = 5000'

2.2 MAJOR WATERSHEDS

In this SDMP, five (5) major watersheds have been defined and cover the entire Sphere of Influence and additional contiguous areas (see Figure 2-1). They are:

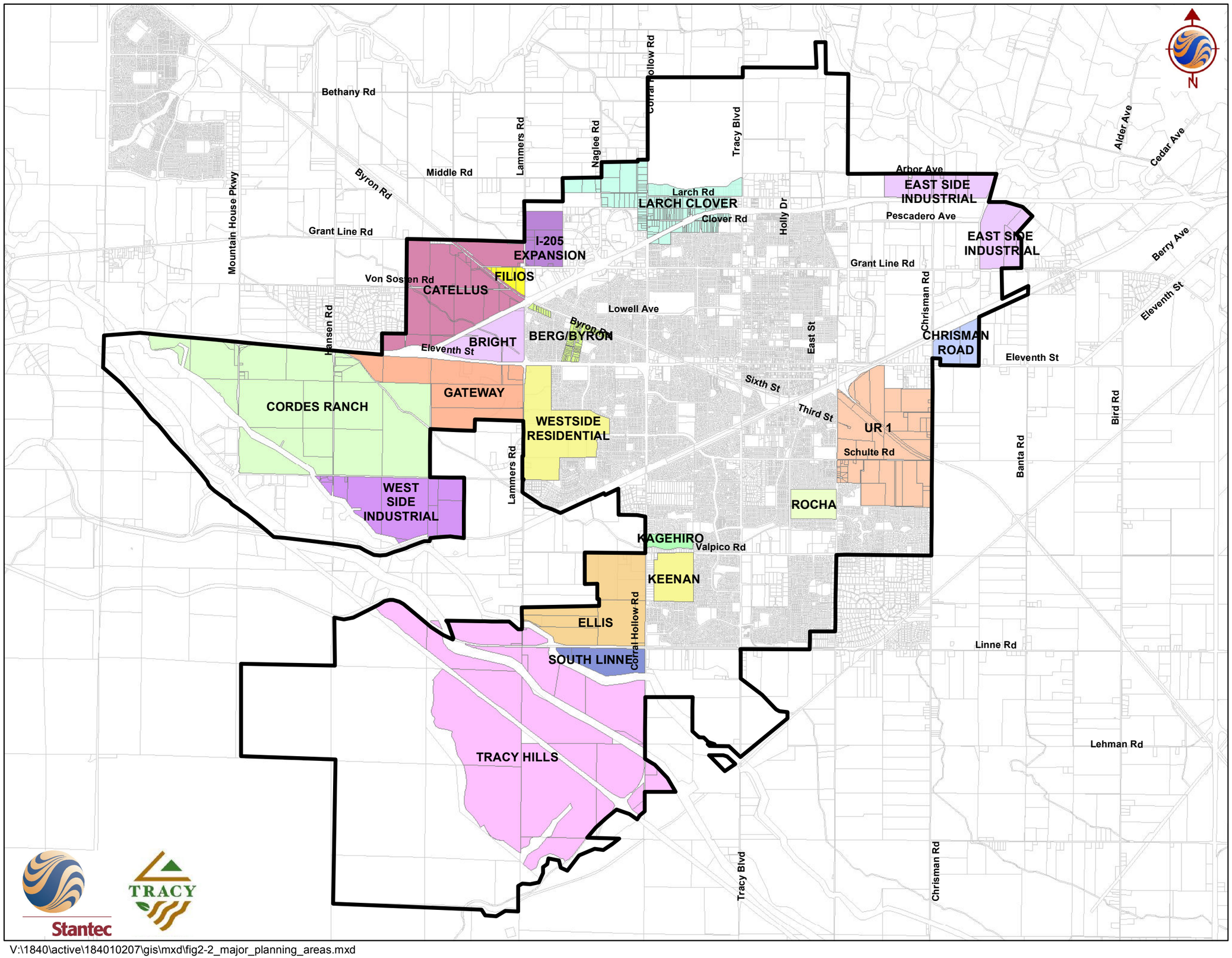
- Eastside Channel Watershed
- Westside Channel Watershed
- Lammers Watershed
- Mountain House Watershed
- Tracy Hills Watershed

2.2.1 Eastside Channel Watershed

The Eastside Channel Watershed is the easternmost watershed in the City's Sphere of Influence and is roughly 9.8 square miles in overall area. It includes minor existing developed areas in the County outside of the Sphere of Influence. The watershed can generally be characterized as encompassing roughly the east half of the developed area for the City plus additional undeveloped areas, and extends as far south as Linne Road, as far east as Banta Road and as far north as Arbor Avenue. It includes the majority of the City's downtown area, several Residential Specific Plan (RSP) subdivisions, the South MacArthur Sub-basin, the Rocha future service area, the Chrisman Road future service area, the UR1 future service area, core residential and industrial areas north and east of the downtown area, the Northeast Industrial Area (NEI), industrial developments north of I-205, the majority of the Larch Clover area, the Eastside Industrial future service area, and other existing and proposed development areas. The Future Service Areas are shown on Figure 2-2.

The primary drainage feature within the Eastside Channel Watershed is the Eastside Channel that extends north from Eleventh Street to the Sugar Cut Outfall north of I-205, generally along or near the alignment of MacArthur Drive. The Eastside Channel is a Channel Parkway that includes landscaping and an undulating linear bike path from Eleventh Street to a location about ¾ mile to the north, where it becomes a non-landscaped open channel segment extending to the Sugar Cut Outfall. An initial (or Phase 1) upstream extension of the Eastside Channel (referred to in this SDMP as the South MacArthur Channel) has also been constructed south from Eleventh Street to the Eastlake/Elissagaray developments about ½ mile south of Schulte Road and includes Phase 1 construction of a detention basin (DET4) on the south side of Eleventh Street. These upstream drainage phases will be augmented in the future as warranted by new development and available funding.

A second, significant drainage feature within the Eastside Channel Watershed is the City Outfall Channel that extends north from Grant Line Road about ¼ mile west of MacArthur Drive and joins the Eastside Channel on the south side of I-205. The City Outfall Channel is an open



Legend

Sphere of Influence

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Client/Project

CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 2-2

Title

MAJOR FUTURE SERVICE AREAS MAP

NOVEMBER 2012
184010207
SCALE 1" = 5000'

channel that provides a drainage outfall for three (3) trunk line storm drains in Grant Line Road, draining the downtown area and established development areas to the north of the downtown area.

The completed Eastside Channel north of Eleventh Street has a capacity to convey the 100-year 24-hour storm discharge under existing conditions and watershed buildout conditions that include additional drainage infrastructure improvements. The City Outfall Channel has a capacity to convey the 10-year 24-hour storm discharge, which is the limiting capacity of underground storm drains that discharge to this channel. Existing and proposed detention basins have a 100-year 24-hour storm capacity.

The majority of storm runoff generated by existing development within the Eastside Channel Watershed is conveyed to one of the major open channel segments via surface drainage and underground storm drains. Other than Phase 1 of DET 4 upstream of Eleventh Street, there is presently little attenuation storage and storm water detention present within the Eastside Channel Watershed.

2.2.2 Westside Channel Watershed

The Westside Channel Watershed is a central watershed that is contiguous to the west of the Eastside Channel Watershed. It is roughly 12.9 square miles in overall area. The watershed can generally be characterized as encompassing roughly the west half of the developed area for the City plus additional undeveloped areas, and extends as far south as Linne Road and beyond, as far west as Lammers Road (and the alignment of San Jose Road in the northwest portion) and as far north as Middle Road and beyond. The Westside Channel Watershed includes significant RSP and Plan “C” development areas, South ISP, Presidio, core residential development areas to the west and northwest of the downtown area, the I-205 Specific Plan Area, the Ellis Program future service area, the South Linne future service area, the Kagehiro future service area, the Keenan future service area, much of the Westside Residential future service area, the Berg/Byron future service area, the Filios future service area, the northeast portion of the Catellus future service area, the I-205 Expansion future service area, and the west portion of the Larch Clover area. It also includes existing residential developments and agricultural land use areas in the County outside of the Sphere of Influence in the southwest portion of the watershed.

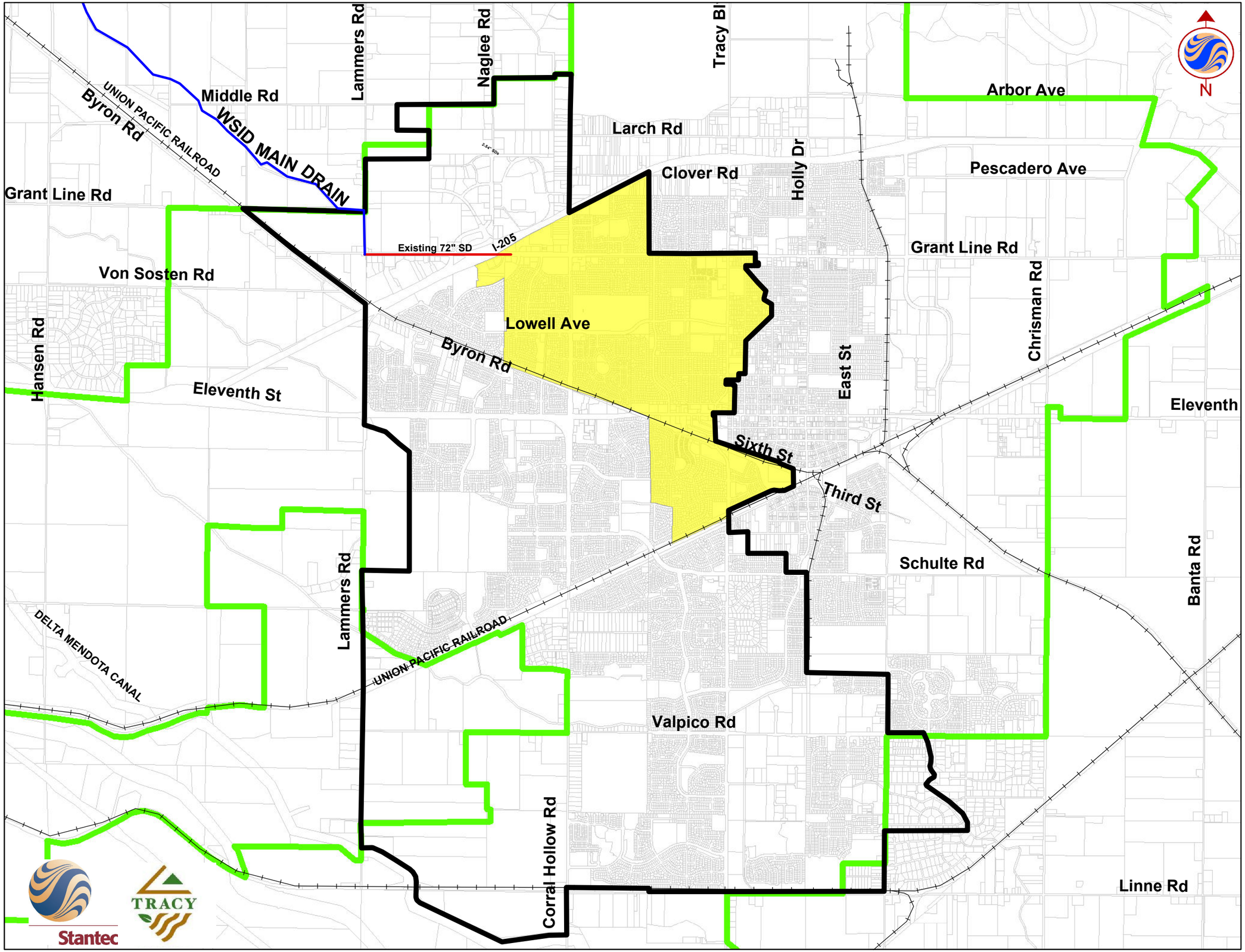
There are two (2) separate outfalls for storm runoff generated within the Westside Channel Watershed. They are the WSID Main Drain that serves a roughly 2-square mile portion of the overall watershed (see following subsection for further discussion) and DET 10/11 with its pump station and force main (extending to Old River to the north) that has the capacity to serve the remaining majority of the overall watershed with the exception of agricultural properties that are outside of the Sphere of Influence.

2.2.2.1 2-Square Mile Area Served by WSID Main Drain

The City and WSID have entered into drainage agreements that have authorized discharges of City storm runoff into WSID facilities and WSID water into City facilities. The original drainage agreement between the parties was established in 1972. Applicable discharges have subsequently been authorized and governed by a consolidated agreement entitled *Integrated Amended 1972 Drainage Agreement between the City of Tracy and The West Side Irrigation District* established in 2002 (2002 Drainage Agreement). The 2002 Drainage Agreement authorizes the City to discharge a maximum rate of 145 cfs into the WSID Main Drain and authorizes WSID to discharge a maximum rate of 35 cfs into the City's Eastside Channel. The City and WSID recently negotiated a new drainage agreement that augments the 2002 Drainage Agreement by incorporating provisions for WSID to accept storm runoff from the Lammers Watershed (defined per Sections 2.2.3 and 5.4.1). In November 2010, the WSID Board of Directors approved the new drainage agreement (2010 Drainage Agreement), and the Tracy City Council adopted the 2010 Drainage Agreement at a public meeting in December 2010. A copy of the 2010 Drainage Agreement is included in Appendix D.

The 2002 and 2010 Drainage Agreements authorize the City to discharge storm runoff from a roughly 2-square mile area to the WSID Main Drain that originates at the intersection of Lammers Road and Grant Line Road. The 2-square mile area is a portion of the Westside Channel Watershed that is roughly bounded by Tracy Blvd. on the east, I-205 on the north, west of Corral Hollow Road on the west, and the Union Pacific Railroad (south of Eleventh Street) on the south (see Figure 2-3). This area is substantially urbanized and is primarily drained by underground storm drains and surface flow in streets. There is a 72" trunk line storm drain extending along Grant Line Road between Corral Hollow Road and Lammers Road that discharges directly to the WSID Main Drain, with smaller connecting trunk lines extending east along Grant Line Road from Corral Hollow Road to Tracy Blvd., south along Corral Hollow Road from Grant Line Road to Lowell Avenue, and east along Lowell Avenue from Corral Hollow Road to Lincoln Blvd. There are numerous additional lateral storm drains serving additional areas within the 2-square mile area and connecting to the trunk line storm drains. An additional drainage feature is the City's Reach "C" Channel that extends north (to the west of Corral Hollow Road) between the Union Pacific Railroad (north of Byron Road) and Grant Line Road, discharging to the 72" trunk line storm drain in Grant Line Road at Orchard Parkway.

The underground storm drains serving the 2-square mile area generally have a capacity to carry the 10-year 24-hour storm discharge or less, and the overall capacity to discharge to the WSID Main Drain is hydraulically limited by the capacity of the 72" trunk line storm drain in Grant Line Road. The Reach "C" Channel has a capacity that exceeds the 100-year 24-hour storm discharge.



Legend

- Westside Channel Watershed
- Sphere of Influence
- 2-square Mile Area Served by WSID Main Drain*
- WSID Main Drain
- Railroad

*Per Provisions of Integrated Amended 1972 Drainage Agreement and Supplemented by the 2010 Drainage Agreement Between the City of Tracy and the West Side Irrigation District.

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CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 2-3

Title

2-SQUARE MILE AREA SERVED BY WSID MAIN DRAIN

NOVEMBER 2012
184010207
SCALE 1" = 3000'

2.2.2.2 Remainder of Watershed

The portion of the Westside Channel Watershed that is not served by the WSID Main Drain is the significantly larger component of the watershed and is about 10.8 square miles in area. The main storm drainage infrastructure elements for the remainder of the watershed have been constructed and are operational. The primary elements of the system consist of channel parkways, open channels, detention basins, and large closed conduits that all have capacity to accommodate a 100-year 24-hour storm. The primary system elements include the following, listed from upstream to downstream:

- A Channel Parkway (Westside Channel) that extends from roughly ½ mile north of Linne Road north to Plasencia Field at the southwest corner of Corral Hollow Road and Eleventh Street. The Channel Parkway exists within a 60-foot wide corridor and includes landscaping and an undulating linear bike path. It extends along segments of Sycamore Parkway, Schulte Road, Lauriana Lane, Cypress Drive, and Corral Hollow Road.

- DET 5 at Plasencia Field, which operates as an existing joint-use park and detention basin.

- A Channel Parkway (Westside Channel) that extends north from DET 5 to Byron Road, adjacent to Belconte Drive.

- Large underground conduits (2-60” RCPs) that extend northwesterly along Byron Road from Belconte Drive to the alignment of Lammers Road, just beyond the underpass at I-205.

- Large underground conduits (2-60” RCPs that transition to 2-76” x 48” HECPs) extending along the projected alignment of Lammers Road from Byron Road to Grant Line Road. At Grant Line Road, the 2-76” x 48” HECPs cross over the top of the 72” RCP trunk line that serves the roughly 2-square mile area described in the previous subsection.

- A large underground conduit (84” RCP) that extends north along Lammers Road (and adjacent to a segment of the WSID Main Drain that runs alongside Lammers Road) from Grant Line Road for a distance of about 3,100 feet.

- A large underground conduit (12’ x 4’ CBC) that extends east from Lammers Road for a distance of about ½ mile along a farm access road to a large terminal detention basin (DET 10/11).

- DET 10/11, a large terminal detention basin located at the southwest corner of Naglee Road and Middle Road. This detention basin will hold a storage volume of 486 acre-feet when runoff is collected from a 100-year 24-hour storm under buildout conditions for the contributing watershed. DET 10/11 is drained by a pump station having a capacity of 10

cfs and an 18" SDFM that extends west along Middle Road and north along Lammers Road, discharging to Old River about 1.3 miles north of Middle Road.

There are additional significant storm drainage facilities that discharge to the primary system described above. These facilities include:

- Underground storm drains that serve the I-205 Specific Plan area and discharge directly to DET 10/11.
- The Central Avenue Tributary Channel Parkway that extends along Central Avenue, originating about ½ mile east of Tracy Blvd. and connecting to the Westside Channel at Sycamore Parkway about ¼ mile west of Tracy Blvd.
- Storm drainage infrastructure that serves Zone 2 of South ISP, a 1-square mile area bounded by Tracy Blvd. on the west, Valpico Road on the north, MacArthur Drive on the east, and Linne Road on the south. Zone 2 includes underground storm drains that connect to an existing detention basin (DET 2A). DET 2A discharges to the upstream limit of the Central Avenue Tributary channel parkway to the north.
- Storm drainage infrastructure serving the Plan "C" Yellow Zone, consisting of underground storm drains and a grouted riprap lined open channel extending north from Cypress Drive to discharge to DET 5. The Plan "C" Yellow Zone consists of existing residential developments located south of DET 5 on the west side of Corral Hollow Road to the Union Pacific Railroad.
- Storm drainage infrastructure serving the Presidio sub-basin, including a joint-use detention basin (DET CP) containing a separated low flow storage basin and overflow storage areas within existing soccer fields in the north portion of Tracy Community Park on the south side of Eleventh Street between Corral Hollow Road and Lammers Road. DET CP discharges to the 2-60" RCPs in Byron Road to the north via a 24" RCP that transitions to a 30" RCP that were installed through the Berg/Byron planning area.

Other developed portions of the remainder of Westside Channel Watershed are served by lateral storm drains that eventually connect to the major storm drainage elements serving the watershed.

There are presently several large properties that are located within the southwest portion of the Westside Channel Watershed, but are outside of the City's Sphere of Influence. These properties are predominantly under agricultural use and drain to terminal tailwater ponds and/or utilize low flow discharges to WSID's Upper Main Canal. There are also two (2) smaller subdivisions adjacent to Corral Hollow Road south of the Union Pacific Railroad that drain to low-lying areas and/or City storm drainage facilities. Existing land use and drainage conditions are assumed to remain for these areas as an assumption in this SDMP.

2.2.3 Lammers Watershed

The Lammers Watershed is a large area contiguous to the west of the Westside Channel Watershed that is substantially undeveloped at present and contains many of the City's larger future service areas proposed for development. Excluding the offsite watersheds that extend into the hills to the southwest and upstream of I-580, the Lammers Watershed consists of an area of about 8.6 square miles. The Lammers Watershed is roughly bounded by Mountain House Parkway on the west, I-580 on the south (plus offsite watersheds extending upstream to the southwest of I-580), Lammers Road on the east, and I-205 and Grant Line Road on the north. Existing development in the Lammers Watershed includes the east portions of Patterson Pass Business Park, the Safeway Distribution Center, and the OI Thermal Energy Development industrial site, all on the south side of Schulte Road between Mountain House Parkway and Lammers Road, Kimball High School on the east side of Lammers Road south of Eleventh Street, and large agricultural properties. Proposed development areas include the following City future service areas: Cordes Ranch, West Side Industrial, Gateway, the westernmost portions of Westside Residential, Bright, and the majority of Catellus.

Drainage and topography in the Lammers Watershed trends from southwest to northeast, with steeper gradients being present in the upslope areas and flatter gradients being present in the downslope areas. The California Aqueduct and the Delta Mendota Canal traverse lines of equal contour parallel to and downstream of I-580. These large water delivery canals tend to control and regulate discharges to downstream areas within the Lammers Watershed via overchutes and culvert crossings at specific locations. There are also several locations of terminal drainage via direct discharge to the Delta Mendota Canal.

Other drainage features include agricultural ditches and tailwater ponds, and low capacity tailwater ditches that drain to WSID tailwater conveyance facilities. WSID's Upper and Lower Main Canals also traverse across the watershed and intercept various upstream irrigation discharges and storm water flows. The WSID Sub-Main Drain tailwater ditch extends northwesterly along the south side of Byron Road between I-205 (near Lammers Road) and the alignment of San Jose Road, and then turns north, crossing Byron Road and the Union Pacific Railroad and joins the WSID Main Drain to the north on the east side of San Jose Road.

2.2.3.1 Local Sub-Basins

Local sub-basins within the Lammers Watershed are defined by topography, future service area boundaries, and the alignment of canals and ditches, streets (existing and future) and highways. Patterson Pass Business Park and the Safeway Distribution Center include onsite detention basins that provide attenuation of onsite runoff during major storms but provide little attenuation during minor storms. These existing industrial developments discharge storm runoff to an existing channel on the north side of Schulte Road (within the Cordes Ranch future service area) that eventually loses definition about 1 mile north of Schulte Road. The OI Thermal Energy Development industrial site drains to an onsite terminal retention pond.

There are significant areas within the southeast quadrant of the Lammers Watershed that are located outside of the City's Sphere of Influence. These areas generally consist of agricultural properties and very low density residential development. Storm runoff from these areas is discharged to tailwater ponds and/or the WSID Upper Main Canal. Existing land use and drainage conditions are assumed to remain for these areas as an assumption in this SDMP.

The WSID Upper Main Canal drains in a southeasterly direction as it extends through the Lammers Watershed, continues easterly as open canal and as underground conduit north of Valpico Road and eventually becomes an underground conduit of limited capacity beginning at MacArthur Drive that generally extends north and discharges to the City's Eastside Channel within an existing box culvert crossing at Grant Line Road via a 36" Irrigation pipeline.

A few specific developers and other entities have entered into drainage discharge agreements with WSID that may facilitate existing and potential future discharges into the WSID Upper Main Canal. They are:

- Safeway (8 cfs) – existing discharge to the canal on the north side of I-205 (north of an existing 2-6' x 3' CBC crossing I-205 just west of Hansen Road).
- Crossroads (20 cfs) – potential future discharge to the canal for Sections 26 and 27 within the Cordes Ranch future service area (discharge location within the northeast quadrant of Section 26).
- Gateway (12 cfs) – potential future discharge to the canal at the southwest corner of this future development area.
- Tracy Defense Depot (15 cfs) – existing discharge to the WSID underground conduit at roughly the Schulte Road/Chrisman Road intersection.

The sum of the individual rates for these drainage agreements is 55 cfs, which exceeds the 35 cfs allowed discharge rate for WSID to discharge to the City's Eastside Channel per the 2002 and 2010 Drainage Agreements between the City and WSID. Future discharges are required to be monitored by telemetry controls, and discharge capacity will need to be regulated for the delivery facilities discharging to the City's Eastside Channel. The separate drainage agreements for Safeway, Crossroads, and Gateway may provide an interim outfall solution for the applicable future developments until an outfall serving the overall Lammers Watershed is constructed by the City.

2.2.3.2 Offsite Sub-Basins

There are two (2) offsite sub-basins that extend into the hills upstream to the southwest of I-580 that will occasionally generate significant rates and volumes of runoff that will enter the City's Sphere of Influence during major storms. Generally, these offsite sub-basins will not contribute runoff that enters the SDMP plan area during the more frequent, lower intensity storms of short duration.

The westernmost offsite sub-basin (OFF2) is roughly 4.5 square miles in area upstream of I-580 and storm runoff enters the existing Patterson Pass Business Park via a 72" RCP culvert crossing of the California Aqueduct. Storm runoff is routed through a small detention basin and discharged to the existing channel within the Cordes Ranch future service area on the north side of Schulte Road. The existing channel extends to the Delta Mendota Canal and flow is regulated by an existing 3.5' x 3.5' CBC that crosses underneath the canal. The existing channel continues on the north side of the canal, but loses definition at a location about 1 mile north of Schulte Road. Continued drainage to the north is provided for low flow in existing minor irrigation ditches and as sheet flow across agricultural fields when the capacity of the minor irrigation ditches is exceeded. The excess flows collect at an existing 2-cell 6' x 3' CBC that crosses I-205 just west of Hansen Road and is intercepted by the WSID Upper Main Canal north of I-205 at the location where a discharge of 8 cfs is authorized per the existing drainage agreement between Safeway and WSID. Facilities north of I-205 have little capacity compared to the rates and volumes that this offsite sub-basin is capable of generating during major, albeit rare, storm events and downstream flooding of streets, properties, and facilities is likely to occur until shortly after a major storm event subsides.

The second offsite sub-basin (OFF3) is roughly 5.7 square miles in area upstream of I-580, and during a major storm event storm runoff enters the Sphere of Influence on the south side of the Safeway Distribution Center via a 10' x 8' overchute crossing of the California Aqueduct and a 45' bridge crossing of the Union Pacific Railroad. Flows generated from this offsite sub-basin are then conveyed eastward in an existing open channel extending along the south side of the Safeway Distribution Center, crossing Hansen Road via 4- 6' x 3' CBC's. Runoff will then spill northeasterly as sheet flow and cross over the Delta Mendota Canal via a 10' x 4' overchute. There is no defined provision for collection and conveyance of this runoff below the Delta Mendota Canal and sheet flow flooding will occur to the northeast across the West Side Industrial future service area and the southeast corner of the Cordes Ranch future service area before exiting the Sphere of Influence during a major storm event. Downstream and outside of the Sphere of Influence, excess offsite runoff is intercepted by the WSID Upper Main Canal.

2.2.4 Mountain House Watershed

The Mountain House Watershed is the westernmost watershed and includes areas within the Sphere of Influence that are west of Mountain House Parkway. It is traversed by a generally well-defined channel/corridor known as Patterson Run that conveys offsite runoff generated by an upstream offsite watershed of about 6.8 square miles extending upstream into the hills to the southwest of I-580. Excluding the upstream offsite watershed for Patterson Run, the Mountain House Watershed is about 1.8 square miles in area and is bounded by I-580 on the southwest (with an additional small offsite sub-basin, OFF1, extending upstream to the southwest), I-205 on the north, and Mountain House Parkway on the east. The central portion of this watershed lies between the California Aqueduct and the Delta Mendota Canal and has been developed as the western portion of Patterson Pass Business Park and the Golden Gate Auto Auction. A detention basin having a storage volume of 68 acre-feet has been constructed off-line from Patterson Run within the Golden Gate Auto Auction development and collects runoff from

existing developed areas to the south and from offsite Sub-basin OFF1, discharging an attenuated peak rate of 7 cfs to Patterson Run. Patterson Run enters the Golden Gate Auto Auction via a 93" RCP culvert crossing of the California Aqueduct, exits the auto auction via 2-5' x 5' CBCs that cross underneath the Delta Mendota Canal, and exits the Sphere of Influence via 2- 10' x 10' CBCs that cross underneath I-205. North of I-205, Patterson Run discharges to facilities that are currently operated by the Mountain House CSD or will be in the future as additional development occurs in the Mountain House community. The northeast portion of the Mountain House Watershed (located between the Delta Mendota Canal and I-205) consists of the northwestern most portion of the Cordes Ranch future service area.

2.2.5 Tracy Hills Watershed

Tracy Hills is a large future development area located in the southernmost portion of the City's Sphere of Influence. A separate SDMP document was originally prepared by Nolte Associates, Inc., entitled *Tracy Hills Storm Drainage Master Plan, Volumes 1 – 3, December 2000* and was reviewed by the City and Stantec. The original separate SDMP is currently undergoing further review and revision. The proposed Tracy Hills development will include several onsite detention basins and an offsite conveyance facility that will deliver all storm runoff discharged from the development to an existing sand and gravel extraction pit located on the east side of Tracy Blvd., across from the Tracy Municipal Airport or to an alternate existing sand and gravel extraction pit. Storm runoff from Tracy Hills is disconnected from the remainder of the Study Area and will not impact other existing or proposed development areas within the City's Sphere of Influence.

3.0 Hydrologic Modeling

3.1 HEC-HMS MODEL

The U.S. Army Corps of Engineers' HEC-HMS computer program was used to develop a rainfall/runoff computer simulation for the watersheds and sub-basins in the Study Area. The Soil Conservation Service (SCS) dimensionless unit hydrograph method, frequently used in practice, was used for the analysis. The HEC-HMS computer model develops a runoff hydrograph for individual sub-basins through the input of numerical representations of their physical and hydrological characteristics. The computed hydrographs are then routed and/or combined with hydrographs from other sub-basins to yield a dynamic numerical analysis of peak discharges (design flows) that may be expected to occur at key locations within the Study Area. The model was run for the 10-year 24-hour and 100-year 24-hour storm events. These design flows were subsequently used for pipeline and detention basin sizing.

The input parameters utilized for sub-basins in the HEC-HMS analysis are presented in Appendix B and are described in the following paragraphs.

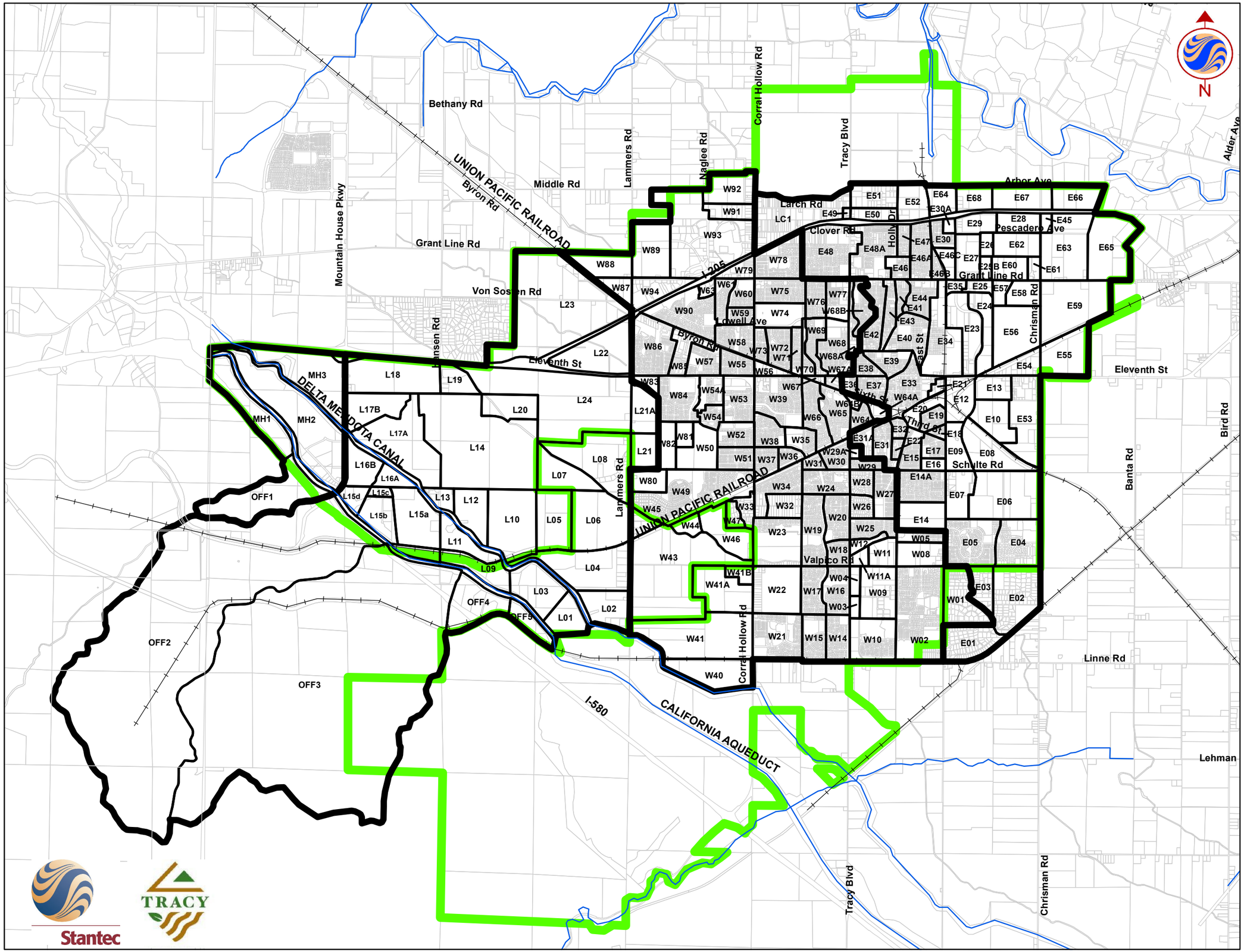
3.2 SUB-BASIN DELINEATION

The boundaries for each sub-basin were determined based on field investigations, U.S. Geological Survey 7.5 minute quadrangle maps, 1 foot contour interval topographic mapping covering many areas of the City dated 1988, prior studies and reports, aerial photographs, a digital terrain model developed from the City's Geographic Information System, and other available maps and plans. The location of various physical features such as roadways, irrigation canals, the Delta-Mendota Aqueduct, the California Aqueduct, storm drainage facilities, railroad tracks and other physical features, as well as future service and planning area boundaries, were also factors in establishing the sub-basins boundaries (see Figure 3-1).

Based on the configurations of the Study Area several sub-basins located within the major watersheds but outside of the City's Sphere of Influence are assumed to not contribute runoff to downstream portions of the Study Area. Based on field investigation, the land uses are currently agricultural, and runoff is prevented from entering the master planned infrastructure either by the Delta Mendota Canal, tailwater ponds and/or the WSID Upper Main Canal. The sub-basins that are assumed to not contribute to the master planned infrastructure are shown in Figure 3-2.

3.3 SOIL GROUP CLASSIFICATIONS

Watershed soil groups were determined using soil maps contained in a report entitled *Soil Survey for San Joaquin County, California* issued December 2007 by the Natural Resources Conservation Service (NRCS) - formerly the US Department of Agriculture Soil Conservation Service. Soil groups are classified as A, B, C, or D with Group A having the highest rate of infiltration (lowest runoff production) and Group D having the lowest rate of infiltration (highest runoff production). In Sub-basins W41 and W41A, the NRCS data was supplemented by sub-



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CITYWIDE STORM DRAINAGE
MASTER PLAN

FIGURE 3-1

Title

SUB-BASIN MAP

NOVEMBER 2012
184010207
SCALE 1" = 5000'

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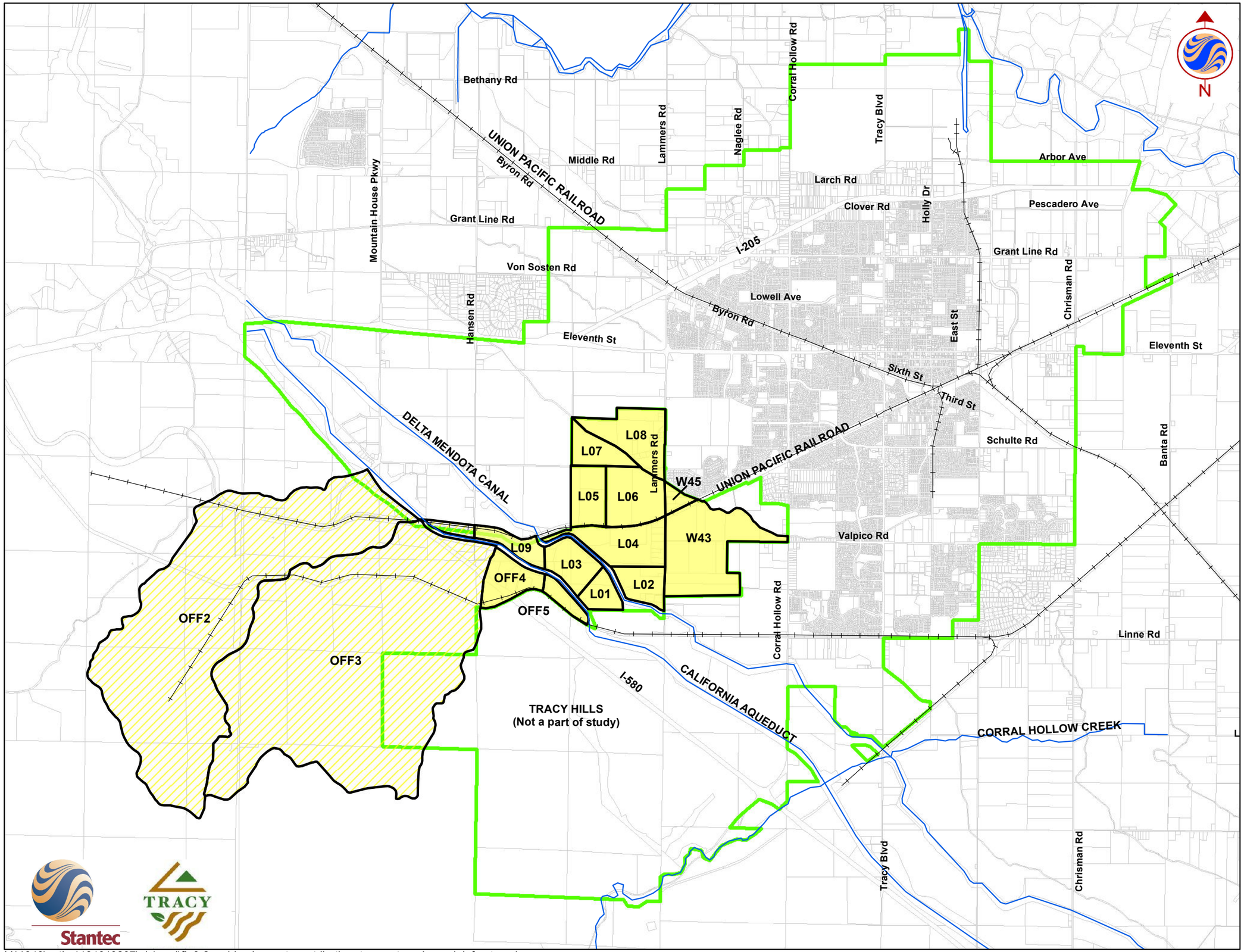

Legend

- Sphere of Influence
- L01 — Sub-basins draining to Delta Mendota Canal, WSID Upper Main Canal, or tailwater ponds
- OFF3 — Offsite sub-basins that must be accounted for in onsite design, but not included in sizing of detention basins serving new development
- Railroad

NOTE: A detention basin is proposed to capture flows derived from Sub-basin OFF2 in the future and limit the downstream discharge to a metered outflow of 5 cfs during a 100-year 24-hour storm. Upon completion of this detention basin (DET OFF2), downstream onsite design will only need to account for the 5 cfs outflow from this sub-basin. There is not a detention basin proposed to regulate discharges into the Sphere of Influence from Sub-basin OFF3.

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FIGURE 3-2

Title
SUB-BASINS ASSUMED NOT TO CONTRIBUTE TO MASTER PLANNED INFRASTRUCTURE

NOVEMBER 2012
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SCALE 1" = 5000'

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TRACY

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basin specific soils data provided by The Surland Companies. Soil groups with watershed boundaries superimposed upon them are depicted in Figure 3-3.

3.4 RAINFALL LOSS AND SCS CURVE NUMBERS

Rainfall loss is that portion of the precipitation depth that is lost due to evaporation, interception by vegetation, infiltration into soil, and surface depression storage. Rainfall excess is that portion of the precipitation depth that appears as surface or collected stormwater runoff during and after a storm event. Rainfall loss consists of both initial and constant losses and were determined using the NRCS Curve Number (CN) Method that uses a soil cover complex for estimating watershed losses. The CN is related to the underlying hydrologic soil group (A, B, C, or D), land use, cover density, and soil moisture conditions. In addition to soil classification, the Curve Numbers are based on the vegetative cover. For the SDMP, a vegetative cover classified as "good" with grass cover on at least 75% of the area was assumed. The four hydrologic soil groups are described in greater detail as follows:

- *Group A:* Low runoff potential soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-drained sands or gravels. These soils have a high rate of water transmission. No Group A soils are located within the Study Area.

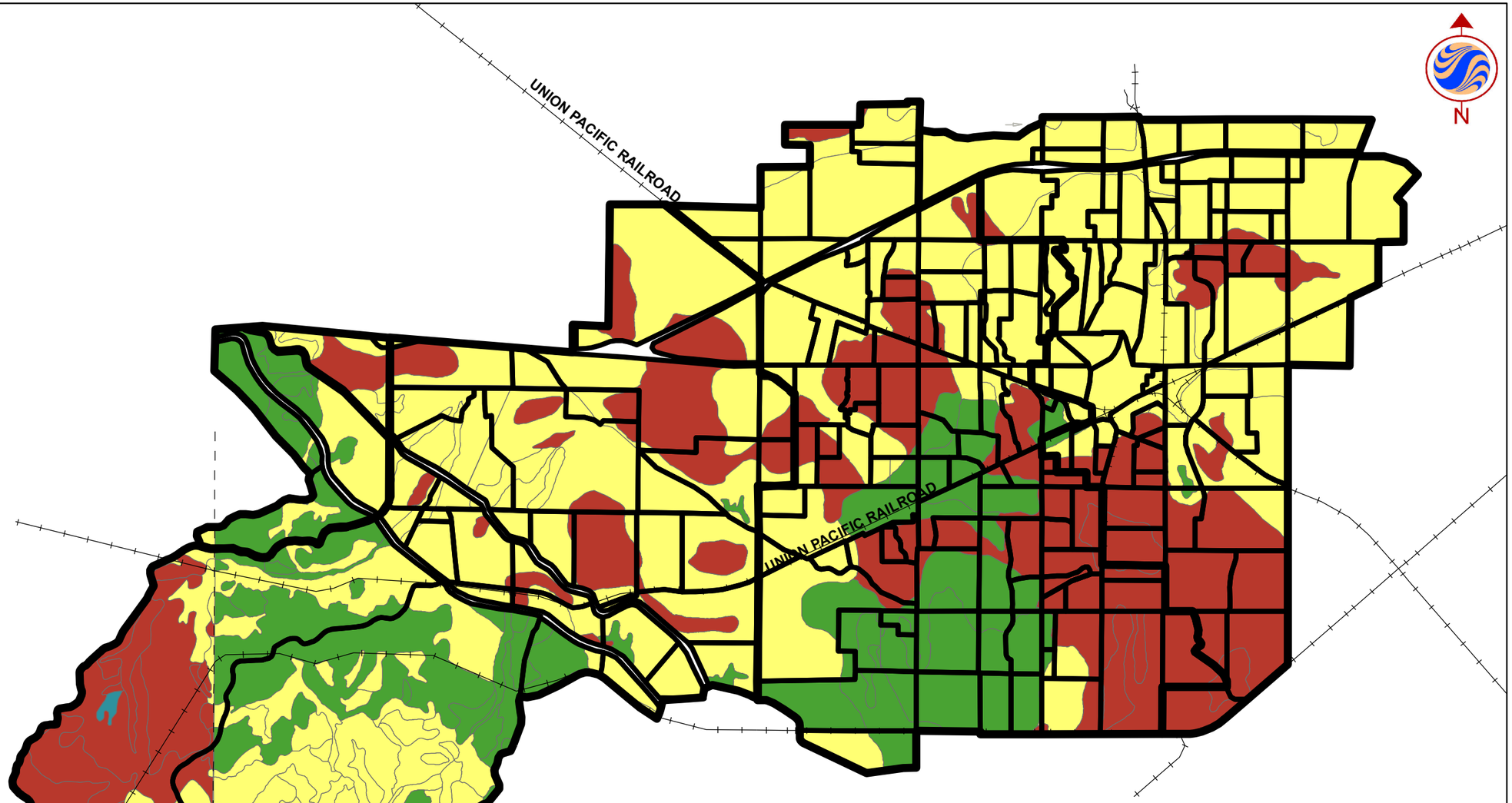
- *Group B:* Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained sandy-loam with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission. *A CN of 61 was used for Group B in the SDMP.*

- *Group C:* Soils having a low infiltration rate when thoroughly wetted and consisting chiefly of silt-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission. *A CN of 74 was used for Group C in the SDMP.*

- *Group D:* High runoff potential soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have slow rate of water transmission. *A CN of 80 was used for Group D in the SDMP.*

3.5 LAND USE ASSUMPTIONS AND PERCENT IMPERVIOUS

Land uses assumed in this SDMP were taken from the City's General Plan Amendment (see Figure 3-4a), with supplemental input and direction from City staff. The supplemental input and direction from City staff pertained to planning and urban reserve areas and was provided by Harris & Associates in June 2011 via the tabular listing shown on Figure 3-4b.



Legend

Watershed Boundaries

Railroad

Hydrologic Soil Group*

A

B

C

D

Group A
Low runoff potential soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-drained sands or gravels. These soils have a high rate of water transmission.

Group B
Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained sandy loam with moderately fine to moderately course textures. These soils have a moderate rate of water transmission.

Group C
Soils having a low infiltration rate when thoroughly wetted and consisting chiefly of silt-loam soils layer that impedes downward movement of water, or soils with moderately fine to fine texture. The soils have a slow rate of water transmission.

Group D
High runoff potential soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with moderately fine to fine texture. The soils have a slow rate of water transmission.

*Hydrologic Soil Groups Derived from Soil Surveys of San Joaquin and Alameda County prepared by the Natural Resources Conservation Service (NRCS), December 2007 (Supplemented by detailed soils data within sub-basins W41 and W41A by Engeo, September 2010).

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FIGURE 3-3

Title
SOILS MAP

NOVEMBER 2012
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SCALE 1" = 5000'

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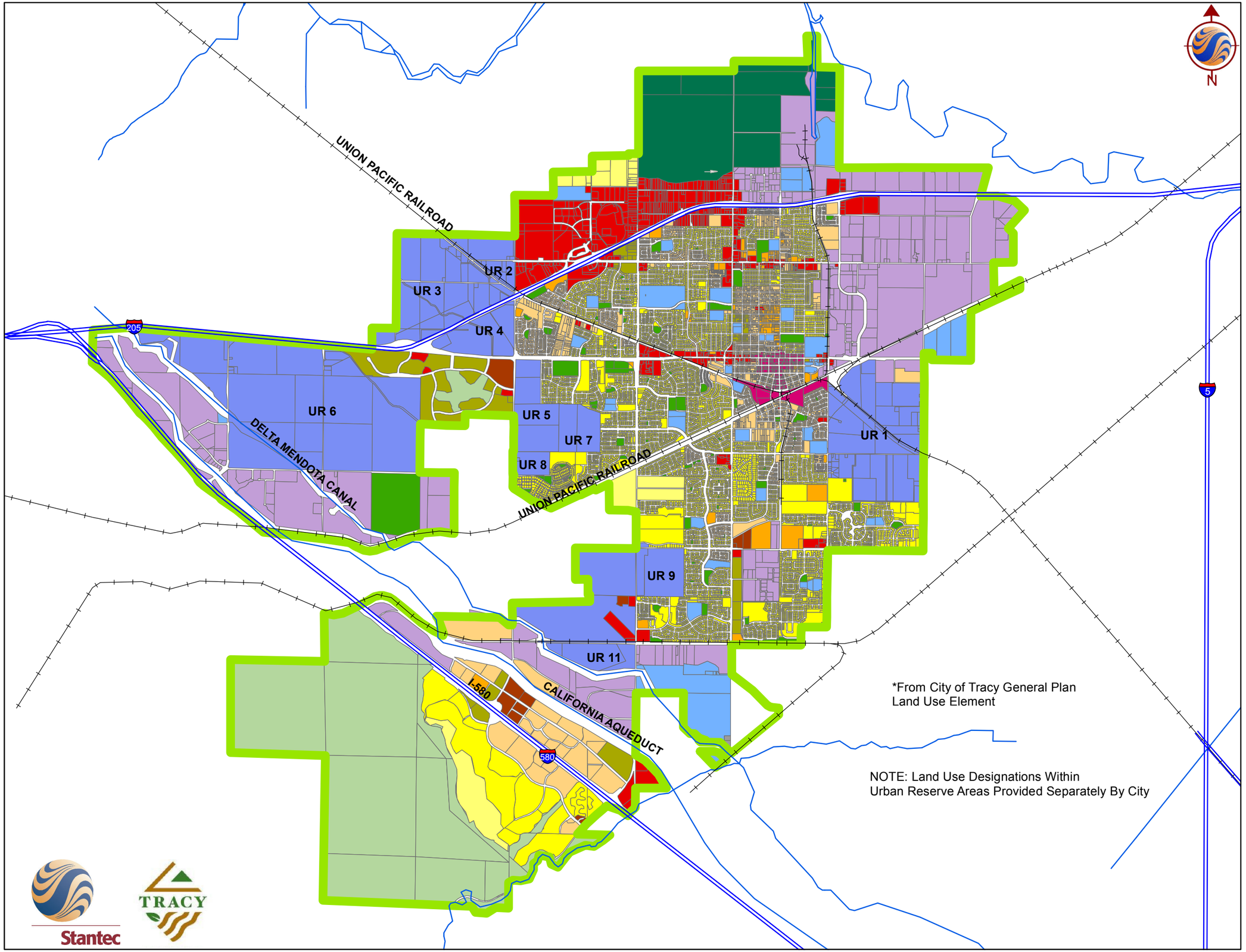

*From City of Tracy General Plan
Land Use Element

NOTE: Land Use Designations Within
Urban Reserve Areas Provided Separately By City

Legend

- Watershed Boundaries
- Sphere of Influence
- Highways
- Canals and Creeks
- Railroad

Land Use Designations

- Residential Very Low
- Residential Low
- Residential Medium
- Residential High
- Commercial
- Office
- Industrial
- Downtown
- Village Center
- Public Facilities
- Park
- Open Space
- Agriculture
- Aggregate
- Urban Reserve

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CITYWIDE STORM DRAINAGE
MASTER PLAN

FIGURE 3-4a

Title
LAND USE MAP*

NOVEMBER 2012
184010207
SCALE 1" = 5000'

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TRACY

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City of Tracy Infrastructure Master Plans DRAFT Land Use Assumptions

Density Breakdown

IMMPA Map ID Number	General Plan Planning Area/Common Name	Approximate Total Acres	Overall Density (Units per Gross Acre)	Very Low Density (1.5 DU per acre)		Low Density (4.35 DU per acre)		Medium Density (9 DU per acre)		High Density (18.75 DU per acre)		Industrial/ Business Park Industrial Acres (0.5 FAR)	Office/ Business Park Acres (0.45 FAR)	Retail/ Commercial Acres (0.30 FAR)	Public Facilities and Open Space
				units	acres	units	acres	units	acres	units	acres				
1	Westside Residential (URs 5, 7, 8, 9)														
1	UR 5 (Bright)	170	9.7			174	40	360	40	375	20			10	60
1	UR 7 (Bright)	107	6.8			174	40	432	48						19
1	UR 8 (Fahmy)	60	8.9			96	22	252	28	188	10				
1	UR 9 (Keenan)	130	7.7			305	70	387	43	319	17				
2	UR1 (Alvarez + others)	780	3.6	570	380	1305	300	585	65	469	25			10	
3	UR10 (Ellis)	320	7			531	122	837	93	581	31			35	39
4	UR11 (South Linne)	120										120			
5	Tracy Hills	2604		83	82	1591	539	3286	557	531	35	383		206	802
6	Gateway	550											491	59	
7	UR6 (Cordes Ranch)	1731										1437.7	152.2	56.3	84.4
8	UR4 (Bright Triangle)	185	18.75							750	40		50	95	
9	UR3 (Catellus)	700		60	40							535	40	45	40
10	UR2 (Filios)	43											7	36	
11	I-205 Expansion	172												172	
12	West Side Industrial	485										485			
13	East Side Industrial	368										368			
14	Larch Clover	498												498	
15	Chrisman Road	113											100	13	
16	Rocha	91	7.9			296	68			431	23				
17	Berg/Byron	54	9					450	50					4	
18	Kagehiro	47	5.85			250	47								
	PARKS - See note 15														
	SCHOOLS - See note 16														
	Totals	**9328**		**713**	**502**	**4721**	**1248**	**6589**	**924**	**3644**	**201**	**3329**	**840**	**1239**	**1044**
	Total Units														
	Total Acres														
	Population Estimate			2353		15578		17790		8016					43737

Explanations:

1. UR is "Urban Reserve", as defined in the General Plan
2. All acreages are approximate gross acres (not adjusted gross), based on the General Plan
3. Public Facilities in UR 5 (Westside Residential) is Kimball High School - 60 acres.
4. Industrial may accommodate flex office. Industrial max FAR is 0.5 per the General Plan
5. Commercial may accommodate residential high (12.1-25du/acre)
6. Residential Very Low =0.1 - 2 du/acre (1.5 DU per acre assumed)
7. Residential Low= 2.0 - 5.8 du/acre (4.35 du per acre assumed)
8. Residential Medium =5.9 - 12.0 du/acre (9 DU per acre assumed)
9. Residential High =12.1 - 25.0 du/acre (18.75 DU per acre assummed)
10. UR 7 includes the currently planned approx 19-acre storm detention pond (existing Srorm Drainage Master Plan)
11. UR 10 (Ellis) assumes 39 acres of public facilities per approved Specific Plan
12. Tracy Hills acres identified as Public Facilities are per the approved Specific Plan
13. Tracy Hills Density Calcs are per the Tracy Hills Specific Plan, not the GP
14. UR 3 identifies 40 acres for the I-205/Lammers Interchange
15. Park areas will be provided by MIG, Park & Rec. Master Plan consultant, at a future date. At 5 acres per 1000 people, the estimate of new parks is 220 acres.
16. School sites will be provided by City staff at a future date.

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CITY OF TRACY
CITYWIDE STORM DRAINAGE
MASTER PLAN

FIGURE 3-4b

Title

SUPPLEMENTAL LAND USE ASSUMPTIONS FOR PLANNING AND URBAN RESERVE AREA

NOVEMBER 2012

The percent of impervious area for each sub-basin was based on a weighted average of the amount and type of the different land uses within the sub-basins, as estimated by direct measurements of the various land uses shown in the General Plan Amendment (as supplemented by City staff). This is an important input parameter in the HEC-HMS program because the model relates the amount of impervious area to the total area of a given sub-basin to estimate the amount of runoff losses attributed to pervious areas. For the purposes of hydrologic modeling, design flow determination, and the planning of storm drainage facilities in this SDMP, future build-out of the City's Sphere of Influence was assumed.

Based on the SWQC Manual requirements (see Section 1.3.2), different land use percent impervious values were used for existing development and for future development. Our analysis of the impact of the use of sustainable infrastructure principles on storm runoff generation rates and volumes during a 100-year 24-hour storm resulted in a general reduction of runoff by roughly a 2-year return period storm peak runoff rate and total runoff volume by implementing practices required per the SWQC Manual with new development.

Using a calibration and hydrologic modeling of a prototype 2-square mile sub-basin within the City containing a broad mix of land uses, reductions in impervious cover percentage were estimated as a means of accounting for the implementation of measures outlined in the SWQC Manual in conjunction with new development. Table 3-1 shows the impervious cover percentages of the different land uses that have been utilized in the HEC-HMS models developed for this SDMP.

Table 3-1. Land Use Impervious Cover Values

Land Use Designation	% Impervious *(Existing and Infill Development)**	% Impervious *(New Development)***
Residential - Very Low Density	10	6
Residential - Low Density	25	16
Residential - Medium Density	35	22
Residential - High Density	65	41
Commercial/Retail	90	57
Office	90	57
Industrial	90	57
Downtown	90	57
Village Center	90	57
Public Facilities	60	38
Park	10	6
Open Space	3	2

* Provisions from City's *Manual of Stormwater Quality Control Standards for New Development and Redevelopment* **NOT applied**

** Provisions from City's *Manual of Stormwater Quality Control Standards for New Development and Redevelopment* **applied**

The values on the table that are proposed to be applied to Existing and small Infill Development areas assume that SWQC Manual provisions will not be applied and are essentially the same values that have been adopted and utilized by the City for several years. The values on the table that are proposed to be applied to New Development areas have been reduced by a uniform percentage reduction factor of 37% as a hydrologic modeling approach to account for the application of SWQC Manual practices. The 37% reduction factor is not an actual impervious cover reduction that will occur with the design of new development projects but represents the reduction in runoff rates and volumes that are projected to occur with the implementation of practices described in the SWQC Manual.

Please note that the hydrologic modeling procedures utilized in this SDMP, and particularly the reduction in % impervious values to model the effects of implementing SWQC Manual practices, are being applied to master plan level (major) storm drainage facilities, only, and are limited in application to the development of the storm drainage infrastructure master plan presented in this SDMP. The design of onsite storm drainage facilities shall continue to utilize the procedures set forth per the City Design Standards.

3.6 RAINFALL

For the purposes of the SDMP, two different areas of precipitation were used as shown in Table 3-2. The SCS 24-hour Type I Rainfall Distribution was used for the Study Area.

Table 3-2. Precipitation

	Eastside Watershed	**Westside, Lammers, and Mountain House Watersheds**
10-year return period storm	1.89 inches	1.85 inches
100-year return period storm	2.75 inches	2.69 inches

3.7 UNIT HYDROGRAPH

For runoff computations from each sub-basin, the NRCS Dimensionless Unit Hydrograph option was utilized in the HEC-HMS computer model.

3.8 LAG TIME

The temporal distribution of the unit hydrograph is a function of the basin lag time. The lag time is defined as a time required for 50 percent of the volume of runoff to reach the basin outlet and was estimated utilizing the NRCS method. The equation is as follows:

$$Lag = (L)^{0.8}(S+1)^{0.7}/1900(Y)^{0.5}$$

L = hydraulic length of watershed in feet

S = potential maximum surface retention = (1000/CN) -10

CN = hydrologic curve number

Y = average watershed land slope in percent

Parameters used for each sub-basin in lag time calculations and the resultant lag times are represented on Appendix B.

3.9 ROUTING

Routing of runoff between sub-basins was performed utilizing the Muskingum-Cunge method for open channel flow. The Modified Puls Reservoir Routing method was used to route flow through detention basins.

3.10 DETENTION BASINS

The proposed detention basins will store and attenuate stormwater runoff, which will significantly reduce the peak flows that would have otherwise overburdened the available downstream outfall systems, and they will provide opportunities for water quality treatment prior to discharge. Due to the capacity limitations associated with the downstream outfall systems and stormwater quality considerations, the detention basins proposed in this SDMP will have limited and regulated outflows as listed in the tables in Section 5. The detention basins were modeled by applying stage-storage and elevation-discharge curves to their inflow hydrographs.

3.11 RESULTS

The HEC-HMS output files are included in Appendix B. The flows at particular concentration points were used for infrastructure sizing and for hydraulic grade line calculations as discussed in the following sections.

Selected 10-year return period and 100-year return period discharges are shown at key locations throughout the Study Area on Figure 5-1b in Section 5 of this SDMP.

4.0 Hydraulic Analysis for Major Existing Conveyance Facilities

4.1 TRUNK LINE STORM DRAINS AND HYDRAULIC GRADE LINES

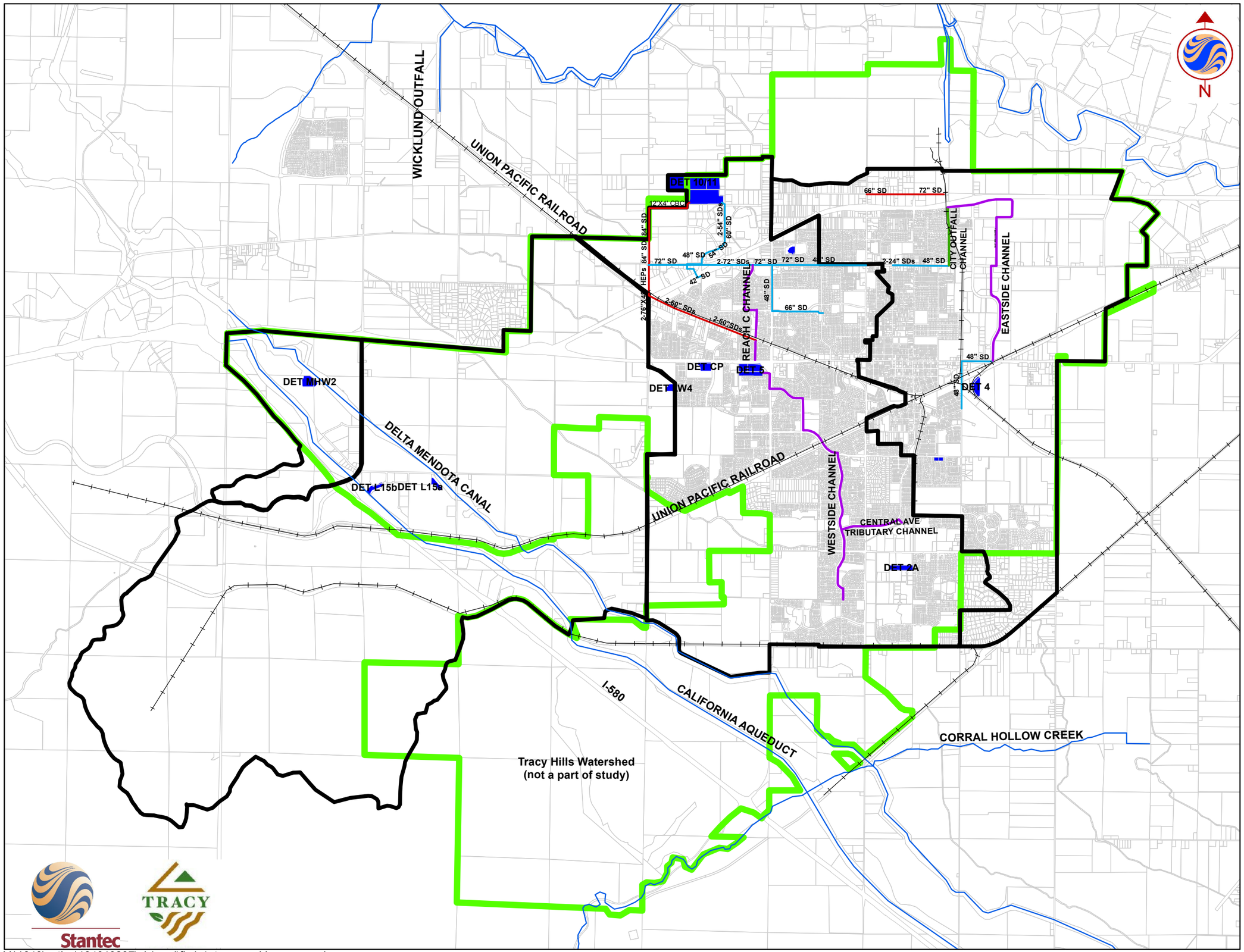
As a part of preparing this SDMP, hydraulic analyses have been performed for several of the City's major trunk line storm drains in order to determine Hydraulic Grade Line Elevations (HGLs) for reference purposes (see Figure 4-1). Depending on facility locations, age, function, and orientation within a given watershed, some trunk line storm drains are intended to have a 10-year return period storm capacity and some are intended to have a 100-year return period storm capacity. Accordingly, the HGL evaluations for each trunk line storm drain that has been analyzed have been based on the return period storm discharges for which each given storm drain was intended to convey.

HGL spreadsheets containing the results of hydraulic modeling are provided in Appendix C. The facility elevations and HGLs were predominantly derived from available plans for the facilities and have subsequently been vertically adjusted to conform to current City datum (NAVD 88) based on field survey spot checks.

4.1.1 Facilities Analyzed for a 10-Year Return Period Design Capacity

The trunk line storm drains analyzed for a 10-year return period storm include the following:

- Grant Line Road storm drain between the discharge to the WSID Main Drain at Lammers Road and Tracy Blvd. to the east.
- Corral Hollow Road storm drain from Grant Line Road south to Lowell Avenue.
- Lowell Avenue storm drain from Corral Hollow Road to Lincoln Blvd.
- I-205 Specific Plan storm drains along Naglee Road from DET 10/11 to Grant Line Road, west along Grant Line Road, and south across I-205.
- Grant Line Road storm drain from the discharge to the City Outfall Channel (west of MacArthur Drive) west to Parker Avenue.
- Eleventh Street storm drain from the Eastside Channel culvert discharge (at the Eleventh Street overpass) west to MacArthur Drive, and MacArthur Drive storm drain from Eleventh Street south to Leamon Street.



Legend

- Watershed Boundaries
- Sphere of Influence
- Existing Detention Basins
- Railroad

System Capacities

- 10-yr Return Period (Pipe)
- 100-yr Return Period (Pipe)
- 10-yr Return Period (Channel)
- 100-yr Return Period (Channel)

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Client/Project
CITY OF TRACY
CITYWIDE STORM DRAINAGE
MASTER PLAN

FIGURE 4-1

Title
CHANNELS/STORM DRAINS WITH HGL CALCULATIONS

NOVEMBER 2012
184010207
SCALE 1" = 5000'

4.1.2 Facilities Analyzed for a 100-Year Return Period Design Capacity

The trunk line storm drains analyzed for a 100-year return period storm include the following:

- Westside Channel Outfall System storm drains, extending upstream from DET 10/11 to the Byron Road/Belconte Drive intersection, including closed conduit segments extending along a farm access road between the southwest corner of DET 10/11 and Lammers Road, extending south along Lammers Road and the alignment of Lammers Road to Byron Road, and extending southeast along Byron Road to the Westside Channel at Belconte Drive.

- Larch Road storm drain extending between Tracy Blvd. and the Eastside Channel.

4.2 OPEN CHANNELS

As a part of preparing this SDMP, hydraulic analysis has been performed for the City's major existing open channels (see Figure 4-1). Depending on channel locations, age, function, and orientation within a given watershed, some open channels are intended to have a 10-year return period storm capacity and some are intended to have a 100-year return period storm capacity. The majority of the City's major open channels have a 100-year return period storm capacity.

The open channels have been modeled using the HEC-2 hydraulic model for channel reaches that were previously analyzed using the HEC-2 model, and the HEC-RAS model for open channels not previously analyzed or previously analyzed using the HEC-RAS model. HEC-2 and HEC-RAS model printouts containing the results of hydraulic modeling are provided in Appendix C. The channel and water surface elevations were predominantly derived from available plans for the facilities and have subsequently been vertically adjusted to conform to current City datum (NAVD 88) based on field survey spot checks.

4.2.1 Facilities Analyzed for a 10-Year Return Period Design Capacity

The major open channels analyzed for a 10-year return period storm include the following:

- City Outfall Channel – From Grant Line Road to the confluence with the Eastside Channel.

4.2.2 Facilities Analyzed for a 100-Year Return Period Design Capacity

The major open channels analyzed for a 100-year return period storm include the following:

- Westside Channel – From upstream limit to DET 5 (Plasencia Field), and from Eleventh Street to Byron Road adjacent to Belconte Drive.

- Central Avenue Tributary Channel – From upstream limit (east of Tracy Blvd. to the Westside Channel).

- Reach "C" Channel – From upstream limit (just north of Byron Road) to Grant Line Road.
- Eastside Channel – From upstream limit at Eleventh Street to the Sugar Cut Outfall, north of Arbor Avenue.

The Phase I South MacArthur channel segment extending upstream to the south of 11th Street was not modeled as it is presently in an interim phase of completion that will change in the future.

5.0 Master Plan Storm Drainage Infrastructure

5.1 FACILITY COMPONENTS

The proposed storm drainage infrastructure plan recommended in this SDMP includes a combination of the following components (see Figures 5-1a and 5-1b herein and larger versions of these Figures located in the pocket at the back of the report):

- Detention facilities
- Open channels, channel parkways, and greenbelt parkways
- Underground storm drains
- Pumping facilities (serving applicable detention basins)
- Percolation facilities, where feasible
- Interflow crossovers between systems
- Irrigation tailwater ditches
- Gravel extraction pit
- Temporary retention facilities

In general, new development projects will be required to provide site-specific or project-specific storm drainage solutions that are consistent with the overall infrastructure approach presented in this SDMP. The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions, including adjustments to alignments of linear storm drainage conveyance facilities and adjustments to configurations of detention facilities. Modifications and refinement to the storm drainage facilities master plan represented herein may be considered by the City during the Specific Plan and development review process for new development. However, any significant modifications to the elements of this SDMP must be approved by the City and will require that a formal “Supplement” be adopted by the City Council.

Figure 5-1b overlays 10-year and 100-year discharges at key locations on the proposed storm drainage infrastructure plan (a larger version of Figure 5-1b is in the pocket at the back of the report).

New development projects will be required to construct elements of the master plan infrastructure that have alignments that pass through them or extend along their project boundaries. The cost of construction of these master plan elements may be offset against other drainage funding requirements applicable to each project (such as drainage impact fees) or may

Legend

- Existing Storm Drain
- Proposed Storm Drain
- Existing Detention
- Proposed Detention
- Pipe Change
- Overchutes
- Culverts
- Proposed Culverts
- Outfalls
- Existing Pump Stations
- Existing Pump Station To Be Upgraded
- Proposed Pump Stations
- Subbasins
- Watershed Boundaries
- Sphere of Influence
- Existing Channel
- Proposed Channel Parkway
- Proposed Greenbelt Parkway
- Proposed Open Channel
- 100-yr Floodplain
- Drain Inlet to Delta Mendota Canal

DETENTION BASIN DATA

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET 1A	Proposed	5.1	8	Pump	33	2.0
DET 4[1]	Phase 1	30	131	Gravity	198	25.0
DET 12	Proposed	2	4	Gravity	37	8.0
DET 13	Proposed	2	4	Gravity	36	8.0
DET 14	Proposed	7	16	Pump	68	1.0
DET 15	Proposed	6	13	Pump	41	1.0
DET 16[2]	Proposed	14	34	Pump	69	1.0
DET NEI	Proposed	31	198	Pump	480	10.0
DET ROCHA	Proposed	5	11	Gravity	31	1.0
DET LC	Proposed	15	36	Pump	83	1.0
DET 2A	Existing	10	74	Gravity	137	5.0
DET 2B[3]	Proposed	4.2	30	Pump	67	5.0
DET SL	Proposed	8	17	Gravity	43	1.0
DET 3A	Proposed	20	36	Gravity	53	3.0
DET 3B	Proposed	9.5	25	Gravity	51	1.0
DET LOWELL	Proposed	3.5	14	Gravity	84	33.4
DET 5	Existing	20	45	Gravity	319	197
DET 10/11	Existing	80	486	Pump	599	10.0
DET CP	Existing	6	14	Gravity	48	9.0
DET V	Proposed	1.5	2	Pump	13	2.0
DET LW1	Proposed	35	90	Gravity	158	3.0
DET LW2	Proposed	11	27	Gravity	60	2.0
DET LW3	Proposed	48	87	Gravity	124	4.0
DET LW4	Existing	4	11	Pump	25	0.5
DET LW5	Proposed	3	7	Pump	18	0.5
DET LW6	Proposed	21	101	Gravity	218	4.0
DET LW7	Proposed	4	10	Gravity	27	0.5
DET LW8	Proposed	13	34	Gravity	91	1.5
DET LW9a	Proposed	25	89	Gravity	202	10.0
DET LW9b	Proposed	7	18	Gravity	52	1.0
DET LW10a/10b[4]	Proposed	9	20	Gravity	67	1.0
DET LW11	Proposed	12	30	Gravity	61	2.5
DET LW12	Proposed	6	13	Pump	44	0.5
DET OFF2	Proposed	25	182	Gravity	387	5.0
DET MHW2	Existing	10	68	Gravity	200	7.0
DET MHW3a/3b/3c	Proposed	10	37	Gravity and Pump	144	5.0

[1] Phase 1 (Existing) DET 4 is approximately 8 acres in area with storage of 13 acre-feet
[2] Discharge to be held until DET NEI is sufficiently drained to accept inflow
[3] Portion of DET 2B is existing City retention pond; 0.9 acres and 6 acre-feet of storage
[4] Discharge is to a proposed greenbelt parkway and DET LW10a/10b outflows will also enter DET LW9a to the north

Client/Project
CITY OF TRACY
STORM DRAINAGE MASTER PLAN

FIGURE 5-1a

Title
PROPOSED STORM DRAINAGE INFRASTRUCTURE

NOVEMBER 2012
184010207
SCALE = 1":1500'

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Legend

- Existing Storm Drain
- Proposed Storm Drain
- Existing Detention
- Proposed Detention
- Pipe Change
- Overchutes
- Culverts
- Proposed Culverts
- Outfalls
- Existing Pump Stations
- Existing Pump Station To Be Upgraded
- Proposed Pump Stations
- Subbasins
- Watershed Boundaries
- Sphere of Influence
- Existing Channel
- Proposed Channel Parkway
- Proposed Greenbelt Parkway
- Proposed Open Channel
- 100-yr Floodplain
- Drain Inlet to Delta Mendota Canal
- 22/35 — 10-yr discharge in cfs / 100-yr discharge in cfs

Bethany Rd
WICKLUND OUTFALL
OLD RIVER
WSID
Lammers Rd
Naglee Rd
Corral Hollow Rd
Tracy Blvd
SUGAR CUT OUTFALL
TOM PAINE SLOUGH
Alder Ave
Cedar
Mountain House Pkwy
Byron Rd
Middle Rd
UNION PACIFIC RAILROAD
WSID MAIN DRAIN
Grant Line Rd
I-205 EXPANSION
I-205
Larch Rd
LARCH CLOVER
Clover Rd
Holly Dr
Arbor Ave
EAST SIDE INDUSTRIAL
Pescadero Ave
EAST SIDE INDUSTRIAL
Von Sosten Rd
CATELLUS
WSID SUB MAIN DRAIN
WSID LOWER MAIN CANAL
BERG/BYRON
Lowell Ave
Byron Rd
Eleventh St
BRIGHT
Hansen Rd
East St
Chrisman Rd
CHRISMAN ROAD
Eleventh St
Sixth St
Third St
Bird Rd
DELTA MENDOTA CANAL
MH1
MH2
MH3
OFF1
OFF2
OFF3
OFF4
OFF5
CORDES RANCH
GATEWAY
WSID UPPER MAIN CANAL
WEST SIDE INDUSTRIAL
WEST SIDE INDUSTRIAL
Lammers Rd
UNION PACIFIC RAILROAD
KAGEHIRO
KEENAN
ELLIS
SOUTH LINNE
Corral Hollow Rd
UNION PACIFIC RAILROAD
Valpico Rd
Schulte Rd
ROCHA
UR 1
Linne Rd
TRACY HILLS
I-580
CALIFORNIA AQUEDUCT
EXISTING GRAVEL PIT (TERMINAL DRAINAGE FOR TRACY HILLS)
Tracy Blvd

DETENTION BASIN DATA

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET 1A	Proposed	5.1	8	Pump	33	2.0
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DET 15	Proposed	6	13	Pump	41	1.0
DET 16[2]	Proposed	14	34	Pump	69	1.0
DET NEI	Proposed	31	198	Pump	480	10.0
DET ROCHA	Proposed	5	11	Gravity	31	1.0
DET LC	Proposed	15	36	Pump	83	1.0
DET 2A	Existing	10	74	Gravity	137	5.0
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DET LW3	Proposed	48	87	Gravity	124	4.0
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DET LW6	Proposed	21	101	Gravity	218	4.0
DET LW7	Proposed	4	10	Gravity	27	0.5
DET LW8	Proposed	13	34	Gravity	91	1.5
DET LW9a	Proposed	25	89	Gravity	202	10.0
DET LW9b	Proposed	7	18	Gravity	52	1.0
DET LW10a/10b[4]	Proposed	9	20	Gravity	67	1.0
DET LW11	Proposed	12	30	Gravity	61	2.5
DET LW12	Proposed	6	13	Pump	44	0.5
DET OFF2	Proposed	25	182	Gravity	387	5.0
DET MHW2	Existing	10	68	Gravity	200	7.0
DET MHW3a/3b/3c	Proposed	10	37	Gravity and Pump	144	5.0

[1] Phase 1 (Existing) DET 4 is approximately 8 acres in area with storage of 13 acre-feet
[2] Discharge to be held until DET NEI is sufficiently drained to accept inflow
[3] Portion of DET 2B is existing City retention pond; 0.9 acres and 6 acre-feet of storage
[4] Discharge is to a proposed greenbelt parkway and DET LW10a/10b outflows will also enter DET LW9a to the north

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STORM DRAINAGE MASTER PLAN

FIGURE 5-1b

Title
10-YEAR AND 100-YEAR DISCHARGES AT KEY LOCATIONS

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be classified as eligible for future reimbursements within time frames to be determined by the City. In some instances, the City may require or may accept the construction of offsite facilities or interim versions of master planned facilities as appropriate.

5.1.1 Detention Facilities

Detention basins are a significant and necessary component of the proposed master plan facilities that will serve new development in this SDMP. Though there are several important goals and benefits associated with the incorporation of detention basins as a storm drainage facility component, the primary driving factors that warrant detention basins are limitations in downstream outfalls and discharge capacities and the need to provide significant storm water quality enhancement. New detention basins will provide a significant amount of storage capacity and will provide significant attenuation of peak flows to meter downstream releases of stormwater to reduced rates that are considered to be reasonable, acceptable, and environmentally sound. All proposed detention basins have been sized to accommodate the 100-year 24-hour storm under build-out conditions, considering outflow discharge rates.

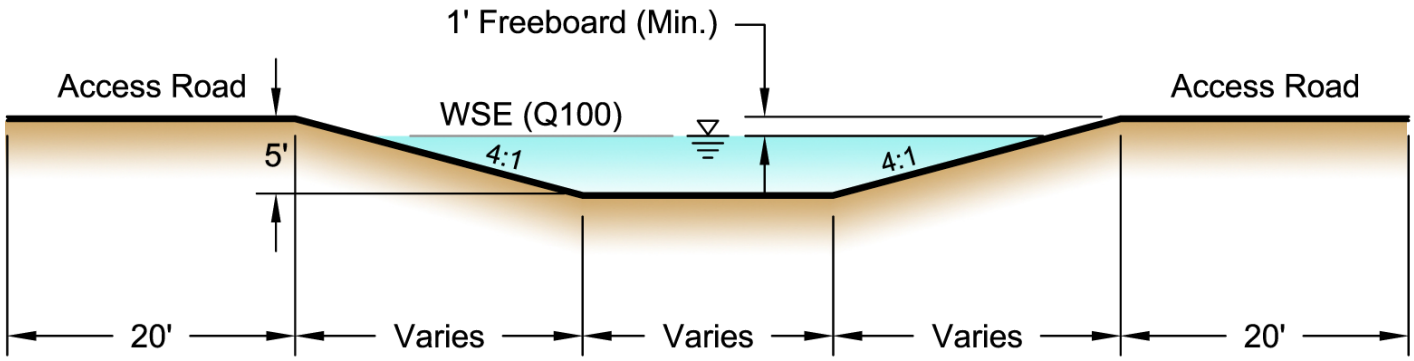
The surface areas of the proposed detention basins, including access roadways and appurtenant features, range from less than 2 acres to 48 acres. Detention basin depths have been typically assumed to be five feet as a general template for most proposed detention basins, including one foot of freeboard above the 100-year water surface elevation. An additional 20% has been added to the surface area of assumed excavation for the detention basins to account for setbacks and provision for vehicular access around them and to the lower areas to facilitate maintenance. Some detention basins have been sized based on a more specific evaluation of a given site. A detention basin typical cross-section is shown in Figure 5-2. The amount of storage required in applicable detention facilities as presented in this SDMP has not been reduced by a potential rate of percolation.

During the actual design of detention basins, depths, configurations and surface areas may need to be adjusted to conform to local topography, groundwater depths and other physical and technical considerations. *Development planning and design proposals to make geometric adjustments to detention basins will also be given reasonable consideration by the City as long as the functional storage volumes, outflow rates, and other hydraulic parameters presented in this SDMP are retained. These geometric adjustments may be made during the Specific Plan and/or development review process for future service areas or individual projects, where applicable.* If berms are integrated into the basin's design, spillways shall be provided above the 100-year water surface elevation in order to control any overflow and provide for emergency releases should the design storm be exceeded.

As part of the future detailed design of the detention basins recommended in this SDMP, the City encourages the integration of aesthetic treatments, including active or passive joint-use recreational components. This SDMP does not specifically identify park-related joint-use components to be incorporated into any of the proposed detention basins, although it is a goal that joint-use elements be incorporated into detention basins wherever possible. By combining

Notes:

1. This is the typical cross-section assumed in the SDMP to estimate surface area of most detention basins. Actual geometry and dimensions will vary based on topography and site specific requirements.
2. Joint-use elements (active and passive recreation) are encouraged with all new detention basins and will require additional land area, grading, and contouring not shown in this cross-section or accounted for in the SDMP land acquisition requirements.
3. Components that promote percolation shall be incorporated into detention basins located in areas having permeable soils.



Detention Basin Typical Cross-Section

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CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 5-2

Title

DETENTION BASIN TYPICAL CROSS-SECTION

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lands allocated to storm water detention with lands allocated to parks or open space, the functional, recreational, environmental and aesthetic value of these facilities will be dramatically improved. Detention basin land area requirements and cost estimates represented in this SDMP account for the acreage required to accommodate the storage volumes needed for flood control only, and additional land area will be required to incorporate provision for joint-use recreation facilities and differential grading, if such facilities are proposed.

An optimized joint-use detention basin will serve to:

- Maximize efficient use of land
- Satisfy attenuation needs for reducing peak flood flows
- Provide storm water quality treatment
- Expand community recreational opportunities, with minimal “down time” for recreation elements (and/or) provide habitat, recharge, and other environmental benefits
- Incur reasonable maintenance requirements and costs
- Serve as a functional open space amenity for the City

With regard to integrating recreation elements as a joint-use into storm water detention facilities, there are several fundamental guidelines that should be followed. They are:

- Low flow must be accommodated in a manner that confines the frequent inundations to areas that will create minimal nuisance or disruption of recreational uses and will characteristically require only limited maintenance.
- Contouring (differential grading) within detention facilities is recommended to create internal elevation variations (or tiers) that have differing frequencies and depths of inundation and differing flood risk.
- Internal drainage within detention facilities should provide for positive flow across elevated tiers and to the lowest lying areas of the facilities.
- Internal slopes should be flat enough to allow for mowing of turf areas and to allow other routine recreational-related maintenance activities to occur.
- Hydraulic design components should be included as needed (inflow structures, outflow structures, pump stations, sediment basins, spillways, surcharge structures, etc.).
- Other requirements as dictated by jurisdictional regulations and policies, local site conditions or additional functional uses should be followed.

In general, passive recreational elements should be incorporated in portions of detention facilities having the greatest potential flood risk and frequency. Active recreation elements are more suitable in areas within detention facilities having lesser degrees of flood risk and frequency.

Table 5-1 that follows lists all existing and proposed detention basins that will serve the buildout of new development in the Sphere of Influence and provides a brief, generalized opinion regarding their potential to serve as joint-use facilities.

Table 5-1. Listing of Existing & Proposed Detention Basins & Potential Suitability for Joint-Use

Detention Basin	Status	Acreage (ac) Needed for Drainage	Joint Use Potential	Comments/ Opportunities
DET 1A	Proposed	5	Good	Linear, passive trail/habitat area along railroad
DET 4	Phase 1	30	Poor	Boundary constraints, little differential grading
DET 12	Proposed	2	Fair	Landscaping adjacent to future parking facilities, high groundwater
DET 13	Proposed	2	Fair	Landscaping adjacent to future parking facilities, high groundwater
DET 14	Proposed	7	Fair	Can be expanded to provide differential grading, high groundwater
DET 15	Proposed	6	Fair	Can be expanded to provide differential grading, high groundwater
DET 16	Proposed	14	Fair	Can be expanded to provide differential grading, high groundwater
DET NEI	Proposed	31	Poor	Boundary constraints, little differential grading
DET ROCHA	Proposed	5	Good	Can be expanded to provide differential grading
DET LC	Proposed	15	Good	Passive habitat viewing adjacent to proposed sports complex, high groundwater
DET 2A	Existing	10	Poor	Boundary constraints, little differential grading, very deep
DET 2B	Proposed	4	Poor	Boundary constraints, little differential grading, very deep
DET SL	Proposed	8	Fair	Detention basin is internal to a proposed industrial development
DET 3A	Proposed	20	Good	Can be expanded to provide differential grading

Table 5-1. Listing of Existing & Proposed Detention Basins & Potential Suitability for Joint-Use				
Detention Basin	**Status**	**Acreage (ac) Needed for Drainage**	**Joint Use Potential**	**Comments/ Opportunities**
DET 3B	Proposed	10	Good	Can be expanded to provide differential grading
DET LOWELL	Proposed	3.5	Poor	Boundary constraints, little differential grading
DET 5	Existing	20	Fair	Plasencia Field, boundary constraints, little differential grading, turf only
DET 10/11	Existing	80	Poor	Boundary constraints, little differential grading, high groundwater
DET CP	Existing	6	Good	Community Center Park, existing joint-use basin w/ low flow area & soccer fields
DET V	Proposed	2	Good	Linear recreation
DET LW1	Proposed	35	Fair	Can be expanded to provide differential grading, high groundwater
DET LW2	Proposed	11	Fair	Can be expanded to provide differential grading, high groundwater
DET LW3	Proposed	48	Good	Proposed wet detention basin (lake) within Tracy Gateway
DET LW4	Existing	4	Fair	Kimball HS, possible potential for expansion
DET LW5	Proposed	3	Good	Can be expanded to provide differential grading
DET LW6	Proposed	21	Good	Can be expanded to provide differential grading
DET LW7	Proposed	4	Good	Can be expanded to provide differential grading
DET LW8	Proposed	13	Good	Can be expanded to provide differential grading
DET LW9a	Proposed	25	Good	Can be expanded to provide differential grading
DET LW9b	Proposed	7	Good	Can be expanded to provide differential grading
DET LW10a/10b	Proposed	9	Good	Can be expanded to provide differential grading
DET LW11	Proposed	12	Good	Can be expanded to provide differential grading
DET LW12	Proposed	6	Good	Can be expanded to provide differential grading
DET OFF2	Proposed	25	Good	Flood control detention upstream of I-580, differential grading available within the site
DET MHW2	Existing	10	Fair	Passive habitat area

Table 5-1. Listing of Existing & Proposed Detention Basins & Potential Suitability for Joint-Use				
Detention Basin	**Status**	**Acreage (ac) Needed for Drainage**	**Joint Use Potential**	**Comments/ Opportunities**
DET MHW3a/3b/3c	Proposed	10	Good	Can be expanded to provide differential grading

In some instances, the City may consider allowing certain future detention basins to remain privately owned and maintained as component of an integrated system. When private ownership is proposed by a development entity, the City will consider the viability of the proposal during the Specific Plan and/or development review process. If private ownership is deemed to be acceptable by the City, the City will establish appropriate governing requirements on a case-by-case basis. The City's SWQC Manual includes provisions, requirements and sample agreements pertaining to private ownership of onsite storm water quality measures, and some of this information may be pertinent when considering requirements for retaining private ownership for detention basins.

An additional benefit of detention basins is improved water quality. Detention basins provide attenuation storage and opportunities for pollutants to settle and be retained within the basin prior to the stormwater being discharged to downstream conveyance elements, other detention basins and/or receiving waters. Detention basins have been used as an acceptable BMP to help the City achieve improvements in stormwater quality. In general, a properly designed and maintained detention basin (that holds stormwater for a prescribed period of time) will reduce the concentration of pollutant constituents discharged into receiving waters by providing for volatization, settlement, and subsequent absorption by vegetative matter and the soil. Suspended solids, heavy metals, hydrocarbons, sediments, and possibly some organic compounds are the most predominant constituents that would be expected to have reduced levels of concentrations after detention storage.

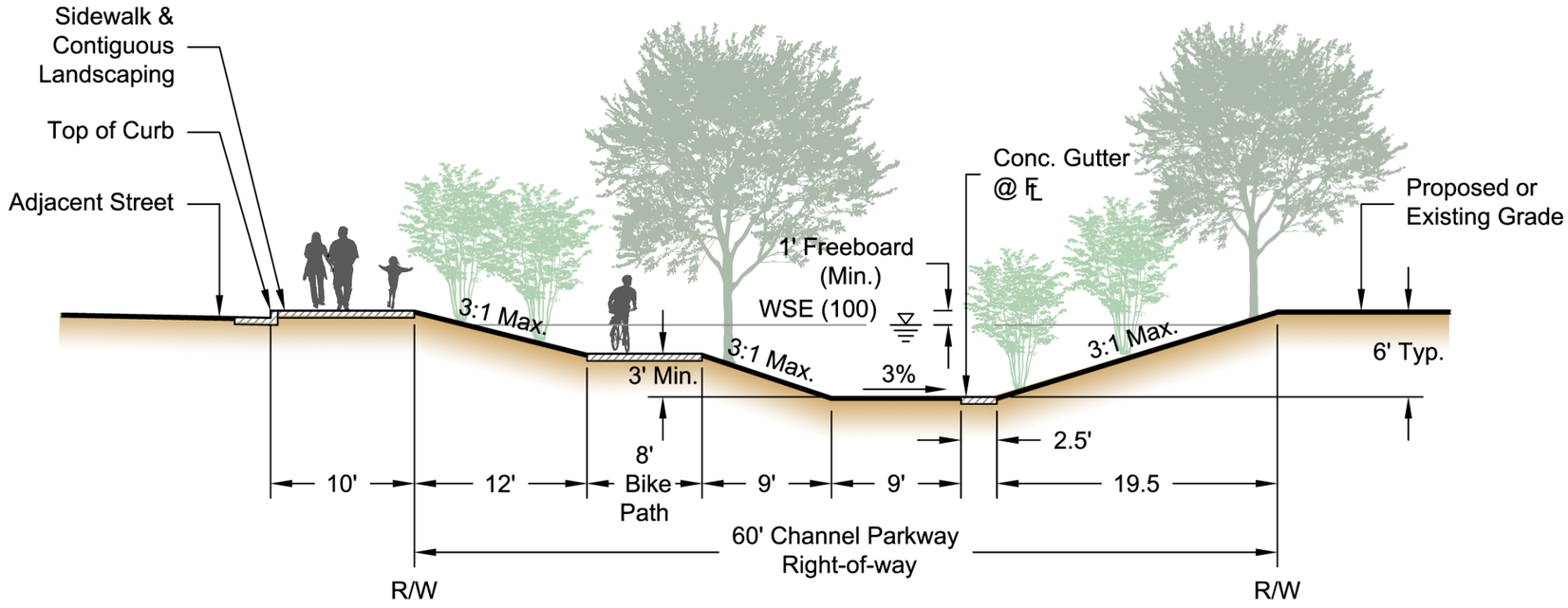
For individual detention basins having very low design outflow rates, site-specific conditions may warrant the incorporation of additional measures to satisfy mosquito vector control requirements. These measures may include additional design components to promote accelerated draining by percolation, aeration, treatment, and/or additional pumping under certain conditions.

5.1.2 Open Channels, Channel Parkways, and Greenbelt Parkways

The storm drainage infrastructure master plan includes several existing and proposed Open Channels, Channel Parkways, and/or Greenbelt Parkways for conveyance of storm runoff to a downstream detention basin or other facilities. These facilities also assist in providing desired levels of flow attenuation and storm water quality treatment while also creating a community amenity. Typical cross sections are shown in Figure 5-3 (Channel Parkway), Figure 5-4 (Open Channel), and Figure 5-5 (Greenbelt Parkway).

Notes:

1. Channel landscaping to be provided per criteria set forth in the City of Tracy Parks and Parkways Design Manual.
2. Bike path elevation meanders between 3' above channel bottom and top of bank.



Channel Parkway Typical Cross-Section

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CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 5-3

Title
CHANNEL PARKWAY TYPICAL CROSS-SECTION

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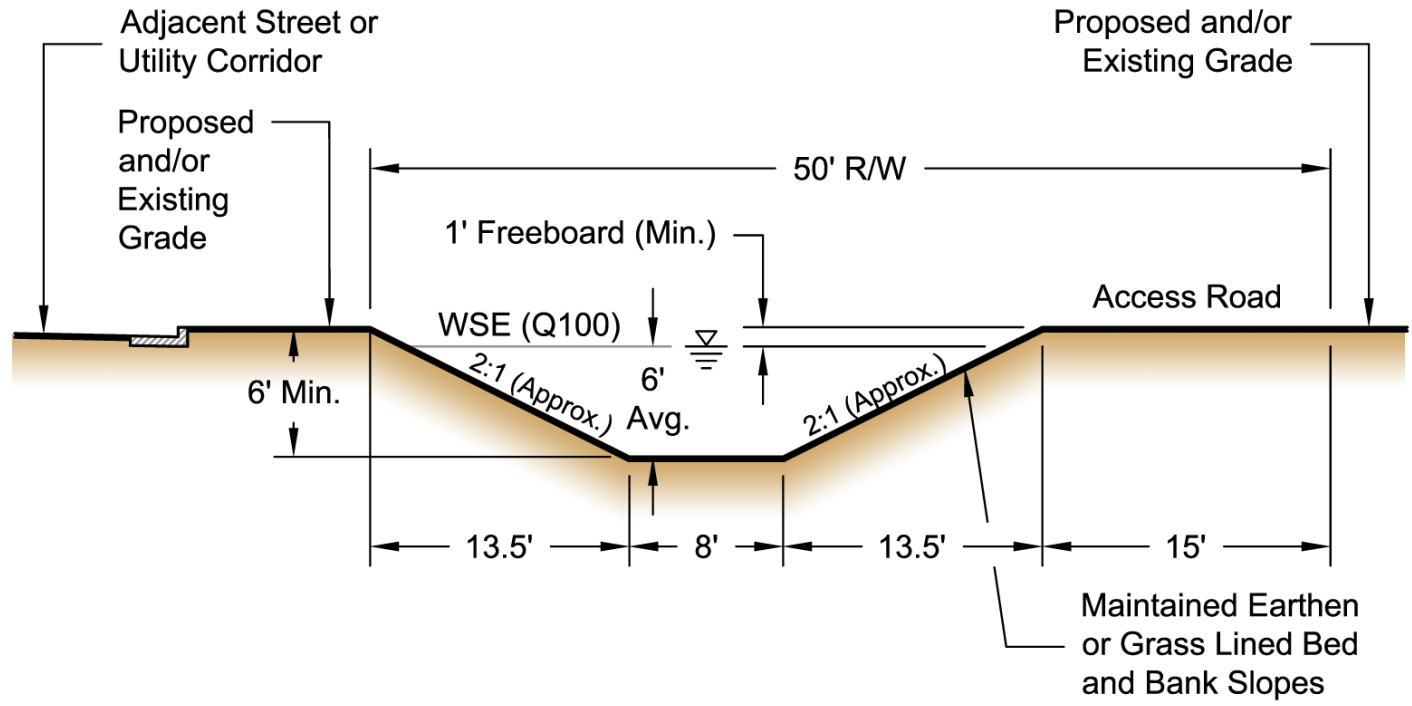

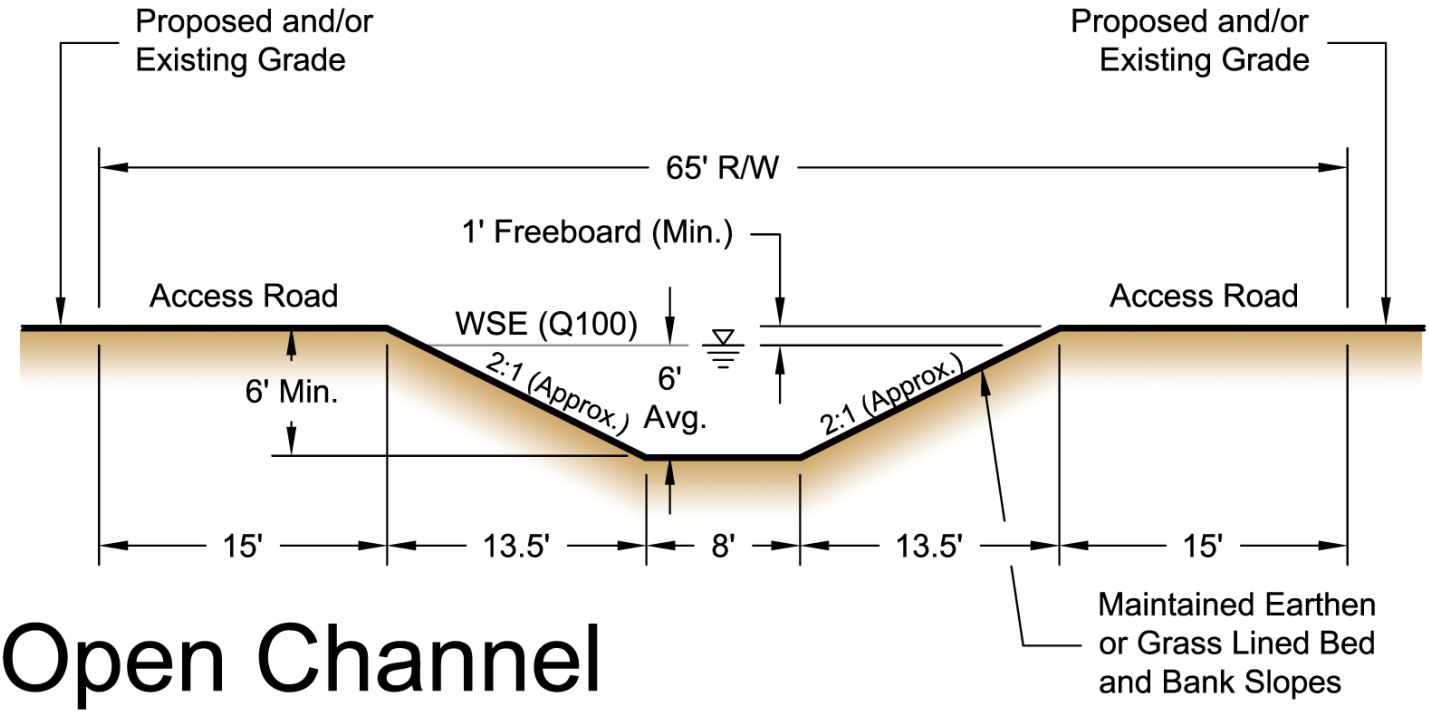

Open Channel Typical Cross-Sections

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CITYWIDE STORM DRAINAGE
MASTER PLAN

FIGURE 5-4

Title

OPEN CHANNEL TYPICAL CROSS-SECTION

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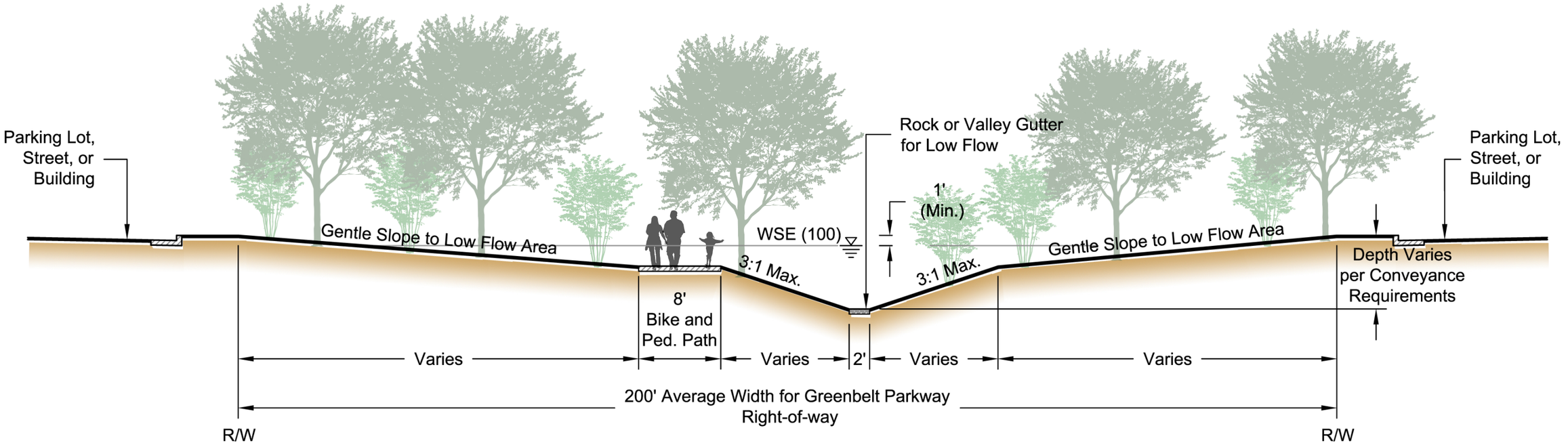
Notes:

1. Low flow area will consist of natural channel through Cordes Ranch planning area where jurisdictional habitat and Waters of the United States are present.
2. Greenbelt Parkway width will vary and be a function of site specific design approved by the City.
3. Landscape and parkway amenities will be established on a site specific basis and subject to City approval



Greenbelt Parkway Typical Cross-Section

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CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 5-5

Title
GREENBELT PARKWAY TYPICAL CROSS-SECTION

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Existing Channel Parkways constructed in the City include the following:

- Westside Channel (Westside Channel Watershed).
- Reach "C" Channel (Westside Channel Watershed).
- Central Avenue Tributary Channel (Westside Channel Watershed).
- Eastside Channel from 11th Street north to a location approximately 1,500 feet south of Grant Line Road (Eastside Channel Watershed).

The Phase 1 South MacArthur Channel extends south from 11th Street and is essentially an upstream extension of the Eastside Channel. Presently, it is a non-landscaped open channel, but is intended to be widened, reconfigured, and landscaped to become a Channel Parkway at some time in the future.

Other than the Channel Parkways mentioned above, there are no additional Channel Parkways specifically recommended in this SDMP.

The Open Channel typical cross-section (Figure 5-4) only applies to a proposed Open Channel extending between Grant Line Road and Pescadero Avenue in the Northeast Industrial Area (Eastside Channel Watershed), and there are no additional new Open Channels specifically recommended in this SDMP.

The following existing open channels serve as City storm drainage conveyance elements within existing development areas:

- Eastside Channel from approximately 1,500 feet south of Grant Line Road north to the Sugar Cut Outfall (Eastside Channel Watershed).
- City Outfall Channel (Eastside Channel Watershed).
- Phase 1 South MacArthur Channel, interim (Eastside Channel Watershed).
- Plan "C" Yellow Zone Channel (Westside Channel Watershed).

These existing open channels vary in cross-section and do not follow the typical Open Channel cross-section (Figure 5-4).

There are no existing Greenbelt Parkways serving the City, and Greenbelt Parkways recommended in this SDMP are all proposed within future development areas. Greenbelt Parkways have been assumed to have an average width of 200 feet, though it is expected that the actual width will undulate and be variable based on function and aesthetics. Recreational uses provided within greenbelt parkways will be defined in greater detail as a part of the development of the City's Park Master Plan, project Specific Plans, and individual development project planning efforts.

5.1.3 Underground Storm Drains

Underground storm drains have been incorporated into the master planned facilities within existing development areas that have constrained right-of-way, for low-flow outfall facilities that serve proposed detention basins, and for some discharge facilities leading to proposed detention basins. For the most part, underground storm drains are proposed to be aligned within the public right-of-way for streets. For alignments that do not follow streets, it has been assumed that a 20' wide drainage easement will need to be acquired by the City.

5.1.4 Pumping Facilities

Several proposed detention basins are topographically situated in a manner that gravity outflows to downstream conveyance facilities are not possible. In these instances, pump stations and force mains of low capacity are proposed to facilitate the draining of these applicable detention basins.

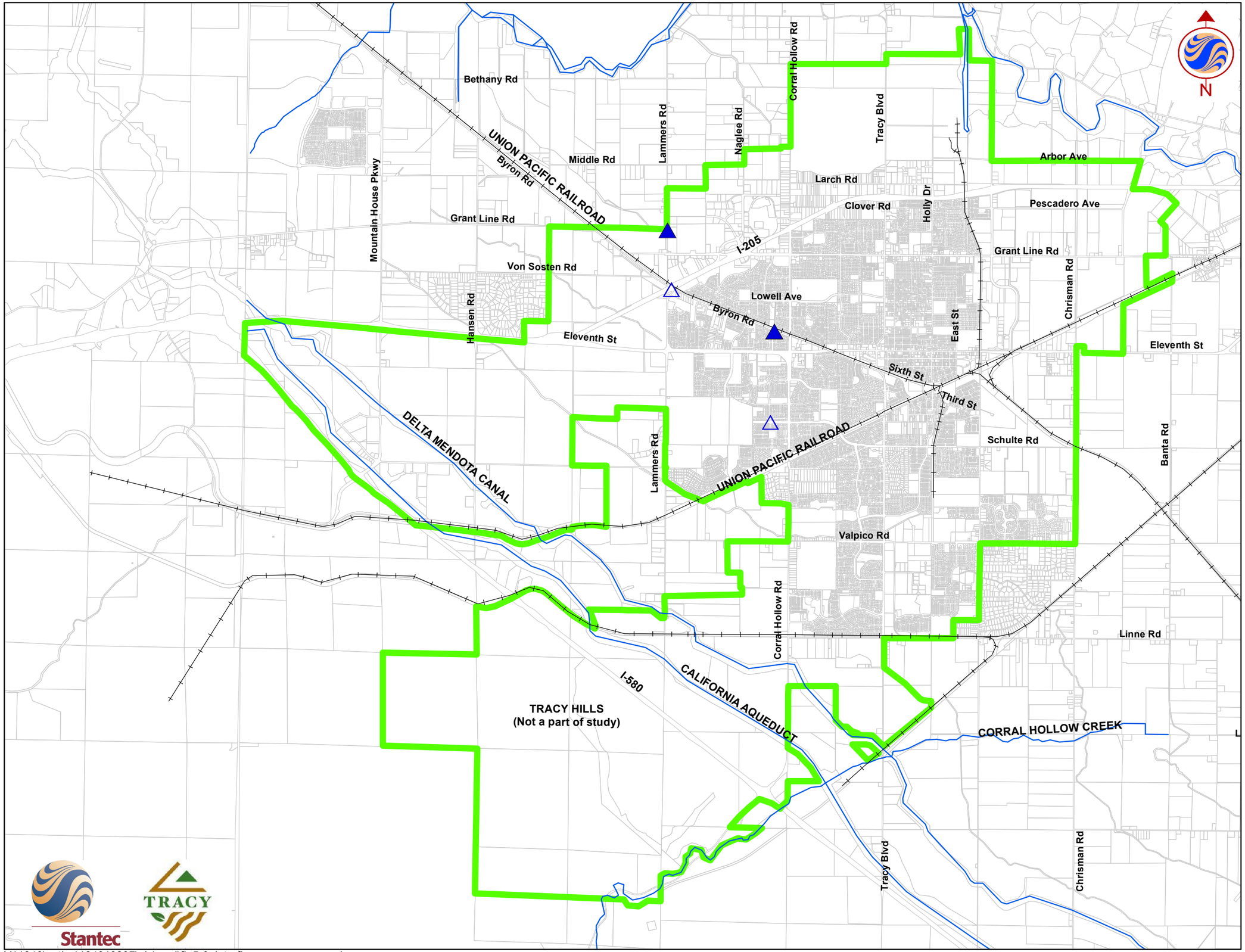
5.1.5 Percolation Facilities

Detention basins proposed within upland areas that have subsurface soils that are found to be suitable for percolation and other locations deemed feasible shall incorporate low-lying components (such as gravel beds) that promote percolation as a supplementary terminal drainage component to gravity or pumping facility outflows. The inclusion of percolation facilities is intended to aid in achieving sustainability by further reducing downstream impacts of land development on runoff production, improving storm water quality, and promoting recharge, where feasible. The volume of detention storage required for applicable detention basins as presented in this SDMP has not been reduced to account for any assumed percolation capabilities and rates. In some specific locations and instances where high percolation rates and capabilities are well documented and supported, the City may consider accepting a degree of reduction in the ultimate required volume for individual detention basins. If a volume reduction is accepted by the City, it will only account for a portion of the assumed percolation rates given that there are inherent uncertainties associated with the long-term function and effectiveness of percolation facilities.

5.1.6 Interflow Crossovers between Systems

Where feasible, interflow crossovers are proposed to allow the City and WSID to move stormwater from one system to another to facilitate maintenance activities or to provide additional options in the event of a hazardous spill into the system or downstream capacity issues during a major storm event. There are presently two (2) existing crossover opportunities available within the Westside Channel Watershed between City facilities and WSID facilities as shown in Figure 5-6. The locations of these existing crossovers are:

- City 84" SD and WSID Main Drain, at Lammers Road roughly 1,350 feet north of Grant Line Road.



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CITYWIDE STORM DRAINAGE
MASTER PLAN

FIGURE 5-6

Title
INTERFLOW CROSSOVERS BETWEEN SYSTEMS

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SCALE 1" = 5000'

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- City open channel and WSID pipeline at the intersection of Belconte Drive and Byron Road.

An additional interflow crossover is proposed to connect the future Lammers Watershed outflow pipeline with existing City 2-60" SDs near the intersection of Lammers Road and Byron Road.

There is also a 48" SD in Schulte Road west of Corral Hollow Road that may be extended further west to allow diversion of flow from future DET 3A and some Plan "C" residential developments into future DET 3B if warranted.

5.1.7 Irrigation Tailwater Ditches

The 2010 Drainage Agreement (as well as the 2002 Drainage Agreement) between the City and WSID provides for the discharge of up to 145 cfs of City storm runoff to the WSID Main Drain tailwater ditch (Appendix D). This discharge rate cannot physically be attained at present due to limitations in capacity for an existing 72" SD in Grant Line Road east of I-205. It is also being proposed by the City that up to 30 cfs be delivered to WSID's Sub-Main Drain as an attenuated (metered) discharge rate from new development in the Lammers Watershed. The WSID Sub-Main Drain discharges to the WSID Main Drain at San Jose Road north of Byron Road. In November 2010, the WSID Board of Directors approved the 2010 Drainage Agreement that authorizes the Lammers Watershed discharge of up to 30 cfs to WSID facilities, subject to the payment of fees and other requirements. The Tracy City Council adopted the 2010 Drainage Agreement at a City Council public meeting in December 2010.

5.1.8 Gravel Extraction Pit

A large existing sand and gravel extraction pit located on the east side of Tracy Blvd. across from the Tracy Municipal Airport is proposed to serve as the terminal point of discharge for storm runoff generated within the future Tracy Hills development. This proposed solution is addressed in the separate storm drainage master plan document prepared for Tracy Hills by Nolte Associates, Inc. An alternate existing sand and gravel extraction pit may potentially be identified for this purpose.

5.1.9 Temporary Retention Facilities

When new development projects are not located near existing or proposed detention basins or conveyance facilities leading to detention basins, the City often considers allowing the use of temporary retention basins as an interim drainage solution, subject to appropriate engineering substantiation regarding feasibility. When temporary retention basins are approved by the City, the project developer is required to maintain them until the storm drainage system for the development project is connected to the City's permanent storm drainage system and the temporary storm drainage basin is filled and decommissioned. In the event that temporary retention basins are approved by the City for individual or groups of development projects, said approvals will only be provided with the understanding or anticipation that a permanent solution that will allow for the decommissioning of applicable temporary retention basins within a

reasonable time frame is imminent. The City may require that the developer deposit enough funds in advance with the City to pay for the future decommissioning of a temporary storm retention basin.

Since temporary retention facilities have no outfall, the City Design Standards do not allow the required storage volume to be reduced by the rate of percolation.

5.2 EASTSIDE CHANNEL WATERSHED

Within the Eastside Channel Watershed, the following existing storm drainage facilities currently serve existing development:

- Eastside Channel
- City Outfall Channel
- Phase I South MacArthur Channel
- Phase I of Detention Basin DET 4
- Pump station serving the existing Larch Road storm drain at its discharge to the Eastside Channel
- Various Trunk Line and Lateral Storm Drains
- Temporary Retention Basins

In order to complete the storm drainage infrastructure needed to serve the future buildout of the Eastside Channel Watershed, the following master plan storm drainage facilities are recommended for construction as the need arises, subject to available funding:

- Upgrading of the Phase I South MacArthur Channel to improve capacity and convert it to a Channel Parkway per Figure 5-3.
- Augmentation of DET 4 to its ultimate configuration and capacity to accommodate new upstream development.
- Facilities that will serve the Northeast Industrial Area, including storm drains and open channels, DET NEI, a pump station serving DET NEI, and a force main and downstream storm drain outfall along Arbor Avenue that will discharge to the Eastside Channel. The NEI storm drainage infrastructure, including DET NEI will be sized to accommodate future upstream development to the south within Sub-basins E53 and E54 (east portions of the UR 1 future service area), and E55 (Chrisman Road future service area) and future development of existing dairies in the area.

- Detention basins and greenbelt parkways serving future development within the East Side Industrial future service area. These detention basins (DET 14, 15, and 16) will have restricted outflows of 1 cfs to facilitate their discharge to NEI constructed storm drainage facilities. Sub-basins E66 and E67 will discharge to the NEI constructed storm drain outfall along Arbor Avenue. Sub-basin 65 will discharge to DET NEI, but will need to delay discharge until DET NEI is sufficiently drained to accommodate additional inflow.

- Detention basin (DET 13) serving future development of the M1 and M2 Parcels located between I-205 and Arbor Avenue, east of MacArthur Drive. DET 13 will discharge to the NEI constructed storm drain outfall along Arbor Avenue.

- Detention basin (DET 12) serving future development of Infill Parcels 7 and 13 located between I-205 and Arbor Avenue, west of MacArthur Drive. DET 12 will discharge directly to the Eastside Channel that borders the west boundary of these parcels.

- Detention basin (DET ROCHA) serving future development of the Rocha future service area. DET ROCHA will have a restricted outflow of 1 cfs to facilitate discharge to a new storm drain extending north along MacArthur Drive, connecting with an existing 42" SD at the alignment of Leamon Street roughly ½ mile north of Schulte Road.

- Detention basin (DET 1A) serving future development and redevelopment in the southern portions of the City's Downtown Specific Plan study area (Mt. Diablo/Mt. Oso area). DET 1A will be a linear parkway joint-use detention basin that will discharge to existing storm drains serving the City's downtown area.

- Detention basin (DET LC) and a short greenbelt parkway inflow segment serving future redevelopment within the main portion of the Larch Clover future service area residing between Corral Hollow Road and Tracy Blvd. DET LC will discharge via a pump station and force main to the existing Larch Road storm drain that extends east from Tracy Blvd. to the Eastside Channel and will have a restricted outflow of 1 cfs.

- Concrete lining of the bottom of the Eastside Channel along the south side of I-205 from the confluence with the City Outfall Channel east beyond MacArthur Drive within a segment of the Eastside Channel that currently has concrete sides and a riprap bottom. Concrete lining of the bed and banks of the Eastside Channel upstream of this segment to Pescadero Avenue within a segment of the Eastside Channel that is currently earthen. These upgrades are proposed to improve the capacity of this segment of the Eastside Channel and to reduce existing maintenance requirements.

- Upgrades to the electrical operation and function of the existing pump station serving the existing Larch Road storm drain at its discharge to the Eastside Channel.

- Various storm drains serving future development that will connect with existing or proposed major elements of the Eastside Channel system.

Table 5-2 provides a summary of all existing and proposed detention basins serving the Eastside Channel Watershed along with pertinent physical and hydraulic characteristics.

Table 5-2. Eastside Channel Watershed Detention Basins

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET 1A	Proposed	5.1	8	Pump	33	2.0
DET 4*	Phase 1	30	131	Gravity	198	25.0
DET 12	Proposed	2	4	Gravity	37	8.0
DET 13	Proposed	2	4	Gravity	36	8.0
DET 14	Proposed	7	16	Pump	68	1.0
DET 15	Proposed	6	13	Pump	41	1.0
DET 16**	Proposed	14	34	Pump	69	1.0
DET NEI	Proposed	31	198	Pump	480	10.0
DET ROCHA	Proposed	5	11	Gravity	31	1.0
DET LC	Proposed	15	36	Pump	83	1.0

* Phase 1 (Existing) DET 4 is approximately 8 acres in area with storage of 13 acre-feet
** Discharge to be held until DET NEI is sufficiently drained to accept inflow

5.3 WESTSIDE CHANNEL WATERSHED

Within the Westside Channel Watershed, the following existing storm drainage facilities currently serve existing development:

- Westside Channel
- Reach “C” Channel
- Central Avenue Tributary Channel
- Plan “C” Yellow Zone Channel
- WSID Main Drain
- DET 2A, DET 5, DET CP, and DET 10/11
- Pump station and force main outfall serving DET 10/11

- Low capacity pump station at Kavanagh Avenue and Corral Hollow Road serving existing residential developments contiguous to the east

- Joint-Use surcharge detention facility at Robert Kenner Park within the residential areas contributing to the Kavanagh Avenue pump station (Sub-basin W78)

- Various Trunk Line and Lateral Storm Drains

- Temporary Retention Basins

In order to complete the storm drainage infrastructure needed to serve the future buildout of the Westside Channel Watershed, the following master plan storm drainage facilities are recommended for construction as the need arises, subject to available funding:

- Detention basins (DET 3A and SL) serving future development of the Ellis and South Linne future service areas and other contiguous properties within Sub-basins W40, W41, W41A and W41B (collectively referred to as the Ellis Program Sub-basin). DET SL will serve Sub-basin W40 (South Linne future service area) and will drain via onsite storm drain facilities within the future Ellis development to DET 3A. DET 3A will discharge to existing storm drains within downstream Plan “C” residential developments that discharge to the Plan “C” Yellow Zone Channel on the north side of Cypress Drive and subsequently to DET 5 (Plasencia Field).

- Detention basin (DET 3B) serving future development of large portions of the Westside Residential future service area residing in Sub-basins W50, W80 and W81. DET 3B will also discharge to existing storm drains within downstream Plan “C” residential developments that discharge to the Plan “C” Yellow Zone Channel on the north side of Cypress Drive and subsequently to DET 5 (Plasencia Field).

- Detention basin (DET V) which will be a small joint-use parkway detention basin in the Downtown Specific Plan study area serving future development in the west “bowtie” area (Sub-basin W64A). DET V will discharge to an existing storm drain at Beechnut Avenue on the west side of Tracy Blvd. that drains to downstream storm drains ultimately discharging to the WSID Main Drain.

- Detention basin (DET LOWELL) on the south side of Lowell Avenue roughly ½ mile east of Corral Hollow Road to provide storage and attenuation of storm runoff generated within existing development areas in Sub-basins W64, W64A, W64B, W65, W66, W67, W67A, W68, W69, W70, and W77.This new detention basin will intercept and attenuate from an existing 66” SD and smaller connecting storm drains at this location, reducing downstream peak discharges contributing to existing trunk line storm drains along Lowell Avenue, Corral Hollow Road, and Grant Line Road within the 2-square mile area governed by the 2010 Drainage Agreement between the City and WSID.

- Detention basin (DET 2B) serving future development of Zone 1 of the South ISP Sub-basin (Sub-basins W05, W08, W11, and W11A). DET 2B will discharge to the upstream limit of the Central Avenue Tributary Channel on the north side of the WSID Upper Main Canal.

- A greenbelt parkway within the I-205 Expansion future service area that will discharge to the existing 12' x 4' CBC that discharges to DET 10/11.

- Installation of a new storm drain along Tracy Blvd., south from Grant Line Road to 12th Street and west on 12th Street to relieve street flooding conditions in this area.

- Various storm drains serving future development that will connect with existing or proposed major elements of the Westside Channel system.

In previous storm drain master planning proposals, DET 3A was intended to drain to DET 3B in the future in order to relieve the future burden on DET 5 downstream of these detention basins. The boundary of the City's Sphere of Influence has since been revised, and there is less future development within the Sphere of Influence boundary that will drain to DET 3A. There is also greater flow attenuation recommended within DET 3A and DET SL than has previously been proposed. Because of this, DET 3A will no longer need to drain through DET 3B. An existing 48" SD that has been constructed in Schulte Road west of Corral Hollow Road may be extended to DET 3B in the future to create an interflow crossover from DET 3A to DET 3B to be utilized to facilitate maintenance or for other future considerations.

Table 5-3 provides a summary of all existing and proposed detention basins serving the Westside Channel Watershed along with pertinent physical and hydraulic characteristics.

Table 5-3. Westside Channel Watershed Detention Basins

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET 2A	Existing	10	74	Gravity	137	5.0
DET 2B*	Proposed	4.2	30	Pump	67	5.0
DET SL	Proposed	8	17	Gravity	43	1.0
DET 3A	Proposed	20	36	Gravity	53	3.0
DET 3B	Proposed	9.5	25	Gravity	51	1.0
DET LOWELL	Proposed	3.5	14	Gravity	84	33.4
DET 5	Existing	20	45	Gravity	319	197

Table 5-3. Westside Channel Watershed Detention Basins						
Detention Basin	**Status**	**Surface Area (acres)**	**100-Year Peak Volume (acre-feet)**	**Type of Outlet**	**100-Year Peak Inflow (cfs)**	**100-Year Peak Outflow (cfs)**
DET 10/11	Existing	80	486	Pump	599	10.0
DET CP	Existing	6	14	Gravity	48	9.0
DET V	Proposed	1.5	2	Pump	13	2.0

* Portion of DET 2B is existing City retention pond; 0.9 acres and 6 acre-feet of storage

5.4 LAMMERS WATERSHED

Within the Lammers Watershed, the following existing storm drainage facilities currently serve existing development:

- Onsite detention basins serving the east portion of Patterson Pass Business Park and the Safeway Distribution Center, both developments residing on the south side of Schulte Road between Mountain House Parkway and Hansen Road (Sub-basin L15).
- Onsite retention basin serving the existing OI Thermal Energy Development industrial site on the south side of Schulte Road, west of Lammers Road (Sub-basin L05).
- Initial phase of DET LW4, serving Kimball High School on the east side of Lammers Road south of Eleventh Street (Sub-basin L21A).

5.4.1 Facilities Serving New Development

The Lammers Watershed is proposed to include significant new development associated with the Cordes Ranch, Gateway, West Side Industrial, and Bright future service areas and the larger portion of the Catellus future service area residing to the south of Byron Road. Also included in the Lammers Watershed are west portions of the Westside Residential future service area (along Lammers Road) and other limited existing and proposed development areas within the City's Sphere of Influence. Presently, there are no downstream storm drainage facilities that have the capacity to accommodate any significant rates of runoff generated from future development within the Lammers Watershed. The 1994 Storm Drainage Master Plan proposed a network of detention basins and large open channels to collect, attenuate and convey flow northward for eventual discharge to Old River. Though attenuation was provided via the detention basins recommended therein, the level of attenuation was not sufficient to eliminate a major flow discharge to Old River derived from future development during a major storm event. The approach recommended in the 1994 Storm Drainage Master Plan is no longer considered to be feasible based on regulatory, policy, and environmental changes and

considerations that have impacted storm drainage master planning goals and approaches since the earlier plan was developed.

The current approach for master plan level storm drainage infrastructure represented in this SDMP will include significant attenuation of storm runoff generated by future development and offsite Sub-basin OFF2 in the Lammers Watershed to a level that will limit the maximum rate of downstream discharge to 30 cfs during the 100-year 24-hour storm event. This will be accomplished via large detention basins that will collect runoff from new development areas and from offsite Sub-basin OFF2 and limit outflows to downstream master plan facilities to rates ranging between 0.5 cfs and 10 cfs, depending upon the size of the development area sub-basins contributing to them. Discharge pipes ranging in diameter between 12” (minimum) and 36” (maximum) are proposed to collect, consolidate, and convey detention basin outflows to a suitable downstream location for discharge. This discharge will only occur after significant storm water quality treatment has occurred via: a) implementation of onsite measures associated with City requirements and policies pertaining to storm water quality management and sustainability practices, including provisions of the SWQC Manual; b) conveyance within designated greenbelt parkways, and; c) attenuation in stormwater detention facilities.

The proposed point of discharge for the maximum runoff rate of 30 cfs generated by new development and attenuated flow from offsite Sub-basin OFF2 (once DET OFF2 is completed in the future) is the WSID Sub-Main Drain that crosses Lammers Road and I-205 via an existing 60” SD just south of Byron Road. All residual runoff generated by new development areas and existing development areas, plus attenuated flow entering the area from DET OFF2 in the Lammers Watershed is proposed to be delivered to this location via a 36” SD outfall pipeline. The WSID Sub-Main Drain presently crosses underneath I-205 via a 60” SD, discharging to an open channel on the west side of I-205. With the exception of drainage culverts that cross Von Sosten Road and Byron Road (and the parallel Union Pacific Railroad), the WSID Sub-Main Drain continues as an open channel downstream of I-205 and joins the WSID Main Drain on the east side of San Jose Road midway between Byron Road and Middle Road. With the exception of the culvert crossing of Von Sosten Road, there is adequate capacity in the WSID Sub-Main Drain to accommodate the 30 cfs value and anticipated irrigation tailwater. There is also adequate capacity in the WSID Main Drain downstream of the WSID Sub-Main Drain to accommodate a 30 cfs contribution as upstream City storm drains do not have the capacity to deliver the 145 cfs flow to the WSID Main Drain allowed by the 2002 and 2010 Drainage Agreements between the City and WSID. In November 2010, the WSID Board of Directors approved the 2010 Drainage Agreement that authorizes the Lammers Watershed discharge of up to 30 cfs to WSID facilities, subject to the payment of fees and other requirements. The Tracy City Council adopted the 2010 Drainage Agreement at a City Council public meeting in December 2010.

The WSID Upper Main Canal drains in a southwesterly direction as it extends through the Lammers Watershed, continues easterly as open canal and as underground conduit north of Valpico Road and eventually becomes an underground conduit of limited capacity beginning at

MacArthur Drive that generally extends north and discharges to the City's Eastside Channel at an existing box culvert crossing at Grant Line Road.

As described in Section 2.2 of this SDMP, there are a few specific developers and other entities that have entered into drainage discharge agreements with WSID that facilitate existing and potential future discharges into the WSID Upper Main Canal. They are:

- Safeway (8 cfs) – existing discharge to the canal on the north side of I-205 (north of an existing 2-6' x 3' CBC crossing I-205 just west of Hansen Road). This drainage discharge agreement is needed to accommodate and authorize low flow discharges originating from the upstream existing Safeway Distribution Center and the eastern portion of Patterson Pass Business Park.

- Crossroads (20 cfs) – potential future discharge to the canal for Sections 26 and 27 within the Cordes Ranch future service area (discharge location within the northeast quadrant of Section 26).

- Gateway (12 cfs) – potential future discharge to the canal at the southwest corner of this future development area.

- Tracy Defense Depot (15 cfs) – existing discharge to the underground conduit at roughly the Schulte Road/Chrisman Road intersection.

The separate drainage agreements for Safeway, Crossroads, and Gateway may provide an interim outfall solution until appropriate components of the ultimate outfall solution serving the overall Lammers Watershed are constructed and operational. However, based on storm water management, maintenance, and environmental considerations, it is the City's desire to establish an overall solution for the Lammers Watershed that includes public storm drainage facilities that combine all storm runoff from new development and deliver it to an appropriate outfall at a highly attenuated rate. Master planned and onsite storm drainage facilities that are constructed in conjunction with new development will need to have the ability to be retrofitted in the future to conform to the long-term drainage solution for the Lammers Watershed represented herein.

In order to complete the storm drainage infrastructure needed to serve the future buildout of the Lammers Watershed, the following master plan storm drainage facilities are recommended for construction as the need arises, subject to available funding:

- Detention basins (DET LW6, LW7, LW8, LW9a, LW9b and LW10a/10b) serving future development of the majority of the Cordes Ranch future service area (Sub-basins L14, L16, L17, L18, and L19), as well as runoff from the westernmost portion of the West Side Industrial future service area (Sub-basin L13) and excess runoff discharged from the existing Patterson Pass Business Park (east of Mountain House Parkway) and Safeway Distribution Center developments (Sub-basins L15a through d).

- Detention basin (DET OFF2) to remove Sub-basin OFF 2 as a flooding source that impacts the western portions of the Sphere of Influence within the Lammers Watershed and downstream existing residential and agricultural properties north of I-205 outside of the Sphere of Influence. DET OFF2 is proposed to have a maximum gravity discharge of 5 cfs during a 100-year 24-hour storm.

- Detention basin (DET LW3) serving the Gateway future service area and the northeast corner of the Cordes Ranch future service area (Sub-basin L20).

- Detention basin (DET LW11) serving the majority of the currently undeveloped portions of the West Side Industrial future service area (Sub-basins L10 and L12).

- Detention basin (DET LW12) serving Sub-basin L11.

- Detention basin (DET LW5) serving a western portion of the Westside Residential future service area (Sub-basin L21).

- Detention basin (DET LW2) serving the Bright future service area (Sub-basin L22).

- Detention basin (DET LW1) serving the majority of the Catellus future service area (Sub-basin L23), located south of Byron Road.

- Various storm drains serving as outflow pipes for detention basins, ranging in diameter from 12” to 36”, that will convey and consolidate flows for delivery to the WSID Sub-Main Drain at Lammers Road south of Byron Road.

- Installation of gates that will provide for an SD interflow crossover connection between the 2-60” SDs that are part of the Westside Channel Outfall System (at the Byron Road/Lammers Road intersection) and the WSID Sub-Main Drain 60” SD in Lammers Road south of Byron Road. These two systems are currently connected by a City 48” SD in Lammers Road, but the entrance to the WSID 60” pipe is plugged. This interflow crossover could be used to facilitate maintenance activities in downstream facilities or to manage flows in the event of an emergency.

- Greenbelt parkways within portions of the Cordes Ranch future service area (along an existing jurisdictional drainage corridor and at the southeast corner of Cordes Ranch that is impacted by an offsite flow) and within a portion of the Catellus future service area.

The system improvements proposed in this SDMP include capacity to capture, convey and attenuate existing storm runoff generated by the Safeway Distribution Center and the east portion of Patterson Pass Business Park to the proposed outfall for the Lammers Watershed at the WSID Sub-Main Drain. Upon completion of these improvements, the Safeway drainage discharge agreement with WSID may be terminated.

Table 5-4 provides a summary of all existing and proposed detention basins serving the Lammers Watershed along with pertinent physical and hydraulic characteristics.

Table 5-4. Lammers Watershed Detention Basins

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET LW1	Proposed	35	90	Gravity	158	3.0
DET LW2	Proposed	11	27	Gravity	60	2.0
DET LW3	Proposed	48	87	Gravity	124	4.0
DET LW4	Existing	4	11	Pump	25	0.5
DET LW5	Proposed	3	7	Pump	18	0.5
DET LW6	Proposed	21	101	Gravity	218	4.0
DET LW7	Proposed	4	10	Gravity	27	0.5
DET LW8	Proposed	13	34	Gravity	91	1.5
DET LW9a	Proposed	25	89	Gravity	202	10.0
DET LW9b	Proposed	7	18	Gravity	52	1.0
DET LW10a/10b*	Proposed	9	20	Gravity	67	1.0
DET LW11	Proposed	12	30	Gravity	61	2.5
DET LW12	Proposed	6	13	Pump	44	0.5
DET OFF2	Proposed	25	182	Gravity	387	5.0

* Discharge is to a proposed greenbelt parkway and DET LW10a/10b outflows will also enter DET LW9a to the north.

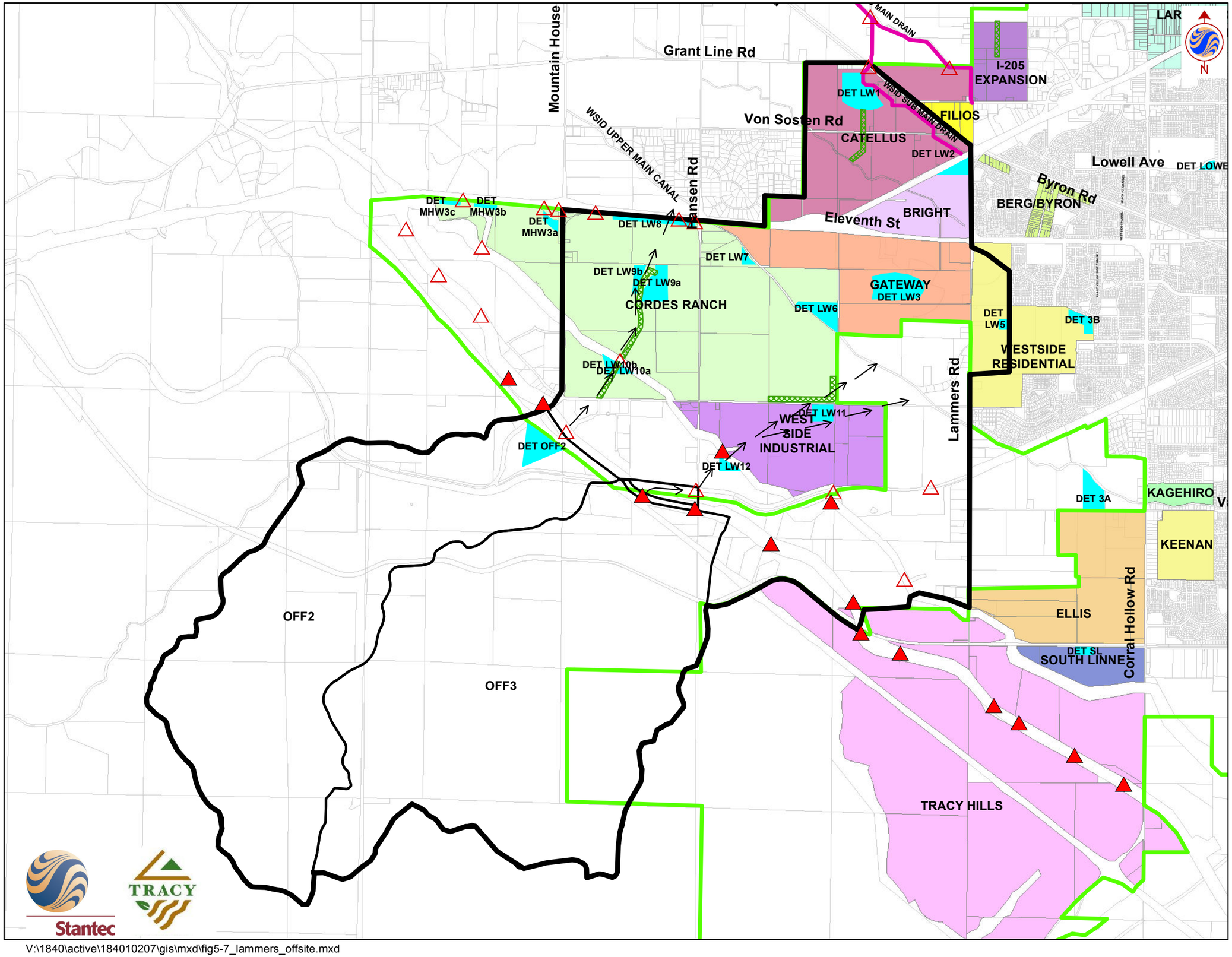
5.4.2 Conveyance of Offsite Runoff

There are offsite watersheds upstream to the southwest of the Sphere of Influence that will, on infrequent occasions, discharge significant rates and volumes to portions of the Lammers Watershed. The locations and rates of these discharges are regulated and defined by overchutes and culverts that cross the California Aqueduct and the Delta Mendota Canal. The master plan facilities for the Lammers Watershed include future offsite detention basin DET OFF2 on the upstream side of I-580 to eventually remove Sub-basin OFF2 as a flooding source that impacts the western portions of the Sphere of Influence within the Lammers Watershed and downstream existing residential and agricultural properties north of I-205 that are outside of the

Sphere of Influence during a 100-year 24-hour storm. A similar measure is not proposed to remove Sub-basin OFF3 as a flooding source as its offsite runoff impacts limited areas within the eastern portions of the Lammers Watershed that are within the Sphere of Influence. No flood control measures are proposed for Sub-basins OFF4 or OFF5 as runoff generated from these offsite sub-basins does not impact the Sphere of Influence. A general representation of areas impacted by flows from the offsite watersheds is provided on Figure 5-7.

With the exception of DET OFF2, master planned detention basins are only proposed to serve runoff derived from existing and new development areas within the Lammers Watershed north of the California Aqueduct. However, as development occurs within the Sphere of Influence provision must be incorporated for offsite runoff to be conveyed along and through master planned facilities without causing flooding of development areas and for excess runoff generated from Sub-basin OFF2 to be discharged to an existing 2-cell 6' x 3' CBC crossing of I-205 just west of Hansen Road and released into existing downstream drainage facilities in essentially the same manner as occurs under existing conditions until or unless the relevant offsite flooding sources are eliminated (which will occur when DET OFF2 is constructed). *In the condition that exists prior to the construction of DET OFF2 in the future, discharges to the 2-cell 6' x 3' CBC crossing of I-205 will be reduced when compared to existing conditions as new development areas (in Sub-basins L16, L17, and L18) and existing industrial developments on the south side of Schulte Road (Sub-basins L15a through d) will no longer discharge to this CBC crossing. Though new development will reduce the incidence and potential for downstream flooding, it will not eliminate the existing potential for downstream flooding created by offsite Sub-basin OFF2.* Future construction of DET OFF2 that is expected to be funded from a variety of future sources, including partial funding from development impact fees, will eliminate future flooding to the north of the 2-cell 6' x 3' CBC crossing of I-205 during the 100-year 24-hour storm event. Upon completion of DET OFF2, downstream areas within Sub-basins L15, L16, L17, and L18 will no longer be subjected to flooding from offsite runoff generated within upstream Sub-basin OFF2 during a 100-year 24-hour storm and will only require a conveyance corridor with a capacity to accommodate onsite runoff (including existing runoff from Sub-basin L15) plus an outflow discharge rate of 5 cfs from DET OFF2. However, prior to the completion of DET OFF2, the runoff from Sub-basin OFF2 will need to be accounted for in new development conveyance areas, and new buildings will need to have finished floor elevations (FFEs) that are elevated a minimum of 1 foot above the 100-year water surface elevations for the combined offsite and onsite flow conditions.

New development and redevelopment within the Sphere of Influence downstream of Sub-basin OFF3 (in Sub-basins L05, L10, L11, L12 and the southeast corner of L14) will need to accommodate sheet flooding produced by runoff generated from Sub-basin OFF3 during a 100-year 24-hour storm in applicable areas as a part of their site design. Required measures will include elevating buildings a minimum of 1 foot above the 100-year shallow flooding elevations and incorporating a greenbelt parkway or other approved conveyance facility along the southeast perimeter of Sub-basin L14.



Legend

- Sphere of Influence
- Lammers Watershed
- Proposed Detention Basins
- Planning Areas
- Proposed Greenbelt Parkway
- Existing Channels
- Overchutes
- Culverts
- General Flow Path for Offsite Flows

NOTE: Upon completion of DET OFF2, metered discharges from Sub-basin OFF2 will be limited to 5 cfs and will be accomodated in downstream master plan storm drainage facilities. There is not a detention basin proposed to regulate discharges from Sub-basin OFF3. Downstream onsite design will need to account for the applicable conditions pertaining to Sub-basins OFF2 and OFF3. See Section 5.4.2 for additional information.

Client/Project
CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 5-7

Title
AREAS IN LAMMERS WATERSHED IMPACTED BY OFFSITE FLOWS

NOVEMBER 2012
184010207
SCALE 1" = 3500'

Stantec

TRACY

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Figure 5-8 identifies areas where new development will be required to submit a Hydrologic and Hydraulic Analysis that determines 100-year 24-hour storm water surface elevations to utilize in determining required FFEs for new buildings potentially impacted by offsite flows originating from Sub-basins OFF2 and OFF3.

Appropriate provision for overland release shall be also provided with all new development.

5.5 MOUNTAIN HOUSE WATERSHED

Within the Mountain House Watershed, the following existing storm drainage facilities currently serve existing development:

- DET MHW2 serving the Golden Gate Auto Auction development and the portion of Patterson Pass Business Park located west of Mountain House Parkway.

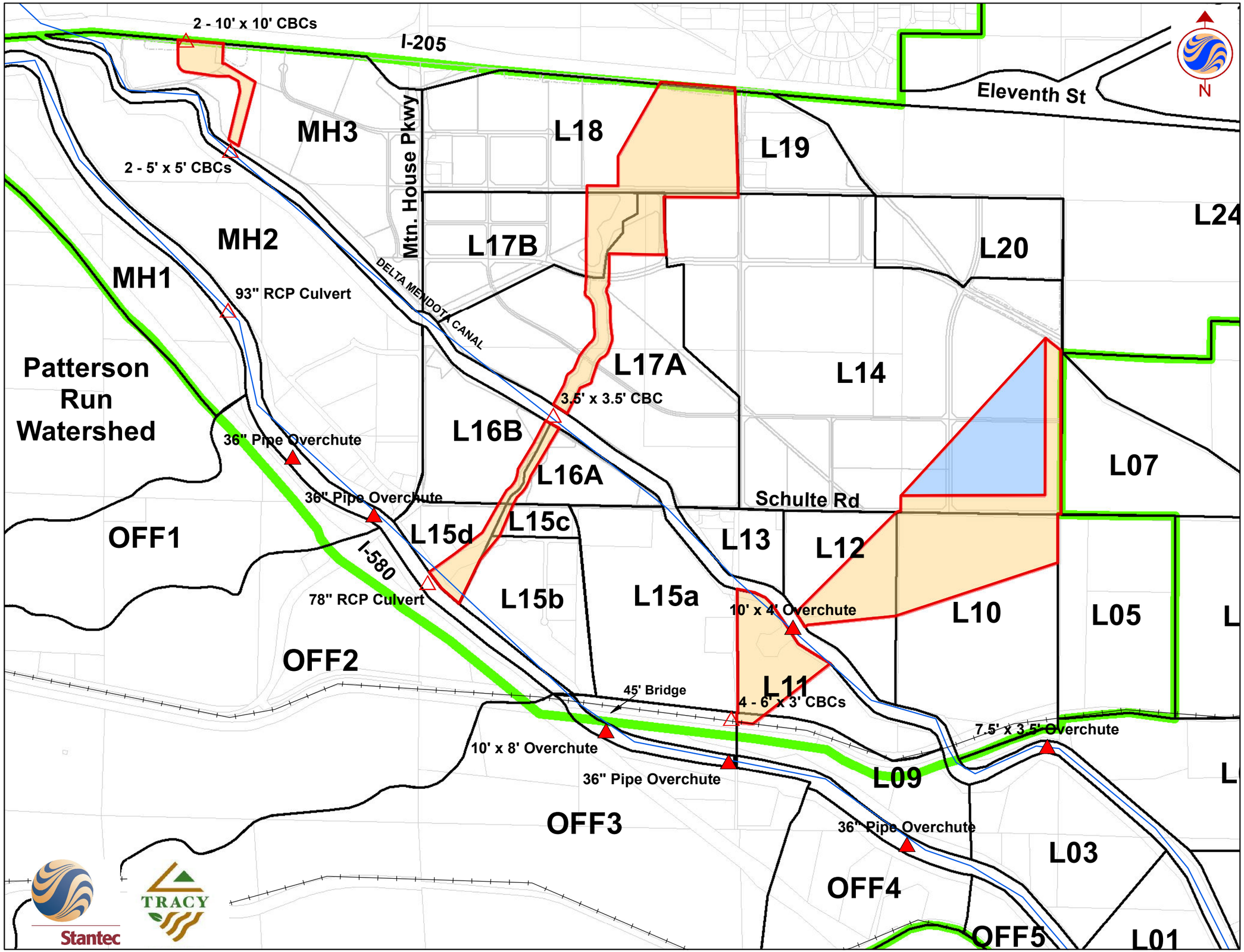
- Patterson Run, a defined conveyance channel carrying significant offsite flow and extending between the California Aqueduct and the Delta Mendota Canal.

5.5.1 Facilities Serving New Development

In order to complete the storm drainage infrastructure needed to serve the future buildout of the Mountain House Watershed, the following master plan storm drainage facilities are recommended for construction as the need arises, subject to available funding:

- Detention basins (DET MHW3a/3b/3c) serving future development of the portion of the Cordes Ranch planning area residing on the west side of Mountain House Parkway (Sub-basin MH3). Areas on the west side of Patterson Run will be served by DET MHW3c and will discharge to Patterson Run, consistent with existing conditions. Areas on the east side of Patterson Run will drain to DET MHW3b and DET MHW3a. DET MHW3a may either discharge to an existing low flow cross culvert underneath I-205 just west of Mountain House Parkway consistent with existing conditions, or discharge to Patterson Run to the west via a pump station and force main. If storm drainage from DET MHW3a is proposed to discharge to Patterson Run, additional approvals will be required from the Mountain House CSD that operates, manages, and maintains existing and future downstream storm drainage facilities to the north. Future costs associated with requirements set forth by the Mountain House CSD to accommodate runoff discharges to their facilities will be borne by new development constituents in the Mountain House Watershed. In any event, DET MHW3a, MHW3b, and MHW3c will be required to provide a significant amount of detention storage and attenuation in order to mitigate the downstream impacts of new development on runoff production.

New development within the Mountain House Watershed will be required to provide the City with documentation and facilitate an agreement between the Mountain House CSD and the City that states that the Mountain House CSD will accept future runoff discharges as proposed herein within their downstream storm drainage facilities. All City costs involved in finalizing this



Legend

- L14 — Sub-basins
- Sphere of Influence
- Canals and Creeks
- Overchutes
- Culverts
- Areas Where New Development Will be Required to Submit a Hydrologic and Hydraulic Analysis that Determines 100-yr 24-hr Storm WSE's. Building Finished Floor Elevations (FFE's) Must be a Minimum of 1-foot Higher than Applicable WSE's.
- Areas Where New Development Will be Required to Set Building FFE's a Minimum of 1.5 feet Above Highest Adjacent Grade (or) 1-foot Above 100-yr 24-hr Storm WSE's if Known.

Client/Project

CITY OF TRACY
CITYWIDE STORM DRAINAGE MASTER PLAN

FIGURE 5-8

Title

AREAS REQUIRING SPECIAL HYDROLOGIC & HYDRAULIC CONSIDERATION DUE TO INFLOWS FROM OFFSITE WATERSHEDS

NOVEMBER 2012
184010207
SCALE 1" = 1500'

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agreement will be paid for by said new development. New development within the Mountain House Watershed will not be allowed by the City prior to execution of said agreement.

Sub-basin MH1 is within the City's Sphere of Influence and is represented in the City's General Plan as having a future industrial use. However, there are severe limitations with regard to the feasibility and availability of access to any new development within this sub-basin that will need to be resolved prior to development becoming possible. In the event that these issues are able to be resolved at some point in the future, new development within this sub-basin will need to provide storm drainage facilities and detention basin(s) that will serve to mitigate its impacts on storm runoff production and discharge, including the requirement for a drainage agreement with Mountain House CSD cited in the above paragraph.

Table 5-5 provides a summary of all existing and proposed detention basins serving the Mountain House Watershed along with pertinent physical and hydraulic characteristics.

Table 5-5. Mountain House Watershed Detention Basins

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET MHW2	Existing	10	68	Gravity	200	7.0
DET MHW3a/3b/3c	Proposed	10	37	Gravity and Pump	144	5.0

5.5.2 Conveyance of Offsite Runoff

New development within the Mountain House Watershed (Sub-basins MH1 and MH3) will be required to maintain Patterson Run as a wide and unobstructed drainage corridor.

Figure 5-8 identifies areas where new development will be required to submit a Hydrologic and Hydraulic Analysis that determines 100-year 24-hour storm water surface elevations to utilize in determining required FFEs for new buildings potentially impacted by offsite flows originating from the Patterson Run Watershed.

5.6 TRACY HILLS WATERSHED

As previously described in Section 2, Tracy Hills is a large future development area located in the southernmost portion of the City's Sphere of Influence. A separate SDMP document was originally prepared by Nolte Associates, Inc., entitled *Tracy Hills Storm Drainage Master Plan, Volumes 1 – 3, December 2000* and was reviewed by the City and Stantec. The original separate SDMP document is currently undergoing further review and revision. The proposed Tracy Hills development will include several onsite detention basins and an offsite conveyance facility that will deliver all storm runoff discharged from the development to an existing sand and gravel extraction pit located on the east side of Tracy Blvd., across from the Tracy Municipal

Airport or to an alternate existing sand and gravel extraction pit. Storm runoff from Tracy Hills is disconnected from the remainder of the study area and will not impact other existing or proposed development areas within the City's Sphere of Influence.

6.0 Opinions of Probable Cost

6.1 GENERAL

This section presents opinions of probable cost and the methodology used to generate them for the proposed storm drainage infrastructure improvements. Storm drainage infrastructure costs are provided for proposed storm drainage infrastructure elements recommended in this SDMP to serve new development in each Watershed and for the sum of the Watersheds. The opinions of probable cost for the Eastside Channel Watershed and the Westside Channel Watershed also include storm drainage infrastructure upgrades that are needed to serve existing development.

6.2 COST ESTIMATION METHODOLOGY

6.2.1 Basis of Cost Estimating

The basis for the opinions of probable cost comes from a number of sources, including bid results from similar projects, previous studies, and industry standardized cost data. They should be adjusted periodically for future construction time frames.

6.2.2 Cost Estimating Accuracy

The project costs were developed as a part of the preparation of the SDMP and are considered “order of magnitude” estimates that are relevant for initial budgeting and funding purposes. Final project costs will be dependent on a number of factors at the time of bidding, including actual scope of work, labor and material costs, number of competing projects, allotted construction schedule, and time of year, among other things. Order of magnitude estimates are appropriate for master planning level work, but it is important to note that they have been made without the benefit of detailed project specifications and design drawings.

6.2.3 Unit Cost Estimates

The unit costs for storm drainage infrastructure elements represent installation costs under what would be considered “typical” site conditions and project schedules. They are based on cost information available in 2012. It is recommended that unit costs be updated on an annual basis.

For the most part, it has been assumed that new underground storm drains will be constructed within the right-of-way (ROW) for public streets, and for these instances ROW acquisition costs have not been included in the opinions of probable cost. However, certain infrastructure elements (such as detention basins, open channel and greenbelt parkway corridors, and underground storm drain alignments that do not correspond with any roadway alignments shown on the Roadway & Transportation Master Plan) include (ROW) or easement purchases when considered applicable.

The City has provided the following unit costs for land acquisitions to be utilized in the preparation of this SDMP:

- Drainage ROW Unit Cost = $150,000/acre
- Drainage Easement Unit Cost = $50,000/acre

Table 6-1 and Table 6-2 show generic cost data for large diameter pipe and pump stations (based on pumping capacity) that have been used in the various cost estimates.

Table 6-1. Unit Cost Data for Pipes

Pipe Diameter (inches)	Cost per Linear Foot ($/ft)
12	$75
18	$100
24	$150
30	$200
36	$300
42	$350
48	$400
54	$450
60	$550
66	$650

Table 6-2. Unit Cost Data for Pump Stations

Max Flow Rate (cfs)	Cost ($)
0-3	$350,000
5	$670,000
10	$940,000

6.2.4 Soft Cost Mark-Ups

Soft cost mark-ups incorporated into the preparation of the opinions of probable cost account for costs and functions that support the actual construction process and for contingencies. The actual costs for each item in the following four main categories of soft cost mark-ups will vary according to many individual project factors (i.e., complexity of the project, existing site conditions, etc.), but, in general, they are supported historically as appropriate mark-up estimates for master planning purposes (standardized as a percentage relative to the estimated construction cost) and are included in the total estimated cost for identified new storm drainage infrastructure applicable to each watershed.

General Contingency – Due to the fact that there are many unknowns related to a given project at the master planning level (i.e., site conditions, unforeseen constraints, details of design alternatives, construction schedule uncertainty, etc.), a 15 percent construction contingency is added to the construction cost estimate.

Design & Planning – These services typically include management of consultant agreements, preliminary site investigations, feasibility studies, plans and specifications, surveying and staking, and geotechnical reports. The cost of this work is estimated to be 10 percent of the estimated construction cost.

Construction Management – This primarily covers management of the construction contract, sampling and testing of materials, and site inspections during construction. This work is estimated to be 10 percent of the estimated construction cost.

Program Administration – Among other things, this category includes management and administrative costs, environmental review, permits, regulatory compliance, financing expenses, and legal review. This work is estimated to be 5 percent of the estimated construction cost.

Table 6-3 shows an example of the mark-ups used in generating the cost estimates provided herein.

Table 6-3. Opinion of Probable Cost Example

Construction	$100,000
General Contingency (15%)	$ 15,000
Design & Planning (10%)	$ 10,000
Construction Management (10%)	$ 10,000
Program Administration (5%)	$ 5,000
Total Estimated Cost	$140,000

6.3 ESTIMATED INFRASTRUCTURE COSTS BY WATERSHED

The following tables provide opinions of probable cost for implementing recommended storm drainage upgrades for the Eastside Channel Watershed (Table 6-4), Westside Channel Watershed (Table 6-5), Lammers Watershed (Table 6-6), and Mountain House Watershed (Table 6-7). A summary of the total costs is also provided on Table 6-8. Storm drainage upgrades for the Eastside Channel Watershed and Westside Channel Watershed include facilities to serve new development and existing development. Storm drainage upgrades for the Lammers Watershed and Mountain House Watershed include facilities to serve new development, only, with the exception of DET LW9a that has been sized to also accommodate excess runoff generated by existing development areas in upstream Sub-basins L15a through d and DET OFF2 that is proposed to eliminate runoff from offsite Sub-basin OFF2 as a flooding source to benefit existing development and future downstream development..

Since it is likely that construction of the recommended facilities will be spread out over a number of years as development warrants and as funding becomes available, it is expected that the cost of implementing the recommendations will increase over the years. Therefore, it is important that the costs estimates be updated annually to allow the funding mechanisms established to implement the various elements of this SDMP to be adjusted to account for the increased costs.

Table 6-4

Opinion of Probable Cost for Drainage Infrastructure

EASTSIDE CHANNEL WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
EASTSIDE CHANNEL WATERSHED				
Construction of Major Facilities				
DET 1A (8 AF, plus 4 AF add'l excavation)	12	AF	$ 10,000	$ 120,000
DET 4 (118 AF remaining for buildout, plus 60 AF add'l exc.)	178	AF	$ 10,000	$ 1,780,000
DET 12 (4 AF, plus 1.5 AF add'l excavation)	5.5	AF	$ 10,000	$ 55,000
DET 13 (4 AF, plus 1.5 AF add'l excavation)	5.5	AF	$ 10,000	$ 55,000
DET 14 (16 AF, plus 6 AF add'l excavation)	22	AF	$ 10,000	$ 220,000
DET 15 (13 AF, plus 5 AF add'l excavation)	18	AF	$ 10,000	$ 180,000
DET 16 (34 AF, plus 10 AF add'l excavation)	44	AF	$ 10,000	$ 440,000
DET NEI (198 AF, plus 31 AF add'l excavation)	229	AF	$ 10,000	$ 2,290,000
DET ROCHA (11 AF, plus 4 AF add'l excavation)	15	AF	$ 10,000	$ 150,000
DET LC (36 AF, plus 12 AF add'l excavation)	48	AF	$ 10,000	$ 480,000
DET 1A Pump Station (2.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
DET 14 Pump Station (1.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
DET 15 Pump Station (1.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
DET 16 Pump Station (1.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
DET NEI Pump Station (10.0 cfs capacity)	1	LS	$ 940,000	$ 940,000
DET LC Pump Station (1.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
Upgrade Existing Larch Road Pump Station @ E/S Channel	1	LS	$ 100,000	$ 100,000
Concrete Lining Eastside Channel (bottom, only)	2,750	LF	$ 140	$ 385,000
Concrete Lining Eastside Channel (bottom and sides)	2,650	LF	$ 890	$ 2,358,500
Greenbelt Parkway	5,250	LF	$ 340	$ 1,785,000
Channel Parkway	6,500	LF	$ 300	$ 1,950,000
Open Channel	3,110	LF	$ 50	$ 155,500
Construction of Storm Drains				
12" SD & SDFM	13,700	LF	$ 75	$ 1,027,500
12" SD (Bore & Jack)	100	LF	$ 500	$ 50,000
18" SD & SDFM	12,700	LF	$ 100	$ 1,270,000
18" SD (Bore & Jack)	300	LF	$ 600	$ 180,000
24" SD	5,910	LF	$ 150	$ 886,500
30" SD	2,880	LF	$ 200	$ 576,000
30" SD (Bore & Jack)	100	LF	$ 700	$ 70,000
36" SD	9,900	LF	$ 300	$ 2,970,000
48" SD	3,200	LF	$ 400	$ 1,280,000
54" SD	1,500	LF	$ 450	$ 675,000
54" SD (Bore & Jack)	200	LF	$ 850	$ 170,000
60" SD	5,150	LF	$ 550	$ 2,832,500
60" SD (Bore & Jack)	200	LF	$ 900	$ 180,000
66" SD	2,650	LF	$ 650	$ 1,722,500
8' x 6' CBC	270	LF	$ 725	$ 195,750

Table 6-4

Opinion of Probable Cost for Drainage Infrastructure

EASTSIDE CHANNEL WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
2-7' x 5' CBCs	100	LF	$ 1,000	$ 100,000
2-8' x 5' CBCs	80	LF	$ 1,150	$ 92,000
Other Items				
Dewatering	1	LS	$ 4,000,000	$ 4,000,000
UPTC Crossing Agreements	4	EA	$ 5,000	$ 20,000
Subtotal of Construction				**$ 33,491,750**
Design & Planning @ 10% of Construction Subtotal				**$ 3,349,175**
Construction Management @ 10% of Construction Subtotal				**$ 3,349,175**
General Contingency @ 15% of Construction Subtotal				**$ 5,023,763**
Program Administration @ 5% of Construction Subtotal				**$ 1,674,588**
Land Acquisition				
DET 1A	5.1	AC	$ 150,000	$ 765,000
DET 4 (remaining acres needed for buildout)	22.0	AC	$ 150,000	$ 3,300,000
DET 12	2.0	AC	$ 150,000	$ 300,000
DET 13	2.0	AC	$ 150,000	$ 300,000
DET 14	7.0	AC	$ 150,000	$ 1,050,000
DET 15	6.0	AC	$ 150,000	$ 900,000
DET 16	14.0	AC	$ 150,000	$ 2,100,000
DET NEI	31.0	AC	$ 150,000	$ 4,650,000
DET ROCHA	5.0	AC	$ 150,000	$ 750,000
Greenbelt Parkway	24.1	AC	$ 150,000	$ 3,615,000
Open Channel (50' Wide R/W, including culvert)	1.0	AC	$ 150,000	$ 150,000
Open Channel (65' Wide R/W, including culvert)	3.7	AC	$ 150,000	$ 555,000
12" SD & SDFM Easement	0.8	AC	$ 50,000	$ 40,000
18" SD Easement	0.3	AC	$ 50,000	$ 15,000
24" SD Easement	0.2	AC	$ 50,000	$ 10,000
30" SD Easement	0.4	AC	$ 50,000	$ 20,000
36" SD Easement	1.1	AC	$ 50,000	$ 55,000
48: SD Easement	0.6	AC	$ 50,000	$ 30,000
60" SD Easement	1.0	AC	$ 50,000	$ 50,000
Subtotal of Land Acquisition				**$ 18,655,000**
TOTAL ESTIMATED COST				**$ 65,543,450**

Table 6-5

Opinion of Probable Cost for Drainage Infrastructure

WESTSIDE CHANNEL WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
WESTSIDE CHANNEL WATERSHED				
Construction of Major Facilities				
DET 2B (24 AF remaining for buildout, plus 12 AF add'l exc.)	36	AF	$ 10,000	$ 360,000
DET SL (17 AF, plus 8 AF add'l excavation)	25	AF	$ 10,000	$ 250,000
DET 3A (36 AF, plus 36 AF add'l excavation)	72	AF	$ 10,000	$ 720,000
DET 3B (25 AF, plus 8 AF add'l excavation)	33	AF	$ 10,000	$ 330,000
DET LOWELL (14 AF, plus 3 AF add'l excavation)	17	AF	$ 10,000	$ 170,000
DET V (2 AF, plus 1 AF add'l excavation)	3	AF	$ 10,000	$ 30,000
DET 2B Pump Station (5.0 cfs capacity)	1	LS	$ 670,000	$ 670,000
DET V Pump Station (2.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
Greenbelt Parkway	1,350	LF	$ 340	$ 459,000
Construction of Storm Drains				
12" SD & SDFM	7,400	LF	$ 75	$ 555,000
12" SD (Bore & Jack)	200	LF	$ 500	$ 100,000
18" SD	8,580	LF	$ 100	$ 858,000
18" SD (Bore & Jack)	200	LF	$ 600	$ 120,000
24" SD	6,950	LF	$ 150	$ 1,042,500
30" SD	4,800	LF	$ 200	$ 960,000
36" SD	5,000	LF	$ 300	$ 1,500,000
42" SD	450	LF	$ 350	$ 157,500
42" SD (Bore & Jack)	50	LF	$ 800	$ 40,000
Other Items				
Dewatering	1	LS	$ 1,000,000	$ 1,000,000
UPTC/WPRR Crossing Agreements	4	EA	$ 5,000	$ 20,000
WSID Crossing Agreement	2	EA	$ 5,000	$ 10,000
Subtotal of Construction				**$ 9,702,000**
Design & Planning @ 10% of Construction Subtotal				**$ 970,200**
Construction Management @ 10% of Construction Subtotal				**$ 970,200**
General Contingency @ 15% of Construction Subtotal				**$ 1,455,300**
Program Administration @ 5% of Construction Subtotal				**$ 485,100**
Land Acquisition				
DET 2B (remaining acres needed for buildout)	3.3	AC	$ 150,000	$ 495,000
DET SL	8.0	AC	$ 150,000	$ 1,200,000
DET 3A	20.0	AC	$ 150,000	$ 3,000,000
DET 3B	9.5	AC	$ 150,000	$ 1,425,000
DET V	1.5	AC	$ 150,000	$ 225,000
DET LOWELL	3.5	AC	$ 150,000	$ 525,000
Greenbelt Parkway	6.2	AC	$ 150,000	$ 930,000

Table 6-5

Opinion of Probable Cost for Drainage Infrastructure

WESTSIDE CHANNEL WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
18" SD Easement	1.9	AC	$ 50,000	$ 95,000
24" SD Easement	0.8	AC	$ 50,000	$ 40,000
30" SD Easement	1.0	AC	$ 50,000	$ 50,000
36" SD Easement	0.9	AC	$ 50,000	$ 45,000
Subtotal of Land Acquisition				**$ 8,030,000**
TOTAL ESTIMATED COST				**$ 21,612,800**

Table 6-6

Opinion of Probable Cost for Drainage Infrastructure

LAMMERS WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
LAMMERS WATERSHED				
Construction of Major Facilities				
DET LW1 (90 AF, plus 32 AF add'l excavation)	122	AF	$ 10,000	$ 1,220,000
DET LW2 (27 AF, plus 10 AF add'l excavation)	37	AF	$ 10,000	$ 370,000
DET LW3 (87 AF, plus 30 AF add'l excavation)	117	AF	$ 10,000	$ 1,170,000
DET LW5 (7 AF, plus 2 AF add'l excavation)	9	AF	$ 10,000	$ 90,000
DET LW6 (101 AF, plus 50 AF add'l excavation)	151	AF	$ 10,000	$ 1,510,000
DET LW7 (10 AF, plus 3 AF add'l excavation)	13	AF	$ 10,000	$ 130,000
DET LW8 (34 AF, plus 11 AF add'l excavation)	45	AF	$ 10,000	$ 450,000
DET LW9a (89 AF, plus 36 AF add'l excavation)	125	AF	$ 10,000	$ 1,250,000
DET LW9b (18 AF, plus 6 AF add'l excavation)	24	AF	$ 10,000	$ 240,000
DET LW10a/10b (20 AF, plus 7 AF add'l excavation)	27	AF	$ 10,000	$ 270,000
DET LW11 (30 AF, plus 11 AF add'l excavation)	41	AF	$ 10,000	$ 410,000
DET LW12 (13 AF, plus 4 AF add'l excavation)	17	AF	$ 10,000	$ 170,000
DET OFF2 (182 AF, plus 218 AF add'l excavation)	400	AF	$ 10,000	$ 4,000,000
Grade Control/Spillway Inlet for DET OFF2	1	LS	$ 300,000	$ 300,000
Overflow Spillway at Outlet for DET OFF2	1	LS	$ 200,000	$ 200,000
DET LW4 Pump Station (0.5 cfs capacity)	1	LS	$ 350,000	$ 350,000
DET LW5 Pump Station (0.5 cfs capacity)	1	LS	$ 350,000	$ 350,000
DET LW12 Pump Station (0.5 cfs capacity)	1	LS	$ 350,000	$ 350,000
Greenbelt Parkway	11,200	LF	$ 340	$ 3,808,000
Construction of Storm Drains				
12" SD & SDFM	13,350	LF	$ 75	$ 1,001,250
18" SD	5,500	LF	$ 100	$ 550,000
18" SD (Bore & Jack)	300	LF	$ 600	$ 180,000
24" SD	3,650	LF	$ 150	$ 547,500
30" SD	12,550	LF	$ 200	$ 2,510,000
36" SD	3,700	LF	$ 300	$ 1,110,000
42" SD (Von Sosten Road, WSID Sub-Main Drain)	180	LF	$ 350	$ 63,000
Other Items				
Dewatering	1	LS	$ 4,000,000	$ 4,000,000
WSID Crossing Agreement	1	EA	$ 5,000	$ 5,000
Interflow Gates at WSID Connection (Lammers Road)	1	LS	$ 25,000	$ 25,000
WSID Discharge Agreement (First 30 Years)	1	LS	$ 2,040,000	$ 2,040,000
Subtotal of Construction				**$ 28,669,750**
Design & Planning @ 10% of Construction Subtotal				**$ 2,866,975**
Construction Management @ 10% of Construction Subtotal				**$ 2,866,975**
General Contingency @ 15% of Construction Subtotal				**$ 4,300,463**
Program Administration @ 5% of Construction Subtotal				**$ 1,433,488**
Land Acquisition				
DET LW1	35.0	AC	$ 150,000	$ 5,250,000

Table 6-6

Opinion of Probable Cost for Drainage Infrastructure

LAMMERS WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
DET LW2	11.0	AC	$ 150,000	$ 1,650,000
DET LW3	48.0	AC	$ 150,000	$ 7,200,000
DET LW5	3.0	AC	$ 150,000	$ 450,000
DET LW6	21.0	AC	$ 150,000	$ 3,150,000
DET LW7	4.0	AC	$ 150,000	$ 600,000
DET LW8	13.0	AC	$ 150,000	$ 1,950,000
DET LW9a	25.0	AC	$ 150,000	$ 3,750,000
DET LW9b	7.0	AC	$ 150,000	$ 1,050,000
DET LW10a/10b	9.0	AC	$ 150,000	$ 1,350,000
DET LW11	12.0	AC	$ 150,000	$ 1,800,000
DET LW12	6.0	AC	$ 150,000	$ 900,000
DET OFF2	25.0	AC	$ 150,000	$ 3,750,000
Greenbelt Parkway	51.4	AC	$ 150,000	$ 7,710,000
12" SD & SDFM Easement	3.5	AC	$ 50,000	$ 175,000
18" SD	2.5	AC	$ 50,000	$ 125,000
30" SD Easement	4.3	AC	$ 50,000	$ 215,000
Subtotal of Land Acquisition and Other Costs				**$ 41,075,000**
TOTAL ESTIMATED COST				**$ 81,212,650**

Table 6-7

Opinion of Probable Cost for Drainage Infrastructure

MOUNTAIN HOUSE WATERSHED

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
MOUNTAIN HOUSE WATERSHED				
Construction of Major Facilities				
DET MHW3a/3b/3c (37 AF, plus 13 AF add'l excavation)	50	AF	$ 10,000	$ 500,000
DET MHW3a Pump Station (3.0 cfs capacity)	1	LS	$ 350,000	$ 350,000
Construction of Storm Drains				
18" SDFM	3,300	LF	$ 100	$ 330,000
Other Items				
Dewatering	1	LS	$ 150,000	$ 150,000
Mountain House Discharge Agreement	1	LS	TBD	TBD
Subtotal of Construction				**$ 1,330,000**
Design & Planning @ 10% of Construction Subtotal				**$ 133,000**
Construction Management @ 10% of Construction Subtotal				**$ 133,000**
General Contingency @ 15% of Construction Subtotal				**$ 199,500**
Program Administration @ 5% of Construction Subtotal				**$ 66,500**
Land Acquisition				
DET MHW3a/3b/3c	10.0	AC	$ 150,000	$ 1,500,000
18" SDFM Easement	1.5	AC	$ 50,000	$ 75,000
Subtotal of Land Acquisition				**$ 1,575,000**
TOTAL ESTIMATED COST				**$ 3,437,000**

Table 6-8
Opinion of Probable Cost Summary
Upgrade Drainage Infrastructure

WATERSHED	OPINION OF PROBABLE COST	
Eastside Channel	$	65,543,450
Westside Channel	$	21,612,800
Lammers	$	81,212,650
Mountain House	$	3,437,000
TOTAL	**$**	**171,805,900**

7.0 Additional Funding Options and Opportunities

This SDMP identifies needs, priorities and costs for new and upgraded storm drainage facilities that are required to accommodate new development areas and to correct existing deficiencies in selected existing development areas. New and upgraded storm drainage facilities may consist of:

- Facilities that serve existing development and are needed to correct existing deficiencies.
- Facilities that are needed to serve new development.
- Facilities that serve a combination of existing development and new development, with varying percentages of costs being attributable to accommodating new development and correcting existing deficiencies.

Given the above general scenarios, several approaches are available to the City for consideration regarding funding the desired capital improvements. Funding approaches may potentially consist of one or a combination of the following elements:

- Development Impact Fees
- Assessment Districts (1913/15 Act)
- Special Tax Districts (Mello Roos Community Facilities District Act of 1982)
- Storm Drain Utility Fee (subject to Proposition 218)
- State and Federal Grants

7.1 DEVELOPMENT IMPACT FEES

To the extent that new development creates a need for new and upgraded storm drainage facilities to accommodate the resultant increase in storm runoff caused by said new development, development impact fees may be assessed against the new development that utilizes these facilities as a fair share contribution towards funding the required upgrades. Existing and proposed development impact fee program areas for storm drainage facilities are described and graphically represented in Section 8.0 of this SDMP.

7.2 ASSESSMENT DISTRICTS (1913/15 ACT)

The potential exists for the establishment of one or more assessment districts to fund required storm drainage facilities and their maintenance where a common interest is shared by a large, but clearly defined group of constituents. Assessment district financing provides a vehicle to apportion the cost of improvements to those who will benefit by typically issuing bonds (although they can be established without bonding), which are then repaid with revenue generated by

assessing those benefiting directly from the improvements. The establishment of an assessment district requires a finding of direct and special benefit to the parcels being assessed, which shall be set forth in an Engineer's Report. Two public hearings and a mailed ballot are also required to establish an assessment district. If an assessment district is selected as a preferred financing mechanism, the SDMP may be utilized as a resource to assist in making the benefit findings required pursuant to Proposition 218 and preparing an Engineer's Report as part of formation of the district.

7.3 SPECIAL TAX DISTRICTS – MELLO ROOS COMMUNITY FACILITIES DISTRICT (ACT OF 1982)

If the City determines that more flexibility is needed in the allocation of costs and funding burdens, a Mello-Roos Community Facilities District (CFD) may be used instead of an assessment district. The Mello-Roos law does not require a finding of benefit for allocating costs among properties within the CFD, and the special tax can be spread in any "reasonable manner" according to the law. If a CFD is determined to be a more feasible funding tool, it will be necessary to prepare a Rate and Method of Apportionment of Special Tax for the CFD as a part of CFD formation and bond issuance. It does require a 2/3 approval of registered voters. However, if less than 12 registered voters reside in the area, which is typical of undeveloped land, the special tax can be implemented with a property owner vote.

7.4 STORM DRAINAGE UTILITY FEE PROGRAM

The City may initiate the steps that are required to implement a City-wide "storm drainage utility fee" program for the purpose of funding street sweeping, leaf collection, system maintenance, storm drain repairs, vegetation removal, and capital improvements to improve existing storm drainage deficiencies. Many of these services are needed to meet the requirements of the Federal Clean Water Act. The proposed fees may include an operating component and a capital component. The process of establishing a storm drainage utility fee program will be subject to Proposition 218, which requires public hearings and a public election.

7.5 STATE AND FEDERAL GRANTS

The Federal government, through the Economic Development Administration, has in the past provided grants to assist communities with the funding of public works projects that contribute to the creation or retention of private sector jobs and to the alleviation of unemployment and underemployment. Depending on circumstances, the construction of drainage improvements identified in this SDMP may be eligible. Funding for projects may also be available from the California Department of Water Resources' (DWR) Integrated Regional Water Management (IRWM) Program for Implementation and Planning grants funded by Proposition 84 (The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coast Protection Bond Act of 2006) and Stormwater Flood Management (SWFM) grants funded by Proposition 1E (The Disaster Preparedness and Flood Prevention Bond Act of 2006).

8.0 Impact Fee Program Areas

8.1 EXISTING IMPACT FEE PROGRAM AREAS

There are several impact fee program areas that have been analyzed and established by the City in recent years in conjunction with new development. These impact fee program areas have been established for individual properties or groupings of properties that have a common outfall and hydrologic context within the Eastside Channel Watershed and/or the Westside Channel Watershed. These impact fee program areas include the following:

- Plan "C"
- South ISP Sub-Basin
- South Mac-Arthur Sub-Basin
- Downtown Specific Plan Study Area
- Northeast Industrial Area
- Tracy Gateway
- Presidio Sub-Basin
- Infill Properties
- Ellis Program Sub-Basin

These impact fee program areas are depicted on Figure 8-1, and they are described in Section 1.2.2 of this SDMP. In all cases, technical studies have been performed to determine storm drainage infrastructure requirements and impact fees and reimbursements.

The South Mac-Arthur Sub-Basin is being reanalyzed at the present time to include the incorporation of the Rocha future service area into its facility plan and impact fee program area.

8.2 PROPOSED AND REVISED IMPACT FEE PROGRAM AREAS

Several new or modified impact fee program areas have been defined in this SDMP and are proposed to be governed by a subsequent impact fee analysis, separately from the SDMP. These new or modified impact fee program areas will cover the substantial majority of the remaining properties in the Sphere of Influence for which impact fee programs do not exist. The proposed new and modified impact fee program areas are shown on Figure 8-1 and are described in the following paragraphs:

- *Keenan* – The Keenan future service area located on the south side of Valpico Road on the east side of Corral Hollow Road.

- *Kagehiro* – The Kagehiro future service area located on the east side of Corral Hollow Road north of Valpico Road.

Legend

- Existing Storm Drain
- Proposed Storm Drain
- Existing Detention
- Proposed Detention
- Pipe Change
- Overchutes
- Culverts
- Proposed Culverts
- Outfalls
- Existing Pump Stations
- Existing Pump Station To Be Upgraded
- Proposed Pump Stations
- Drain Inlet to Delta Mendota Canal
- Subbasins
- Sphere of Influence
- Existing Channel
- Proposed Channel Parkway
- Proposed Greenbelt Parkway
- Proposed Open Channel
- 100-yr Floodplain
- Areas with Existing Fee Programs or Fee Studies
- New or Revised Fee Program Areas
- Existing Fee Program Area Within the a Larger Fee Program Area

Note: Infill Properties - There is an existing impact fee program that was established by the City for "infill" properties. For additional information please refer to the technical report entitled Storm Drainage Analysis – Infill Properties, Final Technical Report, August 2011, by Storm Water Consulting, Inc. and Stantec.

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DETENTION BASIN DATA

Detention Basin	Status	Surface Area (acres)	100-Year Peak Volume (acre-feet)	Type of Outlet	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)
DET 1A	Proposed	5.1	8	Pump	33	2.0
DET 4[1]	Phase 1	30	131	Gravity	198	25.0
DET 12	Proposed	2	4	Gravity	37	8.0
DET 13	Proposed	2	4	Gravity	36	8.0
DET 14	Proposed	7	16	Pump	68	1.0
DET 15	Proposed	6	13	Pump	41	1.0
DET 16[2]	Proposed	14	34	Pump	69	1.0
DET NEI	Proposed	31	198	Pump	480	10.0
DET ROCHA	Proposed	5	11	Gravity	31	1.0
DET LC	Proposed	15	36	Pump	83	1.0
DET 2A	Existing	10	74	Gravity	137	5.0
DET 2B[3]	Proposed	4.2	30	Pump	67	5.0
DET SL	Proposed	8	17	Gravity	43	1.0
DET 3A	Proposed	20	36	Gravity	53	3.0
DET 3B	Proposed	9.5	25	Gravity	51	1.0
DET LOWELL	Proposed	3.5	14	Gravity	84	33.4
DET 5	Existing	20	45	Gravity	319	197
DET 10/11	Existing	80	486	Pump	599	10.0
DET CP	Existing	6	14	Gravity	48	9.0
DET V	Proposed	1.5	2	Pump	13	2.0
DET LW1	Proposed	35	90	Gravity	158	3.0
DET LW2	Proposed	11	27	Gravity	60	2.0
DET LW3	Proposed	48	87	Gravity	124	4.0
DET LW4	Existing	4	11	Pump	25	0.5
DET LW5	Proposed	3	7	Pump	18	0.5
DET LW6	Proposed	21	101	Gravity	218	4.0
DET LW7	Proposed	4	10	Gravity	27	0.5
DET LW8	Proposed	13	34	Gravity	91	1.5
DET LW9a	Proposed	25	89	Gravity	202	10.0
DET LW9b	Proposed	7	18	Gravity	52	1.0
DET LW10a/10b[4]	Proposed	9	20	Gravity	67	1.0
DET LW11	Proposed	12	30	Gravity	61	2.5
DET LW12	Proposed	6	13	Pump	44	0.5
DET OFF2	Proposed	25	182	Gravity	387	5.0
DET MHW2	Existing	10	68	Gravity	200	7.0
DET MHW3a/3b/3c	Proposed	10	37	Gravity and Pump	144	5.0

[1] Phase 1 (Existing) DET 4 is approximately 8 acres in area with storage of 13 acre-feet
[2] Discharge to be held until DET NEI is sufficiently drained to accept inflow
[3] Portion of DET 2B is existing City retention pond; 0.9 acres and 6 acre-feet of storage
[4] Discharge is to a proposed greenbelt parkway and DET LW10a/10b outflows will also enter DET LW9a to the north

Client/Project
CITY OF TRACY
STORM DRAINAGE MASTER PLAN

FIGURE 8-1

Title
STORM DRAINAGE IMPACT FEE PROGRAM AREAS

NOVEMBER 2012
184010207
SCALE = 1":1500'

Stantec

TRACY

- *Westside Residential* – Portions of the Westside Residential future service area located within Sub-basins W50, W80, and W81 of the Westside Channel Watershed. The participating properties are located east of Lammers Road and near the future alignment of Schulte Road.

- *NW WSO Sub-Basin* – The Filios future service area, the I-205 Expansion future service area and the northeast portion of the Catellus future service area residing north of Byron Road, all centered about Lammers Road or the alignment of Lammers Road.

- *West Larch Clover* – The portions of the Larch Clover future service area that reside west of Corral Hollow Road, north of Tracy Mall.

- *Larch Clover* – The larger portion of the Larch Clover future service area residing between Corral Hollow Road and Tracy Blvd.

- *Eastside Industrial* – Properties extending along the north side of I-205 east of MacArthur Drive and on the south side of I-205 east of Paradise Road, including the Eastside Industrial future service area and I-205 Specific Plan Parcels M1 and M2.

- *Chrisman & East UR1* – The Chrisman Road future service area, the eastern portions of the UR1 future service area, and existing industrial developments within Sub-basins E53, E54, and E55, all centered about Chrisman Road south of the Northeast Industrial Area.

- *South MacArthur Sub-Basin* – A roughly 2 ½ square-mile area previously established as an impact fee program area extending between 11th Street and Linne Road between MacArthur Drive and Chrisman Road. Phase 1 storm drainage infrastructure has been constructed within this Sub-Basin to serve the existing Eastlake and Elissagaray development projects. This impact fee program area includes the majority of the UR1 future service area and is being modified to include the Rocha future service area (Sub-basin E14) located on the west side of MacArthur Drive south of Schulte Road.

- *Lammers* – All of the portions of the Lammers Watershed within the Sphere of Influence, including the larger portion of the Catellus future service area residing south of Byron Road, the Bright future service area, the Gateway future service area, the portions of the Westside Residential future service area residing in Sub-basins L21 and L21A along Lammers Road, the larger portion of the Cordes Ranch future service area east of Mountain House Parkway, the West Side Industrial future service area and existing and future industrial developments located south of Schulte Road, west of the Delta Mendota Canal and east of Mountain House Parkway.

- *Mountain House* – The westernmost portion of the Cordes Ranch future service area located on the west side of Mountain House Parkway within the Mountain House Watershed.

9.0 Glossary

AB 162	Assembly Bill 162
BMP	Best Management Practice as applied to any program, technology, or process used to improve or maintain downstream water quality under the NPDES program
CBC	Concrete Box Culvert
CSD	Community Services District
CGP	Construction General Permit
CN	Curve Number
CWA	Clean Water Act
Detention Basin (DET)	A depressed or bermed area that collects and stores surface runoff for regulated downstream release
Discharge	A rate of stormwater runoff experienced at a given location and at a given point in time during or after a storm event, usually expressed in cubic feet per second (cfs)
DWR	State of California Department of Water Resources
FEMA	Federal Emergency Management Agency
General Plan	City of Tracy General Plan Amendment
IRWM Program	Integrated Regional Water Management Program
HGL	Hydraulic grade line elevation associated with flow in a storm drain
Joint-use Facility	Storm drainage detention basin that includes active and/or passive recreation elements as a joint-use with flood storage
LID	Low impact development
MEP	Maximum Extent Practicable, a standard for water quality that applies to all MS4 operators regulated under the NPDES program.
NAVD	North American Vertical Datum

NBID	Naglee Burk Irrigation District
NEI	Northeast Industrial Area
NRCS	Natural Resources Conservation Service
NPDES	National Pollutant Discharge Elimination System, a program that regulates stormwater quality from nonpoint sources
Offsite	Referring to a watersheds that extend upstream, outside of the Study Area
Percolation	The subsurface gravity flow of runoff through the pore spaces in rock or soil
Return Period	The reciprocal of the percent probability of a flood event of a certain magnitude occurring in a given year, often expressed in terms of 10-year flood, 100-year flood, etc.
RCP	Reinforced Concrete Pipe
ROW	Right-of-Way
RWQCB	Regional Water Quality Control Board
SB 5	Senate Bill 5
SDFM	Storm Drain Force Main
SDMP	Storm Drainage Master Plan
SOI	Sphere of Influence per the City's General Plan
Specific Plan Area	An area defined and affected by a City's specific plan, which is a tool for the systematic implementation of the General Plan
Study Area	City's Sphere of Influence area, plus local and offsite sub-basins that impact the City's Sphere of Influence area
Surcharging	An overload of a storm drain system occurring when volumes beyond the system's capacity are introduced and the water level in a storm drain pipe rises above the crown of the pipe

SWMP	Storm Water Management Program, a plan developed to implement measures to improve stormwater quality in Phase II communities participating in the NPDES program
SWPPP	Storm Water Pollution Prevention Plan
SWQC Manual	Stormwater Quality Control Standards for New Development and Redevelopment, adopted by the City of Tracy
SWRCB	State Water Resources Control Board
Temporary Retention	A depressed or bermed area that collects and stores surface runoff and that does not have an outlet other that infiltration or evaporation and is used as an interim storm drainage solution until a physical connection for a suitable downstream facility is available
TMDL	Total Maximum Daily Load, the maximum amount of a pollutant that a water body can receive and still meet water quality standards for beneficial uses
WSID	West Side Irrigation District

10.0 References

Cella Barr Associates, *City of Tracy, 1994 Storm Drainage Master Plan*, November 1994.

Cella Barr Associates, *Presidio Sub-basin Storm Drainage Analysis and Fee Justification Study*, October 1999.

Cella Barr Associates, *Storm Drainage Analysis for South MacArthur Planning Area, Final Report Revised*, December 1999.

City of Tracy, *Engineering Design & Construction Standards, Design Standards*, December 2008.

City of Tracy, *Improvement Plans for Various City CIPs and Development Projects*, Various Dates.

City of Tracy and the West Side Irrigation District, *Integrated Amended 1972 Drainage Agreement Between the City of Tracy and the West Side Irrigation District*, June 2002.

City of Tracy and the West Side Irrigation District, *2010 Drainage Agreement,* December 2010.

Delta Mendota Water Authority, *Delta Mendota Canal Plans and Information Related to Culverts, Overchutes, and Drain Inlets*, January 2010.

Larry Walker Associates, *Manual of Stormwater Quality Control Standards for New Development and Redevelopment*, July 2008.

Natural Resource Conservation Service, *Soil Survey of San Joaquin County, California*.

Nolte Associates, Inc., *Tracy Hills Storm Drainage Master Plan, Volumes 1 – 3,* December 2000.

Schaaf & Wheeler, *Proposed Tracy Truck Stop and Patterson Pass Business Park, Hydrology and Drainage*, September 1991.

Stantec, *Conceptual Storm Drainage Study, 123-acre Crossroads Business Center Re-Zone Site, APN 209-012-009*, September 2008.

Stantec, *Plan "C" Storm Drainage Analysis Update, Final Report*, May 2000.

Stantec, *City of Tracy Storm Water Management Program*, September 2003.

Stantec, *Tracy Gateway Project Storm Drainage Analysis and Supplement to the SDMP, Final Technical Report*, April 2002.

Stantec, *Tracy Unified School District, Kimball High School Site, Storm Drain Analysis, Revised Final Technical Report*, November 2005.

Stantec, *Westside Channel Outfall System, Hydrologic Analysis and Supplement to Storm Drainage Master Plan*, January 2000.

State of California, Department of Water Resources, *Flood Legislation Deadlines for Department Milestones for Bills SB 5, SB 17, AB 5, AB 70, AB 156, and AB 162*, November 2007.

State of California, Department of Water Resources, *Preliminary 100- and 200-Year Floodplains Based Upon Best Available Data*, October 2008.

State of California, Department of Water Resources, *Rain Gage Data (Castle Rock, Carbona, Pump)*.

State of California, Department of Water Resources, *State Water Facilities, California Aqueduct Plans, Delta Pumping Plant to Chrisman Road*, September 1975.

State of California, *Senate Bill No. 5 and Assembly Bill No. 162*, October 2007.

Storm Water Consulting, Inc. and Stantec, *Northeast Industrial Area Updated Storm Drainage Analysis, Draft Technical Report*, March 2008.

Storm Water Consulting, Inc. and Stantec, *Storm Drainage Technical Report for the Downtown Specific Plan Area, Final Report*, July 2008.

Storm Water Consulting, Inc. and Stantec, *Updated Storm Drainage Technical Report for the South ISP Sub-basin, Revised Final Report*, October 2008.

Storm Water Consulting, Inc. and Stantec, *Ellis Program Sub-Basin – Final Storm Drainage Technical Report,* February 2012.

Storm Water Consulting, Inc. and Stantec, *Storm Drainage Analysis – Infill Properties, Final Technical Report,* August 2011.

The West Side Irrigation District and Crossroad Business Center, LP, *Agreement Regarding Storm Water Drainage for Crossroads Business Center*, November 2003.

The West Side Irrigation District and Tracy Gateway, LLC, *Agreement Regarding Option for Interim Drainage, Tracy Gateway Business Park*, October 2000.

The West Side Irrigation District and the United States of America, *Drainage Agreement, Defense Depot Tracy*, January 1974.

Thompson-Hysell Engineers, Conceptual *Storm Drain Plan, Crossroads Business Center*, February 2001.

Thompson-Hysell Engineers, *Proposed Storm Water Drainage Operation for the West Side Irrigation District's Upper Main Canal*, July 2002.

Thompson-Hysell Engineers, *West Side Irrigation District Upper Main Canal Storm Water Management System*, March 2003.

United States Geological Survey, *7.5 Minute Series Topographic Quadrangle Maps (Clifton Court Forebay, Lathrop, Midway, Tracy, Union Island, and Vernalis, California).*

Wilsey & Ham, Inc./Aelytek, Inc., *Rectified Photo/Topo Maps, City of Tracy*, May & June 1988.






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