2.3 Watershed Land Uses

New Alamo Creek watershed land uses are primarily urban and agricultural, with forested areas located in the less intensively developed upper parts of the watershed. **Table 1** presents the land use types and relative percentages within the watershed from the headwaters to Ulatis Creek. **Figure 10** illustrates the locations of the various land uses.

Table 1. Land uses within the New Alamo Creek watershed from the headwaters to Ulatis Creek.

Land Use Type	Area (square miles)	Percent Coverage (%)
Urban	8	18
Agriculture	25	57
Natural / Forest	11	25
Source: Multi-Source Land Cover Data; 100-meter resolution (California Department of Forestry & Fire Protection 2002)		

Land uses in the Ulatis Creek watershed are predominantly agricultural with some urban uses, and some forested and natural areas located in the upper parts of the watershed. **Table 2** presents the land use types and relative percentages within the watershed from the headwaters to Cache Slough.

Table 2. Land uses within the Ulatis Creek watershed from the headwaters to Cache Slough.

Land Use Type	Area (square miles)	Percent Coverage (%)
Urban	10	9
Agriculture	86	80
Natural / Headwater	14	11
Source: Multi-Source Land Cover Data; 100-meter resolution (California Department of Forestry & Fire Protection 2002)		

The flow from the New Alamo Creek watershed produces approximately 36% of the volume of runoff in the Ulatis Creek watershed, while Ulatis Creek and its tributaries generate the remaining 64% of the volume of runoff (Camp Dresser & McKee 1990).

A 2007 Solano County press release, as posted to the County's web site, stated that the total gross agricultural production of the 80-plus crops and commodities in 2006 was $233.5 million. Nursery stock retained its No. 1 ranking with a value of $47.9 million, followed by cattle and calves at $25.1 million and alfalfa at $23.3 million. In this release, Supervisor John Vasquez was quoted as stating: "... our farmers and ranchers consistently make such an incredible impact on our economy." It should be noted that these dollar figures do not reflect the total contribution agriculture makes to the economy of Solano County. Transportation, processing, marketing and other farm-related services substantially multiply these values to the benefit of the local economy.

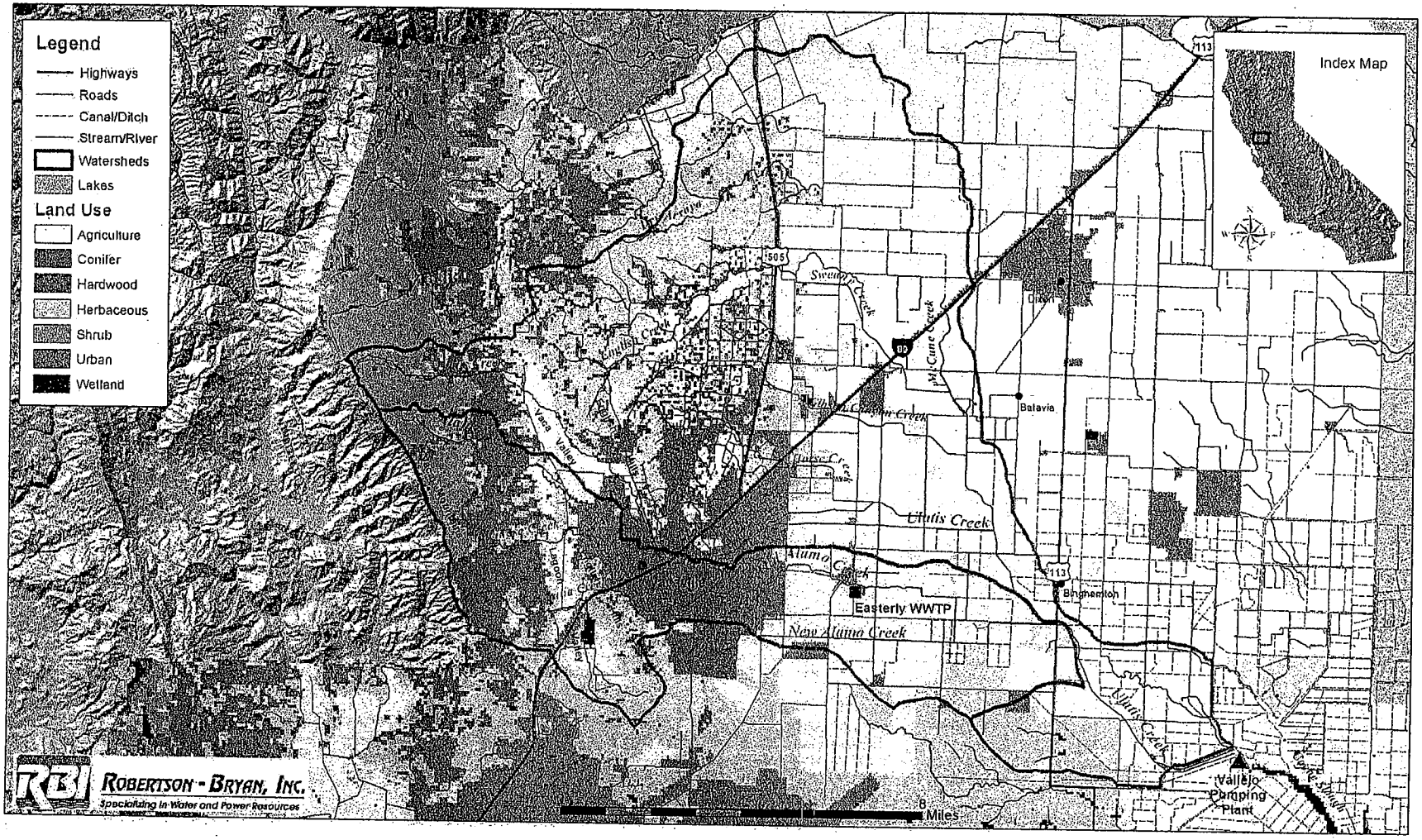

Figure 10. Land use categories in the New Alamo and Ulatis Creek watersheds.

2.4 Description of Point and Nonpoint Sources

The City of Vacaville operates the Easterly WWTP, which discharges treated municipal effluent to Old Alamo Creek, a tributary to New Alamo Creek. The Easterly WWTP has discharged wastewater effluent to the Alamo Creek system since 1959. Easterly WWTP is currently designed to discharge 15 million gallons per day (mgd), average dry weather flow (ADWF) and a peak wet weather flow of 55 mgd. Between 2020 and 2030, the City projects an expansion to 17.5 mgd, ADWF, and after 2030, a buildout expansion of 22 mgd, ADWF. Current flows are approximately 9 mgd, ADWF. Easterly WWTP disinfects the treated effluent with chlorine to inactivate pathogens that may be present in the wastewater. Trihalomethane (THM) compounds, a contaminant of concern in drinking water, are formed in the wastewater during the disinfection process. The WWTP also nitrifies the wastewater to reduce ammonia levels. The effluent discharged contains detectable levels of numerous constituents, including pathogens, THM compounds, and nitrate, which are regulated by the Regional Water Board through the facility's NPDES permit, and organic carbon (a THM precursor).

The Kinder-Morgan groundwater remediation project is another point source discharge within the New Alamo Creek watershed. The project discharges approximately 0.07 mgd of treated groundwater to Old Alamo Creek upstream of the Easterly WWTP. However, the discharge is such a low flow rate that very little water, if any, reaches New Alamo Creek. This is evidenced by the long periods of no flow in Old Alamo Creek upstream of the Easterly WWTP outfall (Tetra Tech 2004).

Nonpoint source contributions to New Alamo Creek and Ulatis Creek during the irrigation season include drainage water from agricultural lands within Solano Irrigation District and Maine Prairie Water District (**Figure 11 and Figure 12**), combined with a small amount of urban runoff (e.g., runoff from car washing and lawn watering). During the precipitation season, nonpoint source contributions consist of storm water runoff from the natural and forested areas in the upper watershed combined with runoff from the urban and agricultural lands within the lower watershed.

3 ANALYSIS METHODOLOGY

A UAA is a structured scientific assessment of the physical, chemical, biological, and economic factors affecting the attainment of a designated use (U.S. EPA 1994). This UAA evaluates whether MUN is an existing or attainable use for the segment of New Alamo Creek from its confluence with Old Alamo Creek downstream to Ulatis Creek, and the segment of Ulatis Creek, from its confluence with New Alamo Creek downstream to Cache Slough. A step-wise analysis was developed to provide the information upon which to base the decision as to whether MUN is and existing or attainable use within these water body segments. The evaluation is organized in a step-wise manner to answer the following key questions.

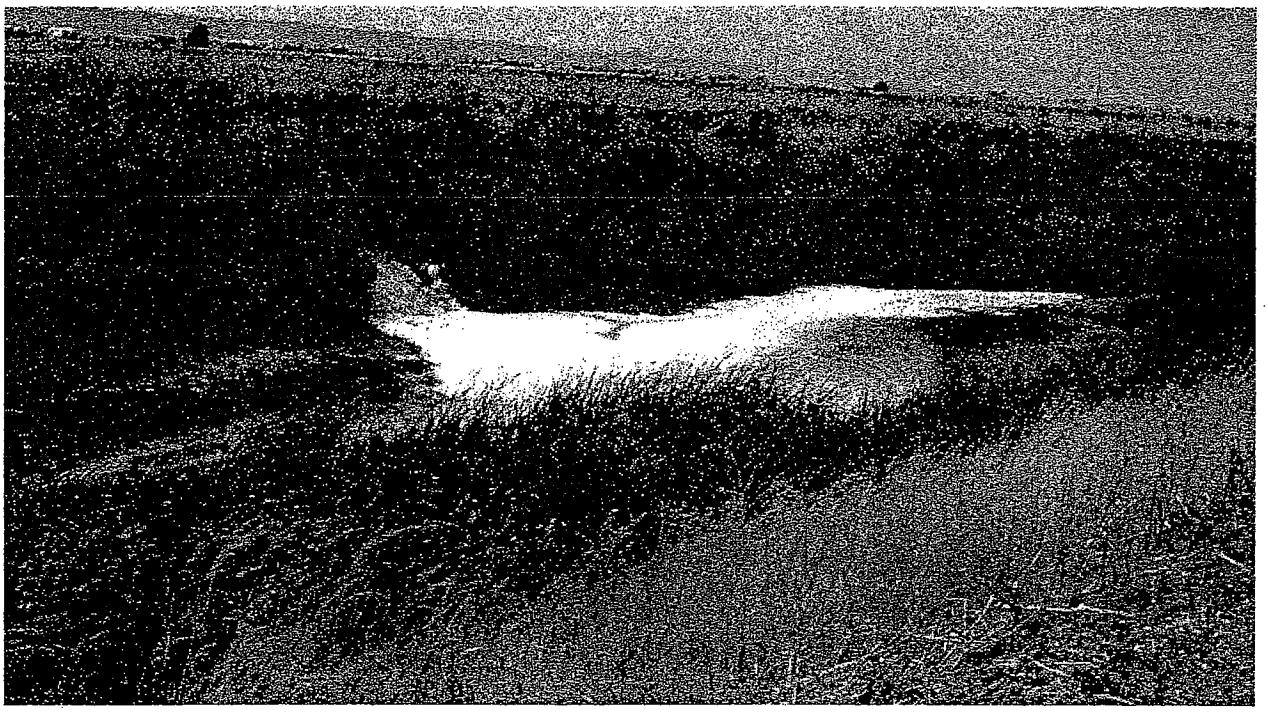

Figure 11. Agricultural return flow into Ulatis Creek between Maine Prairie Road and Brown Road.

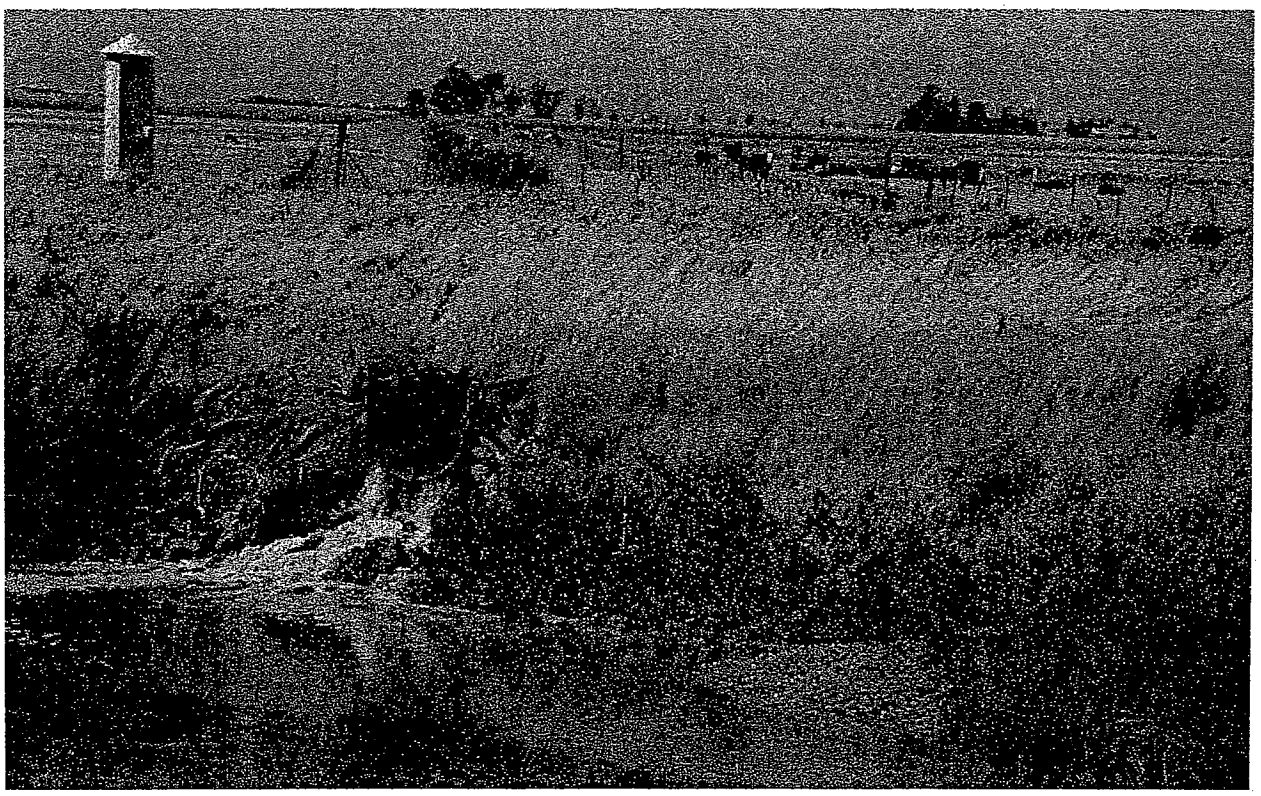

Figure 12. Agricultural return flow into Ulatis Creek upstream of Cache Slough.

1. **Is the MUN use an existing use?**

   a. Is the use currently occurring or has it occurred within the UAA study segments at any time since November 28, 1975?

   b. Has the water quality within the UAA study segments at any time since November 28, 1975 been sufficient to allow the use to occur?

   If the answer is "yes" to question "a" or "b," then the use has been attained and is considered to be an existing use (as defined in 40 CFR § 131.3) and, therefore, cannot be dedesignated.

   If the analysis determines the answer is "no" to both questions "a" and "b," then the use is not an existing use and thus could be dedesignated.

2. **Is the MUN use attainable?**

   Determine whether any of the CFR § 131.10(g) factors preclude the attainment of the use.

3. **Is restoration to an attainable use condition feasible?**

   If restoration to an attainable condition is reasonably feasible, consider restoration rather than use dedesignation.

   If restoration to an attainable condition is not reasonably feasible, address question #4.

4. **If MUN is not an attainable use, is a lesser type and degree of this use occurring or reasonably expected to occur?**

   If yes, dedesignate MUN and then define and designate the appropriate use that is occurring or expected to occur, and define appropriate criteria/objectives to protect that use.

   If no lesser type and degree of the use is occurring and is not reasonably expected to occur in the future, then dedesignate MUN.

The following sections discuss the considerations within each of these steps.

3.1 Step 1: Is MUN an Existing Use?

The first step in this UAA is to determine whether the MUN use has been attained within the defined water body segments since November 28, 1975 and, therefore, whether it is an existing use. A use is considered to be an existing use if either: a) the use has occurred at some time since November 28, 1975, or 2) conditions within the water body have been sufficient to allow the use to occur since November 28, 1975. An existing use cannot be dedesignated.

Information obtained from water rights record reviews; site inspections for physical evidence of diversions, past or present; and interviews with agency staff and local residents was compiled to provide a factual basis upon which to determine whether the use is presently occurring or has occurred since November 28, 1975. In addition, characteristics of the UAA study segments of New Alamo Creek and Ulatis Creek and the surrounding watersheds, including system hydrology, water quality and source water inputs, and surrounding land uses, were compiled and evaluated to determine whether historic water quality conditions in the study segments have been sufficient to allow the use to occur. The determination of whether the MUN is an existing use must include an evaluation of both actual occurrences of the use activity and whether or not the level of water quality necessary to support the use has been achieved at any time since November 28, 1975. If the level of water quality necessary to support MUN has been achieved within the UAA study segments since November 28, 1975, the use is considered an existing use and cannot be dedesignated. If MUN is not an existing use, then its present and future attainability is evaluated in the second step of the assessment.

3.2 Step 2: Is MUN an Attainable Use?

The second step in the UAA process is to evaluate the MUN use within the context of each 40 CFR § 131.10(g) factor (which may be used as a basis for removing a designated use) to determine whether the MUN use is attainable. The 40 CFR § 131.10(g) factors relevant to the UAA study segments are identified in **Table 3** and summarized below.

Table 3. Information elements evaluated in the UAA by category of 40 CFR § 131.10(g) factor.

Factor	Information Elements
Natural Water Quality (131.10(g)(1))	This factor is not applicable, because most of the flow originates from human-influenced sources.
Water Flow Conditions (131.10(g)(2))	• Seasonal sources of water to the segment. • Types and number of MUN diversions and other intake structures in the segments.
Human-made Water Quality Conditions (131.10(g)(3))	• Human sources of contamination of water quality in the segments.
Human-made Physical Alterations (131.10(g)(4))	• Modifications to channels to convey runoff from adjacent developed lands.
Natural Physical Conditions (131.10(g)(5))	This factor is not applicable, because it is relates to evaluating aquatic life uses, not the MUN use.
Economic Considerations (131.10(g)(6))	• Costs to publicly owned treatment works (POTWs) to upgrade treatment processes to meet current water quality standards.

Water Flow Conditions. Quantity and consistency of water flow are essential components to municipal and domestic water supply systems that provide water for drinking, cooking, bathing, and other domestic activities. Thus, typical flow patterns of the water body segments were evaluated.

Human-made Water Quality Conditions. Water quality conditions as a result of human impact can be traced to surrounding urban and agricultural land uses and associated point-source and nonpoint source loadings of constituents. For MUN, pathogen and contaminant concentrations are particularly relevant.

Human-made Physical Alterations. Engineered modifications to channels, including realignment and flow control structures to convey storm water runoff and agricultural drainage water, affect the source of the water in the channel available for MUN.

Economic Considerations. Implementation of water quality standards must consider the economic impact of their implementation. Thus, costs to publicly owned treatment works (POTWs) to meet discharge requirements based on water quality standards protective of the existing MUN beneficial use designation are presented.

This UAA compiled the characteristics of New Alamo Creek and Ulatis Creek and the surrounding watersheds, including system hydrology, water quality and source water inputs, and surrounding land uses to determine the factors that could preclude the attainment of the MUN use.

3.3 Step 3: Is Restoration to an Attainable Use Condition Feasible?

In Step 2 the factors that could preclude the MUN use from being attained are identified. In Step 3, these factors are then evaluated to assess whether reasonably feasible measures can be taken to allow the MUN use to occur. The ability to take actions to attain the MUN use considers the following:

- Water flow conditions,
- Human-made water quality conditions, and
- Human-made physical alterations.

Attainable uses are considered to be those that can be achieved through the implementation of reasonably feasible measures, not extreme measures. Thus, attainable uses are those that can be achieved: 1) when effluent limits under sections 301(b)(1)(A) and (B) and section 306 of the CWA are imposed on point source dischargers, and 2) when cost-effective and reasonable BMPs are imposed on nonpoint source dischargers. Extreme actions such as treatment of point and nonpoint source discharges well beyond that defined above, which may jeopardize the City of Vacaville's planned economic and social development or the viability of agriculture in the area, are not considered.

3.4 Step 4: If MUN is not Attainable, Is a Lesser Type and Degree of this Use Expected to Occur?

The final step of this UAA is to assess whether a lesser type and degree of thisuse is occurring or expected to occur in the future within the UAA study segments. A MUN use as defined in the

Basin Plan requires that the water body meet water quality criteria consisting of drinking water MCLs, and also meet CTR human health criteria for the consumption of water and organisms. These criteria are derived based on the assumption of consumption of 2 liters of water per day over the course of a 70-year lifetime. It is possible that a water body could be used for domestic supply at a lesser rate of water consumption, perhaps in a transient nature, or only for the purpose of non-consumptive household uses, such as bathing and indoor/outdoor household cleaning activities. The likelihood that area municipalities or residents living along the UAA study segments of New Alamo Creek and Ulatis Creek would construct systems to divert and treat this water for any form of municipal or domestic water supply use is evaluated. Determination of the availability of alternative, higher quality water supplies for municipal and domestic use in the area is a key aspect of this assessment.

Section 4 (Data Collection) identifies the information and data collected and compiled to support the necessary assessments needed to address the questions outlined in this UAA assessment methodology outlined above. These evaluations are presented in Section 5 (Evaluation of MUN Attainability), which provide the technical basis from which to make conclusions and recommendations, which are presented in Section 7 of this UAA.

4 DATA COLLECTION

Data were compiled and studies conducted to characterize the hydrologic conditions in the UAA study segments, document existing and historical municipal and domestic water uses, characterize the seasonal sources of flows, and characterize the water quality.

4.1 Hydrologic Conditions

The City of Vacaville operates a system of stream gauging stations with calibrated rating curves that are operated to measure storm runoff and the recording period is dependent on the precipitation forecast. Data from two locations were used to characterize stream flows in New Alamo Creek and Ulatis Creek. Vacaville-V4 is located on New Alamo Creek at Vanden Road, and Vacaville-V3 is located on Ulatis Creek at Leisure Town Road. The period of record is water years 1998-2006.

Additional stream flow data were collected by the City of Vacaville for New Alamo Creek at Fry Road (UAA2) and Ulatis Creek at Brown Road (UAA3) using acoustic Doppler meters. The period of record is October 2005 to May 2007 for the Fry Road (UAA2) gauge and July 2004 to May 2007 for the Brown Road (UAA3) gauge.

Figure 13 shows the location of the gauging stations on New Alamo Creek and Ulatis Creek.

The hydrological and physical characteristics of the UAA study segments are described in *Use Attainability Analysis for New Alamo Creek and Ulatis Creek, Technical Memorandum No. 1, Hydrological and Physical Characteristics of Alamo Creek, Ulatis Creek, and Cache Slough* (RBI 2007a).

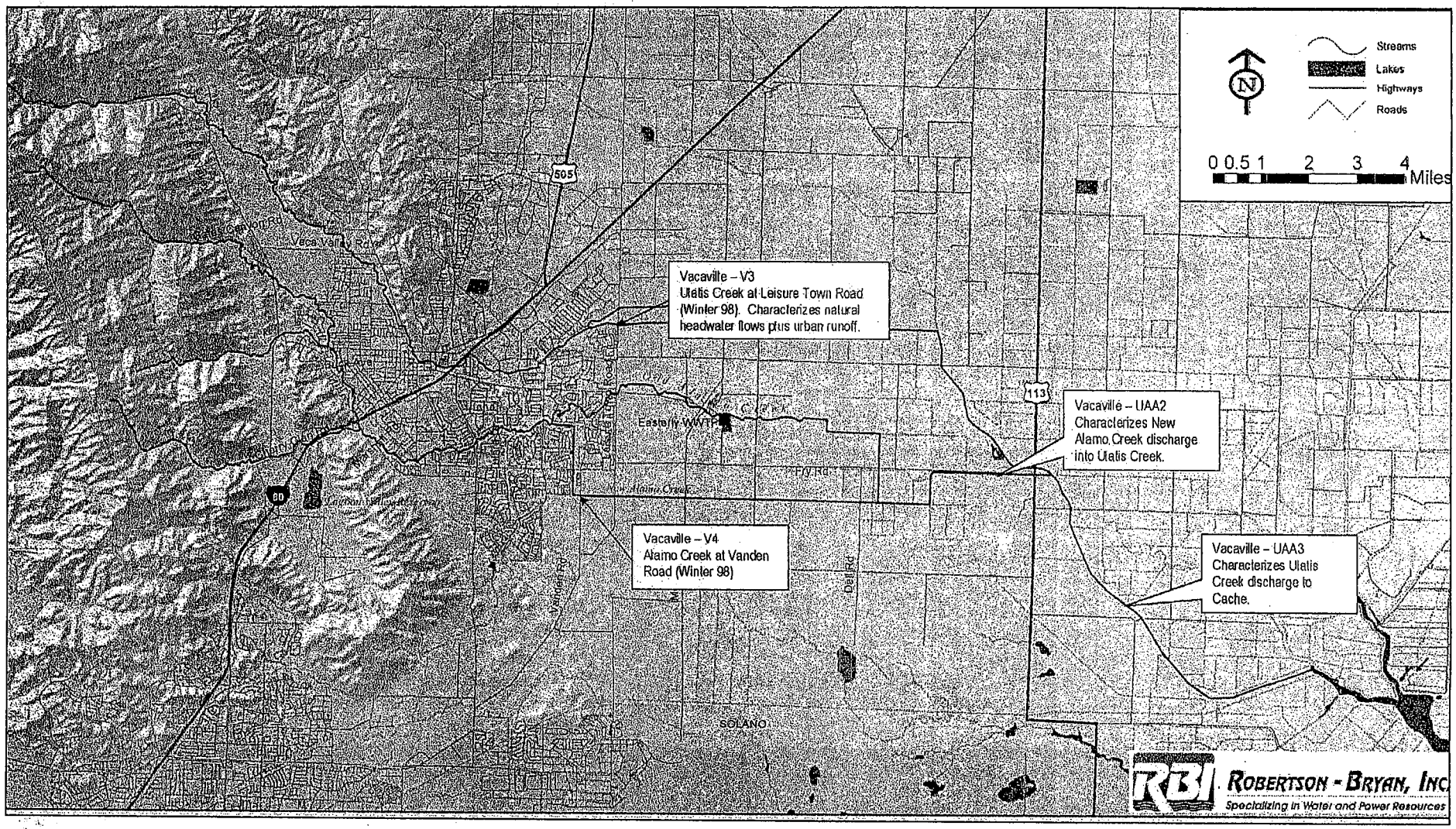

Figure 13. Stream gauge locations.

4.2 Existing and Historical Drinking Water Uses

Existing and historical drinking water uses were determined through a search of water rights records, a physical survey of the UAA study segments for diversion systems, and interviews with agency and City of Vacaville staff and local residents. The State Water Board's Water Rights Division performed a water rights search of the Ulatis Creek watershed to identify all permitted/licensed surface water rights in 2004 (State Water Board 2004). In July 2007, Robertson-Bryan, Inc. performed a follow-up search, by accessing the online database of water rights (WRIMS 2007), to identify any new water rights in the Ulatis Creek watershed during the period 2004-June 2007.

Physical surveys of the UAA study segments were conducted on June 23, and July 8, 27, and 28, 2004 with a follow up survey on July 5, 2007. The creeks were surveyed for pipes and pumps that would indicate an existing or historical diversion of water to an adjacent home for domestic use.

The findings from this research are presented in *Use Attainability Analysis for New Alamo Creek and Ulatis Creek, Technical Memorandum No. 2, Existing Municipal and Domestic Uses of Alamo Creek, Ulatis Creek, and Cache Slough* (RBI 2007b).

4.3 Easterly WWTP Effluent Dilution

Flow Science, Inc. performed field studies to evaluate the fate and dilution of Easterly WWTP effluent within the UAA study segments under a range of seasonal conditions. Dilution studies were conducted using two tracers (rhodamine WT and lithium) in November 2003 (dry conditions, no irrigation), in March 2004 (wet season, no irrigation), and in July 2004 (dry season, significant irrigation). Two tracers were used so that the rate of rhodamine dye loss (dye decay) over time could be estimated, and to improve the accuracy of the estimated effluent dilution ratios at various points throughout the system. Concentrations and mass fluxes of the two tracers were measured at various locations within the creek system and within Cache Slough, to which Ulatis Creek is tributary. Field study results include effluent concentrations throughout the system and estimates of dye decay rates.

Dye loss results from these studies also were used to adjust and interpret results from a 1990-1991 rhodamine dye study conducted by the City of Vacaville. The 1990-1991 studies measured rhodamine concentrations within Cache Slough (but not within the creek system), and these studies did not directly account for dye loss due to either dye decay or effluent pump out within the system over the period of time that dye concentrations were monitored. Results from the new tracer dilution studies, coupled with adjusted results from the 1990-1991 dye study, were used to estimate the seasonal proportion of flow in the system that consists of Easterly WWTP effluent.

This study is described in *Technical Memorandum No. 3, Easterly Wastewater Treatment Plant Effluent Dilution Analysis in Support of Potential Basin Plan Amendments for Defined Reaches of New Alamo Creek, Ulatis Creek and Cache Slough, Solano County, California* (Flow Science 2005).