6 CIRCULATION AND TRANSPORTATION

Novato's transportation system includes roadways, transit service and bicycle and pedestrian facilities. This chapter begins with an overview of the federal, State and local plans and regulations that apply to transportation in Novato, then describes the characteristics of Novato's transportation system. Topics covered include Novato's roadways, existing traffic operations, bicycle and pedestrian facilities, transit service, freight service, citywide modal split and planned and proposed transportation improvements.

A. Regulatory Framework

1. Federal Regulations

a. Americans with Disabilities Act

The Americans with Disabilities Act (ADA) provides comprehensive rights and protections to individuals with disabilities. The goal of the ADA is to assure equality of opportunity, full participation, independent living and economic self-sufficiency. To implement this goal, the U.S. Access Board has created accessibility guidelines for public rights-of-way. The guidelines address various issues, including roadway design practices, slope and terrain issues, pedestrian access to streets, sidewalks, curb ramps, street furnishings, pedestrian signals, parking and other components of public rights-of-way.

2. State Regulations

a. Assembly Concurrent Resolution 211

Assembly Concurrent Resolution 211, enacted in 2002, acknowledges the importance of bicycling and walking to the State of California. The Resolution encourages all cities and counties to "implement the policies of... the United States Department of Transportation's design guidance document on integrating bicycling and walking when building their transportation infrastructure."

b. Caltrans Regulations

The California Department of Transportation (Caltrans) is the primary State agency responsible for surface transportation facilities in California. One of its duties is the construction and maintenance of the State highway system.

Caltrans has established standards for roadway traffic flow and has developed procedures to determine if intersections require improvements. For projects that may physically affect facilities under its administration, Caltrans requires encroachment permits before any construction work may begin. For projects that would not physically affect facilities, but may influence traffic flow and levels of services at such facilities, Caltrans may recommend measures to mitigate the traffic impacts of such projects.

Additionally, the following Caltrans procedures and directives are relative to transportation improvements in Novato:

i. Level of Service Target

Caltrans maintains a target level of service at the transition between Level of Service (LOS) C and LOS D for all of its facilities.[1] Where an existing facility is operating at less than the LOS C/D threshold the existing measure of effectiveness should be maintained.

ii. Caltrans Project Development Procedures Manual

This manual outlines pertinent statutory requirements, planning policies and implementing procedures regarding non-motorized transportation facilities.

iii. Caltrans Deputy Directive 64

This directive requires Caltrans to consider the needs of non-motorized travelers (including pedestrians, bicyclists and persons with disabilities) in all programming, planning, maintenance, construction, operations and project development activities and products. This includes incorporation of the best available standards in all of the Department's practices.

iv. Caltrans Deputy Directive 64-RI

This directive requires Caltrans to provide for the needs of travelers of all ages and abilities in all planning, programming, design, construction, operations,

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[1] Level of Service is explained in detail in section C.1 and Table 6-1.

and maintenance activities and products on the State highway system. Caltrans supports bicycle, pedestrian and transit travel with a focus on "complete streets" that begins early in system planning and continues through project construction and maintenance and operations.

v. Caltrans Director's Policy 22

This policy establishes support for balancing transportation needs with community goals. Caltrans seeks to involve and integrate community goals in the planning, design, construction, and maintenance and operations processes, including accommodating the needs of bicyclists and pedestrians.

3. Regional Regulations

a. Regional Transportation Plan

The Regional Transportation Plan (RTP) is a long-range planning document that identifies the transportation needs of the nine-county San Francisco Bay Area region. The RTP is prepared by the Metropolitan Transportation Commission (MTC), which serves as the federally-designated metropolitan planning organization for transportation projects in the Bay Area. The RTP includes a program of needed capital and operational improvements and recommendations for revenue sources to fund proposed programs. Projects and programs in the RTP relevant to Novato include:

- Maintenance of local streets and roads.
- The widening of Highway 101 from Route 37 to the Sonoma County line from four lanes to six lanes (including two HOV lanes) and the conversion of some highway sections to freeway standards.
- Highway 101 northbound auxiliary lane at Nave Drive.
- Bicycle and pedestrian projects.
- Transit operating and capital improvement program for Golden Gate Transit.

b. MTC Policy on Routine Accommodation of Pedestrians and Bicyclists in the Bay Area

Projects funded all or in part with regional funds (e.g. federal, State Transportation Improvement Program, bridge tolls) must consider the accommodation of bicycle and pedestrian facilities, as described in Caltrans Deputy Directive 64. These recommendations do not replace locally adopted policies regarding transportation planning, design and construction. Instead, these recommendations facilitate the accommodation of pedestrians, including wheelchair users and bicyclists into all projects where bicycle and pedestrian travel is consistent with current adopted regional and local plans.

4. County Regulations

a. Marin County Measure A

The Transportation Authority of Marin (TAM) is designated as both the congestion management agency and the transportation sales tax authority for Marin County. TAM is responsible for managing a variety of transportation projects and programs in Marin County, receiving federal, State, regional, and local funds, working closely with all eleven cities and towns as well as the County. The TAM Board of Commissioners includes representatives from each of the cities and towns in Marin County, and the five members of the County Board of Supervisors. The TAM Board of Commissioners meets monthly and operates under a variety of committees. TAM is designated as the sales tax authority responsible for administering the transportation sales tax.

The Marin County Transportation Sales Tax Expenditure Plan, approved by voters as Measure A in November 2004, authorizes a half-cent sales tax that will generate an estimated $332 million in local sales tax revenues for transportation needs in Marin County over a twenty year period. The goal of Measure A is to improve transportation and mobility for all Marin County residents and workers by providing a variety of transportation improvements and transit options. These include expanding bus service, completing the Highway 101 HOV lane through San Rafael, improving roads, bikeways, pathways, and sidewalks, and ensuring safer access to schools.

b. Congestion Management

The Transportation Authority of Marin (TAM) serves as the County's Congestion Management Agency (CMA). In this capacity, TAM has specified level of service criteria for a number of facilities in the County and its member cities, including Novato. Any changes to the operation of identified facilities that would degrade operation below LOS D would conflict with CMA requirements. The following facilities in Novato are included in the CMA network. As such, operations on these roadways are expected to remain at LOS D or better.

- Highway 101
- State Route 37
- Bel Marin Keys Boulevard from Highway 101 interchange to Commercial Boulevard
- South Novato Boulevard from Diablo Avenue to Highway 101
- Rowland Boulevard from South Novato Boulevard to Highway 101
- Novato Boulevard from Sutro Avenue to Diablo Avenue

c. Marin County Transportation Vision

Moving Forward – A 25-Year Transportation Vision for Marin County was prepared by the Transportation Authority of Marin in 2003. The document evaluates existing conditions and promotes a sustainable transportation system to manage congestion, address mobility and maintain quality of life in Marin County. The Plan includes a series of recommendations in northern Marin relative to the City of Novato, including:

- Express bus routes serving the four primary employment areas of Novato (the Fireman's Fund campus, central Novato, Hamilton Field and the Bel Marin Keys employment area).

- Construction of an HOV on-ramp at either San Marin Drive-Atherton Interchange or Rowland Boulevard that will enable buses, carpools and vanpools to avoid backups and quickly access HOV lanes on Highway 101.

- Bicycle/pedestrian and highway interchange improvements at San Marin Drive-Atherton Interchange and Highway 101 to improve safety, relieve congestion and help connect communities east of the freeway with those to the west of Highway 101.
- New fixed route transit lines operating every 30 minutes to connect Southwest Novato, Hamilton, Ignacio and Black Point with Marin County communities to the south. The new routes will have timed transfers at a new primary transit junction in northern Marin County.
- Improved bicycle safety and access to new transit services, including bike lanes in Novato, a gap closure project between Ignacio/Bel Marin Keys and Novato, and a new bike lane to improve connectivity between Ignacio, the Hamilton area and Marinwood in San Rafael.

d. Marin Transit Short-Range Transit Plan

The Marin County Transit District (Marin Transit) was formed by a vote of the people of Marin County in 1964 and is charged with providing local transit service within Marin County. Marin Transit does not own buses or facilities and does not employ its own drivers. Instead, Marin Transit contracts with other providers, including Golden Gate Transit and Whistlestop Wheels, for local bus and paratransit services.

The Marin Transit Short Range Transit Plan (SRTP) was prepared and adopted in 2006 by the Marin County Transit District. The Plan assesses the current Marin County transit system, identifies transit needs and provides alternative ways to meet those needs. The goal of the plan is to develop a financially sustainable transit system for Marin County that maximizes rider productivity and mobility. The Marin County Transit District is currently preparing a 2008-2009 update of the Short Range Transit Plan. The Marin Transit Board of Directors will review the draft plan at the March and April 2009 board meetings for final adoption.

e. Non-Motorized Transportation Pilot Program

Marin County is one of four communities nationally that has been selected by the U.S. Congress to participate in a Non-Motorized Transportation Pilot

Program (NTPP) and receive $25 million for pedestrian and bicycling improvements. Through a screening and ranking process, the County Board of Supervisors adopted a funding plan for all of the NTPP funds in April 2007. The selected projects and programs will be implemented over the course of the Pilot Program, which concludes in 2010. Funded and completed projects in Novato include Class II bike lanes on Alameda del Prado and a Class I commuter bike connection along Highway 101, roughly between South Novato Boulevard and Enfrente Road. Additionally, the City received grants for bike detection at signalized intersections, bike racks and signage under this program.

5. City Regulations

a. Novato General Plan

The existing General Plan Transportation Chapter includes a number of objectives, policies and programs addressing traffic, roadways, transit and bicycle and pedestrian facilities. The chapter is organized around nine objectives that address all modes of transportation and call for the City to provide a balanced, efficient and accessible circulation system.

b. Downtown Novato Specific Plan

Downtown Novato Specific Plan, Section 2.6, Circulation and Parking, establishes transportation policies for downtown Novato. These policies address issues relating to pedestrian circulation, vehicular access and circulation, transit, bicycle circulation and parking.

c. Novato Bicycle Plan

The Novato Bicycle Plan, adopted in 2007, provides for a citywide network of bicycle paths, lanes and routes, along with bicycle-related programs and support facilities. The goal of the Bicycle Plan is to make bicycling a viable transportation option for people who live, work and recreate in Novato. The Bicycle Plan contains a statement of goals and policies, an overview of existing conditions, a needs analysis, a proposed system of bicycle paths, lanes and routes and list of implementation measures.

B. Roadway System

This section describes the roadway system in Novato, including regional highways and local streets. The roadway system is shown in Figure 6-1.

1. Regional Highway System

The City of Novato is served by two freeways, defined as access-controlled, divided highways having two or more lanes in each direction. Highway 101 has a north-south alignment, with six lanes through the City of Novato. Six Highway 101 interchanges serve the City:

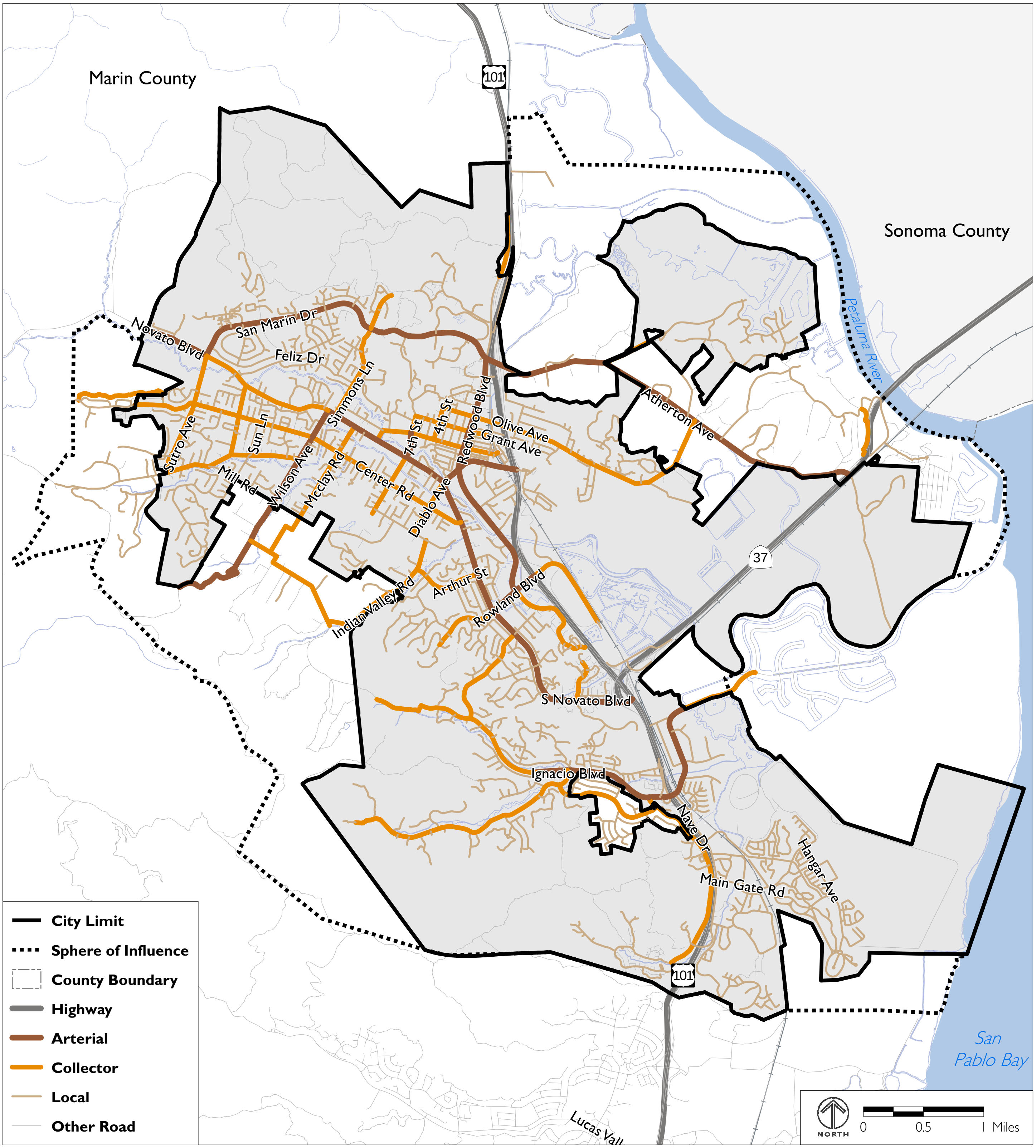
- San Marin Drive-Atherton Avenue
- DeLong Avenue
- Rowland Avenue
- Novato Boulevard-State Route 37
- Ignacio Boulevard-Bel Marin Keys Boulevard
- Alameda del Prado

State Route 37 begins at Highway 101 and extends east with two lanes in each direction. In addition to the interchange at Highway 101, access to State Route 37 is provided at Atherton Avenue.

2. Local Street System

The City of Novato applies three functional classifications to its local streets (see Figure 6-1). The roadway classification system is used to describe a roadway's volume, local access (number and type of curb cuts and driveway access), posted speeds, parking, median type, traffic control and other characteristics. The four functional street classifications in Novato, listed in order of highest to lowest volume, are as follows:

- **Arterial.** An arterial is commonly defined as a roadway, generally with four through lanes, which may be separated by a median and may have bicycle lanes. Parking is generally prohibited on arterial roadways. Arterials serve volumes of 10,000 to 35,000 daily trips. Direct access to fronting parcels is usually prohibited. Most of Novato's arterial roadways meet this definition, though there are some exceptions.



Source: Marin County, GIS

FIGURE 6-1

EXISTING STREET FUNCTIONAL CLASSIFICATION

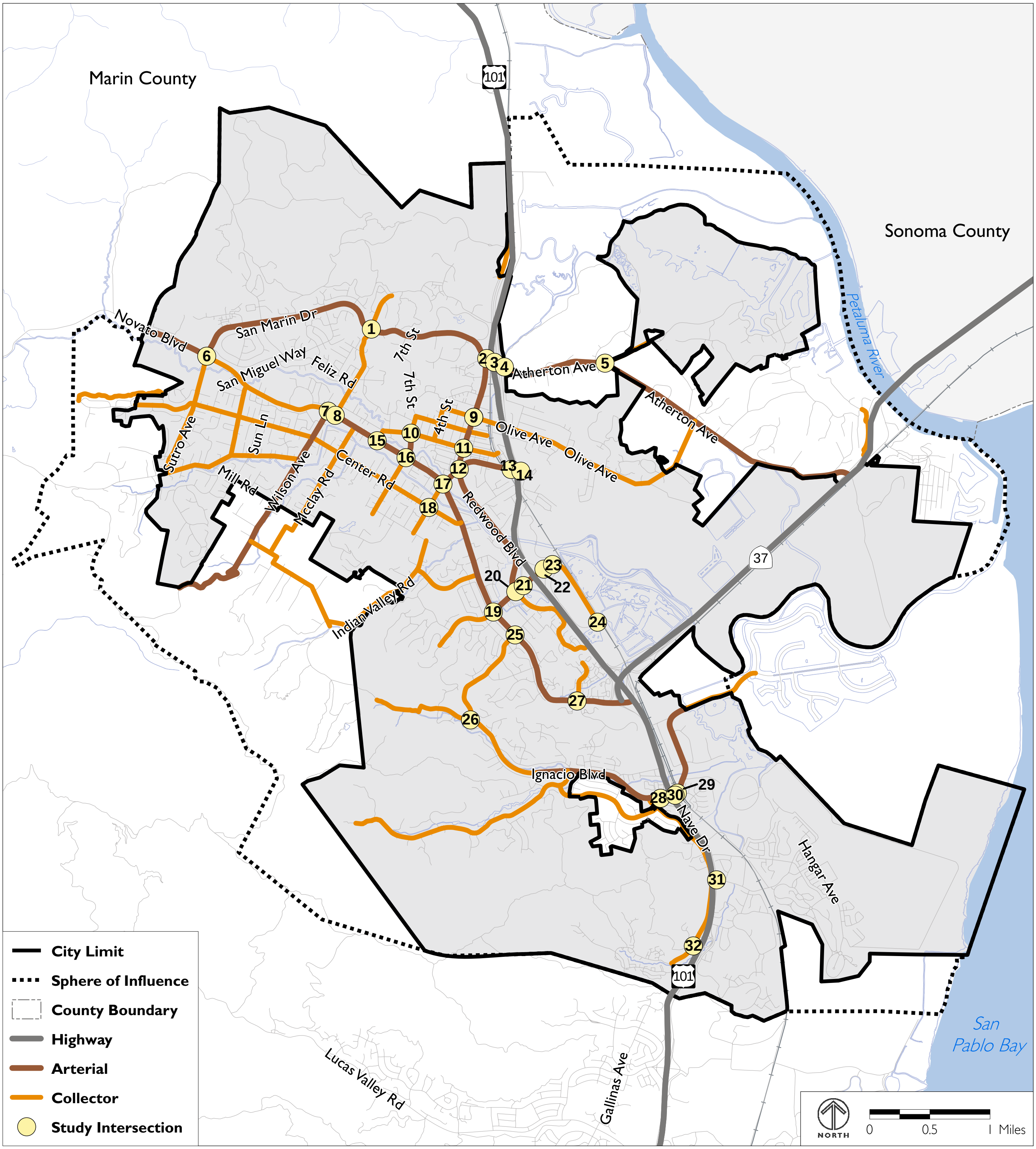
- **Collector.** A collector is generally a two-lane undivided roadway with the primary function of collecting and distributing local traffic. A collector is a relatively low-speed, relatively low-volume street that typically averages 5,000 to 10,000 trips daily and provides access within and between neighborhoods. Collectors usually serve short trips and are intended to collect trips from local streets and distribute them to arterial streets.
- **Local.** Remaining streets are considered local streets as they serve local traffic, feeding into the collector and arterial streets. Local streets have two lanes and usually include parking on both sides, with paved widths of 20 to 40 feet.

C. Existing Traffic Operations

1. Intersection Operation

The capacity of a street system is typically dependent upon the operation of intersections rather than the segments connecting them, since conflicting vehicle movements are concentrated at intersections. Traffic analyses therefore usually focus on the points where two arterial or collector streets intersect. Traffic engineers use "level of service" to rank intersection operations using a series of letter designations ranging from LOS A to F based on traffic volumes during peak periods and capacity. Generally, LOS A represents free flow conditions and LOS F represents forced flow or breakdown conditions, but not failure. The level of service designation is accompanied by a measure that indicates a level of delay. The ranges of delay associated with the various levels of service are indicated in Table 6-1.

The existing General Plan establishes standards for acceptable levels of service for intersections in Novato. Intersections with traffic signals or four-way stop signs should operate at LOS D or better. For intersections with stop signs on side streets only, LOS E is acceptable. To evaluate the current performance of intersections in Novato, traffic consultants studied operations at 32 intersections in the city, shown in Figure 6-2. Intersection operations were



Source: W-Trans, 2008

FIGURE 6-2
STUDY INTERSECTIONS

TABLE 6-1 **INTERSECTION LEVEL OF SERVICE CRITERIA**

LOS	Signalized Intersections	Two-Way and All-Way Stop-Controlled Intersections
A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase and do not stop at all.	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.
B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.
C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.
D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.
E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.
F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.

Source: *Transportation Research Board, Highway Capacity Manual 2000.*

studied during AM and PM peak hours. In Novato, these peak hours are 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.

Study intersections are listed in Table 6-2 along with their identified level of service for the weekday AM and PM peak hours. As shown in Table 6-2, all of the study intersections are currently operating acceptably under the policies of the existing General Plan. The intersection at Redwood Boulevard and Olive Avenue was evaluated as a two all-way, stop-controlled "T"

TABLE 6-2 **EXISTING INTERSECTION LEVELS OF SERVICE**

Intersection Approach	Control[a]	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
1. San Marin Dr./ Simmons Ln.	All-way stop	31.3	D	17.8	C
2. Redwood Blvd./ San Marin Dr.	Signalized	29.0	C	33.5	C
3. Highway 101 S/ San Marin Dr.	Signalized, "T"	16.7	B	24.6	C
4. Highway 101 N/ Atherton Ave.	Signalized, "T"	22.1	C	24.6	C
5. Atherton Ave./Bugeia Ln.	One-way stop, "T"	3.2	A	2.7	A
Southbound (Bugeia) Approach		*10.7*	*B*	*10.1*	*B*
6. Novato Blvd./San Marin Dr.-Sutro Ave.	All-way stop	33.9	D	16.0	C
7. Wilson Ave./Novato Blvd.	Signalized, "T"	31.9	C	21.2	C
8. Simmons Ln./Novato Blvd.	Signalized, "T"	16.3	B	17.4	B
9A. Redwood Blvd. south-bound/Olive Ave.	All-way stop, T"	13.4	B	16.5	C
9B. Redwood Blvd. north-bound/Olive Ave.	All-way stop, T"	13.7	B	19.9	C
10. 7th St/Grant Ave.	Signalized	18.8	B	20.0	C
11. Redwood Blvd./Grant Ave.	Signalized	24.4	C	26.1	C
12. Redwood Blvd./Diablo Ave.-DeLong Ave.	Signalized	30.2	C	32.7	C
13. Highway 101 S/ DeLong Ave.	Signalized	16.1	B	8.9	A
14. Highway 101 N/ DeLong Ave.	Signalized	13.8	B	15.1	B
15. Grant Ave./Novato Blvd.	Signalized	13.4	B	18.2	B
16. 7th St-Tamalpais Ave./ Novato Blvd.	Signalized	16.4	B	17.0	B
17. Diablo Ave./Novato Blvd.	All-way stop	33.7	C	34.6	C
18. Diablo Ave./Center Rd.	All-way stop	14.6	B	13.9	B

TABLE 6-2 **EXISTING INTERSECTION LEVELS OF SERVICE** (CONTINUED)

		AM Peak Hour		PM Peak Hour	
Intersection Approach	**Control[a]**	**Delay**	**LOS**	**Delay**	**LOS**
19. S. Novato Blvd./ Rowland Blvd.	Signalized	27.7	C	34.7	C
20. Redwood Blvd./ Rowland Blvd.	Signalized	14.2	B	21.0	C
21. Highway 101 S/ Rowland Blvd.	Signalized, "T"	8.8	A	17.1	B
22. Highway 101 N/ Rowland Blvd.	Signalized, "T"	12.7	B	34.2	C
23. Rowland Blvd./ Rowland Way	Signalized, "T"	7.2	A	16.5	B
24. Rowland Blvd./ Vintage Way	Signalized	7.0	A	46.9	D
25. S Novato Blvd./ Sunset Pkwy.	Signalized	21.7	C	21.3	C
26. Sunset Pkwy./ Ignacio Blvd.	All-way stop, T"	22.8	C	10.0	A
27. S. Novato Blvd./ Redwood Dr.	All-way stop	30.3	D	15.3	C
28. Highway 101 S/Ignacio Blvd-Enfrente Rd.	Signalized	49.3	D	24.5	C
29. Highway 101 N/Bel Marin Keys Blvd.-Nave Dr.	Signalized, "T"	31.2	C	24.5	C
30. Highway 101 N/Nave Dr.	Signalized, "T"	16.6	B	17.4	B
31. Nave Dr/Main Gate Dr.	Signalized, "T"	19.8	B	22.2	C
32. Alameda del Prado/ Nave Dr. (Overpass)	All-way stop	18.0	C	14.3	B

[a] Unless denoted as a "T" or three-legged, intersection, all study intersections have four legs.

intersections due to the existence of stop signs in the wide median between the northbound and southbound Redwood Boulevard approaches. Existing volumes and evaluation calculations are provided in Appendix C.

2. Freeway Operation

The operation of freeways in Novato was also evaluated for this Existing Conditions Report. Freeways within the City of Novato were divided into three segments for purposes of the analysis:

- Highway 101 from the southern city limits to State Route 37.
- Highway 101 from State Route 37 to the northern city limits.
- State Route 37 from Highway 101 to eastern city limits.[2]

The Caltrans target of operation at the LOS C/D threshold for freeway facilities translates to a "service flow rate" of approximately 1,680 passenger cars per hour per lane.[3]

As shown in Table 6-3, two freeway segments in Novato are currently operating at unacceptable levels of service:

- Northbound Highway 101 from State Route 37 to the northern city limit currently operates at LOS E during the evening peak hour.
- Northbound Highway 101 from the southern city limit to State Route 37 currently operates at LOS D during the evening peak hour.

All other segments are operating at acceptable service levels. Detailed calculations for the freeway operation analysis are provided in Appendix C.

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[2] Source for existing traffic volumes: *2002 High Occupancy Vehicle (HOV) Lane Master Plan Update,* as included in the Draft Environmental Impact Report/Environmental Impact Statement for the Marin-Sonoma Narrows (MSN) HOV Widening Project.

[3] Caltrans uses service flow rates to measure the travel demand on a freeway facility based on the number of passenger cars per hour per lane.

TABLE 6-3 **FREEWAY OPERATIONS**

		AM Peak Hour			PM Peak Hour		
Route/ Direction	Limits	# of Lanes	Volume (per lane)	LOS	# of Lanes	Volume (per lane)	LOS
Highway 101 Southbound	City limits south to State Route 37	3	3,400	C	4	5,100	C
Highway 101 Northbound	City limits South to State Route 37	4	3,900	B	3	5,700	D
Highway 101 Southbound	State Route 37 to northern City limits	3	2,800	B	3	4,300	C
Highway 101 Northbound	State Route 37 to northern City limits	3	3,200	B	3	6,100	E
State Route 37 Eastbound	Highway 101 to eastern City limits	2	900	A	2	2,100	B
State Route 37 Westbound	Highway 101 to eastern City limits	2	1,500	B	2	1,000	A

3. Collision History

Traffic collision data were obtained from the California Highway Patrol's Statewide Traffic Integrated Records System (SWTIRS) for the five-year period including 2003 through 2007. The SWTIRS data includes all reported collisions submitted by the Novato Police Department and the California Highway Patrol. During the five-year study period a total of 2,035 collisions was reported within the City of Novato, averaging 407 collisions per year with the highest number of collisions occurring in 2004 (459 collisions), followed by an overall decreasing trend from 2005 to 2007, with the lowest number of collisions reported in 2006 (345 collisions). In total, five collisions resulted in fatalities during the five-year period. An additional 683 collisions, approximately one-third of all collisions, resulted in injury.

The California Office of Traffic Safety (OTS) compiles and analyzes SWTIRS data annually to determine collision trends and to rank cities. Rankings are based on cities of similar sizes and are generally used by OTS to prioritize funding to high-collision areas. The City of Novato was compared to California cities with a population in the range of 50,001 to 100,000, of which there are 106. Table 6-4 shows Novato's rankings for 2007 based on the type of collision, listed in order from highest to lowest collision rates. A lower number indicates worse performance relative to cities of a similar size. The categories of most concern for the City of Novato are collisions involving bicyclists, especially those under the age of 15, as Novato had the worst ranking by population of all cities in the group. Other types of collisions of concern include those involving bicyclists of all ages and those involving pedestrians and drivers under the age of 21 that had been drinking.

D. Parking

Vehicle parking facilities have a significant impact on the attractiveness and accessibility of neighborhoods, commercial districts and communities as a whole. In Novato, parking for individual land uses are generally provided either directly on-site or along the street adjacent to the site.

1. Residential Parking

On-street parking is typically provided on both sides of the street in residential neighborhoods, on local roads, on collector streets and occasionally along the city's arterials. While an abundance of parking is generally available in the city's residential neighborhoods, some of the city's older multi-family developments provide more limited on-site parking, resulting in greater use of on-street parking in these areas.

2. Downtown Parking

Concerns about the availability of parking tend to be focused on the downtown area because of its visitor-serving amenities and aggregation of activities. An inventory of on-street and off-street parking spaces in the downtown area, along with parking occupancy rates, was documented in the 1998 Downtown Specific Plan and the City's Downtown Parking Study, which is updated annually by City staff. The standard used in the Downtown Parking Study is

TABLE 6-4 **2007 COLLISION RANKINGS**

Type of Collision	Victims Killed and Injured	Ranking by Daily Vehicle Miles Traveled*	Ranking by Population*
Bicyclists (under 15 years old)	8	3	1
Bicyclists	20	22	21
Had Been Drinking (under 21 years old)	4	21	23
Pedestrians (over 65 years old)	11	64	62
Pedestrians	12	57	65
Pedestrians (under 15 years old)	2	70	75
Total Fatal and Injury	171	75	80
Alcohol Involved	12	87	92
Composite	N/A	82	92
Had Been Drinking (21–34 years old)	3	89	93

* Compared with 106 cities of similar size. Lower number indicates worse performance.

that an 85 percent occupancy level indicates a parking shortage. The City's most recent analysis, conducted in 2008, indicates that less than 85 percent of parking spaces downtown are occupied during the peak parking accumulation period from noon to 1:00 p.m. on weekdays.

Parking downtown generally consists of public on-street spaces and parking in private lots that serve individual land-uses. Two small public parking lots exist downtown, one on Blodgett Lane between Machin Avenue and Sherman Avenue and the other on Reichert Avenue between Grant Avenue and De Long Avenue. The Signature Properties/Whole Foods development currently under construction will also include approximately 40 spaces available to the public during business hours. Diagonal on-street parking is provided on Redwood Boulevard, Grant Avenue and several surrounding side streets including Machin Avenue, Sweetser Avenue, Vallejo Avenue and First Street.

On-street parallel parking is available on all other downtown streets. On-street parking in downtown is free, with parking that varies from 30 minutes to two hours on Grant Avenue and up to four hours on the side streets. Individual businesses provide private on-site parking in surface lots throughout downtown.

E. Bicycle and Pedestrian Facilities

1. Bicycle Facilities

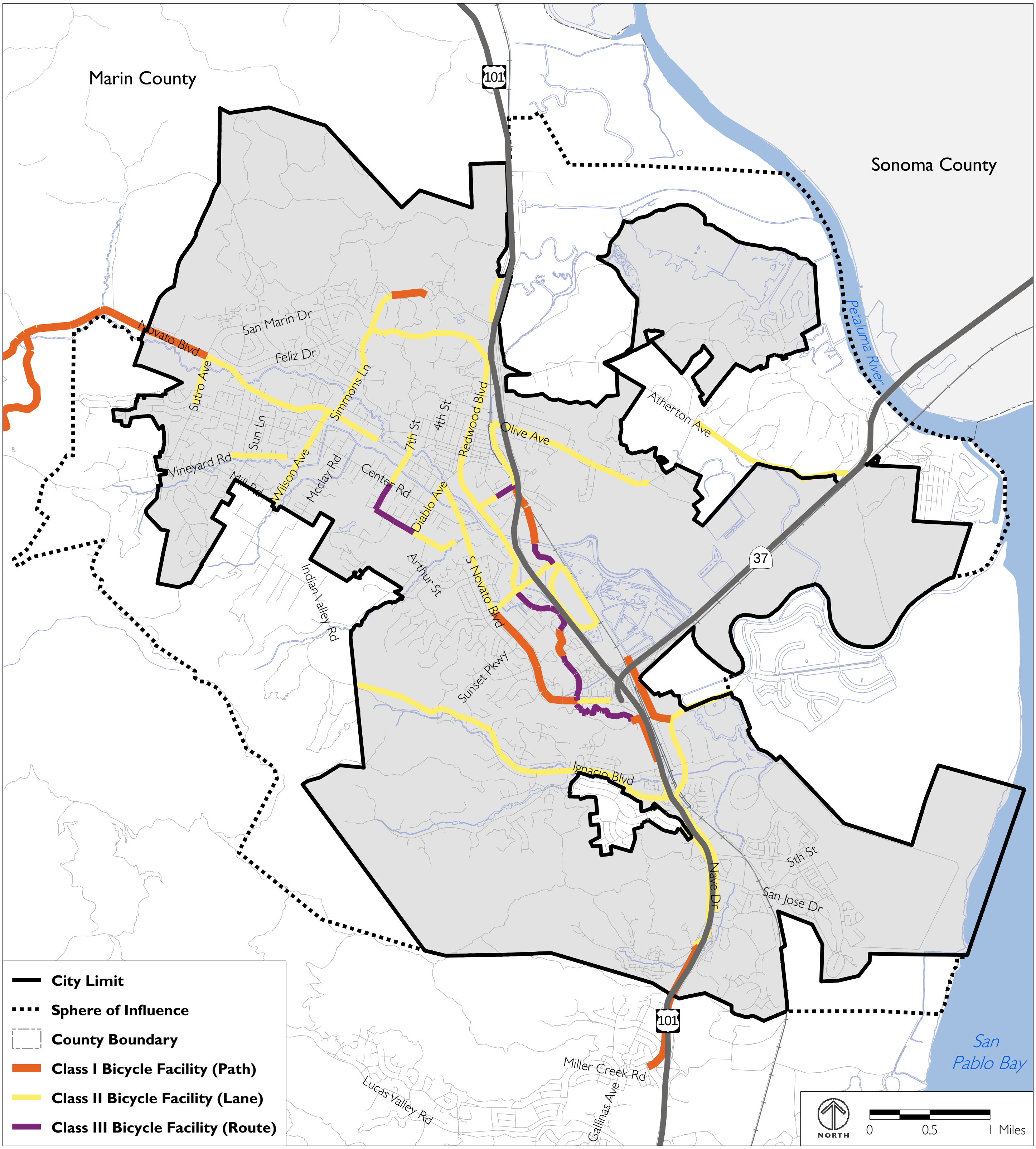
Bicycle facilities in Novato consist of Class I pathways, Class II bike lanes, and Class III bike routes along with support facilities such as bicycle parking, multi-modal transit access and amenities such as showers, changing areas and storage facilities. A breakdown of existing mileage by bikeway type is provided in Table 6-5. Figure 6-3 identifies the location of existing bicycle facilities in Novato.

a. Bicycle Lanes

The majority of Novato's bikeway system is comprised of Class II Bicycle Lanes. The primary north-south bikeway corridor is along Novato and South Novato Boulevards between San Marin Drive to just east of Redwood Boulevard. This bikeway is a major regional connector frequently used by recreational cyclists traveling to and from west Marin County. Bike lanes along Redwood Boulevard continue north to existing and proposed east-west bike lanes on Atherton Avenue. Primary east-west bikeways are provided along San Marin Drive, Atherton Avenue, Olive Avenue, Rowland Boulevard, Ignacio Boulevard, Bel Marin Keys Boulevard and Hamilton Parkway.

b. Bicycle Parking

Bicycle racks can be found at various businesses, employment centers, schools, transit stops and parks throughout Novato. Bicycle lockers for long-term bicycle parking can be leased from Caltrans at the park-and-ride lots at the Nave-Alameda del Prado lot at the Atherton Avenue and Nave Drive interchanges. The park-and-ride lot at Rowland Boulevard has bike lockers



Source: Marin County, GIS

FIGURE 6-3

BICYCLE FACILITIES

TABLE 6-5 **EXISTING BIKEWAY MILEAGE BY TYPE**

Class	Bikeway Type	Total Mileage
I	Multi-Use Path	4.96
II	Striped Bicycle Lanes	24.84
III	Signed Bicycle Routes	4.76
All Bikeways		**34.56**

available to bicyclists on a first-come, first-served basis to riders who bring their own locks.

Bicycle parking was included as a part of the recently-completed Grant Avenue Improvement Project. Racks were placed at various locations for access to retail destinations. New space created by reconfiguring curb lines and constructing bulbouts was used to install racks outside the pedestrian travel zone. The City of Novato has adopted official design standards for sidewalk bicycle parking and an ordinance requiring showers, lockers and change facilities in newly-developed employment centers.

c. Walking and Bicycling in Novato

Novato residents and visitors walk and bicycle throughout the City for leisure, recreation, and for access to schools, employment sites, transit resources, shopping and other utilitarian purposes. The City's Mediterranean climate and mostly flat topography are conducive to walking and bicycling. Moreover, the City has a well-developed network of bicycle and pedestrian facilities and amenities that provide dedicated access for pedestrians and bicyclists along many of its primary transportation routes. Although the planned pedestrian and bicycle network may not be built out for many more years, and barriers such as Highway 101 limit access and permeability to major destinations, the overall quality of the City's non-motorized transportation system is high.

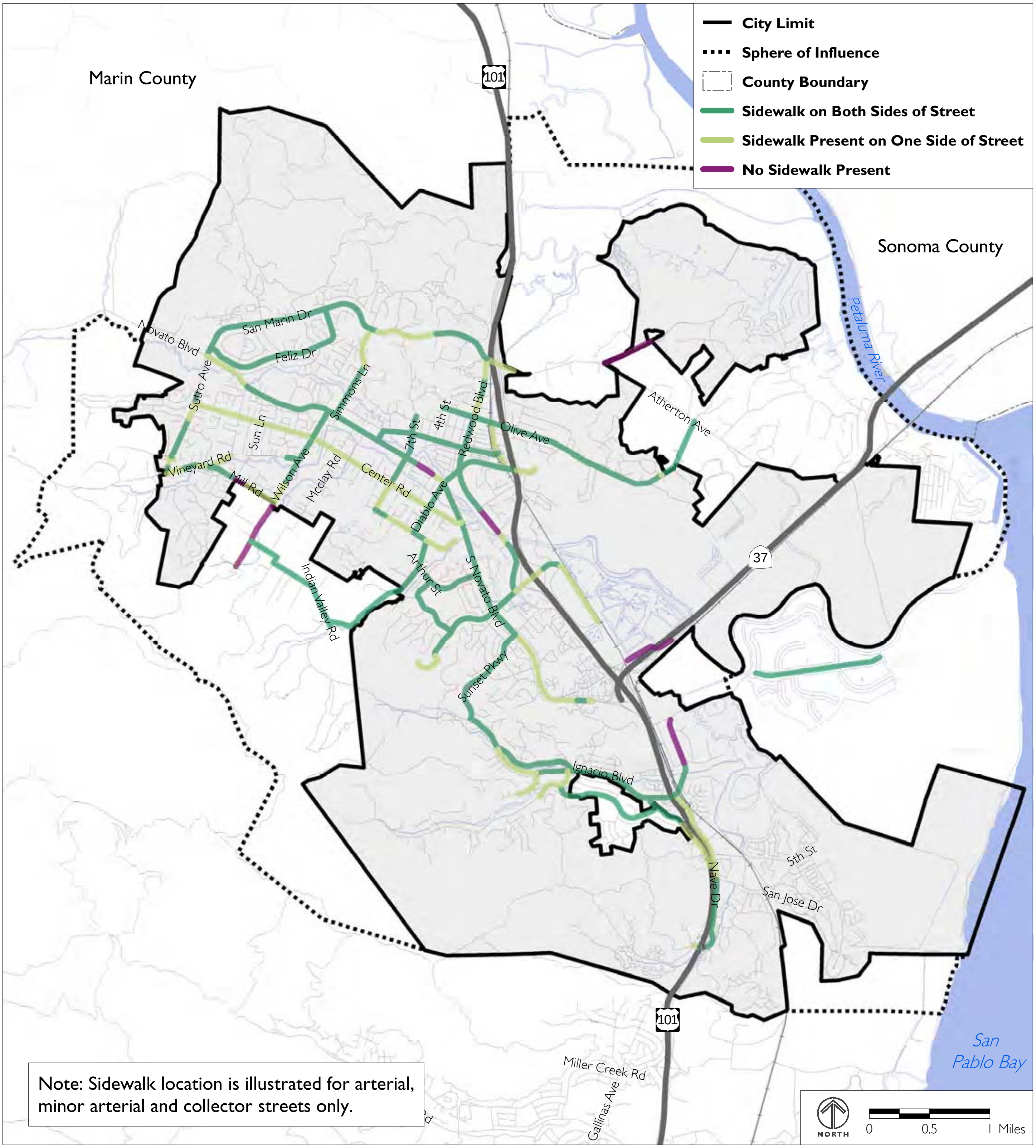
2. Pedestrian Facilities

The City of Novato has a well-developed network of pedestrian facilities that includes sidewalks, pathways, ADA curb ramps, crosswalks and amenities such as bulbouts, pedestrian scale lighting, benches, transit shelters, street trees, landscape plantings and decorative paving treatments. Sidewalks are provided on the majority of streets in Novato, with continuous sidewalks and/or multi-use pathways in place along most principal arterials, minor arterials and collector streets. Downtown Novato and surrounding neighborhoods have a nearly complete sidewalk coverage, while outlying residential areas have varying coverage. Figure 6-3 identifies sidewalk coverage on arterial and collector streets in Novato.

In general, sidewalks are constructed of concrete, are at least 4 to 5 feet wide, and include either a landscape buffer or parking lane between the sidewalk and vehicle travel lanes. ADA curb ramps are provided at most intersections and sidewalk transitions. In recent years the City has installed or upgraded ADA curb ramps throughout the community to meet current accessibility standards. Upgraded ramps, which include accessible grades, landings and tactile inlays, have been installed throughout the downtown area, at intersections along major arterials, in school zones and at select 'high activity' crossings. Bulbouts, pedestrian refuge islands, decorative treatments, landscaping and amenities are provided in downtown and other locations throughout the city. High visibility markings and advanced warning signs are also provided at mid-block crossings on arterials, in school zones and at transit hubs.

3. Multi-Modal Access

Most Golden Gate Transit bus stops within the City of Novato have bicycle racks located at the stops. In addition, up to two bicycles can fit on racks mounted to the front of all Golden Gate Transit buses less than 60 feet long. Commuter "coach" type buses longer than 60 feet were recently outfitted with luggage bay racks that allow two bicycles to ride in the underfloor luggage area. In addition, the Marin County Transit District has included an element in their long-range transit plan to upgrade all bus-mounted front bicycle racks from two to three capacity fixtures.



Source: Marin County, GIS

FIGURE 6-4

PEDESTRIAN FACILITIES

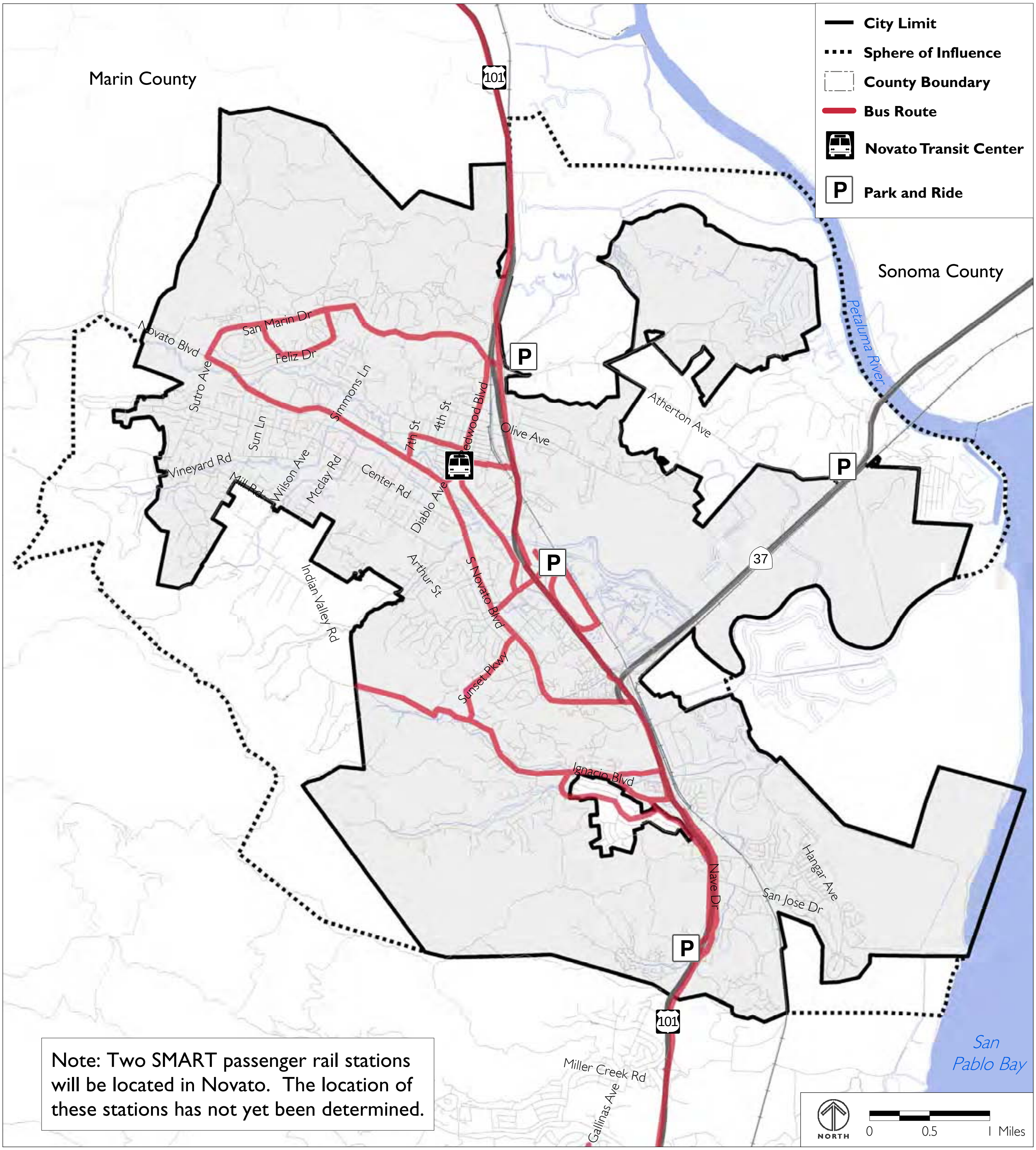
F. Transit Service and Facilities

The Marin County Transit District (MCTD) is responsible for providing local transit service within Marin County, including the city of Novato. As previously mentioned, MCTD does not own any buses or facilities and does not employ its own drivers. Instead, MTCD contracts with other providers, including Golden Gate Transit and Whistlestop Wheels, to provide local transit services in Marin. MTCD determines level of transit service and fares for these services.

1. Bus Service

The Golden Gate Bridge, Highway and Transportation District operates Golden Gate Transit, which provides fixed route bus service in Novato through the Marin County Transit District. Golden Gate Transit serves Novato with local and express bus service that links Novato to Marin and Sonoma County cities, as well as to San Francisco. Golden Gate Transit service in Novato is provided via the following local and regional routes: 49, 51, 52, 54, 56, 58, 70 and 71. Figure 6-4 shows bus route locations in Novato. Route descriptions, including operating days and times, are provided below.

- Route 49 provides local service in Novato and Marin County with approximately 1-hour headways, operating daily from approximately 6:00 a.m. to 9:00 p.m. This route serves the Ignacio and Hamilton areas, and then continues on to San Rafael.
- Route 51 provides local service in Novato and Marin County with approximately 1-hour headways. It operates weekdays from approximately 7:00 a.m. to 8:00 p.m. and serves San Marin, Novato, Sutter Novato Medical Center, Vintage Oaks Shopping Center, Indian Valley College and Ignacio. Route 51 then continues to Hamilton and San Rafael as Route 49.
- Route 52 provides local service in Novato and Marin County with approximately 1-hour headways. Route 52 operates daily from approximately 7:00 a.m. to 7:00 p.m. and serves Novato, Ignacio, and San Rafael.



Source: Marin County, GIS

FIGURE 6-5

BUS ROUTES AND TRANSIT FACILITIES

- Route 54 provides service connecting Novato and other parts of Marin County to San Francisco with an approximately ½-hour headway. Route 54 operates weekdays during peak commute hours, with southbound service provided from approximately 4:30 a.m. to 9:30 a.m. and northbound service provided from approximately 2:30 p.m. to 8:30 p.m.
- Route 56 provides express commuter service between Novato and San Francisco with some intermediate stops and approximately ½-hour headways. Route 56 operates weekdays during peak commute hours, with southbound service provided from approximately 5:30 a.m. to 9:00 a.m. and northbound service provided from approximately 3:30 p.m. to 7:30 p.m.
- Route 58 provides express commuter service between Novato and San Francisco with more intermediate stops than Route 56 and headways of approximately ½-hour. Route 58 operates weekdays during peak commute hours, with southbound service provided from approximately 6:00 a.m. to 9:00 a.m. and northbound service provided from approximately 4:30 p.m. to 7:00 p.m.
- Route 70 provides weekend service between Novato and San Francisco with intermediate stops in other communities and headways of approximately 1-hour. Route 70 overlaps with Route 80, which extends into Sonoma County, and Route 71, which connects Novato to Marin City. The southbound route operates between 5:30 a.m. and 9:00 p.m. and the northbound route operates between 5:00 a.m. to 2:00 a.m.
- Route 71 provides daily local service between Novato and Marin City with approximately 1-hour headways. Route 71 overlaps with Route 70, which provides service between Novato and San Francisco, and Route 80, which provides service between Santa Rosa and San Francisco. The southbound route operates between 6:30 a.m. and 6:30 p.m. and the northbound route operates between 7:00 a.m. and 8:30 p.m.
- Route 153 provides local service on school days between Redwood Boulevard and Grant Avenue in Novato, San Marin and San Marin

High School. Route 153 provides service to school in the morning and from school in the afternoon.

2. Novato Transit Center

Timed bus transfers in Novato currently take place at the transit facility on Redwood Boulevard at Grant Avenue (see Figure 6-4). However, the existing facility serves only a limited number of routes. The development of a transit center and transfer station with the capability of serving a larger number of routes and hosting intermodal trips has been a longstanding community goal. The Marin County Transit District's 2006 Short Range Transit Plan included an evaluation of a number of potential transit center locations. Ultimately, the Plan supported a southern Novato facility near the intersection of Nave Drive and Roblar Drive at the proposed SMART station.

3. Park-and-Ride Lots

There are five park-and-ride lots in Novato. The facilities provide short- and long-term parking for commuters, transit riders and bicyclists. Three of the facilities are located along the Highway 101 corridor and are owned and operated by Caltrans. Additional facilities, operated by the City of Novato and Golden Gate Transit, are located along the State Route 37 corridor at Black Point and at the Hamilton Theater on Palm Drive. Table 6-6 provides further details on the facilities, including their locations and amenities provided.

4. Passenger Rail

Currently, no passenger rail service is provided in Novato. However, in November 2008 Marin and Sonoma County voters passed Measure Q, a quarter-percent increase in the local sales tax to fund the Sonoma Marin Area Rail Transit (SMART) passenger rail project. SMART will provide a 70-mile passenger train service on the existing publically-owned Northwestern Pacific Railroad right-of-way between Cloverdale and Larkspur. The project includes the development of two train stations in Novato, with several alternative sites still under consideration. The project also includes the development

TABLE 6-6 **NOVATO PARK-AND-RIDE LOTS**

Lot	Location	Parking Spaces	GGT Routes	Bicycle Parking	Lighting
Atherton Ave.	Hwy 101 at Atherton Ave.	58	56, 75	Yes	Yes
Hamilton Theater	555 Palm Drive	66	49, 58	No	Yes
Rowland Blvd.	Hwy 101 at Rowland Blvd.	240	56, 70, 71, 80	Yes	Yes
Black Point	North of Route 37 at Atherton Ave.	29	None	No	Yes
Alameda del Prado	Northwest of Alameda del Prado/Hwy 101 Overcrossing	106	49, 52, 58	Yes	Yes

of a parallel bicycle and pedestrian pathway connecting all 14 train stations in Marin and Sonoma Counties.

5. Paratransit

The transportation needs of the elderly and persons with disabilities in Novato are addressed by demand responsive or 'Dial-A-Ride' paratransit services. EZ Rider partners with the Novato Human Needs Center to provide transportation services for all Novato area residents seven days a week. A combination of fixed 'shopper shuttle' trips from designated Novato senior residential facilities as well as general Dial-A-Ride services, are provided for a maximum fare of $1.50 per one-way trip. Dial-A-Ride and 'shopper shuttle' trips are accommodated via automobiles and/or wheelchair lift-equipped vans. Service is offered between 10:30 a.m. and 2:30 p.m. on Mondays and Fridays, between 8:00 a.m. and 5:00 p.m. Tuesdays, Wednesdays and Thursdays, between 1:00 p.m. and 9:00 p.m. Saturdays, and between 9:00 a.m. and 5:00 p.m. Sundays.

G. Freight System

1. Rail Freight System

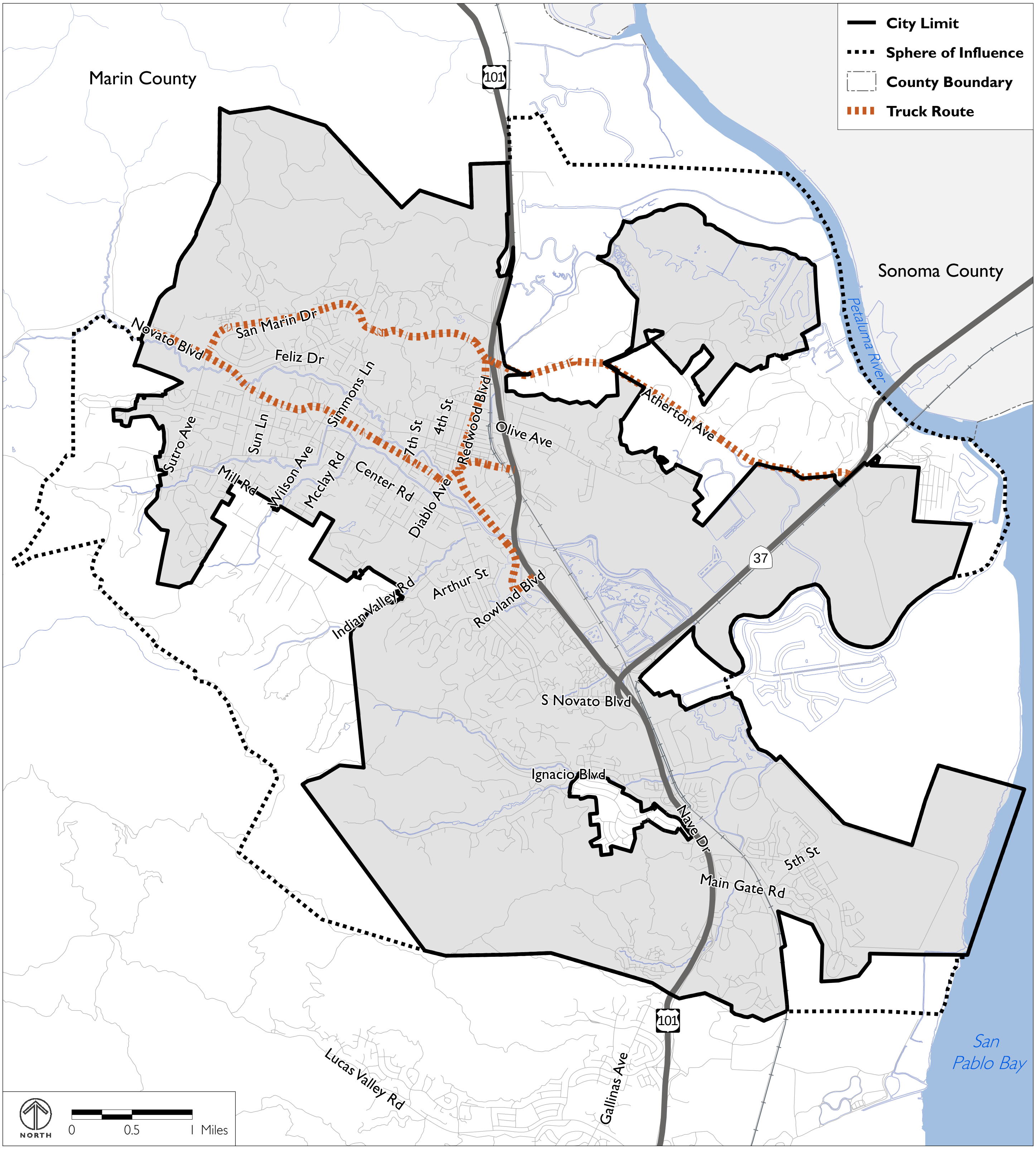
Currently, no rail freight service passes through Novato. However, the North Coast Rail Authority (NCRA) plans to restore rail freight service along the northern coast of California by connecting Arcata in Humboldt County to existing freight rail lines in Fairfield-Suisun in Solano County. This route will pass through Novato; however, no stops are proposed within the city. According to a November 2008 legal settlement, limited freight rail service may begin as early as Spring 2009, with full service starting in 2011 or 2012. As part of the settlement, NCRA must install Federal Railroad Administration (FRA) certified "Quiet Zone Improvements" at eight of the 13 locations in Novato where the tracks cross public roads. Prior to beginning service, NCRA will also complete upgrades at the eight identified track crossings in Novato.

2. Truck Routes

The City of Novato's Municipal Code prohibits any vehicle exceeding the maximum gross weight limit of five tons from traveling or parking on any City street except on those streets designated as truck routes in Municipal Code Section 18-10.2. As shown in Figure 6-5, the following streets are designated as truck routes:

- Redwood Boulevard (from Rowland Boulevard to San Marin Drive)
- Atherton Avenue
- DeLong Avenue (from Redwood Boulevard to Highway 101)
- Novato Boulevard (northwesterly of Diablo Avenue)
- Diablo Avenue (easterly of Novato Boulevard)
- San Marin Drive
- Rowland Boulevard (from Redwood Boulevard to Highway 101)

Additional exceptions, defined in Municipal Code Section 18-10.3, allow trucks to travel on prohibited streets for the purpose of making pick-ups or



Source: W-Trans, 2009

FIGURE 6-6

TRUCK ROUTES

deliveries to a location on a prohibited street. Passenger busses and vehicles used for the purpose of installing, maintaining or repairing public utilities are exempt from weight restrictions.

H. Citywide Modal Split

The 2000 U.S. Census was reviewed to determine the current mode split for residents of the City of Novato. As shown in Table 6-7, about 83 percent of Novato residents who work outside their home travel in motor vehicles, over 8 percent use public transportation, and 2 percent walk or bicycle to work. The remaining 6 to 7 percent work at home (5.6 percent) or commute via other means.

The Census also provides trip distances for those residents who commute by motor vehicle. This data is summarized in Table 6-8. The largest percentage of residents who commute by car, almost 15 percent, had a 45- to 59-minute commute. Just over 12 percent had a 60- to 89-minute commute, and 10.5 percent had a 30- to 34-minute commute.

I. Planned and Proposed Transportation Improvements

1. Marin-Sonoma Narrows Project

The Marin-Sonoma Narrows Project will widen 16.1 miles of Highway 101, from State Route 37 to just north of the Corona Road Overcrossing in the City of Petaluma in Sonoma County. The project has been divided into three discrete segments: the Southern Segment extends from just south of State Route 37 to north of Atherton Avenue; the Central Segment extends from Atherton Avenue Interchange to south of State Route 116 (east), crossing the Marin-Sonoma county line; and the Northern Segment extends from State Route 116 (east) to north of the Corona Overcrossing in the City of Petaluma.

TABLE 6-7 **NOVATO DEMOGRAPHIC AND MODE SPLIT DATA**

Mode Split	Number	Percent
Car, Truck or Van	**20,435**	**83.1%**
Drove alone	17,287	70.3%
Carpooled	3,148	12.8%
Public Transportation	**2,063**	**8.4%**
Bus or trolley bus	1,749	7.1%
Subway or elevated	16	0.1%
Railroad	0	0.0%
Ferryboat	281	1.1%
Taxicab	17	0.1%
Motorcycle	106	0.4%
Bicycle	89	0.4%
Walked	401	1.6%
Other means	119	0.5%
Worked at home	1,375	5.6%
Total	***24,588***	***100%***

The proposed project includes adding northbound and southbound High Occupancy Vehicle (HOV) or "carpool" lanes along the entire project length, widening and realigning Highway 101 along the Novato Narrows, replacing bridges and constructing new bridges, sound walls, and bicycle and pedestrian paths, and upgrading drainage facilities. Project construction is expected to begin by 2010.

TABLE 6-8 **NOVATO JOURNEY TO WORK DATA**

	Number	Percent
Did not work at home	23,213	94.4%
Less than 5 minutes	589	2.4%
5 to 9 minutes	2,291	9.3%
10 to 14 minutes	2,681	10.9%
15 to 19 minutes	2,228	9.1%
20 to 24 minutes	1,920	7.8%
25 to 29 minutes	866	3.5%
30 to 34 minutes	2,594	10.5%
35 to 39 minutes	676	2.7%
40 to 44 minutes	1,253	5.1%
45 to 59 minutes	3,659	14.9%
60 to 89 minutes	2,967	12.1%
90 or more minutes	1,489	6.1%
Worked at home	1,375	5.6%
Total	***24,588***	***100.0%***

Source: 2000 U.S. Census.

2. Local Improvements

The following improvements were identified in the *2002 Citywide Traffic Model Update* as being needed to accommodate long-term growth in the City of Novato, and are to be funded through the City's Traffic Impact Fee.

- Novato Boulevard: Widen to four lanes between 7th Street and Diablo Avenue.
- Redwood Boulevard/Diablo Avenue-DeLong Avenue: Widen approaches and revise signal timing.

- Redwood Boulevard/San Marin Drive: Widen intersection approaches and railroad overcrossing.
- Redwood Boulevard/Olive Avenue: Install a traffic signal or modern roundabout.
- Atherton Avenue/Bugeia Lane: Create a southbound right-turn merge/refuge lane on Atherton Avenue.
- Highway 101 Northbound Ramps/Atherton Avenue: Modify northbound off-ramp to include dual left-turn lanes and a shared through-right turn lane.
- Sunset Parkway/Ignacio Boulevard: Evaluate need for and potentially install a traffic signal.
- San Marin Drive/Simmons Lane: Install a traffic signal or modern roundabout.
- Highway 101 Southbound/San Marin Drive: Create a free right-turn from eastbound San Marin Drive to the southbound on-ramp.
- Redwood Drive north of San Marin Drive: Widen Redwood Drive to include two southbound lanes and modify signal phasing.
- Alameda del Prado/ Highway 101 Overpass (Nave Drive): Signalize and widen on the northbound and eastbound approaches.
- Rowland Boulevard Corridor Improvements: Restripe Rowland Boulevard overpass, provide a new pedestrian/bicycle overcrossing of Highway 101 in the interim and complete improvements at the State Route 37/ Hanna Ranch-March Road interchange.
- Redwood Boulevard/Rowland Boulevard: Extend the westbound right-turn lane.
- Highway 101 Southbound Ramps/DeLong Avenue: Re-stripe the southbound approach to include a left-turn lane, a through-right turn lane, and right-turn lane.
- Nave Drive/Main Gate Drive: Add right-turn overlap phasing to the signal operation.

7 PARKS AND RECREATION

Novato features a wide variety of parks, recreational facilities and open space. These provide recreational amenities for residents, support a healthy environment and contribute to Novato's scenic beauty. This chapter describes applicable plans, policies and regulations and identifies the parks, recreational facilities and open space in Novato and its surrounding areas.

A. Regulatory Framework

1. State Plans and Regulations

a. Quimby Act

Cities and counties are authorized by the Quimby Act (California Government Code Section 66477) to require developers to set aside land, donate conservation easements or pay fees for park improvements. Revenues generated through the Quimby Act cannot be used for the operation and maintenance of park facilities. A 1982 amendment to the Act (AB 1600) requires agencies to clearly show a reasonable relationship between the public need for the recreational facility or park land and the type of development project upon which the fee is imposed. The Quimby Act allows a City to require developers to pay for up to 3 acres of parkland per 1,000 residents.

b. Olompali State Historic Park General Plan

Olompali State Historic Park is a 700-acre State park north of the Novato city boundary and west of Highway 101. The Olompali State Historic Park General Plan is the long-range planning document that guides the development, management and operation of the park. The Plan aims to preserve the historic and cultural features of the park while balancing the recreational needs of its users.

2. County and Regional Plans

a. Marin Countywide Plan

Section 4.14 of the Marin Countywide Plan aims to expand and improve recreational facilities in the county. Section 4.14 also examines how local jurisdictions can contribute to an enhanced park system. Policy PK-1.d calls for the County to work with local jurisdictions "to determine how their facilities contribute to meeting park and recreation needs in Marin."

b. Draft Marin County Parks and Open Space Comprehensive Strategic Plan

Marin County Parks and Open Space Department is currently preparing a Comprehensive Strategic Plan for parks and open space in the county. The draft Strategic Plan assesses existing conditions of parks and open space resources in Marin County, identifies a future vision for the County's park and open space system, establishes goals and strategies and puts forth a financing plan to implement the future vision.

As a component of the Strategic Plan, the Parks Master Plan and the Land Conservation Plan describe resources within specific regions of the county and details about individual facilities. The Land Conservation Plan targets lands that should be preserved as open space. Areas identified in the Land Conservation Plan near Novato include the North County Gateway, including land from the Rush Creek wetlands to Stafford Lake Park, and the East Novato Ridge and Baylands.

The Parks Master Plan specifically addresses issues and opportunities at the County's Stafford Lake Park. The Parks Master Plan recommends that an updated master plan be prepared for Stafford Lake Park to explore ways to improve and expand the facility. Another County facility near Novato identified for improvements is the Black Point Boat Launch on the Petaluma River at the Highway 37 bridge. The plan recommends expanding the facility and improving amenities.

c. Bay Trail

The San Francisco Bay Trail is a regional effort to develop a continuous bicycling and hiking trail along the perimeter of the San Francisco and San Pablo bays. Trail planning is administered by the Bay Trail Project, which is staffed by the Association of Bay Area Governments (ABAG). Once completed, the 500-mile Bay Trail will pass through 47 cities and nine counties. Currently, more than half of the Bay Trail is already built. A feasibility study for the

Bay Trail segment that will pass through the City of Novato is currently underway. However, work on this project has been temporarily suspended due to the State's financial crisis.

d. Bay Area Ridge Trail

The Bay Area Ridge Trail is envisioned to be a continuous multi-use trail that spans the ridgelines of the nine Bay Area counties. Currently, there are 310 dedicated miles of trail with an ultimate goal of more than 550 miles of trail. The Bay Area Ridge Trail Council, a local non-profit, works with jurisdictions, public agencies and other non-profits to complete the remaining links of the Bay Area Ridge Trail. A portion of the Bay Area Ridge Trail connects the Indian Tree Open Space Preserve, west of Novato, to the City's O'Hair Park, located in the western portion of the city on Novato Boulevard and Sutro Avenue.

3. Local Plans and Policies

a. Novato General Plan

Parks and recreation is addressed in the Environment chapter of the existing General Plan. EN Objective 14 calls for the City to "provide an attractive and comprehensive system of parks and trails throughout the city to meet the recreational needs of the entire community." Policies and programs to implement this objective call for the City to maintain existing park facilities, provide neighborhood parks, improve existing undeveloped parks, provide a system of greenways and provide an integrated trail system.

b. Novato Municipal Code Chapter 10

Parks and recreational facilities are addressed in Chapter 10 of the Novato Municipal Code. The purpose of this chapter is to "regulate the use of parks and recreational buildings so that all persons may partake and enjoy them, and to protect the rights of people and uses in the surrounding areas." This chapter discusses activities that require a park permit or application, and provides a summary of unlawful uses within parks regarding domestic animals, camping, fires, amplification of sound and other issues.

c. Community Strategic Plan

The Life Enrichment chapter of the Community Strategic Plan addresses recreation within Novato. The Plan includes vision statements for the future of parks and recreational facilities in Novato and policies to guide the City in accomplishing these goals. The vision describes a community that meets the needs of all ages with high quality, safe, well-designed and maintained facilities; offering recreation programs that appeal to a variety of interest groups; and promoting commercial recreation, leisure opportunities, and community-wide celebrations and events. The Community Strategic Plan includes a number of objectives to achieve this vision.

d. Draft Trails Master Plan

The Trails Master Plan, currently in draft form, will guide the preparation of new trail development and improvement. The Master Plan inventories existing trails, identifies gaps between trails, identifies trail deficiencies, recommends new trail linkages, considers trail design and establishes trail related goals and policies. Additionally, the draft Master Plan explores potential funding sources for trail acquisition and implementation.

e. Target 2000

Target 2000: Taking Novato's Park and Recreational Facilities Into the 21st Century is Novato's most recent comprehensive parks and recreation master plan. This Plan, completed in 1992, provides a recommended framework for the planning, development, acquisition and management of city parks, recreational facilities and recreational programs. The Plan includes an inventory of existing facilities and a description of facilities by Park Planning District. The Plan also identifies funding sources for future park development.

f. Hamilton Area Community Facilities

The Hamilton Field Community Recreation Facilities Implementation Plan provides an overall master plan for the Hamilton area community facilities and a potential program of activities to be offered through the facilities. The Plan also includes an estimated cost analysis and recommendations on development of community facilities in the Hamilton area. This Plan was completed in January 1998; a Phase 2 Study was subsequently completed in August 1999.

g. Art in Public Places

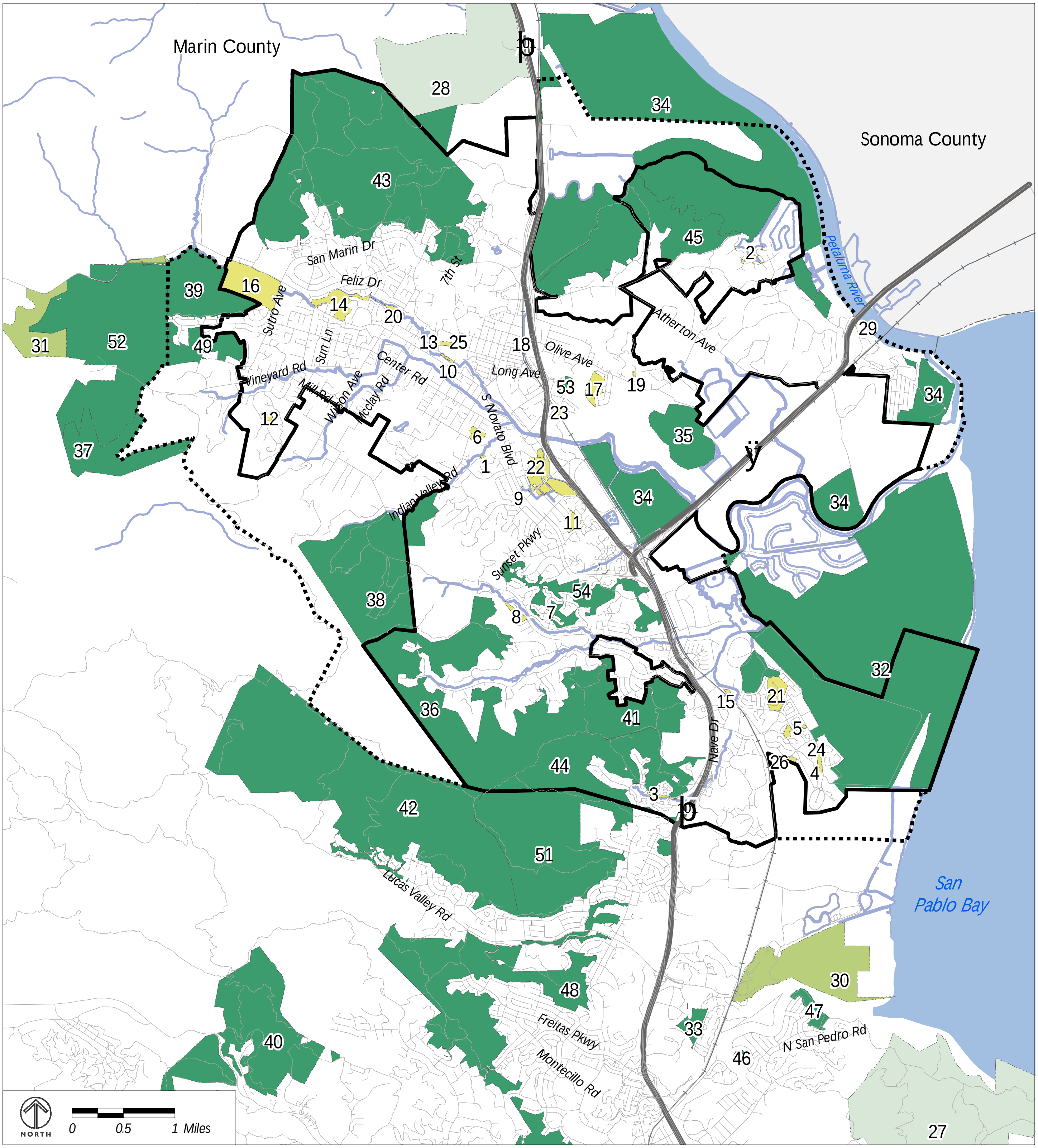
The Art in Public Places Program was developed to facilitate the integration of art into civic places. The Program is administered by the Parks, Recreation and Community Services Department and the Recreation, Cultural and Community Services Commission, who are charged with identifying suitable locations for artwork and implementing the set criteria to select art pieces for display in public and private buildings and outdoor areas.

B. Park, Recreational Facilities and Open Space

Parks and recreational facilities in Novato are administered by the City's Department of Parks, Recreation and Community Services. The Department works to provide Novato residents with access to parks in their neighborhoods and a wide variety of recreational activities at facilities throughout the city. This section describes city parks, recreational facilities, and recreational programming coordinated by the City.

1. City of Novato Parks

The City of Novato manages and operates 27 parks totaling approximately 470 acres. Parks in Novato feature, among other amenities, hiking trails, playgrounds, playing fields and picnic areas. A list of City parks is provided in Table 7-1. The location of these parks is shown in Figure 7-1. In addition to facilities formally recognized as parks, Novato residents have access to school playgrounds and playing fields, which are available for public use outside of school hours. School facilities in Novato are discussed in Chapter 14, Public Services and Facilities.



Source: Marin County, GIS

City Limit
Sphere of Influence
County Boundary
City Park
County Park
State Park
Preserved Open Space

FIGURE 7-1

PARKS AND OPEN SPACE

TABLE 7-1 **CITY OF NOVATO PARKS**

Map ID	Parks	Acres	Amenities
1	Arroyo Avichi Park	7.2	Baseball field, barbeque, playground, tot lot, water spray feature
2	Bahia Mini Parks (6)	1.8	Tot lot
3	Creekside Park	7.9	Benches
4	Hamilton Airport Park	1.4	Playground
5	Hamilton Amphitheater Park	4.1	Amphitheater, restrooms, tot lot, open lawn
5	Hamilton Firehouse Park		Picnic tables, multi-use turf area and future museum
6	Hill Gym/Community Room/Recreation Area	12.4	Ballfields, multi-use turf area, Restrooms
7	Hillside Park	1.2	Playground, tot lot, restrooms
8	Josef Hoog Park	9.8	Group barbeque area, multi-use turf area, basketball court, playground, tot lot, restrooms
9	Joyce Street Tot Lot	0.1	Tot lot, picnic area
10	Lee Gerner Park	2.0	Benches
11	Lynwood Hill Park	11.6	Open access
12	Marin Highlands Park	3.8	Playground
13	Marion Recreation Area	2.0	Multi-use turf area, ballfields
14	Miwok Park	37.9	Trails, Marin Museum of the American Indian, group BBQ areas, bocce ball courts, children's gazebo, horseshoe pits, restrooms
15	Novato Skate Park	1.3	Skate viewing area, lawn, restrooms, parking lot, Golden Gate Transit bus stop
16	O'Hair Park	98.3	Trails, 2.8-acre Dogbone Meadow off-leash dog park, equestrian center, pavilion area
17	Olive Park	22.1	Ballfield, playground
18	Olive Tot Lot	0.1	Barbeque, tot lot, chess table
19	Pansy Tong Lo Tot Lot	0.8	Playground, tot lot
20	Pioneer Park	8.9	Group barbeque area, multi-use turf area, playground, picnic tables, gazebo, lighted tennis courts, paved walking path, restrooms, tot lot
21	Reservoir Hill Vista Trail	32	ADA accessible trail, barbeque, parking
22	Scottsdale Pond/Marsh	51.9	Fishing pier, gazebo, Evalyn Kelly Interpretive Area, model sailboat sailing
23	Slade Park	3.0	Barbeque area, multi-use turf area, playground
24	South Hamilton Park	6.9	Ballfield, multi-use turf area, playground, tot lot, SF Bay trailhead, parking
25	Stafford Grove Park	0.3	Playground
26	Thigpen Sports Courts	1.8	Basketball courts, roller hockey courts, lighted tennis courts

Source: City of Novato Parks, Recreation and Community Services, 2008 Fall Activities Guide, pages 59 and 60.

2. State and County Parks

There are two State parks and three County parks near Novato, as identified in Table 7-2 and shown in Figure 7-1. China Camp State Park is 3 miles south of the city limit east of Highway 101. Olompali State Historic Park, located at the base of Mount Burdell, is 3 miles north of the city limit to the west of Highway 101.

The three County parks include John F. McInnis Park, Stafford Lake Park and Black Point Boat Launch. John F. McInnis Park is approximately 1 mile south of Novato east of Highway 101. Stafford Lake Park is located 3 miles west of the city and offers 139 acres of recreational opportunities. Black Point Boat Launch is located at the intersection of the Petaluma River and the Highway 37 bridge.

3. Protected Open Space

The Novato area includes a significant amount of land designated for open space. In total, there are over 5,540 acres of open space within the Novato city boundary. The majority of this open space is owned and managed by the Marin County Open Space District (MCOSD). MCOSD manages these areas for habitat enhancement, resource preservation, protection of the wild-land-urban interface from fire and for outdoor recreation.

The Rush Creek Open Space preserve, located just north of the City of Novato and to the west of Highway 101, is a 500-plus-acre preserve that was acquired by the Open Space District, with significant help from the Marin Audubon Society, specifically as bird habitat. Each fall and winter, the Rush Creek preserve and adjacent wetlands attract thousands of shorebirds and waterfowl.

The Verissimo Hills Open Space Preserve offers hiking trails and outdoor recreation that are directly accessible from the edge of residential Novato. Several trails in the Verissimo Hills run along ridges and connect via the Stafford Lake Trail to the Little Mountain Preserve in the north and the Indian Tree Preserve to the south.

TABLE 7-2 **STATE AND COUNTY PARKS NEAR NOVATO**

Map ID	Park or Facility	Acres	Amenities
State Park			
27	China Camp State Park	1,529	Hiking
28	Olompali State Historic Park	702	Hiking, horseback riding trails, picnic tables
County Park			
29	Black Point Boat Launch	2	Boat launch, picnic tables
30	John F. McInnis Park	360	Softball fields, soccer fields, boat launch, tennis courts, picnic tables and trails
31	Stafford Lake Park	158	Fishing, tails, picnic tables, barbeque area, softball field, disc golf course, volleyball court, horseshoe court

In addition to MCOSD land, open space preserves in the immediate Novato area are owned and managed by various other agencies, including the California State Department of Fish and Game, the California State Coastal Conservancy, the Marin County Parks and Open Space District, and the North Marin Water District. As shown in Table 7-1, the City of Novato owns the 192.8-acre Anderson Rowe Open Space. The location of these open space areas is shown in Figure 7-1 and listed in Table 7-3.

4. City Recreational Facilities and Programs

In addition to the parks and open space, the City of Novato operates recreational facilities and provides recreational programs for its residents. A detailed description of the programs and facilities is provided below. Table 7-4 summarizes the amenities for each facility.

TABLE 7-3 **PROTECTED OPEN SPACE NEAR NOVATO**

Map ID	Open Space Name	Acres
State Coastal Conservancy		
32	Bel Marin Keys Wetlands	2,694
California Department of Fish and Game		
33	Gallinas Creek	31
34	Petaluma Marsh	2,638
Marin County Open Space District		
35	Deer Island	164
36	Ignacio Valley	940
37	Indian Tree	236
38	Indian Valley	637
39	Little Mountain	239
40	Loma Alta	511
41	Loma Verde	277
42	Lucas Valley	1,672
43	Mt. Burdell	1,620
44	Pacheco Valle	460
45	Rush Creek	491
46	Santa Margarita Island	8
47	Santa Venetia Marsh	32
48	Terra Linda/Sleepy Hollow Divide	1,085
49	Verissimo Hills	114
50	White Hill	381
Marinwood Community Services District		
51	Marinwood Open Space	812
Marin Municipal Water District		
52	Stafford Lake – MMWD	910
53	Other MMWD Lands	9
City of Novato		
54	Anderson Rowe Open Space	192.8

TABLE 7-4 **CITY OF NOVATO RECREATIONAL FACILITIES**

Park or Facility	Amenities
Hamilton Community Center	Dance studio, restrooms, classrooms
Hamilton Gym	Basketball court, racquetball courts, gymnasium, restrooms
Hamilton Pool	YMCA/City of Novato aquatics programs, barbeque, restrooms
Hill Community Room	Meeting room, restrooms
Hill Gym	Gym, bleachers
Lu Sutton Child Care	Multi-use turf area, playground, restrooms
Margaret Todd Senior Center	Full kitchen, auditorium, meeting rooms, stage, restrooms
Novato Gymnastics Center	Gymnastics equipment, restrooms
Novato History Museum	Research library, tours, restrooms
Novato Teen Center	Stage, restrooms, game room, multi-use room, pocket park

a. Hamilton Community Center and Recreation Area

The recreation complex in the Hamilton area offers a variety of indoor and outdoor recreational facilities. The Community Center includes an arts and crafts room, a dance studio, an auditorium, multipurpose rooms, and a recreation room. The Recreation Area has a pool, a baseball field, a multi-use turf area, a gymnasium with a full-length basketball court, racquetball courts, an amphitheater with a stage and a picnic area.

The recreational programs offered at the Hamilton Community Center and Recreation Area serve a range of ages and include:

- Martial arts classes geared for preschoolers, children, teens and adults;
- Dance classes for preschoolers, children and adults;

- Athletic leagues and camps for children, teen and adults;
- Boxing training for beginners and for competitors, and boxercise;
- Aquatic programs at Hamilton Pool are run by the YMCA and include a program for obtaining lifeguard certification; and
- Technology workshops for children and adults.

b. Hamilton Gym

The Hamilton Gym, located at 158 San Pablo Avenue, features 19,500 square feet of gymnasium space, a full basketball court and two racquetball courts. The gym was originally built in 1944 and upgraded in 1955. Plans are underway to upgrade this facility in the future.

c. Hamilton Pool

The Hamilton Pool, located at 203 El Bonito Way in the Hamilton area, consists of a full-size pool, 5,000-square-foot cabana and 1,100-square-foot bathhouse. Since 2000, the YMCA has administered the City's aquatics program, which consists of recreational swimming, swimming lessons, water exercise, diving, lap swimming and synchronized swimming. The pool is closed during the winter season and will be closed during Summer 2009 to undergo renovations.

d. Lu Sutton Child Care Center

The Lu Sutton Child Care Center, located at 1800 Center Road, provides licensed child care services for Novato children. Recreational amenities include a multi-use turf area, playground, restroom and outdoor garden.

e. Margaret Todd Senior Center

The Margaret Todd Senior Center is a non-profit corporation sponsored by the City of Novato Parks, Recreation and Community Services Department. The Center has a large auditorium, a stage, meeting rooms and a commercial kitchen. Amenities at the Senior Center include a computer room with internet access and a lending library. Programs and services offered at the Senior Center include enrichment and fitness courses, senior services, information and referral services. Special events, such as the Holiday Crafts Faire, music events, and an indoor flea market, are hosted by the Senior Center. The Senior Center also offers services and programs for Spanish speakers.

f. Novato Gymnastics Center

The Novato Gymnastics Center offers instructional classes for preschoolers, children, teenagers and adults, as well as classes for special needs gymnasts. The Center hosts gymnastics classes for all experience levels, gymnastics camps, competitive gymnastics programs, and an acro/tumbling class.

g. Novato History Museum

The History Museum provides a look into Novato's early days, with historic photos, documents and books, featuring in-depth accounts of social and ranch life from Novato's past. The museum has a research library, and special tours of the museum can be arranged for groups.

h. Novato Teen Center

The Novato Teen Center offers recreational programs geared for young people in grades 6 through 12. Programmed activities include art projects, movies, card games, sports, tournaments, video games, pool tables and foosball. The Teen Center also offers a range of instructional classes. Events held at the Teen Center include middle school dances and music nights featuring local high school bands.

8 CULTURAL RESOURCES

The term cultural resources applies to a variety of natural and human made items, including paleontological resources (the fossilized remains of plants and animals), traditional cultural properties (sites with value to Native American communities), and archaeological sites and buildings with historic or architectural significance. This chapter provides a description of these resources along with a brief history of Novato and a summary of applicable federal, State and local laws and regulations.

A. *Regulatory Framework*

1. Federal Laws and Regulations

a. National Historic Preservation Act

The federal law which governs the treatment of cultural resources is Section 106 of the National Historic Preservation Act (NHPA). Under Section 106, when a federal agency is involved in an undertaking, it must take into account the effects of the undertaking on historic properties, which are defined as those properties that meet criteria for inclusion on the National Register of Historic Places (National Register). Properties are not required to be listed on the National Register to be considered historic properties.

The National Register defines a historic property or historic resource as a district, site, building, structure or object significant in American history, architecture, engineering, archaeology and culture that may be of value to the nation as a whole or important to the community in which it is located.[1] Properties eligible for listing in the National Register possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

- are associated with important historical events; or
- are associated with the lives of significant persons in our past; or
- embody the distinct characteristics of a type, period, or method of construction; or
- may yield information important in prehistory or history.

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[1] National Park Service, 1995 National Register Bulletin 15. *How to Apply the National Register Criteria for Evaluation.* Page 2.

b. National Environmental Policy Act

The National Environmental Policy Act (NEPA) does not provide specific guidance regarding cultural or paleontological resources. NEPA requires that federal agencies take all practicable measures to "preserve important historic, cultural and natural aspects of our national heritage."[2] Under NEPA, cultural and paleontological resources are typically treated in a similar manner.

2. State Laws and Regulations

a. California Register of Historic Resources

California Code of Regulations Title 14, Chapter 11.5, Section 4850 creates the California Register of Historical Resources (California Register). The California Register is a list identifying the existing historical resources of the State. The list also indicates which resources deserve to be protected from substantial adverse change.

b. California Historic Property Directory

The Historic Property Directory (HPD) is a list compiled by the California Office of Historic Preservation that contains information regarding a property with respect to the California Register of Historical Resources, California State Historical Landmarks, California State Points of Historical Interest and the National Register of Historic Places.

c. Public Resources Code Section 5031

Public Resources Code (PRC) 5031 defines the criteria for designating historical properties. Among other criteria, a property shall be the first, last, only or most significant historical property of its type in the region.

d. Public Resources Code Section 5097

PRC 5097 defines and protects Archeological, Paleontological and Historical sites. Under PRC 5097, an archaeological site survey may be conducted to determine archaeological, paleontological or historical features.

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[2] NEPA Section 101[b][4].

e. Public Resources Code Section 5097.5

California PRC 5097.9 states that no public agency or private party on public property shall "interfere with the free expression or exercise of Native American Religion." The code further states that:

> No such agency or party [shall] cause severe or irreparable damage to any Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine. . . except on a clear and convincing showing that the public interest and necessity so require.

County and City lands are exempt from this provision, expect for parklands larger than 100 acres.

f. Government Code 65352.3-5, Local Government – Tribal Consultation

California Government Code Section 65352.3-5, commonly referred to as Senate Bill (SB) 18, states that prior to the adoption or amendment of a City or County's General Plan, or Specific Plans, a City or county must consult with California Native American tribes that are on the contact list maintained by the Native American Heritage Commission (NAHC). The intent of this legislation is to preserve or mitigate impacts on places, features and objects that are culturally significant to Native Americans. The bill also states that the City or County shall protect the confidentiality of information concerning the specific identity, location, character and use of those places, features and objects identified by Native American consultation.

g. Health and Human Safety Code Section 18950: State Historic Building Code

The State Historic Building Code provides alternative building regulations and building standards for the rehabilitation, preservation, restoration (including related reconstruction), or relocation of buildings or structures designated as historic buildings. These regulations are intended to facilitate the restoration or change of occupancy so as to preserve their original or restored architectural elements and features, to encourage energy conservation and a cost-effective approach to preservation and to provide for the safety of the building occupants.

3. City of Novato Regulations and Policies

a. General Plan

The existing General Plan addresses cultural resources in the Community Identity Chapter. In this chapter, CI Objective 11 calls for the City to "preserve archaelogical and historic resources." Policies and programs implementing this objective further call for the City to protect potential archaelogical resources at building sites and to protect historic buildings, sites and districts.

b. Novato Zoning Code

Section 19.16.060 of the Novato Zoning Code establishes standards and regulations for the Historic (H) overlay district. District boundaries are shown in Figure 2-3, Chapter 2. The purpose of the H overlay district is to "protect areas and structures identified by the community as historically significant elements that contribute to Novato's cultural, social, economic, political, aesthetic, architectural heritage, identity and character." The development of new structures, demolition or alteration of existing structures and establishment of new uses within the H district require Design Review approval and must be consistent with specified design standards. Any request for demolition approval must include an evaluation of the architectural significance of the structure prepared by a qualified person approved by the City.

c. City of Novato Municipal Code Section 4-7

Novato Municipal Code Section 4-7, Cultural Resources, establishes procedures for preserving and studying cultural resources. The Code requires approval of an Archaeological Investigation Permit prior to construction activity that would disturb cultural resources. The Code also requires that records of cultural resources be kept at San Francisco State University, Sonoma State University, the Marin Miwok Museum and the City Community Development Department.

B. Historical Overview of Novato

1. Prehistoric Overview

Archaeological evidence indicates that human occupation of California began at least 12,000 years ago.[3] At the time of Euro-American contact with indigenous peoples, the region was controlled by the Coast Miwok. The Coast Miwok economy focused on marsh resources but also relied on hunting and gathering in the North Coast Ranges. A typical Coast Miwok tribe inhabited a semi-permanent village from which they made trips to temporary, seasonal camps to obtain locally available resources.

After the construction of the Presidio and Mission in San Francisco, many Coast Miwok tribe members began entering the mission, marking the eventual disintegration of much of the Coast Miwok culture. In recent years the tribe has reformed and is now federally recognized as the Federated Indians of Graton Rancheria.

2. Post-Contact History of Novato

The Novato Land Grant was made to Fernando Feliz in 1839 when California was still under Mexican rule. Feliz reportedly constructed an adobe near the location of later settler Francis De Long's home, off of what is now Novato Boulevard. The land grant changed hands from Feliz to Jacob Leese to Bezaar Simmons. In 1848, California became a part of the United States as part of the Treaty of Guadalupe-Hidalgo.[4]

During the latter half of the 19th century, the Novato Land Grant began to be planted with extensive fruit orchards through the partnership of Francis De Long and Joseph Sweetser. In the ensuing decades, settlers arrived in Novato, increasing the demand for utilities.

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[3] Fredrickson, D., 1984, "The North Coastal Region," in *California Archaeology*, San Francisco: Academic Press.

[4] Munro-Fraser, 1880, *History of Marin County, California*, Alley, Bowen & Co.: San Francisco.

By 1911, an electric sub-station was built, followed quickly thereafter by telephone, telegraph and water lines. Novato continued to grow in the early twentieth century until the onset of the First World War, during which many young men from Novato served in the armed forces.

The 1920s saw the continued development of Novato; the Sanitary District was formed and sidewalks were paved. However, the Great Depression brought a halt to Novato's economic growth and development. In an effort to stave off the negative impacts of the Depression, Marin County worked with several Novato businessmen and landowners to acquire over 900 acres along Novato's bay shore, which the County then sold to the federal government for $1.00. The result of this effort, the construction of the Hamilton Air Field in 1932, brought a flood of new jobs to Novato. Officers' quarters were built as the Hamilton Army Air Field expanded into a full-fledged base.

Quartermaster's Construction Officer Captain Howard B. Nurse designed the layout of the Hamilton Air Field Base (HAFB) to reflect the Spanish eclectic style popular at the period. Many of the buildings reflect this style and the layout incorporates many natural features such as knolls, hills and oak groves. At the time, the architecture and layout of the base was unlike any other Army base in the nation.

World War II brought new demands upon the base. HAFB was one of three major bases of the Pacific Sector of the Air Corps Ferrying Command charged with managing and dispatching the safe transport of Pacific-bound aircraft for the war. Many of the women working on the base were members of the Women's Air Corps (WAC), which was later known as the Women's Air Force (WAF). These women served as clerks, medical technicians and training instructors. At the end of the war, HAFB continued to be a training center for pilots, who were joined by their families, creating a need for more family housing.

After World War II, the HAFB continued its services until 1974, when most of the base was closed as encroaching housing development around the base increased the danger of a plane crash or other accident. While this put an end to the base's air related activities, the base continued to act as a training facility and a transfer station.

By this time, Novato had been incorporated since 1960, and residential development in the 1960s and 1970s spread outward along Novato Boulevard. Since its incorporation, perhaps the one development that had the most substantial impact on the City was the construction of State Highway 101, which was completed in 1974. Today, the Fireman's Fund Insurance Company is Novato's largest employer. Novato has also become a center of biotechnology, computer software and entertainment businesses.

C. Existing Cultural Resources

This section identifies baseline conditions for cultural resources in Novato. Sources for information include archaeological base maps, records and reports on file at the Northwest Information Center (NWIC), consultation with the NAHC, local historical societies and local library materials.

1. Paleontological Resources

There are no records of invertebrate, vertebrate, microfossil and paleobotanical fossils located within Novato or its SOI.[5] Identified fossils closest to Novato were found in the Petaluma Formation, which is outside the Novato General Plan area. However, the tuffaceous sandstone unit beneath the volcanic rocks of Mt. Burdell contains fossils; this unit may occur within the northernmost portion of the Novato General Plan area.[6]

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[5] Dr. Mark Goodwin, University of California Museum of Paleontology (UCMP), contacted on November 11, 2008.

[6] Powell, Allen and Holland. 2004. *Invertebrate Paleontology of the Wilson Grove Formation (Late Miocene to Late Pliocene), Sonoma and Marin Counties, California*, *with some Observations on Its Stratigraphy, Thickness, and Structure.* Department of Interior U.S. Geological Survey, Reston, Virginia.

2. Individual Archaeological and Historic Resources

Examination of the NWIC base maps showed that approximately 35 percent of land within the City of Novato's SOI has been surveyed. These surveys have found and recorded a total of 102 potential cultural resources, including both historic and prehistoric sites. Based on the percent of land surveyed, and the number of resources found during those surveys, there is potential for many other sites within Novato's SOI that have not yet been discovered.

a. Prehistoric Sites

Of the potential cultural resources, 79 are prehistoric Native American sites, while one additional site contains both prehistoric and historic elements. These are listed in Tables 8-1 though 8-3. Many of these sites are shell deposits that were discovered in 1907 by Nels Nelson during his survey of the Bay Area.

b. Historic Period Resources

There are 17 potential historic period resources in Novato. Historic period resources are defined as sites, buildings or structures that date to post-contact history after the arrival of the Spanish. These resources consist of, but are not limited to, the remains of the Northwestern Pacific Railroad, a quarry, a section of historic road, and the remains of an historic levee. Some of these resources are located within the boundaries of the Hamilton Air Field Discontinuous District. These potential historic period resources are listed in Table 8-4. In addition to these resources, the Pioneer Memorial Cemetery is currently being evaluated for State historic landmark status and is not listed in the tables.

c. Sites Eligible for the National or California Registry

A total of 52 properties within Novato's SOI are listed on the State of California's Historic Property Directory (HPD). Of these, the Stephen Porcella House and Fashion Shop is listed on the National Register and the California Register. Five other properties are on the California Register and have been determined to be eligible for the National Register. These are listed in Table 8-5 and shown in Figure 8-1.

Figure 8-1 Verified Cultural Resources

CONTENT REMOVED FOR PROTECTION

Table 8-1 Prehistoric Resources – No Determination

CONTENT REMOVED FOR PROTECTION

Table 8-1 Prehistoric Resources – No Determination (continued)

CONTENT REMOVED FOR PROTECTION

Table 8-1 Prehistoric Resources – No Determination (continued)

CONTENT REMOVED FOR PROTECTION

Table 8-1 Prehistoric Resources – No Determination (continued)

Table 8-2 Prehistoric and Historic Sites– No Determination

Table 8-3 Prehistoric– Some Determination

CONTENT REMOVED FOR PROTECTION

Table 8-4 Potential Cultural Resources That Have Not Been Formally Evaluated

CONTENT REMOVED FOR PROTECTION

Table 8-5 Cultural Resources Identified for National Register and California Register

CONTENT REMOVED FOR PROTECTION

3. Hamilton Air Field Discontinuous Historic District

In addition to individual buildings, Novato also has a historic district that encompasses parts of the Hamilton Air Field (see Figure 8-1). The Hamilton Air Field Discontinuous Historic District was listed on the National Register of Historic Places in 1998. According to the National Register Nomination form, HAFB was found significant as a planned community and because it was the work of a master. The buildings within the district exhibit the Mission Revival/Spanish Revival, Modern and Art Deco styles that were popular in the 1930s. The historic district encompasses most of the southwest part of the Hamilton Army Air Field. The district is currently under both private and public ownership. Buildings, structures and sites within the historic district that have been identified as potentially eligible for listing on the National and California registries are shown in Table 8-4.

4. Downtown Specific Plan

Table 8-6 shows historic buildings within Downtown Novato that were identified in the Downtown Specific Plan. The resources on this list are not included in the count of cultural resources listed above. Table 8-7 shows a list of sites where historic structures formerly existed. These sites are also not counted in this analysis of cultural resources.

In summary there are a total of 79 prehistoric Native American resources (archaeological sites), one resource which contains both historic and prehistoric components, six identified cultural resources and 17 historic period resources (buildings, structures and archaeological sites). Addresses have been provided for historic building resources. Because of the sensitive nature of archaeological resources, the nearest cross street or a measurement from a point of reference was provided to give the reader a general location for the resource. A determination of eligibility has not been made for a majority of the resources.

TABLE 8-6 **DOWNTOWN NOVATO HISTORICAL BUILDINGS**

Address	Description
869 Railroad Avenue	County Engineer's house
900 Railroad Avenue	DeBorba c. 1900
904 Railroad Avenue	Augere Hiribarren House
906 Railroad Avenue	Samuels c. 1906
910 Railroad Avenue	Oliver House c. 1894 (1906-World War I Novato Sanitarium - Dr. Kuser's Clinic)
900 Scott Court	Pete Magetti
906 Scott Court	Yelmorini's other house
701 Scott Court	Yelmorini built c. 1908 (so passengers getting off train could only see his saloon at 705)
705 Scott Court	Yelmorini's Saloon downstairs; family upstairs c. 1900
1005 Reichert Avenue	Stephen Porcella living quarters c. 1893
1009 Reichert Avenue	Stephen Porcella House c. 1897 *(National Register)*
1017 Reichert Avenue	Periera House (now Las Guitarras Restaurant)
927 Reichert Avenue	Original Novato Railroad Depot (c.1879) moved to this location behind Druid's Hall
853 Reichert Avenue	Carlisle House c.1896 (now Chamber of Commerce)
849 Reichert Avenue	Potter's House c. 1896
835 Reichert Avenue	Tom Sutton's House c.1896
901 Sherman Avenue	Novato Presbyterian Church c.1896
905 Sherman Avenue	Pastors' House
900 Sherman Avenue	Nielsen/Simmons House c.1906
908 Sherman Avenue	Hanen House c. 1923-former barn from Neilsen/ Simmons House
911 Sherman Avenue	George Morrison House
917 Sherman Avenue	A. D. Scott/Busher House c. 1912
920 Sherman Avenue	Frederick Hamilton House/George Hall House c. 1904
908 Machin Avenue	Novato Community House c. 1922

TABLE 8-6 **DOWNTOWN NOVATO HISTORICAL BUILDINGS** (CONTINUED)

Address	Description
1016 Machin Avenue	Verissimo House
1024 Machin Avenue	Albert Cain House
815 DeLong Avenue	Postmaster's House c. 1850 (now Novato History Museum)
825 DeLong Avenue	Kuser/Silva House c. 1908
817 DeLong Avenue	Malfanti House
850 Cain Lane	Old House - date/original owner unknown
800 Sweetser Avenue	Robert Trumbull Lumber Yard 1911; then Henry Hess Lumber (now Novato Builder's Supply)
821 Sweetser Avenue	Simontacchi House
901 Sweetser Avenue	IDESI Hall c. 1908 (Dancehall added c. 1937)
695 Grant Avenue	Railroad Passenger Station and Freight Depot c. 1917
701 Grant Avenue	Flatiron Bldg. c.1908 (Wells Fargo Express Office - later in 1922 First Novato Advance (printing plant))
801 Grant Avenue	Loustaunau Hall c.1899 (now Druid's Hall since 1937)
809-813 Grant Avenue	Verissimo Bldgs. c. 1914
815 Grant Avenue	Carlisle Hardware c.1910
819 Grant Avenue	DeBorba's Saloon c. 1909 (Converted to billiards during Prohibition)
812 Grant Avenue	Torassa Building c. 1937
814 Grant Avenue	Novato Bakery (bought by Torassa 1922)
818-824 Grant Avenue	Dutra's Store 1893 (bought by Silva 1906)
822 Grant Avenue	Silva Grocery & Saloon (Living quarters above)
824 Grant Avenue	Judge Rudolff's Law Offices (1914-1947) and Justice Court in 1930's Silva Home Second Floor
826 Grant Avenue	Novato Bank c. 1913 (First President James Black Burdell – bought by Central Valley Bank in 1950 – was first City Hall after Novato incorporated in 1960)
828 Grant Avenue	Post Office c. 1917
868 Grant Avenue	Novato Advance c. 1922

TABLE 8-6 **DOWNTOWN NOVATO HISTORICAL BUILDINGS** (CONTINUED)

Address	Description
878 Grant Avenue	Cain's Novato Utilities Company c. 1916-1917
881 Grant Avenue	First National Bank of San Rafael Building c. 1951 (bought by Crocker Bank in 1962 – now All American Printing)
902 Grant Avenue	Gnoss Radio & Electric Shop c. 1935 (now Now and Then Antiques)
906 Grant Avenue	Charles Stafford, DVM Office 1936 (now Grant Avenue Barber Shop)
920 Grant Avenue	Novato Theatre c. 1946 (built after Pini's store burned down in 1945)
928-930-932 Grant Avenue	Nave Building c. 1922 (Nave Garage was 932; now Marin Trophies)
857 Grant Avenue	Scott Hardware/Scott Hall c. 1890
863A-865 Grant Avenue	Dr. Weseman's Medical Offices c. 1936 (now North Bay Chiropractic)
871 Grant Avenue	Quonset Hut Building c. 1948 (site of Sutton's Livery Stable)
904 Grant Avenue	Zunino's Shoe Repair (Ernie Zunino)
1200 West Grant Avenue	Our Lady of Loretto Catholic Church c. 1937 (now Cacti Restaurant)
1107 West Grant Avenue	Pini Hardware c. 1945
1425 West Grant Avenue)	Town & Country Center (Novato First Shopping Center)
7374 Redwood Boulevard	People's Garage (in 1926 became Gordon Anderson's Chrysler Agency – just around the corner from Nave's Garage – now Old Town Import Automotive Service)
7532 Redwood Boulevard	Atherton/Pinheiro House c. 1891 (Pinheiro's since 1940's)
1100 Block Second Street	Nave's Cabbage Patch Store (relocated here from South Novato)
1000 Block Second Street	Fred Sweetser House

Source: Downtown Novato Specific Plan.

TABLE 8-7 **SITES WHERE HISTORIC STRUCTURES FORMERLY EXISTED**

Address	Description
928 Grant Avenue	Site of original Angelo Zunino Shoe Repair Shop
916 Sherman Avenue	Site of Marvin Cain House
912 Railroad Avenue	Site of Dr. Armstrong's House then Captain Hiribarren House (first house in "New Town" of Novato)
901 Block Grant Avenue West on Redwood to DeLong	Site of all three Novato Grammar Schools c. 1859, 1875, 1922-58
830 Grant Avenue	Site of Rayburn's Grocery 1935 (also Pini's Store 1917, then DeBorba's Dry Goods in 1920's and DeBorba's Grocery and Simmons Meat Market)
703 Grant Avenue	Site of Novato House Hotel, built 1899
1000 (West) Grant Avenue	Site of Novato first Fire Station 1930-1980 (historic plaque)
807 Grant Avenue	Yelmorini Meat Market (now Golden Egg Omelette House)
750 Grant Avenue	Samuel's General Merchandise (now Taj Marin Restaurant in recent building)
7369 Redwood Boulevard	DeBorba's Ice Cream Parlor (1925); in 1935 became Laura Rodoni's Village Inn, later sold to Grand Auto and moved to Redwood & Vallejo

Source: Downtown Novato Specific Plan.

9 BIOLOGICAL RESOURCES

Novato is home to a rich diversity of wildlife habitat and plant and animal species. These biological resources represent an important environmental asset for the entire Bay Area and contribute to a unique sense of place in Novato. This chapter provides a description of the regulatory framework related to these resources and identifies and describes the biological resources in and around Novato.

A. Regulatory Framework

1. Federal Regulations

a. Federal Endangered Species Act

The federal Endangered Species Act (ESA) is a complex law enacted in 1973 to protect and recover plant and animal species in danger of becoming extinct and to conserve their ecosystems, with the ultimate goal being the recovery of a species to the point where it is no longer in need of protection. An "endangered" plant or animal species is one that is considered in danger of becoming extinct throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered within the foreseeable future. The ESA prohibits the "take" of protected species. "Take," as defined by the federal ESA, means to "harass, harm, pursue, hunt, shoot, kill, trap, capture, or collect" a threatened or endangered species. "Harm" is further defined by the U.S. Fish and Wildlife Service (USFWS) to include the killing or harming of wildlife due to significant obstruction of essential behavior patterns (i.e. breeding, feeding, or sheltering) through significant habitat modifications or degradation.

The USFWS and the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (NOAA Fisheries) have jurisdiction over species that are formally listed as threatened or endangered under the federal ESA. The USFWS also maintains a list of species proposed for listing as endangered or threatened, and a list of candidate species for which sufficient information is available to support issuance of a proposed listing rule. It is illegal to take any listed species without specific authorization.

b. Migratory Bird Treaty Act

In addition to the protection offered under the ESA, the federal Migratory Bird Treaty Act (MBTA) provides for protection of migratory bird species, birds in danger of extinction, and their active nests. It is illegal to possess or take any bird protected under the Act without a depredation permit from the USFWS, which includes protection of eggs, young, and nests in active use. Although the MBTA technically provides for protection of most bird species, it is typically applied as a mechanism to protect active nests of raptors and colonial nesting species through the breeding and nesting season.

c. Clean Water Act

The Clean Water Act was enacted to address water pollution. It establishes regulations and permit requirements regarding construction activities that affect storm water, dredge and fill material operations, and water quality standards. This regulatory program requires that discharges to surface waters be controlled under the National Pollutant Discharge Elimination System (NPDES) permit program that apply to sources of water runoff, private developments, and public facilities.

On the federal level, the USFWS is responsible for protection of terrestrial and freshwater organisms through implementation of the federal ESA[1] and the MBTA, and NOAA Fisheries is responsible for protection of anadromous fish and marine wildlife.

Under Section 404 of the Clean Water Act, U.S. Army Corps of Engineers (the Corps) is responsible for protecting wetlands and regulating the discharge of fill material into waters of the United States. The term "waters" includes wetlands and non-wetland bodies of water that meet specific criteria as defined in the Code of Federal Regulations. In general, a permit must be obtained before fill can be placed in wetlands or other waters of the U.S.

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[1] The federal Endangered Species Act (ESA) of 1973 declares that all federal departments and agencies shall utilize their authority to conserve endangered and threatened plant and animal species. The California Endangered Species Act (CESA) of 1984 parallels the policies of the ESA and pertains to California species.

In addition, the California Regional Water Quality Control Board (RWQCB) is responsible for upholding State water quality standards. Pursuant to Section 401 of the Clean Water Act, projects that apply for a Corps permit for discharge of dredge or fill material, and projects that qualify for a Nationwide Permit, must obtain water quality certification. The RWQCB is also responsible for regulating wetlands under the Porter-Cologne Act, which may include hydrologically isolated wetlands no longer regulated by the Corps under Section 404 of the Clean Water Act.

2. State Regulations

a. California Endangered Species Act

The California Endangered Species Act (CESA) is similar to the federal ESA both in process and substance, providing additional protection to listed species in California. The CESA does not supersede the federal ESA, but operates in conjunction, with some species having different listing status. The CESA is intended to conserve, protect, restore, and enhance listed species and their habitat.

The CESA prohibits the take of any plant listed as endangered, threatened or rare. A "rare" plant species is one not presently threatened with extinction but that may become endangered if its present environment worsens. State listing of plants began in 1977 with passage of the Native Plant Protection Act (NPPA). The CESA expanded upon the NPPA and enhanced legal protection for plants. To align with federal regulations, CESA created the categories of threatened and endangered species. It grandfathered all rare animals into the CESA as threatened species, but did not do so for rare plants.

The California Department of Fish and Game (CDFG) has jurisdiction over threatened or endangered species that are formally listed under the CESA. Compliance with the CESA is required when a take is considered likely by the CDFG. The CDFG also considers the loss of listed species habitat as "take", although this policy lacks statutory authority and case law support under CESA.

b. California Fish and Game Code

Jurisdictional authority of the CDFG over wetland areas is established under Section 1600 of the Fish and Game Code, which pertains to activities that would disrupt the natural flow or alter the channel, bed, or bank of any lake, river, or stream. The Fish and Game Code stipulates that it is unlawful to substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake, without notifying the CDFG, incorporating necessary mitigation, and obtaining a Streambed Alteration agreement.

At the State level, the CDFG is responsible for administration of the CESA, and for protection of streams and waterbodies through the Streambed Alteration Agreement process under Section 1600 of the California Fish and Game Code. Certification by the California Regional Water Quality Control Board is also required when a proposed activity may result in discharge into navigable waters, pursuant to Section 401 of the Clean Water Act and EPA Section 404(b)(1) Guidelines.

The Wetlands Resources Policy of the CDFG states that the Fish and Game Commission will strongly discourage development in, or conversion of wetlands, unless, at a minimum, project mitigation assures there will be no net loss of either wetland habitat values or acreage.

c. California Natural Diversity Database

The primary information source on the distribution of special-status species in California is the California Natural Diversity Database (CNDDB) inventory, which is maintained by the Wildlife and Habitat Data Analysis Branch of the CDFG. The CNDDB inventory provides the most comprehensive statewide information on the location and distribution of special-status species and sensitive natural communities. The occurrence of a species of concern in a particular region is an indication that an additional population may occur at another location if habitat conditions are suitable. However, the absence of an occurrence in a particular location does not necessarily mean that special-status species are absent from the area in question, only that no data has been entered into the CNDDB inventory.

The CDFG also maintains informal lists of "California Special Concern" (CSC) species. These species are broadly defined as animals that are of concern to the CDFG because of population declines and restricted distribution, and/or because they are associated with habitats that are declining in California. These species are inventoried in the CNDDB, focusing on nesting, roosting, and congregation sites.

The CNDDB is also responsible for maintaining up-to-date records of sensitive natural communities and those considered rare or threatened in the State.

d. California Native Plant Society Inventory

The California Native Plant Society (CNPS) is a non-profit conservation organization dedicated to the preservation of native flora in California. The CNPS has been involved in assembling, evaluating, and distributing information on special-status plant species in the State, as listed in the *Inventory of Rare and Endangered Plants of California* (CNPS, 2001 and electronic update). The status of a plant's listing in the *Inventory* affects the level of protection it is accorded under State law.

3. Local Regulations

a. Novato General Plan

Biological resources are addressed in the Environment chapter of the existing Novato General Plan. EN Objective 1 through EN Objective 6 call for the City to preserve and protect bodies of water, wetlands, historic Baylands, wildlife, and native plants and woodlands. A broad range of policies and programs are provided to implement these objectives.

b. Community Strategic Plan

The Sustainable Community section of the Community Strategic Plan identifies a vision for the natural environment in Novato. Vision Statement 1 envisions "a community which values its ridgetops, hillsides, open space, wetlands and waterways, and nurtures biodiversity." Objectives to achieve this vision call for the City to protect native habitat, maintain and restore open space, and restore creeks, wetlands, and other water bodies.

c. Novato Zoning Code

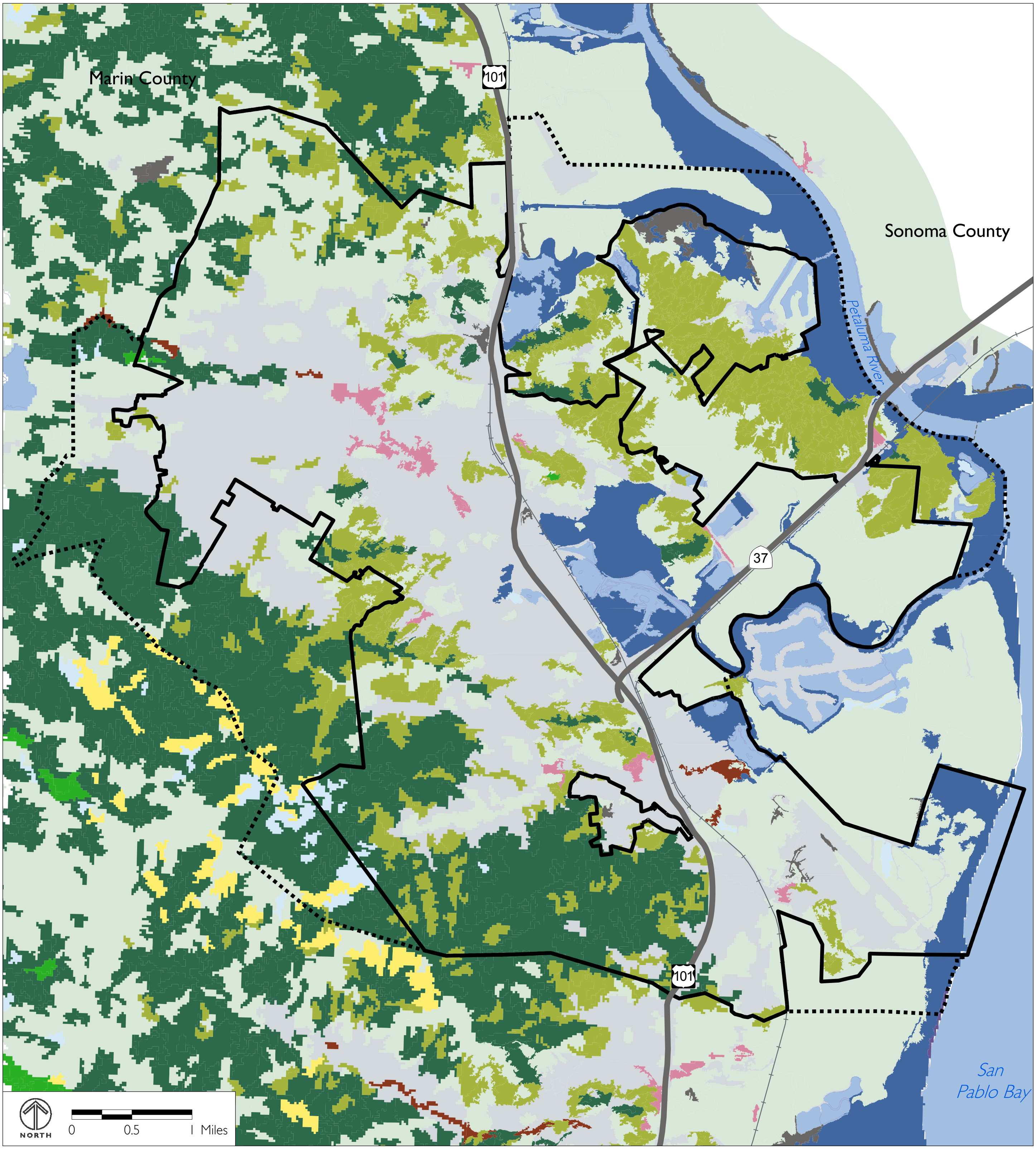
The Novato Zoning Code contains a large number of standards and regulations to protect biological resources. Division 19.08, Agriculture and Resource Zoning Districts, establishes use regulations and development standards to preserve and protect open space, natural resources and agricultural areas in specified zoning districts. Division 19.16.030 establishes the Baylands overlay district with additional standards to protect wildlife and aquatic habitat found in historic Baylands. The location of these zoning districts is shown in Figure 2.2, Zoning Districts in the Land Use chapter of this report.

The Zoning Code also includes special provisions that apply to important natural resources located throughout the city. These standards include Division 19.26, Hillside and Ridgeline Protection; Division 19.35, Waterway and Riparian Protection; Division 19.36, Wetland Protection and Restoration; and Division 19.39, Woodland and Tree Preservation

B. Existing Biological Resources

1. Vegetation and Wildlife Habitat

Novato is in the Central Coast Region of California, which supports a wide range of terrestrial and aquatic habitat types. Figure 9-1 shows the distribution of vegetative cover in the Novato vicinity, modified from the 2004 CalVeg mapping program of the U.S. Forest Service. As indicated in Figure 9-1, the central portion of Novato along the Highway 101 corridor is largely developed with urban and suburban uses, occupying the valley floors and lower elevations of the surrounding hillsides. These largely developed areas are bisected by the remaining natural riparian and marshland habitats along major drainages such as Ignacio, Novato and Rush Creeks. The open water of San Pablo Bay forms the eastern edge of the Novato area, bordered



Source: Marin County GIS, 2004

City Limit	Coastal Salt Marsh	Non-Native Eucalyptus/Pine/Scrub	Water
Sphere of Influence	Coastal Scrub	Oak Woodland	
County Boundary	Douglas Fir/Redwood Forest	Oak/Bay Woodland	
Barren/Rock	Freshwater Marsh	Riparian Scrub/Woodland	
Chaparral	Grassland/Agriculture	Urban/Developed	

FIGURE 9-1

VEGETATION

by large expanses of marshland habitat and diked baylands which support primarily grasslands that continue to be used for grazing. A mosaic of grassland and woodland habitats covers the hillsides that form the northern, western, and southern edges of the Novato vicinity.

Historic land use has altered much of the landscape in the Novato vicinity, including the plant communities and wildlife dependent upon them. Beginning in the mid-nineteenth century and continuing into the present, activities such as livestock grazing, firewood harvesting, clearing and disking for agricultural production, road building, and urban and suburban development have markedly altered the remaining natural communities. Native perennial grasslands in the Novato vicinity and throughout California have been largely replaced by non-native annual grasslands, and a number of highly invasive species now threaten the remaining grasslands. Fire suppression, livestock grazing, and more recently the effects of Sudden Oak Death, have greatly altered the extent of woodland and forest cover. The past effects of overgrazing and urban development along the creeks and tributary drainages on the valley floors continue to affect the aquatic habitat of the creeks and tributaries in the Novato vicinity, and limit the viability of the resident and anadromous fisheries. Although some natural areas remain in local parks, open space, stream corridors, hillsides, ridgelines, and baylands, these are considerably fragmented by urban development.

Nevertheless, the remaining natural communities in the Novato vicinity continue to support a diverse assemblage of plant and animal species, including a high number of special-status species. Even areas now occupied by urban and suburban development continue to support remnants of natural vegetation, including mature oaks and other native trees. The remnant native vegetation and mature ornamental landscaping in urban areas often provide important foraging, resting, and sometimes nesting opportunities to a variety of birds and other wildlife. A description of the various vegetation types and associated habitat types in the Novato vicinity is summarized below.

a. Salt/Brackish Water Marshland

Coastal salt marsh and coastal brackish marsh occupy large expanses of the Novato vicinity along the fringe of San Pablo Bay. They are part of the important wetland ecosystem that comprises the San Francisco Bay Estuary system, of regional and statewide significance. The San Francisco estuary comprised an estimated 628,500 acres of tidal marsh at the time of European colonization. Most of this habitat has been filled and developed with urban uses or converted to other habitats, such as diked wetlands, salt ponds, and agricultural and pasture lands. This conversion has had a significant effect on the health and functioning of the estuary system as a whole, and magnifies the importance of protecting the remaining marshland habitat in the Novato vicinity.

Vegetation associated with the remaining marshlands in the Novato vicinity differs in relation to tides and salinity levels depending on elevation. California cord grass (*Spartina foliosa*) occurs at the lower elevations on the bayward edge of the mudflats that are exposed at low tides. Dense stands of pickleweed (*Salicornia* spp.) occur at the middle elevations of the coastal salt marsh. Transitional marsh species such as salt grass (*Distichlis spicata*), jaumea (*Jaumea carnosa*), salt bush (*Atriplex patula* var. *Hastata*), and gum plant (*Grindelia humilis*) occur at the upper elevations of the salt marsh, together with ruderal grassland species. Areas of brackish water marsh occur at the upper limits of the tidal range, dominated by tules (*Scirpus* spp.) and cattails (*Typha* spp.). Suitable habitat for a number of special-status plant species associated with brackish and coastal salt marsh habitat also occurs in the Novato vicinity, such as Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*), soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*), and Marin knotweed (*Polygonum marinense*).

The marshlands provide important foraging and breeding habitat for a wide variety of aquatic and terrestrial species, and contribute to the health of larger baylands ecosystem. The open water and tidal mudflats provide important resting and feeding habitat for gulls, shorebirds and waterfowl. Bird species commonly associated with the mudflats include: canvasback, scaup, bufflehead, ruddy duck, American avocet, willet and sandpipers. The marshlands provide essential habitat for numerous special-status plant and animal species. The State and federally-endangered California clapper rail, the federally-endangered tidewater goby, and the State-threatened California black rail are known from the lower reaches of Novato Creek.

The State- and federally-endangered salt marsh harvest mouse and salt marsh common yellowthroat, which is recognized as a CSC species by the CDFG, are known from the mouth of the Petaluma River. The federally-threatened steelhead, green sturgeon, and Chinook salmon are all found in the open waters of San Pablo Bay, and move up Petaluma River and Novato Creek for foraging. Anadromous species such as steelhead and salmon move through the marshlands in their way to spawning locations in the upper watersheds. Higher elevations of the marsh typically provide important refugia during storms and high tides for small mammals and birds that typically occupy the lower marsh zones. These higher elevations are frequently used for nesting and resting by other species, such as northern harrier, white-tailed kite, short-eared owl and burrowing owl.

b. Freshwater Marsh

Freshwater marsh occurs along the larger creeks and tributary drainages, scattered seeps and springs, ephemeral and vernal pools, and margins of the stock ponds and other freshwater bodies in the Novato vicinity. Some segments of larger streams support emergent marsh vegetation such as cattails, tules, nut sedge (*Cyperus eragrostis*), monkey flower (*Mimulus guttatus*), narrow-leaved rush (*Juncus xiphioides*) and toad rush (*Juncus bufonius*). Rushes, Douglas' meadowfoam (*Limnanthes douglasii*), prickly buttercup (*Ranunculus muricata*), popcorn flower (*Plagiobothrys stiptatus*), and other wildflowers occur around the seeps, springs, creek margins, and mesic grasslands and seasonal pools, and the showy display of flowers stands out from the surrounding grasslands in the spring. Heavy grazing and trampling by cattle can severely impact vegetative cover and diminish the value of the freshwater marsh habitats in the Novato vicinity, including the margins of ponds, drainages, seeps and springs.

Wildlife value of freshwater marsh habitat is generally high, due to the available surface water, abundance of insect, algae, and plant foliage, and the protective cover when emergent vegetation is present. The available surface water is essential as a source of drinking water for many species of wildlife, and the open water of the larger ponds and pools attracts a variety of birds, mammals, reptiles, and amphibians. Birds expected in the larger waterbodies include waterfowl such as mallard duck and Canada goose, shorebirds such as greater yellowlegs and killdeer, and insectivores such as black phoebe and red-winged blackbird. The larger waterbodies provide potential breeding habitat for a number of amphibians and reptiles, including western terrestrial garter snake, Pacific tree frog, California slender salamander, California newt and western toad. Seasonal ponding in the remaining grasslands and agricultural fields in the diked baylands provide important forage for wintering waterfowl and other birds, including a number of special-status bird species.

c. Grasslands

Much of the remaining undeveloped portions of the Novato vicinity support grasslands dominated by non-native grasses and forbs. Grasslands occupy much of the diked baylands that continue to be used as grazing lands in the eastern potion of the Novato vicinity, as well as the lower slopes of Mount Burdell and the rolling hills of eastern Novato. Species composition in the grasslands varies, depending on the extent of past disturbance, depth to groundwater, and frequency and duration of soil saturation. Highly invasive species, particularly Himalayan blackberry (*Rubus discolor*), poison hemlock (*Conium maculatum*), French broom (*Genista monspessulana*), Scotch broom (*Cytisus scoparius*), and fennel (*Foeniculum vulgare*), are spreading into grassland habitat along road margins and edges of developed areas. These species contribute to the risk of fire through increased fuel loads, and compromise the wildlife habitat values of areas they occupy.

The grasslands in the Novato vicinity tend to support high numbers of insects, reptiles, birds, and small mammals, which in turn serve as important prey for predatory reptiles, birds, and mammals. Some of these species spend all their life in the grasslands, and others forage in the open grasslands and retreat to the protective cover of the surrounding woodlands, scrub, and chaparral for refuge and nesting. Herbivorous small mammals typically associated with grassland habitat include California ground squirrel, Botta's pocket gopher and California vole. Reptiles associated with grassland habitat include gopher snake, common king snake, western rattlesnake, western fence lizard, and alligator lizard. Bird species include granivores, omnivores and insectivores, as well as birds of prey, such as western meadowlark, Say's phoebe, killdeer, savanna sparrow, American goldfinch, blackbird, red-tailed hawk, white-tailed kite, American kestrel, northern harrier, prairie falcon, great-horned owl, barn owl, and occasionally golden eagle. Large herbivores and predatory mammals that frequent the grasslands or use the open areas for dispersal and movement through the Novato vicinity include: black-tailed deer, black-tailed jackrabbit, long-tailed weasel, striped skunk, grey fox, red fox, American badger, bobcat and coyote.

d. Woodlands

Oak woodlands and other hardwood woodlands occupy much of the remaining undeveloped hillsides at Black Point, Deer Island, and the lower slopes of Mount Burdell and Big Rock Ridge in the Novato vicinity. The woodlands vary in species composition and structure, from dense tree cover with a continuous canopy and little understory, to open woodlands with a lush understory of grassland and shrubs, to a widely spaced savanna surrounded by grasslands. Most of the woodlands are dominated by several species of oak and other native tree species, including black oak (*Quercus kelloggii*), valley oak (*Q. lobata*), coast live oak (*Q. agrifolia*), blue oak (*Q. douglasii*), California bay (*Umbellularia californica*) and madrone (*Arbutus menziesii*). Where the woodland canopy is closed, understory vegetation is generally sparse, composed of poison oak (*Toxicodendron diversilobum*), coyote brush (*Baccharis pilularis*), toyon (*Heteromels arbutifolia*) and other shrub and groundcover species. Where the canopy is open or sparse, the understory is dominated by a relatively dense cover of non-native grassland species.

The mature woodlands provide denning, nesting and foraging opportunities for numerous species of small mammals, reptiles, and birds. Mammals and reptiles found in the woodlands include: deer mouse, woodrat, stripped skunk, grey squirrel, western skink, newts, ensatina (a type of salamander), ring-necked snake, and rubber boa. Larger mammals such as black-tailed deer and predatory species such as grey fox, mountain lion, and coyote most likely forage throughout the woodlands and open savanna, and the annual crop of acorns is an important source of food from many species of mammals and birds. The trees provide nesting cavities, perching and foraging opportunities, and nesting substrate for numerous species of birds, including jays, woodpeckers, kinglets and bushtits. Several species of raptors utilize the mature trees for roosting and possibly nesting, with foraging in the understory and areas of open grassland. These include: red-tailed hawk, Cooper's hawk, white-tailed kite, turkey vulture, great-horned owl and barn owl, among others.

e. Riparian Woodland/Scrub

Riparian woodland and scrub occurs along the larger creeks and tributaries in the Novato vicinity, including Igancio, Novato, and Rush Creeks. Native willow (*Salix* spp.), valley oak, coast live oak, and California bay form the dominant native tree cover along these riparian corridors. Other tree species include native California buckeye (*Aesculus californica*), white alder (*Alnus rhombifolia*), box elder (*Acer negundo* var. *californicum*), Fremont cottonwood (*Populus fremontii*) and black walnut (*Juglans hindsii*), as well as a number of non-native invasive species such as silver wattle (*Acacia dealbata*), black locust (*Robinia pseudoacacia*) and plum (*Prunus* sp.). Several highly invasive, non-native species have become well-established along the creeks and tributary drainages, creating impenetrable thickets of Himalayan blackberry in some locations, scattered stands of arundo (*Arundo donax*), and a dense groundcover of periwinkle (*Vinca major*) in other locations. Riparian habitat is relatively scarce because it only forms along watercourses and lakes, and in California much of this habitat has been lost to agricultural uses, urbanization and channelization for flood control.

Riparian habitat tends to be of high resource value to wildlife, due to the complex structure of the vegetation, available surface water, and the transition to other habitat types which border the creek corridors, sometimes referred to as "edge" habitat. The dense cover of trees and shrubs serves to shade the creeks, and help keep temperatures cooler during the hot summer months. Surface water is available for aquatic-dependent organisms, and as a source of drinking water for terrestrial mammals and birds. Creek channels tend to serve as movement corridors for both terrestrial and aquatic species, including resident and anadromous fish, western pond turtle, aquatic garter snake, western toad, and possibly foothill yellow-legged frog and other amphibians, among others. Wildlife dependent on the protective cover associated with riparian habitat includes: black-tailed deer, black-tailed jackrabbit, brushrabbit, rufous-sided towhee, flycatchers and warblers. The mature trees provide important perching, roosting, and suitable nesting habitat for numerous species of birds, including several species of raptors, such as red-tailed hawk, red-shouldered hawk, Cooper's hawk and sharp-shinned hawk.

f. Chaparral and Coastal Scrub

Northern mixed chaparral and coastal scrub occurs in patches in the southwest of the Novato vicinity. Most of the stands of chaparral are associated with shallow soils along the upper slopes of Big Rock Ridge, and are dominated by chamise (*Adenostoma fasciculatum*), coyote brush (*Baccharis pilularis*), poison oak, manzanita (*Arctostaphylos manzanita*), monkey flower (*Diplacus aurantiacus*), California sagebrush (*Artemesia californica*) and squaw bush (*Rhus trilobata*).

Scrub and chaparral habitats provide important protective cover for wildlife, many of which forage in the surrounding grasslands and woodlands. The dense cover provides habitat for several bird and mammal species that are uncommon in other habitats, including California quail, rufous-sided towhee, rufous-crowned sparrow, California thrasher, Bewick's wren, wrentit, Anna's hummingbird, brush rabbit, pinyon mouse and dusky-footed woodrat.

g. Developed Areas/Ornamental Landscaping

Buildings, roadways, parking lots, other impervious surfaces, turf and ornamental landscaping occupy the developed portions of the Novato vicinity. Existing landscaping consists of a mixture of native and non-native trees, shrubs, and groundcovers. Ornamental landscaping includes a wide range of introduced, commercially available species that provide shade and contribute to the aesthetics of the urban landscape. As noted previously, several highly invasive plant species occur in developed areas and are spreading along roadways and into nearby undeveloped lands. These highly invasive species represent major challenges to controlling the risk of fires and protecting the habitat value of open space lands.

The wildlife habitat values of the developed portions of the Novato vicinity are generally considerably less than that of the surrounding remaining natural habitats. Impervious surfaces, turf, and routine maintenance limit protective cover and foraging opportunities. Wildlife in these developed areas are typically more used to human activity, and include species common in suburban habitats such as scrub jay, brown towhee, mourning dove, house finch, house sparrow, American robin, mockingbird, Norway rat and house mouse. The mature trees provide roosting and potential nesting substrate for numerous species of birds, particularly where they occur in close proximity to open space and other undeveloped lands.

2. Special-Status Species

Special-status species[2] are plants and animals that are legally protected under the State and/or federal ESAs or other regulations, as well as other species

[2] Special-status species include: designated (rare, threatened, or endangered) and candidate species for listing by the CDFG; designated (threatened or endangered) and candidate species for listing by the USFWS; species considered to be rare or endangered under the conditions of Section 15380 of the California Environmental Quality Act Guidelines, such as those identified on lists 1A, 1B, and 2 in the 2001 *Inventory of Rare and Endangered Plants of California* by the California Native Plant Society (CNPS); and possibly other species which are considered sensitive due to limited dis-

that are considered rare enough by the scientific community and trustee agencies to warrant special consideration, particularly with regard to protection of isolated populations, nesting or denning locations, communal roosts, and other essential habitat. Species with legal protection under the federal and State Endangered Species Acts often represent major constraints to development.

A relatively high number of special-status species are reported from or are suspected to occur in the Novato vicinity based on the CNDDB records,[3] the CNPS *Inventory*, and other information sources. Collectively, an estimated 128 special-status plants and animal species are reported from or are suspected to occur in the Novato vicinity. Table 9-1 lists a total of 57 special-status animal species and Table 9-2 lists a total of 71 special-status plant species known or suspected to occur in the Novato vicinity. Information contained in Tables 9-1 and 9-2 includes the common and scientific name, status, and preferred habitat characteristics of each of these special-status species. These special-status species tend to occur in the remaining natural communities in the Novato vicinity, including the baylands along the fringe of San Pablo Bay, the open space and undeveloped lands along the slopes of Mount Burdell, and along Big Rock Ridge. Others are dependent on the creeks, freshwater marshes, and riparian habitat in Novato and other locations for dispersal and essential breeding habitat.

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tribution or lack of adequate information to permit listing or rejection for State or federal status, such as those included on list 3 in the CNPS *Inventory* or identified as animal "California Species Concern" (CSC) species by the CDFG. Species designated as CSC have no legal protective status under the California Endangered Species Act but are of concern to the CDFG because of severe decline in breeding populations and other factors.

[3] California Department of Fish and Game, Natural Diversity Data Base, Record Search of Napa, Mt. George, Cordelia & Cuttings Warf 7.5 minute USGS Quadrangles, March 2007.

TABLE 9-1 **SPECIAL-STATUS ANIMAL SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY**

Common Name (*Scientific Name*)	Status Federal/ State	Habitat
Amphibians/Reptiles		
California tiger salamander (*Ambystoma californiense*)	FT/ CSC	Vernal pools/grasslands
Northwestern pond turtle (*Clemmys marmorata marmorata*)	– / CSC	Streams/ponds/lakes
California horned lizard (*Phrynosoma coronatum frontale*)	– / CSC	Forests/woodlands/grasslands with loose soil
California red-legged frog (*Rana aurora draytonii*)	FT / CSC	Forests/woodlands/grasslands along streamsides
Foothill yellow-legged frog (*Rana boylii*)	– / CSC	Streams with rocky substrate
Western spadefoot toad (*Spea hammondii*)	– / CSC	Grasslands/open woodlands with seasonal pools
Birds		
Cooper's hawk (*Accipiter cooperii*) (nesting)	– / –	Nesting in riparian corridors and woodlands
Sharp-shinned hawk (*Accipiter striatus*) (nesting)	– / –	Nesting in riparian corridors and woodlands
Tricolored blackbird (*Agelaius tricolor)* (nesting colony)	– / CSC	Freshwater marsh and surrounding fields
Great egret (*Ardea alba*) (rookery)	– / –	Colonial nester in large trees
Great blue heron (*Ardea herodias*) (rookery)	– / –	Colonial nester in trees, cliff-sides, marshes
Short-eared owl (*Asio flammeus*)	– / CSC	Grassland and marshes
Golden eagle (*Aquila chrysaetos*)	- / CSC; FP	Grassland and open woodlands
Burrowing owl (*Athene cunicularia)* (burrow sites)	– / CSC	Grassland and open scrub
Northern harrier (*Circus cyaneus)* (nesting)	– / CSC	Nesting in marsh and low shrubs
Yellow warbler (*Dendroica petechia brewsteri*) (nesting)	–/ CSC	Nesting in willows and riparian cover
Snowy egret (*Egretta thula*) (rookery)	– / –	Colonial nester in trees, cliff-sides, near marshland

TABLE 9-1 **SPECIAL-STATUS ANIMAL SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY** (CONTINUED)

Common Name (*Scientific Name*)	**Status Federal/ State**	**Habitat**
White-tailed kite (*Elanus leucurus*) (nesting)	– / FP	Nesting in grassland and marshland with trees
Merlin (*Falco columbarius*)	– / –	Open woodlands as winter migrant
Prairie falcon (*Falco mexicanus*) (nesting)	– / –	Open woodlands, grasslands, marshland
American peregrine falcon (*Falco peregrinus anatum*)	Delisted / SE	Open woodlands, grasslands, marshland
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) (nesting)	– / CSC	Salt and brackish water marsh
Bald eagle (*Haliaeetus leucocephalus*)	FT / SE	Open water of lakes, bays, and ocean shoreline
Loggerhead shrike (*Lanius ludovicianus*) (nesting)	– / CSC	Open grassland/scrub
California black rail (*Laterallus jamaicensis coturniculus*)	– / ST; FP	Coastal saltmarsh
San Pablo song sparrow (*Melospiza melodia samuelis*) (nesting)	– / CSC	Coastal saltmarsh and brackish marsh
Long-billed curlew (*Numenius americanus*)	– /	Marshlands, agricultural fields, and grassland as winter migrant
Black-crowned night heron (*Nycticorax nycticorax*) (rookery)	– / –	Colonial nester in trees/shrubs near marshland
Osprey (*Pandion haliaetus*) (nesting)	– / CSC	Nesting in trees associated with water bodies
California brown pelican (*Pelecanus occidentalis californicus*)	FE / SE; FP	Coastal/bay shorelines and open water
Purple martin (*Progne subis*) (nesting)	– / CSC	Woodlands and forest
California clapper rail (*Rallus longirostris obsoletus*)	FE / SE	Salt and brackish marsh
California least tern (*Sterna antillarum browni*)	FE / SE; FP	Coastal/bay shorelines and open water
Northern spotted owl (*Strix occidentalis caurina*)	FT / –	Forest and woodland
Fish		
Green sturgeon (*Acipenser medirostris*)	FT / CSC	Brackish water, marsh/bays
Tidewater goby (*Eucyclogorius newberryi*)	FE / CSC	Brackish water, marsh/bays

TABLE 9-1 **SPECIAL-STATUS ANIMAL SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY** (CONTINUED)

Common Name (*Scientific Name*)	Status Federal/ State	Habitat
Coho salmon (*Oncorhynchus kisutch*)	FE / SE	Spawns in freshwater streams
Steelhead trout (*Oncorhynchus mykiss irideus*)	FT / CSC	Spawns in freshwater streams
Chinook salmon (*Onchorhynchus tshawytscha*)	FT / -	Spawns in freshwater streams
Sacramento splittail (*Pogonichthys macrolepidotus*)	– / CSC	Brackish water, marsh/bays
Invertebrates		
Opler's longhorn moth (*Adela oplerella*)	– / –	Serpentine grasslands
Marin blind harvestman (*Calicina diminua*)	– / –	Rocky outcrops in serpentine grasslands
Monarch butterfly (*Danaus plexippus*) (colonies)	– / –	Overwinters in blue gum eucalyptus
Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*)	– / –	Aquatic habitat/pools and ponds
Myrtles silverspot (*Spexeria zerene myrtleae*)	FE / –	Scrub/grassland with larval host
California freshwater shrimp (*Syncaris pacifica*)	FE / SE	Freshwater streams with undercut banks
Ubick's gnaphosid spider (*Talanites ubicki*)	– / –	Serpentine outcrops
California brackishwater snail (*Tryonia imitator*)	– / –	Coastal marshes and lagoons
Mammals		
Pallid bat (*Antrozous pallidus)*	– / CSC	Roosts in protected locations
Townsend's big-eared bat (*Corynorhinus townsendii*)	– / CSC	Roosts in protected locations
Greater western mastiff-bat (*Eumops perotis californicus*)	– / CSC	Roosts in protected locations
Long-eared myotis bat (*Myotis evotis*)	– / –	Roosts in protected locations
Fringed myotis bat (*Myotis thysanodes*)	– / –	Roosts in protected locations
Long-legged myotis bat (*Myotis volans*)	– / –	Roosts in protected locations

TABLE 9-1 **SPECIAL-STATUS ANIMAL SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY** (CONTINUED)

Common Name (*Scientific Name*)	Status Federal/ State	Habitat
Yuma myotis bat (*Myotis yumanensis*)	– / –	Roosts in protected locations
Salt marsh harvest mouse (*Reithrodontomys raviventris*)	FE / SE; FP	Coastal saltmarsh
Suisun shrew (*Sorex ornatus sinuosus*)	– / –	Coastal saltmarsh

Status Designations
Federal:
FE = Listed as "endangered" under the federal Endangered Species Act
FT = Listed as "threatened" under the federal Endangered Species Act
PE = Proposed for federal listing as "endangered"
PT = Proposed for federal listing as "threatened"
C = A candidate species under review for federal listing Candidates include taxa for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened
State:
SE = Listed as "endangered" under the California Endangered Species Act
ST = Listed as "threatened" under the California Endangered Species Act
CP = California fully protected species; individual may not be possessed or taken at any time
CSC = Considered a "Species of Special Concern" by the CDFG; taxa have no formal legal protection but nest sites and communal roosts are generally recognized as significant biotic features

TABLE 9-2 **SPECIAL-STATUS PLANT SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY**

Common Name (*Scientific Name*)	Status Federal/ State/ CNPS	Habitat
Franciscan onion (*Allium peninsulare* var. *franciscanum*)	– / – / 1B	Woodland/grassland
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	FE / – / 1B	Freshwater marsh/riparian scrub
Napa false indigo (*Amorpha californica* var. *napensis*)	– / – / 1B	Forest/chaparral/woodland
Bent-flowered fiddleneck (*Amsinckia lunaris*)	– / – / 1B	Coastal bluff scrub/woodland/grassland
Mt. Tamalpais manzanita (*Arctostaphylos hookeri* ssp. *montana)*	– / – / 1B	Chaparral/grassland
Marin manzanita (*Arctostaphylos virgata*)	– / – / 1B	Forest/chaparral
Coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*)	– / – / 1B	Coastal scrub/dunes/marshes/swamps
Alkali milk-vetch (*Astragalus tener* var. *tener*)	– / – / 1B	Vernal pools/grassland/playas
Sonoma sunshine (*Blennosperma bakeri*)	FE / SE / 1B	Vernal pools/mesic grassland
Small groundcone (*Boschniakia hookeri*)	– / – / 2	Forest
Round-leaved filaree (*California macrophylla*)	– / – / 1B	Woodland/grassland
Tiburon mariposa lily (*Calochortus tiburonensis*)	FT / ST / 1B	Serpentine grassland
Lyngbye's sedge (*Carex lyngbyei*)	– / – / 2	Marshes/swamps
Tiburon indian paintbrush (*Castilleja affinis* ssp. *neglecta*)	FE / ST / 1B	Serpentine grassland
Humbolt Bay owl's clover (*Castilleja ambigua* ssp. *humboldtiensis*)	– / – / 1B	Coastal saltmarsh
Mason's ceanothus (*Ceanothus masonii*)	– / SR / 1B	Chaparral/serpentine
Pappose tarplant (*Centromadia parryi* ssp. *parryi*)	– / – / 1B	Chaparral/mesic grassland/marshes/coastal prairie
San Francisco Bay spineflower (*Chorizanthe cuspidata* var. *cuspidata*)	– / – / 1B	Coastal scrub/prairie/dunes
Woolly-headed spineflower (*Chorizanthe cuspidata* var. *villosa*)	– / – / 1B	Coastal scrub/prairie/dunes
Robust spineflower (*Chorizanthe robusta* var. *robusta*)	FE / - / 1B	Woodlands, coastal dunes/scrub

TABLE 9-2 **SPECIAL-STATUS PLANT SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY** (CONTINUED)

Common Name (*Scientific Name*)	Status Federal/ State/ CNPS	Habitat
Sonoma spineflower (*Chorizanthe valida*)	FE / SE / 1B	Coastal prairie
Franciscan thistle (*Cirsium andrewsii*)	– / – / 1B	Forest/coastal bluff scrub/prairie/coastal scrub
Mt Tamalpais thistle (*Cirsium hydrophilum* var. *vaseyi*)	– / – / 1B	Forest/chaparral
Round-headed Chinese-houses (*Collinsia corymbosa*)	– / – / 1B	Coastal dunes
Point Reye's bird's beak (*Cordylanthus maritimus* ssp. *palustris*)	– / – / 1B	Coastal saltmarsh/dunes
Soft bird's beak (*Cordylanthus mollis spp. mollis*)	FE / SR / 1B	Coastal saltmarsh
Baker's larkspur (*Delphinium bakeri*)	FE / SR / 1B	Coastal scrub
Yellow larkspur (*Delphinium luteum*)	FE / SR / 1B	Chaparral/coastal scrub/prairie
Western leatherwood (*Dirca occidentalis*)	– / – / 1B	Forest/chaparral/woodland
Dwarf downingia (*Downingia pusilla*)	– / – / 2	Vernal pools/mesic grassland
Koch's cord moss (*Entosthodon kochii*)	– / – / 1B	Woodland
Streamside daisy (*Erigeron biolettii*)	– / – / 3	Forest/Woodland
Tiburon buckwheat (*Eriogonum luteolum var. caninum*)	– / – / 1B	Chaparral/woodland/grassland/coastal prairie
Minute pocket moss (*Fissidens pauperculus*)	– / – / 1B	Forest with damp soil
Marin checker lilly (*Fritillaria laneolata var. tristulis*)	– / – / 1B	Coastal bluff scrub/prairie
Fragrant fritillary (*Fritillaria liliacea*)	– / – / 1B	Coastal scrub/prairie/grassland
Blue coast gilia (*Gilia capitata* ssp. *chamissonis*)	– / – / 1B	Coastal scrub/dunes
Woolly-headed gilia (*Gilia capitata* ssp. *tomentosa*)	– / – / 1B	Coastal bluff scrub
Dark-eyed gilia (*Gilia millefoliata*)	– / – / 1B	Coastal dunes
San Francisco gumplant (*Grindelia hirsutula var. maritima*)	– / – / 1B	Coastal bluff scrub/coastal scrub/grassland
Diablo helianthella (*Helianthella castanea*)	– / – / 1B	Forest/chaparral/woodland/coastal scrub/grassland
Seaside tarplant (*Hemizonia congesta* ssp. *congesta*)	– / – / 1B	Grassland
Marin western flax (*Hesperolinon congestum*)	FT / ST / 1B	Chaparral/grassland

TABLE 9-2 **SPECIAL-STATUS PLANT SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY** (CONTINUED)

Common Name (*Scientific Name*)	Status Federal/ State/ CNPS	Habitat
Santa Cruz tarplant (*Holocarpha macradenia*)	FT / SE / 1B	Coastal prairie/coastal scrub/grassland
Thin-lobed horkelia (*Horkelia tenuiloba*)	– / – / 1B	Mesic grassland/chaparral/forest
Sebastopol meadowfoam (*Limnanthes vinculans*)	FE / SE / 1B	Vernal pools/mesic grassland/seeps
Contra Costa goldfields (*Lasthenia conjugens*)	FE / – / 1B	Vernal pools/grassland/woodland
Baker's goldfields (*Lasthenia macrantha* ssp. *bakeri)*	– / – / 1B	Coniferous forest/coastal scrub
Perennial goldfields (*Lasthenia macrantha* ssp. *macrantha*)	– / – / 1B	Coastal bluff scrub/dunes/coastal scrub
Tamalpais lessingia (*Lessingia micradenia var. micradenia*)	– / – / 1B	Chaparral/grassland in serpentine
Coast yellow leptosiphon (*Leptosiphon croceus*)	– / – / 1B	Coastal bluff scrub/coastal prairie
Woolly-headed lessingia (*Lessingia hololeuca*)	– / – / 3	Forest/scrub/grassland
Maison's lilaeopsis (*Lilaeopsis masonii*)	– / SR / 1B	Fresh and brackish marsh
Mt. Diablo cottonweed (*Micropus amphibolus*)	– / – / 1B	Forest/woodland/chaparral/grassland
Marsh microseris (*Microseris paludosa*)	– / – / 1B	Forest/woodland/coastal scrub/grassland
Elongate copper moss (*Mielichhoferia elongate*)	– / – / 2	Woodland/vernally mesic rocks
Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*)	– / – / 1B	Woodland/seeps/pools/grassland/forest
Marin County navarretia (*Navarretia rosulata*)	– / – / 1B	Coniferous forest/chaparral
White-rayed pentachaeta (*Pentachaeta bellidiflora*)	FE / SE / 1B	Grassland on serpentine
Hairless popcorn flower (*Plagiobothrys glaber*)	/ / 1A	Meadows/seeps/marshes/swamps
North Coast semaphore grass (*Pleuropogon hooverianus*)	– / SB / 1B	Forest/steeps
Marin knotweed (*Polygonum marinense*)	– / – / 3	Marshes/swamps
California beaked-rush (*Rhynchospora californica*)	– / – / 1B	Bogs/marshes/seeps/coniferous forest

TABLE 9-2 **SPECIAL-STATUS PLANT SPECIES KNOWN OR SUSPECTED FROM NOVATO VICINITY** (CONTINUED)

Common Name (*Scientific Name*)	Status Federal/ State/ CNPS	Habitat
Marin checkerbloom (*Sidalcea hickmanii* ssp. *viridis*)	– / – / 1B	Chaparral
Purple-stemmed checkerbloom (*Sidalcea malviflora* ssp. *purpurea*)	– / – / 1B	Forest/prairie
Tamalpais jewel-flower (*Streptanthus batrachopus*)	– / – / 1B	Coniferous forest/chaparral
Mt. Tamalpais jewel-flower (*Streptanthus glandulosus* ssp. *pulchellus*)	– / – / 1B	Chaparral/grassland
Santa Cruz microseris (*Stebbinsoseris decipiens*)	– / – / 1B	Forest/chaparral/coastal scrub and prairie
Tiburon jewel-flower (*Streptanthus niger*)	FE / SE / 1B	Grassland on serpentine
Showy Indian clover (*Trifolium amoenum*)	FE / – / 1B	Grassland/coastal bluff scrub
San Francisco owl's clover (*Triphysaria floribunda*)	– / – / 1B	Coastal prairie/grassland

STATUS DESIGNATIONS

Federal:

FE = Listed as "endangered" under the federal Endangered Species Act
FT = Listed as "threatened" under the federal Endangered Species Act
PE = Proposed for federal listing as "endangered"
PT = Proposed for federal listing as "threatened"
C = A candidate species under review for federal listing. Candidates include taxa for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened.

State:

SE = Listed as "endangered" under the California Endangered Species Act
SR = Listed as "rare" under the California Endangered Species Act
ST = Listed as "threatened" under the California Endangered Species Act

CNPS:

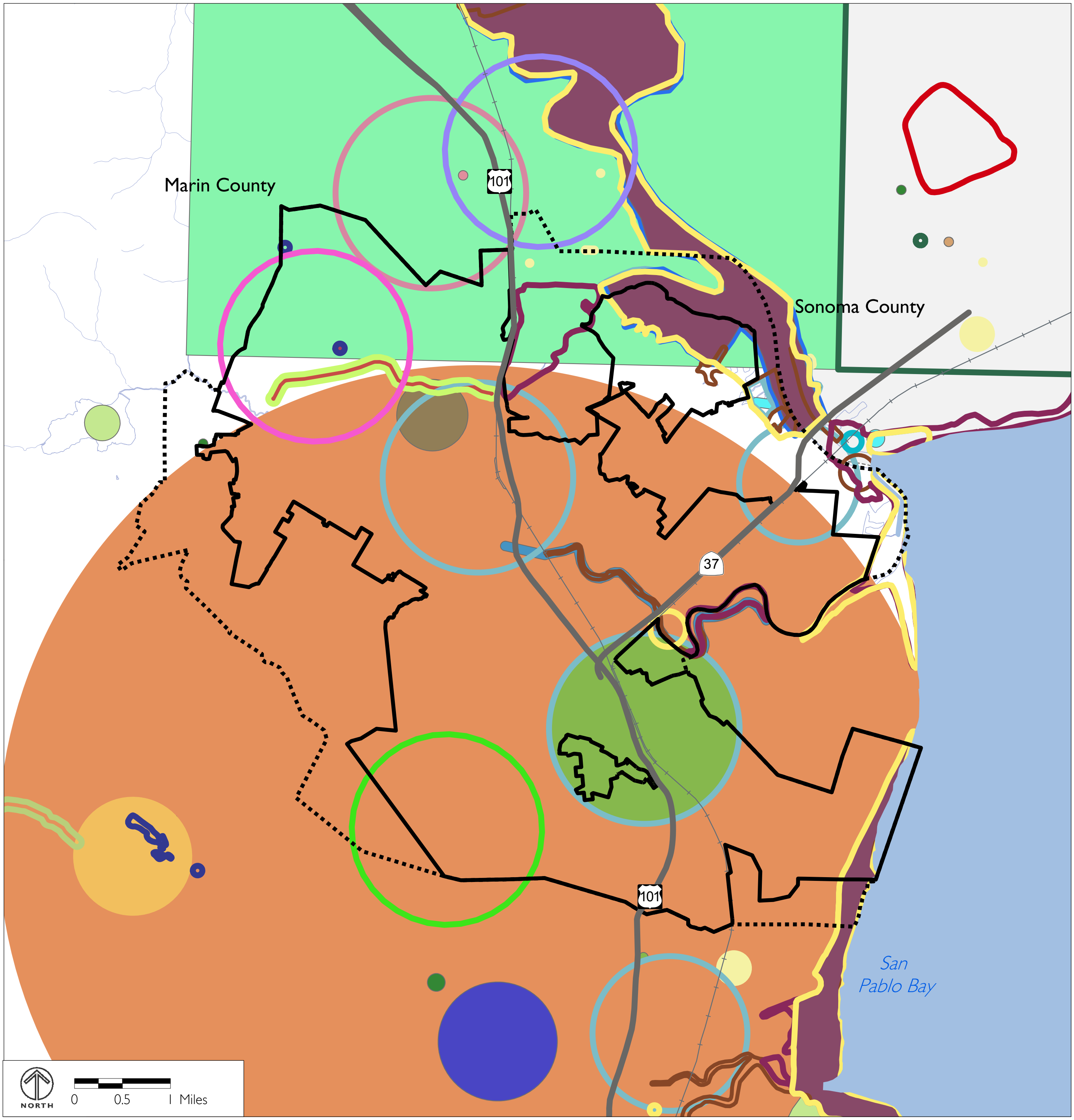
1A = Plants of highest priority; plants presumed extinct in California
1B = Plants of highest priority; plants rare and endangered in California and elsewhere
3 = Plants requiring additional information; a review list
4 = Plants of limited distribution; a watch list

Figure 9-2 shows the location of known occurrences of 34 special-status species reported by the CNDDB from the Novato vicinity. These consist of a total of 21 special-status animal species and 13 special-status plant species. It should be noted that the occurrence records of the CNDDB tend to focus on listed species or those with a high inventory priority. Numerous special-status species that are known from the Novato vicinity are either not monitored at all or are recorded on only a sporadic basis by the CNDDB. The number of occurrences of a species in the CNDDB records does not necessarily mean that it is more abundant or more widely distributed than species that are actually listed under the State or federal Endangered Species Acts.

For many of the special-status species known or suspected from the Novato vicinity, habitat suitability is severely limited by the direct and indirect effects of past development and habitat modifications. These include the direct loss of habitat as a result of conversion to urban uses, effects of on-going habitat disturbance due to vegetation management and agricultural practices, and indirect effects such as stormwater runoff into aquatic habitat and recreational activities in the open space lands. A summary of the special-status plant and animal species known or suspected to occur in the Novato vicinity is provided below.

a. Plant Species

Based on the CNDDB records, the *Inventory of Rare and Endangered Plants of California* (CNPS, 2001 and electronic update), and other information sources, a total of 71 special-status plant species are known or suspected to occur in the Novato vicinity. Most of these are maintained on List 1B (Rare and Endangered in California and elsewhere) of the CNPS *Inventory*, and meet the definition of endangered under Section 15380 of the CEQA Guidelines. Suitable habitat for these special-status plant species includes the coastal salt and brackish water marshlands along the edge of San Pablo Bay, freshwater marshland and seeps, serpentine derived soils and outcroppings, vernal pools and mesic grasslands, woodland, forest, and chaparral habitats.



Source: California Natural Diversity Database (CNDDB)

- City Limit
- Sphere of Influence
- County Boundary

Sensitive Natural Communities

- Coastal Brackish Marsh
- Northern Coastal Salt Marsh

Special-Status Animal Species

- burrowing owl
- California black rail
- California clapper rail
- California red-legged frog
- foothill yellow-legged frog
- great blue heron
- northwestern pond turtle
- Marin blind harvestman
- mimic tryonia (=California brackishwater snail)
- Myrtle's silverspot
- pallid bat
- Sacramento splittail
- saltmarsh common yellowthroat
- salt-marsh harvest mouse
- San Pablo song sparrow
- Suisun shrew
- tidewater goby
- Townsend's big-eared bat
- tricolored blackbird
- Ubick's gnaphosid spider
- white-tailed kite

Special-Status Plant Species

- Baker's navarretia
- bent-flowered fiddleneck
- fragrant fritillary
- Koch's cord moss
- Marin knotweed
- Marin western flax
- Mount Tamalpais bristly jewel-flower
- Mt. Tamalpais manzanita
- Napa false indigo
- Point Reyes bird's-beak
- seaside tarplant
- soft bird's-beak
- Tiburon buckwheat

FIGURE 9-2

KNOWN OCCURRENCES OF SPECIAL-STATUS PLANTS AND ANIMALS/SENSITIVE COMMUNITIES

As indicated in Figure 9-2, the CNDDB has occurrence records for 13 special-status plant species in the Novato vicinity. These range from specific occurrences of Marin western flax and fragrant fritillary on the south slopes of Mount Burdell, to broad, generalized occurrences of Mt. Tamalpais manzanita that extend over much of the Novato vicinity.

b. Fish Species

A number of special-status fish species are known from the open waters of San Pablo Bay and the lower reaches of creeks and sloughs within the Novato vicinity. These include green sturgeon, tidewater goby and Sacramento splittail. Steelhead trout, coho salmon and Chinook salmon – all State- and federally-listed species – also occur in the vicinity and historically used the creeks in the Novato vicinity for dispersal and spawning.

Steelhead and salmon are anadromous, spawning in streams and rivers, and then migrating to and maturing in the ocean. Timber harvest activities, overgrazing, gravel mining operations, channel modifications and removal of riparian vegetation, flood control and hydroelectric facilities, and water quality degradation have all contributed to a decline of these species. As indicated in Figure 9-2, Novato Creek and the Petaluma River are both known to support steelhead and occasionally salmon, based on records from Marin County. Where a record of salmon or steelhead has been reported from a stream, the entire drainage has been indicated as supporting the species, although habitat conditions have generally not been confirmed in the field. Existing drop structures and other barriers may currently prevent fish from moving up the entire drainage.

c. Amphibians and Reptiles

The California red-legged frog was historically known from throughout Marin County, but no populations of this frog are currently known in the Novato vicinity. The closest occurrence records are from the Sears Point vicinity a few miles east.

The middle reaches of Novato Creek, Ignacio Creek, and other drainages in the Novato vicinity provide suitable habitat for foothill yellow-legged frog, which is recognized as a CSC and a fully protected species by the CDFG. It is found in stream habitats throughout northwestern California, the northern and central Coast Ranges, and the Sierra Nevada foothills. Foothill yellow-legged frog inhabits shaded, shallow streams with rocky substrate that is at least cobble-sized.

As indicated in Figure 9-2, western pond turtle has been reported by the CNDDB from a number of locations in the Novato vicinity. Western pond turtle typically occurs in ponds and streams with permanent pools used as retreat habitat. Northwestern pond turtle has been observed along the Napa River throughout the Napa Valley. Pond turtle individuals are known to establish nests in protected uplands near aquatic habitat, sometimes several hundred feet from pools and ponds used for retreat.

Several other amphibians and reptiles are known from or were suspected to historically occur in the Novato vicinity. These include more common species such as California horned lizard and western spadefoot toad, both recognized as CSC species by the CDFG, and the federally listed endangered California tiger salamander. No recent records of California tiger salamander have been made within several miles of Novato. The closest known occurrences are reported from the Cotati and northwestern Petaluma areas.

d. Bird Species

An estimated 28 species of special-status birds are known or suspected from the Novato vicinity, as indicated in Table 9-2. These range from resident species known from essential habitat in the Novato vicinity to seasonal migrants that seasonally pass through and forage in suitable habitat. Listed species such as California clapper rail and California black rail are known from the coastal salt marsh and brackish water marsh along the lower reaches of Novato Creek and the Petaluma River, together with a number of non-listed species recognized by the CDFG as CSC species such as saltmarsh common yellowthroat, San Pablo song sparrow, northern harrier, and tricolored blackbird.

A number of these special-status bird species, such as yellow warbler, sharp-shinned hawk and Cooper's hawk, are typically associated with riparian woodlands. Still others rely on grasslands, scrub and open woodlands for foraging and nesting, such as loggerhead shrike, burrowing owl, golden eagle, short-eared owl, prairie falcon and white-tailed kite. Seasonal winter migrants that utilize the remaining grasslands and agricultural lands in the Novato vicinity include merlin, long-billed curlew, bald eagle, and a number of other bird species. Many of the bird species listed in Table 9-2 have no protective status under the Endangered Species Acts, such as black-crowned night heron, snowy egret, great blue heron and great egret, but their rookeries and nesting locations are considered sensitive habitat resources by the CDFG, and all are protected under the provisions of the Migratory Bird Treaty Act.

e. Bats

Several special-status bat species are known or suspected to occur in the Novato vicinity. A roosting colony of Townsend's big-eared bat occurs in one of the unused historic structures at Olompali State Park, and an occurrence of pallid bat is known from the eastern portion of the Novato vicinity. Like more common bat species, all of the special-status bat species suspected to occur in the Novato vicinity occur in a variety of habitats at lower elevations in California. Most of the special-status bat species are known to roost in abandoned buildings, trees, mines, caves, rock crevices and bridges.

f. Invertebrates

A number of special-status invertebrates have been reported by the CNDDB from the Novato vicinity, as indicated in Figure 9-2. Several of these are typically associated with serpentine grasslands and outcrops, such as Opler's longhorn moth, Marin blind harvestman and Ubick's gnaphosid spider. Most of these species were once considered candidates for federal listing. Wintering colonies of Monarch butterfly, which often congregate on stands of blue gum eucalyptus, are also monitored by the CNDDB, although they have no legally protected status under the Endangered Species Acts.

California freshwater shrimp and Myrtles silverspot butterfly are the only listed invertebrate species known or suspected from the Novato vicinity. California freshwater shrimp are State- and federally-listed as endangered, and typically occur in perennial freshwater channels with undercut banks and riparian vegetation. The shrimp habitat historically occurred throughout Marin County, and potentially suitable habitat remains in the Novato vicinity. Myrtles silverspot is federally listed as endangered, and is now known from only a few occurrences, including one near Sears Point in Sonoma County about two miles northeast of the Novato Sphere of Influence (SOI). This butterfly species was historically associated with coastal dunes, prairie and bluff scrub habitats where the larval host plant, violet (*Viola adunca*) is present.

3. Sensitive Natural Communities

In addition to species-oriented management, protecting sensitive natural communities on an ecosystem level is increasingly recognized as vital to the protection of natural diversity in the State. This is considered the most effective means of providing long-term protection of ecologically viable habitat, and can include whole watersheds, ecosystems, and sensitive natural communities. Providing functional habitat connectivity between natural areas is essential to sustaining healthy wildlife populations and allowing for the continued dispersal of native plant and animal species.

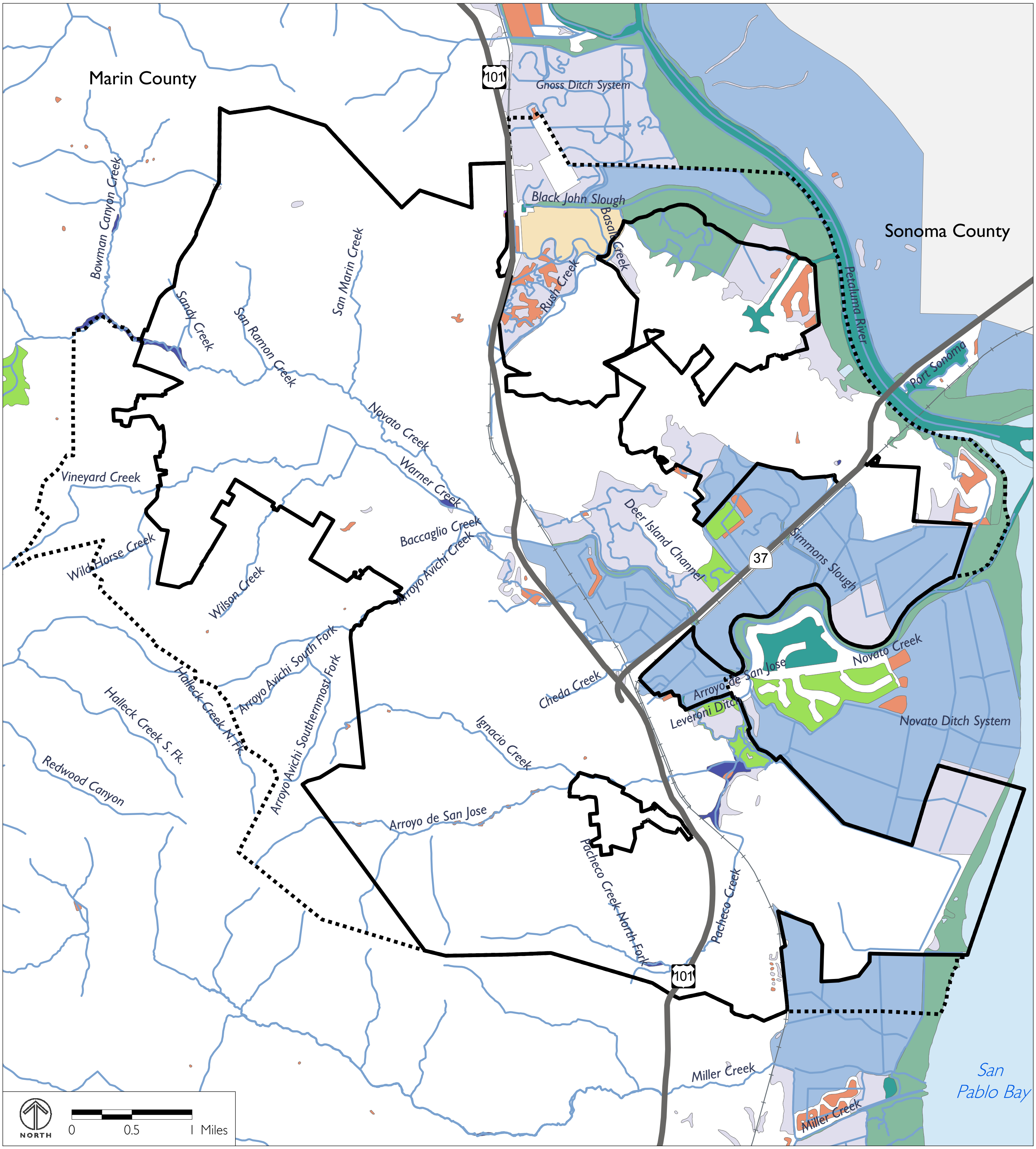
Several of the natural communities within the Novato vicinity are considered to have a high inventory priority with the CNDDB, and should receive appropriate recognition in updating the General Plan. These communities have been designated as "sensitive" due to their rarity and continuing loss as a result of urban and agricultural development, flood control improvements, and other factors. As indicated in Figure 9-2, large areas of northern coastal salt marsh and coastal brackish marsh occur along the fringe of San Pablo Bay and along the lower reaches of Novato Creek, Petaluma Marsh, Black John Slough and Rush Creek. Although not mapped by the CNDDB, other sensitive natural communities known or suspected from the Novato vicinity include areas of well-developed riparian woodland and scrub along segments of the larger creeks, freshwater marshes, and remnant stands of native grasslands. Undeveloped sites may also support sensitive natural communities, including native grasslands, seeps, riparian scrub and woodland, valley oak woodland, coastal salt marsh and coastal brackish marsh, among others.

While oak woodlands in general is not considered to have a high inventory priority with the CNDDB, it should be recognized as an important habitat type in the Novato vicinity due to its high wildlife value and its vulnerability to the effects of Sudden Oak Death Syndrome (SOD). Tanoaks and coast live oaks are dying in large numbers and black oaks, California buckeye, California bay, madrone, huckleberry and rhododendron are suspected to be hosts or potential carriers of the fungus believed to cause oak mortality. SOD is contributing to significant changes in vegetative cover over large parts of Marin County and other areas along the California coast, altering habitat for woodland-dependent species and exacerbating hazardous fire conditions where wildlands interface with developed areas.

4. Wetlands

Although definitions vary to some degree, wetlands are generally considered to be areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted to life in saturated soil. Wetlands are recognized as important features on a regional and national level due to their high inherent value to fish and wildlife, use as storage areas for storm and flood waters, and water recharge, filtration, and purification functions. Technical standards for delineating wetlands have been developed by the Corps and the USFWS that generally define wetlands through consideration of three criteria: hydrology, soils and vegetation.

Wetlands in the Novato vicinity include areas of coastal salt marsh and coastal brackish water marsh along the baylands of San Pablo Bay, riparian habitat along creeks and streams, and scattered freshwater seeps, springs, and ponds. Figure 9-3 shows the extent of major wetland habitat types in the Novato vicinity mapped as part of the National Wetlands Inventory (NWI), which consists of a range of characteristic wetland types, together with streams



Source: Marin County, GIS

- City Limit
- Sphere of Influence
- County Boundary
- Aquatic Bed
- Estuarine Emergent
- Farmed
- Lake
- Palustrine Emergent
- Scrub and Forested
- Estuarine Unconsolidated Bottom/Aquatic Bed
- Unconsolidated Shore/Rocky Shore/Streambed
- Palustrine Unconsolidated Bottom
- Unknown
- Upland

FIGURE 9-3

MAJOR WETLAND HABITAT TYPES

mapped by Marin County. These wetland habitats include the marine and estuarine systems of San Pablo Bay and the lower reaches of Novato Creek, Petaluma River, Black John Slough and Rush Creek; major creeks and channels; and freshwater marsh, riparian scrub, woodland and scattered stock ponds. Some wetland features, such as freshwater seeps and springs, were generally not identified as part of the NWI because of the general scale of the mapping effort. Detailed wetland delineations would be required to determine the extent of any jurisdictional wetlands and other waters at specific locations. The Corps holds the responsibility of making a final determination on the extent of jurisdictional waters for a particular site.

10 GEOLOGY

This chapter provides an overview of geologic conditions in Novato. The chapter begins with a discussion of State and local regulations relating to geologic hazards followed by an overview of local geologic conditions and seismic activity. The chapter concludes with a discussion of the primary seismic and geological hazards in Novato.

A. Regulatory Framework

1. State Regulations

a. California Building Code

The California Building Code (CBC) is included in Title 24 of the California Code of Regulations and is a portion of the California Building Standards Code. Under State law, all building standards must be centralized in Title 24, otherwise they are not enforceable. The CBC incorporates the Uniform Building Code, a widely adopted model building code in the United States. Through the CBC, the State provides a minimum standard for building design and construction. The CBC contains specific requirements for seismic safety, excavation, foundations, retaining walls and site demolition. It also regulates grading activities, including drainage and erosion control.

b. Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This act prohibits the location of structures designed for human occupancy across active faults and regulates construction within fault zones. However, the Alquist-Priolo Act only addresses hazards associated with surface fault rupture, and does not address other hazards associated with earthquakes (the Seismic Hazards Mapping Act addresses these other hazards). There are no Alquist-Priolo zones within the Novato area.

c. The Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 to addresses seismic hazards such as strong ground shaking, soil liquefaction, and earthquake-related landslides. This act requires the State of California to identify and map areas that are at risk for these hazards. Cities and counties are also required to regulate development in the mapped seismic hazard zones. In Novato, the primary method of regulating development projects in these areas is through the permit process. A permit cannot be issued until a geological investigation is completed. However, geotechnical investigations are not required for single-family homes.

d. Assembly Bill 6

In 1998 the State Legislature adopted Assembly Bill 6, which expanded Civil Code Section 1102.6 regarding the disclosure of earthquake hazards. Since June 1998, the sellers of residential property must give prospective buyers a "Natural Hazard Disclosure Statement" if the residential property lies within an earthquake fault zone or a seismic hazard zone. The new law is intended to warn prospective real estate buyers that local earthquake or seismic hazards may limit their ability to develop the property or obtain insurance and may affect their ability to obtain assistance after a disaster.

2. Local Regulations and Plans

a. Novato General Plan

Geology-related hazards are addressed in the Safety and Noise chapter of the existing General Plan. The Safety and Noise chapter contains SF Objective 1, which calls for the City to "reduce seismic hazards." Policies and programs implementing this objective call for the City to mitigate seismic hazards associated with new development and discourage high density development in high-risk areas. SF Objective 2 calls for the City to "minimize the risk of personal injury and property damage resulting from slope and soil instability." Policies and programs implementing this objective call for the City to mitigate slope- and soil-related hazards associated with new development and to require financial protection for public agencies and individuals as a condition of approval for projects in high-risk areas.

b. Hillside Ordinance

Novato Zoning Code Section 19.26, Hillside and Ridgeline Protection, establishes development standards for hillside areas to reduce the potential for slope failure and exposure to other soil-related hazards. The ordinance requires reduced development intensity in areas with steep slopes and establishes design requirements for buildings proposed in hillside areas.

B. Regional Geology

Novato is located in the Coast Range Physiographic province of California. The features of this province were formed by tectonic forces resulting in extensive uplifting, folding and faulting of the area. Northwest trending elongated ridges and intervening valleys characterize the province.

The northern and western portion of Novato is underlain by bedrock of the Franciscan Formation of Late Jurassic to Cretaceous age. The Franciscan Formation consists of a mixture of metamorphosed sandstone, shale, volcanics, serpentine and chert. The eastern area of Novato is underlain by the Late Jurassic to Late Cretaceous of the Great Valley Sequence, consisting of the Novato Conglomerate believed to have been tectonically thrust over the Franciscan Formation rocks.

C. Local Geology

Surficial soils in Novato vary considerably. Soils are comprised primarily of deposits from streams, flood basins and mountain runoff known as alluvium. The low-lying alluvium deposits consist of sand, gravel, silt and small amounts of clay.

Holocene estuarine, tidal, lagoonal deposits of fine sands, silts, clays and sporadic outcroppings of peat (generally referred to as Young Bay Mud) are exposed along the San Francisco Bay margin, along the Petaluma River, and in the Bahia area in the northern part of Novato. Areas of engineered fill placed over bay mud are found in the central to southeastern area between Hamilton Air Force Base and Bel Marin Keys, between the Northwest Pacific Railroad and Highway 101 in the vicinity of Novato Creek, and southward to Novato

Boulevard and south of Highway 37. Engineered levee fill is found in low lying areas along Novato Creek, near the Petaluma River and along roads associated with Hamilton Air Force Base. Engineered fill is also used in scattered areas of low elevation, primarily below Highway 101 and the railroad.

D. Seismicity, Faults, and Fault Zones

Novato is located in the seismically active San Francisco Bay region, an area with a long and complex history of tectonic movements. The region is situated on a plate boundary marked by the San Andreas fault system, which consists of several northwest trending active and potentially active faults. In the Bay Area, movement along this plate boundary is distributed across a complex system of strike-slip, right-lateral, parallel and sub-parallel faults. In the Novato area, these include the San Andreas, Burdell Mountain, Tolay, Rodgers Creek, and Hayward fault zones, as shown on Figure 10-1. The nearest potentially active fault is the Burdell Mountain fault, which is located within Novato's Sphere of Influence (SOI).

1. Earthquake Probability

The United States Geological Survey (USGS) Working Group on California Earthquake Probabilities has evaluated the probability of one or more earthquakes of Richter magnitude 6.7 or higher occurring in the San Francisco Bay Area within the next 30 years. The result of the evaluation indicated a 70 percent likelihood that such an earthquake event will occur in the Bay Area between 2000 and 2030.[1]

An active fault is defined by the California Division of Mines and Geology (CDMG) as one which has had active surface displacement within Holocene time (i.e. over the past 11,000 years). Some faults are characterized as active based on surface displacements within historic time (over the last 200 years),

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[1] U.S. Geological Survey (USGS), 1999. *Earthquake Probabilities in the San Francisco Bay Region: 2000 to 2030 – A Summary of Findings.* Open File Report 99-517.

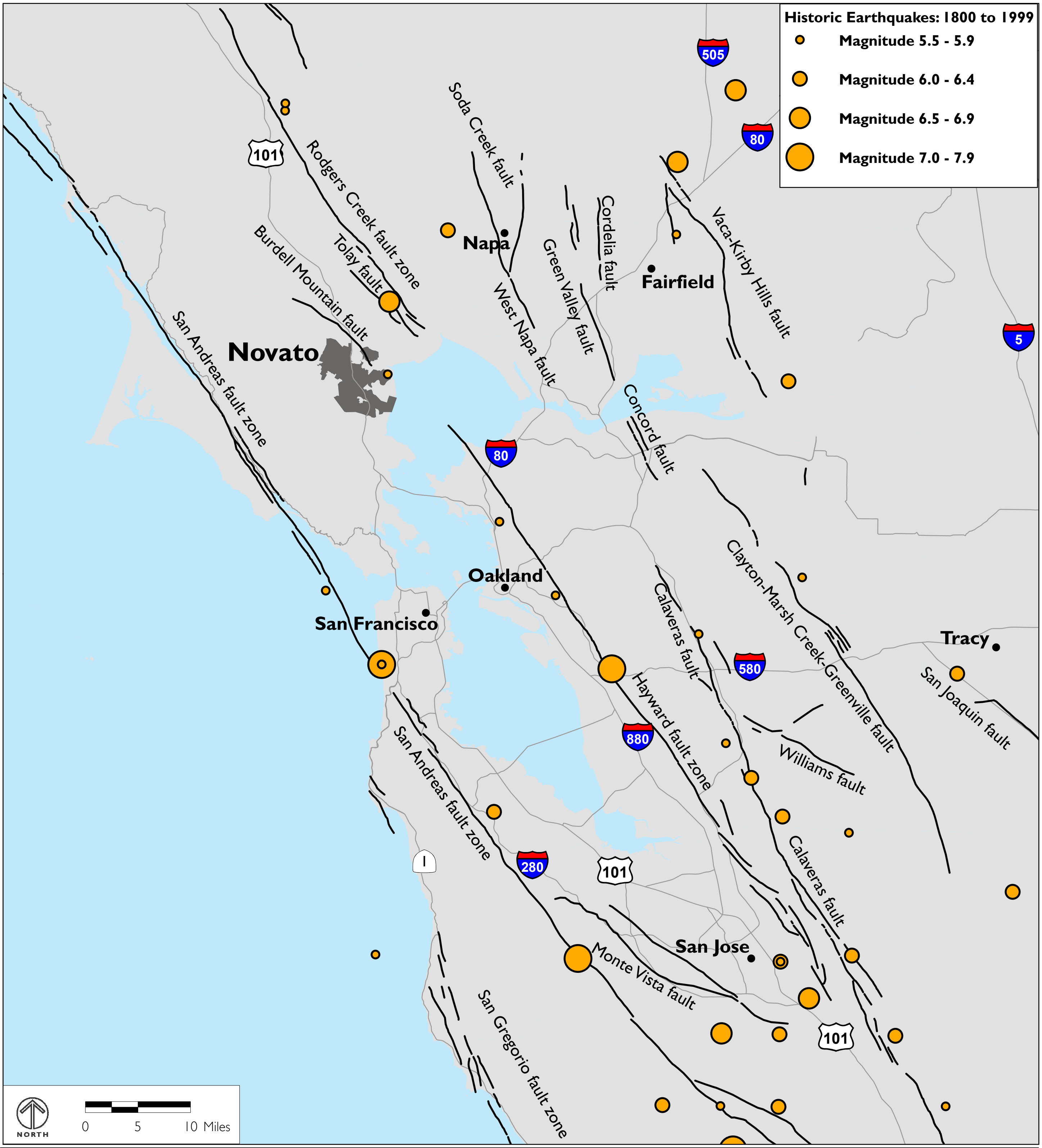

FIGURE 10-1

REGIONAL FAULTS AND HISTORIC EARTHQUAKES while others are characterized as active based on surface displacements in rocks or sediments within the last 11,000 years. The Hayward and San Andreas faults are active faults based on both recorded historical activity and geologic displacement. The Rodgers Creek fault is active based on the geologic record. This definition of "active fault" does not mean that all faults for which there is no evidence of surface displacement during the Holocene period are inactive. Some faults may have been active during this time period, but they did not result in changes to the surfaces that are easily identifiable. Meanwhile, other faults may still be active although they have not been active during the Holocene period. Occasionally, earthquakes occur on blind thrust faults that are buried and show no evidence of past surface rupture, as was the case with the Northridge earthquake in 1994.

2. Active and Potentially Active Faults

The CDMG has defined potentially active faults as those for which there is evidence of surface displacement within the Quaternary period; that is approximately within the last 1.6 million years. Faults classified as potentially active show no evidence of surface displacements within the past 11,000 years, but this period of time is short in geologic terms. The Tolay and Burdell Mountain faults are considered potentially active.

Novato could be subject to damage from movement on any one of the active or potentially active Bay Area earthquake faults. Table 10-1 lists the nearest active and potentially active faults to Novato, maximum expected earthquake and magnitude. The sections below describe each of these faults.

a. San Andreas Fault

The San Andreas fault is active and represents the principal seismic hazard in northern California. The San Andreas fault is an active fault based on both recorded historical activity and geologic displacement. The main trace of the San Andreas fault trends northwest-southeast and extends over 700 miles from the Gulf of California through the Coast Ranges to Point Arena, where the fault extends offshore. Surface rupture during historic earthquakes, fault

TABLE 10-1 **ACTIVE AND POTENTIALLY ACTIVE EARTHQUAKE FAULTS**

Fault	Type[a]	Maximum Potential (Moment) Magnitude Earthquake[b] (Mw)	Distance from Novato (Miles)	Distance from Novato (km)
Hayward	A	7.10	13.7	8.0
Rodgers Creek	A	7.00	4.8	19.3
Tolay	B	NA[c]	0.0	0.0
San Andreas	A	7.90	13.7	8.0
Burdell Mountain	B	NA	4.8	19.3

[a] Type A = active fault; Type B = potentially active fault.
[b] Moment magnitude is related to the physical size of a fault rupture and movement across a fault. Moment magnitude provides a physically meaningful measure of the size of a faulting event. The maximum moment magnitude earthquake data are from *Earthquake Probabilities in the San Francisco Bay Region: 2000 to 2030* (USGS, 1999).
[c] NA = Not Available. There is no data on the maximum magnitude of potentially active faults, since there is no lithologic evidence that forms the basis for the calculations of the other numbers.

creep and historic seismicity confirm that the San Andreas fault and its branches (the Hayward, Calaveras and San Gregorio faults) are all active today. The San Andreas fault is approximately 9.5 miles west of the Novato City limit.

Historical earthquakes along the San Andreas fault and its branches have caused significant seismic shaking in the East Bay region. The most recent large historical earthquake on the San Andreas fault to affect the area was the magnitude 6.9 Loma Prieta earthquake in 1989. The Loma Prieta earthquake caused intense seismic activity throughout the Bay Area, with most damage focused in lowland infill areas.

b. Hayward Fault

The Hayward Fault is an active fault, as determined by both recorded historical activity and geologic displacement. The Hayward fault zone is the southern extension of a fracture zone that includes the Rodgers Creek fault (discussed below), the Tolay fault (discussed below), the Healdsburg fault (located in Sonoma County) and the Maacama fault (located in Mendocino County). The Hayward fault trends to the northwest within the East Bay, extending 60 miles south from San Pablo Bay in Richmond to San Jose, where it converges with the Calaveras fault, a similar type of fault that extends north to Suisun Bay. Historically, the Hayward fault generated two sizable earthquakes, both in the 1800s. The USGS Working Group on California Earthquake Probabilities includes the Hayward–Rodgers Creek fault systems in the list of those faults that have the highest probability of generating earthquakes of magnitude 6.7 and greater.

c. Rodgers Creek Fault

The Rodgers Creek fault is active based on the geologic record. The Rodgers Creek fault is believed to be entirely locked (i.e. no recognized creep, less than 2 mm/yr).[2] No major earthquake has historically occurred along the Rodgers Creek fault.

d. Tolay Fault

The Tolay Fault is considered potentially active. The Tolay fault, a northern extension of the Hayward fault, is a northwest-trending structure that has shown little if any strike-slip displacement. The fault is an approximately 600 meter zone characterized as a schuppen structure with slivers of Franciscan rock, sheared siltstone and gravel of the Miocene Petaluma Formation.

e. Burdell Mountain Fault

The Burdell Mountain Fault is considered potentially active. The Burdell Mountain Fault is similar in nature to the Hayward fault, but with lesser magnitude, slip and recurrence interval potential. Mapped geologic relation-

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[2] U.S. Geological Survey (USGS), 1999. *Earthquake Probabilities in the San Francisco Bay Region: 2000 to 2030 – A Summary of Findings.* Open File Report 99-517.

ships suggest that the Burdell Mountain fault is an important component of the regional fault zone. Geologic evidence shows that movement has occurred on the Burdell Mountain fault zone within the past 11,000 years, suggesting that it might be active.[3] However, at this time, the Burdell Mountain fault zone is classified as potentially active.[4] This fault occurs within Novato's SOI.

E. Seismic and Geological Hazards

This section describes Novato's vulnerability to the seismic hazards related to earthquakes.

1. Ground Rupture

Ground rupture is a hazard only in areas immediately adjoining a fault. The only fault trace that traverses the city is the Burdell Mountain fault, which is potentially active. The geologic record indicates that it is a quaternary fault with an age of last movement in the 1.6-million-year timeframe. The Burdell Mountain fault therefore has minimal potential for causing ground rupture. All other faults in the region are outside the Novato plan area limits.

2. Ground Shaking

Based on the known active faults and on the large number of potentially active faults, all parts of Novato are potentially subject to strong ground shaking. The intensity of ground shaking at any specific location within the city depends on the characteristics of the earthquake, the distance from the earthquake and on the local geologic and soil conditions. Conservatively, ground motions as strong as 6.9 to 7.9 on the Richter Magnitude scale could occur. Currently, there are no critical facilities in Novato, such as high-occupancy buildings, located in areas that have a high risk of ground shaking. The Uni-

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[3] County of Marin, 2007. *Marin Countywide Plan.*

[4] Jennings, C.W., 1994. Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions, CDMG Geologic Data Map No. 6, 1:750,000.

form Building Code requires a higher safety factor for construction in Seismic Zone 4, which includes Novato and the Bay Area. Seismic Zones, developed by the USGS, are based on the strength of ground shaking an area is likely to experience. Although Sesimic Zones numbered 0 through 4 are being phased out by the USGS in favor of more nuanced maps, the current General Plan's Safety and Noise chapter refers to Seismic Zone 4.

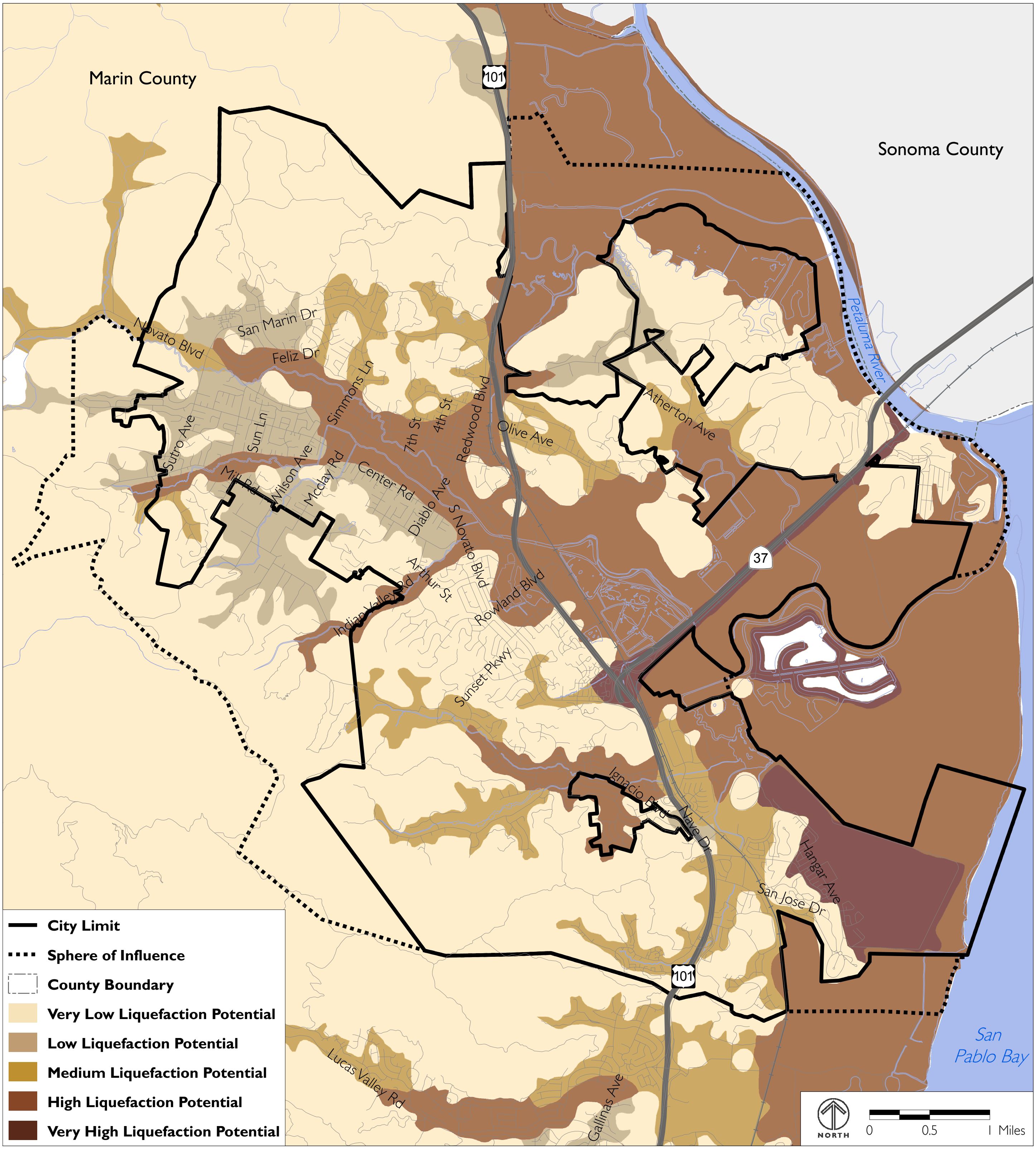
3. Ground Liquefaction

Liquefaction generally occurs as a result of strong ground shaking in areas where granular sediment or fill material either contains, or is located immediately above, high moisture content. The ground shaking transforms the material from a solid state to a temporarily liquid state. Liquefaction is a serious hazard because buildings in areas that experience liquefaction may sink or suffer major structural damage. Liquefaction is most often triggered by seismic shaking, but can also be due to improper grading, landslides or other factors.

Areas in Novato with soils susceptible to liquefaction are primarily located in low-lying area of fill fronting San Pablo Bay, as shown in Figure 10-2. The Early to Late Pleistocene deposits and Holocene estuarine deposits (Bay Mud) are considered to have a medium liquefaction potential. Generally the low-lying areas within the mapped 100- or 500-year floodplain (see Figure 12-3, Chapter 12) will be more prone to liquefaction, especially where underlain by fill. Upland areas within the city have a low to very low potential for liquefaction.

4. Structural Damage or Collapse

The ability for structures to withstand earthquakes varies considerably due to a number of factors. These include location relative to active faults or poor ground areas, building construction, magnitude and intensity of the earthquake, duration of strong ground shaking and distance from the causative faults.



Source: Marin County, GIS

FIGURE 10-2

LIQUEFACTION HAZARD AREAS

In general, evidence from past earthquakes shows that wood frame structures properly tied to their foundations perform very well or, if badly damaged, cause few injuries and life loss even if located in areas of poor ground quality. Older wood frame structures that have stone, brick, or cripple wall foundations, or that are not bolted to their foundations, do not perform well. Unreinforced masonry structures, on the other hand, perform poorly under almost all earthquake conditions, especially if located on poor ground areas. Nearby relatively small earthquakes can be very damaging because of the sharp motions they generate. Distant events, while more damaging to taller buildings, can also damage unreinforced masonry buildings because of the stresses caused by long-period motions. The Uniform Building Code seismic requirements are designed to mitigate against the specific performance of building materials in relation to maximum credible earthquake impacts.

5. Landslides and Ground Failure

Landslides are downward and outward movements of slope-forming materials including rock, soil, artificial fill, or combinations of such materials. The size of landslides can vary from tiny events containing less than a cubic yard of material to massive slides containing millions of cubic yards. Large landslides may move downslope for hundreds of yards, or even several miles. A landslide may move rapidly, as in a soil or rock avalanche, or it may move slowly for hours or even weeks. A similar but much slower movement is called creep. Landslides may be limited to recent activity or be ancient landslide masses that display relative stability.

Site-specific geotechnical reports are required by the City of Novato for any development in areas prone to landslides. The susceptibility of a given area to landslides depends on many variables. However, the general characteristics that influence landslide hazards are well understood and it is possible to map areas in terms of general susceptibility to landslides. There are a number of important factors that dictate the probable formation and relative risk of landslide or slope instability. These include:

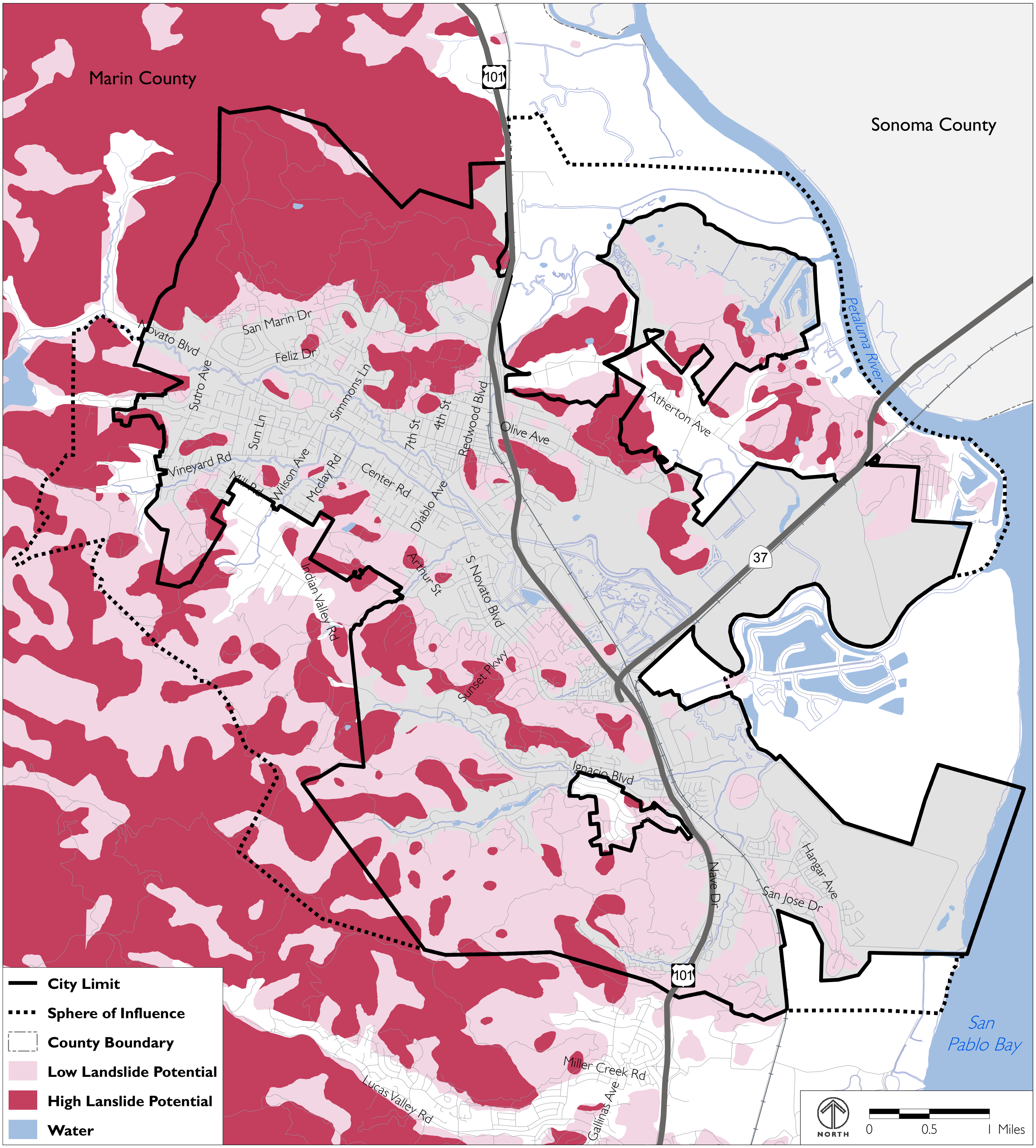
- ♦ Slope Material: Loose, unconsolidated soils and soft, weak rocks are more hazardous than are firm, consolidated soils or hard bedrock.

- Slope Steepness: Most landslides occur on moderate to steep slopes.
- Structure and physical properties of materials, including the orientation of layering and zones of weakness relative to slope direction.
- Water Content: Increased water content increases landslide hazard by decreasing resistance to sliding and adding weight to the materials on a slope.
- Vegetation Coverage: Abundant vegetation with deep roots increases slope stability.
- Proximity to Areas of Erosion or Man-Made Cuts: Undercutting slopes may greatly increase landslide potential.
- Earthquake Ground Motions: Strong ground shaking may trigger landslides in marginally stable slopes or loosen slope materials and thus increase the risk of future landslides.

Figure 10-3 shows the potential for landslides to occur in the city. Landslides are not common in the lower elevation areas due to relatively flat grades. As shown in the figure, landslides more commonly occur in the upland areas. However, the Novato conglomerate in hilly areas is relatively stable with a low risk of landslide. Many of the hills have shallow soil with Franciscan bedrock very close to the surface, resulting in low to moderate landslide potential.

6. Land Subsidence

Subsidence is the sinking of a large area of ground surface in which the material is displaced vertically downward, with little or no horizontal movement. Subsidence problems are common in the diked baylands because of the highly compressible nature of the existing fill. Areas susceptible to earthquake-induced settlement include those areas underlain by thick layers of colluvial material or un-engineered fill. According to past environmental analyses, fill in the Bahia Marsh area in Novato has settled approximately 6 to 18 inches in



Source: Marin County, GIS. Original data from USGS.

FIGURE 10-3

LANDSLIDE HAZARD AREAS

the past 40 years.[5] Land subsidence has occurred within the low lying areas, mainly along the Bay margins. The loss of water within the Bay Mud along the Bay margins has led to subsidence, and many areas, such as the former Hamilton Air Force Base, are now below mean sea level and require pumping to drain.

7. Expansive Soils

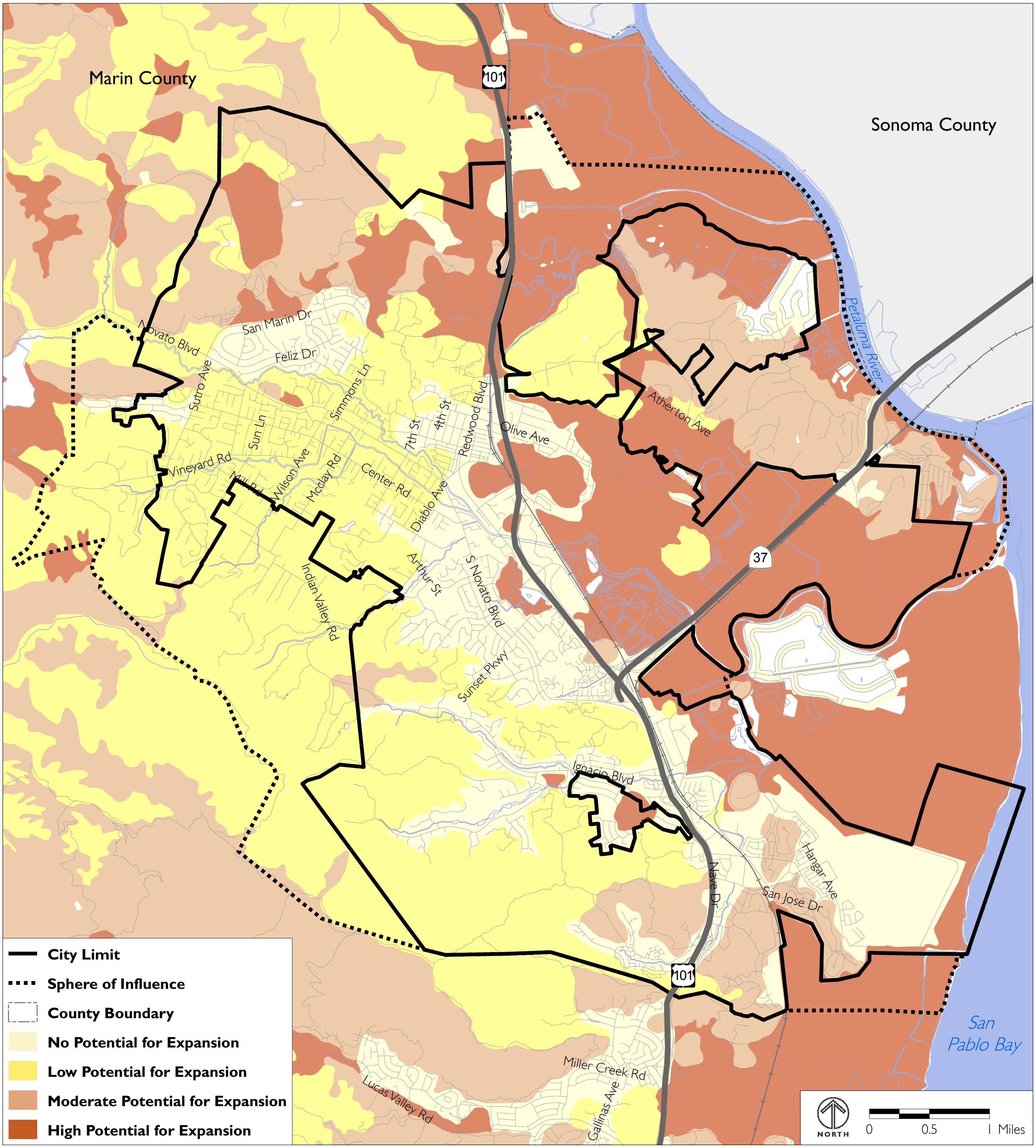
Expansive soils have a potential to undergo significant changes in volume, in the form of either shrinking or swelling, due to changes in moisture content. Periodic shrinking and swelling of expansive soils can cause extensive damage to buildings, other structures and roads.

Moisture content and the percentage and type of clay minerals present in the soil determine the potential volume change of an expansive soil. Soils composed only of sand and gravel have no potential for volume change due to moisture change. Soils containing clays have variable potential for volume changes. Such soils are generally classified into three expansive soils classes with low, moderate and high potential for volume changes:

- **Low:** This soil class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential, if the clay is kaolinite. Kaolinite is a common clay mineral.
- **Moderate:** This class includes silty clay and clay textured soils if the clay is kaolinitic and also includes heavy silts, light sandy clays and silty clays with mixed clay minerals.
- **High:** This class includes clays and clay with mixed monmorillonite, a clay mineral that expands and contracts more than kaolinite.

Figure 10-4 shows the distribution of expansive soils in Novato.

[5] Herzog and Associates, 1986. *Bahia Marsh Restoration Project EIR.*



Source: Marin County, GIS. Original data from USGS.

FIGURE 10-4

EXPANSIVE SOILS

Soils with no or low expansion potential occur along stream and river valleys and on steep mountain slopes. Soils of high expansion potential in Novato generally occur east of Highway 101.

8. Soil Hazards

Corrosivity testing conducted for local projects in Sonoma and Marin Counties indicate that the potential for corrosive to severely corrosive shallow subsurface soils exists in Young Bay Mud, which occurs in Novato. Young Bay Mud possesses high sulfate and chloride concentrations and maintains a low pH, which would negatively impact metals and concrete used in construction. However, corrosivity is easily mitigated on a site-by-site basis in new development projects by requiring that engineered material be imported to replace corrosive soils.

11 AIR QUALITY

This chapter describes existing air quality conditions in Novato. Air quality is primarily assessed in relation to federal and State standards for pollutants harmful to human health. This chapter also provides an overview of federal, State and local regulations relating to air quality and describes the local climate and meteorology. A separate discussion of global warming caused by greenhouse gas (GHG) emissions is provided in Chapter 18, Greenhouse Gases.

A. Regulatory Framework

Regulatory oversight for air quality in the San Francisco Bay Air Basin is overseen by the Environmental Protection Agency Region IX office at the federal level, the California Air Resources Board (CARB) at the State level and the Bay Area Air Quality Management District (BAAQMD) at the regional level.

1. Federal Regulations

a. Federal Clean Air Act

The Environmental Protection Agency (EPA) is responsible for implementing the Federal Clean Air Act (FCAA), which was first enacted in 1955 and amended numerous times thereafter. The FCAA established federal air quality standards known as the National Ambient Air Quality Standards (NAAQS). These standards identify levels of air quality for "criteria pollutants" that are considered the maximum levels of ambient (background) air pollutants considered safe, with an adequate margin of safety, to protect the public health and welfare. As shown in Table 11-1, the "criteria pollutants" regulated by the NAAQS are: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$) and lead (Pb).

2. State and Regional Regulations

a. California Clean Air Act

Approved in 1988, the California Clean Air Act (CCAA) requires that each local air district prepare and maintain an Air Quality Management Plan to

TABLE 11-1 **NATIONAL AND CALIFORNIA AMBIENT AIR QUALITY STANDARDS**

Pollutant	Average Time	California[a] Standard[c]	California[a] Attainment Status	Federal[b] Standards[d]	Federal[b] Attainment Status
NAAQS Criteria Pollutants					
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Nonattainment	N/A[e]	N/A[e]
	8 Hours	0.07 ppm (137 µg/m^3)	Unclassified	0.08 ppm (157 µg/m^3)	Nonattainment
Particulate Matter (PM_{10})	24 Hours	50 µg/m^3	Nonattainment	150 µg/m^3	Nonattainment
	Annual Arithmetic Mean	20 µg/m^3	Nonattainment	NA[g]	Nonattainment
Fine Particulate Matter ($PM_{2.5}$)	24 Hours	*No Separate State Standard*		35 µg/m^3	Unclassified
	Annual Arithmetic Mean	12 µg/m^3	Nonattainment	15 µg/m^3	Nonattainment
Carbon Monoxide (CO)	8 Hours	9.0 ppm (10 mg/m^3)	Attainment	9 ppm (10 mg/m^3)	Attainment
	1 Hour	20 ppm (23 mg/m^3)	Attainment	35 ppm (40 mg/m^3)	Attainment
Nitrogen Dioxide (NO_2)[f]	Annual Arithmetic Mean	0.030 ppm (56 µg/m^3)	N/A	0.053 ppm (100 µg/m^3)	Attainment
	1 Hour	0.18 ppm (338 µg/m^3)	Attainment	N/A	N/A
Lead (PB)	30 Days Average	1.5 µg/m^3	Attainment	N/A	N/A
	Calendar Quarter	N/A	N/A	1.5 µg/m^3	Attainment
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	N/A	N/A	0.030 ppm (80 µg/m^3)	Attainment
	24 Hours	0.04 ppm (105 µg/m^3)	Attainment	0.14 ppm (365 µg/m^3)	Attainment
	3 Hours	N/A	N/A	N/A	Attainment
	1 Hour	0.25 ppm (655 µg/m^3)	Attainment	N/A	N/A

TABLE 11-1 **NATIONAL AND CALIFORNIA AMBIENT AIR QUALITY STANDARDS** (CONTINUED)

California Ambient Air Quality Standard Criteria Pollutants				
Visibility-Reducing Particles	8 Hours (10 a.m. to 6 p.m., PST)	Extinction coefficient = 0.23 km@<70% RH	Unclassified	*No federal standards*
Sulfates	24 Hour	25 μg/m³	Attainment	
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m³)	Unclassified	
Vinyl Chloride	24 Hour	0.01 ppm (26 μg/m³)	Unclassified	

Notes: μg/m³ = micrograms per cubic meter; ppm = parts per million; km = kilometer(s); RH = relative humidity; PST = Pacific Standard Time; N/A = Not Applicable

[a] California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1- and 24-hour), nitrogen dioxide, suspended particulate matter-PM_{10} and visibility-reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California Ambient Air Quality Standards (CAAQS) are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations. In 1990, CARB identified vinyl chloride as a toxic air contaminant (TAC), but determined that there was not sufficient available scientific evidence to support the identification of a threshold exposure level. This action allows the implementation of health-protective control measures at levels below the 0.010 ppm ambient concentration specified in the 1978 standard.

[b] National standards (other than ozone, particulate matter and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. EPA also may designate an area as *attainment/unclassifiable*, if: (1) it has monitored air quality data that show that the area has not violated the ozone standard over a three-year period; or (2) there is not enough information to determine the air quality in the area. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m³ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.

[c] Concentration is expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[d] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[e] The Federal 1-hour ozone standard was revoked on June 15, 2005 in all areas except the 14 8-hour ozone nonattainment Early Action Compact (EAC) areas.

[f] The Nitrogen Dioxide ambient air quality standard was amended on February 22, 2007 to lower the 1-hour standard to 0.18 ppm and establish a new annual standard of 0.030 ppm. These changes become effective after the regulatory changes are submitted and approved by the Office of Administrative Law, expected later this year.

[g] The EPA revoked the annual PM_{10} standard in 2006 (effective December 16, 2006).

Source: California Air Resources Board and U.S. Environmental Protection Agency, April 2008.

achieve compliance with the CAAQS. The amendments to the California Clean Air Act establish the CAAQS and a legal mandate to achieve these standards by the earliest practical date. These standards apply to the same criteria pollutants as those regulated under the Federal Clean Air Act and also include sulfate, visibility-reducing particles, hydrogen sulfide and vinyl chloride.

These standards, included with the NAAQS in Table 11-1, are generally more stringent and apply to more pollutants than the NAAQS. In addition to the criteria pollutants, CAAQS have been established for visibility reducing particulates, hydrogen sulfide and sulfates. The CCAA requires that each local air district prepare and maintain an Air Quality Management Plan (AQMP) to achieve compliance with CAAQS. These AQMPs also serve as the basis for preparation of the State Implementation Plan (SIP) for the State of California.

b. California Air Resources Board

The California Air Resources Board (CARB) administers the air quality standards in California. Similar to the EPA, the CARB designates areas within California as either attainment or nonattainment for each criteria pollutant based on whether the CAAQS have been achieved. Under the California Clean Air Act, areas are designated as nonattainment for a pollutant if air quality data shows that a state standard for the pollutant was violated at least once during the previous three calendar years.

In 2005, CARB released the final version of the Air Quality and Land Use Handbook, which is intended to encourage local land use agencies to consider the risks from air pollution prior to making decisions that approve the siting of new sensitive receptors, such as homes or day care centers near sources of air pollution. Unlike industrial or stationary sources of air pollution, siting of new sensitive receptors does not require air quality permits, but could create adverse human health effects. The primary purpose of the document is to highlight the potential health impacts associated with close proximity to common air pollution sources and to ensure that those issues are considered in the planning process.

CARB makes recommendations regarding the siting of new sensitive land uses near freeways, truck distribution centers, dry cleaners, gasoline dispensing stations and other air pollution sources. Each of these sources is known to emit pollution that is likely to result in adverse health effects. CARB has reviewed proximity studies, air sampling studies, studies of hospital and medical visits, and air quality modeling to establish the appropriate recommended buffer distances from each source type.

CARB acknowledges that land use agencies have to balance other siting considerations such as housing and transportation needs, economic development priorities and other quality of life issues. These "advisory" recommendations, summarized in Table 11-2, are based primarily on modeling information and may not be entirely reflective of conditions in Novato. The siting of new sensitive land uses within these advisory distances may be possible, but only after site-specific studies are conducted to identify the actual health risks.

c. California Government Code

Under the General Plan requirements in California Government Code, coverage/analysis of air quality is an optional component of the Conservation Element. The BAAQMD encourages local jurisdictions to include General Plan policies or elements that, when implemented, would improve air quality. Although air quality elements are not mandated, General Plans are required to be consistent with any air quality policies and programs that exist within that jurisdiction. Local plans should also be consistent with regional air quality plans, such as the Bay Area Clean Air Plan discussed below.

d. Bay Area Air Quality Management District

The Bay Area Air Quality Management District (BAAQMD) is primarily responsible for assuring that the NAAQS and CAAQS are attained and maintained in the Bay Area. BAAQMD is also responsible for adopting and

TABLE 11-2 **CARB RECOMMENDED SETBACK DISTANCES FOR COMMON SOURCES OF TOXIC AIR CONTAMINANTS**

Source Type	Recommended Buffer Distance
Freeways and busy arterial roadways	500 feet
Distribution Centers with 100 or more daily truck trips or 40 daily truck trips that use refrigeration units	1,000 feet
Dry cleaners (onsite dry cleaning)	300 feet for any dry cleaning operation
	At least 500 feet for operations with 2 or more machines
Large gasoline stations (i.e. over 3.6 million gallons pumped per year)	50 feet for typical gas stations
	Up to 300 feet for large gas stations

enforcing rules and regulations concerning air pollutant sources, issuing permits for stationary sources of air pollutants, inspecting stationary sources of air pollutants, responding to citizen complaints, monitoring ambient air quality and meteorological conditions, awarding grants to reduce motor vehicle emissions and conducting public education campaigns. BAAQMD has jurisdiction over much of the nine-county Bay Area region, including all of Marin County.

Under the CCAA, areas not in compliance with the CAAQS for ozone must prepare an ozone reduction plan. All major metropolitan areas within the State of California, including the Bay Area, must comply with this standard and must therefore submit an attainment plan every three years. The following section notes efforts by the BAAQMD to address ozone and ozone precursors through the implementation of the *Ozone Strategy* and *Clean Air Plan*.

i. 2001 Ozone Attainment Plan

The Bay Area 2001 Ozone Attainment Plan was prepared by BAAQMD, the Metropolitan Transportation Commission (MTC), and the Association of Bay Area Governments (ABAG). This plan is a proposed revision to the Bay Area's part of the State Implementation Plan (SIP) to achieve the NAAQS for the 1-hour ozone standard. The plan was prepared in response to US EPA's partial approval and partial disapproval of the Bay Area's 1999 Ozone Attainment Plan. Although the EPA revoked the 1-hour NAAQS, commitments and emissions budgets made in that plan remain valid until the region develops an attainment demonstration/maintenance plan for the 8-hour NAAQS for ozone. The EPA has already determined that the region met the 1997 8-hour ozone standard. Nevertheless, the region is required to submit a maintenance plan and demonstration of attainment with a request for redesignation to EPA when the 8-hour ozone NAAQS is met. BAAQMD will likely not act on this submittal for a few years. In addition, the EPA's new, slightly more stringent, 8-hour standard was recently established. The EPA will be making new attainment designations based on that standard in about 3 years and eventually revoke the older standard.

A Carbon Monoxide Maintenance Plan was approved in 1998 by EPA, which demonstrated how NAAQS for carbon monoxide standard would be maintained.

ii. 1991 Clean Air Plan

In 1991, BAAQMD, MTC and ABAG prepared the Bay Area 1991 Clean Air Plan (CAP). This air quality plan addresses the CCAA. Updates are developed approximately every three years. The plans are meant to demonstrate progress toward meeting the more stringent 1-hour ozone CAAQS. The latest update to the plan, which was adopted in January 2006, is called the *Bay Area 2005 Ozone Strategy*. This plan includes a comprehensive strategy to reduce emissions from stationary, area, and mobile sources. The plan objective is to indicate how the region would make progress toward attaining the stricter State air quality standards mandated by the CCAA. The plan is designed to achieve a region-wide reduction of ozone precursor pollutants. The plan proposes expanded implementation of transportation control measures (TCMs) and programs such as Spare the Air. Spare the Air is a public outreach program designed to educate the public about air pollution in the Bay Area and promote individual behavior changes that improve air quality. Some of these measures or programs rely on local governments for implementation. An update to the plan is currently being developed and should be available by the end of 2009.

iii. 2009 Clean Air Plan

BAAQMD is in the process of preparing the *2009 Bay Area Clean Air Plan*. The *2009 Bay Area Clean Air Plan* will update the *Bay Area 2005 Ozone Strategy* in accordance with California Clean Air Act requirements to implement "all feasible measures" to reduce ozone. The 2009 Plan will also consider the impacts of ozone control measures on particulate matter, air toxics and GHGs. Additionally, the 2009 Bay Area Clean Air Plan will review progress in improving air quality in recent years, and will establish emission control measures to be adopted or implemented from 2009 through 2012. The plan will also address PM_{10} and $PM_{2.5}$, as well as climate change.

iv. PM_{10} and $PM_{2.5}$ Plans

The clean air planning efforts for ozone will also reduce PM_{10} and $PM_{2.5}$, since a substantial amount of all three air pollutants comes from combustion emissions such as vehicle exhaust. BAAQMD also adopts and enforces rules to reduce particulate matter emissions and develops public outreach programs to educate the public on methods for reducing PM_{10} and $PM_{2.5}$ emissions.

However, Senate Bill (SB) 656, approved in 2003, requires further action by CARB and air districts to reduce public exposure to PM_{10} and $PM_{2.5}$. BAAQMD's responses have targeted reductions in wood smoke emissions, reductions in NOx[1] and particulate matter from internal combustion engines,

[1] NOx emissions contribute to ammonium nitrate formation that resides in the atmosphere as particulate matter, so a reduction in NOx emissions would reduce wintertime $PM_{2.5}$ levels.

and reductions in particulate matter from commercial charbroiling activities. The Bay Area experiences the highest PM_{10} and $PM_{2.5}$ in winter when wood smoke and ammonium nitrate contributions to particulate matter are highest. Therefore, BAAQMD recently adopted a rule addressing residential wood burning. The rule restricts operation of any indoor or outdoor fireplace, wood or pellet stove, or masonry heater on specific days during the winter when air quality conditions are forecasted to exceed the NAAQS for $PM_{2.5}$. The rule also limits excess visible emissions from wood burning devices and requires clean burning technology for wood burning devices sold (or resold) or installed in the Bay Area.

3. Local Regulations

a. Novato General Plan

Air quality is addressed in the Environment chapter of the existing Novato General Plan. Objective EN 32 in this chapter calls for the City to "work to protect and improve air quality." Policies and actions to implement this objective call for the City to work with BAAQMD to implement the regional Clean Air Plan, encourage alternate modes of transportation, mitigate air quality impacts associated with development proposals, enforce dust emissions control plans for construction, and supporting street tree and urban forestry programs. Energy conservation and transportation policies and programs included in the General Plan are also intended to help improve air quality.

B. Climate and Meteorology

Novato is located in the Marin County subregion of the San Francisco Bay Area Air Basin. The basin includes the counties of San Francisco, Santa Clara, San Mateo, Marin, Napa, Contra Costa and Alameda, along with the southeast portion of Sonoma County and the southwest portion of Solano County. Due to the proximity of the San Francisco Bay and Pacific Ocean, the climate in the basin is characterized by warm dry summers and cool moist winters. In summers, temperatures in Novato generally range from the 50s to high 70s and low 80s. In winter, temperatures range from the 30s to the 50s.

The major large-scale weather feature controlling climate in the Novato area is a large high pressure system located in the eastern Pacific Ocean, known as the Pacific High. During winter months marine air trapped in the lower atmosphere is often condensed into fog by the cool Pacific Ocean. Stratus-type clouds usually form offshore and move into the area during the evening hours.

During winter months, the Pacific High becomes weaker and shifts south, allowing weather systems associated with the polar jet stream to affect the region. Low pressure systems produce periods of cloudiness, strong shifting winds and precipitation. Novato, which lies mostly on the lee side of the coastal mountains in Marin County, receives about 30 inches of precipitation per year. Mountains to the west receive 40 to 50 inches. Most rainfall occurs from November through April. High-pressure systems are also common in winter, with low-level inversions that produce cool stagnant conditions. Radiation fog and haze trapped near the surface are common during extended winter periods where high-pressure systems influence the weather.

The prevailing wind in most of Novato is primarily from a westerly direction, especially during spring and summer. In winter, winds become variable with more of a southeasterly orientation. Nocturnal winds and land breezes during the colder months of the year prevail with variable drainage out of the mountainous areas. Wind speeds are highest during the spring and early summer and lightest in the fall. Winter storms bring relatively short episodes of strong southerly winds.

C. Existing Air Quality Conditions

Air quality is affected by the rate of pollutant emissions and by meteorological conditions such as wind speed, atmospheric stability and mixing height, all of which affect the atmosphere's ability to mix and disperse pollutants. Long-term variations in air quality typically result from changes in air pollutant emissions, while short-term variations result from changes in atmospheric conditions.

For the most part, Novato experiences good air quality due to the almost persistent westerly flow of air. There are little or no pollution sources upwind or to the west of Novato. Episodes of high particulate levels can occur in late fall and winter when the Pacific High can combine with high pressure over the interior regions of the western United States (known as the Great Basin High) to produce extended periods of light winds and low-level temperature inversions. This condition frequently produces poor atmospheric mixing that results in degraded regional air quality. Ozone standards traditionally are exceeded in downwind portions of the Bay Area when this condition occurs during the warmer months of the year.

1. Monitored Air Pollutant Levels for Criteria Pollutants

BAAQMD monitors air pollutant levels continuously throughout the nine-county Bay Area Air Basin. The closest monitoring station to Novato is located in downtown San Rafael, which is the only station in Marin County. This monitoring station is located about a block east of US Highway 101 and near the freeway ramps. As a result, PM_{10} and CO levels may be affected by local sources. BAAQMD reports that San Rafael's climate and air quality are representative of that found throughout the populous northeastern side of the county. Afternoon sea breezes in Marin County typically keep air pollution levels low.

A summary of air quality monitoring data is shown in Table 11-3. The values in the table are the highest air pollutant levels measured at these stations over the past five years (2003 to 2007). The number of days in which measured concentrations exceeded the NAAQS or CAAQS are given in Table 11-4. As shown, air pollutant levels measured in San Rafael meet all ambient air quality standards with the exception of the State standard for PM_{10}. The 24-hour State PM_{10} standard is exceeded in San Rafael on about 0 to 1 sampling day per year. Because PM_{10} is sampled once every 6^{th} day, the number of days exceeding the standard is estimated at 0 to 6 days per year. The San Rafael

TABLE 11-3 **HIGHEST MEASURED AIR POLLUTANT CONCENTRATIONS**

Pollutant	Avg. Time	Measured Air Pollutant Levels				
		2003	2004	2005	2006	2007
San Rafael						
Ozone (O_3)	1-Hour	0.09 ppm	0.09 ppm	0.081 ppm	0.089 ppm	0.072 ppm
	8-Hour	0.07 ppm	0.06 ppm	0.059 ppm	0.058 ppm	0.057 ppm
Carbon Monoxide (CO)	8-Hour	2.0 ppm	2.0 ppm	1.7 ppm	1.5 ppm	1.3 ppm
Nitrogen Dioxide (NO_2)	1-Hour	0.07 ppm	0.06 ppm	0.05 ppm	0.05 ppm	0.06 ppm
	Annual	0.016ppm	0.015 ppm	0.013ppm	0.014ppm	0.014ppm
Fine Particulate Matter ($PM_{2.5}$)	1-Hour					
	Annual	--	--	--	--	--
Respirable Particulate Matter (PM_{10})	24-Hour	41 ug/m^3	52 ug/m^3	39 ug/m^3	68 ug/m^3	56 ug/m^3
	Annual	9 ug/m^3	18 ug/m^3	17 ug/m^3	18 ug/m^3	17 ug/m^3
Bay Area (Basin Summary)						
Ozone (O_3)	1-Hour	0.12 ppm	0.11 ppm	0.12 ppm	0.12 ppm	0.12 ppm
	8-Hour	0.10 ppm	0.08 ppm	0.09 ppm	0.11 ppm	0.09 ppm
Carbon Monoxide (CO)	8-Hour	4.0 ppm	3.4 ppm	3.1 ppm	2.9 ppm	2.7 ppm
Nitrogen Dioxide (NO_2)	1-Hour	0.09 ppm	0.07 ppm	0.07 ppm	0.11 ppm	0.07 ppm
	Annual	0.021ppm	0.019ppm	0.019ppm	0.018ppm	0.017ppm
Fine Particulate Matter ($PM_{2.5}$)	1-Hour	56 ug/m^3	52 ug/m^3	55 ug/m^3	75 ug/m^3	58 ug/m^3
	Annual	12 ug/m^3	12 ug/m^3	12 ug/m^3	11 ug/m^3	11 ug/m^3
Respirable Particulate Matter (PM_{10})	24-Hour	60 ug/m^3	65 ug/m^3	81 ug/m^3	73 ug/m^3	78 ug/m^3
	Annual	25 ug/m^3	26 ug/m^3	24 ug/m^3	23 ug/m^3	26 ug/m^3

Note: ppm = parts per million.
Shaded values report exceedances of ambient air quality standards.
NA = data not available

Source: BAAQMD, Bay Area Air Pollution Summaries 2003-2007

TABLE 11-4 **SUMMARY OF MEASURED AIR QUALITY EXCEEDANCES AT SAN RAFAEL MONITORING STATION**

Pollutant	Standard	Monitoring Station	Days Exceeding Standard				
			2003	2004	2005	2006	2007
Ozone (O_3)		San Rafael	0	0	X[a]	X	X
		Bay Area	1	0	X	X	X
	NAAQS 1-hr	San Rafael	0	0	0	0	0
		Bay Area	7	0	1	12	1
	NAAQS 8-hr	San Rafael	0	0	0	0	0
		Bay Area	19	7	9	18	4
	CAAQS 1-hr	San Rafael	–	–	0	0	0
		Bay Area	–	–	9	22	9
Respirable Particulate Matter (PM_{10})	CAAQS 8-hr	San Rafael	0	0	0	0	0
		Bay Area	0	0	0	0	0
	NAAQS 24-hr	San Rafael	0	1	0	1	1
		Bay Area	6	7	6	15	4
Fine Particulate Matter ($PM_{2.5}$)	CAAQS 24-hr	San Rafael	–	–	–	–	–
		Bay Area	0	1	0	10	14
All Other (CO, NO_2, Lead, SO_2)	NAAQS 24-hr	San Rafael	0	0	0	0	0
		Bay Area	0	0	0	0	0

[a] X means the standard was revoked and is no longer applicable.
Source: BAAQMD, Bay Area Air Pollution Summaries 2003-2007. This table reports exceedances at the San Rafael Station and throughout the Bay Area.

station has not exceeded either State or federal ozone standards during the last five years. During this period, the Bay Area as a whole experienced an exceedance somewhere within the basin on up to 22 days per year. It should be noted that $PM_{2.5}$ is not measured in San Rafael.

Air quality conditions in San Rafael are described for each criteria air pollutant below:

- **Ozone:** Over the last five years in San Rafael, the NAAQS for 1- and 8-hour ozone was not exceeded. The Bay Area as a whole exceeded the 8-hour ozone NAAQS on 0 to 12 days annually and the 8-hour CAAQS on 9 to 22 days (statistics kept since 2005). The 1-hour State standard for ozone was also not exceeded in San Rafael, but was exceeded on 4 to 19 days annually in the Bay Area as a whole. Most exceedances of ozone standards in the Bay Area occur in downwind portions of the basin, such as Livermore, Concord and Gilroy.

- **Carbon Monoxide**: The highest carbon monoxide concentrations measured in San Rafael have been well below the NAAQS and CAAQS standards.

- **PM_{10} and $PM_{2.5}$:** High levels of PM_{10} can cause negative health effects, as well as reduced visibility. The primary sources of these pollutants are wood smoke and local traffic, and their buildup is greatest during the evenings and early morning periods. Measured exceedances of the PM_{10} standards occurred on three separate sampling days over the last five years. $PM_{2.5}$ is not measured in San Rafael. The closest monitoring station measuring $PM_{2.5}$ is in Santa Rosa, where monitoring data indicate about 0 to 1 exceedance of the standards annually.

- **Other Pollutants:** Other criteria pollutants, such as nitrogen dioxide, sulfur dioxide and lead have always been measured at low levels in San Rafael and the rest of the Bay Area. These pollutants should not pose a major air pollution concern in Novato.

2. Attainment Status

Areas that do not violate ambient air quality standards are considered to have attained the standard. Violations of ambient air quality standards are based on air pollutant monitoring data and are judged for each air pollutant. The Bay Area as a whole does not meet CAAQS or NAAQS for ground level ozone, nor State standards for PM_{10} and $PM_{2.5}$.

Under the Federal CAA, the EPA has classified the region as "marginally nonattainment" for the 1997 8-hour ozone standard. The EPA required the region to attain the standard by 2007. The EPA has determined that the Bay Area has met this standard, but a formal redesignation request and maintenance plan would have to be submitted before redesignation can be made. In May 2008, the EPA lowered the 8-hour ozone standard from 0.08 to 0.075 ppm. Final designations based upon the new 0.075 ppm standard will be made by March 2010.

The EPA has recently designated the entire Bay Area region as nonattainment for the 2006 24-hour $PM_{2.5}$ standard because recent monitoring data indicate levels in San Jose and Vallejo slightly above the standard. Most nonattainment areas have until 2015 to attain the standards with some extensions to 2020 possible.

The Bay Area has met the CO standards for over a decade and is classified attainment maintenance by the US EPA. The EPA grades the region unclassified for all other air pollutants, which includes PM_{10}.

At the State level, the region is considered "serious non-attainment" for ground level ozone and "non-attainment" for PM_{10} and $PM_{2.5}$ (an annual standard). The region is required to adopt plans on a triennial basis that show progress towards meeting the State ozone standard. The area is considered attainment or unclassified for all other pollutants.

3. Toxic Air Contaminants

In addition to the pollutants discussed above, BAAQMD and CARB measure concentrations of TACs throughout the Bay Area. Typical compounds measured by BAAQMD include benzene, carbon tetrachloride, chloroform, ethylene dibromide, ethylene dichloride, methyl tert buytl ether (MTBE), methylene chloride, acetaldehyde, perchloroethylene, toluene, 1,3-butadiene, formaldehyde, and the class of compounds known as polycyclic aromatic hydrocarbons (PAHs). Since the ambient concentrations of these TACs are very small, they are measured and reported as parts per billion (ppb) or nanograms per cubic meter (ng/m^3) on a volume basis.

Emissions of the major TACs are as follows:

- ♦ **Diesel particulate matter (DPM).** Emitted by heavy-duty trucks, buses, construction equipment and electrical generation. DPM makes up the greatest inhalation health risk in the Bay Area.
- ♦ **1,3 Butadiene.** Emitted primarily by on-road motor vehicles. Like carbon monoxide, older model vehicles without adequate catalytic converters have much higher emission rates.
- ♦ **Benzene.** Emitted primarily by on-road motor vehicles and gasoline evaporation.
- ♦ **Formaldehyde.** Emitted both directly and indirectly into the atmosphere. It is primarily formed through photochemical oxidation in the atmosphere with elevated levels of ozone and nitrogen oxides. Sources of emissions leading to elevated formaldehyde levels are fuel combustion from a variety of mobile and stationary sources, especially motor vehicle operations.

Table 11-5 contains a summary of the measured TAC concentrations at the San Rafael monitoring station. These results are based on data reported by BAAQMD for 2003 (the most recent year available). Also included in Table 11-5 are the overall Bay Area monitoring results for 2003 along with the calculated cancer risk. Risks associated with DPM were calculated for 2000, based on modeling information.

Bay Area cancer risk represents the number of excess cancer cases per million people based on a lifetime exposure (70 years) to the annual average TAC concentration in the Bay Area. CARB published maps showing the 2001 total inhalation health risk in the State. According to these maps, the 2001 health risk in Novato ranged from 100 to below 250 cases per million. More densely populated urban areas, such as San Francisco, Oakland and San Jose had higher risks of 1,000 in a million. With all diesel risk reduction measures implemented, CARB predicts that the overall inhalation health

TABLE 11-5 **SUMMARY OF RECENTLY MEASURED TOXIC AIR CONTAMINANT CONCENTRATIONS**

Toxic Contaminant	Concentration (in ppb) Novato 2003	Bay Area 2003	Cancer Risk (Chance in One Million) Bay Area
Gaseous TACs – Annual Concentration (ppb)			
1,3-Butadiene	0.11	0.09	36.0
Benzene	0.38	0.40	37.7
Carbon Tetrachloride	0.10	0.11	29.1
Formaldehyde	--	2.18	16.3
Acetaldehyde	--	0.72	3.6
Perchloroethylene	0.08	0.03	1.1
Methylene Chloride	0.26	0.36	1.3
MTBE	0.37	0.53	0.5
Chloroform	0.02	0.02	0.6
Trichloroethylene	0.03	0.02	0.2
Particulate TACs – Annual Concentration (ng/m^3)			
Diesel Particulate Matter (DPM)	–	–	480.0*
Chromium (hexavalent)	–	0.10	14.4
Dioxin	–	0.000025	1.0
Nickel	–	3.3	0.8
PAHs	–	0.47	0.5
Lead	–	7.8	0.1
Total for all TACs Excluding Diesel Particulate Matter			**143**

Notes: * Risk in reported for 2000, but expected to be much lower in 2008.
NA = data not available
PPB = parts per billion
Ng/m3 = nanograms of contaminant per cubic meter of air
uglm3 = micrograms of contaminant per cubic meter of air

Source: (1) Air Resources Board Almanac 2007 – Chapter 6, and (2) 2004 Status Report: BAAQMD Toxic Air Contaminant Control Program.

risk in Novato would decrease to less than 100 cases per million by 2010. Health risks associated with TACs are based on the average concentration for the entire region; and the health risk at individual locations will vary considerably. Since 1990, average concentrations of TACs and the associated health risks have been reduced by 50 percent or more for many compounds.

4. Existing Sources of Air Pollution

Traffic is the primary source of air pollution in and around Novato. Table 11-6 summarizes emissions for Marin County and the Bay Area for 2006 (the most recent year available). Traffic accounts for about 40 to 50 percent of the emissions of ozone precursor pollutants.

a. Stationary Sources

Excluding gas stations, dry cleaning facilities and repair shops, the 2003 BAAQMD Toxic Air Contaminants 2003 Annual Report emission inventory database identified the Novato Sanitary District as the only stationary source in Novato. Although Redwood landfill is listed in the inventory, the facility is outside of Novato. The list included about 10 dry-cleaning operations that emit perchlorethylene, a solvent commonly used for dry cleaning.

Emissions of TACs from stationary sources in Novato can be found in the most recent version of BAAQMD's annual Toxic Contaminant Control Report. The most prevalent TACs in Novato and Marin County (excluding diesel particulate matter) are benzene and 1,3-Butadiene from mobile sources and formaldehyde that comes from a variety of sources.

b. Area-Wide Sources

Area-wide sources, which include construction activities, residential wood smoke, off-road travel and agriculture, account for the greatest portion of PM_{10} emissions (about 80 percent) and over 50 percent of the $PM_{2.5}$ emissions.

TABLE 11-6 **2006 AIR POLLUTANT EMISSIONS INVENTORY FOR OZONE PRECURSORS AND PARTICULATE MATTER**

	Emissions (Tons/Day)			
	ROG	**NOx**	**PM_{10}[a]**	**$PM_{2.5}$**
Marin County				
Stationary Sources	1.6	0.4	0.3	0.2
Area-Wide Sources	4.1	1.0	8.4	3.1
On-Road Mobile Sources	5.3	8.5	0.3	0.2
Off-Road Mobile Sources	5.3	7.9	0.8	0.7
Total (Rounded)	**16.3**	**17.7**	**9.8**	**4.3**
Bay Area				
Stationary Sources	7.3	47.6	15.3	11.4
Area-Wide Sources	88.0	19.7	176.1	53.
On-Road Mobile Sources	128.4	233.7	10.4	7.4
Off-Road Mobile Sources	79.4	191.1	11.1	9.9
Total (Rounded)	369.2	492.0	212.8	81.7

[a] PM_{10} includes $PM_{2.5}$

Source: California Air Resources Board (http://www.arb.ca.gov/aqd/almanac/almanac07/almanac07.htm) Mobile Source.

However, $PM_{2.5}$ is also formed from reactions of NOx and other gaseous air pollutants in the atmosphere.

c. Mobile Sources

Mobile sources of air pollution make up a large portion of the emissions inventory for Marin County. On-road mobile sources, or cars and trucks, account for about 40 to 50 percent of the emissions of ozone precursor pollutants (NOx and ROG). Off-road mobile sources include boats, construction equipment, trains and aircraft. Approximately 65 percent of the ROG and 93 percent of the NOx emitted in Marin County is from mobile sources, most of which are related to traffic.

d. Dust

Construction and vehicle travel result in the generation of dust, which leads to elevated PM_{10} levels in the region. Dust from construction activities can affect nearby land uses. Activities that generate visible dust clouds extending beyond their boundaries are a source of air pollution that can be controlled.

5. Odors

Significant sources of offending odors are typically identified based on complaint histories received and compiled by BAAQMD. It is difficult to identify sources of odors without requesting information about a given facility from BAAQMD. There are no known facilities with complaint histories in Novato. Typical large sources of odors that result in complaints are wastewater treatment facilities, landfills, food processing facilities and agricultural operations.

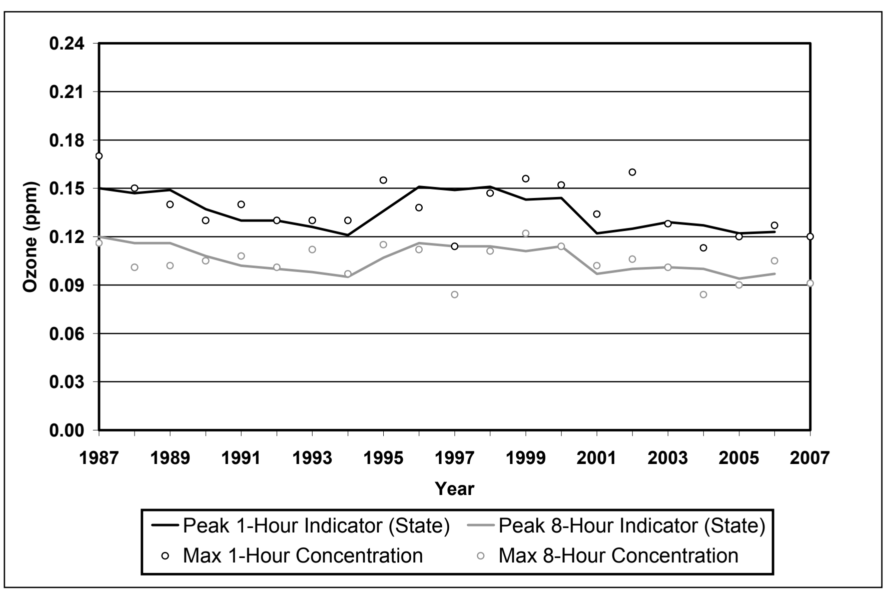
D. Air Quality Trends

Table 11-7 shows the trend in emissions for the Bay Area since 1975. Emissions of ozone precursors have decreased considerably over the last 30 years. During the past ten years, ozone precursor emissions have decreased by 30 to 40 percent. Figure 11-1 shows that, although ozone precursor emissions decreased substantially, the effect on ozone levels is subtle. However, the trend toward lower ozone levels has been fairly consistent for the last 20 years. In fact, the downward trend appears to have been sufficient to show attainment of the NAAQS for ozone. Ozone precursor emissions are projected to continue to decrease by 25 to 40 percent over the next 15 years, while population and vehicle use increases. The projected reductions would be the result of rules and regulations that will be implemented in the future. For instance, new vehicle standards require time to reduce emissions until older more polluting vehicles are retired.

TABLE 11-7 **TREND IN SF BAY AREA AIR BASIN EMISSIONS (TONS/DAY, ANNUAL AVERAGE)**

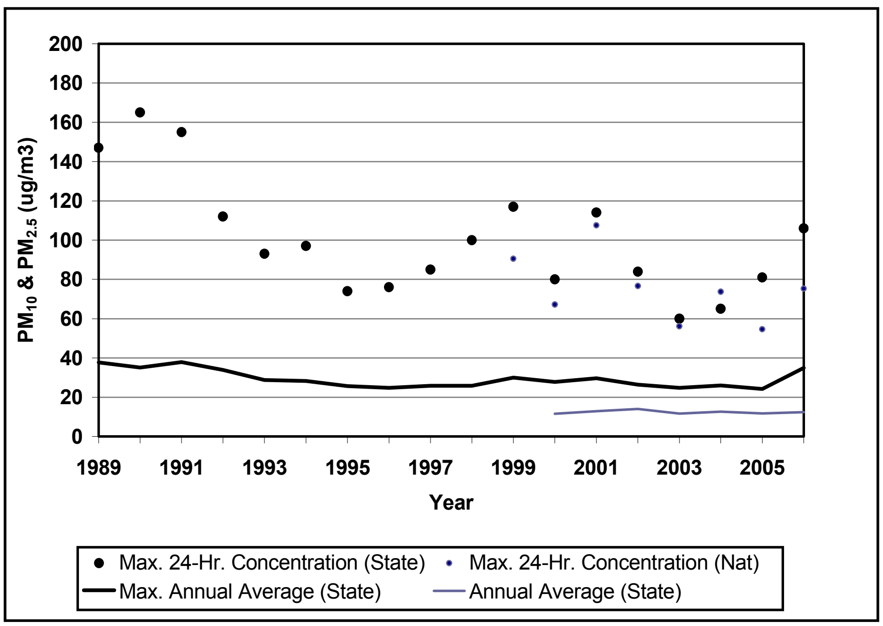
Pollutant	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020
NOx	943	918	821	797	720	622	496	423	348	301
ROG	1430	1320	1047	764	646	525	382	330	302	290
PM_{10}	181	182	195	194	189	218	210	220	230	241
PM_{25}	81	79	79	83	81	84	81	83	84	87
CO	9,075	8,334	7,011	5,325	3,917	2,961	2,041	1,617	1,363	1,230

FIGURE 11-1 **10-YEAR TREND IN SAN FRANCISCO BAY AREA OZONE LEVELS**



The trends in PM_{10} and $PM_{2.5}$ concentrations are shown below in Figure 11-2. PM_{10} levels have increased slightly during the past 10 years. Many of the sources that contribute to ozone formation also lead to PM_{10} formation through chemical reactions in the atmosphere. These secondary particulates contribute to overall PM_{10} and $PM_{2.5}$ concentrations, so efforts to reduce ozone precursor emissions should also provide some reduction to PM_{10} and $PM_{2.5}$ concentrations.

FIGURE 11-2 **15-YEAR TREND IN SAN FRANCISCO BAY AREA ANNUAL PM_{10} AND $PM_{2.5}$ LEVELS**



12 HYDROLOGY, FLOODING AND WATER QUALITY

This chapter describes local and regional hydrology, flooding and water quality in and around Novato, as well as the applicable federal, State and local regulations.

A. Regulatory Framework

1. Federal Regulations

a. Federal Water Pollution Control Act

The Federal Water Pollution Control Act (Clean Water Act), also known as the CWA, was enacted in 1972 to restore and maintain the chemical, physical and biological integrity of the waters of the United States.

The two-phase National Stormwater Program was established as part of the CWA. Phase 1 of the program requires discharges from Municipal Separate Storm Sewer Systems (MS4s) serving over 100,000 people to be covered under a National Pollutant Discharge Elimination System (NPDES) permit. The City of Novato is considered a permittee under California's statewide general permit (Water Quality Order No. 2003-0005-DWQ) for MS4s. Permitees must develop and implement a Stormwater Management Plan (SWMP) with the goal of reducing discharged pollutants to the maximum extent. The City of Novato's NPDES Storm Water Program prevents illicit discharges into drains, waterways and wetlands, and is discussed in more detail in Chapter 16, Utilities.

b. National Flood Insurance Program

Congress passed the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 to address the increasing cost of flood-related disaster relief. The intent of National Flood Insurance Program (NFIP) is to reduce the need for large, publicly-funded flood control structures and disaster relief by restricting development on floodplains.

The Federal Emergency Management Agency (FEMA) administers the NFIP to provide subsidized flood insurance to communities that comply with

FEMA regulations and limit development on floodplains. FEMA issues Flood Insurance Rate Maps (FIRMs) for communities participating in the NFIP. FIRMs delineate flood hazard zones in the community.

c. Executive Order 11988

Executive Order 11988 (Floodplain Management) addresses floodplain issues related to public safety, conservation and economics. It requires federal agencies constructing, permitting, or funding a project in a floodplain to avoid incompatible floodplain development; maintain consistency with the standards and criteria of the NFIP; and restore and preserve natural and beneficial floodplain values.

2. State and Regional Regulations

a. Assembly Bill 162

Assembly Bill 162 (AB 162) requires cities and counties to address flood-related matters in the land use, conservation, safety and housing elements of their General Plans. AB 162 requires that flood management is addressed in General Plans in the following ways:

- ♦ Require that the land use element identify and annually review areas that are subject to flooding as identified by federal and State floodplain maps.
- ♦ Require the conservation element, upon the next housing element review on or after January 1, 2009, to identify rivers, creeks, streams, flood corridors, riparian habitat and land that may accommodate floodwater for specified purposes.
- ♦ Require the safety element, upon the next housing element review on or after January 1, 2009, to identify flood hazard zones and establish policies to avoid or minimize the unreasonable risks of flooding.
- ♦ Allow the housing element to exclude from the determination of land suitable for urban development those areas where the flood management infrastructure is inadequate and housing development would be impractical.

- Require the Reclamation Board and local flood protection agencies to review safety element documents for cities and counties in the Sacramento and San Joaquin Drainage District, and report recommendations to the planning agency within specified timeframes. These cities and counties would also be required to submit any proposals to adopt or substantially amend a general plan to the Reclamation Board for review and comment within 45 days.

b. San Francisco Bay Regional Water Quality Control

Per the Porter-Cologne Act, the San Francisco Bay Regional Water Quality Control (RWQCB) is responsible for the development, adoption, and implementation of the Water Quality Control Plan (Basin Plan) for the San Francisco Bay Region. The Basin Plan is the master policy document that contains descriptions of the legal, technical, and programmatic bases of water quality regulation in the San Francisco Bay Region. The Basin Plan identifies beneficial uses of surface waters and groundwater within its region and specifies water quality objectives to maintain the continued beneficial uses of these waters.

c. San Francisco Bay Area Stormwater Management Agency Programs

Discharge of surface runoff generated from the City of Novato contributes to discharges into watercourses which in turn flow into the San Francisco Bay. The San Francisco Bay Area Stormwater Management Agency (BASMA) has a program to assist in the management of stormwater runoff discharged to the San Francisco bay area. The BASMA's program covers a broader area including Marin County, and therefore the City of Novato.

d. Assembly Bill 70

Assembly Bill 70 (AB 70) requires cities and counties that have "unreasonably approved" development in an area with known flood risks to share liability for flood control damage with State entities.

3. City and County Ordinances and Regulations

a. Marin County Flood Control and Water Conservation District

All of Marin County, including Novato, is under the jurisdiction of the Marin County Flood Control and Water Conservation District (MCFCWCD), which is responsible for managing stormwater and flooding problems in the County. MCFCWCD also maintains weather monitoring stations, stream gauges and precipitation gauges throughout the County.

MCFCWCD is staffed by the Marin County Department of Public Works and is responsible for administering the Marin County Stormwater Pollution Prevention Program (MCSTOPPP) and FEMA Flood Insurance programs. The goal of MCSTOPPP is to prevent stormwater pollution, protect and enhance water quality in creeks and wetlands, preserve beneficial uses in waterways and comply with State and federal regulations. MCSTOPPP submitted a county-wide SWMP to the RWQCB and coordinates consistency between individual SWMPs.

MCFCWCD identifies eight "zones" within the County in order to focus on issues in specific watersheds; Novato is in MCFCWCD's Zone #1. Zone #1 encompasses all of Novato in addition to a sizeable area of unincorporated Marin County. The boundary of Zone #1 is formed by the entire watershed tributary to Rush Creek and Novato Creek.

b. Action Plan 2010

Action Plan 2010 is the five-year SWMP for the member agencies of MCSTOPPP. The County of Marin and each of the cities and towns in the County, including the City of Novato, are member agencies of MCSTOPPP. MCSTOPPP coordinates consistency between individual SMPs. *Action Plan 2010* was submitted to and approved by the State Water Resource Control Board in May 2005.

c. Novato General Plan

Flooding is addressed in the Safety and Noise Chapter of the existing General Plan. NSF Objective 2 calls for the City to "reduce flood hazards." The

General Plan includes policies and programs to implement this objective, including the following:

- ♦ Increase floodwater storage capacity;
- ♦ Use FEMA's updated FIRMs;
- ♦ Work with Marin County Public Works Department to address flooding issues;
- ♦ Pursue funding sources for improvements to storm drainage facilities;
- ♦ Mitigate flooding hazards associated with new development; and
- ♦ Maintain unobstructed water flow in the storm drainage system and consider potential hazards from sea level rise.

d. Local Drainage Master Plan

To accommodate 25-year flood flows, the City has implemented a Local Drainage Master Plan for improving storm drains. A detention pond has been constructed at Deer Island (located on the northern portion of Deer Creek in eastern Novato), and improvements have also been made to the channels of Novato Creek, Warner Creek, and Arroyo Avichi Creek. The City is currently in the process of updating the Local Drainage Master Plan.

e. Novato Municipal Code Section 5-31: Flood Damage Prevention Requirements.

Municipal Code Section 5-31 establishes regulations for "special flood hazard areas" in Novato. Special flood hazard areas are defined by the flood hazard zones delineated in FEMA's Flood Insurance Rate Maps. Development, designation and subdivision of land within a special flood hazard area require the review and approval of the City Engineer, who must find the land use proposal consistent with specific use regulations and development standards intended to reduce flooding hazards. Standards include elevating a structure's lowest level above the base flood elevation and anchoring structures to prevent lateral movement in case of flooding. These rules apply to new structures and to improvements or repairs totaling 50 percent or more of the value of an existing building.

f. Novato Zoning Code Section 19.16.050: Flood Hazard (F) Overlay District

Zoning Code Section 19.16.050 established a Flood Hazard (F) Overlay District in Novato. The purpose of this district is to "protect people and property from flood hazard risks by appropriately regulating development and land uses within an F overlay district." The boundaries of this district are shown in Chapter 2, Figure 2-3. The (F) Overlay District limits land uses permitted in primary and secondary floodways and requires studies and mitigation for development proposed within a 100-year flood plain.

g. Novato Zoning Code Section 19.35: Waterway and Riparian Protection

Section 19.35 of the Zoning Code establishes buffer areas along watercourses to protect water quality, minimize flood hazards and maintain or expand storage capacity for flood waters. Section 19.35 establishes a "stream protection zone" that includes the stream bed, the stream banks, all riparian vegetation and a buffer zone at least 50 feet wide, measured from the top of the channel bank. The stream protection zone may be expanded or reduced based on specific site conditions. Any proposed development, grading, fill, planting, or vegetation removal requires a use permit. In order to obtain a use permit, an applicant must submit a Stream Management Plan and incorporate annual maintenance requirements into the project.

B. Regional Surface Hydrology

Novato covers about 28 square miles, of which approximately two percent is water. The topography of Novato ranges from sea level elevation to 1,558 feet above mean sea level (amsl) at the highest point on Burdell Mountain. Downtown is at 18 feet amsl. The annual precipitation level in Novato averages 27.5 inches per year. Ultimately, all surface drainage flows into San Pablo Bay by overland flow, tributary swales (shallow, vegetated ditches), or perennial streams, such as Novato Creek.

1. San Pablo Bay

Novato is located within the San Francisco Bay Area Hydrologic Basin. The San Francisco Bay functions as the drainage outlet for the waters of the Central Valley. San Francisco Bay can be divided into distinct waterbodies that have different physical and chemical properties. The northern reach includes three major embayments: Suisun Bay, San Pablo Bay and Central Bay. Novato is located on the western shore of San Pablo Bay. Areas near San Pablo Bay are largely salt marsh and levied wetlands.

The physical characteristics (i.e. salinity, temperature, and suspended solids) of the waters of San Pablo Bay vary greatly on a given day due to its location between Suisun Bay and the saltier San Francisco Bay. The interaction of waters of varying salinity has a major influence on the circulation of water in San Pablo Bay itself. When freshwater and saltwater meet, the denser saltwater tends to flow under the freshwater until the waters are mixed by stronger tidal currents and winds.

While the major source of freshwater to San Pablo Bay is inflow from the Delta, other surface water flow, including the Napa and Petaluma Rivers, stormwater runoff, and groundwater are important sources of fresh water to San Pablo Bay. Surface runoff creates the majority of freshwater flows within the rivers and streams. Consequently, stream flow in all of the creeks and rivers varies from season to season depending on precipitation. Most of the water flow during a given year occurs during the rainy season, from November to April. Flows in many of the smaller streams located in the upper reaches of the watershed are intermittent and start to run dry after the end of the rainy season. Major streams intercept some groundwater in their lower reaches, which allows them to flow all year.

2. Natural Drainage Systems

The drainage network in Novato consists of a number of lakes, streams, and creeks, including the Petaluma River, Stafford Lake, Novato Creek, Rush Creek and San Pablo Bay. The Petaluma River begins 20 miles north of the City of Petaluma and borders the eastern edge of Novato. San Pablo Bay borders the eastern edge of the city. Rush Creek flows north and east from Downtown to the Petaluma River. Stafford Lake is a Novato Creek reservoir located approximately 11 miles upstream of San Pablo Bay. The reservoir has a storage capacity of about 4,450 acre-feet and a water surface area of about 230 acres. Novato Creek flows from east to west and bisects the city. The creek and its drainage basin encompass approximately 44 square miles, part of which is shown in Figure 12-1. Several smaller creeks flow into Novato Creek, including Warner Creek (5.1-square mile drainage area), Arroyo Avichi Creek (1.6-square mile drainage area), and Arroyo San Jose Creek (5.7-mile drainage area).

Novato Creek is the dominant perennial stream in the Novato area, extending about 17 miles from its headwaters at Stafford Lake to San Pablo Bay. This creek, along with its numerous tributaries, including Bowman Creek, Simmons Creek, Vineyard Creek, Warner Creek, and Arroyo Avichi Creek, drains a watershed of approximately 27,500 acres.

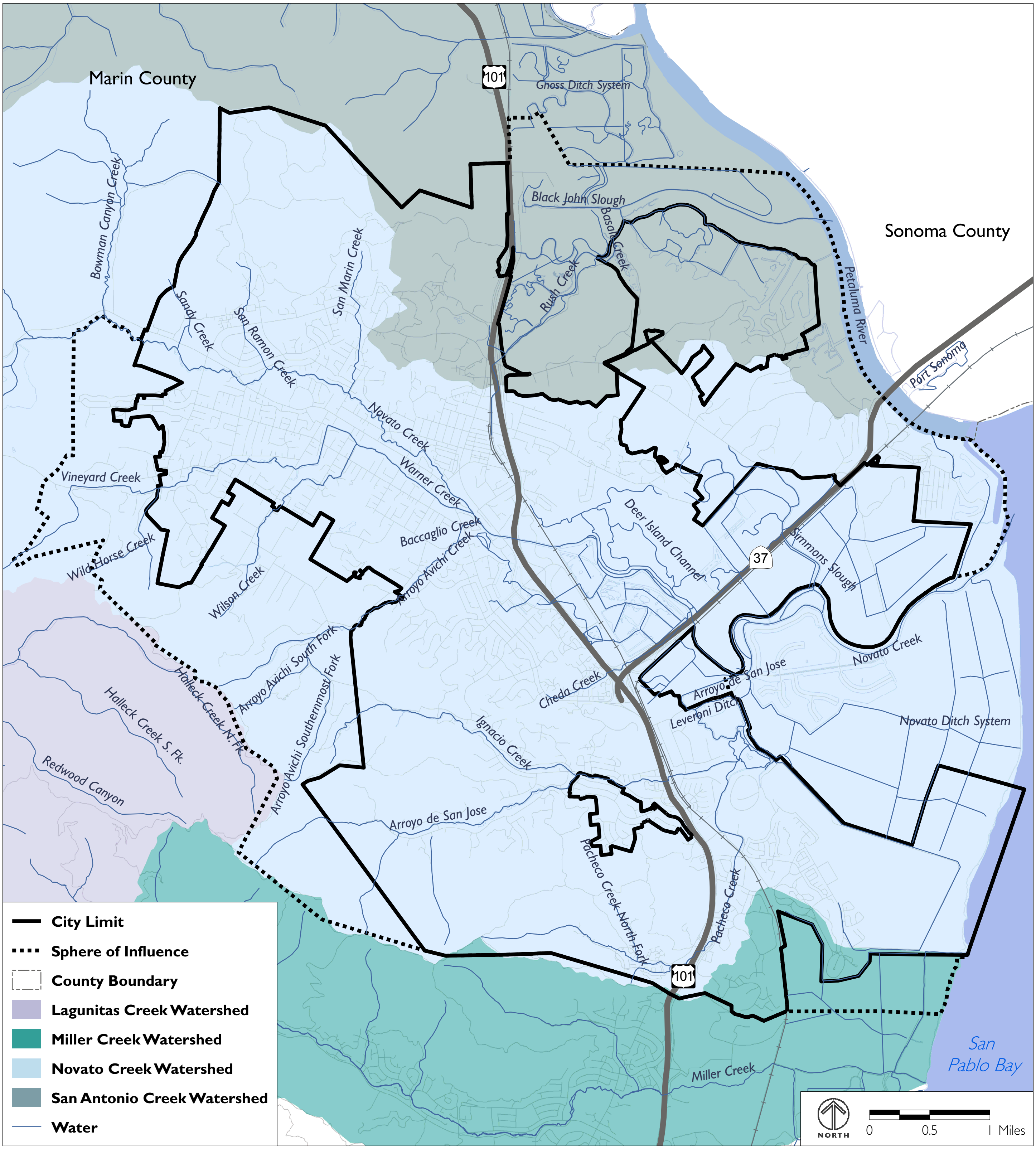
3. Man-made Drainage Systems

Man-made drainage systems within the City of Novato include earthen drainage swales and concrete ditches, 35 major street culverts and 15 bridges, and drainage facilities and basins that are part of City-owned open spaces.

The City's Street Division staff routinely inspect these man-made drainage facilities to ensure that proper protective devices, such as grates, are in place, and to remove hazardous debris upstream. Most of the man-made drainage system is inspected and cleaned before, during and after each storm occasion, which helps to reduce local flooding.

C. Groundwater

Groundwater in the area, as measured at different sites within Novato, generally occurs between 1 and 40 feet amsl, depending on the location. Groundwater flow is generally to the northeast with slight variations due north and due east. However, the direction of groundwater flow may be influenced in



Source: Marin County, GIS

FIGURE 12-1

WATERSHEDS AND WATERBODIES

some areas by groundwater pumping. The groundwater gradient is fairly flat, ranging from a drop of one foot approximately every 500 lateral feet to 1-foot every 700 lateral feet.

D. Water Quality

1. San Pablo Bay

As noted above, San Pablo Bay receives water from the Delta, the Napa and Petaluma Rivers, stormwater runoff and groundwater. San Pablo Bay is included on the 2002 California 303(d) List[1] as an impaired waterbody due to the presence of chlordane, dichloro-diphenyl-trichloroethane (DDT), diazinon, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, nickel, non dioxin-like and dioxin-like polychlorinated biphenyls (PCBs) and selenium.

2. Surface Water Quality

The main source of surface water pollution in Novato is nonpoint source pollution. Nonpoint source pollution refers to any pollution that doesn't come from a "point source" such as a discharge pipe. Nonpoint source pollution includes urban stormwater runoff containing pesticides, oil, grease, pet waste and other contaminants. These substances accumulate on the surface of roadways, parking lots, driveways, sidewalks and landscaped areas and with the flow of stormwater, are washed into lakes, creeks and streams. Another component of nonpoint source pollution is sediment that has eroded from construction sites or stream banks. The upland reaches of Novato Creek are impacted by effects of the Novato Creek Dam and by bank and terrace ero-

[1] Section 303(d) of the 1972 CWA States are required to develop a list of water bodies that do not meet water quality standards. The law further requires that jurisdictions rank the water bodies in order of priority and develop action plans, called Total Maximum Daily Loads (TMDL), to improve water quality. The U.S. EPA approved California's 2002 Section 303(d) List on July 25, 2003. http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists.shtml, accessed February 9, 2009.

sion from grazing practices. Novato Creek's middle and lower reaches are heavily urbanized and impacted mainly by urban stormwater runoff.

3. Groundwater Quality

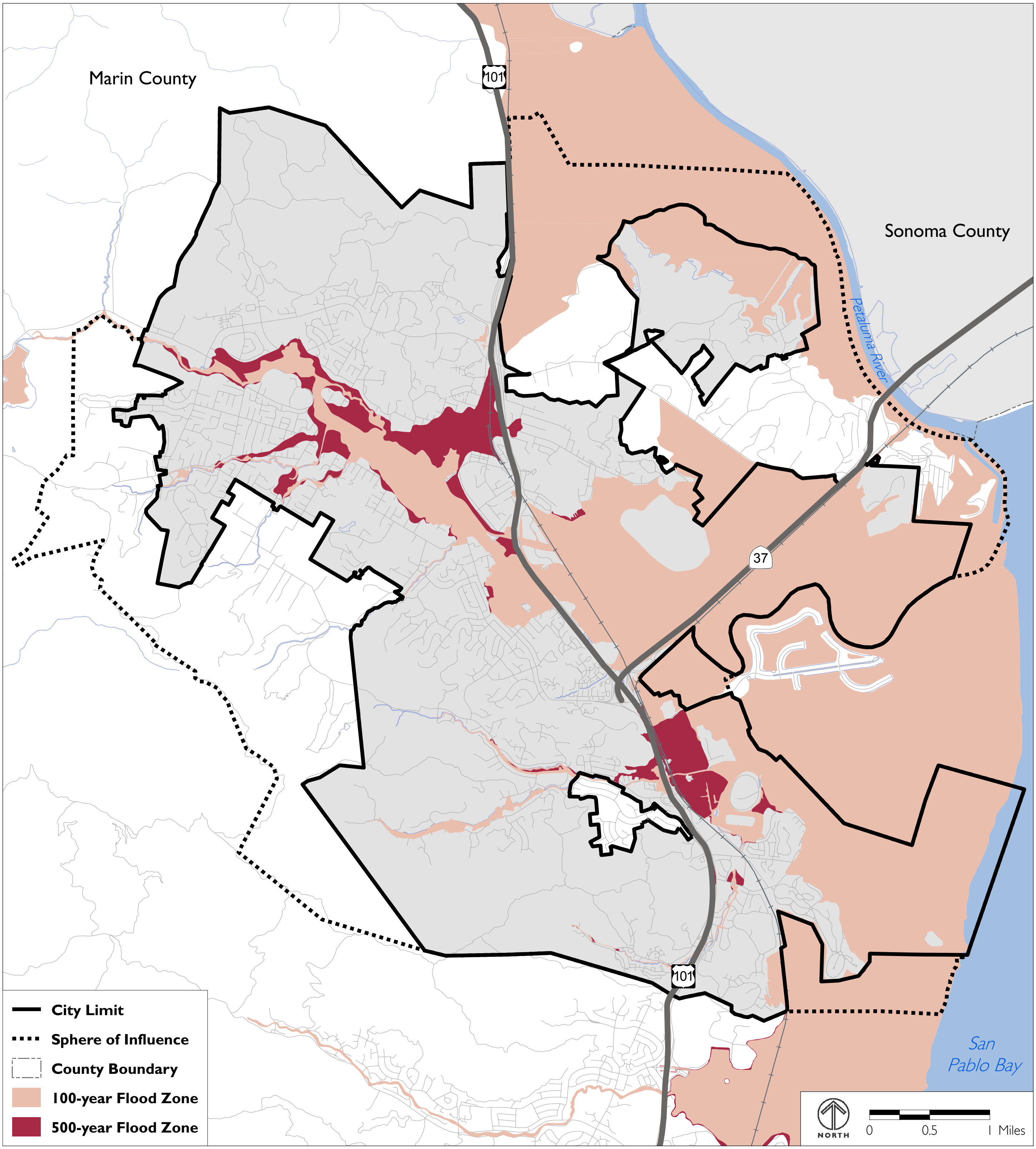
Novato does not rely on groundwater for any part of its water supply. As discussed in Chapter 13, Hazardous Materials, while there is groundwater contamination beneath some specific hazardous materials sites in Novato, the contamination is confined to the sites themselves or immediately adjacent properties.

E. Flood Control and Management

Novato Creek, along with its tributaries such as Warner and Arroyo Avichi Creeks, is a major source of flooding in Novato. Heavy rains occasionally cause flood damage in Novato. Properties upstream of the confluence of Novato, Warner, and Arroyo Avichi Creeks have been particularly susceptible to flooding. Heavy rains in 1980, 1982, 1983, 1986, 1989 and 1998 caused flooding and damage to buildings in these areas. Other areas with high flood danger include Ignacio, Arroyo San Jose, and Vineyard Creeks, as well as much of the bayfront, including the Bahia area. Failure of the Novato Creek Dam, located at Stafford Lake, is another potential source of flooding. This section describes the primary strategies by which the City and other agencies seek to control flooding risks in Novato.

1. FEMA Flood Hazard Zones

Identified FEMA flood hazard zones in Novato, as mapped in 2007 and shown in Figure 12-2, show that all but the high-lying areas of the city are classified as Zone A, defined as "subject to 100-year flooding with no base flood elevation determined." The 100-year flood zone is identified as an area that has a 1 percent chance of being flooded in any given year. Areas around lakes and streams in the northwestern and southern parts of the site are listed as occurring within a 500-year flood zone.



Source: Marin County, GIS (original flood hazard data from FEMA)

FIGURE 12-2

FLOOD HAZARD ZONES

FEMA mapping is a guide for the City in planning for flooding events and regulating development within identified flood hazard areas. However, additional locations within the city could be subject to flooding. For example, while flood control projects and regulations have mitigated many serious flood hazards, some areas could still experience flooding due to breakdowns in the existing systems, such as failed levees. In such cases, empirical information about storm events gathered by staff of the Public Works Department and the State Department of Water Resources (DWR) supplements information provided by FEMA.

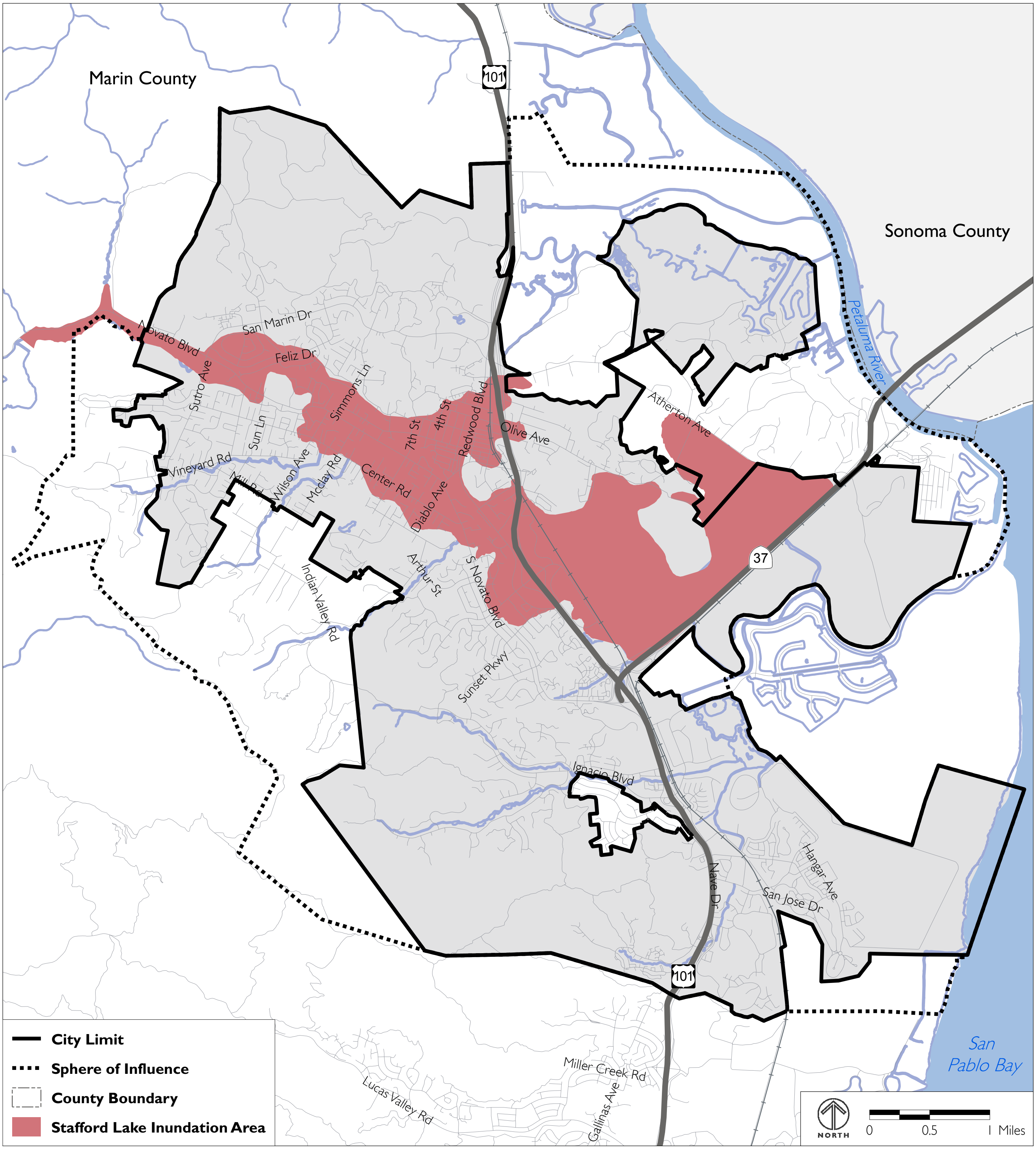
2. Dam Inundation

Novato is subject to potential flooding resulting from the failure of the Novato Creek Dam at Stafford Lake. This earthen dam is designed to withstand an earthquake of a magnitude up to 8.25 on the San Andreas Fault. The area that would be inundated in the hypothetical event of a sudden failure of the dam is shown in Figure 12-3.

3. Tsunami and Mudflows

Although an earthquake on the Hayward and Rodgers Creek fault complex, which runs beneath San Pablo Bay, could create a tsunami, there is believed to be little potential for a tsunami to affect Novato.

Mudflows are not considered a significant threat, given the relative lack of steep grades and the requirements of the City's Hillside Ordinance to prepare a geotechnical study, identify and mitigate any potential mudflow hazards.



Source: Marin County, GIS

FIGURE 12-3

STAFFORD LAKE DAM INUNDATION AREA

13 HAZARDOUS MATERIALS

A hazardous material is a substance that poses a risk to human health, safety or the environment. Hazardous materials are mainly produced from industries involving chemical byproducts from manufacturing, petrochemicals and hazardous building materials. This chapter discusses regulations pertaining to hazardous materials, identifies hazardous materials known to be present in Novato and discusses the transportation and disposal of these materials.

A. Regulatory Framework

1. Federal Regulations

a. Environmental Protection Agency

The Environmental Protection Agency (EPA) is the federal agency responsible for enforcement and implementation of federal laws and regulations pertaining to hazardous materials. Key legislation includes the Clean Water Act (CWA) of 1972, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund), the Superfund Amendments and Reauthorization Acts of 1986, and the Resource Conservation and Recovery Act of 1986 (RCRA). Federal regulations are primarily codified in Title 40 of the Code of Federal Regulations. The EPA provides oversight and supervision for site investigations and remediation projects, and establishes land disposal restrictions and treatment standards for the disposal of certain hazardous wastes.

b. U.S. Department of Transportation

Transportation of chemicals and hazardous materials are governed by the U.S. Department of Transportation (DOT), which establishes regulations for the movement of hazardous material on interstate highways. Regulations require the use of a system of placards, labels and shipping papers that identify the hazards of shipping each class of hazardous material. Existing federal laws which address risks associated with the transport of hazardous materials include the Materials Transportation Act, administered by the DOT.

2. State Regulations

In California, regulation of hazardous materials falls under the authority of the California Environmental Protection Agency. This large agency includes the California Integrated Waste Management Board (CIWMB), responsible for oversight of solid waste disposal, and the Department of Toxic Substances Control (DTSC), which is chiefly responsible for regulation, handling, use, and disposal of toxic materials in California.[1] The State Water Resources Control Board (SWRCB) regulates discharge of potentially hazardous materials to waterways and aquifers, and administers the basin plans for groundwater resources in the various regions of the State.[2]

California Health and Safety Code Section 25531 incorporates the federal law as it pertains to hazardous materials. This includes development of a Risk Management Plan (RMP) for facilities that store or handle acutely hazardous materials in reportable quantities. California Code of Regulations (CCR) Title 8 requires facility owners to prepare and implement safety management plans where large quantities of hazardous materials are handled. The California Fire Code has requirements for storing and handling hazardous materials.

The California Department of Industrial Relations, Division of Occupational Safety and Health, requires that employees of businesses using or storing hazardous materials receive hazard communication training. The training is intended to ensure that employees understand the nature of the hazardous materials that they handle, and can safely use, store, and dispose of the materials in accordance with Title 8 of the CCR. The hazard communication standard requires that employers must:

- Prepare an inventory of hazardous materials.
- Make material safety data sheets available to employees.

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[1] California Environmental Protection Agency, 2006, *The History of the California Environmental Protection Agency,* Cal EPA website, http://www.calepa.ca.gov/About/History01/dtsc.htm, accessed March 5, 2007.

[2] State Water Resources Control Board, 2006, SWRCB web site http://www.swrcb.ca.gov/, accessed on March 5, 2007.

- Conduct employee training on chemical hazards and safe handling of materials.
- Ensure that hazardous material containers are properly stored and labeled.

3. Local Regulations

Agencies responsible for local enforcement of State and federal laws controlling hazardous materials management include the Waste Management Division of the Marin County Department of Public Works and the Environmental Health Services Division of the Marin County Community Development Department. The Marin County Environmental Health Services Division is primarily responsible for household hazardous wastes, including swimming pools, landfills and well installation and abandonments.[3]

a. Marin County Department of Public Works

The Waste Management Division of the Marin County Department of Public Works has been certified by Cal-EPA as the Certified Unified Program Agency (CUPA). The CUPA is the local agency responsible for coordination of hazardous waste generator programs, fuel underground storage tank (UST) management, tiered permitting process for waste treatment and administering the Hazardous Materials Business Plan (HMBP) program. Businesses that store, handle, or dispose of hazardous materials must submit a HMPB in accordance with California Health and Safety Code Section 25504. The HMBP must be updated every two years, or within 30 days after a substantial change in site operations. The HMBP must:

- List all the hazardous materials stored at a site.
- Identify emergency response procedures for spills and personnel.
- Identify evacuation plans and procedures.
- Identify training records for personnel to substantiate annual refresher training.

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[3] Short, Nancy. Environmental Health Technician II, Marin County. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc., December 12, 2008.

b. Novato General Plan

Hazardous materials are addressed in the Safety and Noise chapter of the existing General Plan. SF Objective 8 calls for the City to "reduce hazards of transportation, storage and disposal of hazardous wastes and hazardous materials." Policies and programs implementing this objective call for the City to refer proposed projects involving hazardous materials regulations to the appropriate agencies, establish a household hazardous waste collection and disposal program, adopt a Hazardous Materials and Waste Ordinance and implement the Commercial Occupancy Ordinance requiring notification of transportation, storage, treatment or release of all hazardous materials.

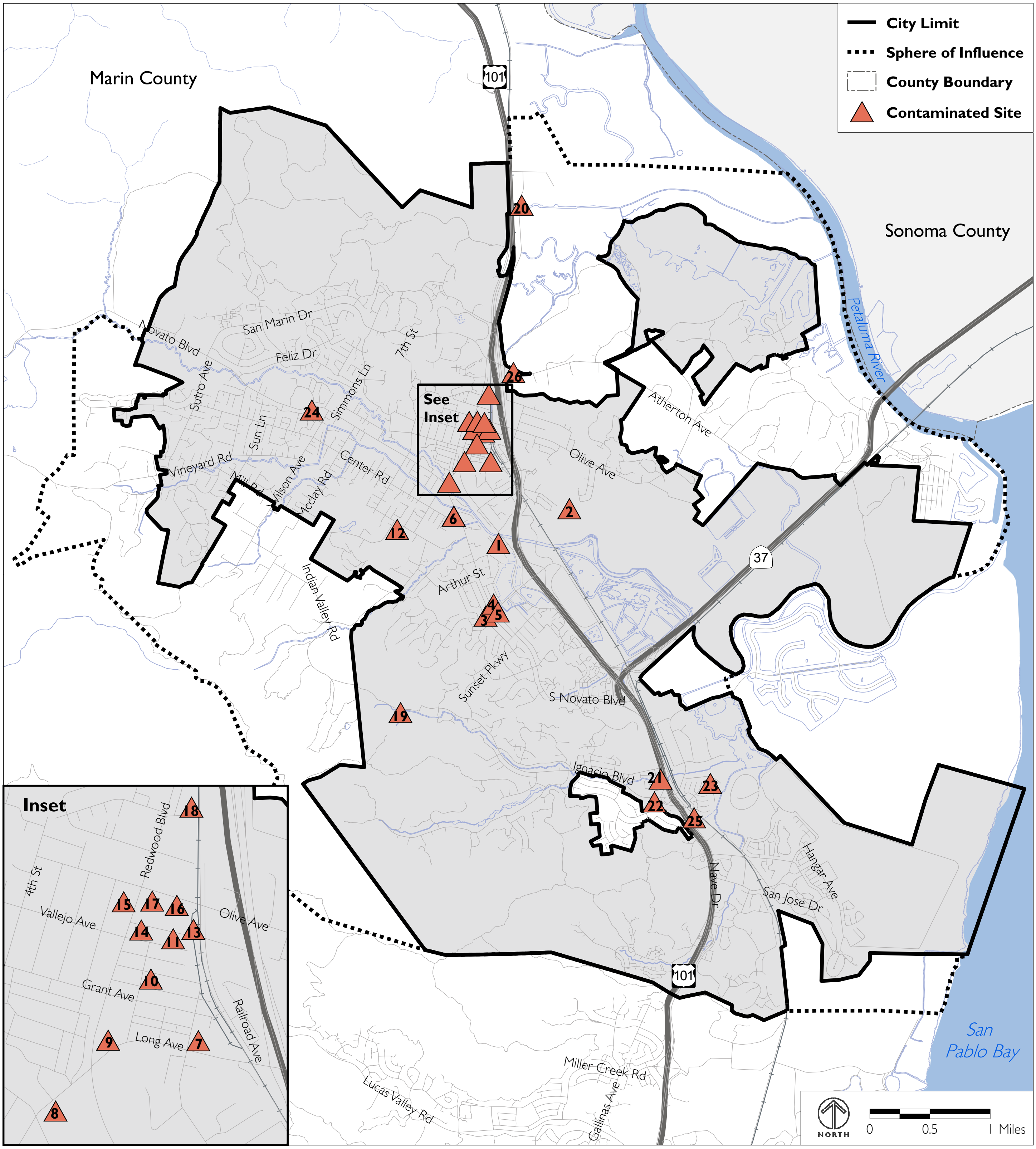
c. NFPD Ordinance 2007-1

NFPD Ordinance 2007-1 adopts the California Fire Code which regulates hazardous conditions from fire or explosion and permits for hazardous uses or operations. This ordinance also establishes a fire loss management division and defines the powers and duties of its officers.

B. Hazardous Materials Sites

This section describes hazardous material sites in Novato. The locations of hazardous materials sites are recorded in databases from various agencies, such as the EPA and the Department of Toxic Control Substances (DTCS). Sites listed on the databases are not necessarily contaminated, but the facilities on the sites may have generated, used, or disposed of hazardous materials at some point. The databases used to identify locations of hazardous materials sites in Novato are provided in Appendix D, Table D-1.

The sites described below currently have documented soil and/or groundwater contamination and are considered open remedial cases. Figure 13-1 shows the location of these active sites. Appendix D includes maps showing contamination plumes and groundwater flow direction and gradient for the sites.



Source: Multiple sources as identified in Appendix D, Table D-1.

FIGURE 13-1

HAZARDOUS MATERIAL SITES

1. Novato Ford – 6995 Redwood Boulevard

This site is listed on several databases for contamination and disposal associated with a leaking underground storage tank (LUST). The site is occupied by the Novato Ford automobile dealership. On September 22, 1997, one 2,000-gallon gasoline UST was removed from the site. Since September 1998, several phases of investigations have been conducted. High concentrations of petroleum hydrocarbons have been detected in groundwater in the area of the former UST location, near the western corner of the service building. The main chemical of concern is methyl tertiary-butyl ether (MTBE).

In accordance with the approved Feasibility Study/Corrective Action Plan and Remedial Action Plan for the site, an ozone sparge and hydrogen peroxide injection remediation system has been operating since February 8, 2008, and groundwater monitoring is currently being conducted.[4] The ozone-sparging process involves the injection of ozone into groundwater to provide in-situ treatment and has been proven to be effective for remediation of volatile organic compounds (VOCs), such as MTBE.

2. Novato Treatment Facility – 500 Davidson Street

This site is listed on several databases for contamination associated with a release in a former diesel product line associated with a fuel UST removed in October 1998. Concentrations of diesel, MTBE, benzene, toluene, ethyl benzene, and total xylenes (BTEX) were detected in soil and groundwater. However, due to the numerous pipelines associated with the water treatment plant running beneath the site, only a portion of the contaminated soil could be removed. From 1999 to 2003, 4,870 gallons were removed from an extraction well. Concentrations detected in three monitoring wells in July 2007 were below laboratory detection levels for diesel and BTEX in all three monitoring wells.[5] Following additional remedial soil excavation and extraction well de-

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[4] EDD Clark and Associates, 2008. *Groundwater Monitoring Report. Novato Ford, 6995 Redwood Boulevard.*

[5] Environ, 2007. *Groundwater Monitoring Report. North Bay Cleaners, 1559 South Novato Boulevard, Novato, California.*

watering in 2008, closure was requested from the State Water Board in May 2008. A response is pending.

3. Former Exxon-Mobil – 1400 Novato Boulevard

This site is listed on databases for contamination associated with three gasoline USTs, one used-oil UST, dispenser islands and piping removed in 1986. Multiple phases of assessment have occurred since that time; the latest action is the installation of soil vapor monitoring points in July 2008. Results from the latest available groundwater monitoring event, conducted in April 2008, showed gasoline at 13,000 μg/L, benzene at 1,500 μg/L, toluene at 56 μg/L, ethyl benzene at 1,200 μg/L, and total xylenes at 820 μg/L.[6] These contaminant levels are well above the RWQCB Environmental Screening Levels for commercial/industrial sites. Active remediation and monitoring continues at the site.

4. Former 7 to 7 Cleaners – 1430 and 1432 S. Novato Boulevard

This site is listed on a number of databases for disposal and contamination associated with the use of tetrachloroethylene (PCE) in dry cleaning activities. Investigation on the site began in 1991, and contamination was discovered in both soil and groundwater. Contaminated soil was removed in 1991, and a dual-phase soil vapor and groundwater extraction system was installed in 2002. Contaminant concentrations detected during the latest available monitoring event conducted in December 2007 showed the highest concentrations nearest to the former source area at: 390 μg/L of PCE, 280 μg/L of trichloroethylene, 9,000 μg/L of cis-1,2-dichloroethene, 1,600 μg/L of trans-1,2-dichloroethene, and 1,700 μg/L of vinyl chloride.[7] These contaminant levels are well above the RWQCB Environmental Screening Levels for commercial/industrial sites. Soil vapor and groundwater extraction and groundwater monitoring are ongoing at the site.

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[6] ERI, 2008. *Groundwater Monitoring Report. Former Mobile Service Station 04HTR, 1400 South Novato Boulevard, Novato, California.*

[7] Mactec, 2008. *Groundwater Monitoring Report. Former 7 to 7 Cleaners, 1430 South Novato Boulevard, Novato, California.*

5. Shell – 1390 S. Novato Boulevard

This site is listed on several databases for contamination associated with a LUST. Gasoline was discovered in a utility vault located downgradient of the site in 1985. This prompted the installation of groundwater monitoring wells on the site in 1986. Maximum contaminant concentrations detected in the most recent available groundwater monitoring event were: 35,000 μg/L of total petroleum hydrocarbons as gasoline (TPHg), 2,400 μg/L of benzene, 380 μg/L of toluene, 690 μg/L of ethyl benzene, 2,870 μg/L of total xylenes, and 920 μg/L of MTBE.[8] These contaminant levels are well above the RWQCB Environmental Screening Levels for commercial/industrial sites. Soil vapor and groundwater extraction and groundwater monitoring are ongoing at the site.

6. North Bay Cleaners – 1557-1559 S. Novato Boulevard

This site is listed on databases for contamination and disposal associated with PCE use for dry-cleaning. Relatively minor concentrations were detected in soil, soil vapor, and groundwater beneath the dry cleaning facility.[9] Additional investigation work is planned, as detailed in a workplan submitted to the State Water Board in October 2007; however, the results of this investigation have yet to be submitted.

7. 790 De Long Avenue Property

This site is listed on the LUST database for contamination associated with a LUST discovered on the property in 2007. The tanks, along with associated contaminated soil and groundwater, were removed in 2007. Subsequent additional borings in the area revealed impacted groundwater. Additional soil excavation (for geotechnical purposes) and soil vapor sampling were conducted in 2008, along with the installation of groundwater monitoring wells. Results from the well sampling revealed all contaminants at levels below their

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[8] Conestoga-Rovers & Associates, October 25, 2007. *Groundwater Monitoring Report. Shell-branded Service Station, 1390 South Novato Boulevard, Novato, California.*

[9] Environ, June 2007. *Groundwater Monitoring Report. North Bay Cleaners, 1559 South Novato Boulevard, Novato, California.*

respective Environmental Screening Levels; thus, the State Water Board issued a letter stating that no further remedial action was required and that the site is suitable for residential use.[10] The State Water Board considers the site closed, but the site has not yet been removed from regulatory databases of "open" cases.

8. Norge Laundry/Holiday Cleaners – 936-938 Diablo Avenue

This site is listed on the State Water Board's database of Spills, Leaks, Investigations and Clean Up (SLIC) for contamination associated with PCE use for dry cleaning. Remedial activities included soil excavation, soil vapor extraction and in situ treatment using potassium permanganate. The levels of contaminants in soil and groundwater were reduced to near-zero levels, and it was determined that further treatment was no longer effective. A deed restriction was developed for the property and is still in place.[11]

9. Shell – 7300 Redwood Boulevard

This site is listed on several databases for contamination associated with LUSTs. The site is an active gasoline station, and USTs are currently located on-site. Previous investigations and remedial actions have been conducted on the site, including groundwater monitoring. However, a March 2008 investigation revealed additional contamination off-site. The highest concentrations were found along Redwood Boulevard.[12] This site remains an open contamination case.

10. George Roth 1991 Trust – 879 Sweetser Avenue

Regulatory databases do not include a description of what type of commercial use was historically located on this site and caused the contamination. This site is listed on the SLIC database; however, there has been little to no inves-

[10] State Water Resources Control Board online GeoTracker Database (GeoTracker), 2008. Searched December 2008.

[11] State Water Resources Control Board online GeoTracker Database (GeoTracker), 2008. Searched December 2008.

[12] Conestoga-Rovers & Associates, 2008. *Groundwater Monitoring Report. Shell-branded Service Station, 7300 Redwood Boulevard, Novato, California.*

tigation or remedial work on this property for several years, and the status of the site is unclear. The State Water Board has not yet determined whether any further action is needed. The State Water Board expects to review this property in 2010 to determine what action is needed, if any.[13]

11. Thorsson's Auto Center/Arnold's Dismantlers – 862 and 864 Vallejo Street

This site is listed on numerous databases; however, there has been little to no investigation or remedial work on this property for several years, and the status of the site is unclear.[14] The State Water Board expects to review this property in 2010 to determine if further action is needed.

12. Novato Community Hospital – 1625 Hill Road

This site is listed on several databases for contamination associated with a leaking diesel UST. However, the site has recently received closure from the State Water Board, and there is little to no remaining residual contamination.[15] Although the State Water Board considers the site closed, the site has not yet been removed from regulatory databases of "open" cases, so it is included on this list of hazardous materials sites in Novato.

13. Novato Unified School District – 819 Olive Street

This site is listed on a number of databases for contamination associated with a leaking diesel UST. However, there has been little to no investigation or

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[13] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

[14] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

[15] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

remedial work on this property for several years, and the status of the site is unclear.[16]

14. H&J Tire/Leonardi Auto Electric Inc. – 7426 Redwood Boulevard

This site is listed on databases for contamination associated with a LUST containing waste oil. According to the GeoTracker database, only soil was affected. Therefore, the potential for off-site migration is low. Little to no remediation or monitoring has been conducted at this site for the past several years.[17]

15. Unocal – 7455 Redwood Boulevard

This site is listed on various UST databases for contamination associated with LUSTs removed in the 1990s. Contaminated soil and groundwater were discovered. Remedial activities included excavating contaminated soil, removing contaminated groundwater and installing groundwater monitoring wells. Further investigation was conducted in 2008, but has yet to be reported. The latest available groundwater monitoring event data are from March 2008. The highest concentrations detected were: 51,000 μg/L of TPHg, 21,000 μg/L of total petroleum hydrocarbons as diesel (TPHd), 160 μg/L of MTBE, and 15,300 μg/L of BTEX.[18] These contaminant levels are well above the RWQCB Environmental Screening Levels for commercial/industrial sites. Soil vapor and groundwater extraction and groundwater monitoring are ongoing at the site. While the majority of the contamination is located on-site, lesser concentrations extend into Redwood Boulevard.

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[16] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

[17] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

[18] Arcadis, June 2008. *Quarterly Groundwater Monitoring Report. Former Unocal #3642, 7455 Redwood Boulevard.*

16. Big 4 Rents Inc./Hertz Equipment Rental – 875 Olive Avenue

This site is listed on numerous databases for contamination associated with a leaking diesel UST. However, little to no investigation or remedial work has been conducted on this property for the past several years, and the status of the site is unclear.[19]

17. A&A Gas Station – 7474 Redwood Boulevard

This site is listed on several databases for contamination associated with LUSTs. Several phases of investigation and remediation have occurred at the site since 1993, including ozone biosparging and quarterly groundwater monitoring. The main contaminants of concern are tertiary-butyl alcohol (TBA) and MTBE. Maximum concentrations from the latest groundwater monitoring event show 710 μg/L of TBA and 1,200 μg/L of MTBE, which are above the RWQCB Environmental Screening Levels. Soil vapor and groundwater extraction and groundwater monitoring are ongoing at the site.[20] While the majority of the contamination is located on-site, some contaminants do extend into Olive Street.

18. Novato Bus Facility – 801 Golden Gate Place

This site is listed on several databases for contamination associated with a leaking diesel UST. The initial release was discovered in 1977. Subsequent investigations and remediation (including the replacement of the original USTs and hydrogen peroxide injections) have occurred from 1990 to the present. Results from the latest monitoring event conducted in June 2008 show the highest concentration located on the northeast corner of the property. However, several wells on the interior of the property contain free-floating hydrocarbon product, which floats as a layer on top of the water, making it

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[19] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

[20] EDD Clark and Associates, 2008. *Groundwater Monitoring Report. Novato Ford, 6995 Redwood Boulevard.*

difficult to sample.[21] While the majority of the contamination appears to be on the subject property, it does appear as if some of the contamination is migrating along Highway 101.

19. Indian Valley College – 1800 Ignacio Boulevard

This site is listed on databases for contamination associated with three historical gasoline USTs and one historical waste oil tank removed in 1989. Soil sampling conducted in 1991 show no TPHg, MTBE, or BTEX above laboratory detection limits in the gasoline UST excavations. However residual hydrocarbons such as gasoline, diesel and waste oil were present in both soil and groundwater in the former waste oil tank excavation.[22] Very little information is available since 1991, and it appears as if the State Water Board has issued several enforcement letters regarding the requirement for additional investigation.

20. Black John Slough Rancho Del Pantano/Binford Land Illegal Disposal Site – 8190 Binford Road

This site is listed on the SLIC database. However, little to no investigation or remedial work have been conducted on this property for the past several years, and the status of the site is unclear.[23] This site is just outside the city limits.

21. Shell Station – 401 Enfrente Road

This site is listed on a number of databases for contamination associated with a LUST discovered in 2003. Results from the latest available monitoring event conducted in June 2008 showed the highest concentrations of the site

[21] PES Environmental, Inc., 2008. *Second Quarter Groundwater Monitoring Report. Golden Gate Bridge Highway and Transportation District, Novato Bus Facility, 801 Golden Gate Place, Novato, California.* September.

[22] Environmental Resource Group, 1991. *Groundwater Monitoring Report, Indian Valley College, 1800 Ignacio Boulevard, Ignacio California.*

[23] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

chemicals of concern—benzene and MTBE—located in the northeastern corner of the property adjacent to Enfrente Road.[24]

22. Unocal Station #7381/Mobile Service Station/Novato 76/Greg's Service Center/Circle K Stores/Conoco Phillips – 375 Ignacio Boulevard

This site is listed on numerous databases for contamination associated with a LUST. Previous investigations were conducted between 1987 and 1997, during which contaminated soil was removed and eight groundwater monitoring wells were installed. Additional contamination was discovered during a Phase I Environmental Site Assessment in 2007.[25] The maximum concentrations observed were located next to the active USTs. The State Water Board recently approved a workplan for the installation of additional wells and monitoring in April 2008, and a report on the completed work was due in December 2008. This report is not yet available for public review.

23. 14 Commercial Boulevard

This light industrial/office building in the Bel Marin Keys Industrial Park area is listed on the SLIC database; however, little to no investigation or remedial work has been conducted on this property for the past several years, and the status of the site is unclear.[26]

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[24] Conestoga-Rovers & Associates, 2008. *Groundwater Monitoring Report. Shell-branded Service Station, 401 Enfrente Road, Novato, California.*

[25] Delta, 2008. *Groundwater Monitoring Report. 76 Station No. 5727, 375 Ignacio Boulevard, Novato, California.*

[26] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

24. Shell Oil Co./West Novato Shell/Equilon Enterprises – 2085 Novato Boulevard

This site is listed on several databases for contamination associated with a LUST. Results from the latest available monitoring event, conducted in July 2008, show the highest concentrations occurring just southwest of the site.[27]

25. Chevron – 5810 Nave Road

This site is listed on the UST and LUST databases for contamination associated with a LUST. The maximum concentrations of TPHg and benzene detected during the latest available monitoring event in July 2008 were located just north of the site, bordering the railroad tracks.[28]

26. Atherton Avenue and Binford Road

This undeveloped site is listed on the SLIC database; however, there is no indication of why the site is listed in the database. Little to no investigation or remedial work has been conducted on this property for the past several years, and the status of the site is unclear.[29] The State Water Board will review the site in 2010 to determine what, if any, action is needed.

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[27] Conestoga-Rovers & Associates, 2008. *Third Quarter 2008 Groundwater Monitoring Report. Shell-Branded Service Station, 2085 Novato Boulevard, Novato, California.*

[28] Gettler-Ryan Inc., 2008. *Groundwater Monitoring Report. Former Chevron Service Station #9-6151, 5810 Novato Drive, Novato, California.*

[29] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

C. Groundwater Contamination Plumes

There are no documented regional contaminant groundwater plumes within the City of Novato or its SOI.[30] An area of sustained groundwater contamination is referred to as a plume. While there is groundwater contamination beneath several of the sites listed above, the contamination is confined to the sites themselves or immediately adjacent properties. These sites are not considered to have impacted the groundwater to the extent of creating a regional groundwater plume.

D. Hazardous Materials Transport

Nearly all of the hazardous materials transported to and from Novato are carried by truck on the State highway system. City streets are used to transport locally-generated wastes from the source to the regional highway system. The City has not quantified the amount of hazardous materials that are transported through it enroute to other destinations.

E. Hazardous Waste Disposal

Hazardous wastes are generated as a part of many normal business operations. For example, dry cleaners accumulate used chemical solvents which must be removed and transported by a licensed hauler to a storage and disposal facility permitted to accept hazardous materials. Most of these operations are small quantity generators (SQGs). A SQG generates more than 100 kilograms (kg) and less than 1,000 kg of hazardous waste per month. A large quantity generator (LQG) generates 1,000 kg or more of hazardous waste per month.

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[30] Jang, John. Lead Regulator, City of Novato, Regional Water Quality Control Board. Personal communication with Teal Glass, Stellar Environmental Solutions, Inc. December 10, 2008.

The Environmental Data Resources, Inc. database report for the Novato project area lists 72 SQGs and three LQGs. The three LQGs are:

- Costco Wholesale #141 – 300 Vintage Way
- Former 7 to 7 Cleaners – 1430 South Novato Boulevard
- Exxon Company USA #79259 – 490 Ignacio Boulevard

The CIWMB has differentiated waste into several categories including household hazardous waste and special wastes. The latter includes ash, sewage solids, industrial sludge, treated medical wastes, bulky items, tires and composite waste.

F. Hazardous Materials Emergency Response

In Novato, the agency that has the overall responsibility and authority to regulate hazardous materials storage and response is the County of Marin. Marin County is responsible for:

- Regulating hazardous materials over specified quantities.
- Receiving Business Plans, providing inventories and 24-hour response contact, 30-day updates and preparing hazardous waste estimates.
- Sending fire departments Business Plan information and notice of unauthorized releases (inspection requirements overlap with Fire Code requirements).
- Developing and implementing Area Plans for emergency response of hazardous materials spills.
- Implementing risk management and prevention programs, preparing inventories of hazardous waste storage and transportation, and implementing procedures for handling of hazardous substances.
- Receiving Risk Management and Prevention Programs, including specific procedures for handling materials and accidental releases.

Marin County Hazardous Waste Management forwards the Novato Fire Protection District (NFPD) updated Hazardous Material Management Plans (HMMP) and Hazardous Material Inventory Statements (HMIS) for businesses in areas served by the NFPD. Copies of these documents are available to the public at the NFPD headquarters.

1. Hazardous Materials Training

The NFPD is a member of the Marin County Hazardous Materials Response team. Currently, all personnel are trained to the Hazardous Material First Responder Operations level. The NFPD has also designated its truck company as a decontamination unit. The NFPD currently has the capability to respond to the incident, assist law enforcement with the role of incident commander and isolate and deny entry to the site.

2. Radioactive Materials

Radioactive materials are distinguished from other hazardous materials. Specific federal and State regulations address handling and transport of these substances. The use and storage of radioactive materials in Novato is limited to medical facilities and the Buck Center for Research in Aging, since no other primary users of radioactive materials, such as research laboratories, nuclear power plants or active military facilities, are located within the vicinity of the city. The principal potential danger to Novato residents from these materials is related to the possibility of a truck accident resulting in rupture of containers holding radioactive materials.

14 PUBLIC SERVICES AND FACILITIES

Novato residents and businesses are served by a variety of public services and facilities. These services include schools, libraries, police, emergency services, fire protection and solid waste. This chapter discusses existing conditions in Novato relating to all of these services.

A. Schools

1. Regulatory Framework

a. Draft Novato Unified School District Facilities Master Plan

The Draft Facilities Master Plan, prepared in 2008, provides a framework for facilities planning and implementation for a 10-year period. The Master Plan provides student enrollment projections and establishes school site, building and capacity standards. The Master Plan also identifies facility needs for each school, capital projects to address these needs, financing options and a schedule to implement funded projects.

b. Novato General Plan

Although schools in Novato are owned and operated by the Novato Unified School District (NUSD), not by the City, the existing General Plan addresses schools in both the Land Use and Public Facilities and Services chapters of the existing General Plan. LU Objective 2 in the Land Use chapter calls for the City to "allow development consistent with infrastructure and adequate public services." Policies and programs to implement this objective call for the City to require new development to pay its fair share of public service costs and to support NUSD in its efforts to collect fees necessary to provide levels of service consistent with NUSD standards.

PF Objective 3 in the Public Facilities and Services chapter calls for the City to "ensure that public service providers can continue to provide adequate public services given the additional demand from new development." Programs implementing this objective call for the City to consider additional project mitigation fees when there are insufficient revenues to construct a new school necessitated by new development and to plan for future school sites that may be needed to serve new growth.

2. Novato Unified School District

The City of Novato is served by the Novato Unified School District (NUSD) which operates eight elementary schools, three middle schools, three high schools, one continuation high school and two high school academies.

a. Schools and Facilities

The names and addresses of the 17 public schools in Novato are shown in Table 14-1. The location of each school and the NUSD service area boundary are shown in Figure 14-1.

b. Student Enrollment and School Capacity

All of the NUSD schools currently have sufficient space for all enrolled students. According to the 2008 Draft Facilities Master Plan, all schools are operating below capacity (see Table 14-1).

The Draft Facilities Master Plan projects future student enrollment for a ten-year period. These projections are based in part upon buildout assumptions in the existing Novato General Plan and recent building permit approval trends. The Plan projects that school enrollment will increase by approximately two percent through 2012 and then will decline by approximately three percent for the following five years. Projected district enrollment for the 2017-2018 school year is 7,835 students. Existing facilities are sufficient to accommodate this projected future enrollment.

c. Facilities and staff

As of the 2006-2007 school year, the NUSD employed 391 full-time equivalent teachers (Table 14-2). The average ratio of students to teachers for the NUSD was 20.7, which was higher than the Marin County average ratio (18.3) and slightly lower than the State average ratio (21.4).

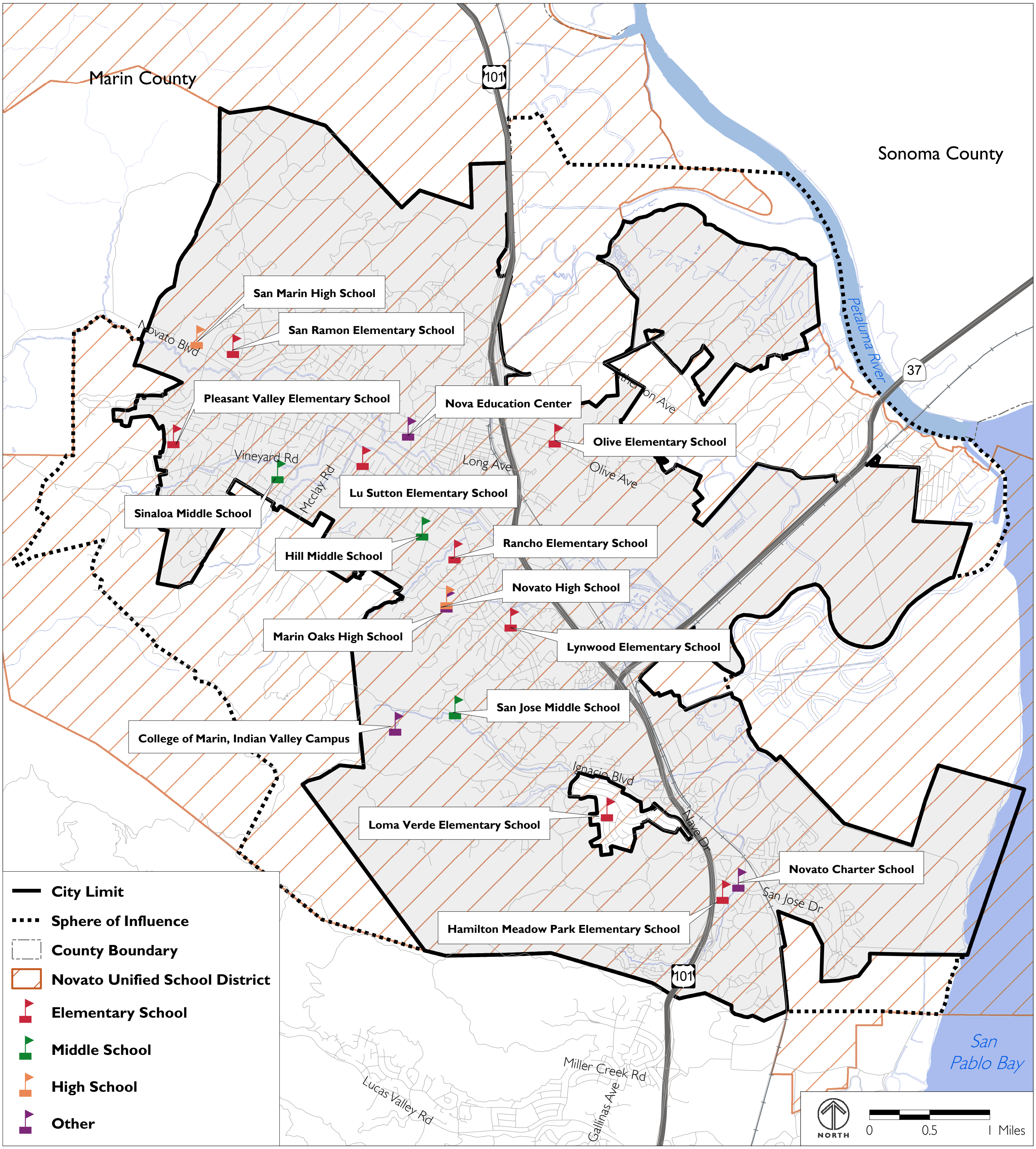
d. Services and Programs

The NUSD offers a range of educational programs for students of all needs and levels. For example, the English Learner Program aims to develop language and academic skills of the non-native speaker. The NUSD also

TABLE 14-1 **NOVATO UNIFIED SCHOOL DISTRICT SCHOOLS, ENROLLMENT AND CAPACITY**

School	Address	2007-2008 Enrollment	Capacity
Hamilton Meadow Park Elementary (K-5)	1 Main Gate Rd	508	668
Loma Verde Elementary (K-5)	399 Alameda De La Loma	395	537
Lu Sutton Elementary (K-5)	1800 Center Rd	422	538
Lynwood Elementary (K-5)	1320 Lynwood Dr	388	506
Olive Elementary (K-5)	629 Plum St	409	525
Pleasant Valley Elementary (K-5)	755 Sutro Ave	380	472
Rancho Elementary (K-5)	1430 Johnson St	500	513
San Ramon Elementary (K-5)	45 San Ramon Way	458	526
Hill Middle (6-8)	720 Diablo Ave	566	868
San Jose Middle (6-8)	1000 Sunset Pkwy	523	868
Sinaloa Middle (6-8)	611 Arthur St	629	899
Marin Oaks High (9-12)	611 Arthur St	65	Included in Novato High data
Novato High (912)	2045 Vineyard Rd	1,229	1,612
San Marin High (9-12)	15 San Marin Dr	1,050	1,550
Nexus Academy (7-10)	1015 Seventh St	26	Included in Novato High data
Nova Education Center	740 Diablo Ave	76	Data unavailable
Novato Charter School (K-8)	940 C St	235	Data unavailable

Sources: http://dq.cde.ca.gov/dataquest/, accessed on September 4, 2008.
Total School Solutions, March 2008, *Draft Novato Unified School District Facilities Master Plan*, pages 43, 44, and 48.



Source: Marin County, GIS

FIGURE 14-1

NOVATO UNIFIED SCHOOL DISTRICT BOUNDARY AND SCHOOLS

TABLE 14-2 **STUDENT-TEACHER RATIO (2006-2007)**

	Number of Schools	Full-Time Equivalent Teachers	Novato Pupil-Teacher Ratio	Marin County Pupil Teacher Ratio	State Pupil Teacher Ratio
Elementary	9[a]	182.9	19.8	17.9	20.0
Middle	3	76.5	22.6	18.6	23.3
High School	3	126.2	20.1	18.9	23.6
Alternative	1	2.6	30.4	19.9	25.8
Continuation	1	2.7	28.5	15.6	19.6
Total	18	391.2	20.7	18.3	21.4

[a] This total includes the eight K-5 elementary schools and the Novato Charter School (K-8).
Source: http://www.ed-data.k12.ca.us, accessed on September 4, 2008.

administers the Gifted and Talented Education (GATE) program for high-achieving students.

e. Planned Improvements

Novato residents passed a $107 million bond in 2001 to improve facilities in the District. The NUSD categorized facility needs into two phases. Phase 1 included the projects with the highest priority, most of which are complete or under construction. The Facilities Master Plan prepared in 2008 prioritizes the remaining improvement projects identified in Phase 2.

3. College of Marin

The College of Marin, established in 1926, is a public community college that serves Marin County residents. The college has two campuses, the Kentfield Campus and the Indian Valley Campus in Novato. The College of Marin acquired Indian Valley College in 1985 to form the Indian Valley Campus, which occupies a 333 acre site containing 22 buildings. Approximately 9,000 credit and non-credit students enrolled in the college per semester. In 2008 the Indian Valley Campus offered 149 classes.

B. Libraries

The Marin County Free Library (MCFL) District serves Novato, unincorporated areas of Marin County as well as the Cities of Corte Madera, Ross, Fairfax and Novato. There are a total of 11 facilities and one bookmobile in the District. The two library branches that serve Novato include the Novato Library, located at 1720 Novato Boulevard, and the South Novato Library, located at 6 Hamilton Landing (see Figure 14-2). Programs and services offered at both branches include loan of library materials, wireless network access, reference service, homework assistance, English- and Spanish-language storytime, computer classes, book clubs and conversation clubs.

The Novato Library, established in 1927, serves a population of approximately 40,000 residents and has a circulation of approximately 430,000 volumes. The South Novato branch, established in 1998, serves a population of approximately 22,500 residents and has a circulation of approximately 63,000 volumes. As of 2009, there were 15 employees at the Novato Library and 3 employees at the South Novato Branch. Funding for the library is mainly from County property taxes. Other funding sources include a $36 parcel tax and a small amount of State and regional funding.[1]

The 2007 *Marin County Free Library Vision Plan* identified several areas that need improvement in the MCFL system. System-wide improvements include adding shelf space to accommodate new resources, increasing seating and space and acquiring additional computers. The Novato Library is the busiest

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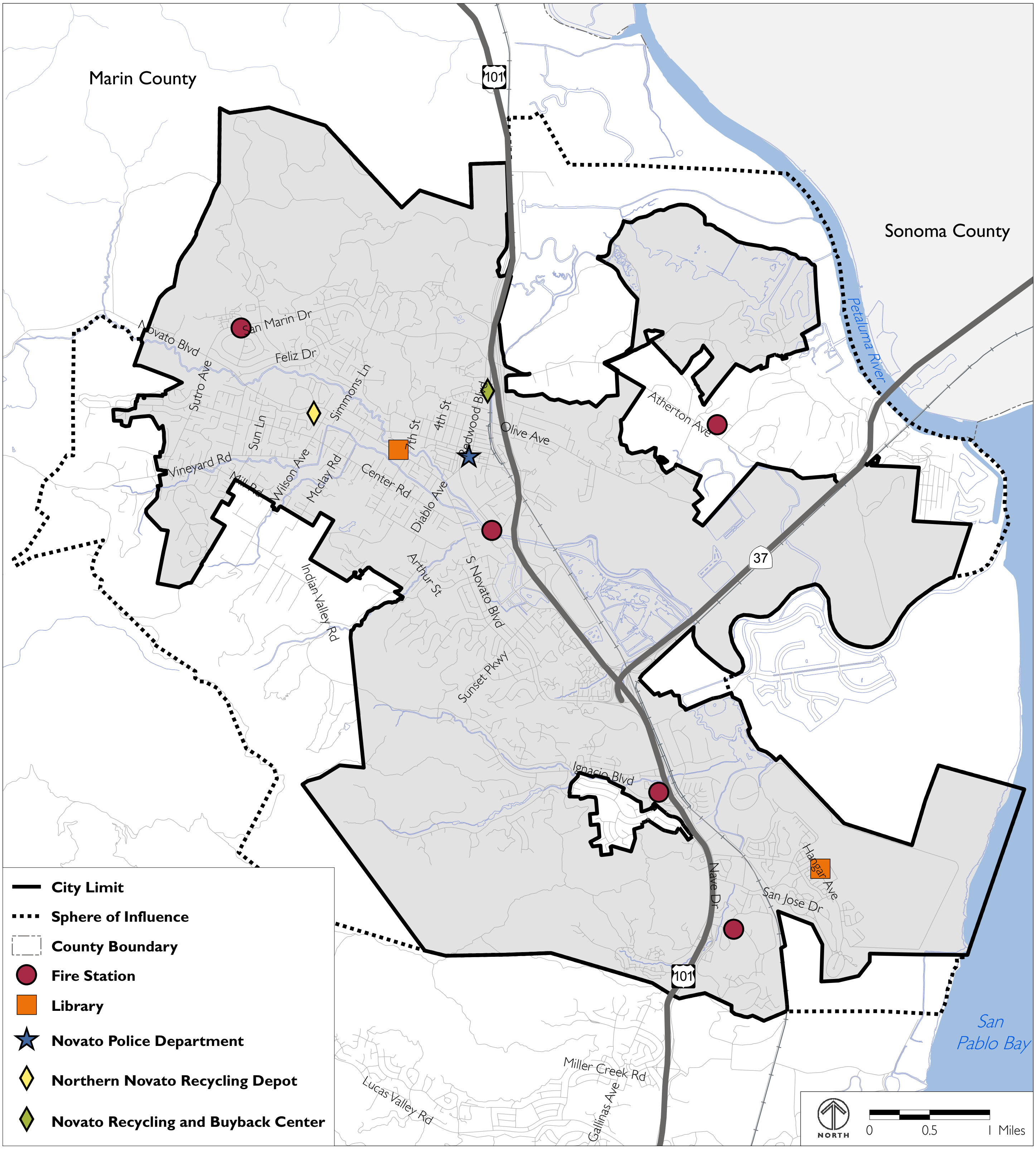
[1] Mettier, Donna. Novato Library Branch Manager, Marin County Free Library. Personal e-mail communication with Carey Stone, DC&E, January 26, 2009.



Source: Marin County GIS

FIGURE 14-2

FIRE, POLICE, LIBRARY SERVICES AND RECYCLING FACILITIES branch in the MCFL system and as such needs additional space to accommodate its users. The building, designed in the 1960s, lacks the electrical wiring needed for current use. Although the South Novato Branch is less used and housed in a recently renovated facility, it is in need of additional space to accommodate its service population. Additional funding is also needed at the South Novato Branch to increase hours of operation.[2]

C. Police

1. Regulatory Framework

a. Novato Police Department Mission, Vision and Values Statement

The City of Novato Police Department is guided by an official statement of Department mission, vision and values. The mission of the Department is to "provide a safe and secure environment through professional and proactive law enforcement in partnership with the community." For its vision, the Department "embraces the challenge of change and builds community trust while continually enhancing the safety, environment, quality of life and economic vitality of Novato's diverse communities and neighborhoods." The values of the Department focus on fairness, integrity, performance, responsibility, teamwork and trust.

b. Novato General Plan

Police service is addressed in the Safety and Noise chapter of the existing Novato General Plan. SF Objective 6 calls for the City to "maintain effective police services." Policies and programs to implement this objective call for the City to require mitigation measures for new development to ensure adequate standards of police service, to maintain civilian support for sworn staff and to continue to provide community-oriented services.

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[2] Page and Morris, 2007, *Marin County Free Library Services and Facilities Vision Plan*, pages 46 and 58.

2. Novato Police Department

The Novato Police Department (NPD) provides service to a 28-square-mile area serving a population of approximately 53,500 people. Responsibilities of the NPD include street patrol, investigations, traffic patrol, emergency services and crime prevention.[3]

a. Staff

The NPD is made up of the Operations Division and the Services and Administrative Division. The NPD has 59 sworn police officers and 21.5 non-sworn personnel. Additionally, the NPD has three part-time interns and 17 volunteers of which four are Chaplains.[4]

b. Facilities

A single central police station located at 909 Machin Avenue also operates two satellite offices, one at the Vintage Oaks Shopping Center and the other at Fire Station 5 at 5 Bolling Drive. The satellite offices are mainly used to write reports and to conduct follow-up investigations. Individual arrests are processed at the Vintage Oaks Shopping Center.

c. Reported Crimes and Arrests

From 2003-2007, total reported crimes and arrests were up by 17 percent and 37 percent respectively (Table 14-3). Reported crimes that increased by 50 percent or more from 2003-2007 included forcible rape and child abuse. In general, arrests in most categories have increased during this same period. Arrests that increased by 50 percent or more included simple assault, sex offenses, robbery, child abuse, vandalism, kidnap and arson.

[3] City of Novato Police Department website, http://www.ci.novato.ca.us/Index.aspx?page=345, accessed on August 14, 2008.

[4] City of Novato Police Department website, http://www.ci.novato.ca.us/Index.aspx?page=345, accessed on August 14, 2008.

TABLE 14-3 **CRIMES REPORTED AND ARRESTS**

Felony & Misdemeanor	2003	2004	2005	2006	2007	% Change from '03-'07
Crimes Reported						
Aggravated Assault	40	29	36	57	33	-21%
Child Abuse	88	76	69	158	211	58%
Domestic Violence	132	174	182	168	157	16%
Forcible Rape	8	9	13	14	16	50%
Hate Crimes	8	0	1	3	4	-100%
Homicide Attempt	3	3	2	0	2	-50%
Homicide	0	1	0	0	0	0%
Kidnap	2	1	2	2	2	0%
Robbery	20	13	23	38	39	49%
Sex Offenses	51	41	34	25	31	-65%
Weapons	21	27	46	56	27	22%
Arson	17	18	12	18	24	29%
Auto Burglary	200	373	260	224	238	16%
Commercial Burglary	131	123	177	171	105	-25%
DUI	158	111	143	135	216	27%
Grand Theft	163	129	150	106	162	-1%
Identity Theft	59	71	78	97	80	26%
Narcotics	123	134	195	162	194	37%

TABLE 14-3 **CRIMES REPORTED AND ARRESTS** (CONTINUED)

Felony & Misdemeanor	2003	2004	2005	2006	2007	% Change from '03-'07
Other	1.076	1.332	1.243	1.203	1.198	10%
Residential Burglary	104	114	148	130	111	6%
School Burglary	7	21	8	17	4	-75%
Simple Assault	165	162	138	243	198	17%
Stolen Vehicle Attempt	2	7	5	0	2	0%
Stolen Vehicle	206	190	145	177	149	-38%
Vandalism	536	531	513	575	682	21%
Warrant	169	224	224	277	297	43%
Total	**3,489**	**3,914**	**3,847**	**4,056**	**4,182**	
Arrests						
Aggravated Assault	26	14	17	22	24	-8%
Child Abuse	5	4	4	9	15	67%
Domestic Violence	97	123	156	155	103	6%
Forcible Rape	6	3	4	9	5	-20%
Hate Crimes	6	0	0	0	0	0%
Homicide Attempt	2	7	2	0	2	0%
Homicide	0	0	0	0	0	0
Kidnap	1	1	2	3	5	80%
Robbery	8	4	9	16	24	67%
Sex Offenses	7	6	11	8	17	59%

TABLE 14-3 **CRIMES REPORTED AND ARRESTS** (CONTINUED)

Felony & Misdemeanor	2003	2004	2005	2006	2007	% Change from '03-'07
Weapons	16	22	38	6	23	30%
Arson	0	3	4	8	11	100%
Auto Burglary	18	7	2	3	6	-200%
Commercial Burglary	29	36	48	50	38	24%
DUI	157	110	143	142	218	28%
Grand Theft	7	1	9	5	5	-40%
Identity Theft	2	0	0	2	1	-100%
Narcotics	119	126	192	171	205	42%
Other	586	790	840	753	940	38%
Residential Burglary	6	6	6	4	11	45%
School Burglary	4	3	2	5	4	0%
Simple Assault	64	67	76	102	129	50%
Stolen Vehicle Attempt	0	0	2	0	0	0%
Stolen Vehicle	17	14	15	18	29	41%
Vandalism	16	16	55	54	49	67%
Warrant	176	237	280	273	305	42%
Total	**1,375**	**1,600**	**1,917**	**1,818**	**2,169**	

d. Service Standards

Although the NPD does not have a standard for staffing levels, the current ratio of officers per 1,000 residents is 1.1. This is below the Federal Bureau of Investigations recommended standard of 2 officers per 1,000 residents and below staffing levels of all law enforcement agencies in Marin County and the City of Petaluma. The NPD's 2007-2008 critical unmet staffing needs include two police officers, a half-time evidence technician, a neighborhood policing team and a records specialist.

e. Funding

Funding for the department comes mainly from the City's General Fund. Other sources of revenue come from user fees, fees for service and fines. Due to City budget constraints, the Novato Police Department is currently unable to expand service and has five fewer staffing positions than the number authorized in the 2004-2005 fiscal year.

f. Mutual Aid Agreements

The NPD operates under a Mutual Aid Agreement with the Marin County Sheriff's Office (MCSO) and will provide service to unincorporated areas when requested by MCSO. Unincorporated areas in or near Novato include Loma Verde, part of Bel Marin Keys, Indian Valley, Wild Horse Valley and Atherton Avenue. Additional law enforcement in Novato is provided by the California Highway Patrol (CHP), primarily along Highway 101, on unincorporated roadways and at Park and Ride areas.

3. Marin County Sheriff

The Marin County Sheriff's Office provides law enforcement in unincorporated areas of Marin County, with the exception of traffic enforcement, traffic complaints, vehicular accidents and auto theft investigations. Traffic and automobile-related incidents are primarily the responsibility of the California Highway Patrol.

D. Emergency Services

1. Regulatory Framework

a. Marin County Sheriff's Office of Emergency Services Strategic Plan

The Strategic Plan prepared by the Marin County Sheriff's Office of Emergency Services (OES) guides the management of major emergency response programs. The Plan establishes the following five goals:

1. Monitor and evaluate emerging threats.
2. Support and influence community disaster readiness efforts.
3. Evaluate, influence, and implement developments in the practice of emergency management.
4. Maintain a professional staff in a productive and supportive work environment.
5. Build an optimally functional Operational Area team.

The Strategic Plan includes policies to implement each goal. Policies to implement Goal 5 call for the OES to support and integrate local efforts into the Operational Area Program, conduct multi-jurisdictional Emergency Operations Center staff training and identify training resources for all jurisdictions and organizations.

b. Novato General Plan

SF Objective 4 of the Safety and Noise chapter of the General Plan calls for the City to assure emergency preparedness. Policies under this objective include interagency cooperation, updating the City's Emergency Preparedness plan as needed and identifying emergency facilities.

c. Novato 1991 Emergency Preparedness Plan

The purpose of the 1991 Emergency Preparedness Plan is to prepare the City of Novato to respond to emergencies; save lives; maintain and restore public services; distribute supplies, food and water; and establish shelter sites and coordinate with other jurisdictions.

2. Marin County Sheriff's Office of Emergency Services (OES)

Emergency services in Novato are provided by the Marin County Sheriff's OES. OES coordinates emergency operations activities among local jurisdictions in Marin County in the case of a natural or manmade disaster. OES also serves as the liaison between the State and local governments on issues relating to emergency services. OES offices are located in Marin County Civic Center in San Rafael.

3. City of Novato Emergency Operations Center

The Emergency Operations Center (EOC) is located at the Novato Fire District Administrative Office at 95 Rowland Way. The EOC will provide centralized emergency management during major disasters and emergencies.

4. Maintenance Division Emergency Response System

The Street Division within the Department of Public Works implements the Emergency Response System for the Maintenance Division. Emergency response duties include:

- Flood and storm operations
- Hazardous materials spills
- Activating maintenance operations center
- Maintenance disaster preparation
- Debris removal and cleanup
- Supporting Police Department and Fire District

The Street Division also responds to mutual aid requests from the Fire and Police Department as needed.

E. Fire

1. Regulatory Framework

a. State Regulations and Plans

i. California Government Code

Section 65302 of the California Government Code requires General Plans to include a Safety Element, which must include an assessment of wildland and urban fire hazards.

ii. California Code of Regulations

Title 24, also referred to as the California Building Standards Code, is published in its entirety every three years by order of the California Legislature. These building regulations or standards have the force of law. Title 19 pertains to fire prevention and engineering measures for new construction.

iii. Assembly Bill 337 (Bates Bill)

In response to the Oakland Hills fire of 1991, this bill was passed in 1992. It requires brush clearance and fire resistant roof material (Class A, B or C) to be used on all new construction that is located in any fire hazard zone.

iv. Public Resources Code

Section 4290 of the Public Resources Code (PRC) covers Fire Safe Regulations. This section establishes minimum standards for roads, signage, private water supply resources, and wild land fuel modification. Section 4290 works in conjunction with current and new building construction development standards in State Responsibility Areas (SRA), defined by the State Board of Forestry and Fire Protection as an area in which the State has primary financial responsibility for preventing and suppressing fires. Section 4291 of the PRC requires annual defensible space of 100 feet to be provided around all structures in or adjoining any mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or any land that is covered with flammable material.

v. Uniform Fire Code

This code may be adopted by local jurisdictions with amendments, and provides minimum standards for many aspects of fire prevention and suppression activities, such as access, water supply, fire protection systems, and the use of fire resistant building materials.

vi. California Fire Code

The California Fire Code incorporates, by adoption, the International Fire Code of the International Code Council with California amendments. This is the official Fire Code for the State and all political subdivisions. It is located in Part 9 of Title 24 of the California Code of Regulations. The California Fire Code is revised and published every three years by the California Building Standards Commission.

Novato Fire Protection District (NFPD) adopts the most current edition of the applicable California Fire Code and building standards relative to fire and life safety. This includes, but is not limited to, the International Urban Wildland Interface Code and the Uniform Fire Code and also references the National Fire Protection Association standards. The NFPD amends these codes locally to provide more restrictive requirements to meet the specific topographic geologic or climatic conditions of the NFPD. The code is adopted once every three years or as the California Fire and Building Code editions are adopted.

vii. California Health and Safety Code and the Uniform Building Code

This code provides regulations pertaining to the abatement of fire-related hazards. It also requires that local jurisdictions enforce the Uniform Building Code, which provides standards for fire resistant building and roofing materials and other fire-related construction methods.

viii. California Fire Plan

The California Fire Plan is the State's "road map" for reducing the risk of wildfire. The overall goal of the Plan is to reduce total costs and losses from wildland fire in California through focused pre-fire management prescriptions and increased initial attack success. The plan was adopted in March 1996 and is currently undergoing review and revision by the California Department of Forestry and Fire Protection (CAL FIRE).

b. County and Local Plans and Regulations

i. Marin County Fire Management Plan

The Marin County Fire Management Plan evaluates the County's geographic environment to reduce fire danger. The Marin County Fire Department has adopted the California Fire Plan, including the following five objectives:

1. Create wildfire protection zones that reduce the risks to citizens and firefighters.
2. Assess all wildlands, not just the State responsibility areas. Analyses will include all wildland fire service providers: federal, State, local government, and private.
3. Identify and analyze key policy issues and develop recommendations for changes in public policy.
4. Monitor the wildland fire protection system in fiscal terms.
5. Translate the analyses into public policies.

ii. Novato Fire Protection District Integrated Risk Management Plan: Standards of Cover

The NFPD's Standards of Cover document assists NFPD in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations, in addition to homeland security issues. The plan discusses areas such as risk assessment, critical task analysis, agency service level objectives, and distribution and concentration measures. It documents reliability studies and historical performance through charts, maps and graphs, and concludes with policy recommendations.

iii. Novato Fire Protection District Community Driven Strategic Plan

The NFPD Community Driven Strategic Plan sets forth a comprehensive vision and mission statement that provides the agency with a clear path into the future. Additionally, this plan identifies the core values that embody how the agency's members, individually and collectively, will carry out the agency's mission. Strategic goals, objectives, and strategies are included that will allow the NFPD to realize its vision. These goals and objectives are prioritized through the annual budget planning process, which then establishes the required funding.

iv. Novato Fire Protection District Department Mission, Vision and Guiding Principles

The mission statement of the NFPD is: "The Novato Fire Protection District exists to care for, protect, and serve our communities."

The vision statement of the NFPD is: "Our vision is to become an internationally accredited agency with focus on quality, cost effective all risk services which exceeds our community's expectations."

The NFPD observes the following Guiding Principles:

- "We are committed to the protection of life, property, and the environment."
- "We believe that our communities are the reason for our existence."
- "We will foster and sustain the trust of our communities and each other, while also protecting that confidence through our attitude, conduct, and actions."
- "We believe that all members of our diverse communities are entitled to our industry's best practices."
- "We will serve our communities with honesty, fairness, and integrity."
- "We will pursue safe, effective, timely, economical, and measurable solutions."
- "We will consistently provide professional, skilled, courteous, and compassionate, customer service."
- "We will be sensitive to the changing needs of our communities."

v. Novato Fire Protection District Ordinance 2007-1

This ordinance adopts the codes that regulate conditions hazardous to life and property from fire or explosion, provide for permits for hazardous uses or operations, and establish and staff a fire loss management division. It is ratified by the City of Novato and County of Marin.

vi. City of Novato General Plan

Fire safety is addressed in the Safety and Noise chapter of the existing General Plan. SF Objective 5 calls for the City to "reduce fire hazards." Policies and programs to implement this objective call on the City to require mitigation measures for new development to reduce hazards from fire, work with the NFPD to ensure a high level of fire protection, implement an effective vegetation management and weed abatement program, ensure sufficient water flow in fire hydrants, continue to participate in mutual aid agreements and manage public lands to minimize wildfire risks.

2. Novato Fire Protection District

The City of Novato, as well as surrounding unincorporated areas, is served by the NFPD. The NFPD is an independent special fire district formed by the Marin County Board of Supervisors on July 6, 1926. The NFPD is governed by a five-person Board of Directors elected by the citizens for four-year terms. The NFPD's legal authority and responsibilities are contained in the State of California Health and Safety Code under Fire Protection District Law of 1987.

The NFPD is located in the northernmost section of Marin County, California. The NFPD encompasses approximately 71 square miles and serves a population of 65,000. The NFPD protects approximately 43,000 acres of which approximately 44 square miles are wildland urban interface areas. It is bounded on the north by San Antonio Creek and Sonoma County, on the south by Pacheco Grade and the community of Marinwood, the Petaluma River and San Pablo Bay to the east. It extends west to a point approximately 3 miles past Stafford Lake along the ridgeline of Big Rock Ridge.

a. Services

The NFPD provides an integrated all risk response to the community. Services include emergency medical services, fires and rescue response for vehicle accidents, surface water bodies, confined space, technical rescue, and hazardous material incidents. Of the NFPD's 71 square miles, approximately 40 square miles are wildland-open space or wildland-urban interface area.

b. Staffing

The NFPD currently has daily 22 emergency response personnel on duty plus one Battalion Chief per shift. There are three shifts (A, B and C) and the personnel work a 2 by 4 (48 by 96 hours) work week known as the modified Kelly schedule. There are an additional 19 administrative and executive team members for a total of 88 NFPD members.

All Advanced Life Support (ALS) Type I Engines are staffed with three personnel: Captain, Engineer, and Firefighter/Paramedic. All ALS transport ambulances are staffed by two Firefighter/Paramedics. The Truck Company/Rescue is staffed with three personnel: Captain and two Engineers.

c. Facilities

The NFPD has five fire stations and one administrative facility. At these stations, there are a total of five engine companies, one truck company, and two ALS transport ambulances. The facilities are described below.

- **Administration Building, 95 Rowland Way**. The Administration Building was purchased and renovated in 2003 and opened in February 2004 as the new administrative support services facility. A total of 18 support personnel provide NFPD administration and direction for the Finance, Fire Loss Management, and Emergency Medical Services divisions, and the EMS Billing Department. It services and hosts the office of the Fire Chief and Deputy Fire Chief.
- **Station 1, 7025 Redwood Boulevard**. Station 1 has nine personnel on duty daily and the following equipment and apparatus:
  - One Type I ALS Engine
  - One 105-foot Aerial Ladder

- One California Office of Emergency Services certified Medium Rescue Squad
- One Water Tender
- One Type III Engine
- One ALS Transport Ambulance
- One Battalion Chief's command vehicle

♦ **Station 2, 450 Atherton Avenue**. Station 2 has three personnel on duty daily and the following equipment and apparatus:
- One Type I ALS Engine
- One Light Duty Rescue Boat (Zodiac)
- One ALS Transport Ambulance

♦ **Station 3, 65 Ramon Way.** Station 3 has three personnel on duty daily and the following equipment and apparatus**:**
- One Type I ALS Engine
- One Type III Engine
- One Mobile Command Vehicle

♦ **Station 4, 319 Enfrente Road**. Station 4 has five personnel on duty daily and the following equipment and apparatus:
- One Type I ALS Engine
- One ALS Transport Ambulance

♦ **Station 5, 5 Bolling Drive**. Station 5 has three personnel on duty daily and the following equipment and apparatus:
- One Type I ALS Engine
- One Type III Engine
- One Type II County Wide Hazmat Vehicle (HM-1)

d. Novato Fire Protection District Incidents

Table 14-4 identifies the number and types of incidents the NFPD responded to between 2005-2007. Emergency medical services represented the majority

TABLE 14-4 **NUMBER OF NOVATO FIRE PROTECTION DISTRICT INCIDENTS 2005-2007**

Incident Type	2005	Percent	2006	Percent	2007	Percent
Unknown	25	1%	24	< 1%	17	< 1%
Alarm	459	9%	467	10%	458	9%
Cancelled	179	4%	230	5%	223	5%
Fire	458	9%	460	9%	470	10%
Hazmat	53	1%	66	1%	46	1%
Medical	2650	55%	2652	54%	2664	55%
Motor Vehicle Accident	458	9%	464	9%	468	10%
Other	239	5%	218	4%	224	5%
Public Assist	322	7%	303	6%	296	6%
Service	1	< 1%	1	< 1%	1	< 1%
Total	**4,844**	**100%**	**4,885**	**99%**	**4,867**	**100%**

of incidents for all three years. Alarm, fire and motor vehicle accidents each represented approximately 10 percent of all yearly incidents for the same period.

e. Major Risk Scenarios

The NFPD has determined that there are eight major risk scenarios within the NFPD. These include earthquake, flooding, hazardous materials, wildland interface fires, structure fires, railroad, aviation events, and emergency medical services. Seismic, flood and hazardous materials risks are discussed in Chapters 10, 12 and 14. Risk scenarios regarding wildland interface fires, structure fires, railroad, aviation hazards, and emergency medical services are discussed below.

i. Wildland Fires

Wildland fires are generally caused by the ignition of dry grass, brush, or timber and more frequently occur in areas with steep, heavily vegetated hillsides. Wildfires play an important role in the ecology of many natural habitats; however, as urban development moves into areas susceptible to wildfire hazards, risks to human safety and property increase. The term *urban-wildland interface* is commonly used to describe an area where urban development has been located in proximity to open space, or wildland areas. Development located within an urban-wildland interface experiences high risk of wildland fire.

After the disastrous firestorm in the Oakland-Berkeley Hills in 1991, the Legislature required CAL FIRE to identify very high fire hazard severity zones. Very high fire hazard severity zones are based on fuel loading, slope, fire weather, and other relevant factors. The NFPD service area includes very high fire hazard severity zones, as identified by CAL FIRE and the NFPD in 2005 that encompass urban-wildland interface areas. The NFPD has experienced several devastating wildland fires in high and very high hazard severity zones.

ii. Structure Fires

Structure fire risk is greatest in older structures and neighborhoods built before modern building codes for fire safety and building systems were in place. Other factors affecting urban fire risk and relative likelihood of loss of life or property include building age, height, and use; storage of flammable material; building construction materials; availability of sprinkler systems; and proximity to a fire station and hydrants.

The NFPD has conducted an assessment of the significant structures that exist within the NFPD using a process called Risk, Hazard, and Value Evaluation (RHAVE), a nationally recognized evaluation tool. RHAVE offers a set of tools and methods to help fire service and community leaders make objective, quantifiable decisions about their fire and emergency service needs. According to the RHAVE categories, most properties in Novato are classified as Category 3, routine or typical risks.

iii. Railroad Hazards

The Southern Pacific Railroad right-of-way has been purchased for potential future transit use. An increase in rail traffic may result in additional exposure to railroad hazards. In the past, the NFPD has responded to fires that were caused by railroad uses. Although these fires are unusual, they are easily handled incidents by fire service personnel. Currently the railroad does not operate nor create a special hazard for firefighting forces, but freight and passenger rail service is expected to resume by 2014. The NFPD plans to incorporate potential railroad hazards risks into the its future planning efforts as well as into any updates of the Standards of Cover.

iv. Aviation Hazards

Gnoss Field is an airport within the service area of the NFPD. The NFPD does not have any specialized equipment to handle air crash rescue scenarios. The Type I engines carry a reserve of Class B foam and staff are trained to fight flammable liquid fires and to respond to multi-causality incidents that may occur from a crash landing. The NFPD has responded to several incidents at the airport, including aircraft landing without their landing gear down, aircraft that have overshot the runway and occasional airplane crashes. However, the airport has an excellent safety record and there have not been any recent significant events.

v. Emergency Medical Services (EMS)

The NFPD's resource deployment strategy is predicated on training as many personnel as possible in all phases of fire protection and emergency medical care. All uniformed personnel have dual roles, as fire suppression and Emergency Medical Services (EMS) personnel. The EMS Division is responsible for first response EMTs, paramedic engine companies and paramedic transport. The Division utilizes the services of a part-time medical director and fulltime quality improvement coordinator. Medical emergencies make up nearly two-thirds of emergency responses.

In the event an emergency situation exceeds the capacity of the NFPD, the multi-casualty incident response plan is implemented. This is a mutual aid plan, which increases medical resources and establishes an emergency organization to deal with major emergencies. Novato maintains four multi-casualty incidents medical caches, one at each station.

F. Solid Waste and Recycling

1. Regulatory Framework

a. California Integrated Waste Management Act

California's Integrated Waste Management Act of 1989 (AB 939) set a requirement for cities and counties throughout the State to divert 50 percent of all solid waste from landfills by January 1, 2000, though source reduction, recycling and composting. To help achieve this, the Act requires that each city and county prepare and submit a Source Reduction and Recycling Element. AB 939 also established the goal for all California counties to provide at least 15 years of on-going landfill capacity. As part of the California Integrated Waste Management Board's (CIWMB) Zero Waste Campaign, regulations affect what common household items can be placed in the trash. As of February 2006, household materials including fluorescent lamps and tubes, batteries, electronic devices and thermostats that contain mercury are no longer permitted in the trash.[5]

In 2000, as part of the Marin Hazardous and Solid Waste Joint Powers Authority (JPA), Novato in collaboration with 10 other jurisdictions in Marin

[5] California Integrated Waste Management Board's Zero Waste Campaign's website, http://www.zerowaste.ca.gov, accessed on August 20, 2007.

County successfully diverted 71 percent of its waste, the highest waste diversion rate for a county in California.[6]

b. California Solid Waste Reuse and Recycling Access Act of 1991

California Solid Waste Reuse and Recycling Access Act requires areas to be set aside for collecting and loading recyclable materials in development projects. The Act required the CIWMB to develop a model ordinance for adoption by any local agency relating to adequate areas for collection and loading of recyclable materials as part of development projects. Local agencies are required to adopt the model, or an ordinance of their own, governing adequate areas for collection and loading of recyclable materials in development projects.

c. Marin County Regional Integrated Waste Management Plan

Marin County's Regional Integrated Waste Management Plan is mandated by State law under AB 939 and was developed in 1990 under the Marin Hazardous and Solid Waste JPA, which includes the cities and towns of Belvedere, Corte Madera, Fairfax, Larkspur, Mill Valley, Novato, San Anselmo, San Rafael, Sausalito, Tiburon and Marin County. The Plan describes waste disposal trends, diversion efforts, and programs intended to achieve the waste diversion goals outlined in AB 939. The Plan serves as the primary tool for designing waste reduction programs that are Countywide in scope.

d. City of Novato Construction and Demolition Debris Ordinance

Section 4-12 of the Novato Municipal Code establishes recycling and reuse requirements for construction and demolition projects. The ordinance requires the reuse or recycling of 50 percent of all debris for construction and demolition projects greater than 500 square feet in size.

[6] "News and Views," Marin Hazardous and Solid Waste Joint Powers Authority, http://www.marinrecycles.org/news_views_item.cfm?News_ID=10, accessed on February 10, 2009.

2. Solid Waste and Recycling

Weekly garbage service is provided to Novato residents by Novato Disposal through a contract with the Novato Sanitation District (NSD). Commercial collection is provided up to 6 days per week. Novato Disposal also provides weekly curbside recycling and greenwaste recycling. Recycling centers in Novato include the Novato Recycling and Buyback Center, 7576 Redwood Boulevard, and the Northern Novato Recycling Depot at the Square Shopping Center, 2045 Novato Boulevard (see Figure 14-2).

3. Landfills

Solid waste from Novato is taken to the Redwood Landfill and Recycling Center, located at 8950 Redwood Highway north of the Novato city limit. The Center manages 222 acres of waste disposal area. Currently, Redwood Landfill and Recycling Center is able to accommodate 1,390 tons of total waste per day with some extra capacity not under contract.[7] 35,000 tons per year of total solid waste is produced by Novato and transferred to Redwood Landfill.[8] Approximately 50 percent of waste arriving at Redwood Landfill comes from outside of Marin County. There is some potential for capacity expansion, but there are currently no known plans to do so.[9] The Redwood Landfill is currently expected to operate until 2024.

4. Household Hazardous Waste

The City of Novato and the NSD operate a permanent hazardous household waste drop-off facility located at the Novato Recycling Center site, 7576 Redwood Boulevard. The facility is open by appointment only.

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[7] Jessica Jones. Manager, Redwood Landfill and Recycling Center. Personal communication with Agnes Chan of DC&E, January 20, 2009.

[8] Steve McCaffrey, Staff, Novato Disposal, personal communication with Agnes Chan of DC&E, February 11, 2009.

[9] Jessica Jones. Manager, Redwood Landfill and Recycling Center, personal communication with Agnes Chan of DC&E, January 20, 2009.

15 HUMAN SERVICES

The Human Services chapter discusses services available to children, seniors and persons with disabilities as well as general social service programs and medical services for Novato residents. The chapter begins with an overview of the local policy framework for those services followed by a description of the services and service providers in Novato.

A. Policy Framework

1. City of Novato General Plan

The City of Novato General Plan includes a Human Services Element. The purpose of this element is to coordinate the delivery of human services and associated facilities for those members of the community having special needs. Topics addressed in this element include services for seniors, the disabled and youth, as well as child care, social service programs and medical services. Objectives, policies and programs in the Human Services Element call for the City to expand outreach and education for human services, coordinate with and assist service providers, and remove regulatory barriers to the provision of human services in Novato.

2. Marin County Child Care Master Plan

To better understand child care needs, the Marin County Child Care Commission published the *Marin County Child Care Master Plan 2008 to 2013*. The Master Plan assesses the current state of the child care system in Marin County, creates a vision for the child care system and develops goals, objectives, indicators and strategies to meet the needs of the child care community. The Master Plan profiles Marin County jurisdictions, including the City of Novato. The Plan identifies a deficit in child care services in the City of Novato, particularly for infant and school age children.[1] The Plan's recommendations and key objectives are presented on county-wide level, rather than providing specific recommendations for individual cities and communities. Key objectives in the Plan include developing a countywide infrastructure of

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[1] Marin County Child Care Commission, *Marin County Child Care Master Plan – 2008 to 2013*, page 33.

child care and early learning, expanding public outreach and advocacy, increasing the supply of child care options and supporting a high quality child care workforce.

B. Human Services

1. Child Care

Child care services in Novato are primarily provided by privately-operated programs. Additional child care services are provided by the City of Novato and the Novato Unified School District.

a. Private Programs

Privately-operated child care programs include family daycare homes and licensed child care centers. Family daycare homes are located in the provider's home, often with a single adult supervising up to 12 children for less than 24 hours per day. There are many family daycare homes servicing the Novato area. Licensed child care centers are usually larger facilities with multiple care givers. The Novato Youth Center is a licensed child care center that provides early child care education, provides five age-related programs from infancy (six weeks) through Kindergarten, and playcare for ages 6 through 14. There are also privately-operated preschools, recreational and social programs in Novato that provide informal child care services.

b. City of Novato

The City of Novato Department of Parks, Recreation and Community Services provides weekly child care programming serving children attending Lu Sutton Elementary School. All-day child care is offered on Teacher Work Days, most holidays and vacation periods. Child care is open to children from any school during school vacations.[2]

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[2] City of Novato Department of Parks, Recreation and Community Services, *2008 Fall Activities Guide*.

c. Novato Unified School District

The Novato Unified School District contracts with private child care programs to provide before- and after- school child care on-site at each elementary school.

2. Youth Services

Services for youth in Novato are provided by the City of Novato Department of Parks, Recreation and Community Services; the City of Novato Police Department and the Novato Youth Center.

a. City of Novato Department of Parks, Recreation and Community Services

The Department of Parks, Recreation and Community Services provides a wide range of programming for preschoolers, children and teenagers. The Department provides programs that appeal to various ages and interests, including educational, recreational, athletic and cultural programs. To serve youth in Novato, the Department operates the Novato Teen Center, which is open Monday through Friday from 2:30 to 6:30 p.m. for youth in 6th through 12th grades. The Center offers drop-in activities, classes, workshops and trips. Additional programs offered by the Department are described in Chapter 7, Parks and Recreation.[3]

b. Police Department

The City of Novato sponsors a number of community programs for youth. Top the Cops, a weekly program at Infineon Raceway, engages high school students in friendly, competitive drag races against police officers. Girls Forum is a sexual assault prevention workshop for girls ages 12 through 17 to increase knowledge and awareness around the issue of sexual assault, and to teach verbal and physical skills to prevent assault. Resisting Aggression Defensively KIDs (radKIDs) is a self-defense program for children ages 5 to 7

[3] City of Novato Department of Parks, Recreation and Community Services, *2008 Fall Activities Guide*.

that teaches principles such as avoidance, recognition and escape from potentially dangerous situations.[4]

c. The Novato Youth Center

The Novato Youth Center at 680 Wilson Avenue is a community-based non-profit organization that provides a variety of services to youth in Novato. The Center operates before- and after-school child care, tutoring, counseling, parenting classes, parent support groups, the Teen Pregnancy Prevention Project and recreational programming, such as sports leagues. The Novato Youth Center also offers services at the Wellness Center, 1767 Grant Avenue, including the Monday Teen Wellness Clinic, Mental Health Services and Parent Child Interaction Therapy.[5]

3. Services for Senior Citizens

Over 13 percent (about 7,700 people) of the City of Novato's population is age 65 or older.[6] Services for seniors in Novato include the provision of affordable housing and non-residential services related to employment, health care, legal assistance and transportation.

a. Housing Services

Choices for Living, published by the Marin County Division of Aging, identifies housing resources for seniors in Marin County. Housing resources for seniors specifically available in Novato include relief assistance with domestic utility bills, emergency housing, subsidized housing, mobile homes, retirement residences, residential care homes and skilled nursing facilities. La Casa Nova at 35 Carmel Drive, MacKey Terrace at 626 Owens Drive and the

[4] City of Novato Police Department website, http://www.ci.novato.ca.us/Index.aspx?page=348, accessed January 2, 2009.

[5] Novato Youth Center website, http://www.novatoyouthcenter.org/, accessed January 2, 2009.

[6] County of Marin Health and Human Services Division on Aging website, http://www.co.marin.ca.us/depts/hh/main/ag/pi.cfm, *The Future of Project Independence*, accessed January 2, 2009.

Nova-Ro complexes at 1128 Olive Street, 1130 7th Street and 31 Pinheiro Circle are subsidized housing developments for seniors located in Novato.[7]

b. Other Services
Services for seniors in Novato that are not housing-related are provided by a network of local non-profit organizations and governmental agencies. The Division of Aging within the Marin County Department of Health and Human Services coordinates the provision of employment services, family caregiver support, health insurance counseling, legal services, health care services and transportation services. In addition, the Marin County Commission on Aging, an advisory council to the Marin County Board of Supervisors, works with the Division of Aging to address the needs of seniors in Marin County.

Non-residential service providers in Novato include Senior Access at 1905 Novato Boulevard, an adult day health care facility providing day programs for seniors with health care and socialization needs. The Margaret Todd Senior Center at 1560 Hill road provides recreation programs, outreach and health and legal counseling. The Center, owned and operated by the City of Novato Parks, Recreation and Community Services Department, provides a meeting space for the Novato Independent Elders Program (NIEP) and the Novato Senior Citizens Club.[8]

4. Social Service Programs

a. County of Marin Department of Health and Human Services
The Division of Social Services within the County of Marin Department of Health and Human Services (HHS) is the governmental agency that administers social service programs for Novato residents. Services provided by the Division of Social Services include general assistance programs such as Medi-Cal, Food Stamps and Cash Aid, Child Protective Services, foster care and employment and training services.

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[7] County of Marin Health and Human Services Division of Aging, *Choices for Living 2008*.

b. Novato Human Needs Center

The Novato Human Needs Center at 1907 Novato Boulevard is a non-profit agency that assists low-income individuals to overcome financial challenges and move toward self-sufficiency. Services offered at the Center include a voucher program for purchasing clothing and household items, emergency food and assistance, transportation services, employment and education services.

c. New Beginnings Center

The New Beginnings Center, a non-profit agency at 1399 North Hamilton Parkway, is an 80-bed emergency housing facility that provides health care, counseling and vocational training programs for families affected by domestic violence.

d. Gilead House

Gilead House is a faith-based transitional home for single mothers. Programs offered at Gilead House include job skills training, basic financial management training, parenting and life-management counseling and mentoring by sponsors.

5. Care of Persons with Disabilities

Many of the same programs and organizations serving seniors described in Section B.2 also provide services for persons with disabilities. Additional services for persons with disabilities in Novato are provided by Easter Seals, a non-profit organization providing education, outreach and advocacy services. Easter Seals' regional headquarters is located at 20 Pimentel Court in Novato. Services provided by Easter Seals include medical rehabilitation, employment and training, child care, adult day programs, camping and recreation programs.

6. Medical Services

In addition to a typical range of private doctors practices and other daily medical offices, Novato is home to the following medical facilities.

a. Novato Community Hospital

The Novato Community Hospital (NCH) is the only general (full service) hospital in the Novato area. NCH is a Sutter Health Affiliate located on the east side of Highway 101 at the Rowland Boulevard exit in Novato. Since opening in May 2001, NCH has operated an acute care facility with 47 patient beds, five private isolation rooms and a 56,000-square-foot medical office building located adjacent to the hospital. Services provided include a 24-hour Emergency Department, inpatient/outpatient surgery, a medical/surgical unit, a critical care unit, complete imaging services, a laboratory, respiratory care and cardiopulmonary services, a pharmacy and rehabilitation services.[9]

Transportation service to the Novato Community Hospital is provided by Health Express, a Novato-based van service sponsored by the City of Novato, Sutter Health and Whistlestop.

b. County of Marin Department of Health and Human Services

The Marin County Department of HHS provides a full range of medical services that are available to County residents regardless of income. There are no HHS office locations in Novato. The closest HHS office at 889 Northgate Drive in San Rafael provides children's medical services, community health and prevention services, public health and communicable disease control, and offers a discount drug program.

[9] Novato Community Hospital website, http://www.novatocommunity.sutterhealth.org/, accessed on December 16, 2008.

16 UTILITIES

The focus of this chapter is utilities in Novato, including water, wastewater and stormwater. The City of Novato works closely with utilities providers to supply Novato residents and businesses with reliable, high quality water, efficient wastewater treatment and stormwater catchment. Adequate provision of utilities largely determines how Novato functions and accommodates growth. The topics in this chapter are utility regulations, existing supply and demand, and future capacity of utilities providers.

A. Water

The following describes regulations and exiting conditions with regard to water service in Novato.

1. Regulatory Framework

A number of federal and State agencies manage and regulate water resources for the City of Novato with the intention of safeguarding these resources for domestic and agricultural use, environmental conservation and power generation. As discussed in detail below, these regulations mandate local assessment of, and planning for, a long-term water supply.

a. State and Federal Water Quality Regulations

i. California State Water Resources Control Board

The California State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs) have the authority in California to protect and enhance water quality.

The RWQCB Region 2 office in Oakland regulates water quality for all waters that flow into the San Francisco Bay, which includes all rivers, streams and tributaries within the nine-county San Francisco Bay region. The RWQCB establishes water quality objectives, administrates the National Pollutant Discharge Elimination System (NPDES) permit program for storm water and construction site runoff and regulates infill of jurisdictional wetlands or waters of the United States under Section 404 of the Clean Water Act.

ii. Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) of 1969 requires the State to adopt water quality policies, plans and objectives to protect the State's waters for the use and enjoyment of the people. The Act states that the SWRCB and RWQCBs must adopt and periodically update water quality control plans, as required by the Clean Water Act and the Porter-Cologne Act, to establish water quality objectives and implementation programs for each of the nine regions in California. The Novato area falls under the Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin.[1] The Act also requires waste dischargers to notify the RWQCBs of their activities via Reports of Waste Discharge. It authorizes the SWRCB and RWQCBs to issue and enforce waste discharge requirements, NPDES permits, Section 401 water quality certifications, and other approvals.[2]

iii. Water Quality Control Plan for the San Francisco Bay Basin

The RWQCB Region 2 office regulates water quality in the San Francisco Bay Basin in accordance with the Water Quality Control Plan or "Basin Plan."[3] The Basin Plan presents the beneficial uses which the Regional Board has designated for surface water, groundwater, marshes and mudflats, as well as the water-quality objectives and criteria that must be met to protect these uses. A number of existing beneficial uses have been designated for Novato Creek and Stafford Lake, and are considered reasonably applicable to their tributaries. The existing beneficial uses for Novato Creek include agricultural, municipal and domestic water supply, recreation, wildlife habitat and preservation of rare and endangered species. The existing beneficial uses for Stafford Lake include municipal and domestic water supply, cold and warm freshwater habitat, fish spawning, wildlife habitat, and non-contact aquatic recreation.

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[1] State Water Resources Control Board, San Francisco Bay Regional Water Quality Control Board Website, http://www.waterboards.ca.gov/sanfranciscobay, accessed on February 7, 2009.

[2] State Water Resources Control Board website, http://www.waterboards.ca.gov/laws_regulations, accessed on February 7, 2009.

[3] California Regional Water Quality Control Board (RWQCB), 2007, *Water Quality Control Plan (Basin Plan), San Francisco Bay Basin (Region 2).*

iv. Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), passed in 1974, is the initial federal legislation passed to ensure the quality of drinking water. Under SDWA, the US Environmental Protection Agency sets standards for drinking water quality and oversees the water suppliers who implement those standards. Regulatory standards established by the SDWA include maximum allowable levels of chemicals and other substances in drinking water, protocols for monitoring drinking water quality and methods for treating drinking water.

In 1976, California enacted its own Safe Drinking Water Act, requiring the California Department of Public Health (CDPH), previously called Department of Health Services, to regulate drinking water by:

- Setting and enforcing federal and State drinking water standards;
- Administering water quality testing programs; and
- Administering permits for public water system operations.

The standards established by CDPH are found in the California Code of Regulations, Title 22.

v. Senate Bill 610 and Senate Bill 221

Statutes of 1995, Chapters 330 and 854 require local water agencies to assess the reliability of their water supplies. Statutes of 1995, Chapter 881 requires consultation with local water agencies to determine if an adequate water supply is available to accommodate pending land use planning decisions. Senate Bill 610 (SB 610) and Senate Bill 221 (SB 221) amended State law to better coordinate local water supply and land use decisions and ensure adequate water supply for new development. Both statutes require that detailed information regarding water availability is provided to City and County decision-makers prior to approval of large development projects. Large development projects are defined as those that include 500 residential units or more, or that would increase the number of existing service connections to the public water system by 10 percent.

vi. Urban Water Management Planning Act

Through the Urban Water Management Act of 1983, the California Water Code requires all urban water suppliers within California to prepare and adopt an Urban Water Management Plan (UWMP) and update it every five years. Novato is covered by the UWMP prepared by the North Marin Water District, which is discussed in section A.1.b, below. The Act is intended to support conservation and efficient use of urban water supplies at the local level. The Act requires that total projected water use be compared to water supply sources over the next 20 years in five year increments, that planning occur for single and multiple dry water years and that plans include a water recycling analysis that incorporates a description of the wastewater collection and treatment system within the agency's service area along with current and potential recycled water uses.[4]

vii. Groundwater Management Act

The Groundwater Management Act of the California Water Code (AB 3030) provides guidance for applicable local agencies to develop a voluntary Groundwater Management Plan (GMP) in State-designated groundwater basins. GMPs can allow agencies to raise revenue to pay for measures influencing the management of the basin, including extraction, recharge, conveyance, facilities' maintenance and water quality.[5]

viii. Regulations for Water Use Efficiency

The California Constitution prohibits the waste, unreasonable use, unreasonable method of use and unreasonable method of diversion of water. It also declares that the conservation and use of water "shall be exercised with a view to the reasonable and beneficial use thereof in the public interest and for the public welfare." Water Code Section 275 directs the California Department

[4] Department of Water Resources, Urban Water Management Planning Program's website. http://www.owue.water.ca.gov/urbanplan/index.cfm, accessed August 20, 2007.

[5] California Department of Water Resources' website. http://www.groundwater.water.ca.gov/water_laws/ab3030_gma/index.cfm, accessed on August 20, 2007.

of Water Resources and SWRCB to "take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste or unreasonable use of water."

ix. California Water Code

The North Marin Water District is a County water district operating under the provisions of Division 12 of the California Water Code.

x. Area of Origin Protections

Area of origin protections were added to the California Water Code to protect local northern California supplies from being depleted by water projects. County of origin statutes reserve water supplies for counties from which the water originates when, in the judgment of the SWRCB, transporting water out of a county would deprive that county of water necessary for its present and future development.

xi. Statewide Bond Measures

In recent years, a number of statewide bond measures has been approved by California voters, establishing funding for a wide range of water-related programs and improvements aimed at protecting the State's critical water resources.

Important among these are the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Bond Act, passed in 2000. This bond authorized $1.97 billion for water-related projects throughout the State. The SWRCB was authorized to allocate $763.9 million of these funds to local projects, such as pollution control programs for coastal and inland waters, watershed protection programs and pesticide source and mitigation programs, mostly through competitive grants.

Passed in March 2002, Proposition 40, the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act, authorizes over one billion dollars for a broad range of water conservation programs, including land acquisition. Later in 2002, an additional $3 billion in bonds was authorized by the voters as part of the Water Quality, Supply and Safe Drinking Water Projects bond measure. The bond funds are to be directed to a wide variety of water resource programs including the CALFED Bay-Delta Program, safe drinking water programs, and integrated regional water management programs, among others.

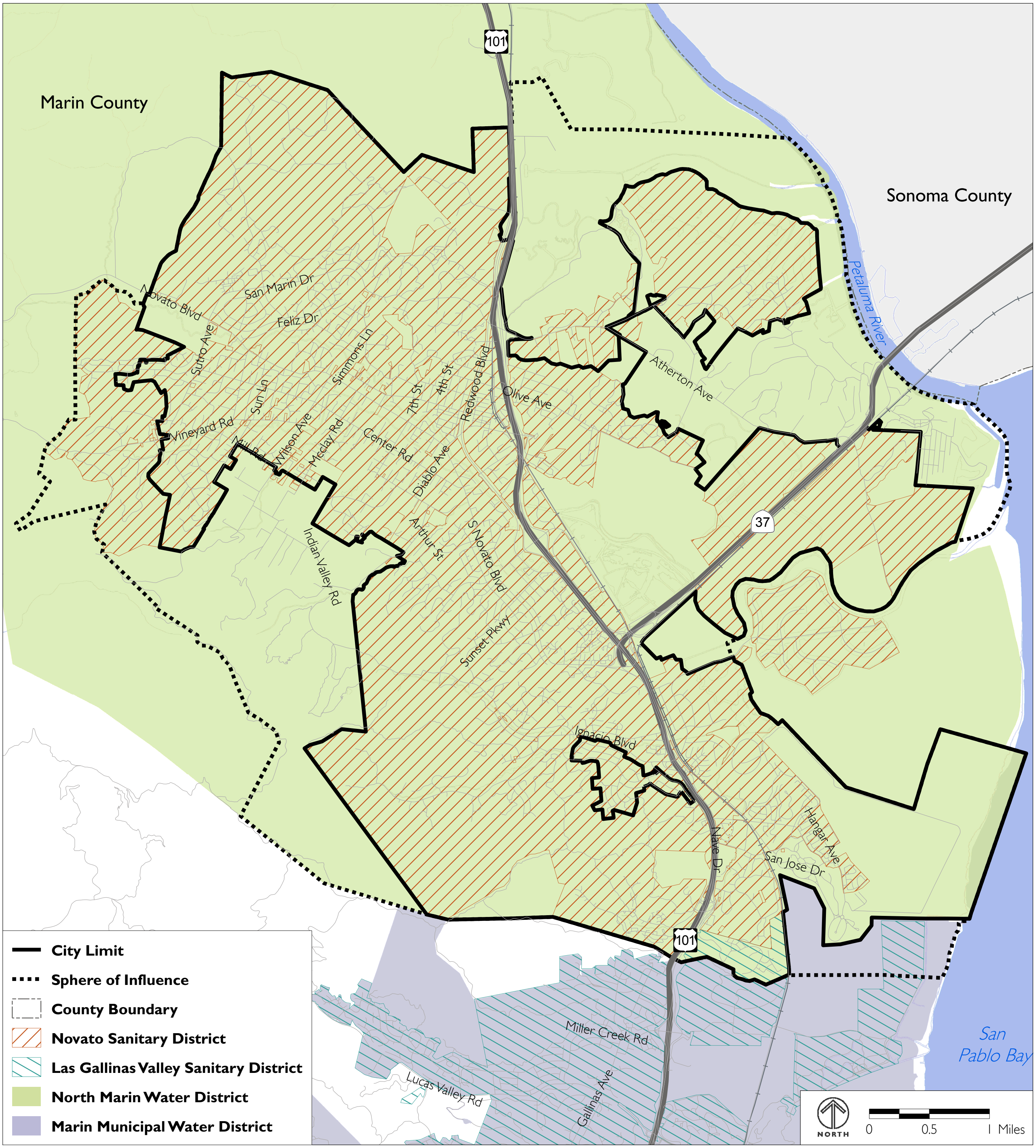
In November 2006 voters approved an initiative allowing the State to sell $5.4 billion in bonds for projects related to safe drinking water, water quality and supply, flood control, natural resource protection and park improvements.

b. Local Regulations and Plans

Water and other public utilities in Marin County are under the jurisdiction of the Marin Local Agency Formation Commission (LAFCO). LAFCO develops and updates the sphere of influence (SOI) for local jurisdictions within a county, and therefore is involved in drawing service area boundaries. As part of the SOI determination report, called a Municipal Service Review (MSR), LAFCOs must also examine the adequacy of public services and capacity of public facilities within the SOI. Marin LAFCO produced the most recent Novato MSR on February 22, 2002.

Water service depends on complex systems of water supply, treatment and distribution, which are provided to the City of Novato by the North Marin Water District (NMWD), as shown in Figure 16-1.[6] The NMWD boundaries within the City of Novato cover an area of 75 square miles and an estimated population of 61,000. The NMWD monitors the Stafford Lake watershed and works cooperatively with significant water users such as City of Novato, Novato Unified School District, the Indian Valley Golf Course and the Marin County Parks and Open Space District.

[6] The Marin Municipal Water District also covers a small portion of Novato's SOI, but this portion is marshland and therefore does not contain any water service customers.



Source: Main County GIS and MarinMap

FIGURE 16-1

WATER DISTRICT AND WASTEWATER SERVICE AREAS *i. Marin County Watershed Management Plan*

The Marin County Watershed Management Plan provides recommendations on watershed management practices and policies that protect and restore the natural environment and aesthetics of watersheds in Marin County. The planning corridors studied include Inland Rural areas, such as the Stafford Lake watershed that is part of the greater Novato Creek watershed, and Coastal Recreation areas, such as West Marin.

ii. Urban Water Management Plan

The 2005 Urban Water Management Plan revised by the NMWD in April 2007 describes water supply sources, historical and projected water use and existing water supply and demand within the NMWD boundary. The plan concludes that NMWD has available water to serve future development anticipated under the current 1996 Novato General Plan, presuming future water treatment and transport facilities are completed by the Sonoma County Water Agency.

iii. Novato Water System Master Plan

The Novato Water System Master Plan, developed by NMWD in 2002 and most recently updated in 2007, is a long-range strategic plan that consolidates planning efforts directly related to the water system and develops procedures to regulate and monitor this system. Currently, new development in Novato is expected occur within existing pressure zones and service areas, and therefore will not require new pressure zones or an extension of facilities beyond current boundaries.[7]

The Plan also identifies and guides necessary Capital Improvement Plan (CIP) projects for the Novato water system. CIP projects are identified in section nine of the Master Plan and organized into four categories: Pipeline Replacement and Additions, System Improvements, Storage Tanks and Pump Stations, and Preliminary Project Engineering and Study. Section 10 of the Mas-

[7] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update*, page 9-1.

ter Plan discusses project timelines and completion dates, as well as individual project costs.

iv. Water Conservation Master Plan

Water conservation is a top priority for NMWD. The Water Conservation Master Plan, developed in 2008, tiers off the District's 1999, 2002 and 2004 Draft Water Conservation Plans and the 2005 Urban Water Management Plan. The Updated Water Conservation Master Plan (Plan) examines the District's existing Tier One Measures, Tier Two Measures and New Development Standards, and recommends potential water conservation programs to be implemented. Tier One Measures refer to the fourteen best management practices recommended by the California Urban Water Conservation Council and approved by NMWD's Board of Directors in 2001. Tier Two Measures are potential conservation programs that reach beyond the Tier One Measures. The Plan also discusses new development standards, necessary funding and staffing for successful program implementation.

The Plan discusses the District's water conservation measures, which are segmented and tailored to four customer types: Residential; Large Landscape; Commercial, Industrial and Institutional; and New Development Standards. The District offers various programs for each customer category, including rebates on water efficient appliances, fixtures and equipment, and free, on-site water use audits. The "Cash for Grass" program is an example of the District's creativity in developing water conservation measures. The "Cash for Grass: program offers residential customers rebates for replacing regularly mowed and irrigated, well taken care of turf, with water conserving California native plant material, a drip irrigation system and mulch.

In addition to incentive-based programming, the Plan also describes education-based water conservation measures. The District's educational programming measures include distributing informational newsletters, maintaining the water efficient demonstration garden at the District's administration office and working with College of Marin and the Marin Municipal Water District to develop the Water Management Technology Education Center.

The Plan also addresses public outreach and conservation marketing. In April 2008, the NMWD hired a consultant to conduct a market penetration study to understand current customer perceptions of water conservation programs. The study gleaned insight into current customer perceptions, such as the belief that the monthly water bill was the least expensive domestic utility bill and therefore saving water to reduce the bill further was not a priority. Customers' perceptions and the District's water programs were analyzed and used to develop new programming and marketing recommendations. These are presented in the Appendix of the Water Conservation Plan, in the final report titled, "Residential Customer Conservation Focus Groups: A Qualitative Market Research Report".

In the Water Conservation Budget and Funding chapter, the Plan addresses the rising costs of implementing the water conservation programs. Future water conservation funding levels were expected to reach a minimum of $500,000 per year to maintain current conservation programs and staffing levels, and to increase conservation activities to meet the water conservation the goal of the 2008 Water Conservation Master Plan.[8]

v. Climate Protection Management Plan

NMWD supports policies and programs to reduce its effect on greenhouse gas emissions. NMWD is implementing the Climate Protection Management Plan to increase awareness of its dedication to reducing greenhouse gas emissions through the following actions:

- Use of high efficiency pumps and motors at plants.
- Identification of opportunities to reduce energy use at water facilities.
- Investigation into solar power panels, including a solar field at Stafford Lake and a solar parking structure at the District's main office.
- Upsizing of transmission mains to reduce total pumping requirements and energy use.

[8] North Marin Water District, 2008, *2008 Water Conservation Master Plan*, page 20.

- Participation in regional Climate Protection Mitigation Management programs with local governments.
- Investigation into becoming 100 percent energy self-sufficient.
- Investigation of impacts of seal level rise by 2050 and 2100 in low-lying areas.
- Planning for floods as a part of emergency response programs at the Stafford Lake Treatment Plant and Novato Creek.
- Continued participation in the annual greenhouse gas and carbon footprint inventory management program to achieve reduction goals.
- Inclusion of climate impacts in CEQA documents, as applicable for future system improvement projects.

2. Water Service

Water service and distribution in Novato are provided by the NMWD.

a. Existing Water Supply

In 2006, NMWD produced an annual total of approximately 3,640 million gallons (MG) of water for the City of Novato and surrounding unincorporated areas. Approximately 80 percent of the water supply comes from the Russian River Aqueduct through the NMWD's wholesale water supplier, the Sonoma County Water Agency (SCWA). The remaining 20 percent comes from local runoff into Stafford Lake that is treated at the Stafford Lake Water Treatment Plant. There were 20,325 active water connections in the City in 2006, supplying various uses including residential, commercial and industrial land uses, as well as fire protection.

The City of Novato receives water exclusively from surface water sources. The NWMD supplies the City of Novato with water obtained from three sources: the Russian River, Stafford Lake and the Recycled Water Facility (managed under a contract with Novato Sanitary District).

i. Russian River Water

Russian River water supplies are provided to the NMWD by means of a contract with SCWA, which owns and operates water supply, storage and transmission facilities in Sonoma County. Lake Mendocino, located northeast of the City of Ukiah, and Lake Sonoma, located west of Healdsburg, feed into the Russian River. Together, the lakes can store up to 367,500 acre-feet (AF).[9] As of June 2006, NMWD's restructured agreement with SCWA entitles NMWD to a delivery capacity of 19.9 million gallons per day (mgd) and a total delivery of 14,100 AF during any fiscal year.[10] In fiscal year 2007, NMWD received 3,015 MG, or 9,254 AF, of Russian River water.[11]

ii. Stafford Lake Water

Stafford Lake is a local reservoir located 4 miles west of downtown Novato; it is impounded by Stafford Dam on Novato Creek. The NMWD operates its Stafford Lake system during the summer months to reduce peak water demand on the Russian River aqueduct. The surface area of Stafford Lake is 230 acres and it holds 1,450 MG (4,450 AF) of water. Water from the lake is treated at the Stafford Lake Water Treatment Plant. In fiscal year 2007, NMWD delivered 349 MG, or 1,072 AF, of treated water from Stafford Lake.

iii. Recycled Water

Water demand in the City of Novato is greatest during the summer months, when water is used mostly for outdoor irrigation of landscapes. NMWD has a contract with the Novato Sanitary District to provide recycled water to irrigate Stone Tree Golf Course in Novato. This service is provided by the Recycled Water Facility, which began operation in June 2007, and treats 500,000 gallons of water per day. Approximately 260 AF is available annually to irrigate the Stone Tree Golf Course and any added water customers. In 2007, the Stone Tree Golf Course received 126 AF of recycled water. Future

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[9] One acre-foot is the amount of water required to cover one acre of ground (43,560 square feet) to a depth of 1-foot.

[10] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report,* page ES-3, December.

[11] North Marin Water District, 2007, *Annual Report 2006-2007*, page 3.

plans call for the incremental expansion of recycled water supply to 736 AF by 2011.[12]

b. Existing Water Demand

As of June 2006, Novato residents used an annual total of 2,744 MG of water.[13] Commercial services, including industrial customers, used 592 MG while government services used approximately 152 MG of water.[14] For fiscal year 2006, the average annual water demand in Novato was 9.64 mgd, while the average day peak month demand was 15.58 mgd. The maximum day demand in the Novato water system was 17.76 mgd. Out of the four total pressure zones in Novato, Zone 1 (0'–60' Elevation) and Zone 2 (60'-200' Elevation) account for approximately 88 percent of the total water demand.[15]

c. Future Estimate of Water Supply Needs

Future water supply needs are estimated based on projections for buildout from the existing 1996 Novato General Plan. NMWD estimates that 7,739 equivalent dwelling units (EDUs) will be added in Novato by 2030, for a total of 31,099 EDUs with a projected annual demand of 13,653 acre-foot per year (AFY).[16,17] A majority of this demand – 68 percent – is expected to occur in

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[12] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report*, page ES-3, December.

[13] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report*, page 4-3, December.

[14] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report*, page 4-4, December.

[15] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report*, page 4-5, December.

[16] An equivalent dwelling unit (EDU) is equal to the estimated quantity of water used on an average day of the peak month by an equivalent single-family home. According to NMWD, 1 EDU = 636 gallons per day (gpd).

[17] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report*, page 4-13, December.

the Zone 1 North Novato area; 24 percent is expected to occur in Zone 2 and the remaining 8 percent in the higher pressure zones.[18]

According to local media, some State officials fear that spring and summer 2009 could bring the worst drought in over 150 years.[19] NMWD's neighbor, the SCWA, announced in February 2009 that the Agency may have to institute 30 to 50 percent cutbacks in spring and summer 2009,[20] and almost every water agency in the State is suffering. Rainfall was less than normal in 2007 and 2008, and 2009 is expected to be the third consecutive dry year. With 100 percent of its water supply from surface water, NMWD is susceptible to drought. Water customers in Novato are likely to be affected by the anticipated water shortages, which may result in water use restrictions, drought pricing and other drought-related inconveniences.

d. Water Quality

NMWD annually publishes Consumer Confidence Reports, also called Water Quality Reports, as required by the Safe Drinking Water Act. According to the April 2008 Novato Annual Water Quality Report, NMWD's tap water meets and exceeds federal and State standards for drinking water. According to the Report, potential contaminants have been detected at concentrations low enough so that no further action to maintain safety of the drinking water is necessary. Those potential contaminants and their sources include:

- fluoride from the erosion of natural deposits;
- total coliform bacteria that is naturally present in the environment;
- lead and copper from internal corrosion of household plumbing systems;
- total triahalomethanes and total haloacetic acids as a by-product of drinking water disinfection.

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[18] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report,* pages 4-13 to 4-16, December.

[19] San Francisco Chronicle website, February 4, 2009, Bone-dry Bolinas - barometer for state?, http://www.sfgate.com/cgibin/article.cgi?f=/c/a/2009/02/04/MNV415MGLA.DTL, accessed on February 10, 2009.

[20] Drew McIntyre, Chief Engineer of North Marin Water District, personal communication with Joanna Jansen of DC&E, January 29, 2009.

As required by the U.S. EPA, NMWD performed a watershed activities assessment, including Stafford Lake's source of supply, in 2002. This assessment determined that animal feeding and waste disposal at the existing stable and dairy operations on the watershed has the highest potential for contaminating Stafford Lake with microbial contaminants and nutrients. According to Novato's Annual Water Quality Report, NMWD actively coordinates with the stable and dairy owners to control and reduce such potential contaminants. NMWD routinely monitors Stafford Lake source water.

e. North Marin Water District's Existing Water Transmission and Distribution System

Water is treated and transmitted through a system that includes a water treatment plant, pump stations, water mains and pipelines, and reservoirs.

i. Russian River Water Treatment

Russian River water goes through a natural filtration process, including filtration through naturally-deposited sand and gravel, and is then treated with chlorine before being pumped directly into the aqueduct system.[21] Water is collected and treated through six water collectors located approximately 10 miles upstream from Guerneville. Water is then piped from the Russian River to Novato via the NMWD North Marin Aqueduct, a 9.4-mile pipeline built in 1961.

ii. Stafford Lake and Water Treatment Plant

As discussed above, Novato is served by one local reservoir, Stafford Lake. Stafford Lake water is treated at the Stafford Lake Treatment Plant, which was improved in 2006. The treatment plant is located just below the Stafford Lake and Stafford Dam, in the Novato Creek watershed. The Plant can process a maximum of 6 MG of water each day. In FY 2007, the Plant processed a total of 349 MG (1,072 AF) of water for distribution by NMWD.

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[21] "Novato Water Supply." North Marin Water District, http://www.nmwd.com/services_novato.php#NovatoWaterSources, accessed January 7, 2009.

iii. Water Distribution and Transmission

NMWD manages over 33 MG of treated water in four distinct pressure zones, through 29 tanks and 26 pump stations.[22] As of June 30, 2008, NMWD managed 312 miles of pipeline in the Novato Water Service Area.[23]

The two primary transmission mains owned and operated by NMWD are the North Marin Water District Aqueduct, a 30-inch diameter main through which water flows from the SCWA aqueduct system into Novato, and an 18-inch pipeline connecting to the Stafford Lake Treatment Plant. Transmission mains generally run north to south across Pressure Zone 1, and larger pipelines are typically made of steel or reinforced concrete.[24]

The distribution system is comprised mostly of 6-, 8-, 10- and 12-inch diameter pipelines connected to the transmission mains. In the older sections of Novato, pipelines were constructed over 50 years ago and are cast iron. During the 1950s, the District began using asbestos cement pipes. PVC pipes have been installed since the 1990s.

f. Water Reuse and Conservation Measures

The Conservation Incentive Tier Rate (CITR) was enacted in 2004, focusing on reducing high-end residential water use by targeting a certain tier of residential customers. The CITR applies a surcharge of $1.49 per 1,000 gallons of water on water usage exceeding the 37,400 gallons standard per dwelling unit in a bimonthly billing period. The CITR also applies a surcharge of $4.45 per 1,000 gallons of water on water use exceeding 112,200 gallons per bimonthly billing period. Approximately 30 percent of residential customers exceed this water usage standard and pay the CITR. According to the North Marin Water District's FY 2006/2007 Annual Report, the CITR has successfully reduced water demand, decreasing demand by 31 percent since 2004. The

[22] North Marin Water District, *Annual Report 2006-2007*, page 8.

[23] North Marin Water District's website, http://www.nmwd.com/services_novato.php, accessed January 12, 2009.

[24] North Marin Water District, 2007, *2007 Novato Water System Master Plan Update: Final Report*, page ES-4.

CITR has also generated revenue of $380,000 dedicated to promoting water conservation measures in Novato.

NMWD's Water Conservation Program focuses on improving the efficiency of water usage for residential, commercial and large landscape areas. This Water Conservation Program includes Best Management Practices from the California Urban Water Conservation Council (CUWCC). In FY 2006/2007, the District saved approximately 250 MG of water through this Program.

In addition to the Water Conservation Program, NMWD has stringent water use standards for new development, including the following standards:[25]

- Installation of high-efficiency washing machines.
- Installation of high-efficiency toilets (HETs), which use one gallon per flush or use a dual flush system.
- Use of weather-based irrigation controllers.
- Restriction of turf for residential development to 800 square feet, and prohibition of turf for commercial development.
- Use of drip or other subsurface irrigation for all irrigated non-turf areas.

For the water Conservation Master Plan, NMWD classifies its water conservation measures into Tier One Measures (BMPs from the CUWCC), Tier Two Measures (programs beyond the BMPs) and New Development Standards. According to the 2008 Water Conservation Master Plan, the District produced significantly higher savings than expected for Tier One Measures. From the Program's inception through 2008, Tier One Measures produced 476 AFY while the Districts 2030 Conservation Savings Target was 294 AFY. NMWD also aggressively implemented the Tier Two Measures and New De-

[25] North Marin Water District, 2007, *Annual Report 2006-2007,* page 4-5.

velopment Standards before their projected start dates. As a result, NMWD found early conservation savings results.[26]

B. Wastewater

The following describes regulations and existing conditions with regard to wastewater services in the City of Novato.

1. Regulatory Framework

In California, all wastewater treatment and disposal systems fall under the overall regulatory authority of the State Water Resources Control Board (SWRCB) and the nine California Regional Water Quality Control Boards (RWQCBs). Each are charged with the responsibility of protecting beneficial uses of State waters (ground and surface) from a variety of waste discharges, including wastewater from individual and municipal systems.

The RWQCBs regulatory role involves the formation and implementation of basic water protection policies. These are reflected in the RWQCBs Basin Plan in the form of guidelines, criteria and/or prohibitions related to the siting, design, construction and maintenance of on-site sewage disposal systems. The SWRCB has historically provided overall policy direction, organizational and technical assistance and a communications link to the State legislature.

a. Federal and State Regulations

Following are several federal and State regulations affect wastewater management and systems in Novato:

i. Biosolids Disposal Requirements

The Code of Federal Regulations, Title 40, Part 503 regulates the treatment, reuse and disposal of biosolids that are sent to a Dedicated Land Disposal (DLD) site. Some of the biosolids produced in Novato are sent to a DLD.

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[26] North Marin Water District, 2008, *Water Conservation Master Plan*, page 6.

b. Local Regulations and Plans

The Novato Sanitary District (NSD) is the primary wastewater service provider for the City of Novato and its environs. A portion of the Sphere of Influence south of Novato is served by the Las Galinas Valley Sanitary District, which primarily serves Las Galinas Valley between San Rafael and Novato. Figure 16-1, presented in section A.1.b of this chapter, shows both sanitary districts' boundaries. The Novato Sanitary Strategic Plan completed in 2001 addressed the capital needs of the wastewater collection, pumping, treatment, and recycling facilities through 2025. Novato Sanitary District completed a Wastewater Treatment Facilities Master Plan in 2004 which provided a detailed update of the planning for upgrading the wastewater treatment facilities. A Recycled Water Implementation Plan was completed jointly with North Marin Water District in 2006. A Collection System Master Plan was completed in 2008.

i. Wastewater Facilities Master Plan, 2004

The 2004 Novato Wastewater Facilities Master Plan assesses the management, condition and capacity of wastewater treatment facilities in Novato and recommends alternatives for future development of such facilities.

2. Existing Wastewater Collection and Treatment System

The Novato Sanitary District's wastewater flows, system capacity, treatment operations, wastewater collection and future system improvements are described below:

a. Existing Wastewater Flows

Until March 2008, NSD operated two wastewater treatment plants that discharged into a common outfall. The Novato Treatment Plant provided service to the northern two-thirds of the service area and the Ignacio Treatment Plant provided treatment to the remaining southern portion of the service area. As of March 2008, the Ignacio Treatment Plant is being operated as a pre-treatment plant only. All of the flows from the Ignacio Treatment Plant are pumped to the Novato Treatment Plant for further treatment and discharge or recycling. The treatment plant has an average dry weather flow of

4.53 MGD. During wet weather, the average flow is 8.1 mgd and during significant storms, peak daily flows are over 23 mgd.

b. Treatment System Capacity

The total permitted capacity for the current wastewater treatment system is 6.55 mgd ADWF. NSD is constructing an upgrade to the Novato Treatment Plant which will provide a design ADWF capacity of 7.05 mgd.

c. Collection System

The Collection System consists of 221 miles of sewer lines ranging in size from 6 to 48 inches in diameter, and 38 pumping stations. The system includes approximately 6,000 manholes and other structures.[27]

d. Treatment Operations

During the months of September to May, the Novato Treatment plant can discharge wastewater through an outfall and multiport diffuser located San Pablo Bay next to Hamilton Air Force Base. Typically there is no discharge between May 1st and November 1st because the water is recycled for irrigation. Wastewater discharged into San Pablo Bay must go through secondary treatment, nitrification, filtration and disinfection. Nitrification converts ammonia, which is toxic to aquatic species, into a non-toxic nitrate. Between June and August, wastewater is discharged into effluent storage ponds where it is reclaimed for 820 acres of pastureland irrigation. Treatment and disinfection are needed prior to discharge into storage ponds. Because of the stricter requirements for wastewater discharge into San Pablo Bay, NSD often extends its reclamation and irrigation operations into five or more months of the year.[28]

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[27] Novato Facilities Update website, http://www.studioefx.com/nsd/qanda.htm, accessed January 21, 2009.

[28] Novato Sanitary District, 2004, *2004 Wastewater Facilities Plan, Executive Summary*, page 3.

Novato Sanitary District effluent is also provided to the North Marin Water District which provides further filtration and disinfection before providing it to the Stonetree Golf Course for irrigation.

e. Biosolids Handling

Biosolids from both treatment plants are dried in six sludge holding ponds – two primary and four secondary ponds – for approximately one year, then transferred to a 15.7-acre Dedicated Land Disposal (DLD) site.[29]

f. Wastewater Quality

Wastewater quality in Novato is regulated by the NSDs NPDES permit #CA0037958, which is obtained from the RWQCB. This five-year permit was most recently renewed in 2004, and must be renewed again after 2009. The NPDES permit regulates wastewater discharge into San Pablo Bay from the Novato and Ignacio treatment plants. During the irrigation season the recycled water is regulated by RWQCB Order 92-065.

g. Future Wastewater System Improvements

Based on technical engineering studies of the current wastewater system, Novato Sanitary District determined that it needed to:

- Replace equipment built in the 1950s and 1960s.
- Replace equipment built in the 1980s.
- Upgrade treatment processes to meet current water quality requirements.
- Add backup equipment for facilities.
- Improve operational efficiency by reducing electrical power usage.
- Increase usage of methane gas (from treatment process) as an electrical power generator.
- Add capacity to meet needs called for in the City and County General Plans.

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[29] Novato Sanitary District, 2004, *2004 Wastewater Facilities Plan, Executive Summary*, page 7.

To address these needs, Novato Sanitary District has a $90 million construction project underway to upgrade wastewater treatment facilities by combining treatment facilities into a larger Novato Treatment Plant and converting the Ignacio Treatment Plant into a pump station. Wastewater flows from the new Ignacio pump station are being diverted to the Novato Treatment Plant through a 16-inch pipeline. Construction for this upgrade project started in 2007 and is expected to be completed in 2010.[30]

Additionally, a program to upgrade the 200 miles of sewer collection pipelines and 40 pump stations has been proposed. The program will target capacity bottlenecks in the collection system, replacing aging pump equipment, and repair pipes in poor condition. The District's capital improvement program is projecting average costs of $5.5 million/year for the five years starting in 2009/10 for collection system repairs and upgrades.[31]

C. Stormwater

The following describes regulations and existing conditions with regard to stormwater services in the City of Novato.

1. Regulatory Framework

Several federal, State and local regulations pertain to stormwater service in Novato.

a. Federal Clean Water Act and National Pollutant Discharge Elimination System

The 1987 amendments to the Federal Clean Water Act [Section 402(p)] provided for U.S. EPA regulation of several new categories of nonpoint pollution sources within the existing National Pollutant Discharge Elimination System

[30] Novato Wastewater Facilities Upgrade website, http://www.studioefx.com/nsd/thesolution.htm, accessed January 21, 2009.

[31] Novato Wastewater Facilities Upgrade website, http://www.studioefx.com/nsd/thesolution.htm, accessed January 21, 2009.

(NPDES) Program. The SWRCB is responsible for issuing NPDES permits to cities and counties through the RWQCBs. Phase 2 implementation of NPDES permitting, effective March 10, 2003, extended urban runoff discharge permitting to cities of 50,000 to 100,000 people, and to construction sites which disturb between 1 and 5 acres. Under Phase 2, federal regulations allow two permitting options for stormwater discharges: individual permits and general permits. The California SWRCB elected to adopt a statewide general permit (Water Quality Order No. 2003-0005-DWQ) for Small Municipal Separate Storm Sewer System (MS4s) operators to efficiently regulate stormwater discharges under a single permit. Permitees must develop and implement of a Stormwater Management Plan (SWMP) with the goal of reducing the discharge of pollutants to the maximum extent practicable. The City of Novato is considered a permitee under the statewide general permit.

Under Phase 2 requirements, Marin County must obtain an NPDES permit for storm water discharge. The Marin County Stormwater Pollution Prevention Program (MCSTOPPP), under the auspices of the Marin County Flood Control and Water Conservation District (MCFCWCD), submitted a county-wide Stormwater Management Plan (SWMP) to the RWQCB, which secured the Small MS4 permit in March 2004. Under the direction of the SWMP, Marin County and each of the eleven cities and towns within the county operate their own individual Stormwater Pollution Prevention Programs (SPPPs).

The City of Novato's NPDES Storm Water Program prevents illicit discharges into drains, waterways and wetlands. Each year, the Program is responsible for inspecting, cleaning and restoring 2,900 catch basins, 230,000 linear feet of public storm pipe and over 200 creek pipe outfalls. Additionally, the Program runs a street sweeping service that reduces pollutants and removes trash before entering the drainage system. The street sweeping service removes 2,000 to 4,000 cubic yards of debris each year.

b. Local Regulations and Plans

Action Plan 2010 serves as a five-year stormwater management plan for the member agencies of the Marin County Stormwater Pollution Prevention Program (MCSTOPPP). The County of Marin and each of the cities and towns in the County are member agencies of MCSTOPPP, including the City of Novato. The goal of MCSTOPPP is to prevent stormwater pollution, protect and enhance water quality in creeks and wetlands, preserve beneficial uses in waterways and comply with State and federal regulations. MCSTOPPP coordinates consistency between individual stormwater management plans.

Action Plan 2010 was submitted to and approved by the State Water Resource Control Board in May 2005.

2. Existing Stormwater System

The Marin County Flood Control and Water Conservation District maintains and operates the stormwater system in Novato. The stormwater system consists of 2,900 storm drain catchment basins, 230,000 linear feet of public storm pipe, 200 creek pipe outfalls, and a street-sweeping program. The City of Novato is located in Flood Control Zone No. 1 of the District. Zone No. 1 also includes a large portion of unincorporated land surrounding Novato.

a. Drainage System

The District maintains four stormwater pump stations and performs regular maintenance on portions of Novato Creek, a perennial stream that extends approximately 17 miles from San Pablo Bay to Stafford Lake, and its tributaries, Warner Creek and Arroyo Avichi.[32]

[32] County of Marin Flood Control and Water Conservation District's website, http://www.co.marin.ca.us/depts/pw/main/floodcontrol/fczone1.cfm, accessed January 19, 2009.

b. Transport System

The City of Novato has two stormwater pump stations located at Hamilton Field. These pump stations collect water that flows down the hills. Stormwater is then pumped over the levy and into San Pablo Bay.

3. Future System Improvements

There are currently no planned future system improvements other than regular maintenance performed by the District.[33]

[33] Harlan, David, Public Works Department, City of Novato. Personal communication with Lisa Katz of DC&E, December 18, 2008.

17 NOISE

This chapter provides background information on noise in Novato. The chapter begins with an overview of noise and vibration concepts, including an explanation of noise-related terminology. The next section describes the policies, standards and plans that regulate noise-generating activity. The chapter concludes with a summary of noise-sensitive land uses in Novato and a description of Novato's existing noise environment, including noise generated by vehicle traffic, aircraft and rail service.

A. Noise and Vibration Concepts

This section explains terminology used to describe the measurement of noise, summarizes adverse effects of noise on humans and presents key concepts associated with the measurement of and impacts from groundborne vibration.

1. Noise Terminology

The discussion of noise requires the use of a number of technical terms. Some of the key noise-related terms used in this chapter include:

- **Decibel (dB)**. A decibel is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities.
- **A-weighted sound level (dBA)**. The A-weighted sound level is the most common method to characterize sound in California. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. All sound levels in this chapter are A-weighted, unless reported otherwise.
- **Energy-equivalent sound/noise level (L_{eq}).** L_{eq} describes the average level that has the same acoustical energy as the summation of all the time-varying events. This descriptor is useful because sound levels can vary

markedly over a short period of time. The most common averaging period for L_{eq} is hourly, but it can be of any duration.

- **Day/night average sound level (L_{dn}).** Since the sensitivity to noise increases during the evening and at night, 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. L_{dn} is a measure of the cumulative noise exposure in a community, with a 10 dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) noise levels. This is the measurement that the City of Novato normally uses in noise evaluations and analysis.

- **Community Noise Equivalent Level (CNEL)**. CNEL is the energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m. and 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m.

2. Effects of Noise

Representative outdoor and indoor noise levels in units of dBA are shown in Table 17-1. This table also identifies subjective impressions of these noise levels. A discussion of how varying levels of noise impact sleep, speech and general annoyance is provided below.

a. Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and about 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise above 35 dBA and fluctuating noise levels above about 45 dBA have been shown to affect sleep.

b. Annoyance

Causes for annoyance include interference with speech, radio and television; house vibrations and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. The threshold for annoyance from vehicle noise is about 55 dBA L_{dn}. At an L_{dn} of about 60 dBA, approximately eight percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the

TABLE 17-1 **TYPICAL SOUND LEVELS**

Noise Generators (at a given distance from Noise Sources)	dBA	Noise Environments	Subjective Impression
Civil Defense Siren (100 feet)	130		
Jet Takeoff (200 feet)	120		Pain Threshold
	110		
Diesel Pile Driver (100 feet)	100	Rock music concert	Very Loud
	90	Boiler Room Printing Press Plant	
Freight Cars (50 feet)	80		
	70	In Kitchen with Garbage Disposal Running	Moderately Loud
Freeway (100 feet) Vacuum Cleaner (10 feet)	60	Data Processing Center	
Light Traffic (100 feet) Large Transformer (200 feet)	50	Department Store	
	40	Private Business Office	
Soft Whisper (5 feet)	30	Quiet Bedroom	Quiet
	20	Recording Studio	
	10		Threshold of Hearing

percentage of the population highly annoyed increases to about 20 to 25 percent of the population.

3. Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Table 17-2 displays continuous vibration impacts on human annoyance and on buildings. Annoyance is a subjective measure and vibrations may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying.

Potential sources of vibration in Novato include construction activities and railroad operations. Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction-related ground-borne vibration levels. Railroad operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains and the type of railroad track. Vibration impacts are generally different for passenger and freight operations. The main difference between passenger and freight operations is the time duration of individual events; a passenger train lasts a few seconds whereas a long freight train may last several minutes, depending on speed and length. A discussion of potential ground vibration impacts from the proposed SMART commuter rail service is in Section D.2.

B. Regulatory Framework

This section describes the relevant policies, standards and guidelines relating to noise as established by federal and State agencies and the City of Novato.

1. Federal

a. Department of Housing and Urban Development

Department of Housing and Urban Development (HUD) has established guidelines for evaluating noise impacts on residential projects seeking

TABLE 17-2 **REACTION OF PEOPLE AND DAMAGE TO BUILDINGS FOR CONTINUOUS VIBRATION LEVELS**

Peak Particle Velocity (in/sec)	Human Reaction	Effect on Buildings
0.006 – 0.019	Threshold of perception	Vibration unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of architectural damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings such as plastered walls or ceilings.
0.4 – 0.6	Vibrations considered unpleasant by people subjected to continuous vibrations	Vibration at this level would cause architectural damage and possibly minor structural damage.

Source: Transportation Related Earthborne Vibrations. Caltrans, Technical Advisory, TAV-02-01-R9601, February 2002.

financial support under various grant programs. 23 CFR 772 and 24 CFR 51(B) describe HUD policies and programs to protect against excessive noise in communities and places of residence. These policies and programs apply to development projects with HUD involvement. Section 51.101 of the Code states the HUD goal that the interior noise level in residences should not exceed 45 dB L_{dn}. The normally acceptable noise level for exterior uses is 65 dB L_{dn}.

b. Federal Highway Administration (FHWA)

Title 23 of the Code of Federal Regulations, Part 772 (23 CFR Part 772) requires an assessment of noise and consideration of noise abatement for major proposed federal or federal-aid highway construction projects. The FHWA must consider noise abatement for sensitive receivers when "worst-hour" noise levels approach or exceed 67 dBA L_{eq}.

c. Federal Transit Administration and Federal Railroad Administration

Federal Transit Administration (FTA) and Federal Railroad Administration (FRA) procedures for the evaluation of noise from transit projects are specified in the document titled *Transit Noise and Vibration Impact Assessment.* This analysis uses the FTA's vibration impact criteria for sensitive buildings, residences, and institutional land uses near railroads. The thresholds for residences are 72 vibration decibels (VdB) for frequent events (more than 70 events of the same source per day), 75 VdB for occasional events (30 to 70 vibration events of the same source per day), and 80 VdB for infrequent events (less than 30 vibration events of the same source per day).

2. State of California

a. California Administrative Code Section 65302(f)

California Government Code Section 65302(f) requires that all General Plans include a Noise Element to address noise problems in the community. State law also requires that current and future noise level contours be developed for the following sources:

- Highways and freeways.
- Primary arterials and major local streets.
- Passenger and freight on-line railroad operations and ground rapid transit systems.
- Commercial, general aviation, heliport, and military airport operations, aircraft flyovers, jet engine tests stands and all other ground facilities and maintenance functions related to airport operation.
- Local industrial plants, including, but not limited to, railroad classification yards.
- Other stationary ground noise sources identified by local agencies as contributing to the community noise environment.

State Land Use Compatibility Standards, illustrated in Table 17-3, include a sound level/land use compatibility chart that divides various outdoor L_{dn} ranges into four compatibility categories based on land use: normally acceptable, conditionally acceptable, normally unacceptable and clearly unacceptable. For many land uses, the chart shows overlapping L_{dn} ranges for two or more categories. These overlapping L_{dn} ranges are intended to indicate that local conditions (existing sound levels and community attitudes toward dominant sound sources) should be considered in evaluating land use compatibility at specific locations.

b. California Noise Insulation Standards

The State of California establishes minimum noise insulation performance standards for hotels, motels, dormitories, apartment houses and dwellings other than detached single-family dwellings as set forth in the 2007 California Building Code. The noise limit is a maximum interior noise level of 45 dBA L_{dn}. Where exterior noise levels exceed 60 dBA L_{dn}, a report must be submitted with the building plans describing the noise control measures that have been incorporated into the design of the project to meet the noise limit.

c. Division of Aeronautic Noise Standards

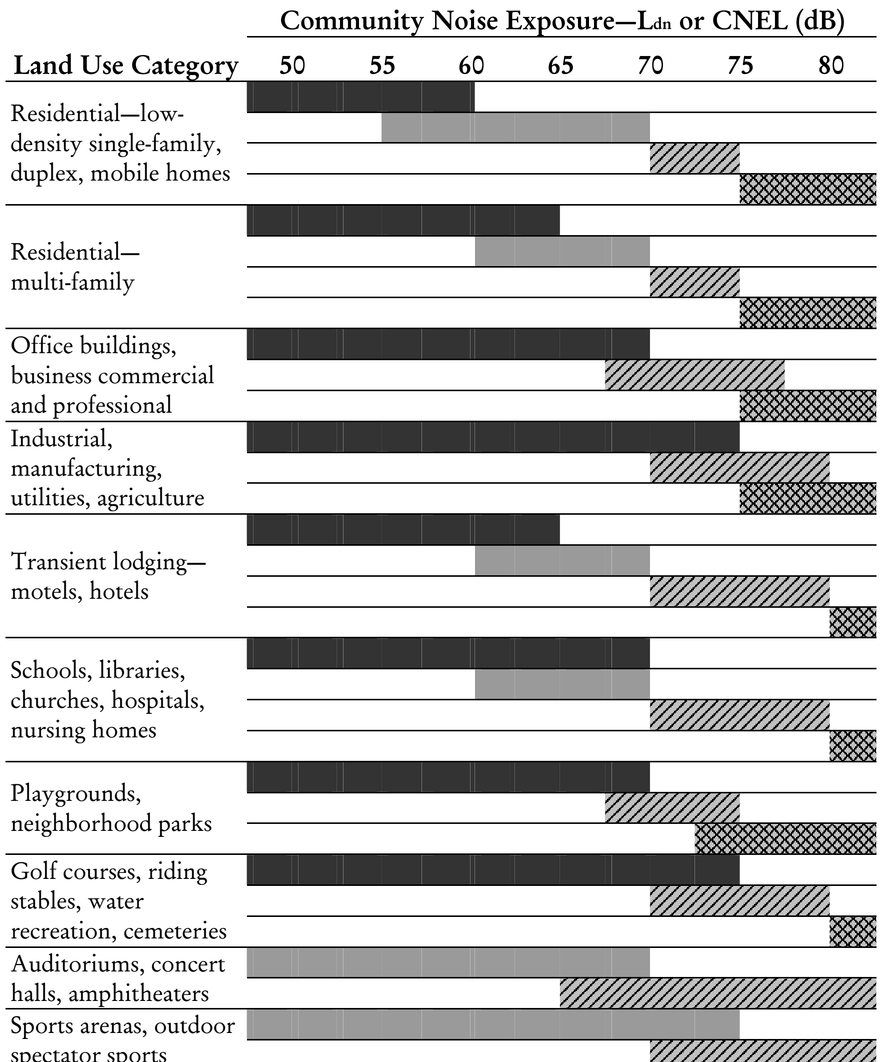
Title 21 Chapter 5000 of the CCR identifies noise compatibility standards for airport operations. Section 5014 of the Code states that the standard for the acceptable level of aircraft noise for persons living in the vicinity of airports is established to be a community noise equivalent level (CNEL) of 65 dB. Land uses such as residences, schools, hospitals or places of worship exposed to aircraft noise exceeding 65 dB CNEL are deemed to be in a noise-impact area.

3. City of Novato

a. General Plan

The existing General Plan includes objectives, policies and programs relating to noise in the Safety and Noise chapter. Noise-related objectives call for the City to ensure compatible development throughout the city, prevent noise increases and reduce noise levels where feasible and practical. Policies and programs to support these objectives focus on enforcing noise and land use

TABLE 17-3 **STATE LAND USE COMPATIBILITY STANDARDS FOR COMMUNITY NOISE ENVIRONMENT**



Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made, and needed noise insulation features must be included in the design.

Clearly Unacceptable: New construction or development generally should not be undertaken.

Source: Governor's Office of Planning and Research 2003.

compatibility standards, mitigating potential noise impacts from new development and roadway projects, restricting truck traffic to designated routes and enforcing the California Vehicle Code that limits noise emissions of vehicles operated on public streets.

The existing General Plan also includes land use compatibility standards for noise, measured in decibels. The General Plan's noise standards are further based on L_{dn}. Normally acceptable noise and land use compatibility standards are presented in Table 17-4.

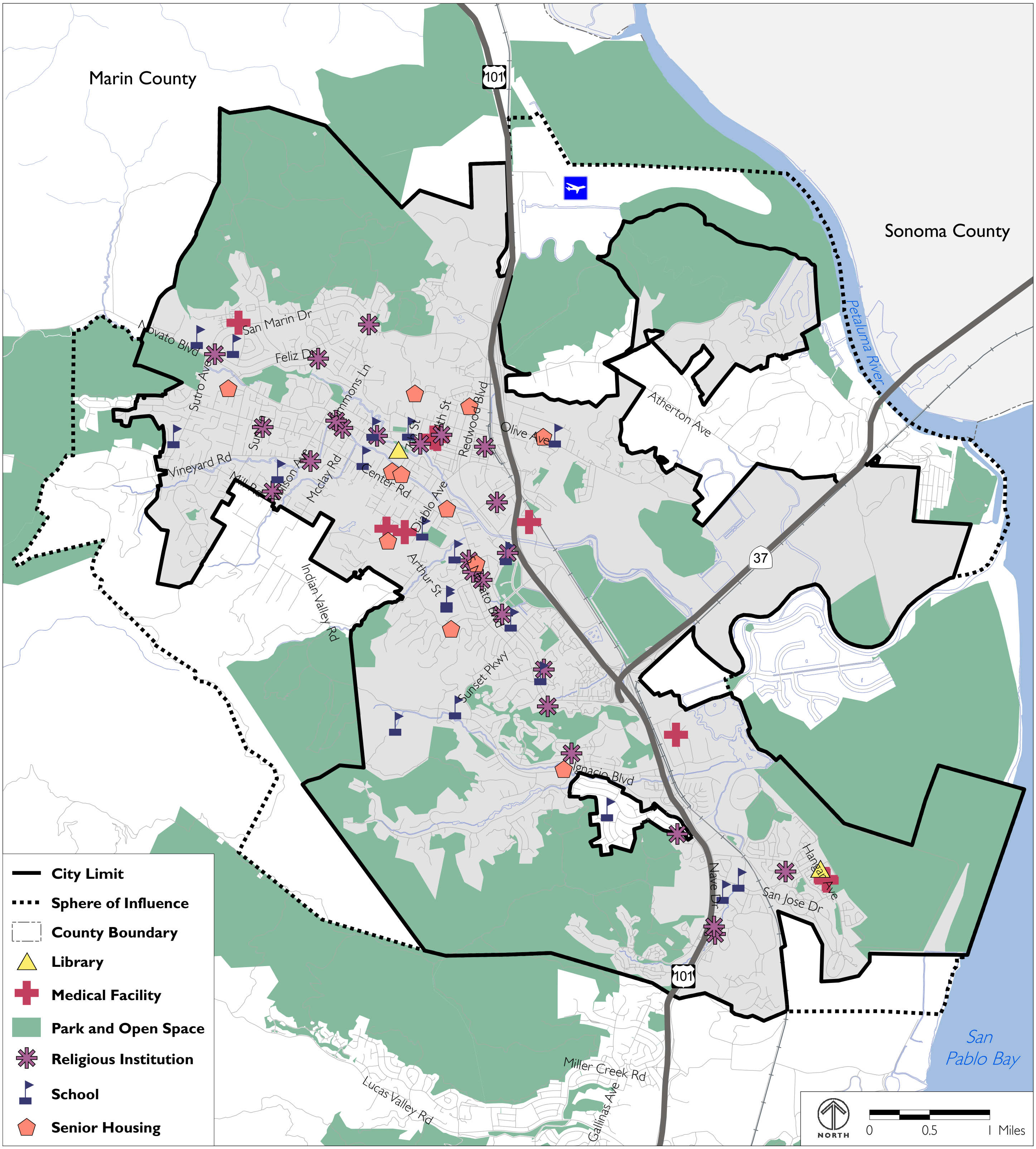
b. City of Novato Municipal Code
Nuisance noise is addressed in Chapter 14 of the Novato Municipal Code. Ordinance 1183 Section 1 states that, "it shall be unlawful and a nuisance for any person between the hours of 10:00 p.m. and 6:00 a.m., within the city persistently to maintain, emit, cause (mechanically or otherwise), or permit any animal owned by or in the possession or control of that person, to emit any noise or sound which, by reason of its raucous or nerve-racking nature, disturbs the peace or comfort or injures the health of any person of normal sensitivity residing within the area provided, however, that poultry and/or livestock in an agriculturally zoned area shall be exempt."

C. Noise-Sensitive Land Uses

Noise-sensitive land uses are defined as locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Specific uses considered sensitive to noise include senior housing, hospitals or healthcare facilities, parks and wildlife areas, places of worship, libraries and schools. The location of these uses are shown in Figure 17-1.

D. Existing Noise Conditions

This section identifies sources of noise and existing noise levels in Novato. The primary source of noise in Novato is vehicle traffic from highways and



Source: Marin County GIS and DC&E

FIGURE 17-1

NOISE SENSITIVE LAND USES

TABLE 17-4 **CITY OF NOVATO LAND USE COMPATIBILITY GUIDELINES FOR COMMUNITY NOISE ENVIRONMENT**

Land Use Category	Threshold of Normally Acceptable
Residential, Hotels and Motels—Indoor	45 L_{dn}
Residential, Hotels and Motels—Outdoor	60 L_{dn}
Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds—Outdoor	65 L_{dn}
Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls and Churches—Outdoor	60 L_{dn}
Office Buildings, Business Commercial and Professional—Outdoor	70 L_{dn}
Industrial, Manufacturing, Utilities and Agriculture—Outdoor	70 L_{dn}

major roadways. Additional noise sources, both present and future, include the Northwest Pacific Railroad corridor and the Marin County Airport at Gnoss Field. There are no known stationary noise sources, such as plants or factories, that make a significant contribution to Novato's noise environment.

1. Highways and Major Roadways

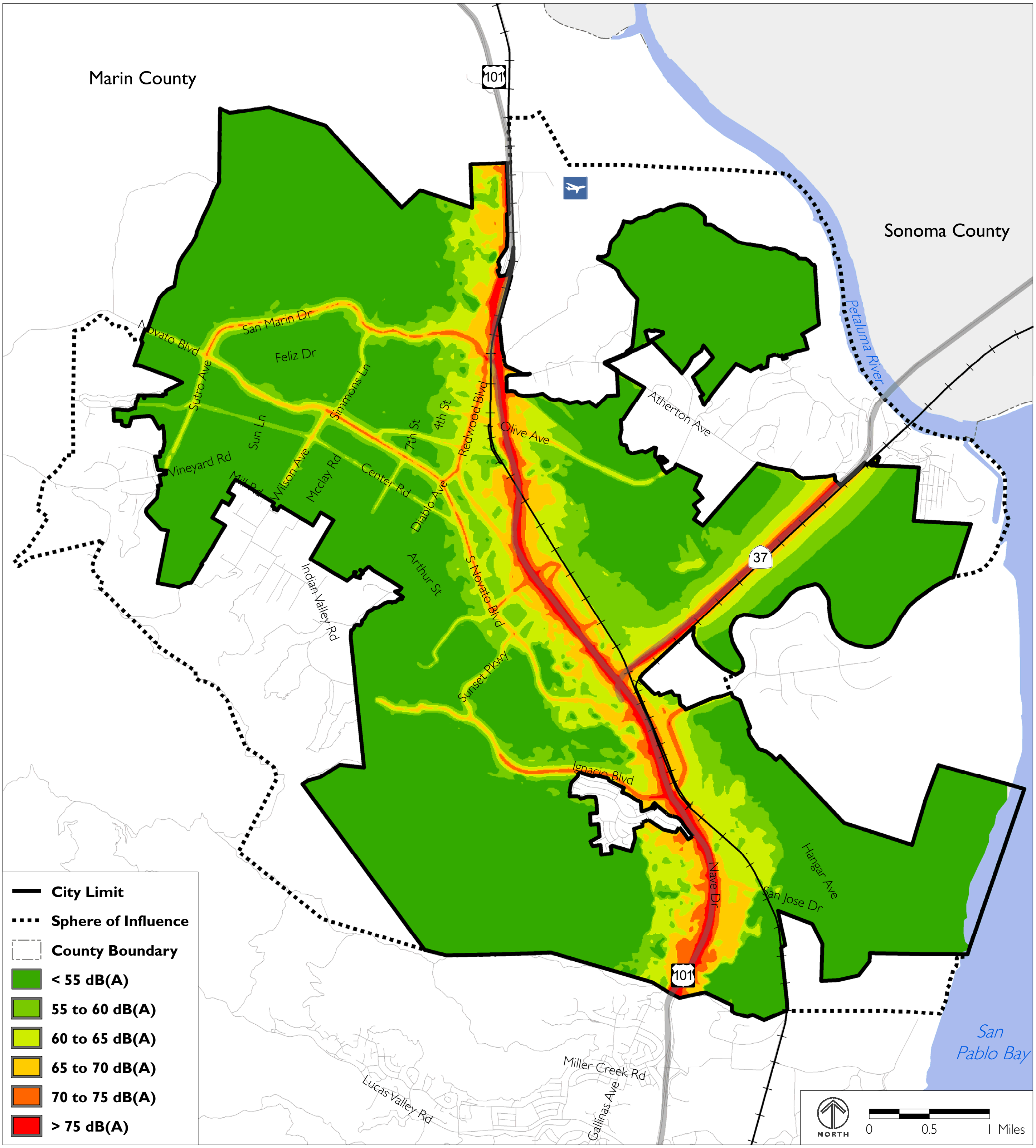
The most significant source of traffic noise in Novato is from Highway 101. State Route 37 also carries high volumes of traffic but does create noise impacts on existing developed areas within the City. Major arterials, including San Marin Drive, Novato Boulevard, South Novato Boulevard, Redwood Road and others are significant noise sources for land uses immediately joining these roadways.

A noise monitoring survey was conducted in December 2008 to quantify noise levels along Highway 101 and major roadways in Novato. Data from this survey was used to create a model of existing traffic noise levels throughout the city. These noise levels, as represented by noise contour lines, are shown in Figure 17-2. Detailed noise measurement data from the December 2008 survey is shown in Appendix N-1.

2. SMART/ Northwest Pacific Railroad

The Northwest Pacific Railroad (NWPRR) roughly parallels Highway 101 in the north and central portion of the city then diverges to the east through Hamilton Field. Freight service has not operated on the NWPRR since September 2001. The North Coast Railroad Authority (NCRA) and Sonoma Marin Area Rail Transit (SMART) propose to reactivate the line with the addition of freight and commute trains in 2014.

SMART recently had a Supplemental EIR approved that analyzed noise and vibration impacts resulting from weekday (12 round trips per day) and weekend (four round trips per day) passenger rail service, as well as three cumulative scenarios including potential freight activity (between three and eight round trips per day). Although the line is not currently a noise source in the community, planned activation of the NWPRR will result in elevated noise levels along the railroad and in the vicinity of at-grade rail crossings. Day-night average noise levels (not near at-grade crossings) are estimated to range from 56 to 59 dBA L_{dn} at a distance of 100 feet from the tracks, assuming combined passenger and freight train service. Train warning whistles can generate maximum noise levels of approximately 105 dBA at 100 feet and would be audible throughout the community. Near at-grade railroad crossings, L_{dn} noise levels will be substantially higher unless the City of Novato obtains Quiet Zone designations from the Public Utilities Commission (PUC), SMART and NCRA, which would eliminate the need for passenger and freight trains to sound their whistles within ¼-mile of at-grade crossings. Trains would also be a source of perceptible groundborne vibration within approximately 50 to 100 feet of the tracks.



Source: Illingworth & Rodkin, 2008

FIGURE 17-2

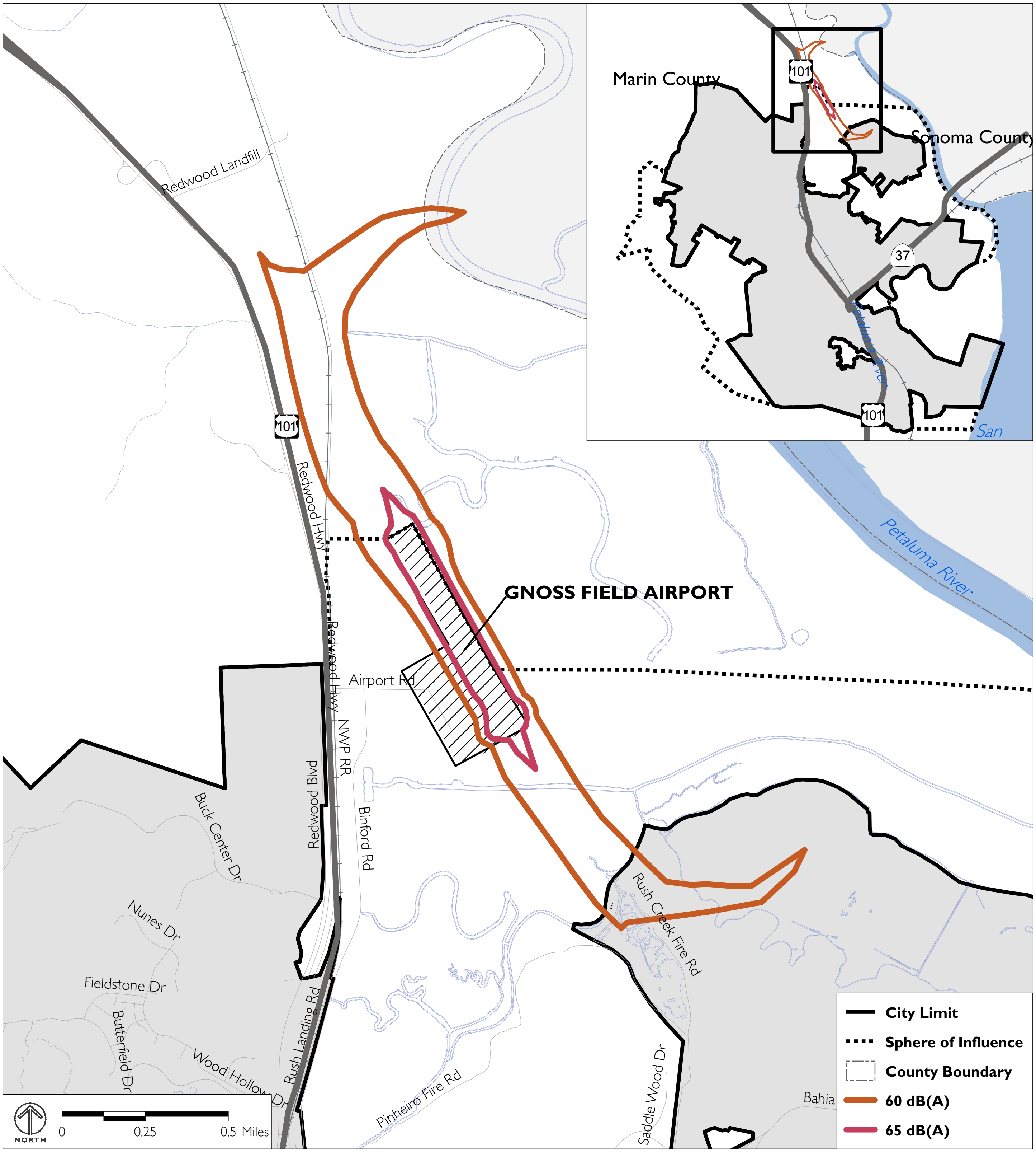
EXISTING VEHICULAR NOISE CONTOURS

3. Aircraft

Aircraft using Gnoss Field Airport intermittently contribute to ambient noise levels in the city. This general aviation airport is located north of the City of Novato east of Highway 101. Aircraft based at the field include 222 aircraft ranging from single-engine light aircraft to corporate jet aircraft. The airport averages about 371 aircraft operations per day. Approximately 77 percent of aircraft operations are local general aviation, 22 percent are transient general aviation, and less than 1 percent are jet air taxi operations. The County encourages airport users to reduce noise and avoid flying over sensitive areas to the south and southeast of the Gnoss Field Airport.

Aircraft noise in California is described in terms of the CNEL, which is approximately equivalent to the day/night average noise level (L_{dn}) but includes a 5 dB weighting factor for the evening hours (7:00 p.m. to 10:00 p.m.). Existing noise contours for Gnoss Field are shown on Figure 17-3. The 60 dBA CNEL noise contour generated by Gnoss Field Airport extends to the northernmost city limits.

Jet aircraft to and from the Oakland and San Francisco International airports generate intermittent noise when passing over the City of Novato. Noise generated by these overflights, although audible and noticeable in quiet areas above other ambient noise sources, does not contribute to daily average noise levels in the city.



Note: Noise contour lines are approximate.

FIGURE 17-3

EXISTING NOISE CONTOURS FOR THE AIRPORT AT GNOSS FIELD

18 GREENHOUSE GASES

This chapter of Novato's Existing Conditions Report describes emissions, relevant State regulations and local policies in Novato and discusses Novato's current strategy and actions to address global warming.

A. Greenhouse Gases and Climate Change

Climate change is a significant, extended change in any measures of average weather over time. Changes may be seen in sustained rising or falling temperatures, significantly higher or lower amounts of precipitation, or changes in wind patterns. Studies predict some positive but mostly negative impacts resulting from human contributions to greenhouse gas (GHG) emissions. Based on these climate change studies, federal, State and local legislation are increasingly encouraging and/or mandating policies that address and mitigate the impacts of global warming.

The earth's atmosphere contains a group of naturally occurring gases that maintain a habitable climate. These gases allow sunlight to enter the earth's atmosphere freely and prevent some of the sun's heat from exiting the atmosphere. Because of their ability to contain heat, the gases are known as greenhouse gases, or GHGs. Natural levels of GHGs exist in balanced proportion, resulting in steady maintenance of the temperature within earth's atmosphere. However, emissions of GHGs from human activities, such as electrical production and motor vehicle use, continue to elevate the concentrations of GHGs, upsetting their natural balance. When GHG concentrations exceed natural concentrations in the atmosphere, the "greenhouse effect" of trapped heat is enhanced, and the phenomenon known as global warming occurs.

1. Greenhouse Gases

California State law defines GHGs to include the following: carbon dioxide, methane, nitrous oxide, and three halocarbons – hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride [Health and Safety Code, Section 38505(g)]. The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide. Many other trace gases have a more powerful effect on global warming, however, these gases are not as plentiful. For this reason, and to gauge the potency of GHGs, scientists at the Intergovernmental Panel on Climate Change (IPCC) have established a Global Warming Potential (GWP) for each GHG based on its ability to absorb and re-radiate thermal radiation. The GWP of a gas is determined using carbon dioxide as the standard unit to assess and add together the impacts of the different gases on global warming. Thus, the GWP of each gas is expressed in carbon dioxide equivalents (CO_2e), where the GWP for carbon dioxide is equal to 1.

a. Carbon Dioxide (CO_2)

Carbon dioxide is primarily generated by fossil fuel combustion in stationary sources, such as power plants, and mobile sources such as vehicles and airplanes. Over the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent. The vast majority of GHG emissions come from the combustion of fossil fuels such as petroleum, coal and natural gas. Carbon dioxide is a by-product of this process, which is elemental to traditional energy production. The production of energy in electrical power plants and automobile engines are two common examples of fossil fuel combustion and resulting carbon dioxide emissions. For this reason, energy use and driving are inextricably linked to global warming. In 2006, energy-related carbon dioxide accounted for approximately 82 percent of GHG emissions in the United States.[1]

b. Methane (CH_4)

Methane is the primary component of natural gas, which is used for space and water heating, steam production and power generation. The GWP of methane is 21. Methane, which accounted for approximately 9 percent of 2006 GHG emissions in the United States, results from the process of organic

[1] United States Energy Information Administration website, http://www.eia.doe.gov/bookshelf/brochures/greenhouse/Chapter1.htm, accessed January 27, 2009.

decomposition.[2] Modern landfills, agricultural operations, coal mines and oil and natural gas operations are the primary sources of methane emissions.

c. Nitrous Oxide (N_2O)
Nitrous oxide is produced by both natural and human related sources. Natural sources are bacteria in the soil and oceans. The majority of nitrous oxide produced by human activity is a result of agriculture, including nitrogen fertilizers and animal waste, which promote nitrous oxide production from naturally-occurring bacteria. Industrial processes and the internal combustion engine also produce nitrous oxide. The GWP of nitrous oxide is 310. Nitrous oxide accounted for 5 percent of total nationwide emissions in 2006.[3]

d. Hydrofluorocarbons (HFCs)
HFCs are typically used as refrigerants for both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam blowing is growing as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) continue to be phased out. The GWP of HFCs ranges from 140 to 6,300.

e. Perfluorocarbons (PFCs)
Perfluorocarbons are compounds consisting of carbon and fluorine, primarily created as byproducts of aluminum production and semi-conductor manufacturing. They are very potent GHGs with a GWP ranging from 5,700 to 11,900. PFCs are a particular concern because their atmospheric lifetime may last up to 50,000 years.

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[2] United States Energy Information Administration website, http://www.eia.doe.gov/bookshelf/brochures/greenhouse/Chapter1.htm, accessed January 27, 2009.

[3] United States Energy Information Administration website, http://www.eia.doe.gov/bookshelf/brochures/greenhouse/Chapter1.htm, accessed August 20, 2008.

f. Sulfur Hexafluoride (SF_6)

This gas is colorless, odorless, nontoxic and nonflammable. It is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity. Sulfur hexafluoride is the most potent GHG that has been evaluated by the IPCC, with a GWP of 23,900. However, its global climate change contribution is not as high when compared to carbon dioxide because of its relatively small presence.

2. Other Compounds

In addition to the six major GHGs discussed above, many other compounds have the potential to contribute to the greenhouse effect. Some of these substances are already being phased out because they are stratospheric ozone depletors. These compounds include hydrochlorofluorocarbons (HCFCs), 1,1,1 trichloroethane, chlorofluorocarbons (CFCs) and ozone.

3. Sources of Greenhouse Gas Emissions

As described above, carbon dioxide, methane, nitrous oxide and other GHGs are emitted as the result of certain natural and technological processes. Emissions levels can be minimized by reducing human activities that rely on those processes. In 2007, CO_2 emissions in the Bay Area came from the following sources:

- Transportation: about 41 percent;
- Industrial and commercial: about 34 percent;
- Electricity: about 15 percent;
- Residential uses (such as home heating and home products like refrigerants or hairspray): about 7 percent; and
- Off-road equipment and agriculture and farming processes: approximately 3 percent.[4]

[4] *Source Inventory of Bay Area Greenhouse Gas Emissions: Base Year 2007*, Bay Area Air Quality Management District, December 2008, page 10.

4. Effects of Global Warming

Although there is strong evidence that global warming is occurring, it is difficult if not impossible to know exactly what will happen to the environment and the economy because of global warming. Some parts of the world may benefit from global warming, receiving longer growing seasons for cultivating crops and less bitter winters.[5] However, many studies predict that more people are likely to see the detrimental effects of global warming, and California and the San Francisco Bay Area are no exception.[6]

According to the California Air Resources Board (CARB), GHG will worsen air quality problems. Scientists predict that rising temperatures as a result of global warming will reduce the Sierra snowpack, thus reducing water quality and supply to the State and increasing risk for catastrophic wildfires, droughts and flash floods. Rising sea levels will displace thousands of businesses and homes, damage the land and marine ecosystems.

B. Regulatory Environment

The section describes state and local regulations relevant to GHG emissions and emissions reduction in the City of Novato.

1. State Regulations

a. Executive Order S-3-05

In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established goals to reduce statewide GHG emissions to 2000 levels by 2010; to 1990 levels by 2020; and to 80 percent below 1990 levels by 2050.

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[5] "Understanding and Responding to Climate Change: Highlights of National Academies Reports, 2008 edition." The National Academies, 2008, page 2.

[6] "Backgrounder: The Greenhouse Effect and California." California Air Resources Board, as part of California Assembly Bill 1493 (Pavley), July 2002, http://www.arb.ca.gov/cc/factsheets/ccbackground.pdf, accessed January 26, 2009.

The Secretary of the California EPA (the Secretary) is required to coordinate efforts of various agencies in order to collectively and efficiently reduce GHGs, in addition to submitting biannual progress reports to the Governor and State Legislature disclosing progress made toward GHG emissions reductions. In addition, another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, coastline and forests as well as reporting possible mitigation and adaptation plans to combat these impacts.

b. Assembly Bill 32

In 2006, the California State Legislature adopted Assembly Bill (AB) 32, known as the California Global Warming Solutions Act (Section 38560.5 of the Health and Safety Code) to further the goals of Executive Order S-3-05. AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries, with penalties for noncompliance. This legislation sets a cap on statewide GHG emissions and establishes the regulatory framework to achieve corresponding reductions in emissions. AB 32 charges CARB, the State agency responsible for regulating statewide air quality, with implementation of the act. CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost effective GHG emission reductions.

CARB's responsibilities include monitoring compliance and enforcing adopted regulations or emission reduction measures. As part of AB 32, CARB was required to adopt mandatory reporting rules for significant sources of greenhouse gases. These rules were adopted by CARB in December 2007 and became effective in January 2009. AB 32 also required CARB to prepare a Scoping Plan to guide the State in reducing significant sources of GHGs. The Scoping Plan, approved by CARB in December 2008, includes direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system.[7] Local government land use decisions, such as the

[7] California Air Resources Board website, http://www.arb.ca.gov/homepage.htm, accessed February 9, 2009.

Novato General Plan, is one category of actions included in CARB's Scoping Plan.

c. Senate Bill 97

Senate Bill (SB) 97 (2007) requires the California Office of Planning and Research (OPR) to develop CEQA guidelines for the analysis and, if necessary, mitigation of GHG emissions or the effects of GHG emissions. OPR must submit these guidelines to the California Natural Resources Agency by July 1, 2009. These CEQA guidelines must address, but are not limited to, GHG emissions effects associated with transportation or energy consumption. The California Natural Resources Agency must certify and adopt the guidelines prepared by OPR by January 1, 2010.

d. Senate Bill 375

The purpose of SB 375 (2008) is to reduce GHG emissions by coordinating transportation funding and land use planning on a regional level. SB 375 directs CARB to reduce emissions from cars and light trucks by incentivizing compact development, calculate statewide emissions reductions targets, and to assign regional emissions reduction targets to each metropolitan planning organization (MPO) in the State. The first step outlined in SB 375 calls for MPOs and the California Air Quality Board to establish a region's greenhouse gas reduction target. Then, the MPO must develop a sustainable community's strategy (SCS), which is a compact-oriented plan for the region's future development pattern that will meet the target. SB 375 requires the greenhouse gas reduction target and the SCS be incorporated into the Regional Transportation Plan (RTP).

Transportation and development projects consistent with the SCS will be given priority for state and regional funding. Additionally, SCS-consistent residential development projects receive streamlined environmental review processes. SB 375 also changes housing element law, extending the planning period for the housing element to eight years, and linking Housing Element timelines to RTP timelines for increased consistency.

2. Local Policies

a. Novato Climate Action Plan (In Progress)

Novato is a member of the International Council for Local Environmental Initiatives (ICLEI), now referred to as ICLEI – Local Governments for Sustainability. As a member of ICLEI, Novato has joined the Cities for Climate Protection Campaign (CCP), which offers tools through ICLEI to help cities achieve their goals to reduce GHG emissions.

The City of Novato formed it's Sustainability Committee in early 2008 to develop strategies and policies to be incorporated into Novato's Climate Action Plan. This Sustainability Committee meets monthly and posts agendas and meeting minutes on the City's website.

The Committee is currently working toward achieving the first three of five total CCP milestones to reduce GHG emissions. The five CCP milestones are:[8]

1. Create a baseline emissions inventory and forecast.
2. Adopt an emissions reduction target/goal.
3. Develop a local Climate Action Plan.
4. Implement strategies and policies within Climate Action Plan.
5. Track and verify results.

The status of the first three milestones as recorded at the November 3, 2008 Sustainability Committee meeting is described below.[9]

i. Emission Inventory

Under the ICLEI model, Milestone 1 requires that Novato develop a baseline community inventory and a municipal inventory of GHG emissions. The community inventory reports GHG emissions that occur with the limits of the City, including emissions from activities that are generated from

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[8] ICLEI's website, http://www.iclei.org/index.php?id=810, accessed January 27, 2009.

[9] "Staff Report: Status of Local Climate Action Plan." Sustainability Committee, City of Novato, November 3, 2008, page 2.

residential, commercial and industrial land uses, transportation and waste management activities. The municipal inventory reports GHG emissions related to the activities if the local government, whether or not the source is located within the boundaries of the City. The Sustainability Committee has completed Novato's community inventory, and the municipal inventory is currently in progress.

ii. Emission Reduction Target/Goal

The inventory data and final report must be completed before the Sustainability Committee can work on Milestone 2 to set and adopt an emissions reduction target/goal. The emissions reduction target/goal will be based on the amount of GHG emissions that must be reduced in order to achieve Novato's 1990 GHG emissions levels by the year 2020. As described earlier, this goal is mandated by AB 32.

The Sustainability Committee plans to use ICLEI's Climate and Air Pollution Planning Assistant (CAPPA) tool, which assists local governments in setting reduction targets/goals and developing emissions reduction strategies. ICLEI expects to release the CAPPA tool in spring of 2009.

iii. Local Climate Action Plan

Although a portion of Milestone 1 has been completed and Milestone 2 has not yet been achieved, the Sustainability Committee has developed a draft outline and some emissions reduction measures for the Local Climate Action Plan. As of the meeting on May 5, 2008, the Sustainability Committee adopted the nine topics suggested by the Institute for Local Government, and will develop GHG reduction measures for each topic.[10]

- ♦ Energy efficiency (usage) and conservation (supply)
- ♦ Waste reduction and recycling
- ♦ Purchasing and contracting and innovations in City operations
- ♦ Efficient transportation
- ♦ Land use and community design

[10] City of Novato, Sustainability Committee, 2008. *Staff Report: Status of Local Climate Action Plan.* November 3, page 3.

- Efficient building practices
- Water and wastewater systems
- Carbon emissions
- Community and individual actions

As of the November 3, 2008 Sustainability Committee meeting, the Committee has proposed some preliminary measures relating to the climate-friendly purchasing and contracting, efficient transportation, and land use and community design topics.

b. Novato Green Building Ordinance

Novato recently adopted a new green building ordinance that incorporates such requirements for residential and commercial development. The new ordinance is based on the California Green Building Standards Code, approved July 17, 2008 by the California Building Standards Commission. Novato's new green building ordinance establishes a "green point" system based generally on the "Silver" Leadership in Energy and Environmental Design (LEED™) rating level. LEED™ is a nationally-accepted green building rating system that many developers follow in order to build projects that incorporate efficient and environmentally sustainable elements.

c. Novato General Plan

Several policies in the existing Novato General Plan, adopted in 1996, relate to climate change issues. The Environment chapter addresses energy conservation and air quality with the following objectives and related policies:

- EN Objective 8: Reduce dependence on non-renewable energy and materials.
  - EN Policy 28: Energy Conservation. Consider land use patterns and policies that promote energy conservation. *The Land Use Chapter encourages mixed use projects in and near the Downtown and in neighborhood shopping centers. The Transportation Chapter contains policies and programs that encourage reductions in the use of single-occupant vehicles and encourage the use of bicycles and other travel modes that do not consume fossil fuels.*

- EN Policy 29: Energy Conservation Measures in Buildings. Reduce energy consumption by requiring structures to meet the energy conservation requirements stipulated in the State Building Code and State Title 24 regulations.
- EN Policy 30: Energy Efficiency in Public Programs. Assure energy efficiency in local government operations.
- EN Policy 31: Development Review Process. Consider energy conservation in the development review process.

♦ EN Objective 9: Work to protect and improve air quality.

- EN Policy 32: Regional Planning to Improve Air Quality. Continue to cooperate with the Bay Area Air Quality Management District (BAAQMD) in implementing the regional Clean Air Plan.
- EN Policy 33: Vehicle Trips. Encourage transportation facilities and modes that minimize motor vehicle use.
- EN Policy 34: Local Efforts. Encourage local efforts to improve air quality.

d. Community Strategic Plan

Novato 2028: A Vision for the Future provides policy recommendations to guide local decision-makers on the future of Novato for the next 25 years. Under the topic "Sustainable Community: Natural Environment, Economy and Social Equity," Novato citizens describe the following vision and policies for the Natural Environment:[11]

♦ Vision 2: A community in which conservation, reclamation, recycling, efficient use of resources, and exploration of renewable sources of energy and materials are the norm.

- 2(b): Implement Novato's official commitment to the "Cities for Climate Protection" (CCP) program to reduce GHG emissions.

[11] City of Novato, 2003. *Novato 2028: A Vision For the Future.* October 20, page 22.

- 2(c): Encourage new construction or retrofitting to use the most advanced "Green Building" technologies.
- 2(d): Encourage the water agencies serving Novato to increase water recycling and reuse plans, and encourage energy efficiency in water processing and movement.

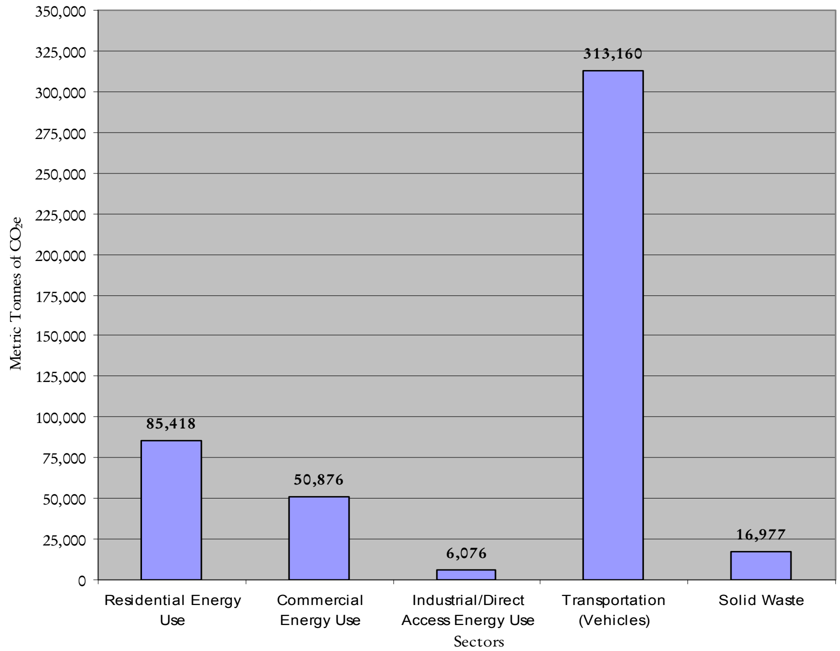
C. Greenhouse Gas Emissions Inventory

As discussed above, Novato's Sustainability Committee completed its community inventory, which estimated GHG emissions within the City of Novato, and is currently working on its municipal inventory. Novato determined its baseline community inventory using the Clean Air and Climate Protection (CACP) software provided by ICLEI to calculate and track GHG emissions. The CACP software was developed jointly by the National Association of Clean Air Agencies (NACAA), ICLEI, and the U.S. Environmental Protection Agency. It quantifies emissions for GHGs in the CO_2 equivalent (CO_2e) units in order to compare the emissions from various GHGs based on their Global Warming Potential (GWP), as described in Section A.1, above.

ICLEI requires the City to choose a baseline year that has sufficiently available data and appropriately represents the general level of emissions over the surrounding time period be used to calculate emissions. Novato used 2005 as its baseline year and estimated its natural gas consumption in therms (heat energy units), electricity consumption in kilowatt-hours (kWh), transportation in vehicle miles traveled (VMT) and solid waste in tons in that year, inputting this information into the CACP software. The software then converts these energy, waste and transportation inputs into CO_2e emissions specific to the California/Nevada section of the Western Electricity Coordinating Council.

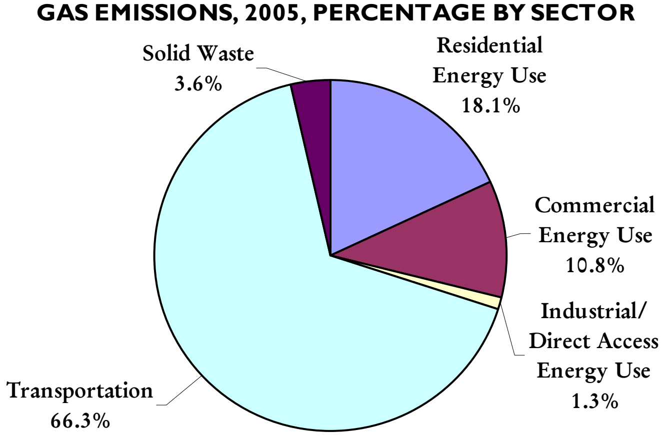
Figures 18-1 and 18-2 below present the GHG emissions outputs for the City of Novato's community inventory using the data inputs from Table 18-1.

FIGURE 18-1 **NOVATO COMMUNITY GREENHOUSE GAS EMISSIONS, 2005, TOTAL TONNES CO_2e PER SECTOR**



Source: "Community GHG Inventory Summary – Report." Sustainability Committee, City of Novato, http://www.ci.novato.ca.us/Index.aspx?page=693, accessed January 29, 2009.

FIGURE 18-2 **NOVATO COMMUNITY GREENHOUSE GAS EMISSIONS, 2005, PERCENTAGE BY SECTOR**



Source: "Community GHG Inventory Summary – Report." Sustainability Committee, City of Novato, http://www.ci.novato.ca.us/Index.aspx?page=693, accessed January 29, 2009.

Figure 18-1 shows Novato's community emissions in baseline year 2005 by total metric tonnes of CO_2e per sector, while Figure 18-2 shows Novato's emissions in 2005 by percentage breakdown by sector. Approximately two-thirds, or 313,160 metric tonnes CO_2e of total community GHG emissions resulted from transportation.

D. Regional Greenhouse Gas Emissions

Novato is located in Marin County, which has the second-lowest annual direct emissions of the nine Bay Area counties, contributing 3.1 million metric tonnes of CO_{2e} emissions in 2007.[12] Only Napa County, with about half Marin County's population, has lower emissions.

Of the emissions attributed to Marin County, over half of emissions come from transportation, about 16 percent from industrial and commercial energy use, about 13 percent from residential sources and about 10 percent from electricity sources. As previously mentioned, the term 'sources,' with respect to a community inventory, refers to all GHG producing energy usage, from fuel combustion in an automobile to the emissions produced from a refrigerator in a single-family home, to hairspray or paint. The remainder, approximately 6 percent, is attributed to off-road equipment, agriculture and farming processes.

[12] *Source Inventory of Bay Area Greenhouse Gas Emissions: Base Year 2007,* Bay Area Air Quality Management District, December 2008, pages 14-15.

Appendix A

Affordable Housing Calculator

AFFORDABLE HOUSING CALCULATOR

Appendix Table A-1: Affordable Sales Price Calculator

	Household Income (a)	Sale Price	Down Payment (b)	Total Mortgage (b)	Monthly Payment	Monthly Property Tax (c)	Mortgage Insurance (d)	Homeowner's Insurance (e)	Total Monthly PITI (f)
Extremely Low Income (30% AMI)									
4 Person HH	$33,950	$137,827	$27,565	$110,262	$704.20	$126.34	$0.00	$18.21	$848.75
Very Low Income (50% AMI)									
4 Person HH	$56,550	$229,577	$45,915	$183,661	$1,172.97	$210.45	$0.00	$30.33	$1,413.75
Low Income (80% AMI)									
4 Person HH	$90,500	$367,404	$73,481	$293,923	$1,877.17	$336.79	$0.00	$48.55	$2,262.50
Median Income (100% AMI)									
4 Person HH	$95,000	$385,673	$77,135	$308,538	$1,970.51	$353.53	$0.00	$50.96	$2,375.00
Moderate (120% AMI)									
4 Person HH	$114,000	$462,807	$92,561	$370,246	$2,364.61	$424.24	$0.00	$61.15	$2,850.00

Notes:

(a) Published by Department of Housing and Community Development. Income limits for Marin County. <http://www.hcd.ca.gov/hpd/hrc/rep/state/inc2k8.pdf>

(b) Mortgage terms:

Annual Interest Rate (Fixed)	6.60%	Freddie Mac historical monthly Primary Mortgage Market Survey data tables. Ten-year average.
Term of mortgage (Years)	30	
Percent of sale price as down payment	20.0%	
(c) Initial property tax (annual)	1.10%	
(d) Mortgage Insurance as percent of loan amount	0.00%	
(e) Annual homeowner's insurance rate as percent of sale price	0.16%	CA Dept. of Insurance website, based on average of all quotes, assuming $150K coverage and newly-built home.

(f) PITI = Principal, Interest, Taxes, and Insurance

Percent of household income available for PITI 30.0%

Sources: CA HCD 2008; Freddie Mac 2008; CA Department of Insurance, 2008; BAE 2008.

Appendix B

Development and Real Estate

APPENDIX B

DEVELOPMENT AND REAL ESTATE

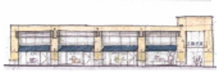
Table B-1: Planned and Proposed Projects in Novato

Name/Address	Status	Description
Eden Housing/ 806 Diablo Avenue	Proposed	61 Multi-Family dwelling units
Whole Foods	Under Construction	Mixed Use: retail/ 124 Multi-Family dwelling units
999 Grant Avenue	Proposed	20,000 sf Retail/Office
Fireman's Fund (The Commons at Mt. Burdell)	Proposed	800,000 sf Commercial/Office/RetailHotel/Residential (150 units)
Hamilton Marketplace	Recently completed	60,000 sf Retail
McPhail's site/junction of Highway 37 & 101	Approved	62,000 sf Office
Woodview/ Dorothy Way	Under Construction	20 Single Family Detached dwelling units
Canyon Green/1625 Hill Road	Approved	25 Single Family dwelling units
Oak View Office/Meadow Crest Road	Approved	24,000 sf Office
200 San Marin Drive	Approved	65,000 sf Office
Novato Creek Landing/ Landing Court	Approved	29,500 sf Office
350 Hangar Avenue Subdivision	Approved	27 Single Family Detached dwelling units
700 Hangar Avenue Infill	Approved	56,000 sf Office
Redwood Commons/999 South Novato Boulevard	Proposed	9,300 sf Office/Commercial
Atherton Place/ North Redwood Boulevard at Phinero Drive	Proposed	Mixed Use: 5,600 sf Retail/Office, 54 Multi-Family dwelling units
Summerston Homes/ Marion Avenue	Under Construction	12 Single Family Detached dwelling units
Rudnick Estates/ Olive Avenue	Approved	24 Single Family dwelling units
Next Key/ 1399 North Hamilton Parkway	Recently Completed	32 very-very low affordable single room occupancy units, Conference/Training Facility
Walnut Meadows/840 McClay Road	Proposed	14 Single Family Detached dwelling units

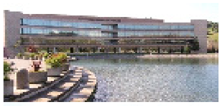
Table B-2: Sample of Currently Leasing Office Properties in Novato

Photo	Name & Address	Year Built	Total SF	Available SF	Vacancy Rates	Monthly Lease/SF	Comments
Bel Marin Keys							
	350 Ignacio Blvd Novato 94949		18,369	7,589	41%	$2.25 Full Svc.	Premier Office Condo Project. Newly renovated building.
	9 Commercial Boulevard Novato 94945	1984	25,635	2,637	10%	$1.65 Full Svc.	2-story office in Bel Marin Office Park. Owner is installing an elevator.
	10 Commercial Blvd. Novato 93945		20,000	7,000	35%	$1.90 Full Svc.	Three private offices. ADA compliant. On-site parking. Easy access to Highway 101.
	353-359 Bel Marin Keys Blvd. Novato 94949		26,000	4,027	15%	$1.65 Gross	Abundant on-site parking. Central downtown location.
	384 Bel Marin Keys Blvd. Novato 93945		30,549	5,782	19%	$1.60 Full Svc.	Nine private offices. Centrally located in Bel Marin Business Park.
	390 Bel Marin Keys Blvd. Unit H Novato 94949		30,500	520	2%	$1.50 Gross	2nd floor office with windows. One private office and onsite parking.
	31 Pamaron Way Novato 94949		8,200	3,040	37%	$1.50 Gross	Ground floor offices. Includes reception area, 3 private offices.
	32 Pamaron Way Novato 94949	1978	13,397	8,525	64%	$1.20 Gross	Office/ light industrial warehouse.
Rowland Plaza							
	75 Rowland Way Novato 94945	1997	80,159	25,079	31%	$2.35 Full Svc.	Class "A" Office Space. Ample Parking, Freeway visibility. Adjacent to Vintage Oaks Shopping Center.
	Rowland Plaza I 88 Rowland Wy Novato 94945	1995	63,793	32,280	51%	$2.35 Full Svc.	Class "A" Office Space. Ample Parking, Freeway visibility. Adjacent to Vintage Oaks Shopping Center.

Central Novato

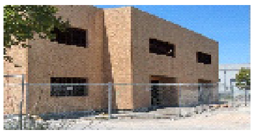
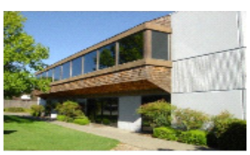
	695 De Long Ave. Novato 94945		13,000	3,450	27%	$1.80 Mod. Gross	Highly visible from Highway 101. 2 ground floor offices.
	690 DeLong Ave Novato 94945	2008	9,900	9,900	100%	$2.25 Gross	For Sale: $3,910,500.00 4 units from 2,475 SF to the entire bldg. Office Condominiums.
	Washington Mutual Bldg. 1595 Grant Ave, #201 Novato 94945		15,400	2,000	13%	$2.10 Full Svc.	3 offices and elevator.
	1737 Grant Ave., Suite 2 Novato 94945		20,000	4,500	23%	$2.00 Full Svc.	Below market rent. 9 private offices. Signage opportunity.
	Novato Executive Building 1450 Grant Ave Novato 94945		20,300	2,000	10%	$1.60 Full Svc.	Lease rate does not include janitorial.
	999 Grant Ave Novato 94949		10,000	10,000	100%	$3.00 Gross	Lease rate includes PG&E Tenant is responsible for own janitorial services. Prime corner location in downtown Novato. Near new Whole Foods.
	1602 Grant Ave. Novato 94945		10,000	1,636	16%	$2.25 Full Svc.	Currently under construction. TI's included.
	1595 Grant Ave, #201 Novato 94945		15,400	2000	13%	$2.10 Full Svc.	Class B Office Space 3 private offices. Ample parking.
	1683 Novato Blvd. Novato 94947		8,000	890	11%	$2.36 Gross	Rancho Novato Office Complex. 2 private offices.
	The City Center 1701 Novato Blvd. Novato 94947	1987	35,600	8,302	23%	$2.25 Full Svc.	Class A office space. Renovated; located at Tamalpais and Novato Blvd.
	2 Ranch Drive Novato 94945	1985	3,974	3,500	88%	$3.00 Gross	11 private offices, 10 private office spaces. Victorian building.

Northern Novato

	773 San Marin Drive Novato 94947	1993	235,000	160,065	68%	$2.20 Full Svc.	Class "A" office building. 2 full floors 57,000 RSF each. Available space is divisible to 3.
	505A San Marin Drive Novato 94945	1982	19,577	5,272	27%	$1.95 Full Svc.	Class B Office Space

Sources: Loopnet, 2008; BAE, 2008.

Table B-3: Sample of Currently Leasing Industrial Properties in Novato

Photo	Name & Address	Year Built	Total SF	Available SF	Vacancy Rates	Monthly Lease/SF	Comments
	400 Enfrente Rd Novato 94949		3,870	3,870	100%	$2.00 Gross	Configured for automotive service. Corner lot with 200 feet of freeway frontage. CalTrans average traffic counts 149,000 vehicles per day.
	275 Bel Marin Keys Blvd. Novato 93945		20,261	5,056	25%	$1.10 Gross	New 2008 2-story Office/Warehouse building. Insulated warehouse and high-end finishes.
	35 Pamaron Way, A & B Novato 94949	1978	5,400	2,000	37%	$1.10 Gross	Approx. 710 sq. ft of office with 1260 sq. ft. of 18' warehouse with two roll up doors. Private Parking lot. 700 sf of Mezzanine space is included with this space.
	5498 Nave Dr Novato 94945		6,830	6,830	100%	$0.73 Gross	Lease price $5,000 per month. GrossOffice: 1,440 sq. ft.Warehouse: 5,390 sq. ft. Lot size: 25,000 sq. ft.Yard area: 15,000 sq. ft For sale or lease.
	32 Hamilton Dr. Novato 94949		9,440	4,720	50%	$1.10- $1.50 Gross	Can be combined with 1,840 sf office.
	25 Leveroni Ct Novato 94945		50,000	11,520	23%	$1.25 NNN (0.85)	Loft type office space, wide open plan ready to occupy.
	15 Leveroni Ct Novato 94949		23,901	12,589	53%	$1.35 NNN ($0.22)	First and second floor office/R&D space. Lakepoint Business Park/ Bel Marin Keys area of Novato.

Sources: Loopnet, 2008; BAE, 2008.

Table B-4: Distribution of Jobs by Industry and Land Use

		Percent Distribution by Place of Work					
NAICS Code	**Title**	**Office**	**Industrial**	**Retail**	**Hotel**	**Other (a)**	**Total**
23	Construction	5%	15%	0%	0%	80%	100%
42	Wholesale trade	10%	85%	0%	0%	5%	100%
44-45	Retail Trade	10%	0%	75%	0%	15%	100%
48-49	Transportation & Warehousing	0%	75%	0%	0%	25%	100%
51	Information	100%	0%	0%	0%	0%	100%
52	Finance & insurance	100%	0%	0%	0%	0%	100%
53	Real estate & rental & leasing	75%	0%	0%	0%	25%	100%
54-55	Professional, Science, Tech Svcs, & Mgmt of Companies	90%	10%	0%	0%	0%	100%
56	Administrative, Support, Waste Mgmt, & Remediation Svcs	30%	0%	0%	0%	70%	100%
61	Educational services	5%	0%	0%	0%	95%	100%
62	Health care & social assistance	50%	0%	0%	0%	50%	100%
71	Arts, entertainment, & recreation	10%	0%	70%	0%	20%	100%
72	Accommodation & foodservices	0%	0%	60%	40%	0%	100%
81	Other services (except public administration)	20%	20%	20%	0%	40%	100%
92	Government	65%	0%	0%	0%	35%	100%

Note: (a) Includes schools, non-place-based workers, hospitals, home-based workers, and other assorted facilities.
Sources: Labor Market Statistics from Florida Agency for Workforce Innovation, 2006; BAE, 2008.

Table B-5: Percent of Office and Industrial Jobs for ABAG Job Sectors, City of Novato (a)

			Office Based Jobs			Industrial Jobs		
Primary Industries (a)		# of Jobs (b)	% of Total Within Sector	% Office-Based Jobs (c)	% Office-Based Jobs within Sector (d)	% of Total Within Sector	% Industrial Based Jobs (c)	% Industrial-Based Jobs within Sector (d)
Agriculture and Natural Resource Jobs								
11	Agriculture, Fishing, and Forestry	30	100%	20%		100%	10%	
21	Mining	0	0%	15%		0%	10%	
TOTAL		30	100%		**20%**	100%		**10%**
Manufacturing, Wholesale and Transportation Jobs								
22	Utilities	27	2%	10%		2%	55%	
31-33	Manufacturing	403	30%	20%		30%	65%	
42	Wholesale trade	774	57%	10%		57%	85%	
48-49	Transportation & Warehousing	148	11%	0%		11%	75%	
TOTAL		1,352	100%		**12%**	100%		**77%**
Retail Jobs								
44-45	Retail Trade	2,568		10%	**10%**		0%	**0%**
Financial and Professional Service Jobs								
52	Finance & insurance	2,229	27%	100%		27%	0%	
53	Real estate & rental & leasing	427	5%	75%		5%	0%	
54-55	Prof, Science, Tech Svcs, & Mgmt of Companies	3,382	40%	90%		40%	10%	
56	Admin, Support, Waste Mgmt, & Remediation Svcs	2,336	28%	30%		28%	0%	
TOTAL		8,374	100%		**75%**	100%		**4%**
Health, Educational and Recreational Service Jobs								
61	Educational services	468	8%	5%		8%	0%	
62	Health care & social assistance	2,047	34%	50%		34%	0%	
71	Arts, entertainment, & recreation	610	10%	10%		10%	0%	
72	Accommodation & foodservices	1,871	31%	0%		31%	0%	
81	Other services (except public administration)	1,038	17%	20%		17%	20%	
TOTAL		6,034	100%		**22%**	100%		**3%**
Other Jobs								
23	Construction	2,061	45%	5%		45%	15%	
51	Information	592	13%	100%		13%	0%	
92	Government	1,881	41%	65%		41%	0%	
TOTAL		4,534	100%		**42%**	100%		**7%**

Notes:
(a) ABAG provides employment projections for six job sectors, each defined by the particular NAICS categories listed below the sector.
(b) Employment data by NAICS category reported for the City of Novato, 3Q 2007, by California EDD.
(c) The percent of office and industrial based jobs for each NAICS category estimated by BAE based on the profile of professions within each sector. See preceding Appendix table.
(d) The percent of office and industrial based jobs for each major sector is the weighted average of the percent of office-based jobs for each NAICS category.
Sources: Association of Bay Area Governments, Projections 2007; California Employment Development Department, 2008, BAE, 2008.

Table B-6: Office and Industrial Job Projections for ABAG Employment Sectors, Novato

	% Office Jobs (a)	% Industrial Jobs (a)	2005 Jobs	2005 Office Jobs	2005 Industrial Jobs	2035 Jobs	2035 Office Jobs	2035 Industrial Jobs
Agriculture and Natural Resource	20%	10%	60	12	6	60	12	6
Manufacturing, Wholesale and Transportation	12%	77%	3,250	386	2,514	4,040	480	3,125
Retail	10%	0%	3,540	354	-	4,830	483	-
Financial and Professional Service	75%	4%	8,350	6,276	337	12,040	9,049	486
Health, Educational and Recreational Services	22%	3%	7,200	1,570	248	10,370	2,261	357
Other	42%	7%	4,170	1,764	284	5,460	2,309	372
Total Jobs			26,570	10,362	3,389	36,800	14,595	4,346

Notes:
(a) See preceding Appendix table.
Sources: Association of Bay Area Governments, Projections 2007; BAE 2008

Note on ABAG Employment Projections

ABAG remains the only source of detailed employment projections for local jurisdictions in the Bay Area. Although ABAG estimates regularly show a greater number of jobs in Novato and the County than the CA Employment Development Department (EDD), this trend is partly due to the fact that the EDD Quarterly Census of Employment and Wages (QCEW) only accounts for jobs that register for unemployment insurance. Sole-proprietors, contractors, and home-based businesses are therefore not included in the QCEW.

While the total number of jobs varies by data source, this analysis relies more on the net new jobs to estimate demand for new space. In this regard, the two data sources are generally comparable. For example, between 2003 and 2007, ABAG reports that Novato gained approximately 743 jobs, a three percent increase. In comparison, EDD reports 1,080 new jobs over this time frame, a five percent gain.

With this in mind, and given the long-term, general nature of this analysis, ABAG projections serve as an adequate projections source for estimating future demand for office and industrial space in the City.

Table B-7: Total Potential Taxable Retail Sales, Novato, 2035

RECAPTURE OF SALES FROM EXISTING RESIDENTS

	CURRENT SALES		POTENTIAL SALES WITH RECAPTURE		NET ADDITIONAL SALES
Business Type	**Total (a)**	**Per Capita (b)**	**Total (c)**	**Per Capita (d)**	**Total**
Apparel	$27,568,000	$540	$34,113,000	$668	$6,545,000
Gen Merchandise	$188,425,000	$3,690	$188,425,000	$3,690	$0
Specialty and Other Retail	$97,327,000	$1,906	$115,640,000	$2,265	$18,313,000
Eating and Drinking Places	$70,040,000	$1,372	$82,719,000	$1,620	$12,679,000
Home Furnishings and Appliances	$13,112,000	$257	$30,187,000	$591	$17,075,000
Building Material and Farm Implements	$28,027,000	$549	$58,941,000	$1,154	$30,914,000
Total	**$424,499,000**	**$8,313**	**$510,025,000**	**$9,988**	**$85,526,000**

SALES FROM NEW RESIDENTS BY 203

Business Type	**Total (e)**	**Sales Per Capita (f)**
Apparel	$7,780,000	$663
Gen Merchandise	$22,861,000	$1,948
Specialty and Other Retail	$28,617,000	$2,439
Eating and Drinking Places	$20,320,000	$1,732
Home Furnishings and Appliances	$10,039,000	$856
Building Material and Farm Implements	$16,793,000	$1,431
Total	**$106,410,000**	**$9,068**

TOTAL POTENTIAL SALES BY 2035

Business Type	**Total (g)**
Apparel	$14,325,000
Gen Merchandise	$22,861,000
Specialty and Other Retail	$46,930,000
Eating and Drinking Places	$32,999,000
Home Furnishings and Appliances	$27,114,000
Building Material and Farm Implements	$47,707,000
Total	**$191,936,000**

Notes:
(a) 2006 taxable sales data from CA BOE, inflated to 2008$.
(b) Novato population, 2006, per CA Department of Finance: 51,066
(c) Equal to Sales per Capita, multiplied by number of Novato residents in 2006.
(d) Equal to greater of 2006 Sales Per Capita for Bay Area or 2006 Sales per Capita for Novato (both inflated to 2008$).
Assumes Novato will continue to achieve current per capita sales or increase sales to Bay Area benchmark, whichever is greater.
(e) Equal to Sales per Capita, multiplied by projected net new residents in Novato Sphere of Influence, through 2035, per ABAG.
(f) 2006 Sales Per Capita for Marin County (inflated to 2008$).
Assumes new Novato residents will more closely match countywide residents, and will therefore have similar retail spending patterns.
(g) Sum of Net Additional Sales from Existing Residents and Total Sales from New Residents.
Sources: California State Board of Equalization; Association of Bay Area Governments, 2007; California Department of Finance; BAE, 2008.

APPENDIX C

TRAFFIC ANALYSIS

```
-------------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                             City of Novato
-------------------------------------------------------------------------------

                   Level Of Service Computation Report
            2000 HCM 4-Way Stop Method (Base Volume Alternative)
*******************************************************************************
Intersection #1 San Marin Dr/Simmons Ln
*******************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.881
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):        31.3
Optimal Cycle:          0              Level Of Service:                  D
*******************************************************************************
Street Name:                 Simmons Ln                      San Marin Dr
Approach:       North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:            Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  1  0  0  1   0  0  1! 0  0   1  0  1  1  0   1  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 22 May 2008 << 7:45-8:45 am
Base Vol:      97   12   253    21   11     8    11  555    77   163  459     9
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   97   12   253    21   11     8    11  555    77   163  459     9
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.84 0.84  0.84  0.84 0.84  0.84  0.84 0.84  0.84  0.84 0.84  0.84
PHF Volume:   116   14   303    25   13    10    13  665    92   195  550    11
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  116   14   303    25   13    10    13  665    92   195  550    11
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  116   14   303    25   13    10    13  665    92   195  550    11
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.89 0.11  1.00  0.53 0.27  0.20  1.00 1.76  0.24  1.00 2.00  1.00
Final Sat.:   351   43   457   201  105    76   387  754   106   397  845   451
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.33 0.33  0.66  0.13 0.13  0.13  0.03 0.88  0.87  0.49 0.65  0.02
Crit Moves:             ****  ****                  ****              ****
Delay/Veh:   15.6 15.6  23.3  13.3 13.3  13.3  11.9 46.9  44.9  19.5 24.8  10.6
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  15.6 15.6  23.3  13.3 13.3  13.3  11.9 46.9  44.9  19.5 24.8  10.6
LOS by Move:    C    C     C     B    B     B     B    E     E     C    C     B
ApproachDel:      21.0             13.3             46.1             23.2
Delay Adj:        1.00             1.00             1.00             1.00
ApprAdjDel:       21.0             13.3             46.1             23.2
LOS by Appr:        C                B                E                C
AllWayAvgQ:   0.4  0.4   1.6   0.1  0.1   0.1   0.0  4.4   4.1   0.9  1.6   0.0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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-------------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                             City of Novato
-------------------------------------------------------------------------------

                   Level Of Service Computation Report
            2000 HCM 4-Way Stop Method (Base Volume Alternative)
*******************************************************************************
Intersection #1 San Marin Dr/Simmons Ln
*******************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.645
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):        17.8
Optimal Cycle:          0              Level Of Service:                  C
*******************************************************************************
Street Name:                 Simmons Ln                      San Marin Dr
Approach:       North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:            Include          Include          Include          Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        0  1  0  0  1   0  0  1! 0  0   1  0  1  1  0   1  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 22 May 2008 << 5:00-6:00 pm
Base Vol:      79   15   155    33    8     5     5  368    71   182  603    15
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   79   15   155    33    8     5     5  368    71   182  603    15
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93
PHF Volume:    85   16   168    36    9     5     5  398    77   197  652    16
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   85   16   168    36    9     5     5  398    77   197  652    16
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   85   16   168    36    9     5     5  398    77   197  652    16
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.84 0.16  1.00  0.72 0.17  0.11  1.00 1.68  0.32  1.00 2.00  1.00
Final Sat.:   352   67   484   300   73    45   423  774   152   469 1010   548
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.24 0.24  0.35  0.12 0.12  0.12  0.01 0.51  0.50  0.42 0.65  0.03
Crit Moves:             ****  ****                  ****              ****
Delay/Veh:   13.3 13.3  13.2  12.1 12.1  12.1  11.0 17.6  17.1  15.4 21.2   9.2
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  13.3 13.3  13.2  12.1 12.1  12.1  11.0 17.6  17.1  15.4 21.2   9.2
LOS by Move:    B    B     B     B    B     B     B    C     C     C    C     A
ApproachDel:      13.2             12.1             17.5             19.7
Delay Adj:        1.00             1.00             1.00             1.00
ApprAdjDel:       13.2             12.1             17.5             19.7
LOS by Appr:        B                B                C                C
AllWayAvgQ:   0.3  0.3   0.5   0.1  0.1   0.1   0.0  1.0   0.9   0.7  1.6   0.0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	706	148	295	849	209	187	74	166	57	34	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.94	1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.97		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	4910		1770	4862		3433	1863	1495	1770	1705	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	4910		1770	4862		3433	1863	1495	1770	1705	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	743	156	311	894	220	197	78	175	60	36	26
RTOR Reduction (vph)	0	32	0	0	44	0	0	0	144	0	21	0
Lane Group Flow (vph)	32	867	0	311	1070	0	197	78	31	60	41	0
Confl. Peds. (#/hr)	15		15	15		15	15		15	15		15
Confl. Bikes (#/hr)			15			15			15			15
Turn Type	Prot			Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			
Actuated Green, G (s)	3.4	23.2		20.7	40.5		16.1	16.1	16.1	16.1	16.1	
Effective Green, g (s)	3.4	23.2		20.7	40.5		16.1	16.1	16.1	16.1	16.1	
Actuated g/C Ratio	0.04	0.25		0.22	0.44		0.17	0.17	0.17	0.17	0.17	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	65	1237		398	2138		600	326	261	309	298	
v/s Ratio Prot	0.02	c0.18		c0.18	0.22		c0.06	0.04		c0.03	0.02	
v/s Ratio Perm									0.02			
v/c Ratio	0.49	0.70		0.78	0.50		0.33	0.24	0.12	0.19	0.14	
Uniform Delay, d1	43.5	31.3		33.6	18.5		33.3	32.7	32.0	32.5	32.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.8	1.8		9.6	0.2		1.5	1.7	0.9	1.4	0.9	
Delay (s)	49.3	33.1		43.2	18.7		34.7	34.5	32.9	33.9	33.1	
Level of Service	D	C		D	B		C	C	C	C	C	
Approach Delay (s)		33.7			24.1			34.0			33.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	29.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	751	201	278	807	68	229	38	468	191	67	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.91		1.00	0.91		0.97	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.94	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	4873		1770	4996		3433	1863	1493	1770	1769	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	4873		1770	4996		3433	1863	1493	1770	1769	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	23	791	212	293	849	72	241	40	493	201	71	23
RTOR Reduction (vph)	0	48	0	0	9	0	0	0	321	0	12	0
Lane Group Flow (vph)	23	955	0	293	912	0	241	40	172	201	82	0
Confl. Peds. (#/hr)	15		15	15		15	15		15	15		15
Confl. Bikes (#/hr)			15			15			15			15
Turn Type	Prot			Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			
Actuated Green, G (s)	3.0	27.5		19.3	43.8		16.1	16.1	16.1	16.1	16.1	
Effective Green, g (s)	3.0	27.5		19.3	43.8		16.1	16.1	16.1	16.1	16.1	
Actuated g/C Ratio	0.03	0.29		0.20	0.46		0.17	0.17	0.17	0.17	0.17	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	56	1411		360	2303		582	316	253	300	300	
v/s Ratio Prot	0.01	c0.20		c0.17	0.18		0.07	0.02		c0.11	0.05	
v/s Ratio Perm									c0.11			
v/c Ratio	0.41	0.68		0.81	0.40		0.41	0.13	0.68	0.67	0.27	
Uniform Delay, d1	45.1	29.8		36.1	16.9		35.2	33.5	37.0	37.0	34.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.8	1.3		13.2	0.1		2.2	0.8	13.7	11.3	2.3	
Delay (s)	50.0	31.1		49.3	17.0		37.4	34.3	50.7	48.3	36.6	
Level of Service	D	C		D	B		D	C	D	D	D	
Approach Delay (s)		31.5			24.8			45.7			44.6	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	33.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	474	462	125	834	0	0	0	0	46	5	509
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	0.88
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.96	1.00
Satd. Flow (prot)		3539	1583	1770	3539						1782	2787
Flt Permitted		1.00	1.00	0.95	1.00						0.96	1.00
Satd. Flow (perm)		3539	1583	1770	3539						1782	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	499	486	132	878	0	0	0	0	48	5	536
RTOR Reduction (vph)	0	0	348	0	0	0	0	0	0	0	0	193
Lane Group Flow (vph)	0	499	138	132	878	0	0	0	0	0	53	343
Turn Type			Perm	Prot						Perm		Perm
Protected Phases		4		3	8						6	
Permitted Phases			4							6		6
Actuated Green, G (s)		19.1	19.1	8.6	31.7						27.7	27.7
Effective Green, g (s)		19.1	19.1	8.6	31.7						27.7	27.7
Actuated g/C Ratio		0.28	0.28	0.13	0.47						0.41	0.41
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1003	449	226	1664						732	1145
v/s Ratio Prot		0.14		0.07	c0.25							
v/s Ratio Perm			0.09								0.03	c0.12
v/c Ratio		0.50	0.31	0.58	0.53						0.07	0.30
Uniform Delay, d1		20.1	19.0	27.7	12.6						12.1	13.3
Progression Factor		1.00	1.00	1.00	1.00						1.00	1.00
Incremental Delay, d2		0.4	0.4	3.8	0.3						0.2	0.7
Delay (s)		20.5	19.3	31.5	12.9						12.2	14.0
Level of Service		C	B	C	B						B	B
Approach Delay (s)		19.9			15.3			0.0			13.8	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	829	559	111	912	0	0	0	0	63	2	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	0.88
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3539	1583	1770	3539						1777	2787
Flt Permitted		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (perm)		3539	1583	1770	3539						1777	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	873	588	117	960	0	0	0	0	66	2	226
RTOR Reduction (vph)	0	0	398	0	0	0	0	0	0	0	0	89
Lane Group Flow (vph)	0	873	190	117	960	0	0	0	0	0	68	137
Turn Type			Perm	Prot						Perm		Perm
Protected Phases		4		3	8						6	
Permitted Phases			4							6		6
Actuated Green, G (s)		30.6	30.6	11.1	45.7						41.2	41.2
Effective Green, g (s)		30.6	30.6	11.1	45.7						41.2	41.2
Actuated g/C Ratio		0.32	0.32	0.12	0.48						0.43	0.43
Clearance Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		1141	510	207	1704						771	1210
v/s Ratio Prot		c0.25		0.07	c0.27							
v/s Ratio Perm			0.12								0.04	c0.05
v/c Ratio		0.77	0.37	0.57	0.56						0.09	0.11
Uniform Delay, d1		28.9	24.8	39.6	17.5						15.8	16.0
Progression Factor		1.00	1.00	1.00	1.00						1.00	1.00
Incremental Delay, d2		3.1	0.5	3.5	0.4						0.2	0.2
Delay (s)		32.0	25.2	43.1	17.9						16.0	16.2
Level of Service		C	C	D	B						B	B
Approach Delay (s)		29.3			20.7			0.0			16.1	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	94.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Atherton Ave & 101 NB

12/11/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	305	226	0	0	376	73	586	0	108	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	14	12	12	12
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	1.00			0.95	1.00	0.95	0.95	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3433	1863			3539	1583	1681	1681	1689			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3433	1863			3539	1583	1681	1681	1689			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	321	238	0	0	396	77	617	0	114	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	25	0	0	0
Lane Group Flow (vph)	321	238	0	0	396	14	308	309	89	0	0	0
Turn Type	Prot					Perm	Perm		Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Actuated Green, G (s)	12.9	31.7			14.8	14.8	41.3	41.3	41.3			
Effective Green, g (s)	12.9	31.7			14.8	14.8	41.3	41.3	41.3			
Actuated g/C Ratio	0.16	0.39			0.18	0.18	0.51	0.51	0.51			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	547	729			647	289	857	857	861			
v/s Ratio Prot	c0.09	0.13			c0.11							
v/s Ratio Perm						0.01	0.18	0.18	0.05			
v/c Ratio	0.59	0.33			0.61	0.05	0.36	0.36	0.10			
Uniform Delay, d1	31.6	17.2			30.5	27.3	11.9	11.9	10.3			
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	1.6	0.3			1.7	0.1	1.2	1.2	0.2			
Delay (s)	33.2	17.5			32.2	27.4	13.1	13.1	10.5			
Level of Service	C	B			C	C	B	B	B			
Approach Delay (s)		26.5			31.4			12.7			0.0	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	81.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Atherton Ave & 101 NB

12/11/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	544	335	0	0	313	65	700	0	157	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	14	12	12	12
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	1.00			0.95	1.00	0.95	0.95	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)	3433	1863			3539	1583	1681	1681	1689			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)	3433	1863			3539	1583	1681	1681	1689			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	573	353	0	0	329	68	737	0	165	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	57	0	0	31	0	0	0
Lane Group Flow (vph)	573	353	0	0	329	11	368	369	134	0	0	0
Turn Type	Prot					Perm	Perm		Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Actuated Green, G (s)	18.7	36.1			13.4	13.4	41.2	41.2	41.2			
Effective Green, g (s)	18.7	36.1			13.4	13.4	41.2	41.2	41.2			
Actuated g/C Ratio	0.22	0.42			0.16	0.16	0.48	0.48	0.48			
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	753	788			556	249	812	812	816			
v/s Ratio Prot	c0.17	0.19			c0.09							
v/s Ratio Perm						0.01	0.22	0.22	0.08			
v/c Ratio	0.76	0.45			0.59	0.04	0.45	0.45	0.16			
Uniform Delay, d1	31.2	17.5			33.4	30.5	14.6	14.6	12.4			
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	4.6	0.4			1.7	0.1	1.8	1.8	0.4			
Delay (s)	35.8	17.9			35.1	30.6	16.4	16.4	12.8			
Level of Service	D	B			D	C	B	B	B			
Approach Delay (s)		29.0			34.3			15.8			0.0	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	85.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

```
--------------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
--------------------------------------------------------------------------------

                    Level Of Service Computation Report
          2000 HCM Unsignalized Method (Base Volume Alternative)
********************************************************************************
Intersection #5 Atherton Ave/Bugeia Ln
********************************************************************************
Average Delay (sec/veh):      3.2      Worst Case Level Of Service: B[ 10.7]
********************************************************************************
Street Name:              Bugeia Ln                       Atherton Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:          Include          Include          Include          Include
Lanes:       0  0  0  0  0   1  0  0  0  1   1  0  1  0  0   0  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:       0    0     0    13    0   101    77  150     0     0  189     6
Growth Adj:  1.00 1.00  1.00  1.05 1.00  1.05  1.05 1.17  1.00  1.00 1.17  1.05
Initial Bse:    0    0     0    14    0   106    81  176     0     0  221     6
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.89 0.89  0.89  0.89 0.89  0.89  0.89 0.89  0.89  0.89 0.89  0.89
PHF Volume:     0    0     0    15    0   120    91  198     0     0  250     7
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:    0    0     0    15    0   120    91  198     0     0  250     7
------------|---------------||---------------||---------------||---------------|
Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx   6.4 xxxx   6.2   4.1 xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:xxxxx xxxx xxxxx   3.5 xxxx   3.3   2.2 xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol: xxxx xxxx xxxxx   630 xxxx   250   257 xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.: xxxx xxxx xxxxx   449 xxxx   794  1308 xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:   xxxx xxxx xxxxx   425 xxxx   794  1308 xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  xxxx xxxx  xxxx  0.04 xxxx  0.15  0.07 xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx   0.1 xxxx   0.5   0.2 xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx  13.8 xxxx  10.3   8.0 xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:    *    *     *     B    *     B     A    *     *     *    *     *
Movement:     LT - LTR - RT   LT - LTR - RT   LT - LTR - RT   LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:     *    *     *     *    *     *     *    *     *     *    *     *
ApproachDel:    xxxxxx             10.7            xxxxxx           xxxxxx
ApproachLOS:       *                 B                *                *
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
--------------------------------------------------------------------------------

                    Level Of Service Computation Report
          2000 HCM Unsignalized Method (Base Volume Alternative)
********************************************************************************
Intersection #5 Atherton Ave/Bugeia Ln
********************************************************************************
Average Delay (sec/veh):      2.7      Worst Case Level Of Service: B[ 10.1]
********************************************************************************
Street Name:              Bugeia Ln                       Atherton Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:          Include          Include          Include          Include
Lanes:       0  0  0  0  0   1  0  0  0  1   1  0  1  0  0   0  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:       0    0     0     6    0    69   112  234     0     0  140     5
Growth Adj:  1.00 1.00  1.00  1.05 1.00  1.05  1.05 1.18  1.00  1.00 1.18  1.05
Initial Bse:    0    0     0     6    0    72   118  277     0     0  166     5
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.88 0.88  0.88  0.88 0.88  0.88  0.88 0.88  0.88  0.88 0.88  0.88
PHF Volume:     0    0     0     7    0    82   134  315     0     0  188     6
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:    0    0     0     7    0    82   134  315     0     0  188     6
------------|---------------||---------------||---------------||---------------|
Critical Gap Module:
Critical Gp:xxxxx xxxx xxxxx   6.4 xxxx   6.2   4.1 xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:xxxxx xxxx xxxxx   3.5 xxxx   3.3   2.2 xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol: xxxx xxxx xxxxx   771 xxxx   188   194 xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.: xxxx xxxx xxxxx   371 xxxx   859  1379 xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:   xxxx xxxx xxxxx   344 xxxx   859  1379 xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  xxxx xxxx  xxxx  0.02 xxxx  0.10  0.10 xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx   0.1 xxxx   0.3   0.3 xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx  15.7 xxxx   9.6   7.9 xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:    *    *     *     C    *     A     A    *     *     *    *     *
Movement:     LT - LTR - RT   LT - LTR - RT   LT - LTR - RT   LT - LTR - RT
Shared Cap.: xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:     *    *     *     *    *     *     *    *     *     *    *     *
ApproachDel:    xxxxxx             10.1            xxxxxx           xxxxxx
ApproachLOS:       *                 B                *                *
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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-----------------------------------------------------------------------------
                  A.M. Peak Hour - Existing Conditions
                     Citywide Traffic Model Update
                           City of Novato
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
*****************************************************************************
Intersection #6 Novato Blvd/San Marin Dr/Sutro Ave
*****************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):        1.070
Loss Time (sec):      0 (Y+R=4.0 sec) Average Delay (sec/veh):      43.5
Optimal Cycle:        0              Level Of Service:                 E
*****************************************************************************
Street Name:     San Marin Dr-Sutro Ave               Novato Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       1  0  0  1  0   1  0  1  0  1   1  0  1  1  0   1  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:      88  235    97   166  144   120    81   78    37    58  131   292
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   88  235    97   166  144   120    81   78    37    58  131   292
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.85 0.85  0.85  0.85 0.85  0.85  0.85 0.85  0.85  0.85 0.85  0.85
PHF Volume:   104  276   114   195  169   141    95   92    44    68  154   344
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  104  276   114   195  169   141    95   92    44    68  154   344
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  104  276   114   195  169   141    95   92    44    68  154   344
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       1.00 0.71  0.29  1.00 1.00  1.00  1.00 1.36  0.64  1.00 0.31  0.69
Final Sat.:   402  313   129   372  392   423   336  483   237   402  144   321
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.26 0.88  0.88  0.52 0.43  0.33  0.28 0.19  0.18  0.17 1.07  1.07
Crit Moves:       ****        ****              ****                        ****
Delay/Veh:   14.5 46.7  46.7  22.0 18.2  15.0  16.8 14.5  14.1  13.1 89.2  89.2
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  14.5 46.7  46.7  22.0 18.2  15.0  16.8 14.5  14.1  13.1 89.2  89.2
LOS by Move:   B    E     E     C    C     C     C    B     B     B    F     F
ApproachDel:      39.9             18.8             15.4             80.1
Delay Adj:        1.00             1.00             1.00             1.00
ApprAdjDel:       39.9             18.8             15.4             80.1
LOS by Appr:        E                C                C                F
AllWayAvgQ:   0.3  4.4   4.4   1.0  0.7   0.5   0.4  0.2   0.2   0.2 10.2  10.2
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-----------------------------------------------------------------------------
                  P.M. Peak Hour - Existing Conditions
                     Citywide Traffic Model Update
                           City of Novato
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
*****************************************************************************
Intersection #6 Novato Blvd/San Marin Dr/Sutro Ave
*****************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):        0.565
Loss Time (sec):      0 (Y+R=4.0 sec) Average Delay (sec/veh):      16.0
Optimal Cycle:        0              Level Of Service:                 C
*****************************************************************************
Street Name:     San Marin Dr-Sutro Ave               Novato Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       1  0  0  1  0   1  0  1  0  1   1  0  1  1  0   1  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      27  145    77   158  230   142    83  119    32   138   81   179
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   27  145    77   158  230   142    83  119    32   138   81   179
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93
PHF Volume:    29  156    83   170  247   153    89  128    34   148   87   192
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   29  156    83   170  247   153    89  128    34   148   87   192
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   29  156    83   170  247   153    89  128    34   148   87   192
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       1.00 0.65  0.35  1.00 1.00  1.00  1.00 1.58  0.42  1.00 0.31  0.69
Final Sat.:   414  301   160   425  453   493   378  636   175   433  154   340
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.07 0.52  0.52  0.40 0.55  0.31  0.24 0.20  0.20  0.34 0.56  0.56
Crit Moves:       ****             ****         ****                   ****
Delay/Veh:   11.5 17.3  17.3  16.0 18.8  12.7  14.2 13.0  12.7  14.6 17.9  17.9
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  11.5 17.3  17.3  16.0 18.8  12.7  14.2 13.0  12.7  14.6 17.9  17.9
LOS by Move:   B    C     C     C    C     B     B    B     B     B    C     C
ApproachDel:      16.6             16.3             13.4             16.7
Delay Adj:        1.00             1.00             1.00             1.00
ApprAdjDel:       16.6             16.3             13.4             16.7
LOS by Appr:        C                C                B                C
AllWayAvgQ:   0.1  0.9   0.9   0.6  1.1   0.4   0.3  0.2   0.2   0.5  1.1   1.1
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
```

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--------------------------------------------------------------------------------
                     A.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------

                      Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
********************************************************************************
Intersection #7 Wilson Ave/Novato Blvd
********************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):         0.879
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       31.9
Optimal Cycle:        77              Level Of Service:                  C
********************************************************************************
Street Name:            WIlson Ave                      Novato Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Permitted        Protected
Rights:           Include          Include          Include          Include
Min. Green:    0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        1  0  0  0  1    0  0  0  0  0    0  0  1  1  0    1  0  2  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:      27    0   589     0    0     0     0  561    19   364  514     0
Growth Adj:  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02
Initial Bse:   28    0   602     0    0     0     0  573    19   372  525     0
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92
PHF Volume:    30    0   652     0    0     0     0  621    21   403  569     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   30    0   652     0    0     0     0  621    21   403  569     0
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   30    0   652     0    0     0     0  621    21   403  569     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 1.00  0.83  1.00 1.00  1.00  1.00 0.98  0.98  0.93 0.98  1.00
Lanes:       1.00 0.00  1.00  0.00 0.00  0.00  0.00 1.93  0.07  1.00 2.00  0.00
Final Sat.:  1769    0  1583     0    0     0     0 3584   121  1769 3724     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.02 0.00  0.41  0.00 0.00  0.00  0.00 0.17  0.17  0.23 0.15  0.00
Crit Moves:             ****                        ****        ****
Green/Cycle: 0.47 0.00  0.47  0.00 0.00  0.00  0.00 0.20  0.20  0.26 0.46  0.00
Volume/Cap:  0.04 0.00  0.88  0.00 0.00  0.00  0.00 0.88  0.88  0.88 0.33  0.00
Delay/Veh:   11.5  0.0  30.9   0.0  0.0   0.0   0.0 43.1  43.1  45.9 11.7   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  11.5  0.0  30.9   0.0  0.0   0.0   0.0 43.1  43.1  45.9 11.7   0.0
LOS by Move:    B    A     C     A    A     A     A    D     D     D    B     A
HCM2kAvgQ:      0    0    18     0    0     0     0   11    11    13    4     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                     P.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------

                      Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
********************************************************************************
Intersection #7 Wilson Ave/Novato Blvd
********************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):         0.785
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       21.2
Optimal Cycle:        53              Level Of Service:                  C
********************************************************************************
Street Name:            WIlson Ave                      Novato Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Permitted        Protected
Rights:           Include          Include          Include          Include
Min. Green:    0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        1  0  0  0  1    0  0  0  0  0    0  0  1  1  0    1  0  2  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      25    0   395     0    0     0     0  477    31   516  883     0
Growth Adj:  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02
Initial Bse:   26    0   404     0    0     0     0  487    32   527  902     0
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96
PHF Volume:    27    0   423     0    0     0     0  510    33   552  945     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   27    0   423     0    0     0     0  510    33   552  945     0
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   27    0   423     0    0     0     0  510    33   552  945     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 1.00  0.83  1.00 1.00  1.00  1.00 0.97  0.97  0.93 0.98  1.00
Lanes:       1.00 0.00  1.00  0.00 0.00  0.00  0.00 1.88  0.12  1.00 2.00  0.00
Final Sat.:  1769    0  1583     0    0     0     0 3465   225  1769 3724     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.02 0.00  0.27  0.00 0.00  0.00  0.00 0.15  0.15  0.31 0.25  0.00
Crit Moves:             ****                        ****        ****
Green/Cycle: 0.34 0.00  0.34  0.00 0.00  0.00  0.00 0.19  0.19  0.40 0.59  0.00
Volume/Cap:  0.04 0.00  0.79  0.00 0.00  0.00  0.00 0.79  0.79  0.79 0.43  0.00
Delay/Veh:   17.7  0.0  31.3   0.0  0.0   0.0   0.0 36.9  36.9  24.8  5.8   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  17.7  0.0  31.3   0.0  0.0   0.0   0.0 36.9  36.9  24.8  5.8   0.0
LOS by Move:    B    A     C     A    A     A     A    D     D     C    A     A
HCM2kAvgQ:      0    0    11     0    0     0     0    9     9    13    4     0
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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---------------------------------------------------------------------------
                  A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                            City of Novato
---------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
***************************************************************************
Intersection #8 Simmons Ln/Novato Blvd
***************************************************************************
Cycle (sec):        100             Critical Vol./Cap.(X):         0.563
Loss Time (sec):      6 (Y+R=4.0 sec) Average Delay (sec/veh):      16.3
Optimal Cycle:       31             Level Of Service:                  B
***************************************************************************
Street Name:            Simmons Ln                       Novato Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected         Permitted
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       0  0  0  0  0   1  0  0  0  1   1  0  2  0  0   0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:      0    0    0    70    0  218   210  966    0     0  673   84
Growth Adj:  1.02 1.02 1.02  1.02 1.02 1.02  1.02 1.02 1.02  1.02 1.02 1.02
Initial Bse:   0    0    0    72    0  223   215  987    0     0  688   86
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92
PHF Volume:    0    0    0    78    0  243   234 1078    0     0  751   94
Reduct Vol:    0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:   0    0    0    78    0  243   234 1078    0     0  751   94
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:   0    0    0    78    0  243   234 1078    0     0  751   94
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  1.00 1.00 1.00  0.93 1.00 0.83  0.93 0.93 1.00  1.00 0.92 0.92
Lanes:       0.00 0.00 0.00  1.00 0.00 1.00  1.00 2.00 0.00  0.00 1.78 0.22
Final Sat.:    0    0    0  1769    0 1583  1769 3538    0     0 3092  386
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00 0.00  0.04 0.00 0.15  0.13 0.30 0.00  0.00 0.24 0.24
Crit Moves:                            ****  ****                  ****
Green/Cycle: 0.00 0.00 0.00  0.27 0.00 0.27  0.24 0.67 0.00  0.00 0.43 0.43
Volume/Cap:  0.00 0.00 0.00  0.16 0.00 0.56  0.56 0.46 0.00  0.00 0.56 0.56
Delay/Veh:    0.0  0.0  0.0  27.8  0.0 32.9  35.5  3.2  0.0   0.0 21.8 21.8
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   0.0  0.0  0.0  27.8  0.0 32.9  35.5  3.2  0.0   0.0 21.8 21.8
LOS by Move:   A    A    A     C    A    C     D    A    A     A    C    C
HCM2kAvgQ:     0    0    0     2    0    7     7    4    0     0   11   11
***************************************************************************
Note: Queue reported is the number of cars per lane.
***************************************************************************
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---------------------------------------------------------------------------
                  P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                            City of Novato
---------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
***************************************************************************
Intersection #8 Simmons Ln/Novato Blvd
***************************************************************************
Cycle (sec):        100             Critical Vol./Cap.(X):         0.677
Loss Time (sec):      6 (Y+R=4.0 sec) Average Delay (sec/veh):      17.4
Optimal Cycle:       40             Level Of Service:                  B
***************************************************************************
Street Name:            Simmons Ln                       Novato Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected         Permitted
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       0  0  0  0  0   1  0  0  0  1   1  0  2  0  0   0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      0    0    0    83    0  267   148  727    0     0 1147   88
Growth Adj:  1.02 1.02 1.02  1.02 1.02 1.02  1.02 1.02 1.02  1.02 1.02 1.02
Initial Bse:   0    0    0    85    0  273   151  743    0     0 1172   90
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.97 0.97 0.97  0.97 0.97 0.97  0.97 0.97 0.97  0.97 0.97 0.97
PHF Volume:    0    0    0    87    0  281   156  764    0     0 1206   93
Reduct Vol:    0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:   0    0    0    87    0  281   156  764    0     0 1206   93
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:   0    0    0    87    0  281   156  764    0     0 1206   93
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  1.00 1.00 1.00  0.93 1.00 0.83  0.93 0.93 1.00  1.00 0.92 0.92
Lanes:       0.00 0.00 0.00  1.00 0.00 1.00  1.00 2.00 0.00  0.00 1.86 0.14
Final Sat.:    0    0    0  1769    0 1583  1769 3538    0     0 3250  249
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00 0.00  0.05 0.00 0.18  0.09 0.22 0.00  0.00 0.37 0.37
Crit Moves:                            ****  ****                  ****
Green/Cycle: 0.00 0.00 0.00  0.26 0.00 0.26  0.13 0.68 0.00  0.00 0.55 0.55
Volume/Cap:  0.00 0.00 0.00  0.19 0.00 0.68  0.68 0.32 0.00  0.00 0.68 0.68
Delay/Veh:    0.0  0.0  0.0  28.8  0.0 37.5  49.4  2.3  0.0   0.0 17.2 17.2
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   0.0  0.0  0.0  28.8  0.0 37.5  49.4  2.3  0.0   0.0 17.2 17.2
LOS by Move:   A    A    A     C    A    D     D    A    A     A    B    B
HCM2kAvgQ:     0    0    0     2    0    9     6    2    0     0   16   16
***************************************************************************
Note: Queue reported is the number of cars per lane.
***************************************************************************
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--------------------------------------------------------------------------------
                      A.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
               2000 HCM 4-Way Stop Method (Base Volume Alternative)
********************************************************************************
Intersection #9A SB Redwood Blvd/Olive Ave
********************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.510
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):        13.4
Optimal Cycle:          0              Level Of Service:                  B
********************************************************************************
Street Name:             SB Redwood Blvd                      Olive Ave
Approach:        North Bound       South Bound       East Bound        West Bound
Movement:      L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign         Stop Sign         Stop Sign         Stop Sign
Rights:            Include           Include           Include           Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  0  0  0    0  1  0  1  0    0  0  0  1  0    0  1  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:       0    0     0   101  277    56     0  170    40   131  125     0
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0    0     0   101  277    56     0  170    40   131  125     0
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.82 0.82  0.82  0.82 0.82  0.82  0.82 0.82  0.82  0.82 0.82  0.82
PHF Volume:     0    0     0   123  338    68     0  207    49   160  152     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0    0     0   123  338    68     0  207    49   160  152     0
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:    0    0     0   123  338    68     0  207    49   160  152     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.00 0.00  0.00  0.46 1.28  0.26  0.00 0.81  0.19  0.51 0.49  0.00
Final Sat.:     0    0     0   263  749   156     0  502   118   313  299     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     xxxx xxxx  xxxx  0.47 0.45  0.44  xxxx 0.41  0.41  0.51 0.51  xxxx
Crit Moves:                   ****                   ****              ****
Delay/Veh:    0.0  0.0   0.0  14.1 13.3  12.8   0.0 12.2  12.2  14.2 14.2   0.0
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0   0.0  14.1 13.3  12.8   0.0 12.2  12.2  14.2 14.2   0.0
LOS by Move:    *    *     *     B    B     B     *    B     B     B    B     *
ApproachDel:     xxxxxx            13.4              12.2              14.2
Delay Adj:        xxxxx            1.00              1.00              1.00
ApprAdjDel:      xxxxxx            13.4              12.2              14.2
LOS by Appr:        *                B                 B                 B
AllWayAvgQ:   0.0  0.0   0.0   0.8  0.7   0.7   0.6  0.6   0.6   0.9  0.9   0.9
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                      P.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
               2000 HCM 4-Way Stop Method (Base Volume Alternative)
********************************************************************************
Intersection #9A SB Redwood Blvd/Olive Ave
********************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.631
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):        16.5
Optimal Cycle:          0              Level Of Service:                  C
********************************************************************************
Street Name:             SB Redwood Blvd                      Olive Ave
Approach:        North Bound       South Bound       East Bound        West Bound
Movement:      L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign         Stop Sign         Stop Sign         Stop Sign
Rights:            Include           Include           Include           Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  0  0  0    0  1  0  1  0    0  0  0  1  0    0  1  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 8 Mar 2007 << 4:45-5:45 pm
Base Vol:       0    0     0   158  400   116     0  192    31   163  165     0
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0    0     0   158  400   116     0  192    31   163  165     0
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:     0    0     0   166  421   122     0  202    33   172  174     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0    0     0   166  421   122     0  202    33   172  174     0
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:    0    0     0   166  421   122     0  202    33   172  174     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.00 0.00  0.00  0.47 1.19  0.34  0.00 0.86  0.14  0.50 0.50  0.00
Final Sat.:     0    0     0   263  696   209     0  499    81   292  295     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     xxxx xxxx  xxxx  0.63 0.61  0.59  xxxx 0.41  0.41  0.59 0.59  xxxx
Crit Moves:                   ****                   ****              ****
Delay/Veh:    0.0  0.0   0.0  19.0 17.5  16.3   0.0 12.8  12.8  16.8 16.8   0.0
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0   0.0  19.0 17.5  16.3   0.0 12.8  12.8  16.8 16.8   0.0
LOS by Move:    *    *     *     C    C     C     *    B     B     C    C     *
ApproachDel:     xxxxxx            17.6              12.8              16.8
Delay Adj:        xxxxx            1.00              1.00              1.00
ApprAdjDel:      xxxxxx            17.6              12.8              16.8
LOS by Appr:        *                C                 B                 C
AllWayAvgQ:   0.0  0.0   0.0   1.5  1.3   1.3   0.6  0.6   0.6   1.3  1.3   1.3
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
--------------------------------------------------------------------------------
                    Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
********************************************************************************
Intersection #9B NB Redwood Blvd/Olive Ave
********************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):          0.534
Loss Time (sec):        0 (Y+R=4.0 sec)  Average Delay (sec/veh):        13.7
Optimal Cycle:          0              Level Of Service:                   B
********************************************************************************
Street Name:              NB Redwood Blvd                      Olive Ave
Approach:       North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:     0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        0  1  0  1  0   0  0  0  0  0   0  1  0  0  0   0  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 2 Oct 2001 <<
Base Vol:      65  261    83     0    0     0   111  160     0     0  191    73
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   65  261    83     0    0     0   111  160     0     0  191    73
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.83 0.83  0.83  0.83 0.83  0.83  0.83 0.83  0.83  0.83 0.83  0.83
PHF Volume:    78  314   100     0    0     0   134  193     0     0  230    88
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   78  314   100     0    0     0   134  193     0     0  230    88
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   78  314   100     0    0     0   134  193     0     0  230    88
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.32 1.28  0.40  0.00 0.00  0.00  0.41 0.59  0.00  0.00 0.72  0.28
Final Sat.:   176  731   241     0    0     0   251  361     0     0  458   175
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.44 0.43  0.41  xxxx xxxx  xxxx  0.53 0.53  xxxx  xxxx 0.50  0.50
Crit Moves:  ****                                   ****              ****
Delay/Veh:   13.7 13.1  12.4   0.0  0.0   0.0  14.7 14.7   0.0   0.0 13.6  13.6
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  13.7 13.1  12.4   0.0  0.0   0.0  14.7 14.7   0.0   0.0 13.6  13.6
LOS by Move:    B    B     B     *    *     *     B    B     *     *    B     B
ApproachDel:      13.1            xxxxxx            14.7             13.6
Delay Adj:        1.00             xxxxx            1.00             1.00
ApprAdjDel:       13.1            xxxxxx            14.7             13.6
LOS by Appr:        B                *                B                B
AllWayAvgQ:   0.7  0.6   0.6   0.0  0.0   0.0   1.0  1.0   1.0   0.9  0.9   0.9
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
```



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--------------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
--------------------------------------------------------------------------------
                    Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
********************************************************************************
Intersection #9B NB Redwood Blvd/Olive Ave
********************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):          0.704
Loss Time (sec):        0 (Y+R=4.0 sec)  Average Delay (sec/veh):        19.9
Optimal Cycle:          0              Level Of Service:                   C
********************************************************************************
Street Name:              NB Redwood Blvd                      Olive Ave
Approach:       North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:     0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        0  1  0  1  0   0  0  0  0  0   0  1  0  0  0   0  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 8 Mar 2007 << 4:45-5:45 pm
Base Vol:      71  497   124     0    0     0   152  155     0     0  243    78
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   71  497   124     0    0     0   152  155     0     0  243    78
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.90 0.90  0.90  0.90 0.90  0.90  0.90 0.90  0.90  0.90 0.90  0.90
PHF Volume:    79  552   138     0    0     0   169  172     0     0  270    87
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   79  552   138     0    0     0   169  172     0     0  270    87
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   79  552   138     0    0     0   169  172     0     0  270    87
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.20 1.44  0.36  0.00 0.00  0.00  0.50 0.50  0.00  0.00 0.76  0.24
Final Sat.:   112  804   207     0    0     0   276  281     0     0  439   141
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.70 0.69  0.67  xxxx xxxx  xxxx  0.61 0.61  xxxx  xxxx 0.62  0.62
Crit Moves:  ****                                   ****              ****
Delay/Veh:   22.9 21.6  20.0   0.0  0.0   0.0  18.4 18.4   0.0   0.0 17.9  17.9
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  22.9 21.6  20.0   0.0  0.0   0.0  18.4 18.4   0.0   0.0 17.9  17.9
LOS by Move:    C    C     C     *    *     *     C    C     *     *    C     C
ApproachDel:      21.4            xxxxxx            18.4             17.9
Delay Adj:        1.00             xxxxx            1.00             1.00
ApprAdjDel:       21.4            xxxxxx            18.4             17.9
LOS by Appr:        C                *                C                C
AllWayAvgQ:   2.1  1.8   1.8   0.0  0.0   0.0   1.4  1.4   1.4   1.4  1.4   1.4
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                     A.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
********************************************************************************
Intersection #10 7th St/Grant Ave
********************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):        0.362
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       18.8
Optimal Cycle:        22              Level Of Service:                 B
********************************************************************************
Street Name:               7th St                        Grant Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        1  0  1  0  1    1  0  0  1  0    1  0  0  1  0    1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:       4   89   141    18  127   104    53  185    30    77  108    27
Growth Adj:  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02
Initial Bse:    4   91   144    18  130   106    54  189    31    79  110    28
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.90 0.90  0.90  0.90 0.90  0.90  0.90 0.90  0.90  0.90 0.90  0.90
PHF Volume:     5  101   160    20  145   118    60  211    34    88  123    31
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    5  101   160    20  145   118    60  211    34    88  123    31
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:    5  101   160    20  145   118    60  211    34    88  123    31
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.48 0.98  0.83  0.66 0.91  0.91  0.93 0.96  0.96  0.93 0.98  0.83
Lanes:       1.00 1.00  1.00  1.00 0.55  0.45  1.00 0.86  0.14  1.00 1.00  1.00
Final Sat.:   903 1862  1583  1253  955   782  1769 1569   254  1769 1862  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.01 0.05  0.10  0.02 0.15  0.15  0.03 0.13  0.13  0.05 0.07  0.02
Crit Moves:                        ****              ****        ****
Green/Cycle: 0.42 0.42  0.42  0.42 0.42  0.42  0.17 0.37  0.37  0.14 0.33  0.33
Volume/Cap:  0.01 0.13  0.24  0.04 0.36  0.36  0.20 0.36  0.36  0.36 0.20  0.06
Delay/Veh:   13.6 14.4  15.3  13.8 16.3  16.3  28.7 18.6  18.6  32.3 19.1  18.1
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  13.6 14.4  15.3  13.8 16.3  16.3  28.7 18.6  18.6  32.3 19.1  18.1
LOS by Move:    B    B     B     B    B     B     C    B     B     C    B     B
HCM2kAvgQ:      0    2     3     0    5     5     1    5     5     2    2     1
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                     P.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------
                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
********************************************************************************
Intersection #10 7th St/Grant Ave
********************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):        0.447
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       20.0
Optimal Cycle:        25              Level Of Service:                 C
********************************************************************************
Street Name:               7th St                        Grant Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        1  0  1  0  1    1  0  0  1  0    1  0  0  1  0    1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      37   99   191    30  112   129    79  192    65   148  338    53
Growth Adj:  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02
Initial Bse:   38  101   195    31  114   132    81  196    66   151  345    54
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.91 0.91  0.91  0.91 0.91  0.91  0.91 0.91  0.91  0.91 0.91  0.91
PHF Volume:    41  111   214    34  126   145    89  215    73   166  379    59
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   41  111   214    34  126   145    89  215    73   166  379    59
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   41  111   214    34  126   145    89  215    73   166  379    59
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.42 0.98  0.81  0.62 0.90  0.89  0.93 0.94  0.94  0.93 0.98  0.81
Lanes:       1.00 1.00  1.00  1.00 0.46  0.54  1.00 0.75  0.25  1.00 1.00  1.00
Final Sat.:   805 1862  1538  1180  790   909  1769 1336   452  1769 1862  1548
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.05 0.06  0.14  0.03 0.16  0.16  0.05 0.16  0.16  0.09 0.20  0.04
Crit Moves:                        ****              ****        ****
Green/Cycle: 0.36 0.36  0.36  0.36 0.36  0.36  0.11 0.36  0.36  0.21 0.46  0.46
Volume/Cap:  0.14 0.17  0.39  0.08 0.45  0.45  0.44 0.45  0.45  0.45 0.44  0.08
Delay/Veh:   17.8 17.8  19.8  17.2 20.3  20.3  34.8 20.0  20.0  28.4 15.2  12.3
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  17.8 17.8  19.8  17.2 20.3  20.3  34.8 20.0  20.0  28.4 15.2  12.3
LOS by Move:    B    B     B     B    C     C     C    C     C     C    B     B
HCM2kAvgQ:      1    2     4     1    5     5     3    6     6     4    7     1
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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-----------------------------------------------------------------------------
                  A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------
                    Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*****************************************************************************
Intersection #11 Redwood Blvd/Grant Ave
*****************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):         0.287
Loss Time (sec):      12 (Y+R=5.0 sec) Average Delay (sec/veh):       24.4
Optimal Cycle:        30              Level Of Service:                  C
*****************************************************************************
Street Name:              Redwood Blvd                    Grant Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected         Permitted        Permitted
Rights:           Include          Include           Include          Include
Min. Green:    0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        1  0  1  1  0    1  0  1  1  0    1  0  1  0  1    1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:     144  317    32    47  273    57    56  113   103    14  107    24
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:  144  317    32    47  273    57    56  113   103    14  107    24
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96
PHF Volume:   150  330    33    49  284    59    58  118   107    15  111    25
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  150  330    33    49  284    59    58  118   107    15  111    25
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  150  330    33    49  284    59    58  118   107    15  111    25
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.92  0.92  0.93 0.91  0.91  0.64 0.98  0.83  0.63 0.98  0.83
Lanes:       1.00 1.82  0.18  1.00 1.65  0.35  1.00 1.00  1.00  1.00 1.00  1.00
Final Sat.:  1769 3168   320  1769 2851   595  1214 1862  1583  1188 1862  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.08 0.10  0.10  0.03 0.10  0.10  0.05 0.06  0.07  0.01 0.06  0.02
Crit Moves:  ****                  ****                   ****
Green/Cycle: 0.30 0.51  0.51  0.14 0.35  0.35  0.24 0.24  0.24  0.24 0.24  0.24
Volume/Cap:  0.29 0.20  0.20  0.20 0.29  0.29  0.20 0.27  0.29  0.05 0.25  0.07
Delay/Veh:   27.4 13.5  13.5  38.9 23.8  23.8  31.0 31.4  31.7  29.6 31.3  29.7
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  27.4 13.5  13.5  38.9 23.8  23.8  31.0 31.4  31.7  29.6 31.3  29.7
LOS by Move:    C    B     B     D    C     C     C    C     C     C    C     C
HCM2kAvgQ:      4    3     3     1    4     4     2    3     3     0    3     1
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-----------------------------------------------------------------------------
                  P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------
                    Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*****************************************************************************
Intersection #11 Redwood Blvd/Grant Ave
*****************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):         0.497
Loss Time (sec):      12 (Y+R=5.0 sec) Average Delay (sec/veh):       26.1
Optimal Cycle:        40              Level Of Service:                  C
*****************************************************************************
Street Name:              Redwood Blvd                    Grant Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected         Permitted        Permitted
Rights:           Include          Include           Include          Include
Min. Green:    0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        1  0  1  1  0    1  0  1  1  0    1  0  1  0  1    1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 4:45-5:45 pm
Base Vol:     227  435    47    53  350    92    95  137   201    36  303    49
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:  227  435    47    53  350    92    95  137   201    36  303    49
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96
PHF Volume:   236  453    49    55  364    96    99  143   209    37  315    51
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  236  453    49    55  364    96    99  143   209    37  315    51
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  236  453    49    55  364    96    99  143   209    37  315    51
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.92  0.92  0.93 0.90  0.90  0.39 0.98  0.83  0.62 0.98  0.83
Lanes:       1.00 1.80  0.20  1.00 1.58  0.42  1.00 1.00  1.00  1.00 1.00  1.00
Final Sat.:  1769 3145   340  1769 2715   714   743 1862  1583  1169 1862  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.13 0.14  0.14  0.03 0.13  0.13  0.13 0.08  0.13  0.03 0.17  0.03
Crit Moves:  ****                  ****                                ****
Green/Cycle: 0.27 0.44  0.44  0.10 0.27  0.27  0.34 0.34  0.34  0.34 0.34  0.34
Volume/Cap:  0.50 0.32  0.32  0.32 0.50  0.50  0.39 0.22  0.39  0.09 0.50  0.09
Delay/Veh:   31.7 18.2  18.2  43.3 31.2  31.2  26.0 23.7  25.5  22.5 26.8  22.5
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  31.7 18.2  18.2  43.3 31.2  31.2  26.0 23.7  25.5  22.5 26.8  22.5
LOS by Move:    C    B     B     D    C     C     C    C     C     C    C     C
HCM2kAvgQ:      6    5     5     2    7     7     3    3     5     1    8     1
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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A.M. Peak Hour - Existing Conditions
Citywide Traffic Model Update
City of Novato

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #12 Redwood Blvd/Diablo Ave/DeLong Ave

Cycle (sec):	100	Critical Vol./Cap.(X):	0.423
Loss Time (sec):	10 (Y+R=4.0 sec)	Average Delay (sec/veh):	28.3
Optimal Cycle:	32	Level Of Service:	C

Street Name:	Redwood Blvd						DeLong Ave-Diablo Ave					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ignore			Ignore		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0 2 0 1			2 0 1 0 1			2 0 2 0 1			1 0 2 0 1		
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am												
Base Vol:	32	131	28	88	162	140	219	352	120	130	550	109
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	32	131	28	88	162	140	219	352	120	130	550	109
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.00	0.93	0.93	0.00
PHF Volume:	35	141	30	95	175	151	236	380	0	140	593	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	35	141	30	95	175	151	236	380	0	140	593	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
FinalVolume:	35	141	30	95	175	151	236	380	0	140	593	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.93	0.93	0.83	0.90	0.98	0.83	0.90	0.93	1.00	0.79	0.79	0.85
Lanes:	1.00	2.00	1.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00
Final Sat.:	1769	3538	1583	3432	1862	1583	3432	3538	1900	1504	3007	1615
Capacity Analysis Module:												
Vol/Sat:	0.02	0.04	0.02	0.03	0.09	0.10	0.07	0.11	0.00	0.09	0.20	0.00
Crit Moves:	****					****	****				****	
Green/Cycle:	0.05	0.16	0.16	0.11	0.23	0.23	0.16	0.34	0.00	0.29	0.47	0.00
Volume/Cap:	0.42	0.25	0.12	0.25	0.42	0.42	0.42	0.32	0.00	0.32	0.42	0.00
Delay/Veh:	49.9	36.9	36.1	41.0	33.8	34.0	38.2	24.8	0.0	28.0	18.0	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	49.9	36.9	36.1	41.0	33.8	34.0	38.2	24.8	0.0	28.0	18.0	0.0
LOS by Move:	D	D	D	D	C	C	D	C	A	C	B	A
HCM2kAvgQ:	2	2	1	2	5	4	4	5	0	4	6	0

Note: Queue reported is the number of cars per lane.

P.M. Peak Hour - Existing Conditions
Citywide Traffic Model Update
City of Novato

Level Of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)

Intersection #12 Redwood Blvd/Diablo Ave/DeLong Ave

Cycle (sec):	100	Critical Vol./Cap.(X):	0.567
Loss Time (sec):	10 (Y+R=4.0 sec)	Average Delay (sec/veh):	29.9
Optimal Cycle:	41	Level Of Service:	C

Street Name:	Redwood Blvd						DeLong Ave-Diablo Ave					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ignore			Ignore		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0 2 0 1			2 0 1 0 1			2 0 2 0 1			1 0 2 0 1		
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm												
Base Vol:	127	262	77	176	208	180	221	505	80	55	712	174
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	127	262	77	176	208	180	221	505	80	55	712	174
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.00	0.95	0.95	0.00
PHF Volume:	134	276	81	185	219	189	233	532	0	58	749	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	134	276	81	185	219	189	233	532	0	58	749	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
FinalVolume:	134	276	81	185	219	189	233	532	0	58	749	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.93	0.93	0.83	0.90	0.98	0.83	0.90	0.93	1.00	0.79	0.79	0.85
Lanes:	1.00	2.00	1.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00
Final Sat.:	1769	3538	1583	3432	1862	1583	3432	3538	1900	1504	3007	1615
Capacity Analysis Module:												
Vol/Sat:	0.08	0.08	0.05	0.05	0.12	0.12	0.07	0.15	0.00	0.04	0.25	0.00
Crit Moves:	****				****		****				****	
Green/Cycle:	0.13	0.20	0.20	0.14	0.21	0.21	0.12	0.45	0.00	0.11	0.44	0.00
Volume/Cap:	0.57	0.39	0.25	0.39	0.57	0.58	0.57	0.34	0.00	0.34	0.57	0.00
Delay/Veh:	43.8	34.9	34.0	39.7	37.6	38.2	43.4	18.2	0.0	42.0	21.5	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	43.8	34.9	34.0	39.7	37.6	38.2	43.4	18.2	0.0	42.0	21.5	0.0
LOS by Move:	D	C	C	D	D	D	D	B	A	D	C	A
HCM2kAvgQ:	5	4	2	3	7	6	4	6	0	2	9	0

Note: Queue reported is the number of cars per lane.

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------------------------------------------------------------------------------
               A.M. Peak Hour - Existing Conditions
                  Citywide Traffic Model Update
                         City of Novato
------------------------------------------------------------------------------
               Level Of Service Computation Report
       2000 HCM Operations Method (Base Volume Alternative)
******************************************************************************
Intersection #13 U.S. 101 South Ramps/DeLong Ave
******************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):         0.625
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       16.1
Optimal Cycle:        35              Level Of Service:                  B
******************************************************************************
Street Name:        US 101 South Ramps                  DeLong Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Protected         Protected
Rights:           Include          Include          Include           Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  0  0  0    1  1  0  0  1    0  0  2  0  1    1  0  2  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:      0    0     0    9    1   298    0  137   520   23  671     0
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:   0    0     0    9    1   298    0  137   520   23  671     0
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90  0.90
PHF Volume:    0    0     0   10    1   332    0  153   579   26  747     0
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0    0     0   10    1   332    0  153   579   26  747     0
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:   0    0     0   10    1   332    0  153   579   26  747     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 1.00  1.00 0.99 0.99  0.84 1.00 0.93  0.83 0.93 0.93  1.00
Lanes:       0.00 0.00  0.00 1.80 0.20  1.00 0.00 2.00  1.00 1.00 2.00  0.00
Final Sat.:    0    0     0 3372  375  1599    0 3538  1583 1769 3538     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00 0.00 0.00  0.21 0.00 0.04  0.37 0.01 0.21  0.00
Crit Moves:                             ****             **** ****
Green/Cycle: 0.00 0.00  0.00 0.33 0.33  0.33 0.00 0.58  0.58 0.02 0.61  0.00
Volume/Cap:  0.00 0.00  0.00 0.01 0.01  0.63 0.00 0.07  0.63 0.63 0.35  0.00
Delay/Veh:    0.0  0.0   0.0 22.4 22.4  30.5  0.0  9.0  14.9 75.1  9.8   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0   0.0 22.4 22.4  30.5  0.0  9.0  14.9 75.1  9.8   0.0
LOS by Move:   A    A     A    C    C     C    A    A     B    E    A     A
HCM2kAvgQ:     0    0     0    0    0     9    0    1    12    2    6     0
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
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------------------------------------------------------------------------------
               P.M. Peak Hour - Existing Conditions
                  Citywide Traffic Model Update
                         City of Novato
------------------------------------------------------------------------------
               Level Of Service Computation Report
       2000 HCM Operations Method (Base Volume Alternative)
******************************************************************************
Intersection #13 U.S. 101 South Ramps/DeLong Ave
******************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):         0.714
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):        8.9
Optimal Cycle:        44              Level Of Service:                  A
******************************************************************************
Street Name:        US 101 South Ramps                  DeLong Ave
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase       Protected         Protected
Rights:           Include          Include          Include           Include
Min. Green:    0    0     0    0    0     0    0    0     0    0    0     0
Lanes:       0  0  0  0  0    1  1  0  0  1    0  0  2  0  1    1  0  2  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 4:45-5:45 pm
Base Vol:      0    0     0    4    5   154    0  245   802   31 1361     0
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:   0    0     0    4    5   154    0  245   802   31 1361     0
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92
PHF Volume:    0    0     0    4    5   167    0  265   868   34 1473     0
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0    0     0    4    5   167    0  265   868   34 1473     0
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:   0    0     0    4    5   167    0  265   868   34 1473     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 1.00  1.00 0.99 0.99  0.84 1.00 0.93  0.83 0.93 0.93  1.00
Lanes:       0.00 0.00  0.00 1.00 1.00  1.00 0.00 2.00  1.00 1.00 2.00  0.00
Final Sat.:    0    0     0 1873 1873  1599    0 3538  1583 1769 3538     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00 0.00 0.00  0.10 0.00 0.07  0.55 0.02 0.42  0.00
Crit Moves:                             ****             **** ****
Green/Cycle: 0.00 0.00  0.00 0.15 0.15  0.15 0.00 0.77  0.77 0.03 0.79  0.00
Volume/Cap:  0.00 0.00  0.00 0.02 0.02  0.71 0.00 0.10  0.71 0.71 0.52  0.00
Delay/Veh:    0.0  0.0   0.0 36.6 36.6  50.8  0.0  2.9   8.0 89.1  3.8   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0   0.0 36.6 36.6  50.8  0.0  2.9   8.0 89.1  3.8   0.0
LOS by Move:   A    A     A    D    D     D    A    A     A    F    A     A
HCM2kAvgQ:     0    0     0    0    0     6    0    1    15    2    9     0
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
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-----------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*****************************************************************************
Intersection #14 U.S. 101 North Ramps/DeLong Ave
*****************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):         0.356
Loss Time (sec):      6 (Y+R=4.0 sec) Average Delay (sec/veh):       13.8
Optimal Cycle:       22              Level Of Service:                 B
*****************************************************************************
Street Name:       US 101 North Ramps                 DeLong Ave
Approach:     North Bound      South Bound      East Bound      West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:       1  1  0  0  1   0  0  0  0  0   1  0  2  0  0   0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:     650    2   20     0    0    0   118   28    0     0   45    8
Growth Adj:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse:  650    2   20     0    0    0   118   28    0     0   45    8
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.86 0.86 0.86  0.86 0.86 0.86  0.86 0.86 0.86  0.86 0.86 0.86
PHF Volume:   752    2   23     0    0    0   137   32    0     0   52    9
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:  752    2   23     0    0    0   137   32    0     0   52    9
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:  752    2   23     0    0    0   137   32    0     0   52    9
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  0.83 0.83 0.82  1.00 1.00 1.00  0.93 0.93 1.00  1.00 0.91 0.91
Lanes:       1.99 0.01 1.00  0.00 0.00 0.00  1.00 2.00 0.00  0.00 1.70 0.30
Final Sat.:  3143   10 1567     0    0    0  1769 3538    0     0 2935  522
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.24 0.24 0.01  0.00 0.00 0.00  0.08 0.01 0.00  0.00 0.02 0.02
Crit Moves:       ****                       ****                     ****
Green/Cycle: 0.67 0.67 0.67  0.00 0.00 0.00  0.22 0.27 0.00  0.00 0.05 0.05
Volume/Cap:  0.36 0.36 0.02  0.00 0.00 0.00  0.36 0.03 0.00  0.00 0.36 0.36
Delay/Veh:    7.1  7.1  5.4   0.0  0.0  0.0  33.8 27.1  0.0   0.0 47.2 47.2
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   7.1  7.1  5.4   0.0  0.0  0.0  33.8 27.1  0.0   0.0 47.2 47.2
LOS by Move:    A    A    A     A    A    A     C    C    A     A    D    D
HCM2kAvgQ:      5    5    0     0    0    0     4    0    0     0    1    1
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-----------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*****************************************************************************
Intersection #14 U.S. 101 North Ramps/DeLong Ave
*****************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):         0.647
Loss Time (sec):      6 (Y+R=4.0 sec) Average Delay (sec/veh):       15.1
Optimal Cycle:       37              Level Of Service:                 B
*****************************************************************************
Street Name:       US 101 North Ramps                 DeLong Ave
Approach:     North Bound      South Bound      East Bound      West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:       1  1  0  0  1   0  0  0  0  0   1  0  2  0  0   0  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 4:45-5:45 pm
Base Vol:    1338   13   28     0    0    0   224   33    0     0   43   16
Growth Adj:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse: 1338   13   28     0    0    0   224   33    0     0   43   16
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.94 0.94 0.94  0.94 0.94 0.94  0.94 0.94 0.94  0.94 0.94 0.94
PHF Volume:  1420   14   30     0    0    0   238   35    0     0   46   17
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol: 1420   14   30     0    0    0   238   35    0     0   46   17
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume: 1420   14   30     0    0    0   238   35    0     0   46   17
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  0.83 0.83 0.82  1.00 1.00 1.00  0.93 0.93 1.00  1.00 0.89 0.89
Lanes:       1.98 0.02 1.00  0.00 0.00 0.00  1.00 2.00 0.00  0.00 1.46 0.54
Final Sat.:  3122   30 1567     0    0    0  1769 3538    0     0 2473  920
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.45 0.45 0.02  0.00 0.00 0.00  0.13 0.01 0.00  0.00 0.02 0.02
Crit Moves:  ****                            ****                     ****
Green/Cycle: 0.70 0.70 0.70  0.00 0.00 0.00  0.21 0.24 0.00  0.00 0.03 0.03
Volume/Cap:  0.65 0.65 0.03  0.00 0.00 0.00  0.65 0.04 0.00  0.00 0.65 0.65
Delay/Veh:    8.7  8.7  4.5   0.0  0.0  0.0  40.2 29.5  0.0   0.0 62.3 62.3
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   8.7  8.7  4.5   0.0  0.0  0.0  40.2 29.5  0.0   0.0 62.3 62.3
LOS by Move:    A    A    A     A    A    A     D    C    A     A    E    E
HCM2kAvgQ:     13   13    0     0    0    0     8    0    0     0    2    2
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-----------------------------------------------------------------------------
                  A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------

                  Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*****************************************************************************
Intersection #15 Grant Ave/Novato Blvd
*****************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):         0.432
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       13.4
Optimal Cycle:        24              Level Of Service:                  B
*****************************************************************************
Street Name:                Grant Ave                       Novato Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       0  0  1! 0  0   1  0  0  1  0   1  0  1  1  0   1  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:      0    0    0    34    0   138   216  789    0     0  566    73
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   0    0    0    34    0   138   216  789    0     0  566    73
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93  0.93 0.93  0.93
PHF Volume:    0    0    0    37    0   149   234  853    0     0  612    79
Reduct Vol:    0    0    0     0    0     0     0    0    0     0    0     0
Reduced Vol:   0    0    0    37    0   149   234  853    0     0  612    79
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   0    0    0    37    0   149   234  853    0     0  612    79
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 1.00  1.00  0.82 1.00  0.83  0.93 0.93  0.95  1.00 0.93  0.83
Lanes:       0.00 1.00  0.00  1.00 0.00  1.00  1.00 2.00  0.00  1.00 2.00  1.00
Final Sat.:     0 1900     0  1560    0  1583  1769 3538     0  1900 3538  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00  0.02 0.00  0.09  0.13 0.24  0.00  0.00 0.17  0.05
Crit Moves:                               ****  ****                 ****
Green/Cycle: 0.00 0.00  0.00  0.22 0.00  0.22  0.31 0.71  0.00  0.00 0.40  0.40
Volume/Cap:  0.00 0.00  0.00  0.11 0.00  0.43  0.43 0.34  0.00  0.00 0.43  0.12
Delay/Veh:    0.0  0.0   0.0  25.2  0.0  27.8  22.8  4.6   0.0   0.0 17.6  15.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0   0.0  25.2  0.0  27.8  22.8  4.6   0.0   0.0 17.6  15.2
LOS by Move:   A    A     A     C    A     C     C    A     A     A    B     B
HCM2kAvgQ:     0    0     0     1    0     4     5    4     0     0    6     1
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-----------------------------------------------------------------------------
                  P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------

                  Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*****************************************************************************
Intersection #15 Grant Ave/Novato Blvd
*****************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):         0.636
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       18.2
Optimal Cycle:        35              Level Of Service:                  B
*****************************************************************************
Street Name:                Grant Ave                       Novato Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       0  0  1! 0  0   1  0  0  1  0   1  0  1  1  0   1  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      0    0    0    24    0   341   154  653    0     0  883    57
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   0    0    0    24    0   341   154  653    0     0  883    57
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.94 0.94  0.94  0.94 0.94  0.94  0.94 0.94  0.94  0.94 0.94  0.94
PHF Volume:    0    0    0    26    0   363   164  695    0     0  940    61
Reduct Vol:    0    0    0     0    0     0     0    0    0     0    0     0
Reduced Vol:   0    0    0    26    0   363   164  695    0     0  940    61
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   0    0    0    26    0   363   164  695    0     0  940    61
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 1.00  1.00  0.86 1.00  0.83  0.93 0.93  0.95  1.00 0.93  0.83
Lanes:       0.00 1.00  0.00  1.00 0.00  1.00  1.00 2.00  0.00  1.00 2.00  1.00
Final Sat.:     0 1900     0  1626    0  1583  1769 3538     0  1900 3538  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.00  0.02 0.00  0.23  0.09 0.20  0.00  0.00 0.27  0.04
Crit Moves:                               ****  ****                 ****
Green/Cycle: 0.00 0.00  0.00  0.36 0.00  0.36  0.15 0.56  0.00  0.00 0.42  0.42
Volume/Cap:  0.00 0.00  0.00  0.04 0.00  0.64  0.64 0.35  0.00  0.00 0.64  0.09
Delay/Veh:    0.0  0.0   0.0  16.6  0.0  23.6  37.3  9.6   0.0   0.0 19.4  14.1
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0   0.0  16.6  0.0  23.6  37.3  9.6   0.0   0.0 19.4  14.1
LOS by Move:   A    A     A     B    A     C     D    A     A     A    B     B
HCM2kAvgQ:     0    0     0     0    0     8     5    5     0     0   10     1
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-------------------------------------------------------------------------------
                    A.M. Peak Hour - Existing Conditions
                        Citywide Traffic Model Update
                               City of Novato
-------------------------------------------------------------------------------

                      Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #16 7th St/Tamalpais Ave/Novato Blvd
*******************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):         0.635
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       16.4
Optimal Cycle:        35              Level Of Service:                 B
*******************************************************************************
Street Name:       7th St-Tamalpais Ave                 Novato Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        1  0  0  1  0   1  0  1  0  1   1  0  0  1  0   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:     116   93    36    71  118    43    85  638    98    67  480    94
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:  116   93    36    71  118    43    85  638    98    67  480    94
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:   123   98    38    75  125    46    90  675   104    71  508    99
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  123   98    38    75  125    46    90  675   104    71  508    99
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  123   98    38    75  125    46    90  675   104    71  508    99
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.54 0.94  0.94  0.51 0.98  0.83  0.93 0.96  0.96  0.93 0.98  0.83
Lanes:       1.00 0.72  0.28  1.00 1.00  1.00  1.00 0.87  0.13  1.00 1.00  1.00
Final Sat.:  1019 1286   498   965 1862  1583  1769 1582   243  1769 1862  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.12 0.08  0.08  0.08 0.07  0.03  0.05 0.43  0.43  0.04 0.27  0.06
Crit Moves:  ****                                   ****        ****
Green/Cycle: 0.19 0.19  0.19  0.19 0.19  0.19  0.12 0.67  0.67  0.06 0.62  0.62
Volume/Cap:  0.64 0.40  0.40  0.41 0.35  0.15  0.44 0.64  0.64  0.64 0.44  0.10
Delay/Veh:   36.6 29.2  29.2  30.0 28.8  27.3  34.5  8.6   8.6  48.0  8.2   6.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  36.6 29.2  29.2  30.0 28.8  27.3  34.5  8.6   8.6  48.0  8.2   6.2
LOS by Move:    D    C     C     C    C     C     C    A     A     D    A     A
HCM2kAvgQ:      4    3     3     2    3     1     3   12    12     3    7     1
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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-------------------------------------------------------------------------------
                    P.M. Peak Hour - Existing Conditions
                        Citywide Traffic Model Update
                               City of Novato
-------------------------------------------------------------------------------

                      Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #16 7th St/Tamalpais Ave/Novato Blvd
*******************************************************************************
Cycle (sec):          80              Critical Vol./Cap.(X):         0.655
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):       17.0
Optimal Cycle:        37              Level Of Service:                 B
*******************************************************************************
Street Name:       7th St-Tamalpais Ave                 Novato Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted        Protected        Protected
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        1  0  0  1  0   1  0  1  0  1   1  0  0  1  0   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:     103   86    29   140  127   131   111  502    85    44  730   174
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:  103   86    29   140  127   131   111  502    85    44  730   174
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.97 0.97  0.97  0.97 0.97  0.97  0.97 0.97  0.97  0.97 0.97  0.97
PHF Volume:   107   89    30   145  131   135   115  519    88    46  755   180
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  107   89    30   145  131   135   115  519    88    46  755   180
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  107   89    30   145  131   135   115  519    88    46  755   180
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.54 0.94  0.94  0.56 0.98  0.83  0.93 0.96  0.96  0.93 0.98  0.83
Lanes:       1.00 0.75  0.25  1.00 1.00  1.00  1.00 0.86  0.14  1.00 1.00  1.00
Final Sat.:  1020 1340   452  1071 1862  1583  1769 1557   264  1769 1862  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.10 0.07  0.07  0.14 0.07  0.09  0.06 0.33  0.33  0.03 0.41  0.11
Crit Moves:                   ****              ****                  ****
Green/Cycle: 0.21 0.21  0.21  0.21 0.21  0.21  0.10 0.67  0.67  0.05 0.62  0.62
Volume/Cap:  0.51 0.32  0.32  0.65 0.34  0.41  0.65 0.50  0.50  0.50 0.65  0.18
Delay/Veh:   30.1 27.5  27.5  36.0 27.6  28.4  43.3  7.0   7.0  41.2 11.1   6.6
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  30.1 27.5  27.5  36.0 27.6  28.4  43.3  7.0   7.0  41.2 11.1   6.6
LOS by Move:    C    C     C     D    C     C     D    A     A     D    B     A
HCM2kAvgQ:      3    3     3     5    3     3     4    8     8     2   13     2
*******************************************************************************
Note: Queue reported is the number of cars per lane.
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---------------------------------------------------------------------------------
                    A.M. Peak Hour - Existing Conditions
                        Citywide Traffic Model Update
                               City of Novato
---------------------------------------------------------------------------------

                     Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*********************************************************************************
Intersection #17 Diablo Ave/Novato Blvd/S Novato Blvd
*********************************************************************************
Cycle (sec):         100             Critical Vol./Cap.(X):        0.549
Loss Time (sec):       8 (Y+R=4.0 sec) Average Delay (sec/veh):     33.7
Optimal Cycle:        35             Level Of Service:                 C
*********************************************************************************
Street Name:               Diablo Ave               Novato Blvd-S Novato Blvd
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase      Split Phase      Split Phase
Rights:          Ignore          Include           Ignore           Ignore
Min. Green:     0    0    0     0    0    0     0    0    0     0    0    0
Lanes:        1  0  1  0  1   1  1  0  1  0   0  1  0  1  0   1  1  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:      17  338   189   321  431    20    30  220    30   198  218   307
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   17  338   189   321  431    20    30  220    30   198  218   307
User Adj:    1.00 1.00  0.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  0.00
PHF Adj:     0.95 0.95  0.00  0.95 0.95  0.95  0.95 0.95  0.00  0.95 0.95  0.00
PHF Volume:    18  354     0   336  452    21    31  231     0   208  229     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   18  354     0   336  452    21    31  231     0   208  229     0
PCE Adj:     1.00 1.00  0.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  0.00
MLF Adj:     1.00 1.00  0.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  0.00
FinalVolume:   18  354     0   336  452    21    31  231     0   208  229     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.98  1.00  0.91 0.91  0.91  0.93 0.93  0.95  0.91 0.91  1.00
Lanes:       1.00 1.00  1.00  1.25 1.67  0.08  0.24 1.76  0.00  1.43 1.57  1.00
Final Sat.:  1769 1862  1900  2154 2892   134   422 3095     0  2468 2717  1900
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.01 0.19  0.00  0.16 0.16  0.16  0.07 0.07  0.00  0.08 0.08  0.00
Crit Moves:       ****             ****             ****        ****
Green/Cycle: 0.35 0.35  0.00  0.28 0.28  0.28  0.14 0.14  0.00  0.15 0.15  0.00
Volume/Cap:  0.03 0.55  0.00  0.55 0.55  0.55  0.55 0.55  0.00  0.55 0.55  0.00
Delay/Veh:   21.6 27.4   0.0  30.8 30.8  30.8  41.7 41.7   0.0  40.0 40.0   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  21.6 27.4   0.0  30.8 30.8  30.8  41.7 41.7   0.0  40.0 40.0   0.0
LOS by Move:    C    C     A     C    C     C     D    D     A     D    D     A
HCM2kAvgQ:      0    9     0     8    8     8     5    5     0     5    5     0
*********************************************************************************
Note: Queue reported is the number of cars per lane.
*********************************************************************************
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---------------------------------------------------------------------------------
                    P.M. Peak Hour - Existing Conditions
                        Citywide Traffic Model Update
                               City of Novato
---------------------------------------------------------------------------------

                     Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*********************************************************************************
Intersection #17 Diablo Ave/Novato Blvd/S Novato Blvd
*********************************************************************************
Cycle (sec):         100             Critical Vol./Cap.(X):        0.613
Loss Time (sec):       8 (Y+R=4.0 sec) Average Delay (sec/veh):     34.6
Optimal Cycle:        39             Level Of Service:                 C
*********************************************************************************
Street Name:               Diablo Ave               Novato Blvd-S Novato Blvd
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase      Split Phase      Split Phase
Rights:          Ignore          Include           Ignore           Ignore
Min. Green:     0    0    0     0    0    0     0    0    0     0    0    0
Lanes:        1  0  1  0  1   1  1  0  1  0   0  1  0  1  0   1  1  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Oct 2008 << 5:00-6:00 pm
Base Vol:      52  433   232   368  377    32    35  208    38   237  212   544
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   52  433   232   368  377    32    35  208    38   237  212   544
User Adj:    1.00 1.00  0.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  0.00
PHF Adj:     0.96 0.96  0.00  0.96 0.96  0.96  0.96 0.96  0.00  0.96 0.96  0.00
PHF Volume:    54  453     0   385  394    33    37  218     0   248  222     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   54  453     0   385  394    33    37  218     0   248  222     0
PCE Adj:     1.00 1.00  0.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  0.00
MLF Adj:     1.00 1.00  0.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  0.00
FinalVolume:   54  453     0   385  394    33    37  218     0   248  222     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.98  1.00  0.90 0.90  0.90  0.92 0.92  0.95  0.91 0.91  1.00
Lanes:       1.00 1.00  1.00  1.42 1.46  0.12  0.29 1.71  0.00  1.58 1.42  1.00
Final Sat.:  1769 1862  1900  2441 2500   212   506 3007     0  2728 2440  1900
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.03 0.24  0.00  0.16 0.16  0.16  0.07 0.07  0.00  0.09 0.09  0.00
Crit Moves:       ****                   ****  ****                   ****
Green/Cycle: 0.40 0.40  0.00  0.26 0.26  0.26  0.12 0.12  0.00  0.15 0.15  0.00
Volume/Cap:  0.08 0.61  0.00  0.61 0.61  0.61  0.61 0.61  0.00  0.61 0.61  0.00
Delay/Veh:   18.8 25.6   0.0  33.6 33.6  33.6  44.7 44.7   0.0  41.4 41.4   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  18.8 25.6   0.0  33.6 33.6  33.6  44.7 44.7   0.0  41.4 41.4   0.0
LOS by Move:    B    C     A     C    C     C     D    D     A     D    D     A
HCM2kAvgQ:      1   12     0     8    8     8     5    5     0     6    6     0
*********************************************************************************
Note: Queue reported is the number of cars per lane.
*********************************************************************************
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-----------------------------------------------------------------------------
                  A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
*****************************************************************************
Intersection #18 Diablo Ave/Center St
*****************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.595
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):       14.6
Optimal Cycle:          0              Level Of Service:                 B
*****************************************************************************
Street Name:                Diablo Ave                       Center St
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  1! 0  0   0  0  1! 0  0   0  0  1! 0  0   0  0  1! 0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 15 Nov 2008 << 7:30-8:30 am
Base Vol:      11  182   101    19  199    38    42  154    19    79   67    30
Growth Adj:  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02
Initial Bse:   11  186   103    19  203    39    43  157    19    81   68    31
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.85 0.85  0.85  0.85 0.85  0.85  0.85 0.85  0.85  0.85 0.85  0.85
PHF Volume:    13  219   122    23  240    46    51  185    23    95   81    36
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   13  219   122    23  240    46    51  185    23    95   81    36
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   13  219   122    23  240    46    51  185    23    95   81    36
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.04 0.62  0.34  0.07 0.78  0.15  0.19 0.72  0.09  0.45 0.38  0.17
Final Sat.:    22  368   204    42  443    85   104  382    47   231  196    88
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.59 0.59  0.59  0.54 0.54  0.54  0.49 0.49  0.49  0.41 0.41  0.41
Crit Moves:       ****              ****        ****              ****
Delay/Veh:   15.8 15.8  15.8  14.8 14.8  14.8  14.0 14.0  14.0  12.9 12.9  12.9
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  15.8 15.8  15.8  14.8 14.8  14.8  14.0 14.0  14.0  12.9 12.9  12.9
LOS by Move:    C    C     C     B    B     B     B    B     B     B    B     B
ApproachDel:      15.8              14.8              14.0              12.9
Delay Adj:        1.00              1.00              1.00              1.00
ApprAdjDel:       15.8              14.8              14.0              12.9
LOS by Appr:        C                 B                 B                 B
AllWayAvgQ:   1.2  1.2   1.2   0.9  0.9   0.9   0.7  0.7   0.7   0.5  0.5   0.5
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-----------------------------------------------------------------------------
                  P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
*****************************************************************************
Intersection #18 Diablo Ave/Center St
*****************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.556
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):       13.9
Optimal Cycle:          0              Level Of Service:                 B
*****************************************************************************
Street Name:                Diablo Ave                       Center St
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:     0    0     0     0    0     0     0    0     0     0    0     0
Lanes:        0  0  1! 0  0   0  0  1! 0  0   0  0  1! 0  0   0  0  1! 0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 15 Nov 2008 << 5:00-6:00 pm
Base Vol:       6  182    59    40  179    83    41   95     6    63  184    41
Growth Adj:  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02  1.02 1.02  1.02
Initial Bse:    6  186    60    41  183    85    42   97     6    64  188    42
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92
PHF Volume:     7  201    65    44  198    92    45  105     7    70  204    45
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    7  201    65    44  198    92    45  105     7    70  204    45
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:    7  201    65    44  198    92    45  105     7    70  204    45
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Lanes:       0.02 0.74  0.24  0.13 0.60  0.27  0.29 0.67  0.04  0.22 0.64  0.14
Final Sat.:    14  428   139    80  356   165   148  343    22   127  370    82
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.47 0.47  0.47  0.56 0.56  0.56  0.31 0.31  0.31  0.55 0.55  0.55
Crit Moves:  ****              ****                   ****        ****
Delay/Veh:   13.1 13.1  13.1  14.7 14.7  14.7  11.6 11.6  11.6  14.9 14.9  14.9
Delay Adj:   1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  13.1 13.1  13.1  14.7 14.7  14.7  11.6 11.6  11.6  14.9 14.9  14.9
LOS by Move:    B    B     B     B    B     B     B    B     B     B    B     B
ApproachDel:      13.1              14.7              11.6              14.9
Delay Adj:        1.00              1.00              1.00              1.00
ApprAdjDel:       13.1              14.7              11.6              14.9
LOS by Appr:        B                 B                 B                 B
AllWayAvgQ:   0.7  0.7   0.7   1.0  1.0   1.0   0.3  0.3   0.3   1.0  1.0   1.0
*****************************************************************************
Note: Queue reported is the number of cars per lane.
*****************************************************************************
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-------------------------------------------------------------------------------
                    A.M. Peak Hour - Existing Conditions
                        Citywide Traffic Model Update
                               City of Novato
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #19 S Novato Blvd/Rowland Blvd
*******************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):         0.577
Loss Time (sec):      8 (Y+R=4.0 sec) Average Delay (sec/veh):        27.7
Optimal Cycle:       37              Level Of Service:                 C
*******************************************************************************
Street Name:            S Novato Blvd                     Rowland Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected        Protected
Rights:          Include          Include          Include           Ignore
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       1  0  0  1  0   2  0  0  1  0   1  0  0  1  0   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 2 Oct 2001 << 7:00-8:00
Base Vol:      15  241    90   352  456    42    25  150    31   100   98   138
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   15  241    90   352  456    42    25  150    31   100   98   138
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00
PHF Adj:     0.84 0.84  0.84  0.80 0.80  0.80  0.86 0.86  0.86  0.87 0.87  0.00
PHF Volume:    18  287   107   441  571    53    29  175    36   115  113     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   18  287   107   441  571    53    29  175    36   115  113     0
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00
FinalVolume:   18  287   107   441  571    53    29  175    36   115  113     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.94  0.94  0.90 0.97  0.97  0.93 0.95  0.95  0.93 0.98  1.00
Lanes:       1.00 0.73  0.27  2.00 0.92  0.08  1.00 0.83  0.17  1.00 1.00  1.00
Final Sat.:  1769 1300   486  3432 1683   155  1769 1503   311  1769 1862  1900
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.01 0.22  0.22  0.13 0.34  0.34  0.02 0.12  0.12  0.07 0.06  0.00
Crit Moves:  ****                  ****             ****        ****
Green/Cycle: 0.02 0.38  0.38  0.22 0.59  0.59  0.07 0.20  0.20  0.11 0.25  0.00
Volume/Cap:  0.58 0.58  0.58  0.58 0.58  0.58  0.25 0.58  0.58  0.58 0.25  0.00
Delay/Veh:   72.9 25.7  25.7  35.8 13.6  13.6  45.3 38.3  38.3  46.2 30.4   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  72.9 25.7  25.7  35.8 13.6  13.6  45.3 38.3  38.3  46.2 30.4   0.0
LOS by Move:    E    C     C     D    B     B     D    D     D     D    C     A
HCM2kAvgQ:      1   10    10     7   12    12     1    7     7     4    3     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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-------------------------------------------------------------------------------
                    P.M. Peak Hour - Existing Conditions
                        Citywide Traffic Model Update
                               City of Novato
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #19 S Novato Blvd/Rowland Blvd
*******************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):         0.759
Loss Time (sec):      8 (Y+R=4.0 sec) Average Delay (sec/veh):        34.7
Optimal Cycle:       57              Level Of Service:                 C
*******************************************************************************
Street Name:            S Novato Blvd                     Rowland Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected        Protected        Protected
Rights:          Include          Include          Include           Ignore
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:       1  0  0  1  0   2  0  0  1  0   1  0  0  1  0   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 25 Sep 2001 << 4:30-5:30
Base Vol:      42  369   114   451  393   121    50  196    25   148  208   384
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   42  369   114   451  393   121    50  196    25   148  208   384
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00
PHF Adj:     0.95 0.95  0.95  0.80 0.80  0.80  0.81 0.81  0.81  0.82 0.82  0.00
PHF Volume:    44  388   120   564  491   151    62  242    31   180  254     0
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   44  388   120   564  491   151    62  242    31   180  254     0
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00
FinalVolume:   44  388   120   564  491   151    62  242    31   180  254     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.95  0.95  0.90 0.95  0.95  0.93 0.96  0.96  0.93 0.98  1.00
Lanes:       1.00 0.76  0.24  2.00 0.76  0.24  1.00 0.89  0.11  1.00 1.00  1.00
Final Sat.:  1769 1373   424  3432 1374   423  1769 1623   207  1769 1862  1900
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.02 0.28  0.28  0.16 0.36  0.36  0.03 0.15  0.15  0.10 0.14  0.00
Crit Moves:       ****        ****                  ****        ****
Green/Cycle: 0.04 0.37  0.37  0.22 0.55  0.55  0.07 0.20  0.20  0.13 0.26  0.00
Volume/Cap:  0.65 0.76  0.76  0.76 0.65  0.65  0.52 0.76  0.76  0.76 0.52  0.00
Delay/Veh:   67.4 32.5  32.5  41.3 17.3  17.3  49.0 47.0  47.0  54.9 32.4   0.0
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  67.4 32.5  32.5  41.3 17.3  17.3  49.0 47.0  47.0  54.9 32.4   0.0
LOS by Move:    E    C     C     D    B     B     D    D     D     D    C     A
HCM2kAvgQ:      3   15    15    10   14    14     3   10    10     7    7     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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HCM Signalized Intersection Capacity Analysis
20: Rowland Blvd. & Redwood Blvd.

12/11/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	638	16	19	373	181	38	30	71	213	13	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.89		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3366		1770	3167		3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3366		1770	3167		3433	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	117	672	17	20	393	191	40	32	75	224	14	115
RTOR Reduction (vph)	0	0	5	0	67	0	0	65	0	0	0	90
Lane Group Flow (vph)	117	672	12	20	517	0	40	42	0	224	14	25
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	4.9	23.4	23.4	0.8	19.3		2.0	6.2		6.0	10.2	10.2
Effective Green, g (s)	5.9	24.4	24.4	1.8	20.3		3.0	7.2		7.0	11.2	11.2
Actuated g/C Ratio	0.11	0.47	0.47	0.03	0.39		0.06	0.14		0.13	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	199	1648	737	61	1304		101	435		459	398	338
v/s Ratio Prot	c0.07	c0.19		0.01	0.15		0.02	0.01		c0.07	0.01	
v/s Ratio Perm			0.01									c0.02
v/c Ratio	0.59	0.41	0.02	0.33	0.40		0.40	0.10		0.49	0.04	0.07
Uniform Delay, d1	22.1	9.2	7.5	24.7	11.6		23.8	19.8		21.0	16.3	16.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.4	0.2	0.0	3.1	0.2		2.5	0.1		0.8	0.0	0.1
Delay (s)	26.5	9.4	7.5	27.8	11.8		26.4	19.9		21.9	16.4	16.5
Level of Service	C	A	A	C	B		C	B		C	B	B
Approach Delay (s)		11.8			12.3			21.6			19.9	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	52.4	Sum of lost time (s)	6.0
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: Rowland Blvd. & Redwood Blvd.

12/11/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	590	46	107	851	289	25	22	74	355	40	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.88		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3405		1770	3130		3433	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3405		1770	3130		3433	1863	1583
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	91	590	46	107	851	289	25	22	74	355	40	106
RTOR Reduction (vph)	0	0	14	0	30	0	0	67	0	0	0	83
Lane Group Flow (vph)	91	590	32	107	1110	0	25	29	0	355	40	23
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									4
Actuated Green, G (s)	8.2	36.1	36.1	8.8	36.7		3.1	7.0		12.1	16.0	16.0
Effective Green, g (s)	9.2	37.1	37.1	9.8	37.7		4.1	8.0		13.1	17.0	17.0
Actuated g/C Ratio	0.12	0.46	0.46	0.12	0.47		0.05	0.10		0.16	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	204	1641	734	217	1605		91	313		562	396	336
v/s Ratio Prot	0.05	0.17		c0.06	c0.33		0.01	0.01		c0.10	c0.02	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.45	0.36	0.04	0.49	0.69		0.27	0.09		0.63	0.10	0.07
Uniform Delay, d1	33.0	13.8	11.7	32.8	16.6		36.5	32.7		31.2	25.4	25.2
Progression Factor	1.00	1.00	1.00	0.89	0.89		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.6	0.6	0.1	1.6	2.3		1.6	0.1		2.3	0.1	0.1
Delay (s)	34.6	14.4	11.8	30.8	17.0		38.2	32.8		33.5	25.5	25.2
Level of Service	C	B	B	C	B		D	C		C	C	C
Approach Delay (s)		16.8			18.2			33.9			31.1	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	398	508	111	445	0	0	0	0	220	7	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Lane Util. Factor		0.91	0.91	0.97	0.95					0.91	0.91	
Frt		0.95	0.85	1.00	1.00					1.00	0.91	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (prot)		3205	1441	3433	3539					1610	3034	
Flt Permitted		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (perm)		3205	1441	3433	3539					1610	3034	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	419	535	117	468	0	0	0	0	232	7	147
RTOR Reduction (vph)	0	106	179	0	0	0	0	0	0	0	110	0
Lane Group Flow (vph)	0	554	115	117	468	0	0	0	0	135	141	0
Turn Type			Perm	Prot						Split		
Protected Phases		2		1	6					4	4	
Permitted Phases			2									
Actuated Green, G (s)		14.7	14.7	4.5	23.2					9.1	9.1	
Effective Green, g (s)		15.7	15.7	5.5	24.2					10.1	10.1	
Actuated g/C Ratio		0.39	0.39	0.14	0.60					0.25	0.25	
Clearance Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		1249	561	469	2125					403	760	
v/s Ratio Prot		c0.17		c0.03	0.13					c0.08	0.05	
v/s Ratio Perm			0.08									
v/c Ratio		0.44	0.20	0.25	0.22					0.33	0.19	
Uniform Delay, d1		9.1	8.2	15.6	3.7					12.4	11.9	
Progression Factor		1.00	1.00	1.00	1.00					1.00	1.00	
Incremental Delay, d2		0.3	0.2	0.3	0.1					0.5	0.1	
Delay (s)		9.3	8.3	15.8	3.8					12.8	12.0	
Level of Service		A	A	B	A					B	B	
Approach Delay (s)		9.0			6.2			0.0			12.3	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	40.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	439	601	808	1145	0	0	0	0	189	4	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Lane Util. Factor		0.91	0.91	0.97	0.95					0.91	0.91	
Frt		0.94	0.85	1.00	1.00					1.00	0.92	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (prot)		3194	1441	3433	3539					1610	3047	
Flt Permitted		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (perm)		3194	1441	3433	3539					1610	3047	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	439	601	808	1145	0	0	0	0	189	4	107
RTOR Reduction (vph)	0	83	190	0	0	0	0	0	0	0	73	0
Lane Group Flow (vph)	0	632	135	808	1145	0	0	0	0	104	123	0
Turn Type			Perm	Prot						Split		
Protected Phases		2		1	6					4	4	
Permitted Phases			2									
Actuated Green, G (s)		32.2	32.2	24.3	60.5					11.5	11.5	
Effective Green, g (s)		33.2	33.2	25.3	61.5					12.5	12.5	
Actuated g/C Ratio		0.42	0.42	0.32	0.77					0.16	0.16	
Clearance Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Lane Grp Cap (vph)		1326	598	1086	2721					252	476	
v/s Ratio Prot		c0.20		c0.24	0.32					c0.06	0.04	
v/s Ratio Perm			0.09									
v/c Ratio		0.48	0.23	0.74	0.42					0.41	0.26	
Uniform Delay, d1		17.1	15.1	24.5	3.2					30.4	29.7	
Progression Factor		0.97	1.62	1.00	1.00					1.00	1.00	
Incremental Delay, d2		1.1	0.8	2.8	0.5					1.1	0.3	
Delay (s)		17.7	25.3	27.3	3.6					31.5	30.0	
Level of Service		B	C	C	A					C	C	
Approach Delay (s)		20.1			13.4			0.0			30.5	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR2	NBL2	NBL	NBR	NEL
Lane Configurations								
Volume (vph)	131	480	172	132	383	7	434	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	0.91	1.00	1.00	0.95	0.88	1.00
Frt	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.95	1.00	0.95
Satd. Flow (prot)	1770	3539	5085	1583	1770	1681	2787	1770
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.95	1.00	0.95
Satd. Flow (perm)	1770	3539	5085	1583	1770	1681	2787	1770
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	138	505	181	139	403	7	457	9
RTOR Reduction (vph)	0	0	0	111	0	0	0	0
Lane Group Flow (vph)	138	505	181	28	206	204	457	9
Turn Type	Prot			Perm	custom	Prot	custom	
Protected Phases	5	2	6		8	8		4
Permitted Phases				6	8		8	
Actuated Green, G (s)	7.4	20.0	8.6	8.6	14.6	14.6	14.6	0.9
Effective Green, g (s)	8.4	21.0	9.6	9.6	15.6	15.6	15.6	1.9
Actuated g/C Ratio	0.18	0.44	0.20	0.20	0.33	0.33	0.33	0.04
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	313	1565	1028	320	581	552	915	71
v/s Ratio Prot	c0.08	c0.14	0.04		0.12	0.12		c0.01
v/s Ratio Perm				0.02			c0.16	
v/c Ratio	0.44	0.32	0.18	0.09	0.35	0.37	0.50	0.13
Uniform Delay, d1	17.5	8.6	15.7	15.4	12.1	12.2	12.8	22.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.1	0.1	0.1	0.4	0.4	0.4	0.8
Delay (s)	18.4	8.7	15.8	15.5	12.5	12.6	13.2	22.8
Level of Service	B	A	B	B	B	B	B	C
Approach Delay (s)		10.8	15.7					22.8
Approach LOS		B	B					C

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR2	NBL2	NBL	NBR	NEL	NER
Lane Configurations									
Volume (vph)	70	563	1083	426	833	0	615	25	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95	0.91	1.00		1.00	0.88	1.00	
Frt	1.00	1.00	1.00	0.85		1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00		0.95	1.00	0.96	
Satd. Flow (prot)	1770	3539	5085	1583		1770	2787	1744	
Flt Permitted	0.95	1.00	1.00	1.00		0.95	1.00	0.96	
Satd. Flow (perm)	1770	3539	5085	1583		1770	2787	1744	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	563	1083	426	833	0	615	25	6
RTOR Reduction (vph)	0	0	0	313	0	0	0	0	0
Lane Group Flow (vph)	70	563	1083	113	0	833	615	31	0
Turn Type	Prot			Perm	custom	Prot	custom		
Protected Phases	5	2	6			8		7	
Permitted Phases			6	6	8		8		
Actuated Green, G (s)	4.2	33.7	25.5	25.5		49.3	49.3	5.0	
Effective Green, g (s)	5.2	34.7	26.5	26.5		50.3	50.3	6.0	
Actuated g/C Ratio	0.05	0.35	0.26	0.26		0.50	0.50	0.06	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	92	1228	1348	419		890	1402	105	
v/s Ratio Prot	c0.04	0.16	c0.21					c0.02	
v/s Ratio Perm				0.07		0.47	0.22		
v/c Ratio	0.76	0.46	0.80	0.27		0.94	0.44	0.30	
Uniform Delay, d1	46.8	25.4	34.3	29.1		23.3	15.8	45.0	
Progression Factor	1.00	1.00	0.94	1.51		1.00	1.00	1.00	
Incremental Delay, d2	30.3	1.2	4.5	1.4		16.6	0.2	1.6	
Delay (s)	77.1	26.6	36.6	45.2		40.0	16.1	46.5	
Level of Service	E	C	D	D		D	B	D	
Approach Delay (s)		32.2	39.0					46.5	
Approach LOS		C	D					D	

Intersection Summary			
HCM Average Control Delay	34.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	519	389	222	32	13	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0		3.0	3.0
Lane Util. Factor	0.97	0.91	0.95		1.00	0.95
Frt	1.00	1.00	0.98		0.89	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	3433	5085	3472		1641	1504
Flt Permitted	0.95	1.00	1.00		0.99	1.00
Satd. Flow (perm)	3433	5085	3472		1641	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	546	409	234	34	14	81
RTOR Reduction (vph)	0	0	15	0	0	0
Lane Group Flow (vph)	546	409	253	0	48	47
Turn Type	Prot					pm+ov
Protected Phases	5	2	6		4	5
Permitted Phases						4
Actuated Green, G (s)	11.7	26.6	10.9		2.4	14.1
Effective Green, g (s)	12.7	27.6	11.9		3.4	16.1
Actuated g/C Ratio	0.34	0.75	0.32		0.09	0.44
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	1178	3793	1117		151	776
v/s Ratio Prot	c0.16	0.08	c0.07		c0.03	0.02
v/s Ratio Perm						0.01
v/c Ratio	0.46	0.11	0.23		0.32	0.06
Uniform Delay, d1	9.5	1.3	9.2		15.7	6.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.3	0.0	0.1		1.2	0.0
Delay (s)	9.8	1.3	9.3		16.9	6.1
Level of Service	A	A	A		B	A
Approach Delay (s)		6.2	9.3		11.6	
Approach LOS		A	A		B	

Intersection Summary			
HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	37.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	217	990	1042	23	55	471
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0		3.0	3.0
Lane Util. Factor	0.97	0.91	0.95		1.00	0.95
Frt	1.00	1.00	1.00		0.88	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	3433	5085	3528		1624	1504
Flt Permitted	0.95	1.00	1.00		0.99	1.00
Satd. Flow (perm)	3433	5085	3528		1624	1504
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	217	990	1042	23	55	471
RTOR Reduction (vph)	0	0	1	0	0	0
Lane Group Flow (vph)	217	990	1064	0	267	259
Turn Type	Prot					pm+ov
Protected Phases	5	2	6		4	5
Permitted Phases						4
Actuated Green, G (s)	11.6	68.9	53.3		23.1	34.7
Effective Green, g (s)	12.6	69.9	54.3		24.1	36.7
Actuated g/C Ratio	0.13	0.70	0.54		0.24	0.37
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	433	3554	1916		391	597
v/s Ratio Prot	0.06	0.19	c0.30		c0.16	c0.05
v/s Ratio Perm						0.12
v/c Ratio	0.50	0.28	0.56		0.68	0.43
Uniform Delay, d1	40.8	5.6	14.9		34.5	23.8
Progression Factor	0.91	0.67	1.00		1.00	1.00
Incremental Delay, d2	0.8	0.2	1.2		4.9	0.5
Delay (s)	38.1	3.9	16.1		39.3	24.3
Level of Service	D	A	B		D	C
Approach Delay (s)		10.1	16.1		32.0	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	78	297	2	69	2	188	0	2	0	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Util. Factor	1.00	0.95	0.88	1.00	0.95		0.97	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85			0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770	3539	2787	1770	3525		3433	1583			1695	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1770	3539	2787	1770	3525		3433	1583			1695	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	6	82	313	2	73	2	198	0	2	0	1	2
RTOR Reduction (vph)	0	0	0	0	2	0	0	2	0	0	2	0
Lane Group Flow (vph)	6	82	313	2	73	0	198	0	0	0	1	0
Turn Type	Prot		pm+ov	Prot			Prot			Split		
Protected Phases	5!	2!	3	1	6!		3	2!		4	4	
Permitted Phases			2									
Actuated Green, G (s)	0.7	7.0	14.7	0.7	7.0		7.7	7.0			0.7	
Effective Green, g (s)	1.7	8.0	16.7	1.7	8.0		8.7	8.0			1.7	
Actuated g/C Ratio	0.05	0.25	0.52	0.05	0.25		0.27	0.25			0.05	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	94	882	1710	94	879		930	395			90	
v/s Ratio Prot	c0.00	0.02	c0.05	0.00	0.02		0.06	0.00			c0.00	
v/s Ratio Perm			0.06									
v/c Ratio	0.06	0.09	0.18	0.02	0.08		0.21	0.00			0.01	
Uniform Delay, d1	14.4	9.3	4.1	14.4	9.2		9.1	9.0			14.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	0.0	0.1	0.1	0.0		0.1	0.0			0.1	
Delay (s)	14.7	9.3	4.1	14.5	9.3		9.2	9.1			14.5	
Level of Service	B	A	A	B	A		A	A			B	
Approach Delay (s)		5.4			9.4			9.2			14.5	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	32.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	201	808	2	290	3	760	9	1	3	1	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Util. Factor	1.00	0.95	0.88	1.00	0.95		0.97	1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.98			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1770	3539	2787	1770	3534		3433	1835			1718	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.43	1.00			0.98	
Satd. Flow (perm)	1770	3539	2787	1770	3534		1549	1835			1718	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	201	808	2	290	3	760	9	1	3	1	3
RTOR Reduction (vph)	0	0	0	0	1	0	0	1	0	0	3	0
Lane Group Flow (vph)	35	201	808	2	292	0	760	9	0	0	4	0
Turn Type	Prot		custom	Prot			custom			Split		
Protected Phases	5	2	3	1	6			8		4	4	
Permitted Phases			2				3					
Actuated Green, G (s)	5.5	46.8	100.8	1.3	42.6		54.0	1.5			1.4	
Effective Green, g (s)	6.5	47.8	102.8	2.3	43.6		55.0	2.5			2.4	
Actuated g/C Ratio	0.05	0.38	0.82	0.02	0.35		0.44	0.02			0.02	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	92	1353	2359	33	1233		682	37			33	
v/s Ratio Prot	c0.02	0.06	c0.15	0.00	0.08			c0.00			c0.00	
v/s Ratio Perm			0.14				c0.49					
v/c Ratio	0.38	0.15	0.34	0.06	0.24		1.11	0.24			0.12	
Uniform Delay, d1	57.3	25.3	2.7	60.3	28.9		35.0	60.3			60.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	2.6	0.2	0.1	0.8	0.5		70.3	3.4			1.7	
Delay (s)	59.9	25.5	2.8	61.1	29.3		105.3	63.7			61.9	
Level of Service	E	C	A	E	C		F	E			E	
Approach Delay (s)		9.1			29.6			104.8			61.9	
Approach LOS		A			C			F			E	

Intersection Summary			
HCM Average Control Delay	46.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

```
-------------------------------------------------------------------------------
                 A.M. Peak Hour - Existing Conditions
                     Citywide Traffic Model Update
                            City of Novato
-------------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #25 S Novato Blvd/Sunset Pkwy
*******************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):        0.624
Loss Time (sec):      8 (Y+R=4.0 sec) Average Delay (sec/veh):       21.7
Optimal Cycle:       40              Level Of Service:                 C
*******************************************************************************
Street Name:           S Novato Blvd                    Sunset Pkwy
Approach:       North Bound     South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected       Protected        Permitted        Permitted
Rights:           Include         Include          Include          Include
Min. Green:     0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        1  0  0  1  0   1  0  0  1  0   1  0  0  1  0   1  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 6 Nov 2008 << 7:45-8:45 am
Base Vol:      19  245    61    63  452   115   154   72    84    75   37    91
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   19  245    61    63  452   115   154   72    84    75   37    91
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.82 0.82  0.82  0.82 0.82  0.82  0.82 0.82  0.82  0.82 0.82  0.82
PHF Volume:    23  298    74    77  549   140   187   87   102    91   45   111
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   23  298    74    77  549   140   187   87   102    91   45   111
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   23  298    74    77  549   140   187   87   102    91   45   111
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.95  0.95  0.93 0.95  0.95  0.55 0.90  0.90  0.49 0.88  0.88
Lanes:       1.00 0.80  0.20  1.00 0.80  0.20  1.00 0.46  0.54  1.00 0.29  0.71
Final Sat.:  1769 1446   360  1769 1440   366  1041  790   921   940  481  1182
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.01 0.21  0.21  0.04 0.38  0.38  0.18 0.11  0.11  0.10 0.09  0.09
Crit Moves:  ****                  ****        ****
Green/Cycle: 0.02 0.52  0.52  0.11 0.61  0.61  0.29 0.29  0.29  0.29 0.29  0.29
Volume/Cap:  0.62 0.39  0.39  0.39 0.62  0.62  0.62 0.38  0.38  0.34 0.32  0.32
Delay/Veh:   77.5 14.6  14.6  42.7 13.4  13.4  35.0 29.0  29.0  28.8 28.4  28.4
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  77.5 14.6  14.6  42.7 13.4  13.4  35.0 29.0  29.0  28.8 28.4  28.4
LOS by Move:    E    B     B     D    B     B     C    C     C     C    C     C
HCM2kAvgQ:      2    7     7     3   14    14     6    5     5     2    4     4
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```



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-------------------------------------------------------------------------------
                 P.M. Peak Hour - Existing Conditions
                     Citywide Traffic Model Update
                            City of Novato
-------------------------------------------------------------------------------
                   Level Of Service Computation Report
          2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #25 S Novato Blvd/Sunset Pkwy
*******************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):        0.568
Loss Time (sec):      8 (Y+R=4.0 sec) Average Delay (sec/veh):       21.3
Optimal Cycle:       36              Level Of Service:                 C
*******************************************************************************
Street Name:           S Novato Blvd                    Sunset Pkwy
Approach:       North Bound     South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected       Protected        Permitted        Permitted
Rights:           Include         Include          Include          Include
Min. Green:     0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        1  0  0  1  0   1  0  0  1  0   1  0  0  1  0   1  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 6 Nov 2008 << 5:00-6:00 pm
Base Vol:      59  328    35    45  338   183   231   17    34    23   16    41
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   59  328    35    45  338   183   231   17    34    23   16    41
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96  0.96 0.96  0.96
PHF Volume:    62  342    36    47  352   191   241   18    35    24   17    43
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   62  342    36    47  352   191   241   18    35    24   17    43
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:   62  342    36    47  352   191   241   18    35    24   17    43
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.93 0.97  0.97  0.93 0.93  0.93  0.71 0.88  0.88  0.71 0.87  0.87
Lanes:       1.00 0.90  0.10  1.00 0.65  0.35  1.00 0.33  0.67  1.00 0.28  0.72
Final Sat.:  1769 1659   177  1769 1144   619  1341  559  1117  1350  466  1195
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.03 0.21  0.21  0.03 0.31  0.31  0.18 0.03  0.03  0.02 0.04  0.04
Crit Moves:  ****                  ****        ****
Green/Cycle: 0.06 0.53  0.53  0.07 0.54  0.54  0.32 0.32  0.32  0.32 0.32  0.32
Volume/Cap:  0.57 0.39  0.39  0.39 0.57  0.57  0.57 0.10  0.10  0.06 0.11  0.11
Delay/Veh:   52.6 13.9  13.9  46.6 15.9  15.9  30.3 24.2  24.2  23.8 24.3  24.3
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  52.6 13.9  13.9  46.6 15.9  15.9  30.3 24.2  24.2  23.8 24.3  24.3
LOS by Move:    D    B     B     D    B     B     C    C     C     C    C     C
HCM2kAvgQ:      3    7     7     2   11    11     7    1     1     1    1     1
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

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-------------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-------------------------------------------------------------------------------
                     Level Of Service Computation Report
           2000 HCM 4-Way Stop Method (Base Volume Alternative)
*******************************************************************************
Intersection #26 Sunset Pkwy/Ignacio Blvd
*******************************************************************************
Cycle (sec):        100             Critical Vol./Cap.(X):         0.860
Loss Time (sec):      0 (Y+R=4.0 sec) Average Delay (sec/veh):      22.8
Optimal Cycle:        0             Level Of Service:                  C
*******************************************************************************
Street Name:             Sunset Pkwy                      Ignacio Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:          Include          Include          Include          Include
Min. Green:     0    0    0     0    0    0     0    0    0     0    0    0
Lanes:        0  0  0  0  0    1  0  0  0  1    1  0  2  0  0    0  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 6 Nov 2008 << 7:30-8:30 am
Base Vol:       0    0    0   282    0   64    33   70    0     0  119  242
Growth Adj:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse:    0    0    0   282    0   64    33   70    0     0  119  242
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.64 0.64 0.64  0.64 0.64 0.64  0.64 0.64 0.64  0.64 0.64 0.64
PHF Volume:     0    0    0   443    0  100    52  110    0     0  187  380
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:    0    0    0   443    0  100    52  110    0     0  187  380
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:    0    0    0   443    0  100    52  110    0     0  187  380
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.50 1.50 1.50
Lanes:       0.00 0.00 0.00  1.00 0.00 1.00  1.00 2.00 0.00  0.00 2.00 1.00
Final Sat.:     0    0    0   515    0  608   420  892    0     0 1519  856
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     xxxx xxxx xxxx  0.86 xxxx 0.17  0.12 0.12 xxxx  xxxx 0.12 0.44
Crit Moves:                  ****            ****                       ****
Delay/Veh:    0.0  0.0  0.0  37.7  0.0  9.5  11.9 11.3  0.0   0.0 11.1 19.7
Delay Adj:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   0.0  0.0  0.0  37.7  0.0  9.5  11.9 11.3  0.0   0.0 11.1 19.7
LOS by Move:    *    *    *     E    *    A     B    B    *     *    B    C
ApproachDel:     xxxxxx           32.5             11.5             16.8
Delay Adj:        xxxxx           1.00             1.00             1.00
ApprAdjDel:      xxxxxx           32.5             11.5             16.8
LOS by Appr:        *               D                B                C
AllWayAvgQ:   0.0  0.0  0.0   4.0  0.0  0.2   0.1  0.1  0.0   0.0  0.2  1.7
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```



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-------------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
-------------------------------------------------------------------------------
                     Level Of Service Computation Report
           2000 HCM 4-Way Stop Method (Base Volume Alternative)
*******************************************************************************
Intersection #26 Sunset Pkwy/Ignacio Blvd
*******************************************************************************
Cycle (sec):        100             Critical Vol./Cap.(X):         0.280
Loss Time (sec):      0 (Y+R=4.0 sec) Average Delay (sec/veh):      10.0
Optimal Cycle:        0             Level Of Service:                  A
*******************************************************************************
Street Name:             Sunset Pkwy                      Ignacio Blvd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:          Include          Include          Include          Include
Min. Green:     0    0    0     0    0    0     0    0    0     0    0    0
Lanes:        0  0  0  0  0    1  0  0  0  1    1  0  2  0  0    0  0  2  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 6 Nov 2008 << 5:00-6:00 pm
Base Vol:       0    0    0   128    0  112    98   97    0     0  105  144
Growth Adj:  1.10 1.10 1.10  1.10 1.10 1.10  1.10 1.10 1.10  1.10 1.10 1.10
Initial Bse:    0    0    0   141    0  123   108  107    0     0  116  158
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92
PHF Volume:     0    0    0   153    0  134   117  116    0     0  126  172
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:    0    0    0   153    0  134   117  116    0     0  126  172
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:    0    0    0   153    0  134   117  116    0     0  126  172
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.50 1.50 1.50
Lanes:       0.00 0.00 0.00  1.00 0.00 1.00  1.00 2.00 0.00  0.00 2.00 1.00
Final Sat.:     0    0    0   547    0  667   531 1141    0     0 1741  986
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     xxxx xxxx xxxx  0.28 xxxx 0.20  0.22 0.10 xxxx  xxxx 0.07 0.17
Crit Moves:                  ****            ****                       ****
Delay/Veh:    0.0  0.0  0.0  11.4  0.0  9.1  11.0  9.4  0.0   0.0  9.3  9.7
Delay Adj:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   0.0  0.0  0.0  11.4  0.0  9.1  11.0  9.4  0.0   0.0  9.3  9.7
LOS by Move:    *    *    *     B    *    A     B    A    *     *    A    A
ApproachDel:     xxxxxx           10.3             10.2              9.6
Delay Adj:        xxxxx           1.00             1.00             1.00
ApprAdjDel:      xxxxxx           10.3             10.2              9.6
LOS by Appr:        *               B                B                A
AllWayAvgQ:   0.0  0.0  0.0   0.4  0.0  0.2   0.3  0.1  0.0   0.0  0.1  0.3
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

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------------------------------------------------------------------------------
                  A.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
------------------------------------------------------------------------------

                    Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
******************************************************************************
Intersection #27 S Novato Blvd/Redwood Blvd
******************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         1.061
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):        39.4
Optimal Cycle:          0              Level Of Service:                  E
******************************************************************************
Street Name:               Redwood Blvd                  S Novato Blvd
Approach:        North Bound      South Bound      East Bound       West Bound
Movement:      L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:            Include          Include          Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        1  0  1  0  1   1  0  0  1  0   1  0  1  0  1   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 1 Dec 2006 << 7:45-8:45 am
Base Vol:     114   11    63  107   16    63   47  474   128   53  225    29
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:  114   11    63  107   16    63   47  474   128   53  225    29
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90  0.90
PHF Volume:   127   12    70  119   18    70   52  529   143   59  251    32
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:  127   12    70  119   18    70   52  529   143   59  251    32
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:  127   12    70  119   18    70   52  529   143   59  251    32
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Lanes:       1.00 1.00  1.00 1.00 0.20  0.80 1.00 1.00  1.00 1.00 1.00  1.00
Final Sat.:   389  409   446  416   96   377  453  499   538  416  446   482
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.33 0.03  0.16 0.29 0.19  0.19 0.12 1.06  0.27 0.14 0.56  0.07
Crit Moves:  ****            ****                 ****                 ****
Delay/Veh:   15.7 11.4  11.8 14.3 11.7  11.7 11.4 83.9  11.5 12.5 20.0  10.4
Delay Adj:   1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:  15.7 11.4  11.8 14.3 11.7  11.7 11.4 83.9  11.5 12.5 20.0  10.4
LOS by Move:   C    B     B    B    B     B    B    F     B    B    C     B
ApproachDel:      14.2             13.2             64.3             17.8
Delay Adj:        1.00             1.00             1.00             1.00
ApprAdjDel:       14.2             13.2             64.3             17.8
LOS by Appr:        B                B                F                C
AllWayAvgQ:   0.4  0.0   0.2  0.4  0.2   0.2  0.1 10.2   0.3  0.2  1.2   0.1
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
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------------------------------------------------------------------------------
                  P.M. Peak Hour - Existing Conditions
                      Citywide Traffic Model Update
                             City of Novato
------------------------------------------------------------------------------

                    Level Of Service Computation Report
          2000 HCM 4-Way Stop Method (Base Volume Alternative)
******************************************************************************
Intersection #27 S Novato Blvd/Redwood Blvd
******************************************************************************
Cycle (sec):          100              Critical Vol./Cap.(X):         0.667
Loss Time (sec):        0 (Y+R=4.0 sec) Average Delay (sec/veh):        15.3
Optimal Cycle:          0              Level Of Service:                  C
******************************************************************************
Street Name:               Redwood Blvd                  S Novato Blvd
Approach:        North Bound      South Bound      East Bound       West Bound
Movement:      L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:            Include          Include          Include          Include
Min. Green:     0    0     0    0    0     0    0    0     0    0    0     0
Lanes:        1  0  1  0  1   1  0  0  1  0   1  0  1  0  1   1  0  1  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 27 Nov 2006 << 4:45-5:45 pm
Base Vol:     117   30    91   84    8    66   53  218    54   58  306   102
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:  117   30    91   84    8    66   53  218    54   58  306   102
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92
PHF Volume:   127   33    99   91    9    72   57  236    59   63  332   111
Reduct Vol:     0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:  127   33    99   91    9    72   57  236    59   63  332   111
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:  127   33    99   91    9    72   57  236    59   63  332   111
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Lanes:       1.00 1.00  1.00 1.00 0.11  0.89 1.00 1.00  1.00 1.00 1.00  1.00
Final Sat.:   413  434   477  424   53   435  434  469   508  457  497   541
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.31 0.07  0.21 0.21 0.16  0.16 0.13 0.50  0.12 0.14 0.67  0.20
Crit Moves:  ****            ****                 ****                 ****
Delay/Veh:   14.3 11.0  11.4 12.7 10.8  10.8 11.7 16.8  10.2 11.4 22.0  10.6
Delay Adj:   1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:  14.3 11.0  11.4 12.7 10.8  10.8 11.7 16.8  10.2 11.4 22.0  10.6
LOS by Move:   B    B     B    B    B     B    B    C     B    B    C     B
ApproachDel:      12.8             11.8             14.9             18.2
Delay Adj:        1.00             1.00             1.00             1.00
ApprAdjDel:       12.8             11.8             14.9             18.2
LOS by Appr:        B                B                B                C
AllWayAvgQ:   0.4  0.1   0.2  0.2  0.2   0.2  0.1  0.9   0.1  0.1  1.7   0.2
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
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-------------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
              2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #28 U.S. 101 South Ramps/Ignacio Blvd/Enfrente Rd
*******************************************************************************
Cycle (sec):          100               Critical Vol./Cap.(X):         0.935
Loss Time (sec):        8 (Y+R=4.0 sec) Average Delay (sec/veh):        49.3
Optimal Cycle:        123               Level Of Service:                  D
*******************************************************************************
Street Name:        US 101 South Ramps           Ignacio Blvd-Enfrente Rd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase        Protected        Protected
Rights:            Ovl            Include           Ignore           Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        0  0  0  0  2   0  1  0  0  1   1  0  2  0  1   1  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:      0    0   894   414  103   414    26  626   192   143  371    56
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   0    0   894   414  103   414    26  626   192   143  371    56
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.00  0.92 0.92  0.92
PHF Volume:    0    0   977   452  113   452    28  684     0   156  405    61
Reduct Vol:    0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   0    0   977   452  113   452    28  684     0   156  405    61
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  1.00
FinalVolume:   0    0   977   452  113   452    28  684     0   156  405    61
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 1.00  0.73  0.94 0.94  0.83  0.93 0.93  1.00  0.93 0.91  0.91
Lanes:       0.00 0.00  2.00  0.80 0.20  1.00  1.00 2.00  1.00  1.00 1.74  0.26
Final Sat.:    0    0  2786  1433  356  1583  1769 3538  1900  1769 3012   455
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.35  0.32 0.32  0.29  0.02 0.19  0.00  0.09 0.13  0.13
Crit Moves:             ****       ****                ****       ****
Green/Cycle: 0.00 0.00  0.38  0.34 0.34  0.34  0.03 0.21  0.00  0.09 0.27  0.27
Volume/Cap:  0.00 0.00  0.93  0.93 0.93  0.85  0.50 0.93  0.00  0.93 0.50  0.50
Delay/Veh:    0.0  0.0  44.8  53.9 53.9  42.6  54.4 58.1   0.0  95.6 31.3  31.3
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0  44.8  53.9 53.9  42.6  54.4 58.1   0.0  95.6 31.3  31.3
LOS by Move:   A    A     D     D    D     D     D    E     A     F    C     C
HCM2kAvgQ:     0    0    21    21   21    16     2   15     0     8    7     7
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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-------------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
              2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #28 U.S. 101 South Ramps/Ignacio Blvd/Enfrente Rd
*******************************************************************************
Cycle (sec):          100               Critical Vol./Cap.(X):         0.730
Loss Time (sec):        8 (Y+R=4.0 sec) Average Delay (sec/veh):        24.5
Optimal Cycle:         52               Level Of Service:                  C
*******************************************************************************
Street Name:        US 101 South Ramps           Ignacio Blvd-Enfrente Rd
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:       Split Phase      Split Phase        Protected        Protected
Rights:            Ovl            Include           Ignore           Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        0  0  0  0  2   0  1  0  0  1   1  0  2  0  1   1  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      0    0   543   153   85   322    36  429   280   574  840   129
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   0    0   543   153   85   322    36  429   280   574  840   129
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  1.00
PHF Adj:     0.97 0.97  0.97  0.97 0.97  0.97  0.97 0.97  0.00  0.97 0.97  0.97
PHF Volume:    0    0   562   158   88   333    37  444     0   594  869   133
Reduct Vol:    0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:   0    0   562   158   88   333    37  444     0   594  869   133
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  0.00  1.00 1.00  1.00
FinalVolume:   0    0   562   158   88   333    37  444     0   594  869   133
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 1.00  0.73  0.95 0.95  0.83  0.93 0.93  1.00  0.93 0.91  0.91
Lanes:       0.00 0.00  2.00  0.64 0.36  1.00  1.00 2.00  1.00  1.00 1.73  0.27
Final Sat.:    0    0  2786  1160  644  1583  1769 3538  1900  1769 3005   462
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.00  0.20  0.14 0.14  0.21  0.02 0.13  0.00  0.34 0.29  0.29
Crit Moves:       ****              ****       ****       ****
Green/Cycle: 0.00 0.00  0.46  0.29 0.29  0.29  0.04 0.17  0.00  0.46 0.59  0.59
Volume/Cap:  0.00 0.00  0.44  0.47 0.47  0.73  0.49 0.73  0.00  0.73 0.49  0.49
Delay/Veh:    0.0  0.0  18.5  30.0 30.0  38.0  51.7 43.7   0.0  25.3 12.1  12.1
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0  0.0  18.5  30.0 30.0  38.0  51.7 43.7   0.0  25.3 12.1  12.1
LOS by Move:   A    A     B     C    C     D     D    D     A     C    B     B
HCM2kAvgQ:     0    0     7     7    7    11     2    8     0    16    9     9
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
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--------------------------------------------------------------------------------
                     A.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------
                       Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
********************************************************************************
Intersection #29 U.S. 101 North On-ramp/Bel Marin Keys Blvd/Nave Dr
********************************************************************************
Cycle (sec):          100                Critical Vol./Cap.(X):         1.086
Loss Time (sec):        8 (Y+R=4.0 sec)  Average Delay (sec/veh):        31.2
Optimal Cycle:        180                Level Of Service:                  C
********************************************************************************
Street Name:  US 101 North On-Ramp-Nave Dr    Bel Marin Keys Blvd-Ignacio Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected        Protected
Rights:           Ovl            Include            Ovl            Include
Min. Green:   0    0    0    0    0    0    0    0    0    0    0    0
Lanes:       1  1  1  0  1   0  0  0  0  0   0  0  2  0  1   1  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 7:45-8:45 am
Base Vol:     380  458   660     0    0     0     0  856  1084    91  181   189
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:  380  458   660     0    0     0     0  856  1084    91  181   189
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95  0.95 0.95  0.95
PHF Volume:   401  484   697     0    0     0     0  904  1145    96  191   200
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  401  484   697     0    0     0     0  904  1145    96  191   200
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  401  484   697     0    0     0     0  904  1145    96  191   200
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.94 0.94  0.83  1.00 1.00  1.00  1.00 0.98  0.83  0.93 0.90  0.90
Lanes:       1.36 1.64  1.00  0.00 0.00  0.00  0.00 2.00  1.00  1.00 1.00  1.00
Final Sat.:  2437 2937  1583     0    0     0     0 3724  1583  1769 1719  1719
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.16 0.16  0.44  0.00 0.00  0.00  0.00 0.24  0.72  0.05 0.11  0.12
Crit Moves:             ****                              ****  ****
Green/Cycle: 0.36 0.36  0.41  0.00 0.00  0.00  0.00 0.51  0.87  0.05 0.56  0.56
Volume/Cap:  0.46 0.46  1.09  0.00 0.00  0.00  0.00 0.47  0.83  1.09 0.20  0.21
Delay/Veh:   25.0 25.0  90.8   0.0  0.0   0.0   0.0 15.8   7.5 168.3 10.7  10.8
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  25.0 25.0  90.8   0.0  0.0   0.0   0.0 15.8   7.5 168.3 10.7  10.8
LOS by Move:    C    C     F     A    A     A     A    B     A     F    B     B
HCM2kAvgQ:      7    7    33     0    0     0     0    9    19     7    3     3
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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--------------------------------------------------------------------------------
                     P.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
--------------------------------------------------------------------------------
                       Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
********************************************************************************
Intersection #29 U.S. 101 North On-ramp/Bel Marin Keys Blvd/Nave Dr
********************************************************************************
Cycle (sec):          100                Critical Vol./Cap.(X):         0.893
Loss Time (sec):        8 (Y+R=4.0 sec)  Average Delay (sec/veh):        24.5
Optimal Cycle:         97                Level Of Service:                  C
********************************************************************************
Street Name:  US 101 North On-Ramp-Nave Dr    Bel Marin Keys Blvd-Ignacio Blvd
Approach:     North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:      Split Phase      Split Phase       Protected        Protected
Rights:           Ovl            Include            Ovl            Include
Min. Green:   0    0    0    0    0    0    0    0    0    0    0    0
Lanes:       1  1  1  0  1   0  0  0  0  0   0  0  2  0  1   1  0  1  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 4:30-5:30 pm
Base Vol:     747  553   321     0    0     0     0  291   860   180  751   853
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:  747  553   321     0    0     0     0  291   860   180  751   853
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.91 0.91  0.91  0.91 0.91  0.91  0.91 0.91  0.91  0.91 0.91  0.91
PHF Volume:   821  608   353     0    0     0     0  320   945   198  825   937
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:  821  608   353     0    0     0     0  320   945   198  825   937
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:  821  608   353     0    0     0     0  320   945   198  825   937
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  0.91 0.91  0.83  1.00 1.00  1.00  1.00 0.98  0.83  0.93 0.90  0.90
Lanes:       1.72 1.28  1.00  0.00 0.00  0.00  0.00 2.00  1.00  1.00 1.00  1.00
Final Sat.:  2988 2212  1583     0    0     0     0 3724  1583  1769 1713  1713
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.27 0.27  0.22  0.00 0.00  0.00  0.00 0.09  0.60  0.11 0.48  0.55
Crit Moves:       ****                      ****                            ****
Green/Cycle: 0.31 0.31  0.47  0.00 0.00  0.00  0.00 0.45  0.76  0.16 0.61  0.61
Volume/Cap:  0.89 0.89  0.48  0.00 0.00  0.00  0.00 0.19  0.78  0.71 0.79  0.89
Delay/Veh:   39.9 39.9  18.9   0.0  0.0   0.0   0.0 16.3  10.4  48.1 16.4  22.2
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:  39.9 39.9  18.9   0.0  0.0   0.0   0.0 16.3  10.4  48.1 16.4  22.2
LOS by Move:    D    D     B     A    A     A     A    B     B     D    B     C
HCM2kAvgQ:     18   18     8     0    0     0     0    3    19     7   20    28
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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-------------------------------------------------------------------------------
                     A.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
-------------------------------------------------------------------------------
                       Level Of Service Computation Report
               2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #30 U.S. 101 North Off-ramp/Nave Dr
*******************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):        0.623
Loss Time (sec):      6 (Y+R=4.0 sec) Average Delay (sec/veh):       16.6
Optimal Cycle:       35              Level Of Service:                 B
*******************************************************************************
Street Name:                Nave Dr                   US 101 North Off-Ramp
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted       Split Phase      Split Phase
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:       0  0  2  0  0   0  0  1  1  0   2  0  0  0  1   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:      0  784     0    0  927   280  653    0   140    0    0     0
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:   0  784     0    0  927   280  653    0   140    0    0     0
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92 0.92 0.92  0.92
PHF Volume:    0  850     0    0 1005   304  708    0   152    0    0     0
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0  850     0    0 1005   304  708    0   152    0    0     0
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:   0  850     0    0 1005   304  708    0   152    0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.93  1.00 1.00 0.91  0.91 0.90 1.00  0.83 1.00 1.00  1.00
Lanes:       0.00 2.00  0.00 0.00 1.54  0.46 2.00 0.00  1.00 0.00 0.00  0.00
Final Sat.:    0 3538     0    0 2648   800 3432    0  1583    0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.24  0.00 0.00 0.38  0.38 0.21 0.00  0.10 0.00 0.00  0.00
Crit Moves:                       ****       ****
Green/Cycle: 0.00 0.61  0.00 0.00 0.61  0.61 0.33 0.00  0.33 0.00 0.00  0.00
Volume/Cap:  0.00 0.39  0.00 0.00 0.62  0.62 0.62 0.00  0.29 0.00 0.00  0.00
Delay/Veh:    0.0 10.2   0.0  0.0 12.9  12.9 29.3  0.0  25.1  0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 10.2   0.0  0.0 12.9  12.9 29.3  0.0  25.1  0.0  0.0   0.0
LOS by Move:   A    B     A    A    B     B    C    A     C    A    A     A
HCM2kAvgQ:     0    7     0    0   14    14   10    0     4    0    0     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```



```
-------------------------------------------------------------------------------
                     P.M. Peak Hour - Existing Conditions
                         Citywide Traffic Model Update
                                City of Novato
-------------------------------------------------------------------------------
                       Level Of Service Computation Report
               2000 HCM Operations Method (Base Volume Alternative)
*******************************************************************************
Intersection #30 U.S. 101 North Off-ramp/Nave Dr
*******************************************************************************
Cycle (sec):        100              Critical Vol./Cap.(X):        0.578
Loss Time (sec):      6 (Y+R=4.0 sec) Average Delay (sec/veh):       17.4
Optimal Cycle:       32              Level Of Service:                 B
*******************************************************************************
Street Name:                Nave Dr                   US 101 North Off-Ramp
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Permitted        Permitted       Split Phase      Split Phase
Rights:          Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:       0  0  2  0  0   0  0  1  1  0   2  0  0  0  1   0  0  0  0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 5:00-6:00 pm
Base Vol:      0 1079     0    0  742   333  694    0   210    0    0     0
Growth Adj:  1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
Initial Bse:   0 1079     0    0  742   333  694    0   210    0    0     0
User Adj:    1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
PHF Adj:     0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95 0.95 0.95  0.95
PHF Volume:    0 1133     0    0  779   350  729    0   221    0    0     0
Reduct Vol:    0    0     0    0    0     0    0    0     0    0    0     0
Reduced Vol:   0 1133     0    0  779   350  729    0   221    0    0     0
PCE Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
FinalVolume:   0 1133     0    0  779   350  729    0   221    0    0     0
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900  1900
Adjustment:  1.00 0.93  1.00 1.00 0.90  0.90 0.90 1.00  0.83 1.00 1.00  1.00
Lanes:       0.00 2.00  0.00 0.00 1.38  0.62 2.00 0.00  1.00 0.00 0.00  0.00
Final Sat.:    0 3538     0    0 2353  1056 3432    0  1583    0    0     0
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.32  0.00 0.00 0.33  0.33 0.21 0.00  0.14 0.00 0.00  0.00
Crit Moves:                       ****       ****
Green/Cycle: 0.00 0.57  0.00 0.00 0.57  0.57 0.37 0.00  0.37 0.00 0.00  0.00
Volume/Cap:  0.00 0.56  0.00 0.00 0.58  0.58 0.58 0.00  0.38 0.00 0.00  0.00
Delay/Veh:    0.0 13.8   0.0  0.0 14.1  14.1 26.1  0.0  23.7  0.0  0.0   0.0
User DelAdj: 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00
AdjDel/Veh:   0.0 13.8   0.0  0.0 14.1  14.1 26.1  0.0  23.7  0.0  0.0   0.0
LOS by Move:   A    B     A    A    B     B    C    A     C    A    A     A
HCM2kAvgQ:     0   12     0    0   12    12   10    0     5    0    0     0
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

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------------------------------------------------------------------------------
                   A.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
------------------------------------------------------------------------------

                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
******************************************************************************
Intersection #31 Main Gate/Nave Dr
******************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):         0.376
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):        19.8
Optimal Cycle:        22              Level Of Service:                  B
******************************************************************************
Street Name:                Nave Dr                          Main Gate
Approach:       North Bound      South Bound      East Bound       West Bound
Movement:      L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Protected        Protected       Split Phase      Split Phase
Rights:            Include          Include          Include          Include
Min. Green:     0    0    0     0    0    0     0    0    0     0    0    0
Lanes:         0  0  1  0  1   1  0  1  0  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2008 << 8:00-9:00 am
Base Vol:       0  167   238   155  360     0     0    0     0   183    0    94
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0  167   238   155  360     0     0    0     0   183    0    94
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.97 0.97  0.97  0.97 0.97  0.97  0.97 0.97  0.97  0.97 0.97  0.97
PHF Volume:     0  173   247   161  373     0     0    0     0   190    0    97
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  173   247   161  373     0     0    0     0   190    0    97
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:    0  173   247   161  373     0     0    0     0   190    0    97
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.98  0.83  0.93 0.98  1.00  1.00 1.00  1.00  0.93 1.00  0.83
Lanes:       0.00 1.00  1.00  1.00 1.00  0.00  0.00 0.00  0.00  1.00 0.00  1.00
Final Sat.:     0 1862  1583  1769 1862     0     0    0     0  1769    0  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.09  0.16  0.09 0.20  0.00  0.00 0.00  0.00  0.11 0.00  0.06
Crit Moves:             ****  ****                              ****
Green/Cycle: 0.00 0.41  0.41  0.24 0.66  0.00  0.00 0.00  0.00  0.28 0.00  0.28
Volume/Cap:  0.00 0.22  0.38  0.38 0.31  0.00  0.00 0.00  0.00  0.38 0.00  0.22
Delay/Veh:    0.0 19.1  20.7  32.2  7.6   0.0   0.0  0.0   0.0  29.1  0.0  27.5
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 19.1  20.7  32.2  7.6   0.0   0.0  0.0   0.0  29.1  0.0  27.5
LOS by Move:   A    B     C     C    A     A     A    A     A     C    A     C
HCM2kAvgQ:      0    3     5     4    5     0     0    0     0     5    0     2
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
```



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------------------------------------------------------------------------------
                   P.M. Peak Hour - Existing Conditions
                       Citywide Traffic Model Update
                              City of Novato
------------------------------------------------------------------------------

                      Level Of Service Computation Report
             2000 HCM Operations Method (Base Volume Alternative)
******************************************************************************
Intersection #31 Main Gate/Nave Dr
******************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):         0.379
Loss Time (sec):       6 (Y+R=4.0 sec) Average Delay (sec/veh):        22.2
Optimal Cycle:        22              Level Of Service:                  C
******************************************************************************
Street Name:                Nave Dr                          Main Gate
Approach:       North Bound      South Bound      East Bound       West Bound
Movement:      L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:         Protected        Protected       Split Phase      Split Phase
Rights:            Include          Include          Include          Include
Min. Green:     0    0    0     0    0    0     0    0    0     0    0    0
Lanes:         0  0  1  0  1   1  0  1  0  0   0  0  0  0  0   1  0  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 5 Nov 2006 << 5:00-6:00 pm
Base Vol:       0  255   224   130  192     0     0    0     0   235    0   112
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:    0  255   224   130  192     0     0    0     0   235    0   112
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.98 0.98  0.98  0.98 0.98  0.98  0.98 0.98  0.98  0.98 0.98  0.98
PHF Volume:     0  261   230   133  197     0     0    0     0   241    0   115
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
Reduced Vol:    0  261   230   133  197     0     0    0     0   241    0   115
PCE Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
MLF Adj:     1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
FinalVolume:    0  261   230   133  197     0     0    0     0   241    0   115
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900  1900  1900 1900  1900  1900 1900  1900  1900 1900  1900
Adjustment:  1.00 0.98  0.83  0.93 0.98  1.00  1.00 1.00  1.00  0.93 1.00  0.83
Lanes:       0.00 1.00  1.00  1.00 1.00  0.00  0.00 0.00  0.00  1.00 0.00  1.00
Final Sat.:     0 1862  1583  1769 1862     0     0    0     0  1769    0  1583
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.00 0.14  0.15  0.08 0.11  0.00  0.00 0.00  0.00  0.14 0.00  0.07
Crit Moves:             ****  ****                              ****
Green/Cycle: 0.00 0.38  0.38  0.20 0.58  0.00  0.00 0.00  0.00  0.36 0.00  0.36
Volume/Cap:  0.00 0.37  0.38  0.38 0.18  0.00  0.00 0.00  0.00  0.38 0.00  0.20
Delay/Veh:    0.0 22.5  22.7  35.4  9.9   0.0   0.0  0.0   0.0  24.2  0.0  22.3
User DelAdj: 1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
AdjDel/Veh:   0.0 22.5  22.7  35.4  9.9   0.0   0.0  0.0   0.0  24.2  0.0  22.3
LOS by Move:   A    C     C     D    A     A     A    A     A     C    A     C
HCM2kAvgQ:      0    6     5     4    3     0     0    0     0     6    0     2
******************************************************************************
Note: Queue reported is the number of cars per lane.
******************************************************************************
```

```
-------------------------------------------------------------------------------
                 A.M. Peak Hour - Existing Conditions
                     Citywide Traffic Model Update
                            City of Novato
-------------------------------------------------------------------------------

                  Level Of Service Computation Report
        2000 HCM 4-Way Stop Method (Base Volume Alternative)
*******************************************************************************
Intersection #32 Alameda del Prado/US 101 Overpass (Nave Dr)
*******************************************************************************
Cycle (sec):        100               Critical Vol./Cap.(X):        0.703
Loss Time (sec):      0 (Y+R=4.0 sec) Average Delay (sec/veh):       18.0
Optimal Cycle:        0               Level Of Service:                 C
*******************************************************************************
Street Name:          Alameda del Prado          US 101 Overpass (Nave Dr-Clay)
Approach:       North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        0  0  1! 0  0   1  0  0  1  0   0  0  1! 0  0   0  0  1! 0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 6 Nov 2008 << 7:30-8:30 am
Base Vol:        4  177   76    40   38   10   128   11    2   133  113  628
Growth Adj:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse:     4  177   76    40   38   10   128   11    2   133  113  628
User Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:      0.91 0.91 0.91  0.91 0.91 0.91  0.91 0.91 0.91  0.91 0.91 0.91
PHF Volume:      4  195   84    44   42   11   141   12    2   147  125  692
Reduct Vol:      0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:     4  195   84    44   42   11   141   12    2   147  125  692
PCE Adj:      1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:      1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:     4  195   84    44   42   11   141   12    2   147  125  692
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Lanes:        0.01 0.69 0.30  1.00 0.79 0.21  0.91 0.08 0.01  0.30 0.26 1.44
Final Sat.:      8  361  155   427  366   96   449   39    7   209 -508 1651
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:      0.54 0.54 0.54  0.10 0.11 0.11  0.31 0.31 0.31  0.70-0.25 0.42
Crit Moves:               ****       ****                 ****  ****
Delay/Veh:    16.8 16.8 16.8  11.5 10.8 10.8  12.9 12.9 12.9  19.1 19.1 19.7
Delay Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:   16.8 16.8 16.8  11.5 10.8 10.8  12.9 12.9 12.9  19.1 19.1 19.7
LOS by Move:     C    C    C     B    B    B     B    B    B     C    C    C
ApproachDel:        16.8             11.1             12.9             19.8
Delay Adj:          1.00             1.00             1.00             1.00
ApprAdjDel:         16.8             11.1             12.9             19.8
LOS by Appr:          C                B                B                C
AllWayAvgQ:    1.0  1.0  1.0   0.1  0.1  0.1   0.4  0.4  0.4   2.1  2.1  2.1
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```



```
-------------------------------------------------------------------------------
                 P.M. Peak Hour - Existing Conditions
                     Citywide Traffic Model Update
                            City of Novato
-------------------------------------------------------------------------------

                  Level Of Service Computation Report
        2000 HCM 4-Way Stop Method (Base Volume Alternative)
*******************************************************************************
Intersection #32 Alameda del Prado/US 101 Overpass (Nave Dr)
*******************************************************************************
Cycle (sec):        100               Critical Vol./Cap.(X):        0.589
Loss Time (sec):      0 (Y+R=4.0 sec) Average Delay (sec/veh):       14.3
Optimal Cycle:        0               Level Of Service:                 B
*******************************************************************************
Street Name:          Alameda del Prado          US 101 Overpass (Nave Dr-Clay)
Approach:       North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:    0    0    0    0    0    0    0    0    0    0    0    0
Lanes:        0  0  0  1  0   1  0  0  1  0   0  0  1! 0  0   0  0  1! 0  1
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 6 Nov 2008 << 5:00-6:00 pm
Base Vol:        0   64   62   195   76    4    14   14    2   100   13  695
Growth Adj:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse:     0   64   62   195   76    4    14   14    2   100   13  695
User Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:      0.94 0.94 0.94  0.94 0.94 0.94  0.94 0.94 0.94  0.94 0.94 0.94
PHF Volume:      0   68   66   208   81    4    15   15    2   107   14  743
Reduct Vol:      0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:     0   68   66   208   81    4    15   15    2   107   14  743
PCE Adj:      1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:      1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:     0   68   66   208   81    4    15   15    2   107   14  743
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Lanes:        0.00 0.51 0.49  1.00 0.95 0.05  0.47 0.47 0.06  0.25 0.03 1.72
Final Sat.:      0  272  264   486  494   26   231  231   33   181 -708 1940
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:      xxxx 0.25 0.25  0.43 0.16 0.16  0.06 0.06 0.06  0.59-0.02 0.38
Crit Moves:               ****  ****                 ****       ****
Delay/Veh:     0.0 11.5 11.5  14.8 10.5 10.5  10.3 10.3 10.3  14.0 14.0 14.8
Delay Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:    0.0 11.5 11.5  14.8 10.5 10.5  10.3 10.3 10.3  14.0 14.0 14.8
LOS by Move:     *    B    B     B    B    B     B    B    B     B    B    B
ApproachDel:        11.5             13.5             10.3             15.1
Delay Adj:          1.00             1.00             1.00             1.00
ApprAdjDel:         11.5             13.5             10.3             15.1
LOS by Appr:          B                B                B                C
AllWayAvgQ:    0.3  0.3  0.3   0.7  0.2  0.2   0.1  0.1  0.1   1.3  1.3  1.3
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

Appendix D

Hazardous Materials Databases

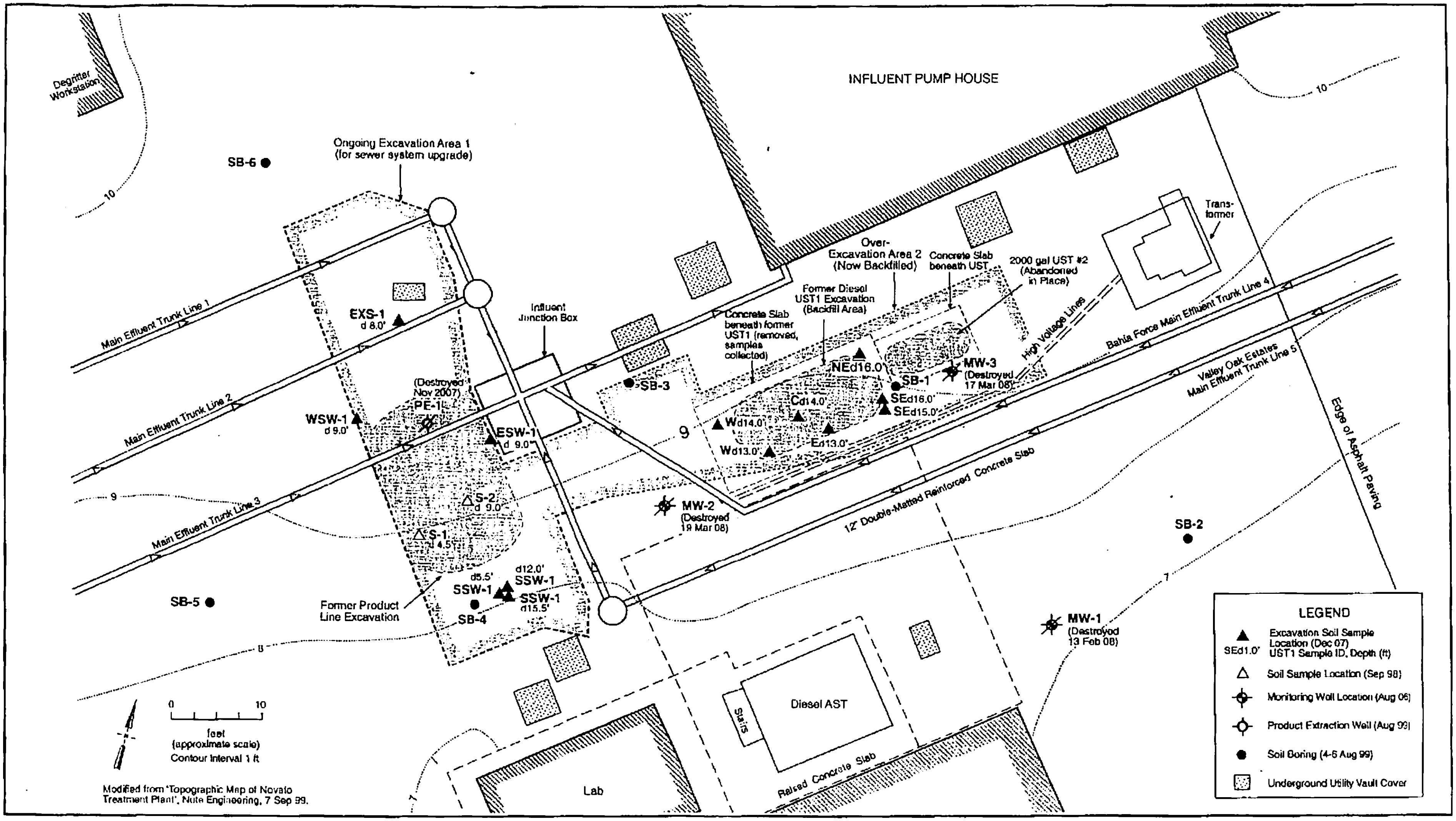
APPENDIX D
HAZARDOUS MATERIALS DATABASES

TABLE D-1 **Primary Databases Searched**

Database	Type of Records	Agency	Listed Sites
ERNS	Emergency Response Notification System	EPA	26
FTTS	Pesticide Enforcement Actions and Compliance	EPA	1
RCRA-LQG	Resource Conservation and Recovery Act Large Quantity Generator	EPA	3
RCRA-SQG	Resource Conservation and Recovery Act Small Quantity Generator	EPA	72
FINDS	Pointer to other more detailed databases	EPA	129
FUDS	Formerly Used Defense Site Properties	USACE	3
DOT OPS	Office of Pipeline Safety Incident and Accident Report	DOT	2
SCH	School sites being evaluated for hazmat contamination	DTSC	1
VCP	Low threat level properties	DTSC	1
RESPONSE	Sites undergoing active remediation	DTSC	1
HAZNET	Sites generating hazardous waste manifests	DTSC	351
ENVIROSTAR	Sites with known contamination or that have need for further investigation	DTSC	8
LUST	Leaking Underground Storage Tanks	State Water Board	50
SLIC	Spills, Leaks, Investigations, and Clean-up	State Water Board	12
UST	Active Underground Storage Tank Sites	State Water Board	126
AST	Active Aboveground Storage Tank Sites	State Water Board	9
Notify 65	Facility notifications involving a release which could impact groundwater	State Water Board	7

Database	Type of Records	Agency	Listed Sites
CHMIRS	Hazardous material incidents, releases, and spills	CA Office of Emergency Services	41
EMI	Toxics and criteria pollutant emissions data	ARB	51

Source: Stellar Environmental Services.



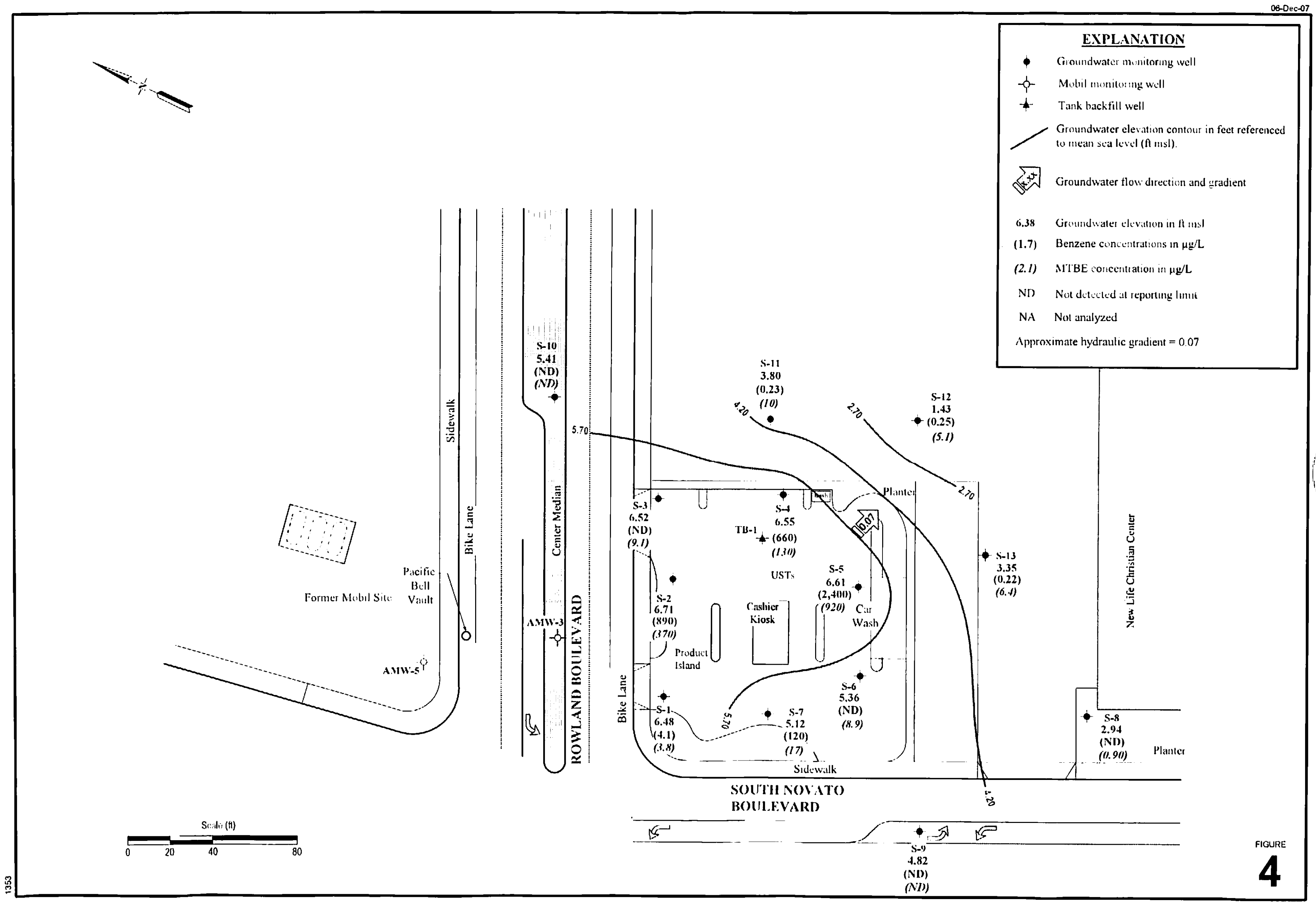
TRACE #419/RG/22May08

EDD CLARK & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

SITE PLAN
Novato Water District
Wastewater Treatment Facility
500 Davidson Street
Novato, California

FIGURE 2

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	SHEET NO.
0337,001.99	EC&A, Kevin Coker	September 1999	May 2008	1 of 1

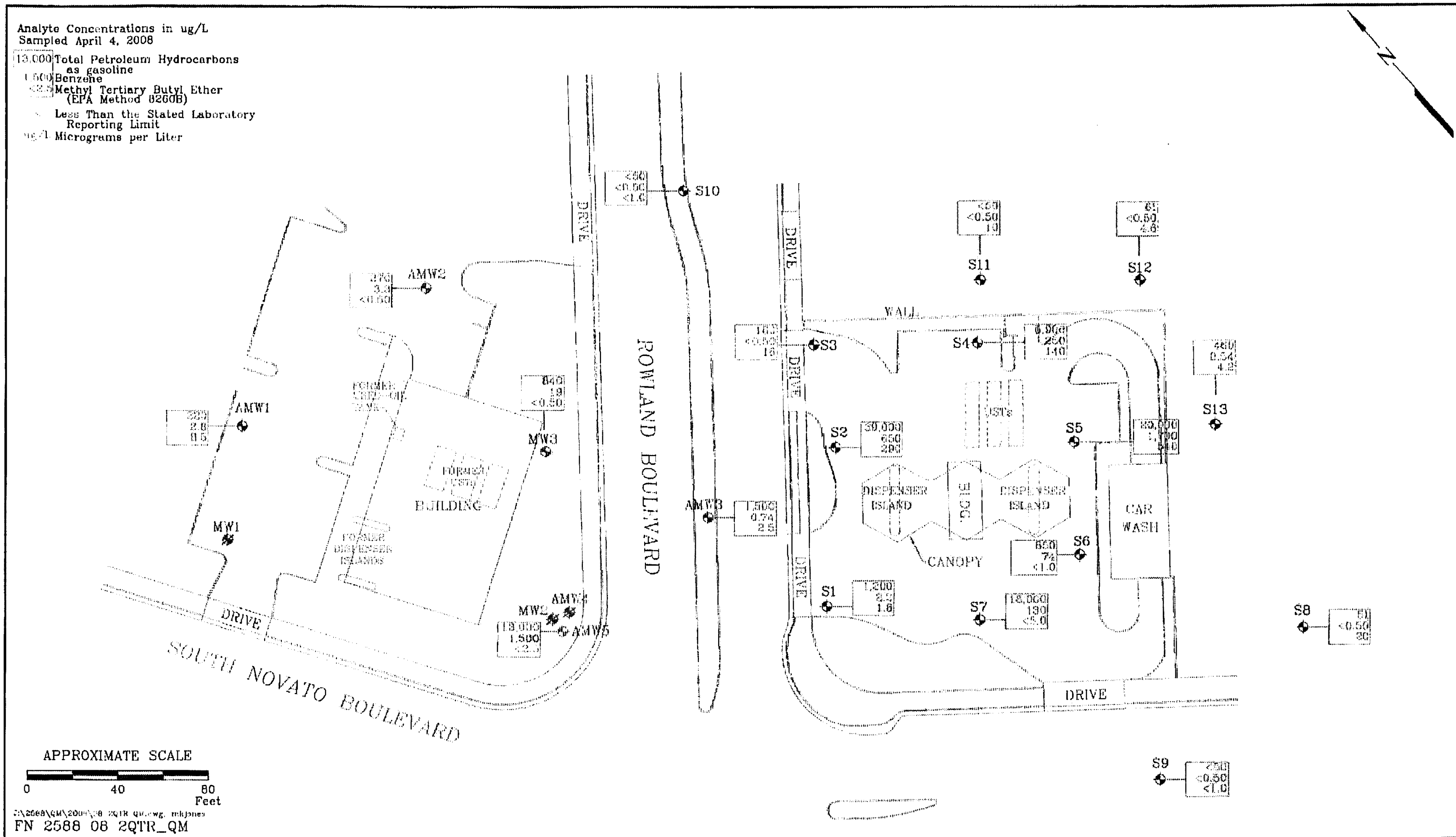


Shell-branded Service Station
1390 South Novato Boulevard
Novato, California

CONESTOGA-ROVERS & ASSOCIATES

Groundwater Contour and Chemical Concentration Map

October 25, 2007



SELECT ANALYTICAL RESULTS
April 4, 2008
FORMER
MOBIL SERVICE STATION 04HTR
1400 South Novato Boulevard
Novato, California

EXPLANATION

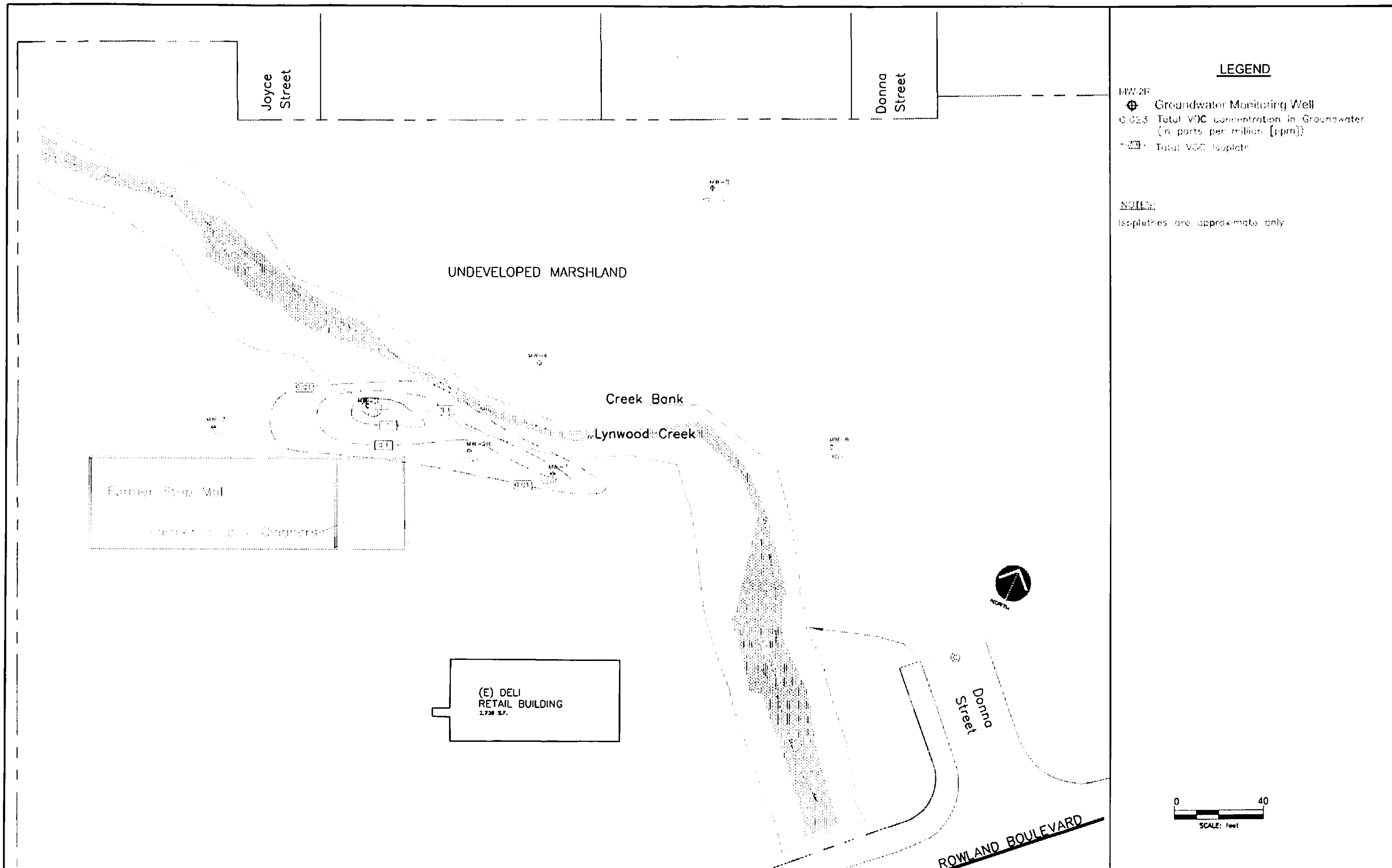
AMW5 Groundwater Monitoring Well

S13 Groundwater Monitoring Well by Others

AMW4 Destroyed Groundwater Monitoring Well

PROJECT NO. 2588

PLATE 2



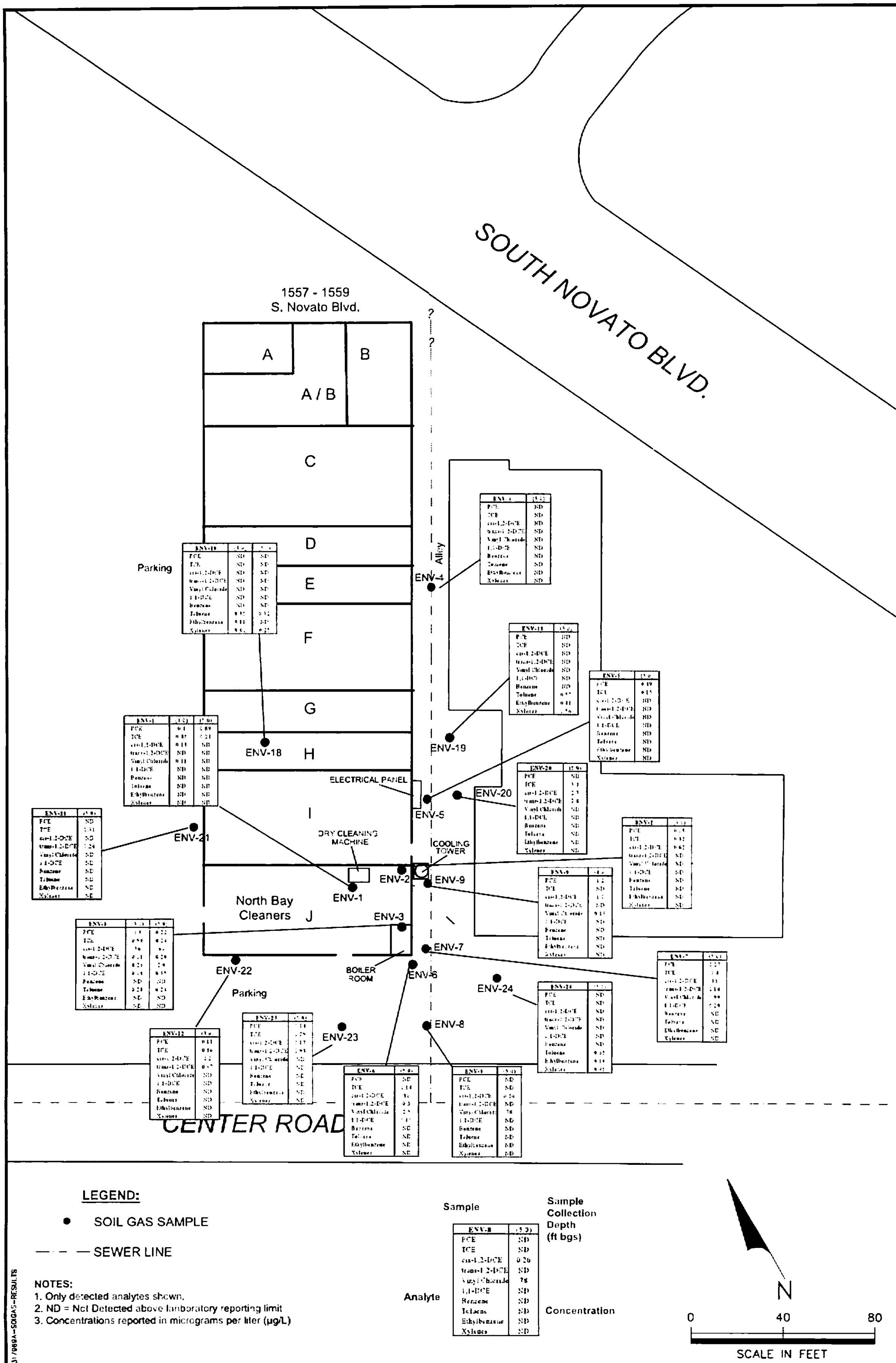
LEGEND

Extent of VOC Groundwater Plume
(December 20, 2007)
FORMER 7 TO 7 CLEANERS
1430 South Novato Boulevard
Novato, California

MACTEC Project No.: 4088-07-5476.02

Figure
4
1/22/08
4088075476001.dwg

MACTEC

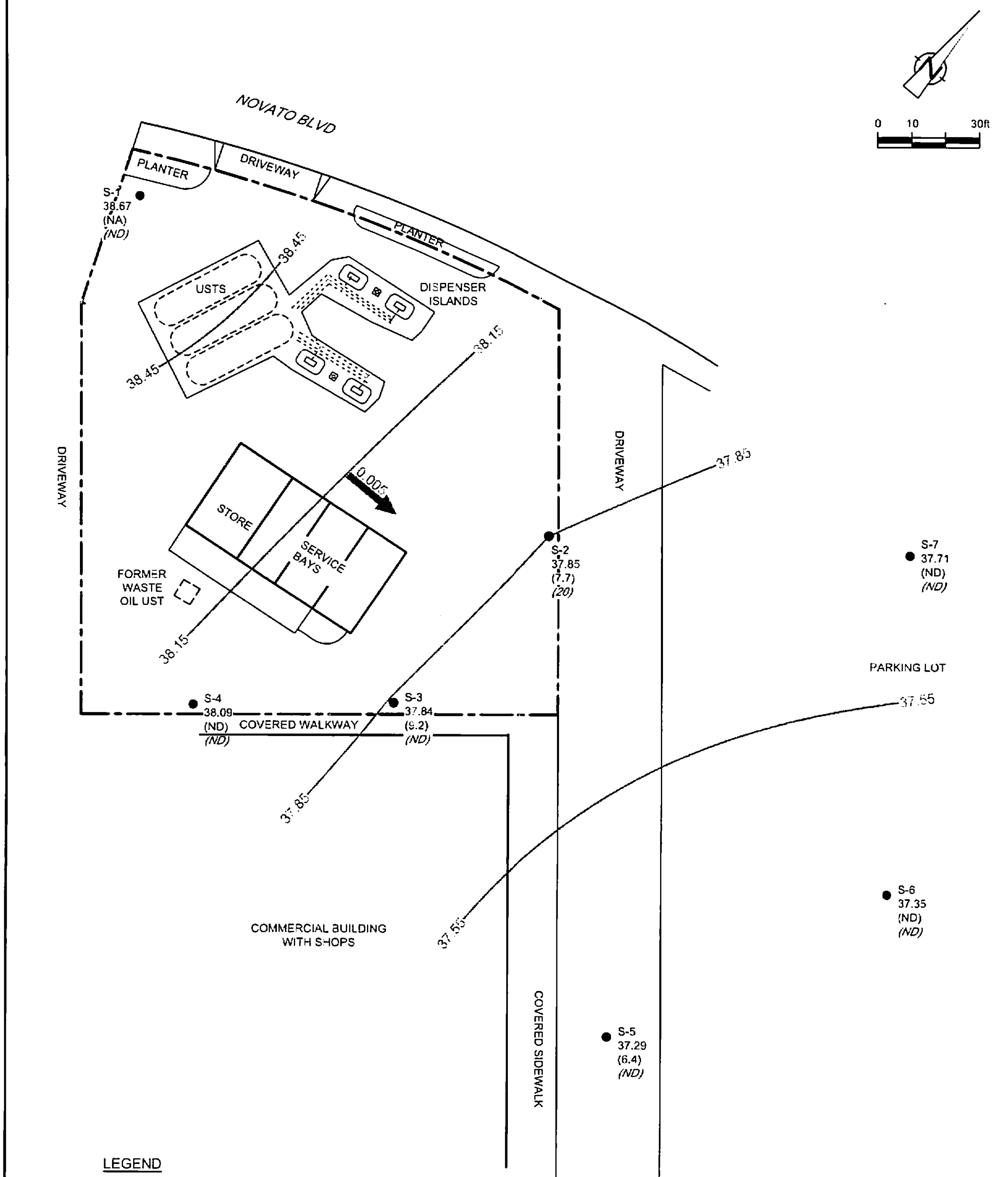


ENVIRON

SOIL GAS SAMPLE RESULTS
NORTH BAY CLEANERS
1559 SO. NOVATO BOULEVARD
NOVATO, CALIFORNIA

Figure
3

Drafter: EC | Date: 6/12/07 | Contract Number: 03-17969A | Approved: | Revised:



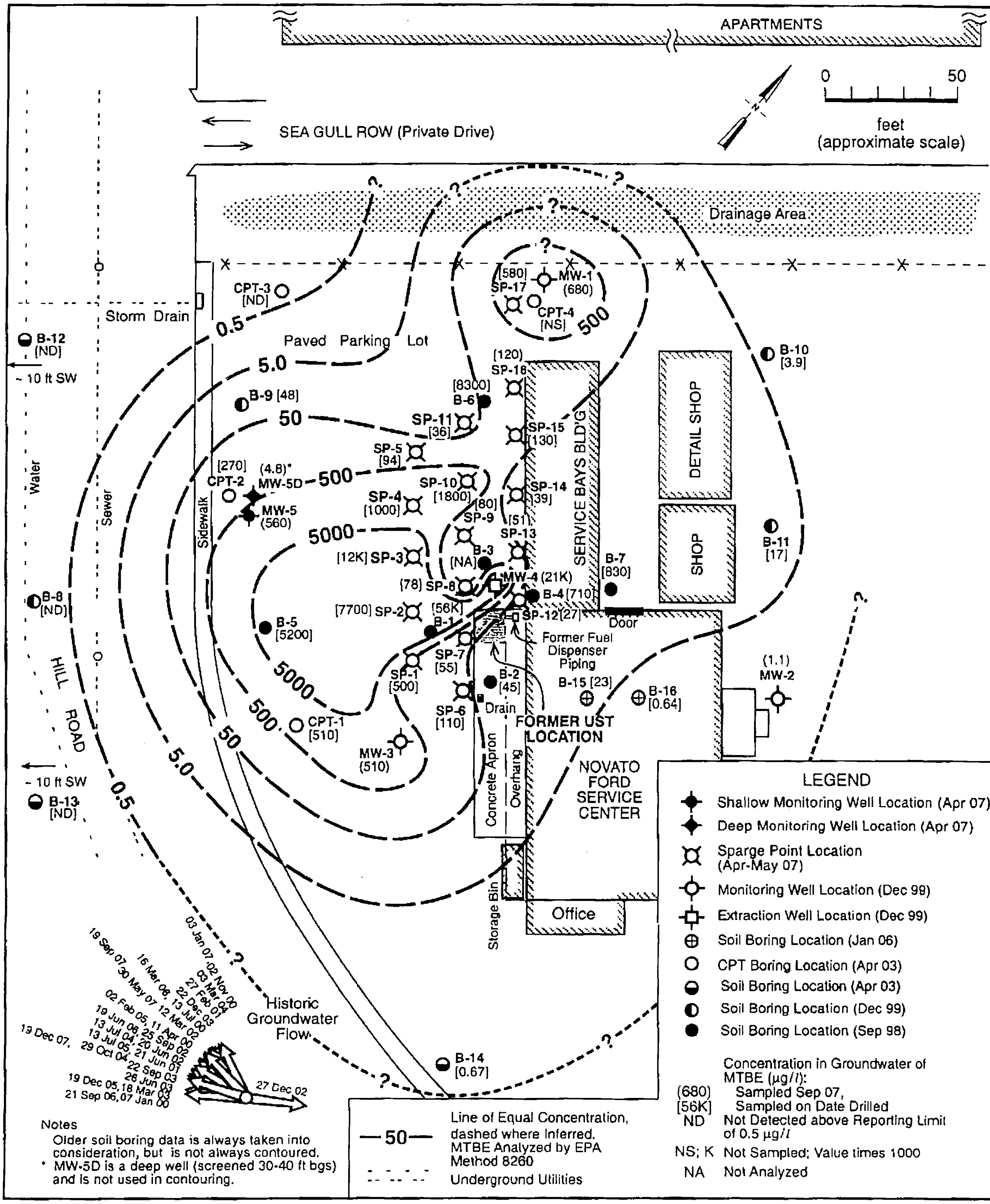
LEGEND

●	MONITORING WELL LOCATION
14.37	GROUNDWATER ELEVATION (ft MSL)
(<0.50)	BENZENE CONCENTRATION IN MICROGRAMS PER LITER (µg/L)
(150)	MTBE CONCENTRATION IN µg/L
—38.3—	GROUNDWATER ELEVATION CONTOUR REFERENCED TO MEAN SEA LEVEL (ft MSL)
0.006 ➔	GROUNDWATER FLOW DIRECTION AND GRADIENT
ND	NOT DETECTED AT REPORTING LIMIT
NA	NOT ANALYZED

figure 2

GROUNDWATER CONTOUR AND CHEMICAL CONCENTRATION MAP
JUNE 2, 2008
SHELL-BRANDED SERVICE STATION
2085 Novato Boulevard, Novato, California

241009-2008(3Q08)GN-SO001 AUG 22/2008



(TRACE #342/RG/22Apr08)

EDD CLARK & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

MTBE ISOCONCENTRATION MAP, SHALLOW GROUNDWATER, 19 December 2007

Novato Ford
6995 Redwood Boulevard
Novato, California

FIGURE 28

JOB NUMBER	REVIEWED BY	DATE	REVISED
0306, 001.97	EC&A, Kevin Coker	April 2003	April 2008

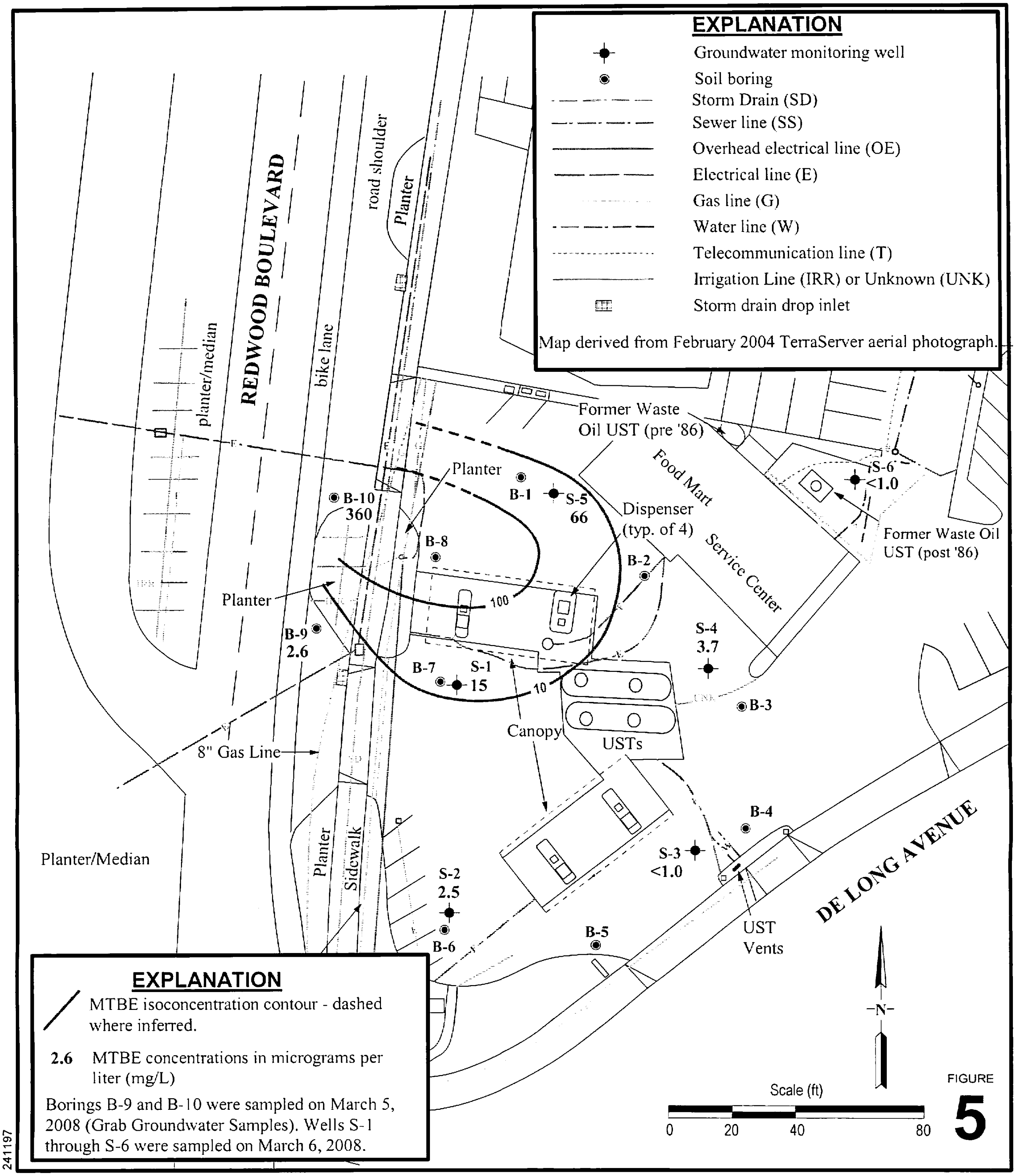


FIGURE
5

Shell-branded Service Station
7300 Redwood Boulevard
Novato, California

MTBE Isoconcentration Contour Map

March 5 and 6, 2008

20-May-08

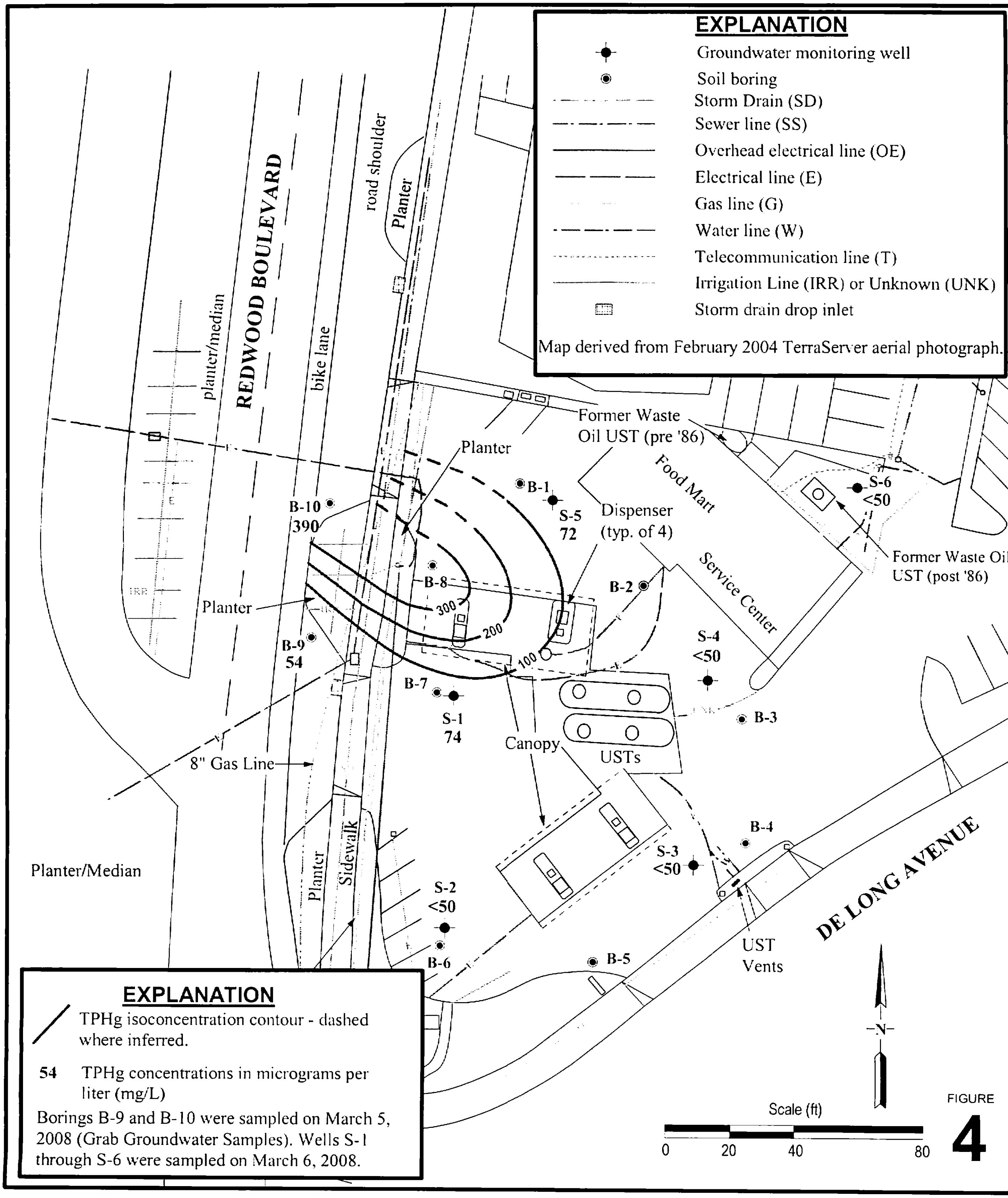
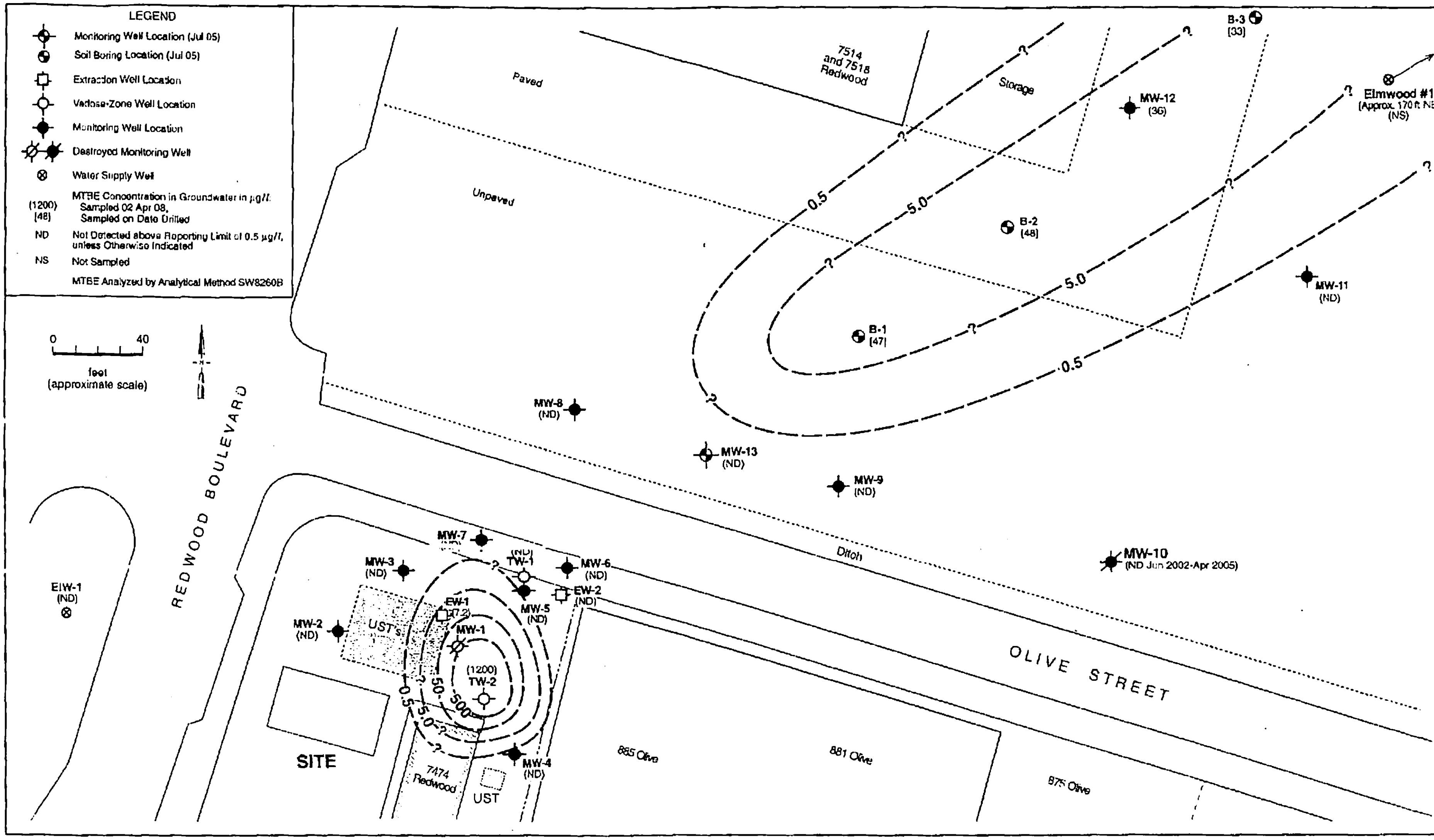


FIGURE 4

Shell-branded Service Station
7300 Redwood Boulevard
Novato, California

TPHg Isoconcentration Contour Map

March 5 and 6, 2008

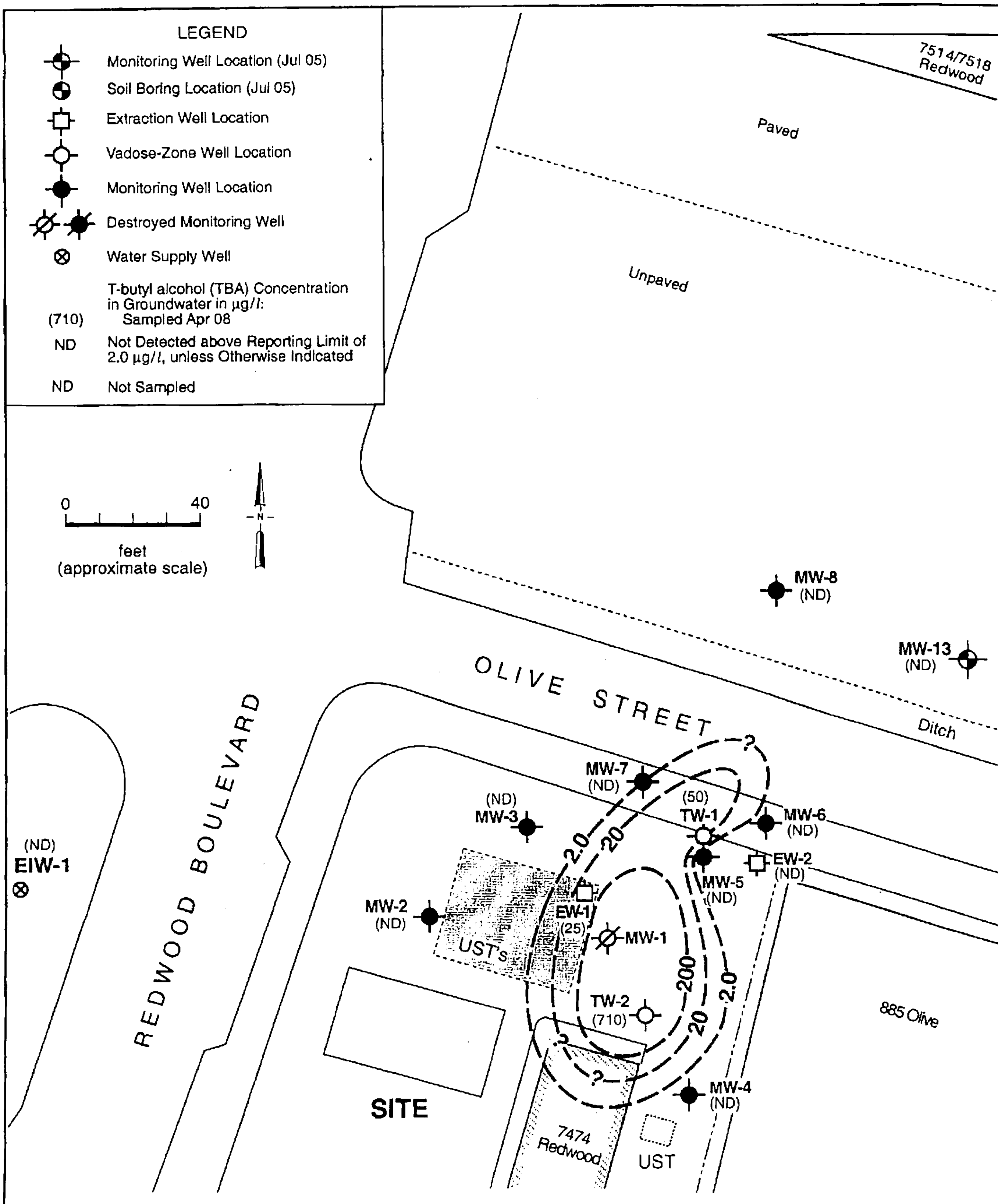


EDD CLARK & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

MTBE ISOCONCENTRATION MAP,
02 April 2008
VIA Service Station
7474 Redwood Boulevard
Novato, California

FIGURE 4

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
0294, 004.97	EC&A, Kevin Coker	November 2000	June 2008



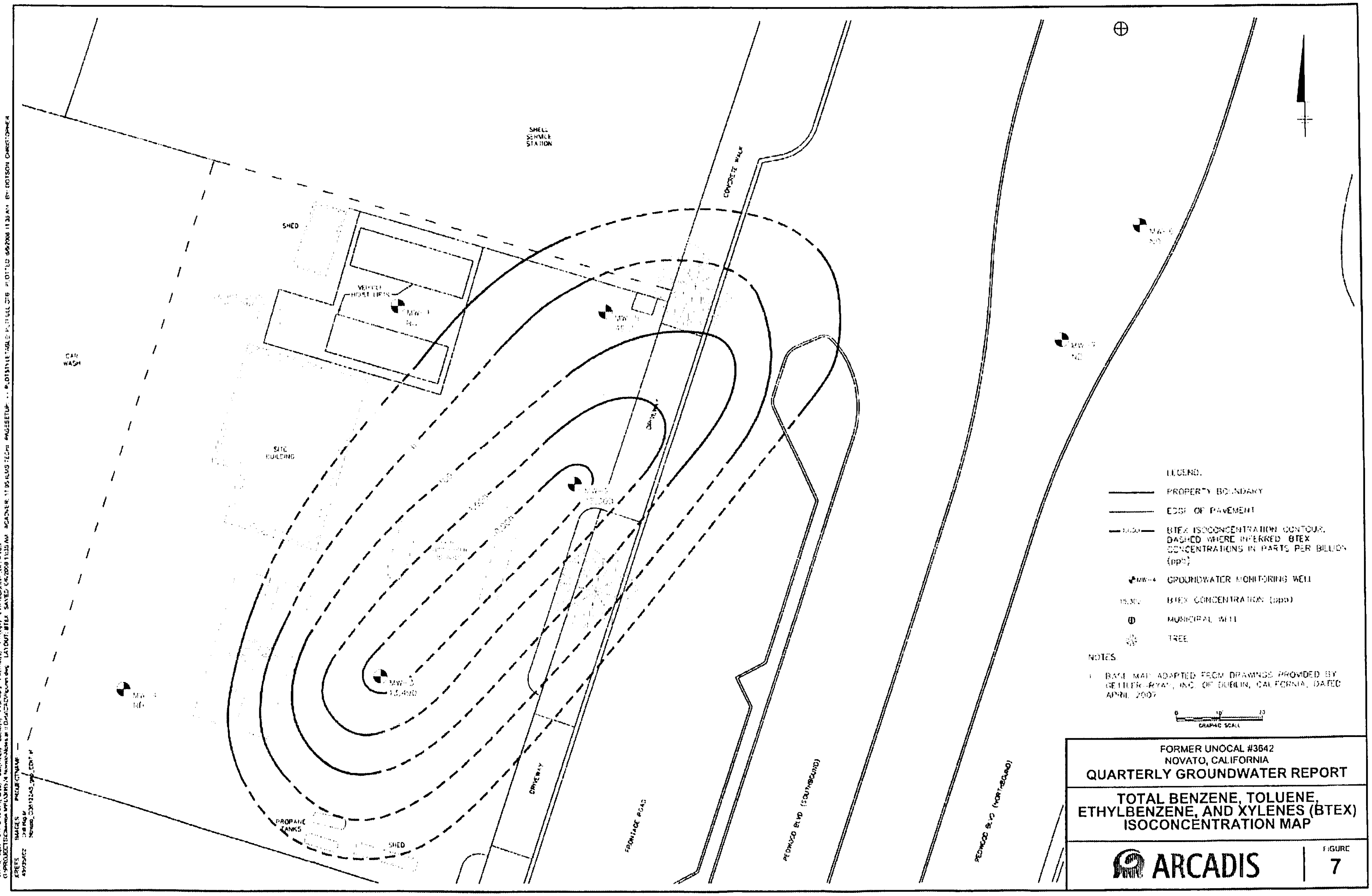
EDD CLARK & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

TBA ISOCONCENTRATION MAP,
02 April 2008
VIA Service Station
7474 Redwood Boulevard
Novato, California

FIGURE
5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
0294, 004.97	EC&A, Kevin Coker	January 2004	June 2008

(TRACE#406/RG/25Jun08)

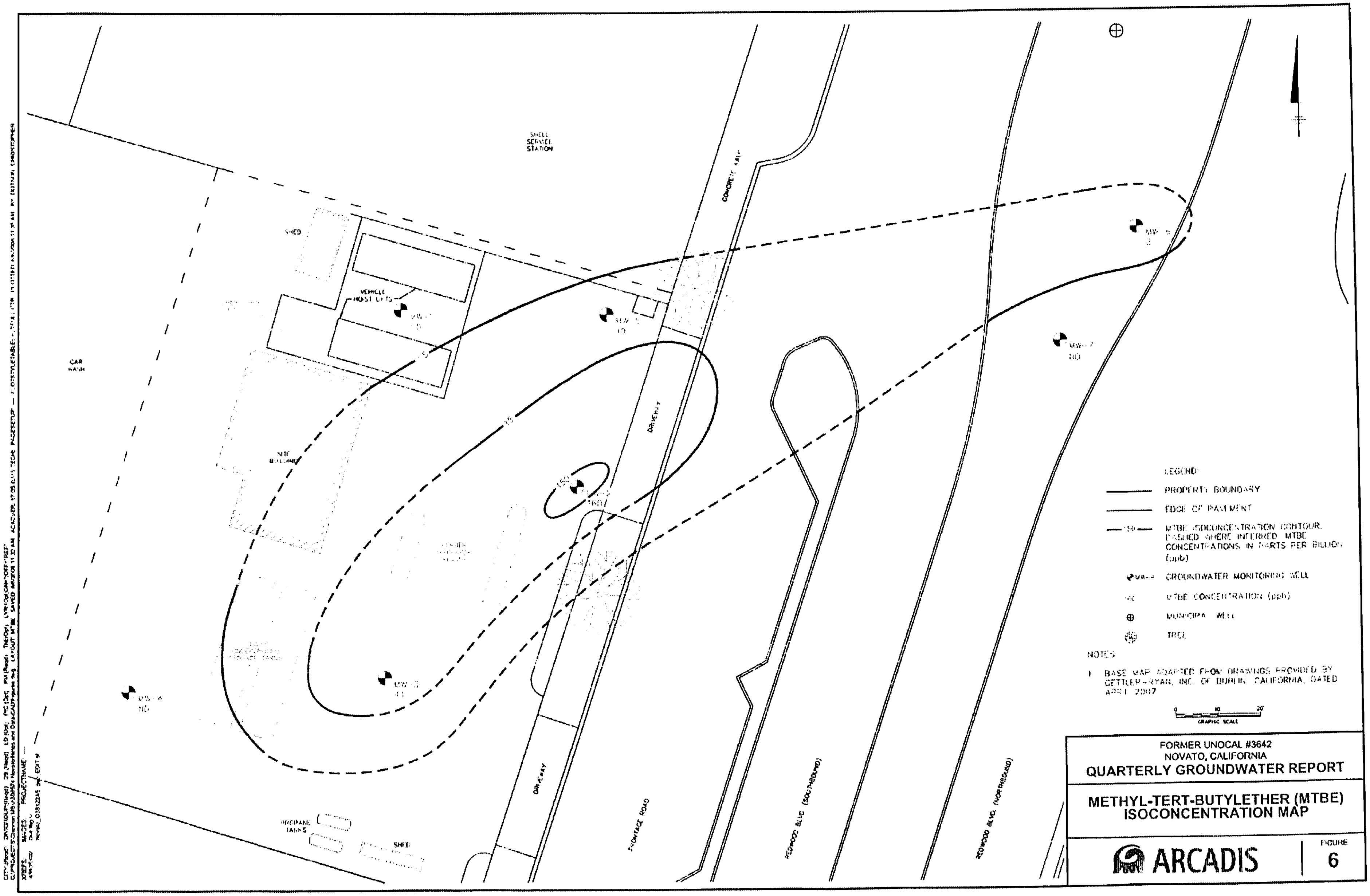


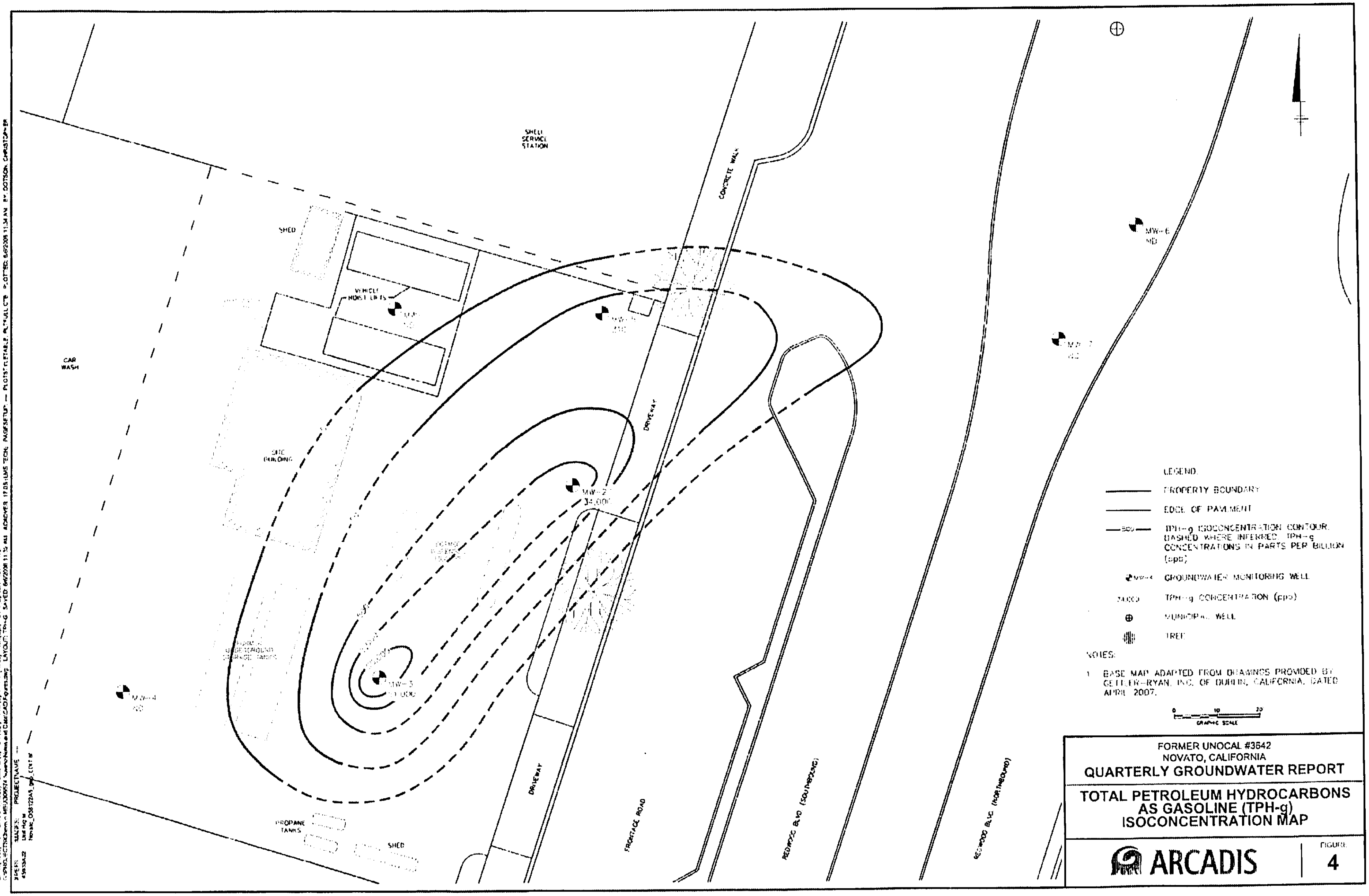
FORMER UNOCAL #3642
NOVATO, CALIFORNIA
QUARTERLY GROUNDWATER REPORT

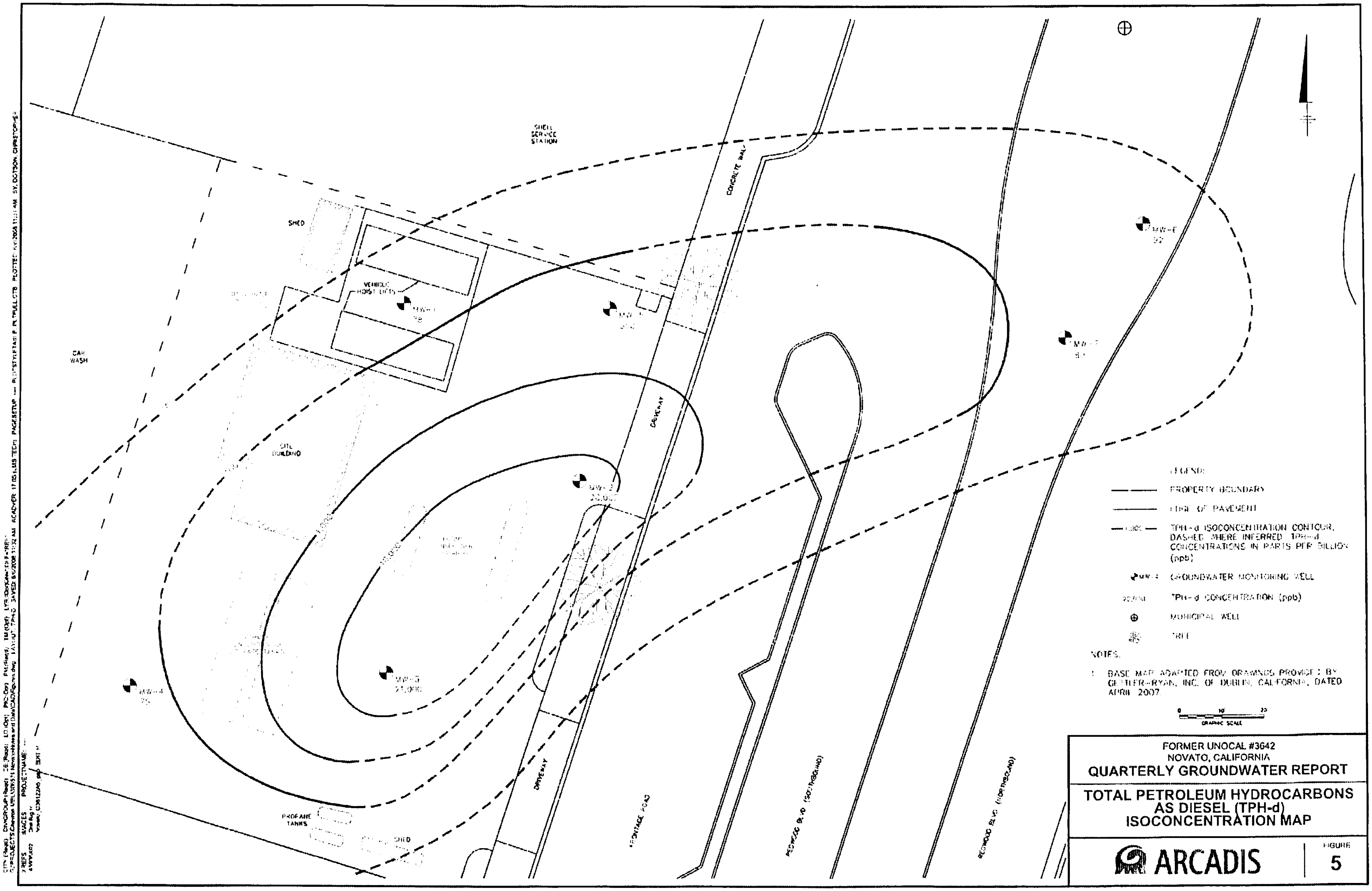
TOTAL BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES (BTEX) ISOCONCENTRATION MAP

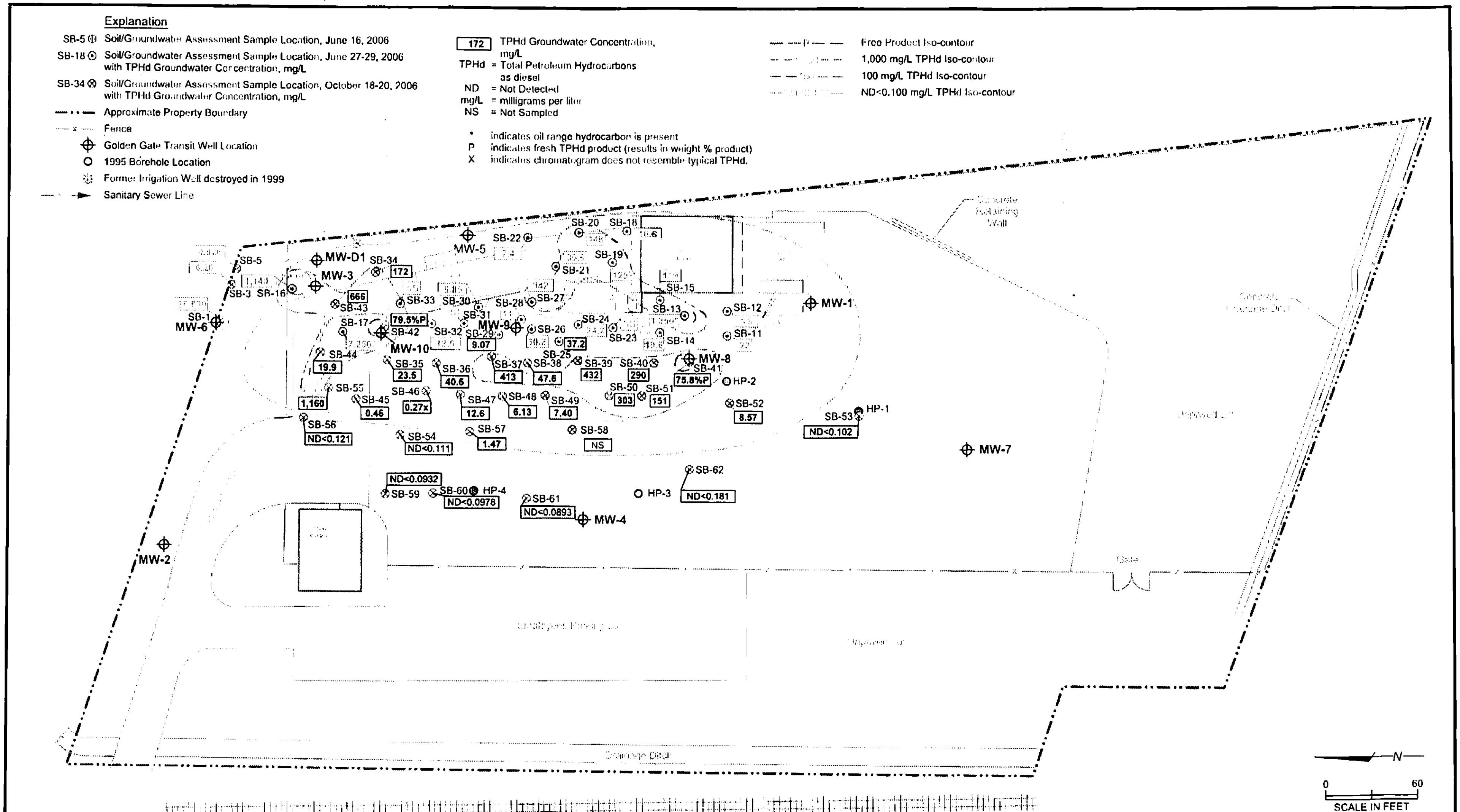
ARCADIS

FIGURE 7


SHELL SERVICE STATION
CAR WASH
SHED
VEHICLE HOIST LIFTS
SITE BUILDING
CONCRETE WAY
DRIVEWAY
FRONTAGE ROAD
REDWOOD BLVD. (SOUTHBOUND)
REDWOOD BLVD. (NORTHBOUND)
PROPANE TANKS
SHED
MW-4
ND
MW-7
ND
LEGEND
PROPERTY BOUNDARY
EDGE OF PAVEMENT
MTBE ISOCONCENTRATION CONTOUR, DASHED WHERE INFERRED. MTBE CONCENTRATIONS IN PARTS PER BILLION (ppb)
GROUNDWATER MONITORING WELL
MTBE CONCENTRATION (ppb)
MUNICIPAL WELL
TREE
NOTES
1 BASE MAP ADAPTED FROM DRAWINGS PROVIDED BY GETTLER-RYAN, INC. OF DUBLIN, CALIFORNIA, DATED APRIL 2007
0 10 20'
GRAPHIC SCALE
FORMER UNOCAL #3642
NOVATO, CALIFORNIA
QUARTERLY GROUNDWATER REPORT
METHYL-TERT-BUTYLETHER (MTBE) ISOCONCENTRATION MAP
ARCADIS
FIGURE
6


SHELL SERVICE STATION
CAR WASH
SHED
VEHICLE HOIST LIFTS
SITE BUILDING
CONCRETE WALK
DRIVEWAY
FRONTAGE ROAD
REDWOOD BLVD (SOUTHBOUND)
REDWOOD BLVD (NORTHBOUND)
PROPANE TANKS
MW-2
34,000
MW-3
MW-4
ND
MW-6
ND
LEGEND
PROPERTY BOUNDARY
EDGE OF PAVEMENT
TPH-g ISOCONCENTRATION CONTOUR, DASHED WHERE INFERRED. TPH-g CONCENTRATIONS IN PARTS PER BILLION (ppb)
GROUNDWATER MONITORING WELL
TPH-g CONCENTRATION (ppb)
MUNICIPAL WELL
TREE
NOTES:
1. BASE MAP ADAPTED FROM DRAWINGS PROVIDED BY GETTLER-RYAN, INC. OF DUBLIN, CALIFORNIA, DATED APRIL 2007.
GRAPHIC SCALE
FORMER UNOCAL #3642
NOVATO, CALIFORNIA
QUARTERLY GROUNDWATER REPORT
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-g) ISOCONCENTRATION MAP
ARCADIS
FIGURE
4


SHELL SERVICE STATION
SHED
CAR WASH
SITE BUILDING
VEHICLE HOIST LIFTS
CONCRETE WALL
DRIVEWAY
DRIVEWAY
FRONTAGE ROAD
PROPANE TANKS
SHED
MW-5
21,000
LEGEND:
PROPERTY BOUNDARY
EDGE OF PAVEMENT
TPH-d ISOCONCENTRATION CONTOUR, DASHED WHERE INFERRED. TPH-d CONCENTRATIONS IN PARTS PER BILLION (ppb)
GROUNDWATER MONITORING WELL
TPH-d CONCENTRATION (ppb)
MUNICIPAL WELL
TREE
NOTES:
1. BASE MAP ADAPTED FROM DRAWINGS PROVIDED BY GETTLER-RYAN, INC. OF DUBLIN, CALIFORNIA, DATED APRIL 2007.
0
10'
20'
GRAPHIC SCALE
FORMER UNOCAL #3642
NOVATO, CALIFORNIA
QUARTERLY GROUNDWATER REPORT
TOTAL PETROLEUM HYDROCARBONS AS DIESEL (TPH-d) ISOCONCENTRATION MAP
ARCADIS
FIGURE
5

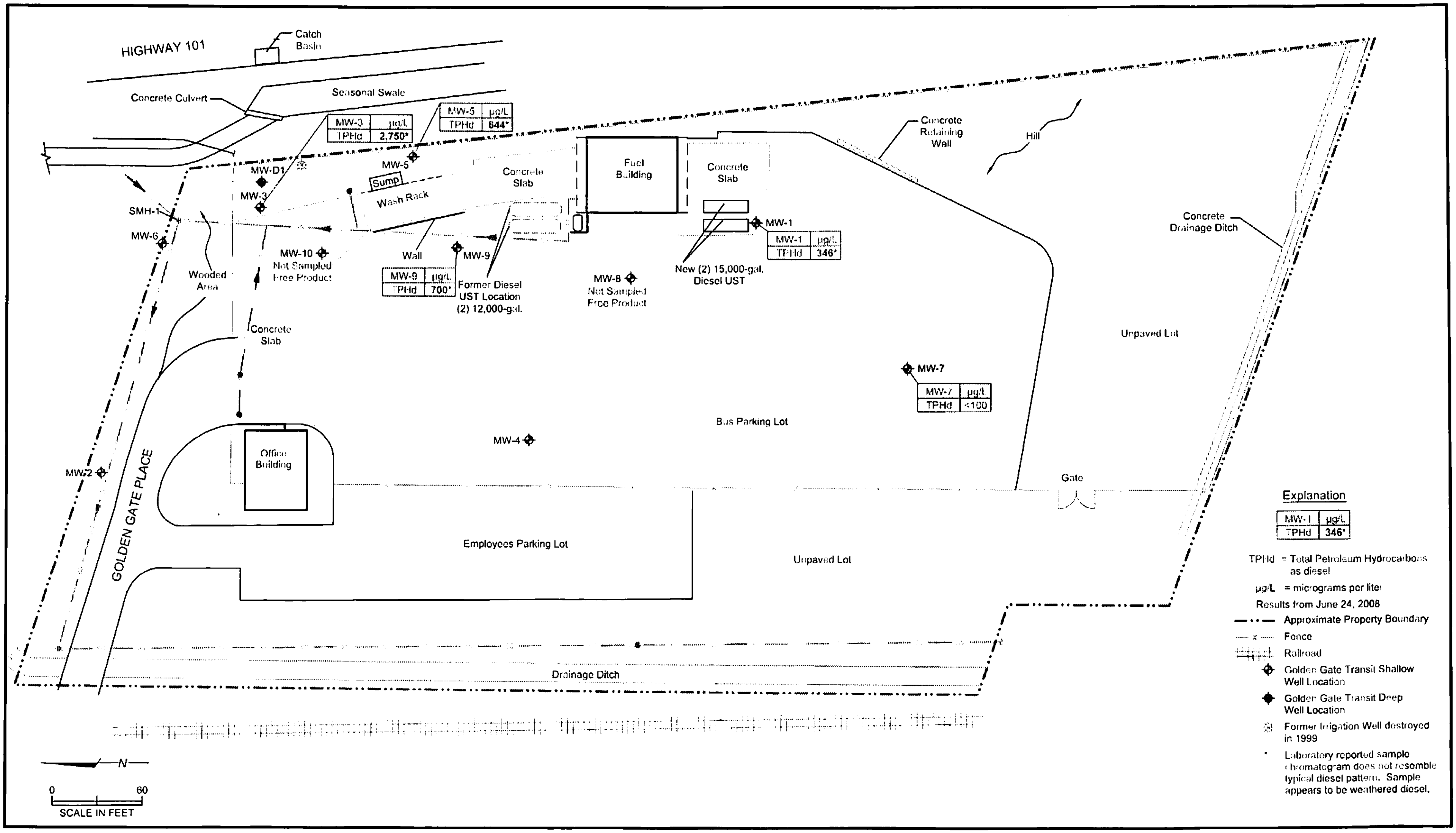


PES Environmental, Inc.
Engineering & Environmental Services

2006 TPHd Iso-concentration Groundwater Contours
Golden Gate Bridge Highway and Transportation District
Novato Bus Facility
801 Golden Gate Place
Novato, California

PLATE
4

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
272.005.01.030	272-00501030_Q2-08_4	SEG	9/08

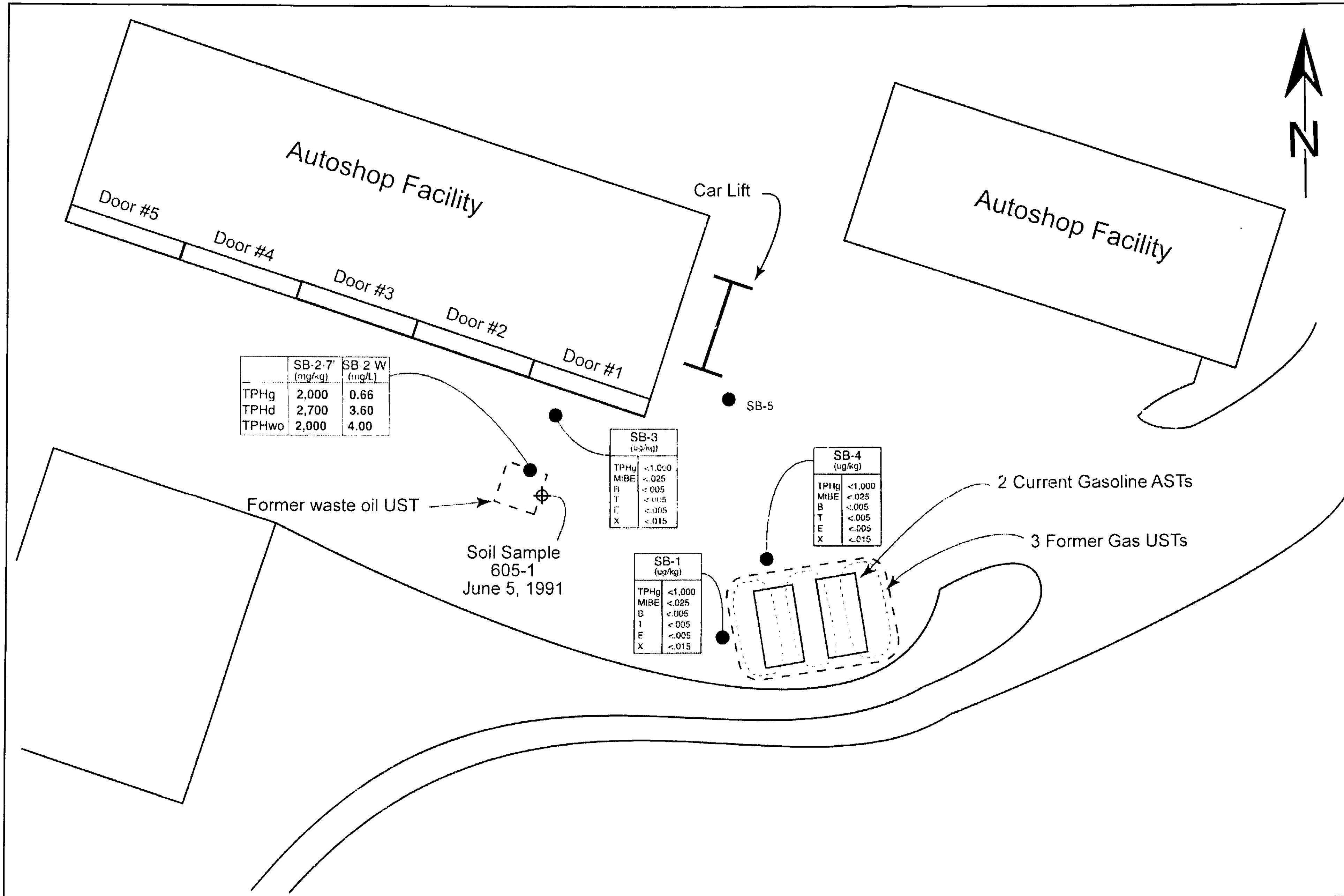


PES Environmental, Inc.
Engineering & Environmental Services

June 2008 TPHd Groundwater Concentrations
Golden Gate Bridge Highway and Transportation District
Novato Bus Facility
801 Golden Gate Place
Novato, California

PLATE
6

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
272.005.01.030	272-00501030_Q2-08_6	SEG	9/08



ERG Environmental Resource Group	**INDIAN VALLEY COLLEGE** **Auto Shop Yard** **Ignacio, California**	**Plate 2** Boring Locations and Soil & Ground Water Results

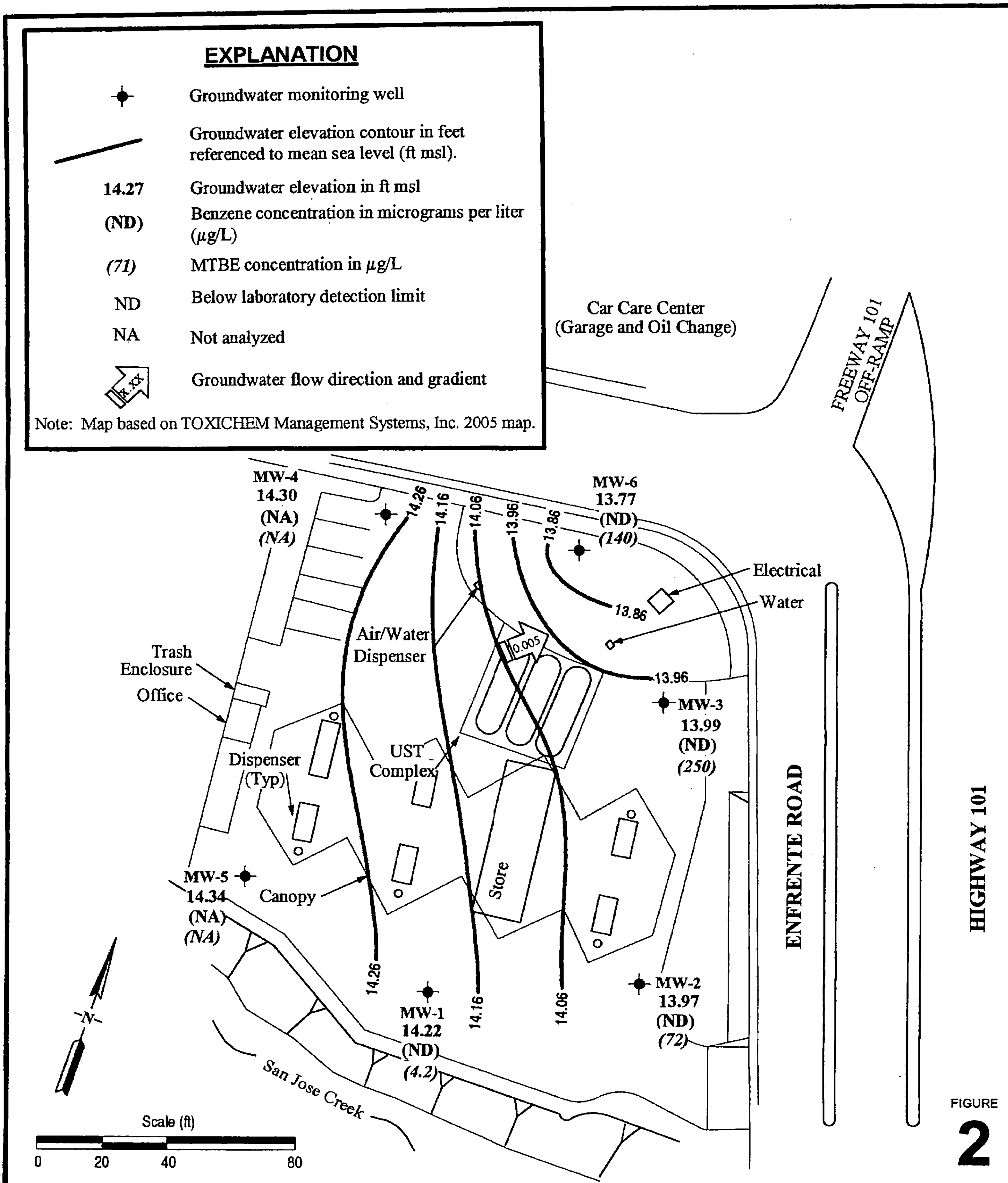


FIGURE
2

0995

Shell-branded Service Station
401 Enfrente Road
Novato, California

CONESTOGA-ROVERS & ASSOCIATES

Groundwater Contour and Chemical Concentration Map

June 10, 2008

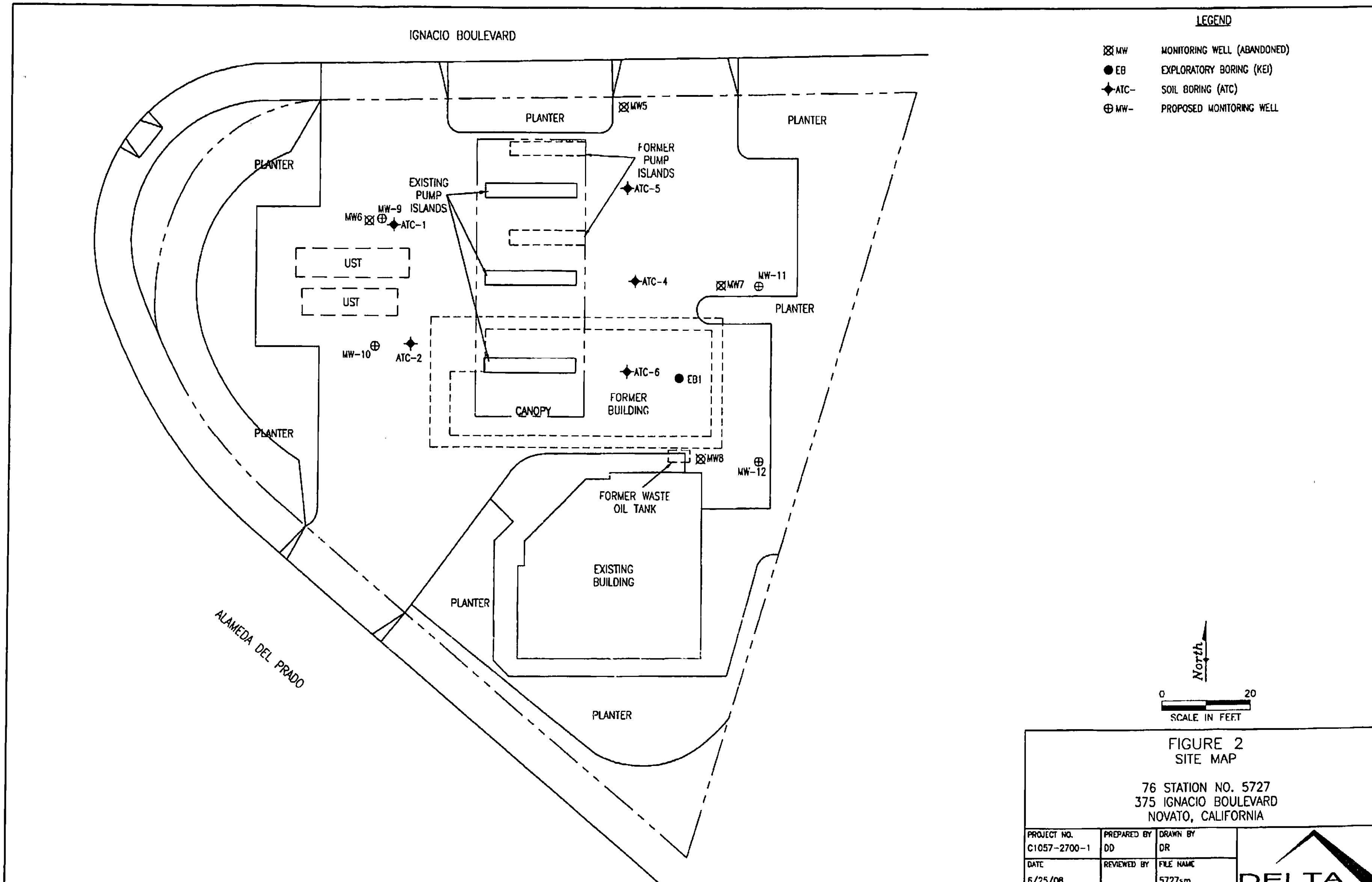
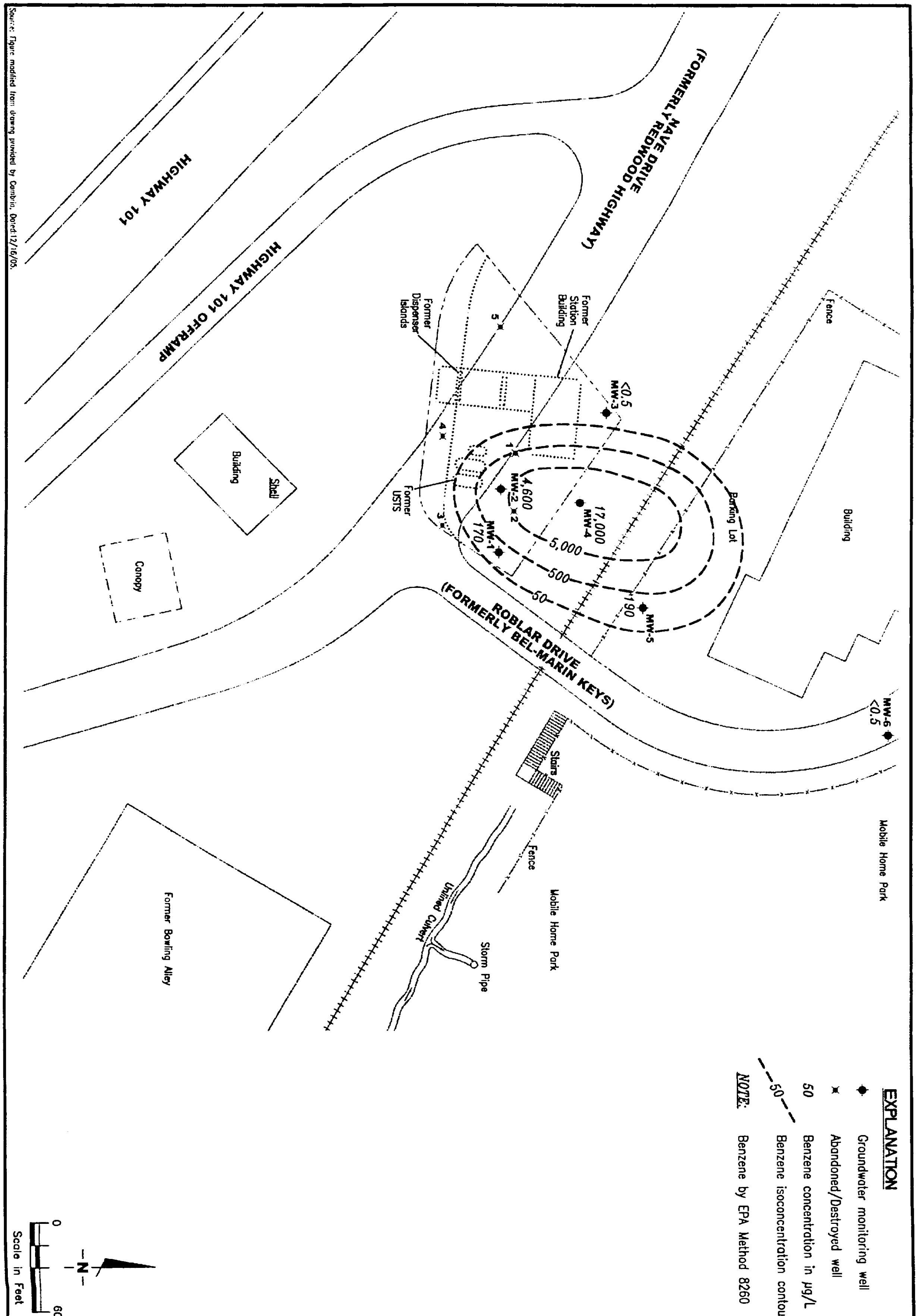


FIGURE 2
SITE MAP

76 STATION NO. 5727
375 IGNACIO BOULEVARD
NOVATO, CALIFORNIA

PROJECT NO.	PREPARED BY	DRAWN BY
C1057-2700-1	DD	DR
DATE	REVIEWED BY	FILE NAME
6/25/08		5727sm

DELTA



GETTLER - RYAN INC.

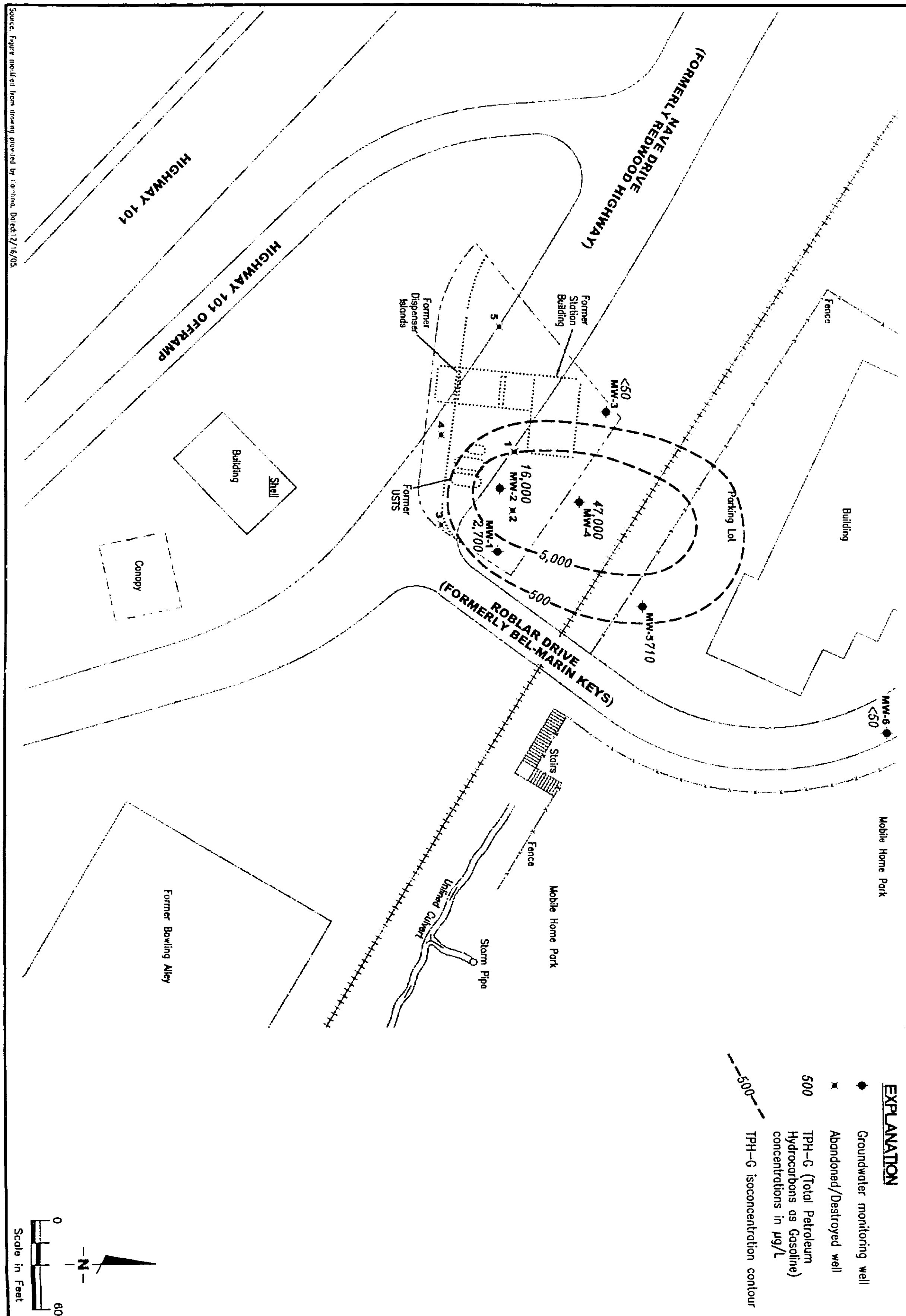
6747 Sierra Court, Suite J
Dublin, CA 94568 (925) 551-7555

BENZENE ISOCONCENTRATION MAP
Former Chevron Service Station #9-6151
5810 Nave Drive
Novato, California

FIGURE
3

PROJECT NUMBER	REVIEWED BY	DATE	REVISED DATE
386377		July 10, 2008	

FILE NAME: P:\Enviro\Chevron\9-6151\Q08-9-6151.dwg | Layout Tab: Benz3



GETTLER - RYAN INC.
6747 Sierra Court, Suite J
Dublin, CA 94568
(925) 551-7555

TPH-G ISOCONCENTRATION MAP
Former Chevron Service Station #9-6151
5810 Nave Drive
Novato, California

FIGURE
2

PROJECT NUMBER
386377

REVIEWED BY

DATE
July 10, 2008

REVISED DATE

FILE NAME: P:\Enviro\Chevron\9-6151\Q08-9-6151.dwg | Layout Tab: Tpng3

Appendix E

Noise Analysis

APPENDIX E

NOISE ANALYSIS

TABLE E-1 **Daily Noise Measurements at Selected Locations in Novato – December 2008**

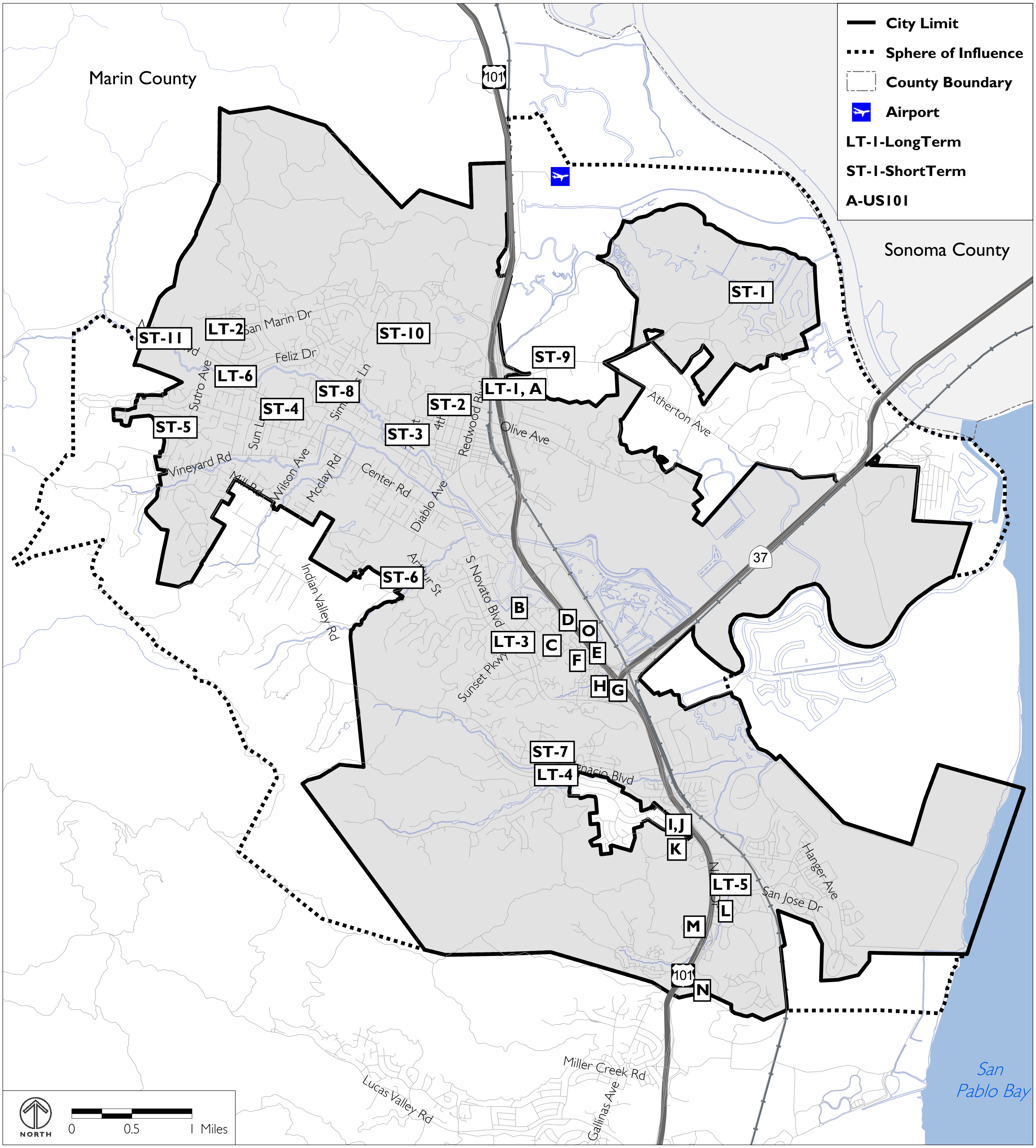
Location	Measured L_{dn}	Comments
LT-1) US 101	77	Reference measurement – 125 ft. from Highway 101 centerline
LT-2) San Marin Drive	67	Residential front yard – 55 ft. from road centerline
LT-3) South Novato Boulevard	69	Landscape frontage – 40 ft. from road centerline
LT-4) Ignacio Boulevard	61	Residential area – 55 ft. from road centerline
LT-5) Hamilton Field	63	End of Kelly Court south of Main Gate Road – 880 ft. from Highway 101 centerline
LT-6) Novato Boulevard	63	Miwok Park – 75 ft. from road centerline

TABLE E-2 **Short-Term Noise Measurements at Selected Locations in Novato – December 2008**

Location	Date Time	Measured L_{eq} (dBA)	Estimated L_{dn} (dBA)
ST-1) End of Topaz Drive at Bahia Recreation Center	12/11/08 4:00 p.m.	50	50
ST-2) 50 ft. from Olive Ave. centerline at 2nd St.	12/10/08 4:10 p.m.	60	60
ST-3) 50 ft. from Grant Ave. centerline in Marion Park	12/11/08 3:00 p.m.	62	62
ST-4) 25 ft. from So. Novato Blvd. Centerline at Olive Ave.	12/11/08 2:10 p.m.	69	69
ST-5) 25 ft. from Sutro Ave. centerline at Dominic Dr.	12/11/08 2:30 p.m.	62	63
ST-6) 100 ft. from Indian Valley Rd. centerline at Chamberlain Ave.	12/11/08 4:00 p.m.	62	62
ST-7) 45 ft. from Ignacio Blvd. Centerline	12/11/08 10:10 a.m.	64	64
ST-8) 45 ft. from Simmons Ave. centerline in Pioneer Park	12/11/08 1:50 p.m.	59	60
ST-9) 100 ft. from Atherton Ave. centerline at Sandalwood Dr.	12/12/08 10:00 a.m.	61	61
ST-10) 160 ft. from San Marin Dr. centerline at Sommerset Dr.	12/12/08 10:20 a.m.	64	65
ST-11) 65 ft. from Novato Blvd. Centerline at Sandy Creek Way	12/12/08 10:40 a.m.	60	61

TABLE E-3 **Noise Measurements Along U.S. Highway 101 – December 2008**

Location	**Date** Time	**Measured** **L_{eq}** (dBA)	**Estimated** **L_{dn}** (dBA)
A) Location representing LT-1 at-grade receptor height	12/10/08 11:10 a.m.	66	68
B) Redwood Blvd. At Cutlass Dr.	12/10/08 12:00 p.m.	62	64
C) Park Crest Ct. at Redwood Blvd.	12/10/08 12:40 p.m.	53	55
D) Oak Crest Ct. at Redwood Blvd.	12/10/08 12:40 p.m.	53	55
E) End of Village Circle	12/9/08 1:40 p.m.	59	61
F) End of Briarwood Ct.	12/10/08 1:30 p.m.	60	62
G) Inyo Circle behind sound wall	12/10/08 2:10 p.m.	58	60
H) Plumas Ct.	12/10/08 2:30 p.m.	69	71
I) Calle Arboleda	12/11/08 10:30 a.m.	67	70
J) Calle Arboleda at Novato Community Church	12/11/08 10:50 am.	59	62
K) End of Madrid Ct.	12/11/08 11:10 a.m.	63	66
L) Nave Dr. behind sound wall	12/11/08 11:40 a.m.	63	65
M) Rest area by Marin Independent Journal	12/11/08 12:05 p.m.	65	67
N) Marin Valley Dr.	12/11/08 12:30 p.m.	69	71
O) End of Redwood Blvd.	12/17/08 12:40 p.m.	64	66



Source: Illingworth & Rodkin, 2008

LOCATION OF NOISE MEASUREMENTS